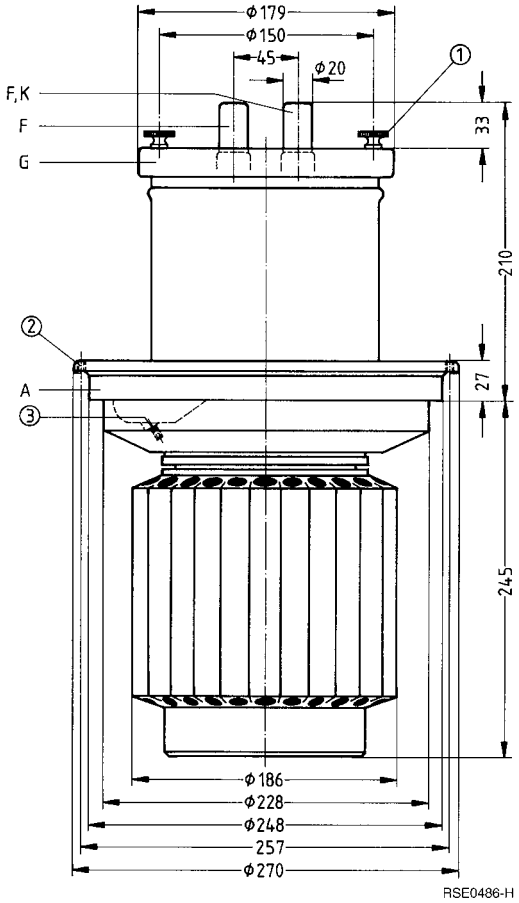
For frequencies up to 30 MHz Ordering code Q53-X2001

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



Dimensions in mm

① 4 tapholes M5 (4 × 90°)
② Taphole M6 for screw-in handle RöZub201K
③ Taphole M5 for tube fuse RöSich4

Approx. weight 34 kg

Heating

Heater voltage	U_F	18	V
Heater current	I_F	≈ 164	A
Heating: direct			
Cathode: thoriated tungsten			

Characteristics

Emission current at $U_A = U_G = 750$ V	I_{em}	125	A
Amplification factor at $U_A = 4$ to 10 kV, $I_A = 5$ A	μ	50	
Transconductance at $U_A = 4$ kV, $I_A = 5$ A	s	110	mA/V

Capacitances

Cathode/grid	c_{kg}	≈ 170	pF
Cathode/anode	c_{ka}	≈ 4,0	pF [1])
Grid/anode	c_{ga}	≈ 68	pF

Accessories		**Ordering code**
Mounting instruction	RöMo14	
Mounting instruction	RöMo25	
Cathode connecting strip (2 for each tube)	RöKat41	Q81-X1141
Socket wrench for tube fuse	RöZub10	Q81-X2110
Handle	RöZub201K	Q81-X2151
Tube fuse	RöSich4	Q81-X1404
Pull switch for tube fuse	RöKt11	Q81-X1311
Boiler	RöKüV201	Q81-X1671
Union at water inlet	RöKüV41Zub7	Q81-X1647
Insulating pipe at vapor outlet	RöKüV201Zub3	Q81-X1673
Insulating pipe at water inlet	RöKüV201Zub4	Q81-X1675
Insulator	RöKüV201Zub5K	Q81-X1676
Gasket at vapor outlet	RöKüV201Zub8	Q81-X1678
Water level stabilizer with control electrodes	RöZubV4	Q81-X2105
LL electrolytic target	RöEl23	C65055-A667-A23
Gasket ring for boiler	RöN9355	C65051-A201-C531

1) Measured by means of a 40 cm × 40 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	30	30	A
Peak cathode current	$I_{K M}$	100	100	A
Anode dissipation	P_A	110	110	kW
Grid dissipation	P_G	2,0	2,0	kW

Operating characteristics

Frequency	f	≤ 10	≤ 10	≤ 30	≤ 30	MHz
Output power	P_2	220	150	140	100	kW [1]
Anode voltage (dc)	U_A	15	15	12	12	kV
Grid voltage (dc)	U_G	– 300	– 285	– 230	– 230	V
Peak grid voltage (ac)	$U_{g m}$	730	605	600	515	V
Zero signal anode current (dc)	$I_{A 0}$	0,8	1,0	1,0	1,0	A
Anode current (dc)	I_A	21	13,7	16	11,5	A [2]
Grid current (dc)	I_G	3,32	2,2	2,9	1,95	A
Anode input power	$P_{B A}$	315	206	192	138	kW
Drive power	P_1	2,17	1,3	1,6	0,95	kW [1]
Anode dissipation	P_A	95	56	52	38	kW
Grid dissipation	P_G	1,17	0,65	0,95	0,5	kW
Efficiency	η	70	73	73	72,5	%
Anode load resistance	R_A	445	700	475	660	Ω

1) Circuit losses are not included.
2) Modulated anode current.

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	30	30	A
Peak cathode current	$I_{K M}$	100	100	A
Anode dissipation	P_A	110	110	kW
Grid dissipation	P_G	2,0	2,0	kW

Operating characteristics

Frequency	f	≤ 10	≤ 30	≤ 30	MHz
Output power	P_2	200	165	110	kW [1)]
Anode voltage (dc)	U_A	14	12	10	kV
Grid voltage (dc)	U_G	– 650	– 600	– 500	V
Peak grid voltage (ac)	$U_{g m}$	1150	1100	925	V
Anode current (dc)	I_A	17,6	17,1	13,8	A
Grid current (dc)	I_G	3,8	4,0	3,4	A
Anode input power	$P_{B A}$	247	205	138	kW
Drive power	P_1	4,0	4,0	2,9	kW [1)]
Anode dissipation	P_A	47	40	28	kW
Grid dissipation	P_G	1,55	1,6	1,2	kW
Efficiency	η	81	80,5	80	%
Anode load resistance	R_A	442	387	393	Ω

1) Circuit losses are not included.

Anode voltage modulation,
constant RF grid ac voltage, 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	20	A
Peak cathode current	$I_{K\,M}$	125	A
Anode dissipation	P_A	110	kW
Grid dissipation	P_G	2,0	kW

Operating characteristics

Frequency	f	≤ 30	≤ 30	MHz
Carrier power	P_{trg}	100	66	kW 1)
Anode voltage (dc)	U_A	11	10	kV
Grid bias (dc), fixed	$U_{G\,fix}$	– 200	– 195	V
Grid resistance	R_G	70	80	Ω
Peak grid voltage (ac)	$U_{g\,m}$	960	785	V
Anode current (dc)	I_A	11,4	8,5	A
Grid current (dc)	I_G	4,7	3,2	A
Anode input power	$P_{B\,A}$	125	85	kW
Drive power	P_1	4,3	2,3	kW 1)
Anode dissipation	P_A	25	19	kW 2)
Grid dissipation	P_G	1800	850	W
Efficiency	η	80	77,5	%
Anode load resistance	R_A	600	765	Ω
Modulation factor	m	100	100	%
Modulation power	P_{mod}	62,5	42,5	kW
Grid current (dc)	I_G	4,8	4,0	A 3)
Drive power	P_1	4,2	3,0	kW 1) 3)
Grid current (dc)	I_G	3,7	2,6	A 4)
Drive power	P_1	3,4	1,9	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 plate 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.

Anode voltage modulation,
50 % modulated driver stage, 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	20	A
Peak cathode current	$I_{K\,M}$	125	A
Anode dissipation	P_A	110	kW
Grid dissipation	P_G	2,0	kW

Operating characteristics

Frequency	f	≤ 30	MHz
Carrier power	P_{trg}	110	kW [1]
Anode voltage (dc)	U_A	11	kV
Grid bias (dc), fixed	$U_{G\,fix}$	– 200	V
Grid resistance	R_G	190	Ω
Peak grid voltage (ac)	$U_{g\,m}$	1200	V
Anode current (dc)	I_A	12	A
Grid current (dc)	I_G	3,1	A
Anode input power	$P_{B\,A}$	132	kW
Drive power	P_1	3,4	kW [1]
Anode dissipation	P_A	22	kW [2]
Grid dissipation	P_G	0,96	kW
Efficiency	η	83	%
Anode load resistance	R_A	500	Ω
Modulation factor	m	100	%
Modulation power	P_{mod}	66	kW
Grid dissipation at modulation	$P_{G\,mod}$	1,32	kW [3]
Peak grid voltage (ac)	$U_{g\,m}$	1800	V [4]
Grid current (dc)	I_G	5,1	A [4]
Drive power	P_1	8,7	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 plate dissipation increases to about 1,5 times the power dissipation stated for the carrier value.
3) Average value at m = 100 %.
4) Maximum values at peak modulation.

Anode voltage modulation,
50 % modulated driver stage, 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	20	A
Peak cathode current	$I_{K\,M}$	125	A
Anode dissipation	P_A	110	kW
Grid dissipation	P_G	2,0	kW

Operating characteristics

Frequency	f	≤ 30	MHz
Carrier power	P_{trg}	110 + 12,6 [2]	kW [1]
Anode voltage (dc)	U_A	11	kV
Grid bias (dc), fixed	$U_{G\,fix}$	– 200	V
Grid resistance	R_G	190	Ω
Peak grid voltage (ac)	$U_{g\,m}$	1200	V
Anode current (dc)	I_A	12	A
Grid current (dc)	I_G	3,1	A
Anode input power	$P_{B\,A}$	132	kW
Drive power	P_1	3,4 + 12,6 [2]	kW [1]
Anode dissipation	P_A	22	kW [3]
Grid dissipation	P_G	0,96	kW
Efficiency	η	83	%
Anode load resistance	R_A	560	Ω
Modulation factor	m	100	%
Modulation power	P_{mod}	66	kW
Grid dissipation at modulation	$P_{G\,mod}$	1,32	kW [4]
Peak grid voltage (ac)	$U_{g\,m}$	1800	V [5]
Grid current (dc)	I_G	5,1	A [5]
Drive power	P_1	8,7 + 38 [2]	kW [1] [5]
Anode dissipation at modulation	$P_{A\,mod}$	33	kW

1) Circuit losses are not included.
2) Power transition of the 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 plate dissipation increases to about 1,5 times the power dissipation stated for the carrier value.
4) Average value at m = 100 %.
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	– 800	V
Cathode current (dc)	I_K	25	A
Peak cathode current	$I_{K\,M}$	80	A
Anode dissipation	P_A	110	kW
Grid dissipation	P_G	2,0	kW

Operating characteristics at modulator operation for

		300 kW carrier power		200 kW carrier power		
Output power	P_2	0	230	0	155	kW
Anode voltage (dc)	U_A	11	11	8,0	8,0	kV
Grid voltage (dc)	U_G	– 200	– 200	– 160	– 160	V
Peak control grid voltage (ac) between the 2 tubes	$U_{gg\,m}$	0	1060	0	950	V
Anode current (dc)	I_A	2×2	$2 \times 15{,}1$	$2 \times 1{,}2$	$2 \times 14{,}3$	A
Grid current (dc)	I_G	0	$2 \times 2{,}6$	0	$2 \times 2{,}6$	A
Peak grid current	$I_{G\,M}$	0	2×13	0	2×13	A
Anode input power	$P_{B\,A}$	2×22	2×166	$2 \times 9{,}6$	2×114	kW
Drive power	P_1	0	$2 \times 1{,}3$	0	$2 \times 1{,}2$	kW
Anode dissipation	P_A	2×22	2×51	$2 \times 9{,}6$	$2 \times 36{,}5$	kW
Grid dissipation	P_G	0	2×780	0	2×750	W
Efficiency	η	–	69,3	–	68	%
Effective load resistance (anode to anode)	R_{AA}	–	870	–	670	Ω

Tube mounting

Axis vertical, anode down.

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

For connecting the grid, M5 tapholes are provided at the grid terminal ring; knurled head screws are included in delivery.

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. At f > 10 MHz an equally distributed slight air stream on the grid connector ring and the cathode terminal pins is required.

Vapor cooling

Cooling data for maximum anode dissipation	$P_{A\,max}$ = 110 kW
Total power to be dissipated by the cooling system ($P_A + P_G + 0{,}8\ P_F$)	114,5 kW
Equivalent thermal output	6860 kJ/min (1640 kcal/min)
Flow rate of returning water	
at returning water temperature of 20 °C	approx. 2,7 l/min
at returning water temperature of 90 °C	approx. 3,1 l/min
Volume of generated vapor	
at returning water temperature of 20 °C	approx. 4,5 m^3/min
at returning water temperature of 90 °C	approx. 5,1 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 — — — — — — — —