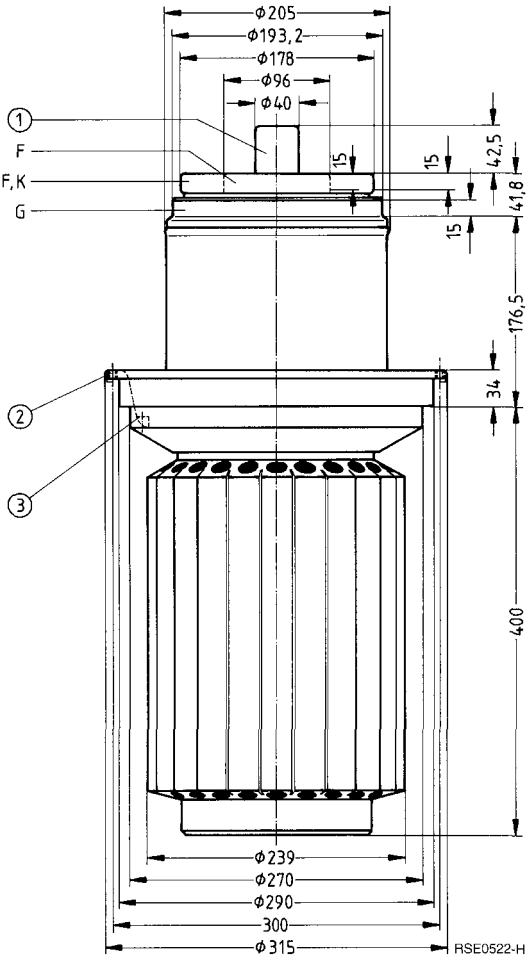
Ordering code Q53-X2041

Coaxial triode in metal-glass-ceramic technology, vapor-cooled, suitable for broadcast transmitters up to 300 kW medium and short wave, for modulators in transmitters up to 600 kW and for RF amplifiers up to 600 kW/up to 30 MHz.



Dimensions in mm

① Do not use as terminal
② Taphole M8 for screw-in handle RöZub41V
③ Taphole M5 for tube fuse RöSich4

Approx. weight 66 kg

Heating

Heater voltage	U_F	21	V
Heater current	I_F	≈ 400	A
Heating: direct			
Cathode: thoriated tungsten			

Characteristics

Emission current at $U_A = U_G = 1000$ V	I_{em}	380	A
Amplification factor at $U_A = 4$ to 10 kV, $I_A = 10$ A	μ	35	
Transconductance at $U_A = 4$ kV, $I_A = 10$ A	s	215	mA/V

Capacitances

Cathode/grid	c_{kg}	≈ 330	pF
Cathode/anode	c_{ka}	≈ 6,5	pF [1]
Grid/anode	c_{ga}	≈ 135	pF

Accessories		**Ordering code**
Mounting instruction	RöMo104	
Mounting instruction	RöMo105	
Cathode terminal	RöKat202	C65055-A805-A61
Cathode connecting strip (4 for each tube)	RöKat221	Q81-X1136
Grid terminal	RöGit202b	Q81-X953
MW header socket without blocking	RöKpf241MO	Q81-X1843
Socket wrench for tube fuse	RöZub10	Q81-X2110
Handle	RöZub41V	Q81-X2141
Tube fuse	RöSich4	Q81-X1404
Pull switch for tube fuse	RöKt11	Q81-X1311
Boiler	RöKüV241	Q81-X1691
Insulating pipe at vapor outlet	RöKüV241Zub3	Q81-X1693
Insulating pipe at water inlet	RöKüV241Zub4	Q81-X1694
Insulator	RöKüV241Zub5K	Q81-X1695
Union at water inlet	RöKüV241Zub7	Q81-X1697
Gasket at vapor outlet	RöKüV241Zub8	Q81-X1698
Water level stabilizer with control electrodes	RöZubV4	Q81-X2105
Grid and cathode terminals with protective gaps (complete set)	RöKG241	Q81-X1001
LL electrolytic target	RöEl24	C65055-A667-A24
Gasket ring for boiler	RöN9374	C65051-A202-C553

1) Measured by means of a 50 cm × 50 cm screening plate in the screen grid terminal plane.

RF amplifier,
class C operation, grounded cathode circuit

Maximum ratings

Frequency	f	10	30	MHz
Anode voltage (dc)	U_A	19	15	kV
Grid voltage (dc)	U_G	– 1200	– 1200	V
Cathode current (dc)	I_K	60	60	A
Peak cathode current	I_{KM}	340	340	A
Anode dissipation	P_A	220	220	kW
Grid dissipation	P_G	7	5	kW

Operating characteristics

Frequency	f	≤ 10	≤ 30	≤ 30	MHz
Output power	P_2	660	530	440	kW [1)]
Anode voltage (dc)	U_A	18	14	12	kV
Grid voltage (dc)	U_G	– 1000	– 800	– 800	V
Peak grid voltage (ac)	U_{gm}	1620	1420	1420	V
Anode current (dc)	I_A	45	46	46	A
Grid current (dc)	I_G	7,5	7,5	7,5	A
Anode input power	P_{BA}	810	650	550	kW
Drive power	P_1	11	9,6	9,6	kW [1)]
Anode dissipation	P_A	150	120	110	kW
Grid dissipation	P_G	3,5	3,6	3,6	kW
Efficiency	η	81	81	80	%
Anode load resistance	R_A	220	160	135	Ω

1) Circuit losses are not included.

Anode voltage modulation,
50 % modulated driver stage, grounded cathode circuit

Maximum ratings

Frequency	f	10	MHz
Anode voltage (dc)	U_A	11,5	kV
Grid voltage (dc)	U_G	– 1200	V
Cathode current (dc)	I_K	60	A
Peak cathode current	$I_{K\,M}$	380	A
Anode dissipation	P_A	220	kW
Grid dissipation	P_G	7,0	kW

Operating characteristics

Frequency	f	≤ 10	≤ 10	MHz
Carrier power	P_{trg}	330	280	kW [1]
Anode voltage (dc)	U_A	11	11	kV
Grid bias (dc), fixed	$U_{G\,fix}$	– 530	– 430	V
Grid resistance	R_G	20	26	Ω
Peak grid voltage (ac)	$U_{g\,m}$	1240	1120	V
Anode current (dc)	I_A	37	31,5	A
Grid current (dc)	I_G	8,5	8,0	A
Anode input power	$P_{B\,A}$	407	348	kW
Drive power	P_1	9,5	8,0	kW [1]
Anode dissipation	P_A	77	68	kW [2]
Grid dissipation	P_G	3,6	2,9	kW
Efficiency	η	81	81	%
Anode load resistance	R_A	160	200	Ω
Modulation factor	m	100	100	%
Modulation power	P_{mod}	204	174	kW
Grid dissipation at modulation	$P_{G\,mod}$	5,2	4,5	kW [3]
Peak grid voltage (ac)	$U_{g\,m}$	1860	1680	V [4]
Grid current	I_G	16	15	A [4]
Drive power	P_1	28	24	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) Average value at m = 100 %.
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	– 1200	V
Cathode current (dc)	I_K	60	A
Peak cathode current	$I_{K\,M}$	380	A
Anode dissipation	P_A	220	kW
Grid dissipation	P_G	5,0	kW

Operating characteristics

Frequency	f	≤ 30	MHz
Carrier power	P_{trg}	252 + 28 [2])	kW [1])
Anode voltage (dc)	U_A	11	kV
Grid bias (dc), fixed	$U_{G\,fix}$	– 370	V
Grid resistance	R_G	33	Ω
Peak grid voltage (ac)	$U_{g\,m}$	1040	V
Anode current (dc)	I_A	28,4	A
Grid current (dc)	I_G	7,0	A
Anode input power	$P_{B\,A}$	312	kW
Drive power	P_1	6,6 + 28 [2])	kW [1])
Anode dissipation	P_A	60	kW [3])
Grid dissipation	P_G	2,4	kW
Efficiency	η	81	%
Anode load resistance	R_A	210	Ω
Modulation factor	m	100	%
Modulation power	P_{mod}	156	kW
Grid dissipation at modulation	$P_{G\,mod}$	3,4	kW [4])
Peak grid voltage (ac)	$U_{g\,m}$	1570	V [5])
Grid current (dc)	I_G	13	A [5])
Drive power	P_1	19 + 86 [2])	kW [1])[5])

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 anode 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	15	kV
Grid voltage (dc)	U_G	– 1200	V
Cathode current (dc)	I_K	60	A
Peak cathode current	$I_{K\,M}$	340	A
Anode dissipation	P_A	220	kW
Grid dissipation	P_G	7,0	kW

Operating characteristics at modulator operation for

		600 kW carrier power		
Output power	P_2	0	410	kW
Anode voltage (dc)	U_A	11	11	kV
Grid voltage (dc)	U_G	– 280	– 280	V
Peak control grid voltage (ac) between the 2 tubes	$U_{gg\,m}$	0	1140	V
Anode current (dc)	I_A	2×3	2×30	A
Grid current (dc)	I_G	0	$2 \times 2{,}3$	A
Peak grid current	$I_{G\,M}$	0	2×14	A
Anode input power	$P_{B\,A}$	2×33	2×330	kW
Drive power	P_1	0	$2 \times 1{,}2$	kW
Anode dissipation	P_A	2×33	2×125	kW
Grid dissipation	P_G	0	2×550	W
Efficiency	η	—	62	%
Effective load resistance (anode to anode)	R_{AA}	—	400	Ω

Tube mounting

Axis vertical, anode down.

For connection of the tube use the terminals listed under “Accessories”. The complete header sockets are intended for transmitter operation, where as the individual connectors are to be used for modulator operation (complete terminal set RöKG241).

Maximum tube surface temperature

The temperature of the glass bulb and of the glass-metal seals must not exceed 180 °C at any point. In SW transmitters using single-sided resonant circuits, the glass bulb will be unilaterally heated by RF reactive currents. Additional cooling of the glass bulb is necessary to ensure that the temperature on this side will not exceed 180 °C.

The maximum temperature of the metal-ceramic seals is 220 °C. When using the individual terminals for modulators, an air flow rate of approx. 5 m³/min is required in order to maintain these maximum temperatures.

The header sockets for transmitter operation are provided with a centrally located cooling air terminal allowing uniform cooling air distribution over the terminal parts. The cooling air amount necessary for keeping below the specified temperatures lies between 0,5 and 1 m³/min, according to the operating frequency. The pressure drop is approx. 3,5 mbar for 1 m³/min.

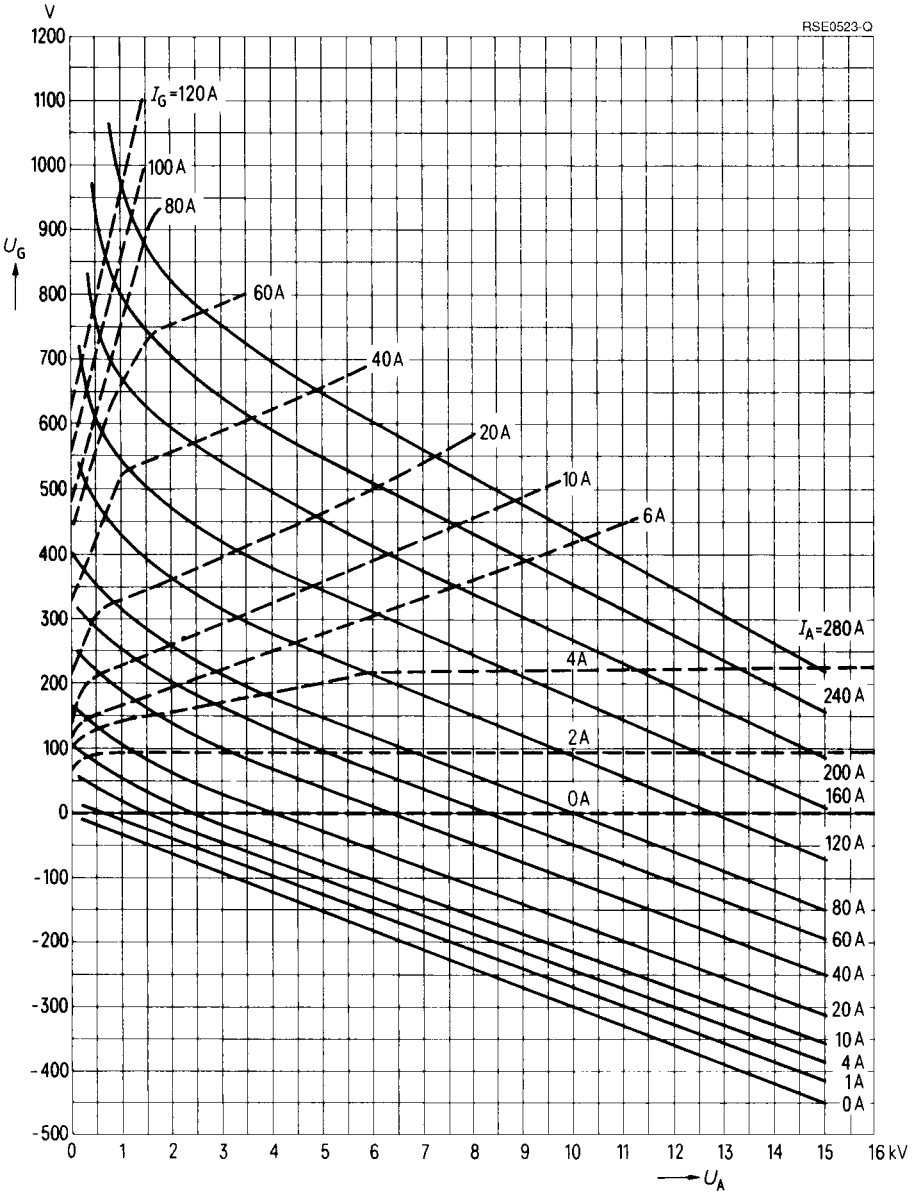
Vapor cooling

Cooling specifications for maximum anode dissipation	$P_{A\,max}$ = 220 kW
Total power to be dissipated by the cooling system ($P_A + P_G + 0{,}8\ P_F$)	234 kW
Equivalent thermal output	14040 kJ/min (3350 kcal/min)
Flow rate of returning water	
at returning water temperature of 20 °C	approx. 5,4 l/min
at returning water temperature of 90 °C	approx. 6,1 l/min
Volume of generated vapor	
at returning water temperature of 20 °C	approx. 9,0 m³/min
at returning water temperature of 90 °C	approx. 10,2 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 0,30 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 (accessories).

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