SIEMENS
RÖHREN

POWER TRAVELLING WAVE TUBE

f = 1.7 . . . 2.3 kMc

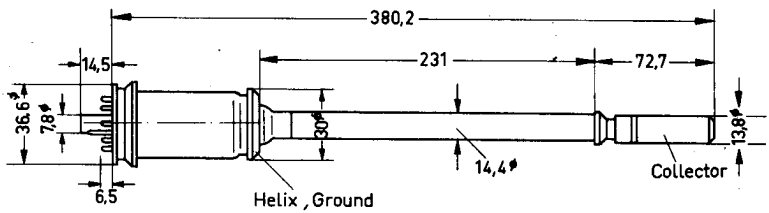
RW 2

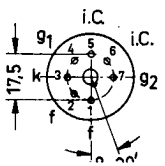
Design and Application

Preliminary Data

Power travelling wave tube specially designed for broadband radio relay systems with an average power output of 20 watts and an average gain of 35 db. The magnet system including the tube and the connections is provided with RF shielding.
The RW 2 is a periodic, permanent-magnet focused travelling wave tube and is replaceable within the magnet system MRW 2 which is distinguished by its particularly small leakage field. It is arranged to operate with depressed collector.

At full power air cooling is necessary. The RF power is coupled in and out by way of coaxial connections.





Dimensions in mm

Base:	special type, included in magnet system
Tube mount:	delivered with magnet system
Weight of tube:	approx. 200 gm net
Weight of magnet system:	approx. 14 kg
Dimensions of magnet system:	100 x 100 x 400 mm
Rf connection:	optional: UG 21 D/U 3.5/9.5 (60 Ω) 7/16 (50Ω) 6/16 (60Ω)
Mounting position:	any (see cooling)

Heating

Heater voltage	=	6.3	V (1)
Heater current	≈	0.9	A
Cathode heating time	≧	2	min

indirect by AC, parallel supply
MK-dispenser cathode

Characteristics

Frequency range	=	1.7 to 2.3	kMc
Saturation power	≈	30	W
Average Gain (P_o = 20 W)	≈	35	db
Reflection factor	≦	30	% (2)
Magnetic field strength	≈	500	Gauss (4)

Typical Operation

Operating frequency	=	2	kMc
Power output	=	20	W (4)
Gain	≈	35	db
Collector voltage	=	1600	Vdc (5)
Helix voltage	≈	2000	Vdc
Grid No.2 voltage	≈	600	Vdc
Grid No.1 voltage	=	-20	Vdc (5,6)
Helix current	≈	3	mA
Grid No. 2 current	≦	0.1	mA (5)
Cathode current	=	85	mA

(1) If the maximum variation of the heater voltage exceeds the absolute limits of ± 2 %, the operating performance of the tube will be impaired and its life shortened.

(2) At input and output of cold tube in the frequency range from 1.7 to 2.3 kMc.

(3) Peak value of alternating magnetic field.

(4) The tube is designed so that it can be operated with reduced cathode currents in applications requiring a lower power output.

(5) Adjusting value

(6) It is recommended to adjust the grid No. 1 voltage by means of the cathode resistor.

Maximum Ratings (absolute values)

Collector voltage	min	1500	Vdc
Collector voltage	max	1800	Vdc
Collector dissipation	max	150	W
Helix voltage	max	2300	Vdc
Helix current	max	7	mAdc (1
Grid No. 2 voltage	max	900	Vdc
Grid No. 2 dissipation	max	0.2	W
Negative grid No. 1 voltage	max	30	Vdc
Cathode current	max	100	mAdc
Collector temperature	max	250	°C

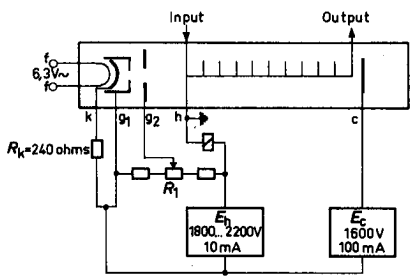
Operating Instructions

The travelling wave tube RW 2 is operated in conjunction with its associated magnet system MRW 2. The advantages of the periodic permanent-magnetic focusing of the RW 2 are the particularly small dimensions of the magnet system and an extremely small leakage field. The magnetic field is therefore largely insensitive to metal parts located in its vicinity. The sensitivity of the tube to temperature changes is low.

The magnet system should only be mounted by way of the fixing holes provided for this purpose. All voltages applied to the tube are referred to the cathode. The helix voltage (E_h) must be adjustable between 1800 and 2200 V, the grid No. 2 voltage (E_{g2}) between 500 and 800 V. The grid No. 2 voltage is tapped from a voltage divider R_1 whose total series resistance must not exceed 2.5 Meg. The grid No. 1 voltage (E_{g1}) can be generated by the cathode current across resistor R_k.

The helix lead must be provided with a protective relay which causes the helix and grid No. 2 voltages to be switched off if the maximum rating for the helix current is exceeded.

(1) The helix current may rise momentarily to 10 mAdc due to power supply surges and during starting.



Cooling

At the typical operation values listed on Sheet 2, an air flow of approximately 100 l/min is required to cool the collector. At reduced operating values the tube may be operated up to a maximum collector dissipation of 70 W without additional cooling, provided that the tube is in a horizontal position and natural circulation of the air vertically through the radiator is ensured. Otherwise, the manufacturer should be consulted.

Starting

For safe handling of the equipment, the magnet system must be properly grounded. For starting the tube, the preliminaries should be performed in the following order:

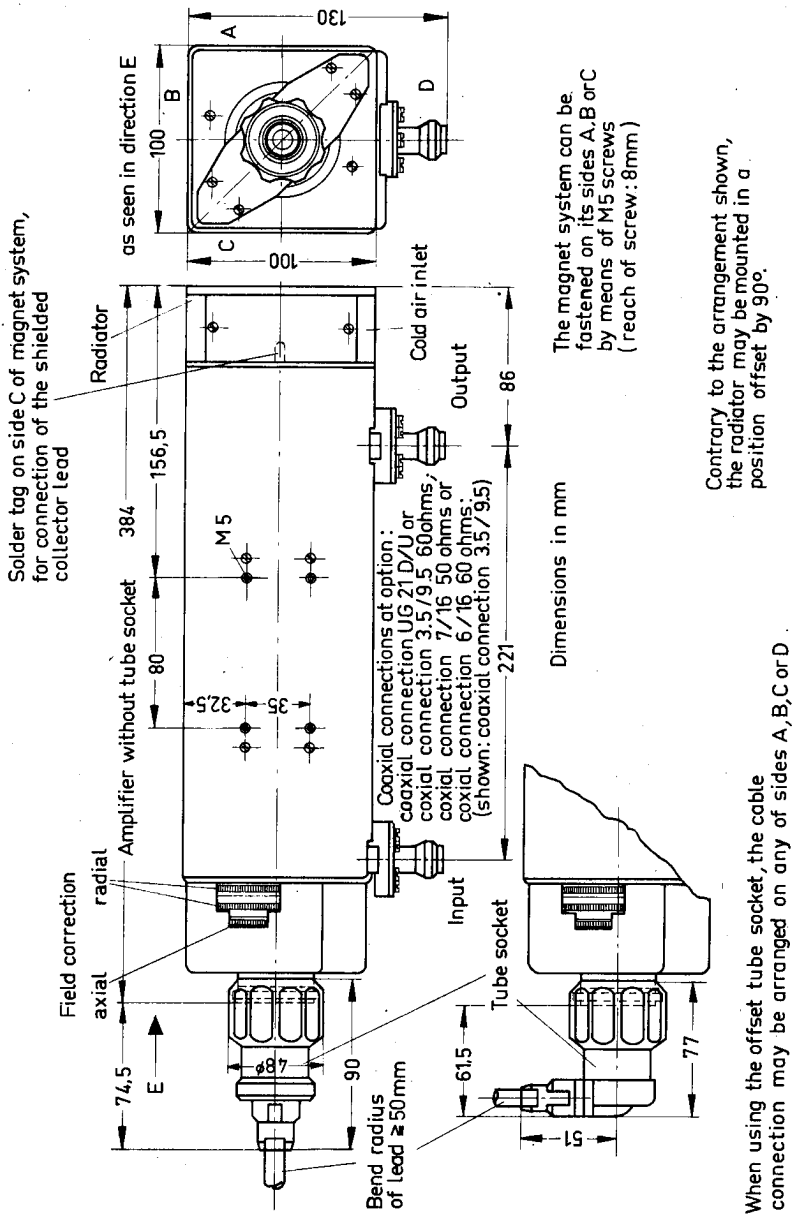
1. Connect up leads:

Heater	f,f :	brown
Cathode	k :	yellow
Grid No.1	g_1 :	green
Grid No.2	g_2 :	blue
Helix, ground	h :	red

   Connect shielded collector lead to solder tag on side C of the magnet system (cf. Sheet 5).
2. Screw off sleeve
3. Insert tube in magnet system, plug in tube socket, and screw on sleeve until stop is reached (avoid tilting the socket).
4. Apply heater voltage and preheat tube for at least 2 min.
5. Switch on air cooling.
6. Apply collector voltage.
7. Switch on voltage supply simultaneously for helix and grid No.2. Make sure that full voltages are applied immediately and not increased gradually to full value.
8. Adjust cathode current by varying grid No.2 voltage.
9. Adjust helix current to minimum with the aid of radial field correction (pair of set rings on cathode side of magnet system) and axial field correction (separate ring adjustable along the tube axis).
10. Apply RF input signal and readjust helix voltage to largest possible gain at specified power output.
11. Repeat field correction according to Point 9.

Switching off

The operating voltages can be disconnected either simultaneously or in the reverse order to that in which they were applied.


130
A
B
100
C
D
as seen in direction E
Radiator
Solder tag on side C of magnet system, for connection of the shielded collector lead
Cold air inlet
Output
86
384
156,5
80
M5
35
32,5
Amplifier without tube socket
Coaxial connections at option:
coaxial connection UG 21 D/U or
coaxial connection 3.5/9.5 60ohms;
coaxial connection 7/16 50 ohms or
coaxial connection 6/16 60 ohms;
(shown: coaxial connection 3.5/9.5)
221
Input
Field correction
radial
axial
74,5
E
ø87
90
Bend radius of lead ≥ 50mm
Tube socket
61,5
51
77
The magnet system can be fastened on its sides A,B or C by means of M5 screws (reach of screw: 8mm)
Dimensions in mm
Contrary to the arrangement shown, the radiator may be mounted in a position offset by 90°.
When using the offset tube socket, the cable connection may be arranged on any of sides A, B, C or D