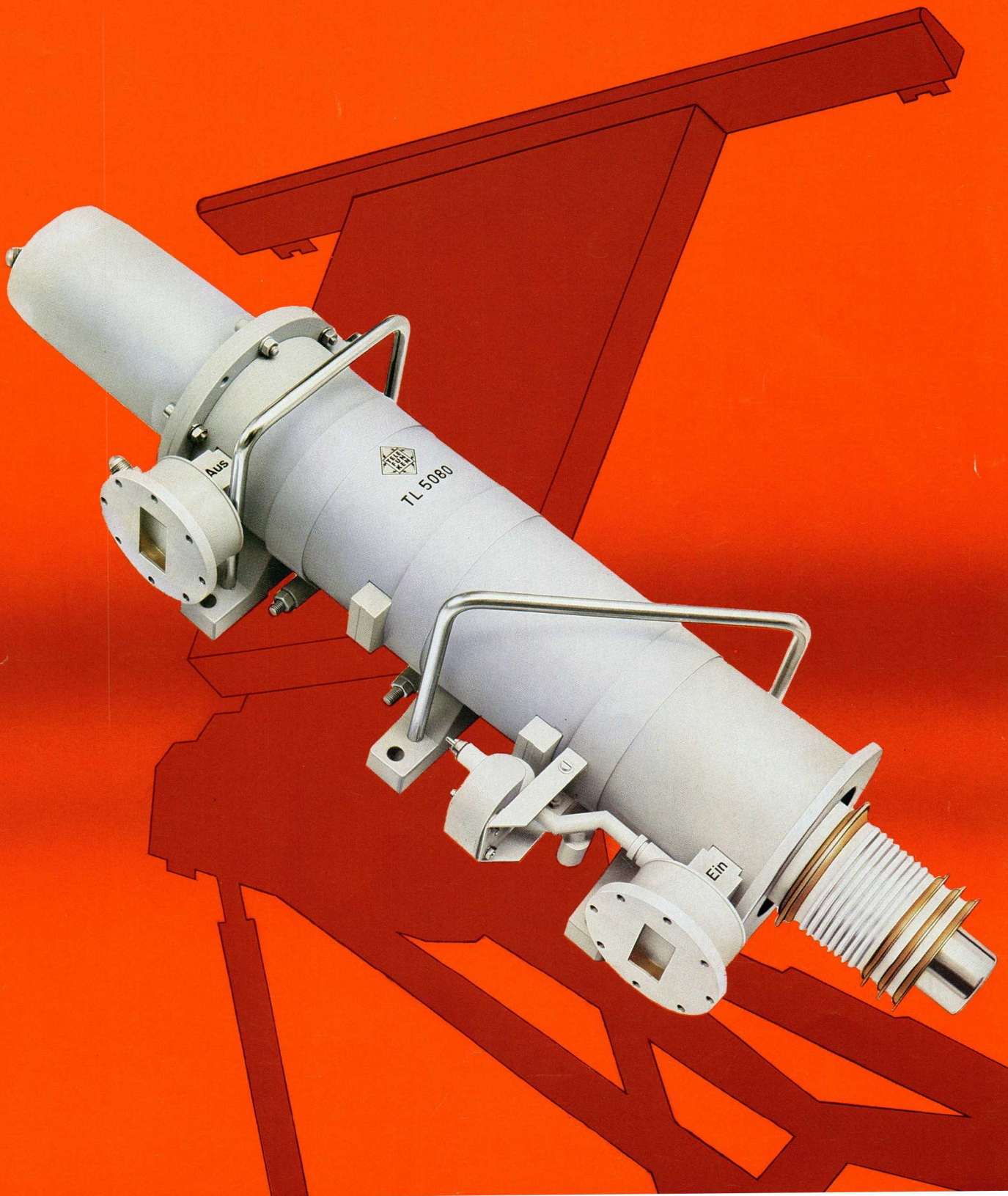


AEG-TELEFUNKEN

Survey

Microwave Tubes



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Main facility of Tubes and Sub-assemblies Division
Ulm, West-Germany.

Introduction

Wide Product Range

This short-form catalogue gives a brief survey of the microwave tube products of AEG-TELEFUNKEN Tubes and Sub-assemblies Division. The following tubes are currently being manufactured:

Travelling-Wave Tubes

Radio link
Satellite, medium and high power
Terrestrial, high-power

Magnetrons

Standard and coaxial

Klystrons

Reflex

Planar Triodes

Other types that are not included in this short-form catalogue may be available or under development. For further information or more detailed data sheets on particular types please contact us.

Over 30 Years Experience

AEG-TELEFUNKEN has been actively involved in microwave production for over 30 years. The older TWT's in glass construction for radio links were superseded in the 60's by compact high-efficiency TWT's in metal ceramic with integral p.p.m. focussing. Over 4800 TWT's of this type are now in worldwide service in radio links. One of the reasons why AEG-TELEFUNKEN was amongst the first companies to be in a position to offer modern, compact TWT's with high-efficiency for terrestrial use, was the intensive development work done in the early 1960's on satellite TWT's. This led to a 4 GHz TWT from AEG-TELEFUNKEN being selected for the European "Symphonie" satellite programme. Much of the experience gained here has been used for terrestrial applications for a range of 4,6 and 8 GHz compact, long-life TWT's.

The introduction of 11 GHz radio link tubes followed shortly after the development of 11 GHz satellite TWT's. In the meantime, 12 GHz satellite TWT's have been selected against strong international competition for many space projects including OTS, ECS, TDRSS, ANIK B, ANIK C and SBS.

To ensure that the strictly-controlled production for space-programmes can be implemented there has been an increasing trend to manufacture within clean-room conditions.

The company has also been involved in the field of magnetron manufacture since the early days of radar. One of the significant milestones was the introduction of very high-power magnetrons for long-range ATC radars. Operating lives of over 25 000 hours have been achieved by magnetrons with a peak output power of 5 MW. A range of coaxial magnetrons for airborne, marine and ground use is also being produced.

World-wide Organisation

The Tubes and Sub-assemblies Division forms part of the parent company AEG-TELEFUNKEN which employs some 160 000 people and operates in many countries of the world. The main facilities of the Tubes and Sub-assemblies Division are situated in Ulm in Southern Germany.

One of the advantages of a large group like AEG-TELEFUNKEN are the central facilities offered for research and environmental testing. There is close collaboration in particular with the Radio and Radar Systems Division of AEG-TELEFUNKEN in space activities, radio link and radar applications.

Customer Support Network

It is a fact that for microwave tubes, export customers outnumber domestic customers. There is therefore a network of overseas agents and representatives in all areas of the world. Apart from sales coordination, valuable after-sales support is available to customers to ensure that assistance is given at the right time and in the right place.

Travelling-wave tubes for point-to-point radio links

Type No.	Frequency	Output power	Sat. gain	Efficiency	Collector stages	Helix voltage	Cathode current	Cooling 2)	Focusing 3)
	GHz	W	dB	%		kV	mA		
YH 1000 ¹⁾	1,7 . . . 2,3	16	>40	17	1	1,1	80	FA	EM
TL 6 ¹⁾	3,6 . . . 4,2	6	>30	13	1	1,35	30	FA	EM
YH 1050 ¹⁾	4,4 . . . 5,0	2	>26	12	1	1,1	20	CV	PM
YH 1110 ¹⁾	5,8 . . . 8,5	15	>40	18	1	2,9	50	CD	PPM n.i.
YH 1120 ¹⁾	5,8 . . . 8,5	10	>36	18	1	2,8	50	CD	PPM n.i.
YH 1162	3,4 . . . 4,2	22	39	38	2	2,2	58	CD	PPM
YH 1203	6,4 . . . 7,1	22	39	26	1	3,0	55	CD	PPM
YH 1160	3,6 . . . 4,2	8,5	36	23	1	1,85	35	CD	PPM
TL 5015	4,9 . . . 5,25	17	38	38	2	2,55	43	CD	PPM
YH 1201	5,2 . . . 5,8	15	45	25	1	2,5	39	CD	PPM
YH 1202	5,8 . . . 6,4	11	39	23	1	2,5	40	CD	PPM
YH 1502	5,8 . . . 6,4	11	39	23	1	2,5	40	CD	PPM
YH 1205	5,9 . . . 7,1	15	40	37	2	2,5	43	CD	PPM
YH 1208	6,4 . . . 7,1	11	39	23	1	2,5	42	CD	PPM
YH 1204	7,7 . . . 8,5	11	39	23	1	3,12	37	CD	PPM
YH 1206	7,7 . . . 8,5	11	39	30	2	3,12	38	CD	PPM
YH 1191	10,7 . . . 11,7	20	43	28	1	3,36	52	CD	PPM
YH 1193	10,7 . . . 11,7	22	40	38	2	3,38	48	CD	PPM
YH 1192	11,7 . . . 12,4	20	43	27	1	3,36	51	CD	PPM
YH 1197	11,7 . . . 12,5	22	30	38	2	3,38	50	CD	PPM
YH 1194	12,5 . . . 13,2	22	30	38	2	3,38	50	CD	PPM
YH 1196	14,0 . . . 14,5	16	45	23	1	3,45	50	CD	PPM

Remarks: ¹⁾ As replacement only for existing systems; ²⁾ FA = Forced-air, CD = Conduction, CV = Convection; ³⁾ EM = Electro-magnetic beam focussing system, PPM = Periodic permanent-magnet system integrated with the tube; ⁴⁾ CO = Coaxial line, WA = Waveguide.

Length	Weight	RF connections input/output 4)	Associated power supply		
mm	kg				
281	0,2	WA/WA	-		
266	0,2	WA/WA	-		
205	0,09	WA/WA	-		
264	0,11	WA/WA	-		
271	0,14	WA/WA	-		
377	1,7	CO/CO	NYH 1162		
377	1,6	CO/CO	NYH 1203		
292	0,8	CO/CO	NYH 1160		
292	1,1	CO/CO	NTL 5015		
292	0,8	CO/CO	NYH 1201		
292	0,8	CO/CO	NYH 1202		
292	0,8	CO/CO	NYH 1502		
292	1,1	CO/CO	NYH 1205		
292	0,8	CO/CO	NYH 1208		
292	0,8	CO/CO	NYH 1204		
292	1,1	CO/CO	NYH 1206		
275	1,1	CO/CO	NYH 1191		
275	1,2	CO/CO	NYH 1193		
275	1,1	CO/CO	NYH 1192		
275	1,2	CO/CO	NYH 1197		
275	1,2	CO/CO	NYH 1194		
275	1,1	CO/CO	NYH 1196		

Travelling-wave tubes for satellite-borne applications

Type No.	Frequency	Output power	Sat. gain.	Efficiency	Collector stages	Helix voltage	Cathode current	Cooling 1)	Focusing 2)
	GHz	W	dB	%		kV	mA		
TL 4002	3,7 . . . 4,2	10	43	33	1	1,9	30	CD	PPM
TL 4003	3,7 . . . 4,2	13	46	32	1	1,9	35	CD	PPM
TL 4010	3,7 . . . 4,2	10	54	40	3	1,55	37	CD	PPM
TL 4012	3,7 . . . 4,2	12	57	44	3	1,59	41	CD	PPM
TL 12022	10,9 . . . 11,8	20	55	41	2	3,35	47	CD	PPM
TL 12008	10,9 . . . 11,5	9	58	42	3	2,45	32	CD	PPM
TL 12016	11,7 . . . 12,2	15	56	43	3	2,95	42	CD	PPM
TL 12024	11,7 . . . 12,2	20	52	48	3	3,5	45	CD	PPM
TL 12025	11,7 . . . 12,2	20	55	41	2	3,35	47	CD	PPM
TL 12026	11,7 . . . 12,2	20	55	44	3	3,35	47	CD	PPM
TL 12030	11,7 . . . 12,2	30	58	40	2	4,27	54	CD	PPM
	13,4 . . . 14,05	>25	55	39		4,27	54		
TL 12100	11,7 . . . 12,5	115	40	45	3	6,3	120	RA	PPM
TL 12200	11,7 . . . 12,5	200	45	45	3	7,2	220	RA	PPM
TL 12260	11,7 . . . 12,5	260	42	45	5	7,5	250	RA	PPM
TL 12450	11,7 . . . 12,5	450	50	50	5	9,0	400	RA	PPM
TL 12800	11,7 . . . 12,2	700	46	46	5	12	375	RA	PPM
TL 20030	18,5 . . . 21,5	22	50	38	2	4,1	45	CD	PPM

Remarks: 1) CD = Conduction, RA = Radiation
 2) PPM = Periodic permanent-magnet system integrated with the tube
 3) CO = Coaxial line, WA = Waveguide

Length mm	Weight kg	RF connections input/output 3)	Satellite programme	
301	0,65	CO/CO	Nat. Progr.	
301	0,65	CO/CO	Symphonie	
350	0,68	CO/CO	Anik B	
350	0,68	CO/CO	Comsat. Dev.	
285	0,6	CO/CO	OTS	
295	0,6	CO/WA	Nat. Progr.	
311	0,6	CO/WA	Anik C	
305	0,7	CO/WA	Comsat. Dev.	
295	0,82	CO/WA	ECS/Anik B	
311	0,6	CO/WA	SBS	
320	0,62	CO/WA	TDRSS	
421	2,6	CO/WA	Nat. Progr.	
421	4,5	CO/WA	Nat. Progr.	
430	4,5	CO/WA	TV Sat.	
563	6,8	WA/WA	Nat. Progr.	
460	8	WA/WA	Nat. Progr.	
280	0,9	WA/WA	Nat. Progr.	

High-power TWT's for satellite ground stations/radar/troposcatter

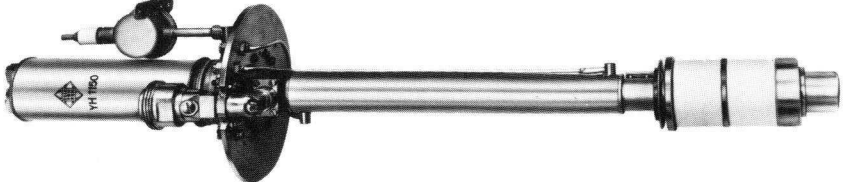
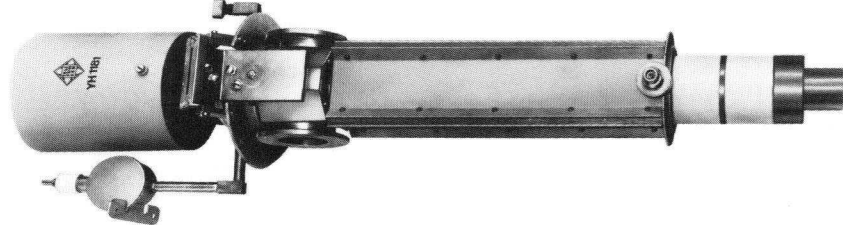
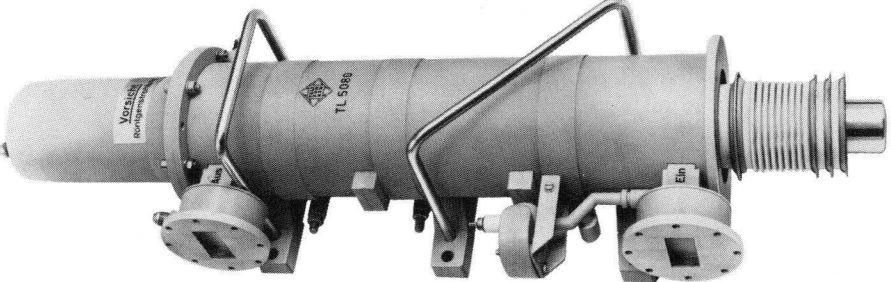
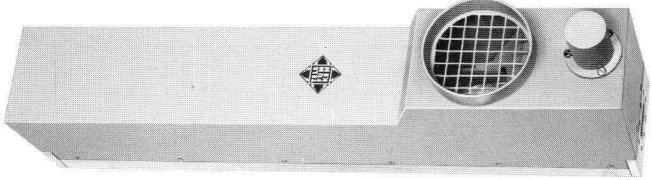
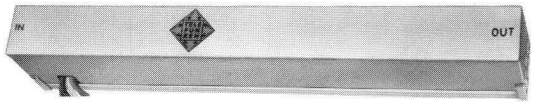
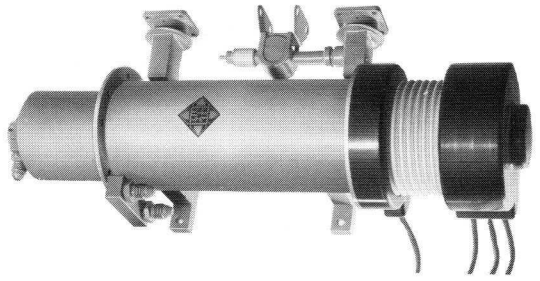
Type No.	Frequency	Output power	Sat. gain	Efficiency	Collector stages	Helix voltage	Cathode current	Cooling 2)	Focusing 3)
	GHz	W	dB	%		kV	mA		
YH 1150	1,7 . . . 2,3	1000	>26	19	1	7,2	1200	L	EM
TL 3400	3,0 . . . 3,6	1300	>23	22	1	13	700	FA	PPM
YH 1181	4,4 . . . 5,0	1000	36	23	1	13,5	650	FA	PPM
TL 5080¹⁾	5,2 . . . 5,7	90 000	40	25	1	45	12 500	L	PPM
YH 1300	5,9 . . . 6,4	200	>40	25	1	5,2	250	FA	PPM
YH 1301	7,7 . . . 8,0	220	34	25	1	7,1	220	FA	PPM
YH 1190	11,7 . . . 12,7	40	40	25	1	6	100	CD	PPM
TL 16 000¹⁾	16,0 . . . 17,0	4 000	>36	23	1	22	1 700	L	PPM

Remarks: 1) The ratings indicated for this tube apply for pulse operation

2) L = Liquid, CD = Conduction, FA = Forced air

3) EM = Electro-magnetic beam focussing system, PPM = Periodic permanent-magnet system integrated with the tube

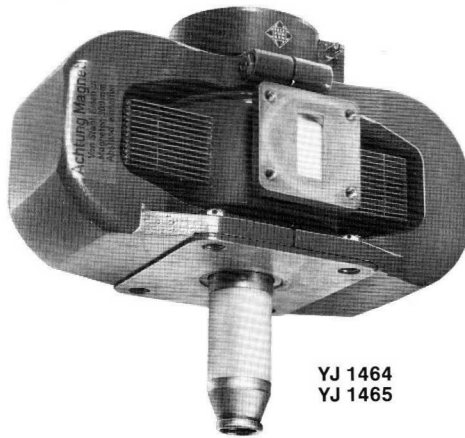
4) CO = Coaxial line, WA = Waveguide

Length	Weight	RF connections	
mm	kg	input/output 4)	
862	11	CO/CO	
830	20	CO/WA	
830	20	CO/WA	
769	23	WA/WA	
405	4,3	WA/WA	
405	4,3	WA/WA	
390	3	WA/WA	
392	5,5	WA/WA	

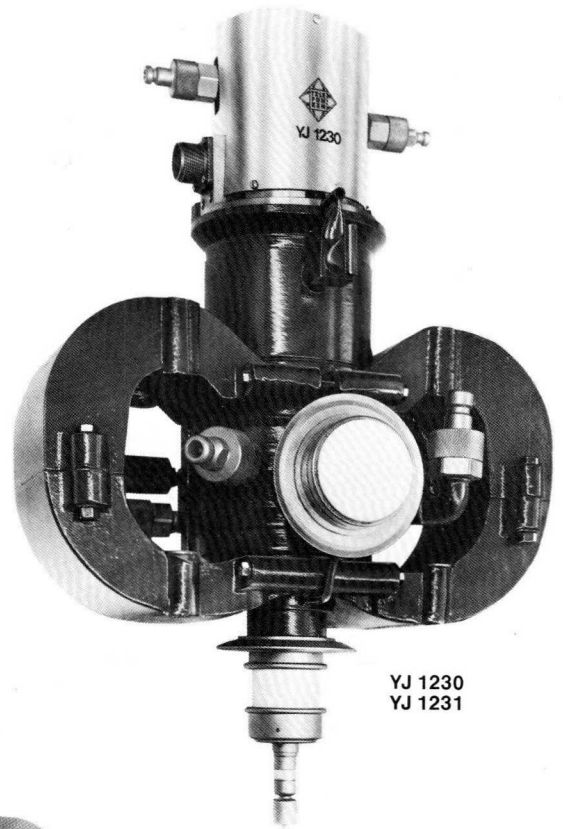
Pulse magnetrons

Type No.	Frequency	Output power	Pulse width	Duty cycle	Heater voltage	Heater current
	GHz	kW	μ s		V	A
YJ 1210	8,5 . . . 9,6	250	0,25-3	0,001	13,75	3
YJ 1230	1,25 . . . 1,35	5 000	5	0,0018	14	155
YJ 1231	1,25 . . . 1,35	4 000	6	0,0018	12,6	140
YJ 1350 6344	5,45 . . . 5,825	170	1,3	0,00085	11	11
YJ 1400	16,3 . . . 16,9	57	0,22	0,001	12,6	1,81
YJ 1405	15,5 . . . 17,5	100	0,1-2,5	0,001	12,6	3
YJ 1464	8,5 . . . 9,6	100	0,2-3	0,001	13,75	3
YJ 1465	8,5 . . . 9,6	100	0,1-2,5	0,0003	13,75	3

Anode peak voltage	Anode peak current	Weight
kV	A	kg
22	27,5	6,2
70	155	55
67	120	55
22	18,7	10,7
13,5	12	1,7
17,5	18	6,3
20	15	6,2
20,5	15	6,2



YJ 1464
YJ 1465



YJ 1230
YJ 1231



YJ 1400

Reflex klystrons

Type No.	Frequency	Oscillation mode	Output power	Heater voltage	Heater current	Resonator voltage	Resonator current
	GHz		mW	V	A	V	mA
TK 8 ²⁾	3,7 4,3	3	105	6,3	0,38	300	28
TK 61 ²⁾	6,5 7,7	3	180	6,3	0,4	300	28
YK 1023 ^{1) 2)}	7,6 8,2	2	120	6,3	0,44	300	28
YK 1030 ²⁾	6,2 7,2	2,3	1400	6,3	1,55	750	75
YK 1050 ²⁾	7,0 8,2	3	170	6,3	0,4	300	28
YK 1080 ²⁾	9,8 10,5	3	25	6,3	1,23	300	25
YK 1082 ²⁾	9,3 9,6	2	125	6,3	1,23	330	33
YK 1100	7,4 7,7	2	1200	6,3	1,55	800	90
YK 1160 ²⁾ 6975	8,5 9,66	7/4	45	6,3	0,42	300	29
2 K25 ²⁾ 723 A/B ²⁾	8,5 9,66	2	35	6,3	0,44	300	22

Remarks: 1) With thermal frequency tuning
2) Maintenance replacement type only, not recommended for new system development

Planar triodes

Type No.	Static characteristics					Typical operation	
	Heater voltage V	Heater current A	Anode voltage V	Anode current mA	Transconductance mA/V	Frequency GHz	Heater voltage V
YD 1040	6	1	600	75	25	1,1	6
YD 1050	6	1	500	95	25	0,5 2,5	5,8 4,8
YD 1051	6	1	500	100	30	0,6 2,5	5,6 4,6
YD 1052	6,3	1	500	125	32	1,6	6,3
YD 1053	6	1	500	100	27	0,5 2,5	5,8 4,8
YD 1054	6,3	1	700	150	12	0,8	6,3
YD 1055	6,3	1	600	100	27	1,03	6,3
YD 1060/01	6	0,8	420	60	16	6	6
2 C 39 A	6,3	1	600	75	25	2,5 2,5	4,8 4,8
2 C 39 BA	6	1	600	75	25	2,5 2,5	4,8 4,8
2 C 40	6,3	0,7	250	17,5	5	2,3 3,3	6,3 6,3
2 C 40 A	6,3	0,7	250	17,5	5	3	6,3
7211	6,3	1	600	90	30	0,5 2,5	6 4,8
7815 R	6	1	600	75	25	2,5	5,8

Remarks: 1) Pulse

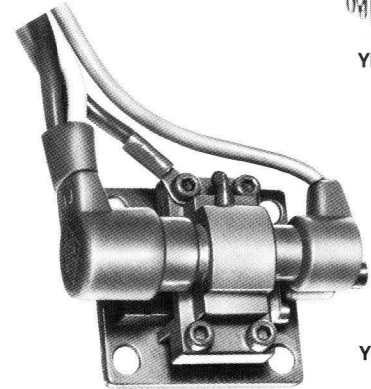
Reflector voltage	Electronic tuning	Dimensions	Weight
V	MHz	mm	g
-60 . . . -170	58	ø43 x 87	50
-50 . . . -190	49	ø44 x 87	50
-100 . . . -260	25	86 x 62 x 57	250
-120 . . . -850	50	97 x 79 x 50	420
-80 . . . -290	35	ø44 x 87	50
-98 . . . -118	22	63 x 41 x 43	160
-115 . . . -185	30	60 x 31 x 35	160
-20 . . . -1000	65	106 x 58 x 60	420
-85 . . . -150	38	40 x 77 x 42	90
-85 . . . -200	37	ø41 x 90	55



TK 61



YK 1023



YK 1080

Typical operation

Anode voltage V	Anode current mA	Grid voltage V	Grid current mA	Output power W
1700	1900 ¹⁾	-45	1100 ¹⁾	1500 ¹⁾
600	100	-16	6	26
600	80	-20	25	16
850	100	-20	5	30
850	100	-16	10	20
1500	2500 ¹⁾	-35	1400 ¹⁾	1000 ¹⁾
600	100	-16	6	26
600	80	-20	25	16
800	140	-16	-	25
2000 ¹⁾	5000 ¹⁾	-35	-	1500 ¹⁾
420	60	-35	9	1,8
600	100	-15	10	15
800	100	-24	8	21
600	100	-15	10	16
800	100	-24	8	24
250	20	-5	0,3	0,075
250	20	-10	1,2	0,5
1400 ¹⁾	1500 ¹⁾	0	-	0,2
900	140	-20	15	25
900	140	-30	40	60
3500 ¹⁾	3000 ¹⁾	-45	1400 ¹⁾	2000 ¹⁾



2 C 39 BA



YD 1053



2 C 39 A

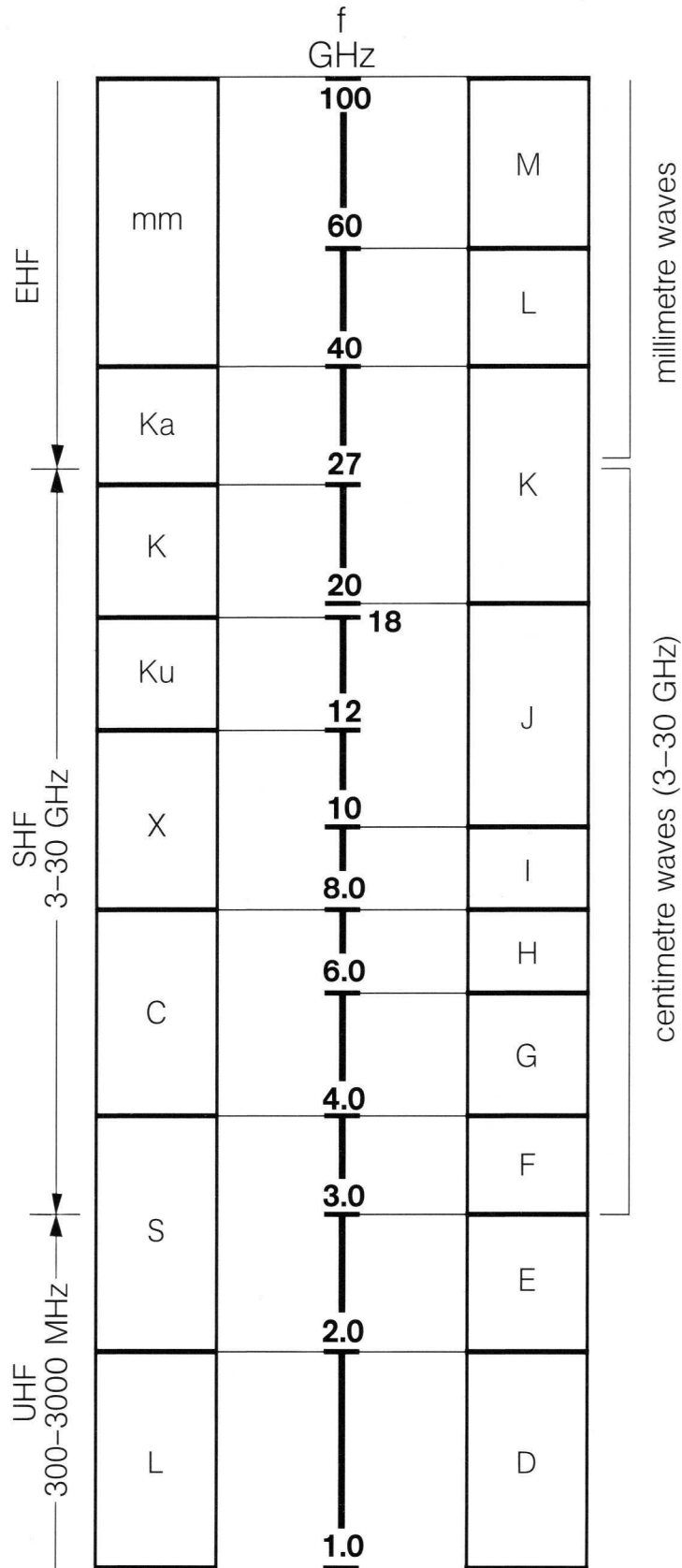


YD 1060

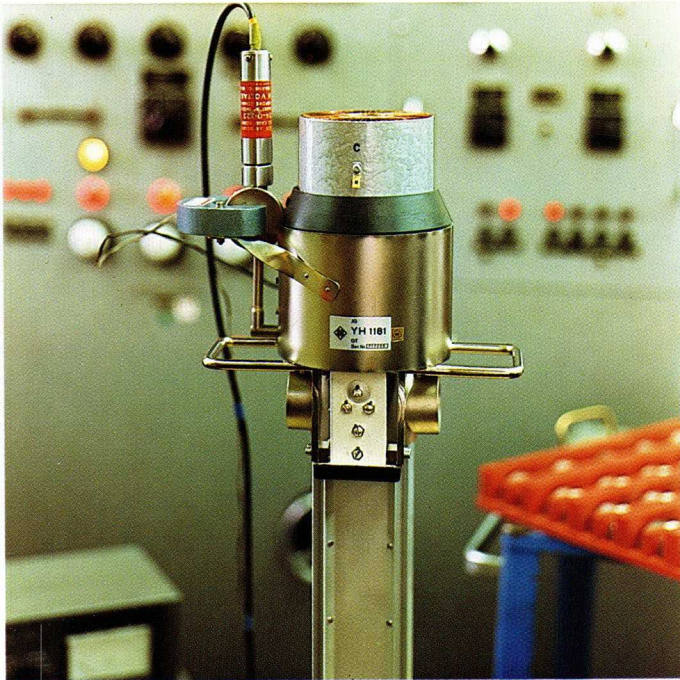
For each band

JEEE
Radar Standard 521

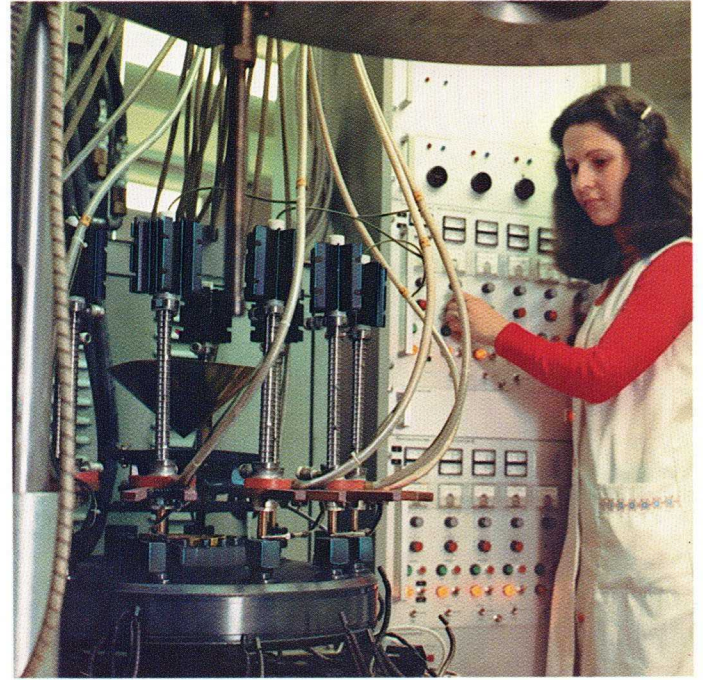
US Military Bands



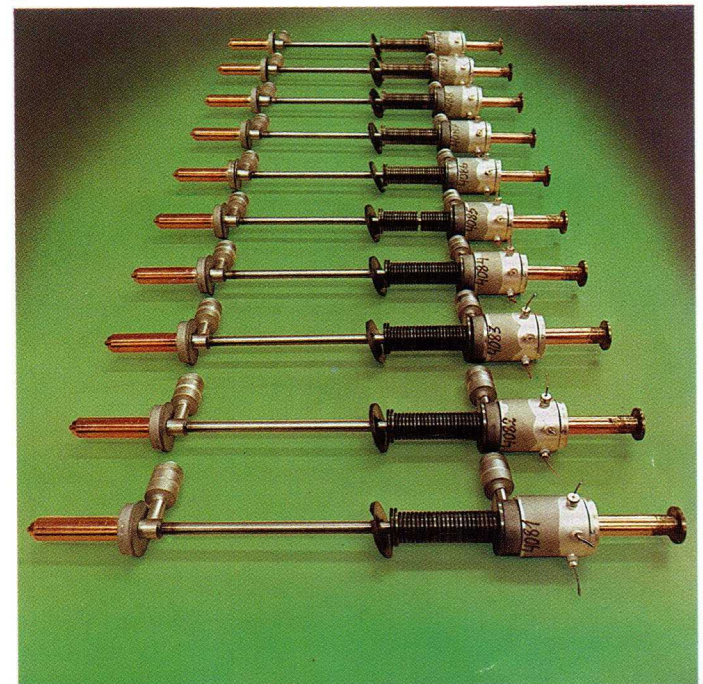
there is a tube from AEG-TELEFUNKEN



1
1 The YH 1181 is a modern high-power TWT for troposcatter systems in the 4.4 to 5.0 GHz frequency band. The tube has a CW output power of 1 kW and is air-cooled.



2
2 Medium-power TWT's on the automatically-controlled vacuum pump station. Following high-temperature bake-out a vacuum of better than 10^{-10} Torr is achieved.



3
3 Series production of radio-link TWT's. These tubes are awaiting assembly of the PPM magnets.



4
4 Assembly of satellite travelling-wave tubes under clean room conditions.

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