

MICROWAVE TUBES

FOR RADAR, EW AND COMMUNICATIONS APPLICATIONS

At TMD we understand microwave tubes. We've been immersed in the research, design and manufacture of electron devices since their inception, delivering solutions into some of the most demanding applications, supporting our customers' requirements.

Our tube engineering "DNA" extends back over 60 years, to EMI Electronics' high power klystron developments during WWII. Since then TMD has been instrumental in many of the industry's major TWT, magnetron and klystron developments.

During the 1970s and 1980s, the company was funded by UK MoD, ESA and US DoD to investigate the fundamental chemical and physical properties of impregnated tungsten dispenser cathodes, with the aim of extending the life of microwave tubes.

As a result, TMD is a recognised European Centre of Excellence for dispenser cathode and electron gun technology, producing tubes for some applications with lives of more than 90,000 hours. Having the capability to design and manufacture cathodes in-house enables us to achieve optimal performance and minimises reliance on ITAR controlled parts.



Most recently, we have focussed our tube developments on coupled cavity TWTs for ATC radar, and ring loop TWTs for seeker applications; in particular, rugged, fast warm, high duty Ku band ring loop TWTs. This work has culminated in a range of tubes including; high mean powers, fast start capabilities and multi-stage depressed collectors. From conception these tubes have been designed for manufacture using industry best practice in manufacturing processes and materials.

The following table shows a selection of generic products in this range – but don't worry if you can't see exactly what you are looking for – custom solutions are available and our Business Development Team is always eager to discuss TMD's contribution to new technology areas.

After sales support

At TMD relationships with our customers do not end when an order is placed. We pride ourselves in our after sales support, through delivery, set up and user testing. We also offer a comprehensive repairs service for our

own or other companies' microwave products; contact us at wecare@tmd.co.uk for an evaluation.

TMD is approved to the rigorous Quality Standard BS EN ISO9001:2008. Quality is at the heart of everything we do.

For more details of TMD's products and capabilities, please go to www.tmd.co.uk

Special products can be designed to customers' specific requirements.

DID YOU KNOW?

Our new x-ray machine is a recent investment, made to enable us to carry out in-line inspection through x-ray and CT analysis to a level previously unobtainable.



Pulsed Travelling Wave Tubes

TMD manufactures three main types of TWT - ring loop, ring bar and coupled cavity. Applications include naval surveillance radar, air traffic control radar and airborne radar.

Our TWTs are often combined with our own switched mode power supplies to produce TWTAs used in a variety of markets, both military and commercial, and in particular as part of radar transmitter subsystems.

The coupled cavity TWTs we have produced for the Watchman air traffic control radar are providing up to 90,000 hours of service. This reliability is largely a consequence of our expertise in dispenser cathode technology. Latest TWT developments include rugged Ku band ring loop tubes for very demanding airborne environments.

Please note - these are generic types only – many other variants are available to order

Part	Type	Freq Range	Peak Power	Duty Cycle	Gain (Min)	Pulse Length	Structure Voltage	Peak Beam Current	Collector Volts (Wrt. Cathode)	Focussing	Weight
		GHz	kW	(Max)	dB	us	kV	A	kV		kg
PT6055	coupled cavity	2.75-3.05	50	0.023	50	30	33	9	22	PPM	41
In the X band range various designs are available in the range 8.5-10 GHz with peak power up to 9 kW, bandwidth up to 1 GHz and mean power up to 250 W											
PT6067	ring loop	8.7-9.2	8	0.002	60	30	14.5	2.7	11	PPM	2.5
PT6074	ring loop	9.0-9.5	5.3	0.03	60	40	13.5	2	10	PPM	2.5
PT6156	ring loop	9.0-10.0	9	0.035	60	40	14.5	2.5	11.5/9.5 dual stage	PPM	2.5
PT6073	ring loop	9.2-9.4	8.5	0.02	60	20	14.5	2.7	11	PPM	2.5
PT6744	ring loop	9.2-9.5	1	0.05	40	80	6.5	1.0	4/1.5	PPM	0.65
PT6226	ring loop	9.2-10.0	4	0.04	45	30	13.0	2.0	9.1	PPM	2.0
PT6109	ring loop	9.5-10.0	8	0.02	60	30	14.5	2.7	10	PPM	2.5
In the Ku band range, the main generic types are listed below. However additional custom designs are available in the range 200-1000 W peak power and up to 400 W mean power, up to 1 GHz bandwidth-anywhere between 13 and 18 GHz. In addition many of the variants are fast-warm - < 3 seconds (FW)											
PT6713	ring loop	14.5-17.0	2	0.02	63	40	11-15	0.9	8.5	PPM	1
PT6715	ring loop	16.0-17.0	2	0.02	63	40	11.5	0.9	8	PPM	1
PT6745 ^{FW}	ring loop	16.0-18.0	0.4	0.33	35/55*	20	8	0.35	4/5 dual stage	PPM	1
PT6738 ^{FW}	ring loop (dual mode)	16-18	3.5 0.8	0.02 0.07	60*	40	12.5 11.5	1.4 0.6	8/4.5/2.5 7.5/4.5/2.5 triple stage	PPM	1.5
PT6789 ^{FW}	ring loop	17.0-18.0	0.8-1.0	0.33	35/55*	40	11	0.55	5/6 dual stage	PPM	1

Notes PPM – Periodic Permanent Magnet IS – Integral solenoid UD – Undepressed * with saturating amplifier

Magnetrons

TMD manufactures a wide variety of magnetrons with conventional and coaxial structures: fixed frequency or tunable, using dither or shutter tuning mechanisms. The latter, which achieves especially high agility rates, is unique to TMD and was developed during the 1970s and 1980s as part of many refinements to magnetron design, including work on improved frequency stability, reduced spectral noise and increased life.

Our magnetrons have proven their worth in many applications, including arduous helicopter environments for search and rescue radar and in fixed wing aircraft for terrain-following radars. An evaluation and repair service is provided for the many mature platforms still requiring support.

Part	Type	Freq Range	Peak Power	Tuning Range	Duty Cycle	Peak Anode Volts	Peak Anode Current	Agility Rate	Tuning Mechanism	Weight
		GHz	kW	MHz	(max)	kV	A	Hz		kg
PT6250	fixed	16.0-17.0	29-60	-	0.00126	11	8.5	-	-	2.5
PT6240	agile	16.0-17.0	35	230	0.0012	13.5	9	100	Dither	2.2
PT5065	fixed	16.0-17.0	50	-	0.0015	13	13	-	-	1.3
PT5064	agile	16.0-17.0	70	200	0.0012	14	15	133	Dither	3.2

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