

TMD

...the *power* in microwaves!

INSTRUMENTATION  
AMPLIFIERS



product summary

# INSTRUMENTATION AMPLIFIERS

[www.tmd.co.uk](http://www.tmd.co.uk)  
[www.tmdus.com](http://www.tmdus.com)

# INSTRUMENTATION AMPLIFIERS

FOR LABORATORY APPLICATIONS (INCLUDING EMC TESTING, PIM TESTING,  
SCIENTIFIC AND MEDICAL)

**TMD's latest innovation is a new modular amplifier design, available for certain units designated PTCM... These units feature major improvements to user interface and maintainability. Please contact TMD for the full datasheet.**

- Advanced self-diagnostics
- Ethernet interface
- Remote management and diagnostics
- VSWR reflected power protection
- Plug and play field replaceable power supplies
- And more...

Our instrumentation amplifiers are closely related to our rugged amplifiers.

They are based on the same switched mode power supply technology as the rugged amplifiers - with all the advantages of performance and reliability, but have been neatly re-packaged for less demanding physical environments into compact, lightweight and affordable rack-mountable units.

A set of standard amplifiers covers the range between 1-40 GHz in both pulsed and CW modes. In addition, **special products can be designed to customers' specific requirements.**

Over the past 20 years TMD has proved itself to be a world leader in TWTA design innovation, offering particularly unusual products for a variety of markets and applications, many of which have proven to be unobtainable elsewhere. We have particular strength in the area of high power pulsed TWTAs (up to 40 kW) for EMC HIRF testing.

Recently we have developed a new range of Ultra High Power HIRF amplifiers achieving over 10 kW. TMD also now offers a full range of solid state amplifiers. Designated the PTCS Series, these amplifiers have been developed for use at frequencies below 18 GHz.



Left hand page: Pictured left - standard amplifier. Pictured right - new modular amplifier.

Right hand page: HIRF testing facility at TRW Conekt (photo (c) TRW Limited)

Cover image: C band 4 kW CW amplifier for ultra high power testing (courtesy Honeywell Aerospace)

**EMC test laboratories using TMD's range of Ultra High Power amplifiers have generated 14,000 V/m, easily complying with the latest most demanding test requirement - RTCA/DO-160G and L. Other standards covered include: MIL Standard, EUROCAE and AIRBUS ABD 100.**

For many years TMD has been providing amplifiers for scientific establishments such as CERN. Projects we have been involved with have included: Driver Amplifiers for Anti-matter Experimentation (CERN in collaboration with Riken Laboratory, Japan), Amplifiers for the CERN CLIC Test Facility CTF3 and Kicker Amplifiers for Oxford University.

**Special products can be designed to customers' specific requirements.**

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 – bespoke solutions are available and our Business Development Team is always eager to discuss the ways in which TMD can contribute to new technology areas.

**For more details of TMD's products and capabilities, please go to [www.tmd.co.uk](http://www.tmd.co.uk).**

### **After sales support**

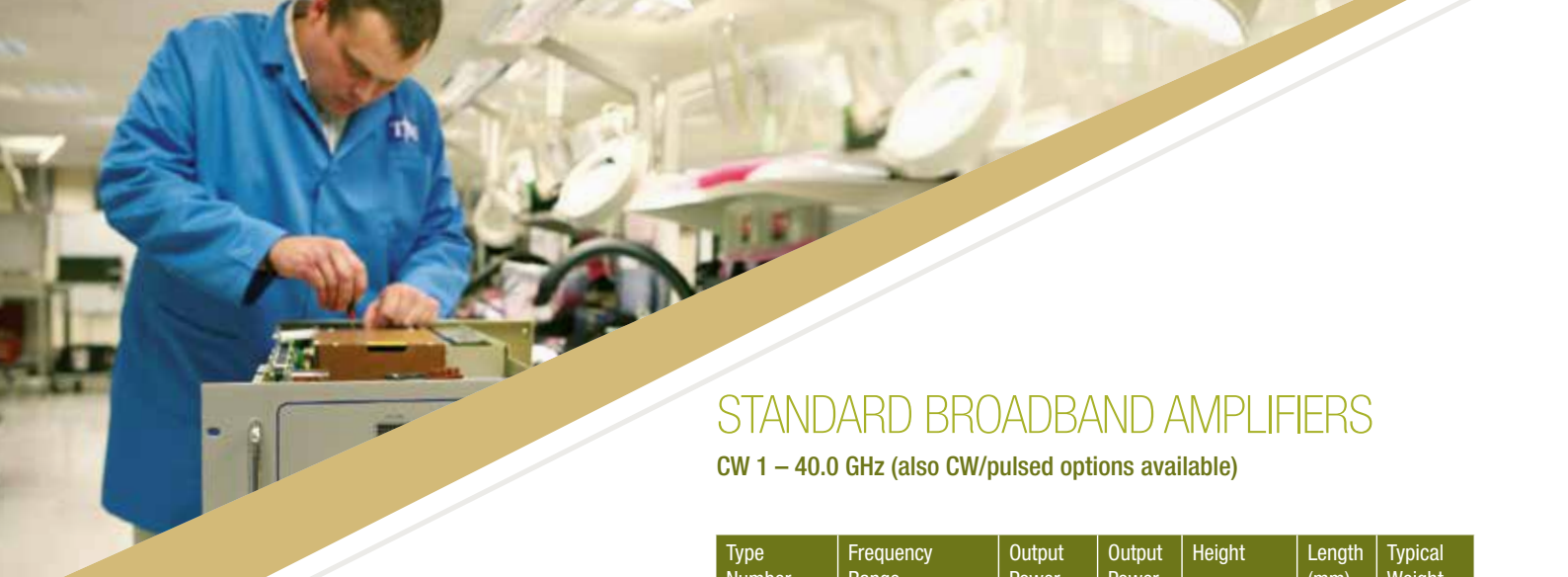
At TMD relationships with our customers do not end when an order is placed. We pride ourselves in our after sales support, through delivery, set up and user testing. We also offer a comprehensive repairs service for our own or other companies' microwave products; contact us at [wecare@tmd.co.uk](mailto:wecare@tmd.co.uk) for an evaluation.

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

### **DID YOU KNOW?**

TMD's Instrumentation Amplifiers have helped investigate the mysteries of the universe. A few years ago we provided a Driver Amplifier to CERN for an antimatter experiment carried out in collaboration with Riken Laboratory, Japan. We are also in close collaboration with several other leading organisations involved in fundamental particle physics.





## STANDARD BROADBAND AMPLIFIERS

CW 1 – 40.0 GHz (also CW/pulsed options available)

EMC test laboratories using TMD's range of Ultra High Power amplifiers have generated 14,000 V/m, easily complying with the latest most demanding test requirement - RTCA/DO-160G and L.

Type Number	Frequency Range GHz	Output Power (W Min)	Output Power (W Typ)	Height	Length (mm)	Typical Weight (kg)
<b>Low Power</b>						
PTCM1002	0.8 - 2.8	250	300	6U	800	45
PTCM1003	2.0 - 4.0	250	300	6U	800	45
PTCM1004	2.0 - 6.0	200	250	6U	800	45
PTCM1005	2.5 - 8.0	250	300	6U	800	45
PTCM1006	4.0 - 8.0	250	300	6U	800	45
PTCM1007	6.5 - 18.0	200	220	6U	800	45
PTCM1008	6.0 - 18.0	300	320	6U	800	45
PTCM1009	7.5 - 18.0	200	250	6U	800	45
PTCM1010	7.5 - 18.0	250	300	6U	800	45
PTCM1011	1.0 - 18.0	50	60	6U	800	45
<b>Medium Power</b>						
PTCM1012	0.8 - 2.5	500	560	6U	800	45
PTCM1013	2.5 - 7.5	500	560	6U	800	45
PTC6522	6.0 - 18.0	550	570	8U	700	48
PTC6442	7.5 - 18.0	500	560	8U	700	48
PTCM1014	10.5 - 13.0	400	450	6U	800	45
<b>High Power</b>						
PTC7440	1.0 - 2.5	1000	1000	12U	700	110
PTC7441	2.5 - 7.5	1000	1000	12U	700	110
PTC7442	7.5 - 18.0	1000	1000	19U	700	130
<b>Millimetric</b>						
PTCM1015	17.5 - 21.5	210	280	6U	800	45
PTCM1016	18.0 - 28.0	45	70	6U	800	45
PTCM1017	18.0 - 23.0	210	311	6U	800	45
PTC6437	18.0 - 23.0	250	270	4U	700	30
PTCM1018	18.0 - 40.0	40	80	6U	800	45
PTCM1019	23.0 - 27.0	400	420	6U	800	45
PTCM1020	24.93 - 25.93	60	80	6U	800	45
PTCM1021	24.93 - 25.93	250	270	6U	800	45
PTCM1022	26.0 - 31.0	200	220	6U	800	45
PTCM1023	26.5 - 40.0	40	70	6U	800	45
PTCM1024	27.0 - 31.0	112	125	6U	800	45
PTCM1025	31.6 - 32.5	230	260	6U	800	45
PTCM1027	34.5 - 35.5	100	35	6U	800	47
PTCM1026	35.65 - 35.85	300	320	6U	800	45

A suite of TMD's CW amplifiers in use. Photo courtesy Thales Group



“TMD units, delivered a decade ago are still the most reliable we’ve ever used.”

Major US EMC Facility

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

## STANDARD BROADBAND AMPLIFIERS

### Pulsed 1 – 18.0 GHz

Type Number	Frequency Range GHz	Output Power (W Min)	Output Power (W Typ)	Duty Cycle (Max %)	Pulse Length (µs)	Height	Length (mm)	Typical Weight (kg)
<b>Low Power</b>								
PTCM1201P	2.0 - 4.0	1700	2000	6	0.2-100	6U	800	47
PTCM1202P	2.5 - 8.0	1700	2100	6	0.2-100	6U	800	47
PTCM1203P	4.0 - 8.0	1700	2100	6	0.2-100	6U	800	47
PTCM1204P	5.0 - 11.0	1600	2200	5	0.2-100	6U	800	47
PTCM1205P	7.5 - 18.0	1500	2000	6	0.2-100	6U	800	47
<b>Medium Power</b>								
PTCM1206P	1.0 - 2.5	2000	2500	6	0.2-100	6U	800	47
PTCM1207P	2.0 - 8.0	1900	2100	6	0.2-100	6U	800	47
PTC7383	2.0 – 8.0	3500	4000	6	0.2-100	8U	700	70
PTC9643	6.5 - 18.0	2000	2400	6	0.2-50	8U	800	70
PTCM1208P	8.0 - 12.4	1700	2500	6	0.2-20	6U	800	47
PTCM1209P	8.0 - 18.0	2000	2200	4	0.2-20	6U	800	47
<b>High Power (for HIRF testing)</b>								
PTC6704	1.0 - 1.5	10000	11000	1	0.2-50	4U	900	40
PTC6706	1.5 - 2.0	7000	8000	1	0.2-20	4U	880	30
PTC7030	1.1 - 1.5	30000	40000	1	0.2-20	8U	1200	100
PTCM1210P	1.0 - 2.0	3800	4000	4	0.1-50	6U	800	47
PTCM1211P	2.0 - 4.0	5000	5500	6	0.2-20	6U	800	47
PTCM1212P	2.9 - 4.0	9000	11000	4	0.2-50	6U	800	47
PTC7383	2.0 - 8.0	4000	4500	6	0.2-50	8U	700	70
PTCM1219P	4.0 - 8.0	4000	5000	6	0.2-20	6U	780	35
PTCM1213P	8.0 - 12.4	4000	5000	6	0.2-20	6U	800	47
PTCM1214P	8.0 - 11.0	5900	7500	5	0.2-20	6U	800	47
PTCM1220P	8.5 - 10.5	6800	8000	5	0.2-100	IFA	S	30
PTCM1215P	8.7 - 10.0	5000	6500	7	0.2-50	6U	800	47
PTCM1216P	8.0 - 12.0	4200	5000	6	0.2-50	6U	800	47
PTCM1217P	10.5 - 12.5	9000	10000	2	0.1-20	6U	800	47
PTCM1218P	12.4 -18.0	3500	4000	6	0.2-20	6U	800	47
<b>Ultra High Power (for HIRF Testing)</b>								
PTC6708	1.0 – 1.5	10000	11000	2	0.2-20	8U	880	40
PTC6709	1.5 – 2.0	8000	10000	2	0.2-20	8U	880	40
PTC9740	1.0 – 1.5	8000	9000	4	0.2-20	8U	880	40
PTC9741	1.5 – 2.0	6000	9000	4	0.2-20	8U	880	40
PTC7373	1.0 – 2.0	6000	6500	4	0.2-20	10U	800	100
PTC7370	2.0 – 4.0	9000	11000	6	0.2-50	12U	880	100
PTC7369	4.0 - 8.0	7000	10000	6	0.2-50	16U	880	100
PTC7368	8.0 – 12.4	8000	9000	5	0.2-50	12U	800	100
PTC7362	8.0 – 11.0	12000	12600	5	0.2-20	12U	880	110
PTC7372	12.4 – 18.0	6000	8000	6	0.2-50	12U	880	100

All units are Integral Forced Air cooled except PTC7030 which is IFA plus internal liquid cooled.

# SOLID STATE AMPLIFIERS

Type Number	Frequency Range	Output Power (W Min)	Output Power (W Typ)	Duty Cycle (Max %)	Pulse Length ( $\mu$ s)
PTCS9648	9 kHz – 100 MHz	500	550	100	-
PTCS9649	9 kHz – 100 MHz	600	700	100	-
PTCS9669	9 kHz – 220 MHz	3000	3300	100	-
PTCS9670	9 kHz – 220 MHz	5000	5500	100	-
PTCS9732	9 kHz – 250 MHz	500	550	100	-
PTCS9711	9 kHz – 250 MHz	800	900	100	-
PTCS9717	9 kHz – 400 MHz	400	450	100	-
PTCS9667	20 MHz – 100 MHz	500	550	100	-
PTCS9668	20 MHz – 100 MHz	1000	1100	100	-
PTCS9719	80 MHz – 1 GHz	250	300	100	-
PTCS9729	80 MHz – 1 GHz	400	450	100	-
PTCS9684	80 MHz – 1 GHz	1000	1100	100	-
PTCS6909	80 MHz – 3 GHz	500	550	100	-
PTCS6922	200 MHz – 1 GHz	1000	1100	100	-
PTCS6924	400 MHz – 1 GHz	1200	1300	100	-
PTCS9762	400 MHz – 1 GHz	1500	1600	100	-
PTCS9761	400 MHz – 1 GHz	2000	2100	100	-
PTCS6913	400 MHz – 1 GHz	4000	4200	100	-
PTCS6932	0.5 GHz – 2.5 GHz	200	220	100	-
PTCS6907	0.5 GHz – 2.5 GHz	250	270	100	-
PTCS9731	0.5 GHz – 2 GHz	500	550	100	-
PTCS6918	0.8 GHz – 3 GHz	200	220	100	-
PTS9611	0.8 GHz – 2.5 GHz	250	280	100	-
PTCS9655	0.8 GHz – 3 GHz	250	280	100	-
PTCS9651	0.8 GHz – 4.2 GHz	700	770	100	-
PTCS7364	1 GHz – 2 GHz	200	220	100	-
PTCS6923	1 GHz – 2.5 GHz	500	550	100	-
PTS9612	1 GHz – 6 GHz	50	55	100	-
PTCS9672	1 GHz – 2.5 GHz	1000	1100	100	-
PTCS9650	1 GHz – 3 GHz	100	110	100	-
PTCS9720	1 GHz – 4 GHz	120	130	100	-
PTCS6929	1 GHz – 2.5 GHz	1000	1100	6%	0.2 – 50 $\mu$ s
PTCS6937	1 GHz – 18 GHz	10	12	100	-
PTCS9756	1 GHz – 18 GHz	50	60	100	-
PTCS9759	2 GHz – 6 GHz	100	110	100	-
PTCS9758	2 GHz – 6 GHz	200	220	100	-
PTCS9757	2 GHz – 6 GHz	500	550	100	-



Photo: Category G testing at Element Materials Technology Warwick Ltd

Over the past 20 years TMD has proved itself to be a world leader in TWTA design innovation, offering particularly unusual products for a variety of markets and applications.

EMC testing of vehicles at SP in Sweden - in the low frequency microwave range (photo courtesy of SP).



# HIRF AMPLIFIER AND ANTENNA SOLUTIONS

## FOR D0160 CAT-G TESTING

INCREASED POWER CAN ALSO BE PROVIDED TO MEET CATEGORY L. PLEASE CONTACT TMD FOR MORE INFORMATION.

TMD has close working partnerships with antenna specialists, and is therefore able to provide test laboratories with amplifier/antenna turnkey solutions - delivering some of the highest field strengths available for EMC HIRF testing.

The examples given below are proven solutions used both in the UK and throughout the world, achieving D0160 category G in various chamber setups. Antenna photos are provided courtesy of Steatite Q-par.



0.4 – 1 GHz

700 V/m at 1 metre with an input power of 1.1 kW



PTC6924  
400 MHz – 1 GHz 1.2 kW



1 – 1.6 GHz

3,000 V/m at 1 metre with an input power of 3.8 kW



PTC6704  
1.0 – 1.5 GHz 8 kW



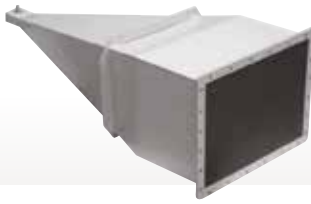
1.5 – 2.6 GHz

3,000 V/m at 1 metre with an input power of 2.8 kW



PTC6706  
1.5 – 2 GHz 6 kW

# HIRF AMPLIFIER AND ANTENNA SOLUTIONS



3000 V/m at 1 metre with  
an input power of 2.85 kW

2.6 – 4 GHz

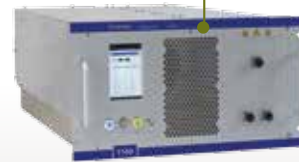


**PTCM1211P**  
2.0 – 4.0 GHz 5 kW

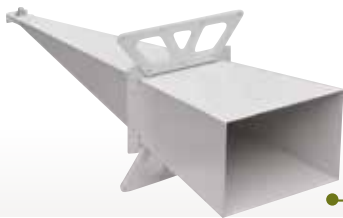


3000 V/m at 1 metre with  
an input power of 2.3 kW

4 – 6 GHz



**PTCM1219P**  
4.0 – 8.0 GHz 4 kW



3000 V/m at 1 metre with  
an input power of 2.0 kW

6 – 8 GHz

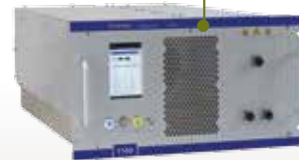


**PTCM1219P**  
4.0 – 8.0 GHz 4 kW

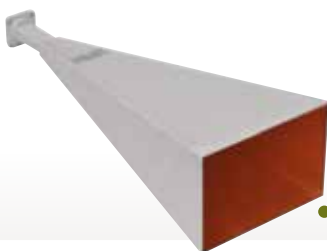


3000 V/m at 1 metre with  
an input power of 2.5 kW

8 – 12 GHz



**PTCM1213P**  
8.0 – 12.4 GHz 4 kW



3000 V/m at 1 metre with  
an input power of 2.1 kW

12 – 18 GHz



**PTCM1218P**  
12.4 – 18 GHz 3.5 kW

EVD6057 Issue 27 (May 2017)



© TMD Technologies Ltd  
Swallowfield Way Hayes Middx UB3 1DQ UK  
Telephone +44 (0)20 8573 5555  
Fax +44 (0)20 8569 1839  
Email [wecare@tmd.co.uk](mailto:wecare@tmd.co.uk)  
[www.tmd.co.uk](http://www.tmd.co.uk)

This document gives only a general description of the products and/or services and is liable to update or improvement without notice. TMD Technologies accepts no responsibility for any interpretation of or reliance placed in this document.