

TMD

...the power in microwaves!

INSTRUMENTATION
AMPLIFIERS



product summary

INSTRUMENTATION AMPLIFIERS

www.tmd.co.uk

INSTRUMENTATION AMPLIFIERS

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

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, typically at 4U or 3U high.

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.



Pictured above: Typical TMD Instrumentation Amplifier

Pictured right: EMC testing of vehicles at SP in Sweden - in the low frequency microwave range (photos courtesy of SP).

Cover Image: A suite of TMD amplifiers in a HIRF testing facility at TRW Conekt (photo (c) TRW Limited).

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 .

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.

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) |
|---------------------|---------------------|----------------------|----------------------|--------|-------------|---------------------|
| Low Power | | | | | | |
| PTC6341 | 0.8 - 2.8 | 250 | 300 | 4U | 700 | 30 |
| PTC6342 | 2.0 - 4.0 | 250 | 300 | 4U | 700 | 30 |
| PTC6492 | 2.0 - 6.0 | 200 | 250 | 4U | 700 | 30 |
| PTC6343 | 2.5 - 8.0 | 250 | 300 | 4U | 700 | 30 |
| PTC6344 | 4.0 - 8.0 | 250 | 300 | 4U | 700 | 30 |
| PTC6581 | 6.5 - 18.0 | 200 | 220 | 4U | 700 | 30 |
| PTC6322 | 6.0 - 18.0 | 300 | 320 | 4U | 700 | 30 |
| PTC7814 | 7.5 - 18.0 | 200 | 250 | 4U | 700 | 30 |
| PTC6348 | 7.5 - 18.0 | 250 | 300 | 4U | 700 | 30 |
| PTC7378 | 1.0 – 18.0 | 50 | 60 | 4U | 700 | 30 |
| Medium Power | | | | | | |
| PTC6440 | 0.8 - 2.5 | 500 | 560 | 4U | 800 | 37 |
| PTC6441 | 2.5 - 7.5 | 500 | 560 | 4U | 700 | 35 |
| PTC6522 | 6.0 - 18.0 | 550 | 570 | 8U | 700 | 48 |
| PTC6442 | 7.5 - 18.0 | 500 | 560 | 8U | 700 | 48 |
| PTC6478 | 10.5 - 13.0 | 400 | 450 | 5U | 700 | 35 |
| High Power | | | | | | |
| 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 |
| Millimetric | | | | | | |
| PTC6479S | 17.5 - 21.5 | 210 | 280 | 4U | 700 | 30 |
| PTC6329 | 18.0 - 28.0 | 45 | 70 | 4U | 700 | 27 |
| PTC6479 | 18.0 - 23.0 | 210 | 311 | 4U | 780 | 27 |
| PTC6437 | 18.0 – 23.0 | 250 | 270 | 4U | 700 | 30 |
| PTC6337 | 18.0 - 40.0 | 40 | 80 | 4U | 700 | 27 |
| PTC9752 | 23.0 – 27.0 | 400 | 420 | 4U | 700 | 35 |
| PTC9653 | 24.93 – 25.93 | 60 | 80 | 4U | 700 | 30 |
| PTC9653 | 24.93 – 25.93 | 250 | 270 | 5U | 700 | 40 |
| PTC7736 | 26.0 – 31.0 | 200 | 220 | 4U | 700 | 30 |
| PTC6333 | 26.5 - 40.0 | 40 | 70 | 4U | 700 | 27 |
| PTC7732 | 27.0 - 31.0 | 112 | 125 | 4U | 780 | 30 |
| PTC7732S | 31.6 - 32.5 | 230 | 260 | 4U | 700 | 27 |
| PTC6429 | 34.5 - 35.5 | 100 | 35 | 4U | 700 | 30 |
| PTC9641 | 35.65 - 35.85 | 300 | 320 | 5U | 700 | 50 |

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) |
|--|---------------------|----------------------|----------------------|--------------------|-------------------|--------|-------------|---------------------|
| Low Power | | | | | | | | |
| PTC6352 | 2.0 - 4.0 | 1700 | 2000 | 6 | 0.2-100 | 4U | 700 | 30 |
| PTC6353 | 2.5 - 8.0 | 1700 | 2100 | 6 | 0.2-100 | 4U | 700 | 30 |
| PTC6354 | 4.0 - 8.0 | 1700 | 2100 | 6 | 0.2-100 | 4U | 700 | 30 |
| PTC6338 | 5.0 - 11.0 | 1600 | 2200 | 5 | 0.2-100 | 4U | 700 | 30 |
| PTC6358 | 7.5 - 18.0 | 1500 | 2000 | 6 | 0.2-100 | 4U | 700 | 30 |
| Medium Power | | | | | | | | |
| PTC7351 | 1.0 - 2.5 | 2000 | 2500 | 6 | 0.2-100 | 4U | 800 | 30 |
| PTC7353 | 2.0 - 8.0 | 1900 | 2100 | 6 | 0.2-100 | 4U | 700 | 30 |
| 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 |
| PTC6356 | 8.0 - 12.4 | 1700 | 2500 | 6 | 0.2-20 | 4U | 700 | 30 |
| PTC6658 | 8.0 - 18.0 | 2000 | 2200 | 4 | 0.2-20 | 4U | 700 | 30 |
| High Power (for HIRF testing) | | | | | | | | |
| 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 |
| PTC7359 | 1.0 - 2.0 | 3800 | 4000 | 4 | 0.1-50 | 4U | 800 | 35 |
| PTC7352 | 2.0 - 4.0 | 5000 | 5500 | 6 | 0.2-20 | 4U | 880 | 35 |
| PTC6303 | 2.9 - 4.0 | 9000 | 11000 | 4 | 0.2-50 | 4U | 780 | 30 |
| PTC7383 | 2.0 - 8.0 | 4000 | 4500 | 6 | 0.2-50 | 8U | 700 | 70 |
| PTC7354 | 4.0 - 8.0 | 4000 | 5000 | 6 | 0.2-20 | 6U | 780 | 35 |
| PTC6326 | 8.0 - 12.4 | 4000 | 5000 | 6 | 0.2-20 | 4U | 780 | 35 |
| PTC6357 | 8.0 - 11.0 | 5900 | 7500 | 5 | 0.2-20 | 4U | 700 | 30 |
| PTC6568 | 8.5 - 10.5 | 6800 | 8000 | 5 | 0.2-100 | IFA | S | 30 |
| PTC7716 | 8.7 - 10.0 | 5000 | 6500 | 7 | 0.2-50 | 4U | 700 | 30 |
| PTC7376 | 8.0 - 12.0 | 4200 | 5000 | 6 | 0.2-50 | 4U | 700 | 35 |
| PTC6447 | 10.5 - 12.5 | 9000 | 10000 | 2 | 0.1-20 | 4U | 700 | 30 |
| PTC6382 | 12.4 - 18.0 | 3500 | 4000 | 6 | 0.2-20 | 4U | 780 | 35 |
| Ultra High Power (for HIRF Testing) | | | | | | | | |
| 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 (μs) |
|-------------|-------------------|----------------------|----------------------|--------------------|-------------------|
| 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 μs |
| 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 | - |



Category G testing at TRaC Global
Photo courtesy TRaC Global

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.



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



PTCS6924
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



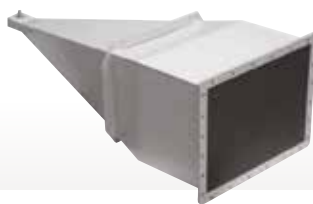
1.5 – 2.6 GHz

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



PTC7352
2.0 – 4.0 GHz 5 kW



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

4 – 6 GHz



PTC7354
4.0 – 8.0 GHz 4 kW



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

6 – 8 GHz

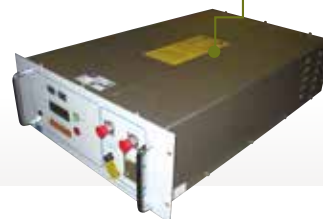


PTC7354
4.0 – 8.0 GHz 4 kW

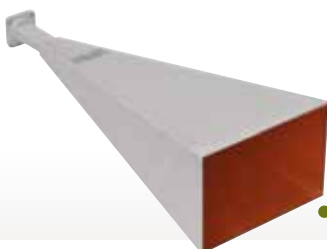


3000 V/m at 1 metre with
an input power of 2.5 kW

8 – 12 GHz



PTC6326
8.0 – 12.4 GHz 4 kW



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

12 – 18 GHz



PTC6382
12.4 – 18 GHz 3.5 kW

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