TriMode™ Probe Family

P7700 Series TriMode Probes Datasheet



Overview

The P7700 Series TriMode probes provide the highest probe fidelity available for real-time oscilloscopes. In addition, with connectivity innovations such as solder-in tips with the probe's input buffer mounted only a few millimeters from the end of the tip, the P7700 Series probes provide unmatched usability for connecting to today's most challenging electronic designs.

High bandwidth for signal fidelity

- 25 GHz P7725
- 20 GHz P7720
- 16 GHz P7716
- 13 GHz P7713
- 8 GHz P7708

Minimal device impact

- Thin and flexible solder tips
- Lightweight and flexible probe cable
- Active buffer tip design for low probe loading
- High performance RC probe tips

Easy to connect TekFlex™ Connector technology

- Pinch-to-Open accessory connector
- Versatile Connectivity - solder-in tips, optional browser for handheld or fixtured probing, and coaxial input (SMA adapter)
- Full Bandwidth to 25 GHz
- Probe cable and solder-in tips operate over an extended temperature range

Probe and tip specific S-parameters

- Full AC calibration of the probe and tip's signal path based upon unique S-parameter models
- Unique DSP filters created for each probe and tip

TekConnect® interface for oscilloscope/probe control and usability

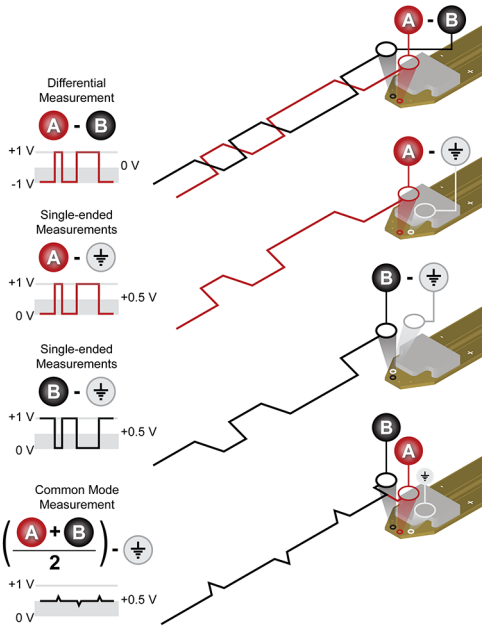
- Direct control via probe buttons or from the oscilloscope's menus
- Automated control of probe settings via the oscilloscope
- Automatic recognition of the probe and tip when attached to the oscilloscope

Applications

- DDR/LPDDR memory verification
- High speed serial bus debugging
- MIPI D-PHY/C-PHY/M-PHY conformance tests
- HDMI and DisplayPort compliance tests

TriMode Probes

With TriMode probing one probe setup makes differential, single-ended, and common-mode measurements accurately. This unique capability allows you to work more effectively and efficiently, switching between differential, single-ended and common-mode measurements without moving the probe's connection points.

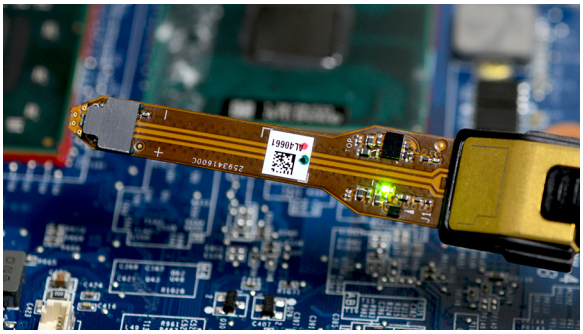


TekFlex connector technology

The P7700 Series TriMode probes use the new TekFlex connector technology that combines a high speed signal path with power and communication support for an active buffer tip in a single, easy to connect accessory connector. The TekFlex connector has a pinch-to-open design that when open requires minimal force to attach an accessory tip. When the TekFlex connector is closed, it provides a secure connection to the accessory to avoid accidental disconnections.

With the TekFlex connector, the P7700 series probes offer a set of active probe tips with the probe's buffer amplifier only millimeters from the input connections. The short signal path enabled with the active tips provides high fidelity and a high impedance input. It also minimizes signal loss, capacitance, and additive noise.

P77STFLXA and P77STFLXA24 solder-in flex-circuit accessory for direct high-impedance probing at accessible signal nodes.



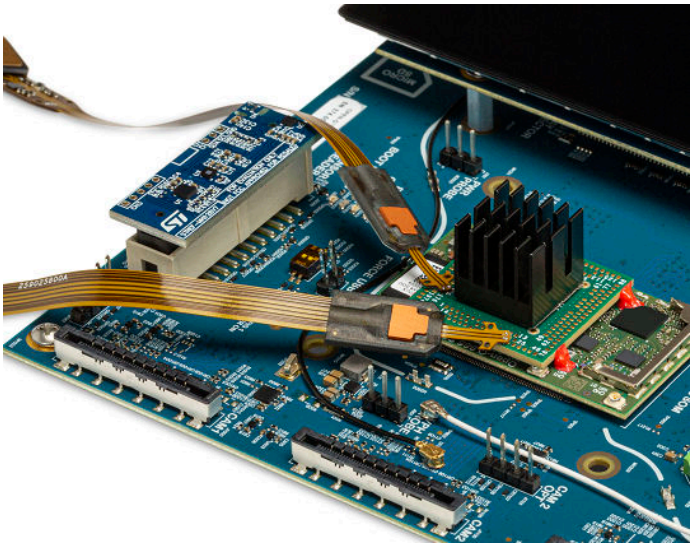
P77STFLXB solder-in flex-circuit accessory for DDR/LPDDR validation with SI interposers using a ~100 Ω isolation resistor in the probe-access path.



P77STCABL solder down accessory with a long reach, flexible cable combined with an active buffer amplifier on the tip.



P77STFLRB solder-in, flex-circuit accessory provides improved signal access and mechanical strain relief for DDR and LPDDR electrical validation with interposers.



Browser accessory for handheld probing

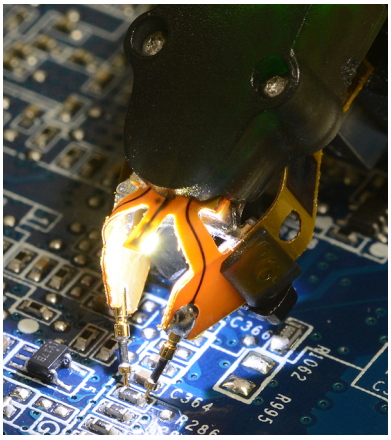
When you need to make a quick measurement or debug a problem, the P7700 series browser accessory provides a simple to use option. With precision engineered tips that are easy to see and position accurately, the P77BRWSR handheld browser accessory enables hand or fixtured probing and is ideal for probing fine pitch components and differential traces with spacing as narrow as 0.2 mm (.008 in).

P77BRWSR handheld browser accessory enables hand or fixtured probing with adjustable tip spacing. Up to 16 GHz bandwidth.



The browser's tips have a full range of compliance and are adjustable in spacing using a convenient thumb wheel. A headlight on the tip enhances visibility of the probe point and can be switched on and off as needed. The browser tips are constructed of high strength BeCu and super-ceramic resistors (patent pending pin technology). With 16 GHz bandwidth performance, the P77BRWSR handheld browser accessory enables hand or fixtured probing with signal fidelity and convenience.

Headlight on P77BRWSR handheld browser accessory enables hand or fixtured probing and enhances visibility of the probe point.

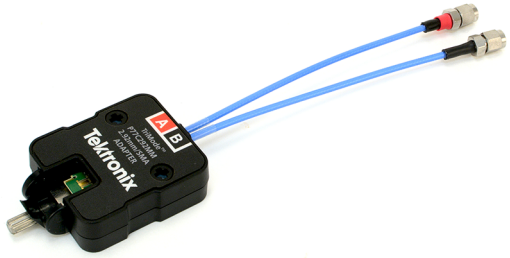


Coaxial input (SMA) adapter

RF/coaxial connectors, such as SMA, are often found on test fixtures or on prototype board designs. Attaching a P7700 series probe to these on-board connectors is easy with the SMA adapter. The P77C292MM adapter allows you to connect to 2.92 mm, 3.5 mm or SMA connectors with full bandwidth and low noise. The P77C292MM adapter includes TriMode functionality enabling differential, single-ended, and common-mode measurements.

For compliance testing of the HDMI and DisplayPort standards, the P77C292MM and P7700 series probes are fully supported in Tektronix automated measurement suites for these standards. With the P77C292MM adapter attached, a P7700 series probe can provide the DC termination voltage required by HDMI and other high-speed communication standards. The termination voltage can be set manually or automatically using voltage sense circuitry in the P7700 probe and covers a range of ±4 V.

P77C292MM SMA/2.92mm adapter for connecting to coaxial connectors.



Automatic probe and tip identification and AC calibration

The P7700 Series probes automatically identify the accessory connected to the probe. When the probe and tip are attached to an oscilloscope, they are recognized and a unique DSP filter providing a calibrated response is enabled. All calibration and filter calculation is based upon a unique set of S-parameters stored in the probe and tip.

These unique filters also de-embed probe parasitics from the measurement. Creating probe and tip specific filters is critical as bandwidths increase. At high bandwidth, small variations in the signal path can lead to significant variation in frequency response which cannot be corrected using a nominal DSP filter.

The P77BRWSR accessory extends the calibration further. As the spacing of the browser's tips is adjusted, the change in opening is automatically recognized by the probe and oscilloscope. Using the value of the tip spacing, a width specific DSP filter is used to calibrate the probe's response.

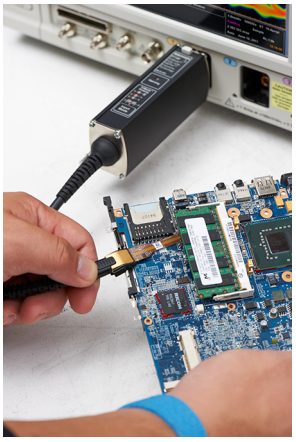
The automatic recognition of the probe and tips and the automatic filter selection eliminates the risk of manually selecting the wrong filter and improves your efficiency.

Signal fidelity

You can be confident in the signal fidelity of your measurements. The innovative new probe design uses SiGe technology to provide the bandwidth and fidelity needed today and in the future.

The P7700 Series probe architecture provides:

- An active buffer amplifier on the tips with the solder-in tips probe input only 3.2 mm from the input
- Excellent step response and low insertion loss up to 25 GHz
- Low-DUT loading with 100 kΩ (DC) and 0.4 pF (AC) performance
- High CMRR
- Low noise



Performance you can count on

Depend upon Tektronix to provide you with performance you can count on. In addition to industry leading service and support, these probes are backed by a one-year warranty.



Specifications

Specifications are typical unless noted otherwise.

All specifications apply to all models unless noted otherwise.

P7700 Series TriMode probe models

The P77STLRCB accessory is discontinued.

P7725 probe specifications

P7725 Characteristic	P77C292MM	P77STFLXA24
Bandwidth (typical)	25 GHz	24 GHz
		Differential and single-ended modes only. Bandwidth is 16 GHz in the common-mode setting.
Rise time (10-90%)	< 20 ps	< 25 ps
	Rise times in common-mode setting: < 22 ps (10-90%), < 17 ps (20-80%)	Rise times in common-mode setting: < 27 ps (10-90%), < 17 ps (20-80%)
Rise time (20-80%)	16 ps	< 16 ps

P7720 probe specifications

P7720 Characteristic	P77STFLXA, P77STCABL, P77C292MM, P77STFLRA, P77HTFLRA	P77STFLXB, P77STLRCB	P77BRWSR, P77STFLRB, P77HTFLRB
Bandwidth (typical)	20 GHz	15 GHz	16 GHz
	Differential and single-ended modes only. Bandwidth is 19 GHz in the common-mode setting.		
Rise time (10-90%)	27 ps	36 ps	32 ps
	Rise times in common-mode setting: 29 ps (10 - 90%), 19 ps (20 - 80%).		
Rise time (20-80%)	18 ps	24 ps	24 ps

P7716 probe specifications

P7716 Characteristic	P77STFLXA, P77STCABL, P77C292MM, P77BRWSR, P77STFLRB, P77HTFLRB, P77STFLRA, P77HTFLRA	P77STFLXB, P77STLRCB
Bandwidth (typical)	16 GHz	15 GHz
Rise time (10-90%)	32 ps	36 ps
Rise time (20-80%)	24 ps	24 ps

P7713 probe specifications

P7713 Characteristic	P77STFLXA, P77STFLXB, P77STCABL, P77C292MM, P77BRWSR, P77STLRCB, P77STFLRB, P77HTFLRB, P77STFLRA, P77HTFLRA
Bandwidth (typical)	13 GHz
Rise time (10-90%)	40 ps
Rise time (20-80%)	28 ps

P7708 probe specifications

P7708 Characteristic	P77STFLXA, P77STFLXB, P77STCABL, P77C292MM, P77BRWSR, P77STLRCB, P77STFLRB, P77HTFLRB, P77STFLRA, P77HTFLRA
Bandwidth (typical)	8 GHz
Rise time (10-90%)	55 ps
Rise time (20-80%)	35 ps

Electrical characteristics

Attenuation

- Solder-in tips: 4x
- Browser: 10x
- Coaxial input (SMA) adapter: 0.7x/1.3x/2.7x/5x/10x

Input range

Accessory	Single-ended	Differential
Solder-in tips	2.5 V_{p-p}	5.0 V_{p-p}
Browser	6.0 V_{p-p}	12.0 V_{p-p}
SMA Adapter	1.2 V_{p-p}	2.0 V_{p-p}

Operating voltage window

- Solder-in tips: ±5.25 V
- Browser: ±10 V
- SMA adapter: ±4 V

Offset voltage range

- Solder-in tips: -4 V to +4 V
- Browser: -10 V to +10 V
- SMA adapter: -4 V to +4 V

SMA adapter termination voltage range

-4 V to +4 V

DC gain accuracy

±2.0%

DC input resistance, differential

- Solder-in tips: 100 kΩ
- Browser: 150 kΩ
- SMA adapter: 100 Ω

Noise

- P77STFLXA24, P77STFLXA, P77STFLXB, P77STCABL, and P77STLRCB (discontinued) tips: < 32 nV/rt-Hz
- P77STFLRB, P77HTFLRB, P77STFLRA, and P77HTFLRA: < 35 nV/rt-Hz
- Browser: < 80 nV/rt-Hz
- SMA adapter: < 11 nV/rt-Hz

Low frequency input capacitance (differential, typical)

- P77STFLXA24, P77STFLXA, P77STFLXB, P77STCABL, and P77STLRCB (discontinued) tips: 0.4 pF
- P77STFLRB and P77HTFLRB: 0.7 pF
- P77STFLRA and P77HTFLRA: 0.44 pF
- Browser: 0.23 pF @ 50 mil spacing, 0.22 pF @ 200 mil spacing

CMRR/DMRR

Frequency range	Min. CMRR/DMRR
≤ 50 MHz	34 dB
> 50 MHz, ≤ 800 MHz	24 dB
> 800 MHz, ≤ 4 GHz	14 dB
> 4 GHz, ≤ 10 GHz	10 dB
> 10 GHz, Less than equal to 25 GHz	5 dB

Non-destructive input range

- Solder-in tips, Browser: -15 V to +15 V
- SMA adapter: -5 V to +5 V

Nominal characteristics

Oscilloscope interface

TekConnect

Accessory connector

TekFlex

Cable length

1.3 m (4.3 feet)

Weight

- Probe cable and head: 3.5 oz
- Probe (comp box, cable, head): 9.6 oz

Environmental specifications

Description	Specification
Operating temperature	Probe compensation box: 0°C to 45°C
	P77C292MM adapter: -35°C to 105°C
	P77BRWSR: 0°C to 45°C
	Probe cable and FLX solder tips: -35°C to 105°C
	Standard temperature FLR solder tips: -40°C to 105°C
	High temperature FLR solder tips: -40°C to 125°C
	Minimum airflow required 46°C to 125°C
Non-operating temperature	Probe compensation box: -20°C to 60°C
	P77C292MM adapter: -35°C to 105°C
	P77BRWSR: -20°C to 60°C
	Probe cable and FLX solder tips: -35°C to 105°C
	Standard temperature FLR solder tips: -40°C to 105°C
	High temperature FLR solder tips: -40°C to 125°C
Operating humidity	Cable, tips, and SMA adapter: 20% to 80% RH (relative humidity) at up to 45°C non-condensing
	Probe compensation box: 8% to 80% RH at up to 32°C non-condensing, and as limited by a maximum wet-bulb temperature of 29.4°C (derates relative humidity to 32% RH at 45°C)
	P77BRWSR: 20% to 80% RH at up to +45°C, non-condensing
Non-operating humidity	Cable, tips, and P77C292MM adapter: 10% to 90% RH, non-condensing
	Probe compensation box: 5% to 95% RH at up to 30°C, 5% to 45% RH above 30°C up to 60°C, non-condensing, and as limited by a maximum wet-bulb temperature of 29.4°C (derates relative humidity to 11% RH at 60°C)
	P77BRWSR: 10% to 90% RH, non-condensing at up to +45°C; and 45% RH at up to 60°C
Non-operating altitude	Probe compensation box, cable, tips, and SMA adapter: 12,000 meters

Compatibility

The P7700 Series probes are compatible with the following oscilloscopes running Microsoft Windows 7 and TekScope firmware version 10.6 or higher: DPO70000C Series, DSA70000C Series, MSO70000C Series, DPO70000D Series, DSA70000D Series, DPO70000DX Series, MSO70000DX Series, DPO70000SX Series, and 7 Series DPO.

The P7725 requires 7 Series DPO firmware version 2.28.18 or later.

Ordering information

Select the appropriate instrument and options for your measurement needs.

Model overview

Model	Description
P7725	25 GHz TriMode probe with TekFlex connector technology
P7720	20 GHz TriMode probe with TekFlex connector technology
P7716	16 GHz TriMode probe with TekFlex connector technology
P7713	13 GHz TriMode probe with TekFlex connector technology
P7708	8 GHz TriMode probe with TekFlex connector technology

Bandwidth upgrade

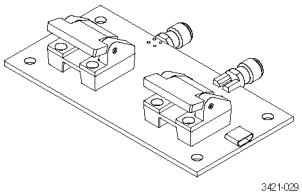
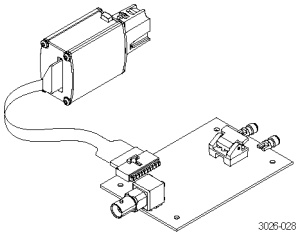
Model	Description
P77BW16T25	P7716 (16 GHz) to P7725 (25 GHz) bandwidth upgrade, includes 2x P77STFLXA24
P77BW20T25	P7720 (20 GHz) to P7725 (25 GHz) bandwidth upgrade, includes 2x P77STFLXA24

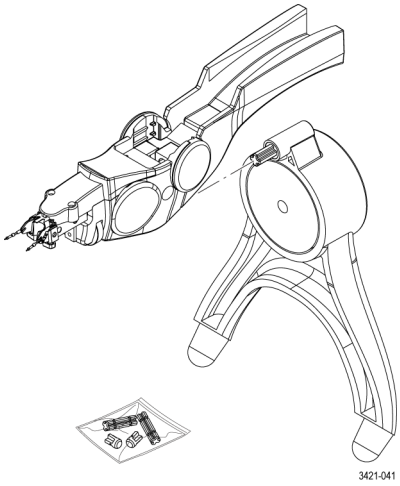
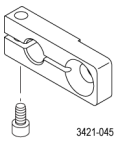
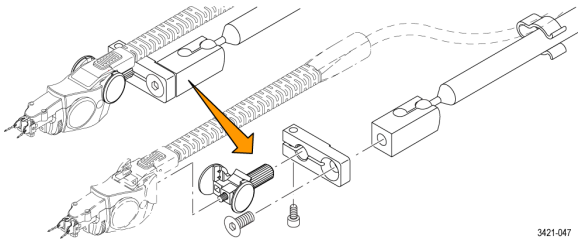
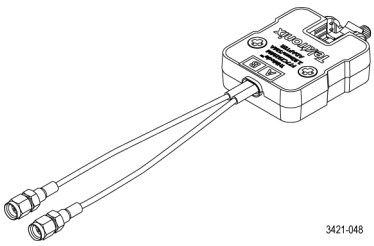
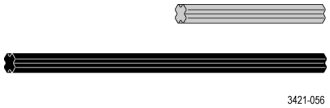
Standard accessories

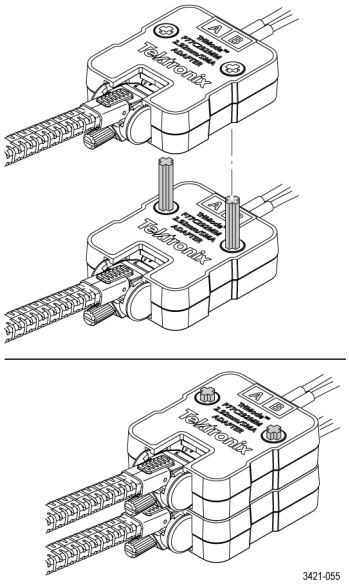
The following accessories are shipped with your probe.

Part number	Description
P77STFLXA24	Active tips (2 solder tips), only available for the P7725
P77STFLXA	Active tips (2 solder tips), only available for the P7708, P7713, P7716, and P7720
020-3167-xx	Adhesive tape
016-2111-xx	Color bands
017-0103-xx	Wire kit (38 AWG, 4 mil)
071-7386-xx	Accessory re-order and info card
006-3415-xx	**Antistatic wrist strap.** When you use the probe, always work at an antistatic work station and wear the antistatic wrist strap.
–	**Calibration certificate.** A certificate of traceable calibration is provided with every probe.
–	**Data calibration report.** The Data Calibration Report lists the manufacturing test results of your probe at the time of shipment and is included with every probe.

Optional accessories

Optional accessory	Part and description
	P77STCABL, Solder-in active tip This tip provides a soldered, multi-point connection that supports full TriMode measurement capabilities at full probe bandwidth.
	P77STFLXA24 standard reach Flex circuit based solder tips Active, solder-in tip with TekFlex connector technology, 24 GHz (5 tips/kit) up to 125 ºC. Each P7725 probe ships with two of these solder-in tips as standard accessories
	P77STFLXA standard reach Flex circuit based solder tips Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit) up to 125 ºC.
	P77STFLRB and P77HTFLRB long reach Flex circuit based solder tips. The B tips have dark gray plastic housing.
	P77STFLRA and P77HTFLRA long reach Flex circuit based solder tips. The A tips have blue plastic housing. There is also an intentional cutout near the plastic housing.
	P77STFLXB Flex circuit based solder-in tips for memory interposer probing. These tips use flex circuit material and provide soldered, multi-point connections. Designed to be used with Nexus Technology memory interposers.
	P77DESKEW, Deskew fixture Use this fixture to compensate a probe, deskew up to 2 probes at once, or to perform a probe functional check.
	DC probe calibration fixture Use this fixture (090-0103-02) to perform a DC compensation with the host instrument.

Optional accessory	Part and description
	P77BRWSR, Browser accessory includes these items: **Browser wand.** Extends the length of the browser for a more comfortable grip. (Part number 020-3160-xx.) **Browser hands-free tripod.** Holds the browser on a test point without the need to use your hands. (Part number 020-3161-xx.) **Browser replacement tips.** Use to repair any browser tips that are broken with use. (Part number 020-3162-xx.) **Adapter attachment.** Attaches the browser to the hands-free tripod or other holders. **Ground lead.** Attaches the browser to a circuit ground if necessary. The browser accessories can be stored in the TekFlex accessories box that comes standard with the probe.
	407-6019-xx, Probe adapter Use this accessory to attach the browser to the PPM203B (probe arm/positioner)
	
	P77C292MM, 25 GHz, 2.92 mm adapter Use this adapter to connect a P7700 series probe to a DUT with 50 Ω test point connectors.
	020-3179-xx, Linkage adapter kit Use the adapters for stacking two or more P77C292MM 2.92 mm adapters.

Optional accessory	Part and description
	Use two gray adapters to stack two P77C292MM adapters; use two black adapters to stack three or four P77C292MM adapters. Insert the linkage adapters into the P77C292MM adapters as shown (gray linkage adapters shown).

Service options

Opt. CD3 - Calibration with full data report service 3 years

Opt. CD5 - Calibration with full data report service 5 years

Opt. ACC3 - Accredited calibration Service 3 years. Includes 3 accredited calibration events over 3 years.

Opt. ACC5 - Accredited calibration Service 5 years. Includes 5 accredited calibration events over 5 years.

Opt. G3 - Three year Gold Care Protection Plan. Includes all of the benefits of Total Product Protection Plan plus access to a loaner product during repair or advance exchange to reduce downtime.

Opt. G5 - Five year Gold Care Protection Plan. Includes all of the benefits of Total Product Protection Plan plus access to a loaner product during repair or advance exchange to reduce downtime.

Opt. R3 - Standard warranty extended to 3 years

Opt. R5 - Standard warranty extended to 5 years

Opt. ISO - Accredited calibration report for new product

Certifications

Tektronix is registered to ISO 9001:2015 and ISO 14001:2015.

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