

# Digital Phosphor Oscilloscopes

## TDS3000C Series Datasheet



The TDS3000C Series provides you with the performance you need at a price you can afford. Bandwidths range from 100 MHz to 500 MHz, with up to 5 GS/s sample rates for accurate representation of your signal.

### Key performance specifications

- 100 MHz, 300 MHz, and 500 MHz bandwidth models
- 2 or 4 analog channel models
- Sample rates up to 5 GS/s real time on all channels
- 10k record length on all channels
- 3,600 wfms/s continuous waveform capture rate
- Suite of advanced triggers

### Key features

- Front-panel USB host port for easy storage and transfer of measurement data
- 25 automatic measurements
- FFT standard
- Multiple language user interface
- WaveAlert<sup>®</sup> automatic waveform anomaly detection
- TekProbe<sup>®</sup> interface supports active, differential, and current probes for automatic scaling and units

### Portable design

- Lightweight design (only 7 lb./3.2 kg) for easy transport
- Optional internal battery operation provides up to three hours without line power

### Application modules for specialized analysis

- Advanced analysis module
- Limit testing module
- Telecommunications mask testing module
- Extended video module
- 601 serial digital video module

### Applications

- Digital design and debug
- Video installation and service
- Power supply design
- Education and training
- Telecommunications mask testing
- Manufacturing test
- General bench testing

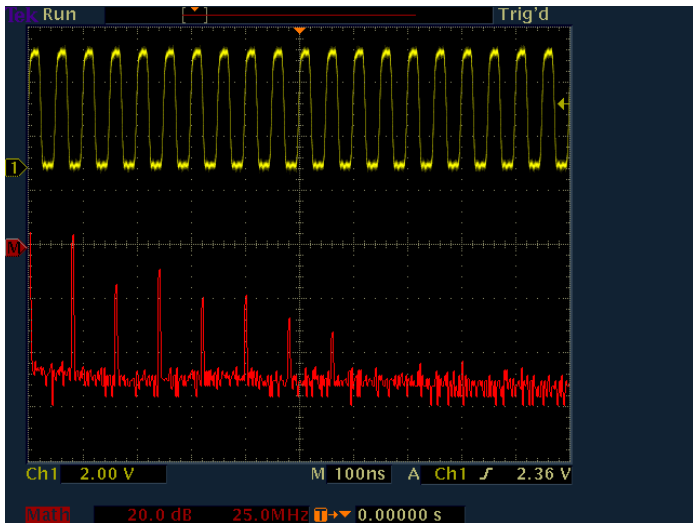
### DPOs provide greater level of insight into complex signals

The TDS3000C Series offers fast waveform capture rates on a continuous basis that save you time by quickly revealing the nature of faults, so advanced triggers can be applied to isolate them.

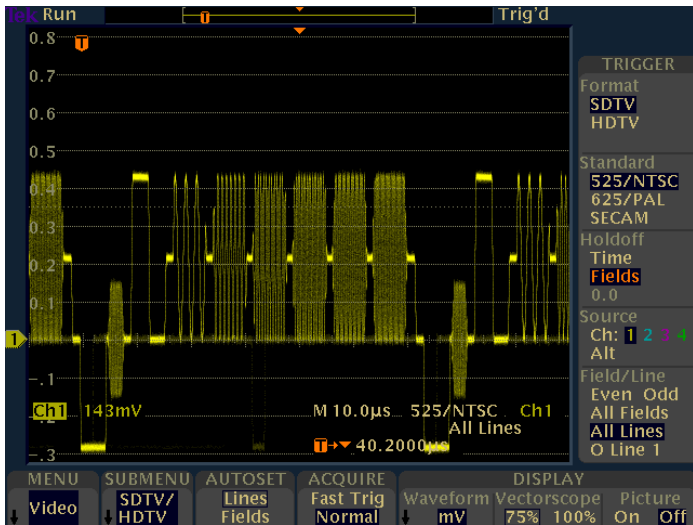
Real-time intensity grading highlights the details about the history of a signal's activity, making it easier to understand the characteristics of the waveforms you've captured. Unlike other comparable oscilloscopes, the history remains even after the acquisition has been stopped.

## Quickly debug and characterize signals with DRT sampling technology and sin(x)/x interpolation

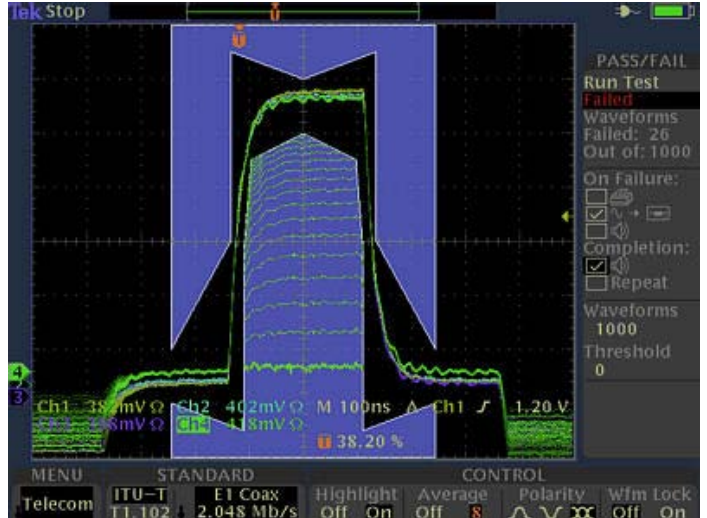
The TDS3000C Series combines unique digital real-time (DRT) sampling technology with sin(x)/x interpolation to allow you to accurately characterize a wide range of signal types on all channels simultaneously. With the TDS3000C Series there is no change in sampling rate when additional channels are turned on, unlike other comparable oscilloscopes. This sampling technology makes it possible to capture high-frequency information, such as glitches and edge anomalies, that elude other oscilloscopes in its class, while sin(x)/x interpolation ensures precise reconstruction of each waveform.



Look for unintentional circuit noise with the TDS3000C series' FFT capability.



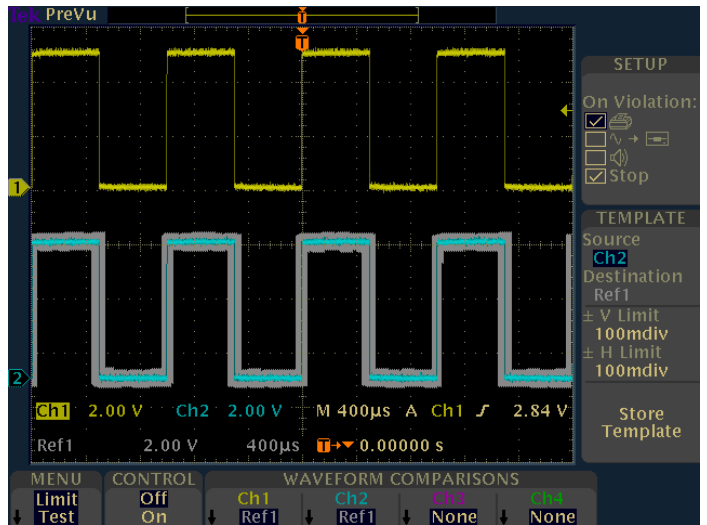
Custom video triggering allows the TDS3000C Series to trigger on standards such as RS-343 (26.2 kHz scan rate).



The TDS3000C Series provides breakthrough test speeds for telecommunications line card testing. The telecom QUICKMENU puts all the commonly used telecom test functions on a single menu.

## Easy to setup and use

When working under tight deadlines, you need your oscilloscope to be intuitive; you want to minimize time spent learning and relearning how to use it. The TDS3000C Series oscilloscopes help reduce your learning curve. Simple navigation and dedicated front-panel controls get you to where you want to be quickly, so that you spend less time learning and more time on the task at hand.



The TDS3000C series with the TDS3LIM module is ideal for manufacturing test applications where fast Go/No-Go decisions are required.

### Simple documentation and analysis

The TDS3000C Series comes equipped with a USB host port so you can easily store and transfer measurement information to your PC.

OpenChoice® PC Communication Software allows you to simply pull screen images and waveform data into a standalone desktop application or directly into Microsoft Word and Excel.

To complement OpenChoice, National Instruments LabVIEW SignalExpress™ Tektronix Edition Software provides you with extended capabilities including advanced analysis, data logging, remote instrument control, and live waveform analysis.

If you prefer not to use a PC for analysis, the TDS3000C Series comes standard with 25 automatic measurements, waveform add, subtract, divide, and multiply math functions, and Fast Fourier Transform (FFT). Unlike other comparable oscilloscopes, the TDS3000C Series math and measurement allows you to use the full acquisition record length or isolate a specific occurrence within an acquisition.

### Instrument control

Utilizing the built-in ethernet port, e\*Scope web-based remote control allows you to control TDS3000C series oscilloscope from anywhere, using the internet and your PC.

### Work where you need to

The TDS3000C Series packs the power of a DPO in a compact design that is only 5.9 in. (149 mm) deep, freeing up valuable benchtop space. And when you need to move your oscilloscope to another lab, its portable 7 lb. (3.2 kg) design makes for easy transport.

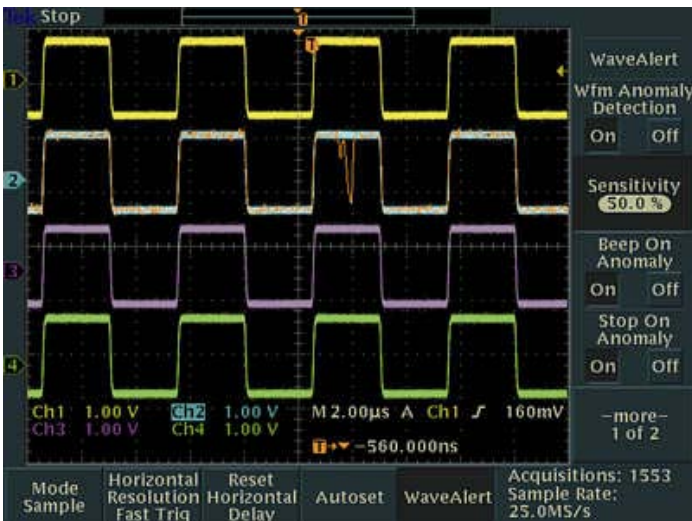
If your work demands even more mobility, then the optional battery pack will give you up to three hours of operation without line power.



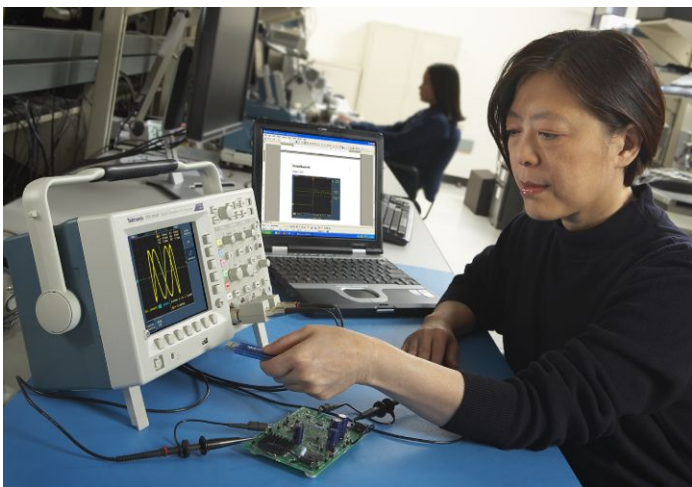
TDS3BATC provides you with up to three hours of portable battery operation.



Trace and identify ITU-R BT.601 video signals with the TDS3SDI 601 Serial Digital Video Module.



WaveAlert waveform anomaly detection alerts you to any waveform that deviates from the "normal" input such as the glitch on channel 2.



Easily transfer, document, and analyze data on your PC.



# Specifications

All specifications apply to all models unless noted otherwise.

	TDS3012C	TDS3014C	TDS3032C	TDS3034C	TDS3052C	TDS3054C
Input channels	2	4	2	4	2	4
Bandwidth	100 MHz	100 MHz	300 MHz	300 MHz	500 MHz	500 MHz
Rise time (typical)	3.5 ns	3.5 ns	1.2 ns	1.2 ns	0.7 ns	0.7 ns
Sample rate on each channel	1.25 GS/s	1.25 GS/s	2.5 GS/s	2.5 GS/s	5 GS/s	5 GS/s
Record length	10 kpoints					

## Vertical system

Hardware bandwidth limits	TDS3012C	TDS3014C	TDS3032C	TDS3034C	TDS3052C	TDS3054C
	20 MHz	20 MHz	20 MHz, 150 MHz	20 MHz, 150 MHz	20 MHz, 150 MHz	20 MHz, 150 MHz
Input coupling	AC, DC, GND					
Input impedance	1 M $\Omega$ in parallel with 13 pF or 50 $\Omega$					
Input sensitivity range						
1 M $\Omega$	1 mV/div to 10 V/div					
50 M $\Omega$	1 mV/div to 1 V/div					
Vertical resolution	9 bits					
Maximum input voltage						
1 M $\Omega$	150 V <sub>RMS</sub> with peaks at $\leq$ 400 V					
50 M $\Omega$	5 V <sub>RMS</sub> with peaks at $\leq$ 30 V					
DC gain accuracy	$\pm$ 2%					
Position range	$\pm$ 5 div					

## Horizontal system

Seconds/division range	TDS3012C	TDS3014C	TDS3032C	TDS3034C	TDS3052C	TDS3054C
	4 ns to 10 s	4 ns to 10 s	2 ns to 10 s	2 ns to 10 s	1 ns to 10 s	1 ns to 10 s
Time base accuracy	$\pm$ 20 ppm over any 1 ms time interval					

## Trigger system

Trigger modes	Auto (supports Roll Mode for 40 ms/div and slower), Normal, Single Sequence
B trigger	Trigger after time or events
Trigger after time range	13.2 ns to 50 s
Trigger after events range	1 to 9,999,999 events
Trigger types	
Edge	Conventional level-driven trigger. Positive or negative slope on any channel. Coupling selections: AC, DC, Noise Reject, HF Reject, LF Reject
Video	Trigger on all lines or individual lines, odd/even or all fields on NTSC, PAL, SECAM
Extended video	Trigger on specific lines in broadcast and non-broadcast (custom) standards and on analog HDTV formats (1080i, 1080p, 720p, 480p). Requires TDS3VID or TDS3SDI application module
Pulse width (or glitch)	Trigger on a pulse width <, >, =, $\neq$ to a selectable time limit ranging from 39.6 ns to 50 s

## Datasheet

<b>Runt</b>	Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again
<b>Rise/fall time</b>	Trigger on pulse edge rates that are either faster or slower than a set rate. Edges can be rising, falling, or either
<b>Pattern</b>	Specifies AND, OR, NAND, NOR when true or false for a specific time
<b>State</b>	Any logic state. Triggerable on rising or falling edge of a clock. Logic triggers can be used on combinations of 2 inputs (not 4)
<b>Comm</b>	Provides isolated pulse triggering required to perform DS1/DS3 telecommunications mask testing per ANSI T1.102 standard. Requires TDS3TMT application module
<b>Alternate</b>	Sequentially uses each active channel as a trigger source

## Acquisition system

<b>DPO</b>	Captures and displays complex waveforms, random events and subtle patterns in actual signal behavior. DPOs provide 3 dimensions of signal information in real time: Amplitude, time, and the distribution of amplitude over time
<b>Sample</b>	Sample data only
<b>Average</b>	Waveform averaged, selectable from 2 to 512
<b>Envelope</b>	Min-max values acquired over one or more acquisitions
<b>Peak detect</b>	High-frequency and random glitch capture. Captures glitches as narrow as 1 ns (typical) using acquisition hardware at all time base settings
<b>WaveAlert®</b>	Monitors the incoming signals on all channels and alerts the user to any waveform that deviates from the normal waveform being acquired
<b>Single sequence</b>	Use the Single Sequence button to capture a single triggered acquisition sequence at a time

## Waveform measurements

<b>Cursors</b>	Amplitude, time
<b>Automatic measurements</b>	Display any four measurements from any combination of waveforms. Or display all measurements with measurement snapshot feature. Measurements include Period, Frequency, +Width, -Width, Rise time, Fall time, +Duty cycle, -Duty cycle, +Overshoot, High, Low, Max, Min, Peak-to-peak, Amplitude, Mean, Cycle mean, RMS, Cycle RMS, Burst width, Delay, Phase, Area <sup>1</sup> , Cycle Area <sup>1</sup>
<b>Measurement statistics</b>	Mean, Min, Max, Standard deviation. Requires TDS3AAM application module
<b>Thresholds</b>	User-definable thresholds for automatic measurements; settable in percent or voltage
<b>Gating</b>	Isolate a specific occurrence within an acquisition to take measurements, using either the screen or cursors

## Waveform math

<b>Arithmetic</b>	Add, subtract, multiply, and divide waveforms
<b>FFT</b>	Spectral magnitude. Set FFT vertical scale to Linear RMS or dBV RMS, and FFT window to Rectangular, Hamming, Hanning, or Blackman-Harris
<b>Advanced math</b>	Integrate, differentiate, define extensive algebraic expressions including analog waveforms, math functions, scalars, up to two user-adjustable variables and results of parametric measurements. For example: $(\text{Intg}(\text{Ch1}-\text{Mean}(\text{Ch1})) \times 1.414 \times \text{VAR1})^2$

<sup>1</sup> Requires TDS3AAM application module.

<sup>2</sup> Requires TDS3AAM application module.

**Waveform processing**

<b>Autoset</b>	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo autoset
<b>Deskew</b>	Channel-to-channel deskew $\pm 10$ ns may be manually entered for better timing measurements and more accurate math waveforms

**Display system**

<b>Display type</b>	6.5 in. (165.1 mm) liquid-crystal TFT color display
<b>Display resolution</b>	640 horizontal $\times$ 480 vertical pixels (VGA)
<b>Interpolation</b>	Sin(x)/x
<b>Waveform styles</b>	Dots, vectors, variable persistence, infinite persistence
<b>Graticules</b>	Full, grid, crosshair, and frame. NTSC, PAL, SECAM, and vectorscope (100% and 75% color bars) with optional TDS3VID or TDS3SDI application modules
<b>Format</b>	YT, XY, and Gated XYZ (XY with Z-axis blanking available on 4-channel instruments only)

**Input/output ports**

<b>Ethernet port</b>	RJ-45 connector, supports 10Base-T LAN
<b>USB port</b>	Front-panel USB 2.0 host port. Supports USB flash drive
<b>GPIB port</b>	Full talk/listen modes, setting and measurements. (Optional with TDS3GV Communications Module)
<b>RS-232C port</b>	DB-9 male connector, full talk/listen modes; control of all modes, settings and measurements Baud rates up to 38,400 (Optional with TDS3GV Communications Module)
<b>VGA video</b>	DB-15 female connector, monitor output for direct display on large VGA-equipped monitors (Optional with TDS3GV communications module)
<b>External trigger input</b>	BNC connector, input impedance $> 1$ M $\Omega$ in parallel with 17 pF; max input voltage is 150 V <sub>RMS</sub>

**Power source**

<b>AC line power</b>	
<b>Source voltage</b>	100 V <sub>RMS</sub> to 240 V <sub>RMS</sub> $\pm 10\%$
<b>Source frequency</b>	45 Hz to 440 Hz from 100 V to 120 V 45 Hz to 66 Hz from 120 V to 240 V
<b>Power consumption</b>	75 W maximum
<b>Battery power</b>	Requires TDS3BATC, rechargeable lithium ion battery pack
<b>Operating time, typical</b>	3 hours

## Datasheet

### Physical characteristics

#### Dimensions

	mm	inches
Width	375.0	14.8
Height	176.0	6.9
Depth	149.0	5.9

#### Weight

	kg	lb.
Instrument only	3.2	7.0
with accessories	4.5	9.8

#### Package dimensions

	mm	inches
Width	502.0	19.8
Height	375.0	14.8
Depth	369.0	14.5

#### Rackmount (RM3000)

	mm	inches
Width	484.0	19.0
Height	178.0	7.0
Depth	152.0	6.0

### EMC, environment and safety

#### Temperature

Operating 0 °C to +50 °C

Non-operating -40 °C to +71 °C

#### Humidity

(Operating and non-operating)

At or below +30 °C Up to 95% RH

+30 °C up to +50 °C Up to 45% RH

#### Altitude

Operating To 3,000 meters

Non-operating 15,000 meters

#### Electromagnetic compatibility

Meets or exceeds EN61326 Class A, Annex D radiated and conducted emissions and immunity; EN6100-3-2 AC Powerline Harmonic Emissions; EN6100-3-3 Voltage Changes, Fluctuation, and Flicker; FCC 47 CFR, Part 15, Subpart B, Class A; Australian EMC framework

#### Safety

UL61010B-1, CSA1010.1, IEC61010-1, EN61010-1



## Ordering information

### TDS3000C family

TDS3012C	100 MHz, 2 channels, 1.25 GS/s
TDS3014C	100 MHz, 4 channels, 1.25 GS/s
TDS3032C	300 MHz, 2 channels, 2.5 GS/s
TDS3034C	300 MHz, 4 channels, 2.5 GS/s
TDS3052C	500 MHz, 2 channels, 5 GS/s
TDS3054C	500 MHz, 4 channels, 5 GS/s

Please specify a language option and a power plug option from the lists that follow.

### Standard accessories

#### Probes

P6139B	500 MHz 10x passive probe, one per channel
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#### Accessories

Front protective cover

Accessory tray

Documentation CD Contains User Manuals in all languages

Front panel overlay Translated front panel overlay. Specify language option.

Installation and Safety Manual

Power cord Specify power plug option.

Battery charger TDS3ION

OpenChoice® PC connectivity software Enables fast and easy communication between Windows PC and the TDS3000C Series through LAN, GPIB, or RS-232. Transfer and save settings, waveforms, measurements, and screen images

NI LabVIEW SignalExpress™  
Tektronix Edition LE software A fully interactive measurement software environment optimized for the TDS3000C Series. Enables you to acquire, generate, analyze, compare, import, and save measurement data and signals using an intuitive drag-and-drop user interface that does not require any programming. Standard TDS3000C Series support for acquiring, controlling, viewing, and exporting your live signal data is permanently available through the software. A 30-day trial period of the full version provides additional signal processing, advance analysis, mixed signal, sweeping, limit testing, and user-defined step capabilities. Order SIGEXPTE for permanent full version capability

Traceable Certificate of Calibration NIM/NIST

### Warranty

Three year warranty covering all labor and parts, excluding probes and accessories

## Instrument options

### Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A4	North America power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 110/120 V, 60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A99	No power cord

### Language options

Opt. L0	English manual
Opt. L1	French manual
Opt. L2	Italian manual
Opt. L3	German manual
Opt. L4	Spanish manual
Opt. L5	Japanese manual
Opt. L6	Portuguese manual
Opt. L7	Simplified Chinese manual
Opt. L8	Traditional Chinese manual
Opt. L9	Korean manual
Opt. L10	Russian manual
Opt. L99	No manual

Language options include translated front-panel overlay for the selected language(s).

## Service options

Available at time of purchase	
Opt. CA1	Provides a single calibration event or coverage for the designated calibration interval, whichever comes first
Opt. D1	Calibration data report
Opt. R5	Repair service - 5 year
Opt. SILV400	Standard warranty extended to 5 years

Available after purchase	
TDS30xxC-CA1	Provides a single calibration event or coverage for the designated calibration interval, whichever comes first
TDS30xxC-R1PW	Repair service coverage 1 year post-warranty
TDS30xxC-R2PW	Repair service coverage 2 years post-warranty
TDS30xxC-R5DW	Repair service coverage 5 years (includes product warranty period); 5-year period starts at time of customer instrument purchase

## Recommended accessories

### Probes

ADA400A	100x, 10x, 1x, 0.1x high-gain differential amplifier
P5100	2.5 kV, 100x high-voltage passive probe
P5205	1.3 kV, 100 MHz high-voltage differential probe
P5210	5.6 kV, 50 MHz high-voltage differential probe
P6243	1 GHz, $\leq 1$ pF input C 10x active probe
TCP202	50 MHz, 15 A AC/DC current probe
TCP303	15 MHz, 150 A current probe <sup>3</sup>
TCP305	50 MHz, 50 A current probe <sup>3</sup>
TCP312	100 MHz, 30 A current probe <sup>3</sup>
TCPA300	100 MHz probe amplifier
TCPA400	50 MHz probe amplifier
TCPA404XL	2 MHz, 500 A current probe <sup>4</sup>

<sup>3</sup> Requires TCPA300 probe amplifier.

<sup>4</sup> Requires TCPA400 probe amplifier.

## Accessories

<b>TDS3GV</b>	GPIB, VGA, RS-232 interface
<b>TDS3AAM</b>	Advanced Analysis Module. Adds extended math capability, arbitrary math expressions, measurement statistics, and additional automated measurements
<b>TDS3LIM</b>	Limit Testing Module. Adds custom waveform limit testing capabilities
<b>TDS3TMT</b>	Telecom Mask Testing Module. Adds pass/fail compliance of ITU-T G.703 and ANSI T1.102 standards, custom mask testing, and more
<b>TDS3VID</b>	Extended Video Analysis Module. Adds video quickmenu, autoset, hold, line count trigger, video picture mode, vectorscope <sup>5</sup> mode, HDTV format trigger graticules, and more
<b>TDS3SDI</b>	Serial/Digital Video Module. Adds 601 serial digital video to analog video conversion, video picture, vectorscope <sup>5</sup> , and analog HDTV triggering capabilities, and more
<b>TDS3BATC</b>	Lithium-ion battery pack for up to 3 hours continuous operation without line power
<b>AC3000</b>	Soft case for carrying instrument
<b>HCTEK4321</b>	Hard plastic case for carrying instrument (requires AC3000)
<b>RM3000</b>	Rackmount kit
<b>SIGEXPTE</b>	NI LabVIEW SignalExpress™ Tektronix Edition Software full version
<b>071-2507-xx</b>	Service manual (English only)
<b>TNGTDS01</b>	Extensive instructions and step-by-step lab exercises provide education about the operation of TDS3000C Series Oscilloscopes. Kit includes self-paced CD-ROM based manual and signal source board. Optional hardcopy manual available for order separately



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

<sup>5</sup> Vectorscope does not support composite video.



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\* European toll-free number. If not accessible, call: +41 52 675 3777

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**For Further Information.** Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com).

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