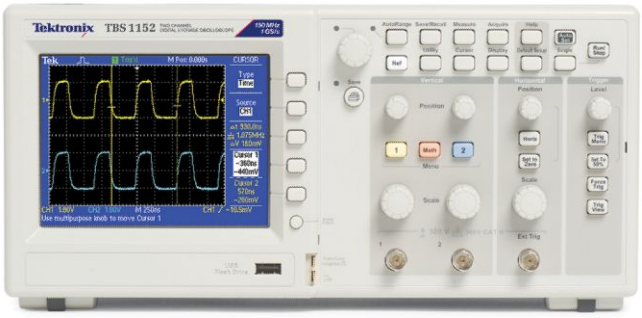
Digital Storage Oscilloscopes

TBS1000 Series Datasheet



The TBS1000 Digital Storage Oscilloscope Series provides you with affordable performance in a compact design. Packed with standard features - including USB connectivity, 16 automated measurements, limit testing, data logging, and context-sensitive help - the TBS1000 Series oscilloscopes help you get more done, in less time.

Key performance specifications

- 150 MHz, 100 MHz, 60 MHz, 40 MHz and 25 MHz bandwidth models
- 4 and 2-channel models
- Up to 1 GS/s sample rate on all channels
- 2.5k point record length on all channels
- Advanced triggers including pulse width trigger and line-selectable video trigger

Key features

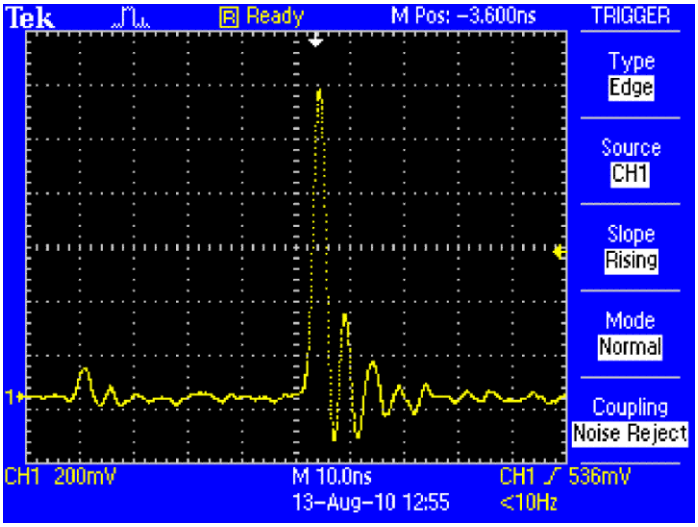
- 16 automated measurements, and FFT analysis for simplified waveform analysis
- Built-in waveform limit testing
- Automated, extended data logging feature
- Autoset and signal auto-ranging
- Built-in context-sensitive help
- Probe check wizard
- Multiple-language user interface
- 5.7 in. (144 mm) Active TFT Color Display
- Small footprint and lightweight - Only 4.9 in. (124 mm) deep and 4.4 lb. (2 kg)

Connectivity

- USB 2.0 host port on the front panel for quick and easy data storage
- USB 2.0 device port on rear panel for easy connection to a PC or direct printing to a PictBridge®-compatible printer
- Includes Tektronix OpenChoice® software for connecting your bench

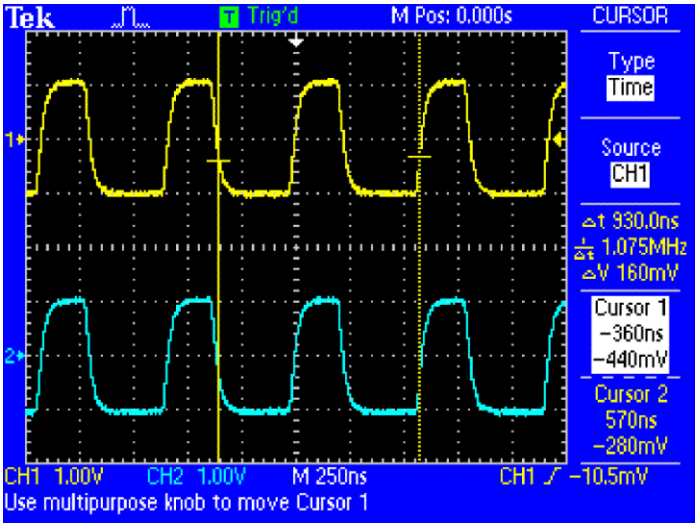
Digital precision for accurate measurements

With up to 150 MHz bandwidth and 1 GS/s maximum sample rate, no other digital storage oscilloscope offers as much bandwidth and sample rate for the price. Tektronix proprietary sampling technology provides real-time sampling with the stated sampling rate on all channels, all the time to accurately capture your signals. Sampling performance is not reduced when using multiple channels.



See all the details other oscilloscopes might miss with Tektronix proprietary digital real-time sampling

The TBS1000 Digital Oscilloscope Series is especially well suited to meet the needs of today's schools and universities. Packed with features and built-in tools, the TBS1000 is easy to learn and simple to operate - ideal for first-time oscilloscope users and students. Featuring the same user interface as the Tektronix TDS Oscilloscope Family, your students will learn to operate the world's most popular oscilloscope platform, with over 500,000 oscilloscopes in operation worldwide.

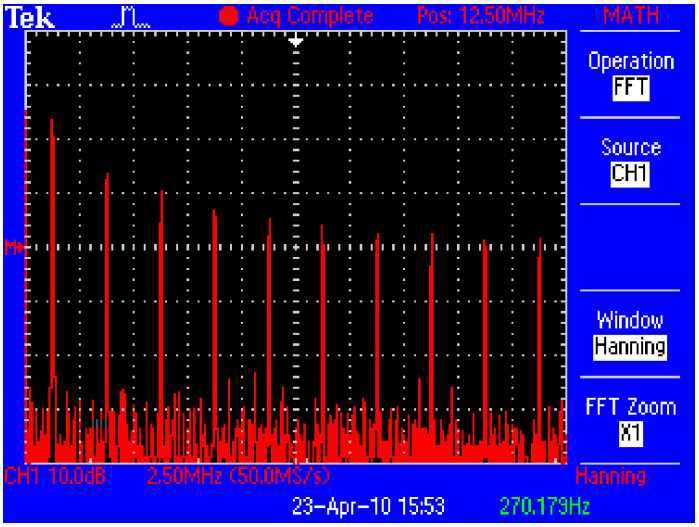


Quickly and easily capture waveforms

To simplify integration with your existing curriculum, the TBS1000 also includes an Education Resource CD filled with tools to help your students master the use of an oscilloscope. The TBS1000 offers the tools and performance you need at a price you can afford.

Critical tools for troubleshooting your device

Advanced triggers - rising/falling edge, pulse width, and video - help you quickly isolate your signals of interest. Once you've captured a signal, advanced math capabilities and automated measurements can speed your analysis. Quickly perform an FFT or add, subtract, or multiply waveforms. Sixteen automated measurements quickly and reliably calculate important signal characteristics such as frequency or rise time, while the built-in Limit Test function enables you to easily identify problems in your signal.



Quickly perform an FFT with the advanced math functions

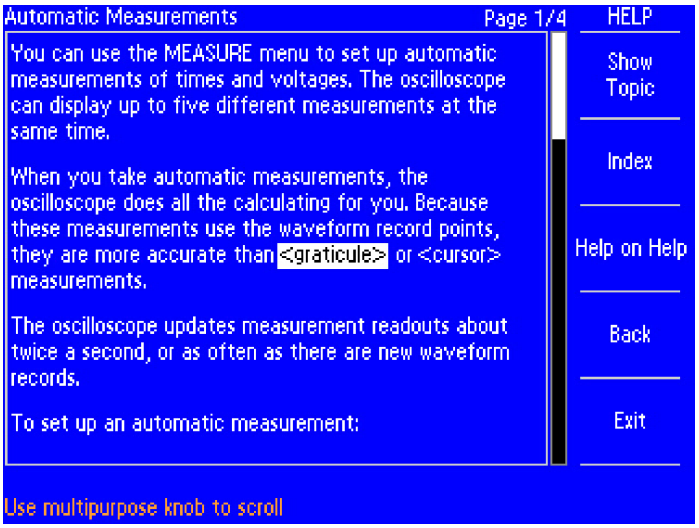
Designed to make your work easy

The TBS1000 series oscilloscopes are designed with the ease of use and familiar operation you have come to expect from Tektronix.

Intuitive operation

The intuitive user interface with dedicated per-channel vertical controls, auto-setup, and auto-ranging makes these instruments easy to use, reducing learning time and increasing efficiency.

Help when you need it, where you need it



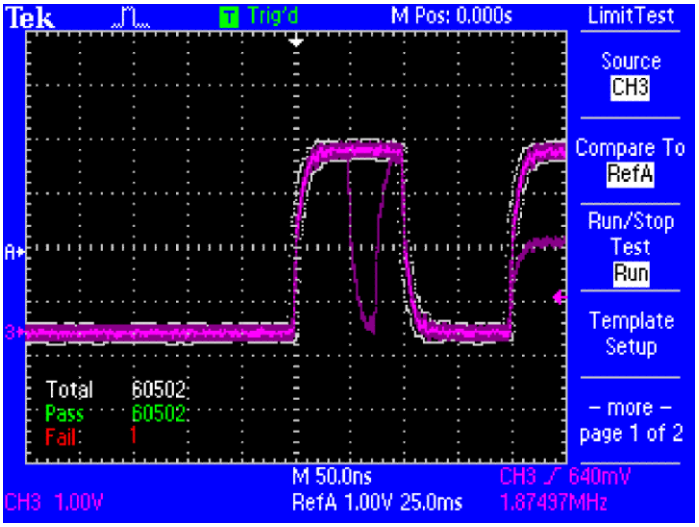
The context-sensitive help system provides important information specific to the task you are working on

The built-in Help menu provides you with important information on your oscilloscope's features and functions. Help is provided in the same languages as the user interface.

Probe check wizard

Check out your probe compensation before making measurements with just one button that starts a fast, easy procedure.

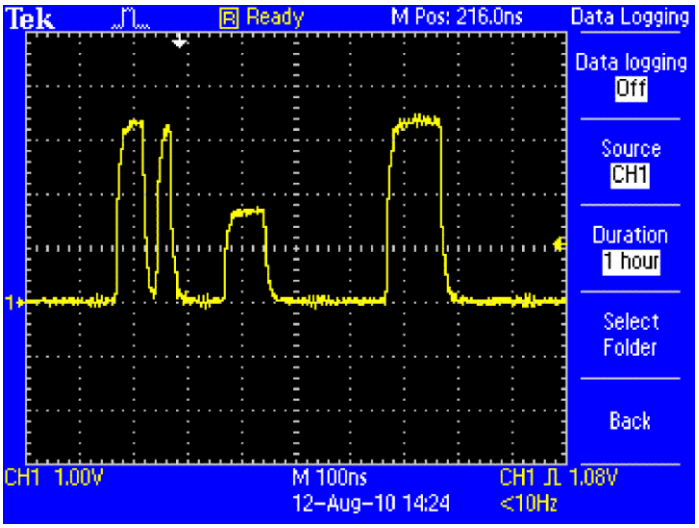
Limit test



Limit test provides a quick Pass/Fail comparison of any triggered input signal to a user-defined template

The oscilloscope can automatically monitor source signals and output Pass or Fail results by judging whether the input waveform is within predefined boundaries. Specific actions can be triggered on violation including stopping waveform acquisition, stopping Limit Test functions, saving the failed waveform data or screen image to a USB memory device, or any combination of the above. This is an ideal solution for manufacturing or service applications where you need to make decisions quickly.

Flexible data transfer

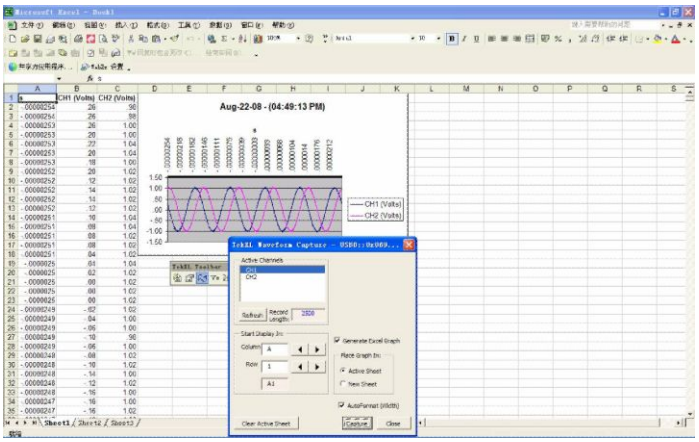


Data logging enables automatic saving of triggered waveforms

The USB host port on the front panel enables you to save your instrument settings, screenshots, and waveform data in a flash. The built-in Data Logging feature means you can set up your oscilloscope to save user-specified triggered waveforms to a USB memory device for up to 24 hours. You can also select the "Infinite" option for continuous waveform monitoring. With this mode you can save your triggered waveforms to an external USB memory device without a duration limitation until the memory device is full. The oscilloscope will then guide you to insert another USB memory device to continue saving waveforms.

Easy PC connectivity

Easily capture, save, and analyze measurements results by connecting to your PC with the rear-panel USB device port and the included copy of OpenChoice PC Communications Software. Simply pull screen images and waveform data into the stand-alone desktop application or directly into Microsoft Word and Excel. Alternatively, if you prefer not to use your PC, you can simply print your image directly to any PictBridge-compatible printer.



Easily capture, save and analyze measurement results with OpenChoice™ PC communications software

Performance you can count on

In addition to industry-leading service and support, every TBS1000 series oscilloscope comes backed with a 5-year warranty as standard.

Educational resources

Every TBS1000 model includes an education resource CD filled with tools to help your students master the use of an oscilloscope. The education resource CD includes two student labs and instructor's guides, and two primers. The *Introduction to Oscilloscopes* student lab and instructor's guide explains the basics of oscilloscope operation complete with hands-on exercises for your students. The *Introduction to Oscilloscope Probes* student lab and instructor's guide explains the fundamentals of probing and how probes can affect measurement quality. The two primers included are the most popular and widely-used from Tektronix - the *XYZs of Oscilloscopes* and *ABCs of Probes*.

The included education resource CD is filled with tools to help students master the use of an oscilloscope

Specifications

All specifications apply to all models unless noted otherwise.

Model overview

	TBS1022	TBS1042	TBS1062	TBS1064	TBS1102	TBS1104	TBS1152	TBS1154
Bandwidth [1]	25 MHz	40 MHz	60 MHz	60 MHz	100 MHz	100 MHz	150 MHz	150 MHz
Channels	2	2	2	4	2	4	2	4
Sample rate on each channel	500 MS/s	500 MS/s	1.0 GS/s	1.0 GS/s	1.0 GS/s	1.0 GS/s	1.0 GS/s	1.0 GS/s
Record length	2.5k points at all time bases							

Vertical system — Analog channels

Vertical resolution	8 bits
Input sensitivity range	2 mV to 5 V/div on all models with calibrated fine adjustment
DC gain accuracy	±3%, from 10 mV/div to 5 V/div
Maximum input voltage	300 V_{RMS} CAT II; derated at 20 dB/decade above 100 kHz to 13 V_{p-p} AC at 3 MHz
Offset range	2 mV to 200 mV/div: ±1.8 V >200 mV to 5 V/div: ±45 V
Bandwidth limit	20 MHz
Input coupling	AC, DC, GND
Input impedance	1 MΩ in parallel with 20 pF
Vertical zoom	Vertically expand or compress a live or stopped waveform

Horizontal system — Analog channels

Time base range	5 ns to 50 s/div
Time base accuracy	50 ppm
Horizontal zoom	Horizontally expand or compress a live or stopped waveform

1 Bandwidth is 20 MHz at 2 mV/div

Input/Output ports

USB interface	USB host port on front panel supports USB flash drives USB device port on back of instrument supports connection to PC and all PictBridge®-compatible printers
GPIB interface	Optional

Data storage

Nonvolatile storage

Reference waveform display	2.5K point reference waveforms
Waveform storage without USB flash drive	2.5K point
Maximum USB flash drive size	64 GB
Waveform storage with USB flash drive	96 or more reference waveforms per 8 MB
Setups without USB flash drive	10 front-panel setups
Setups with USB flash drive	4000 or more front-panel setups per 8 MB
Screen images with USB flash drive	128 or more screen images per 8 MB (the number of images depends on file format selected)
Save All with USB flash drive	12 or more Save All operations per 8 MB A single Save All operation creates 3 to 9 files (setup, image, plus one file for each displayed waveform)

Acquisition system

Acquisition modes

Peak Detect	High-frequency and random glitch capture. Captures glitches as narrow as 12 ns (typical) at all time base settings from 5 µs/div to 50 s/div
Sample	Sample data only
Average	Waveform averaged, selectable: 4, 16, 64, 128
Single Sequence	Use the Single Sequence button to capture a single triggered acquisition sequence
Roll	At acquisition time base settings of >100 ms/div

Trigger system

External trigger input	Included on all models
Trigger modes	Auto, Normal, Single Sequence

Trigger types

Edge (Rising/Falling)	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 from composite video, or broadcast standards (NTSC, PAL, SECAM)
Pulse Width (or Glitch)	Trigger on a pulse width less than, greater than, equal to, or not equal to, a selectable time limit ranging from 33 ns to 10 s

Trigger source	Two channel models: CH1, CH2, Ext, Ext/5, AC Line Four channel models: CH1, CH2, CH3, CH4, Ext, Ext/5, AC Line
Trigger view	Displays trigger signal while Trigger View button is depressed.
Trigger signal frequency readout	Provides a frequency readout of the trigger source.

Waveform measurements

Cursors	
Types	Amplitude, Time
Measurements	ΔT, 1/ΔT, ΔV
Automatic measurements	Period, Frequency, +Width, –Width, Rise Time, Fall Time, Max, Min, Peak-to-Peak, Mean, RMS, Cycle RMS, Cursor RMS, Duty Cycle, Phase, and Delay

Waveform math

Arithmetic	Add, Subtract, Multiply
Math functions	FFT
FFT	Windows: Hanning, Flat Top, Rectangular 2048 sample points
Sources	Two channel models: CH1 – CH2, CH2 – CH1, CH1 + CH2, CH1 × CH2 Four channel models: CH1 – CH2, CH2 – CH1, CH1 + CH2, CH1 × CH2, CH3 – CH4, CH4 – CH3, CH3 + CH4, CH3 × CH4

Autoset

Autoset menu	Single-button, automatic setup of all channels for vertical, horizontal, and trigger systems, with undo Autoset
Square wave	Single Cycle, Multicycle, Rising or Falling Edge
Sine wave	Single Cycle, Multicycle, FFT Spectrum
Video (NTSC, PAL, SECAM)	Field: All, Odd, or Even Line: All or Selectable Line Number

Autorange

Automatically adjust vertical and/or horizontal oscilloscope settings when probe is moved from point to point, or when the signal exhibits large changes.

Display system

Interpolation	Sin (x)/x
Waveform styles	Dots, vectors
Persistence	Off, 1 s, 2 s, 5 s, infinite
Format	YT and XY

Physical characteristics

Dimensions

	mm	in.
Height	158.0	6.22
Width	326.3	12.85
Depth	124.2	4.89

Shipping dimensions

	mm	in.
Height	266.7	10.5
Width	476.2	18.75
Depth	228.6	9.0

Weight

	kg	lb.
Instrument only	2.0	4.4
...with accessories	2.2	4.9

RM2000B rackmount

	mm	in
Width	482.6	19.0
Height	177.8	7.0
Depth	108.0	4.25

Environmental

Temperature

Operating	0 to +50 ºC
Nonoperating	–40 to +71 ºC

Humidity

Operating and nonoperating	Up to 85% RH at or below +40 ºC
	Up to 45% RH up to +50 ºC

Altitude

Operating and nonoperating	Up to 3,000 m (9,843 ft.)

Regulatory

Electromagnetic compatibility	Meets Directive 2004/108/EC, EN 61326-2-1 Class A; Australian EMC Framework
Safety	UL61010-1:2004, CSA22.2 No. 61010-1:2004, EN61010-1:2001, IEC61010-1:2001

Ordering information

Models

TBS1022	25 MHz, 2 Ch, 500 MS/s, TFT DSO
TBS1042	40 MHz, 2 Ch, 500 MS/s, TFT DSO
TBS1062	60 MHz, 2 Ch, 1 GS/s, TFT DSO
TBS1064	60 MHz, 4 Ch, 1 GS/s, TFT DSO
TBS1102	100 MHz, 2 Ch, 1 GS/s, TFT DSO
TBS1104	100 MHz, 4 Ch, 1 GS/s, TFT DSO
TBS1152	150 MHz, 2 ch, 1 GS/s, TFT DSO
TBS1154	150 MHz, 4 ch, 1 GS/s, TFT DSO

Language options

Translated front-panel overlays included with their respective user manuals. [2]

Language	Description
L0	English (front-panel overlay on instrument)
L1	French (front-panel overlay)
L2	Italian (front-panel overlay)
L3	German (front-panel overlay)
L4	Spanish (front-panel overlay)
L5	Japanese (front-panel overlay)
L6	Portuguese (front-panel overlay)
L7	Simple Chinese (front-panel overlay)
L8	Standard Chinese (front-panel overlay)
L9	Korean (front-panel overlay)
L10	Russian (front-panel overlay)

2 User manuals (PDF) in 11 languages are available on the CD and for download from www.tektronix.com . There are no printed user manuals.

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. 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. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Service options

Opt. D1	Calibration Data Report

Probes and accessories are not covered by the oscilloscope warranty and Service Offerings. Refer to the datasheet of each probe and accessory model for its unique warranty and calibration terms.

Standard accessories

Accessory	Description
Passive probes, one per channel	TPP0101: 100 MHz passive probe for: TBS1022, TBS1042, TBS1062, TBS1064, TBS1102, and TBS1104
	TPP0201: 200 MHz passive probe for: TBS1152 and TBS1154
Power cord	(Please specify plug option)
NIM/NIST	Traceable certificate of calibration
Printed documentation	Installation and safety manual
	(English, Japanese, and Simplified Chinese)
CD with customer documentation and OpenChoice PC communications software	Customer documentation including detailed user manuals (English, French, German, Italian, Japanese, Korean, Portuguese, Russian, Simplified Chinese, Spanish, Traditional Chinese)
	Software for fast and easy communication between an MS Windows PC and the TBS1000 series using USB to transfer and save settings, waveforms, measurements, and screen images
Educators Classroom and Lab Resource CD	Contains lab experiments and primers for both oscilloscopes and probes
5-year warranty	Covers labor and parts for defects in materials and workmanship for 5 years, excluding probes and accessories (probes and accessories are not covered by the oscilloscope warranty and service offerings. refer to the data sheet of each probe and accessory model for its unique warranty and calibration terms)

Recommended accessories

Accessory	Description
TEK-USB-488	GPIB-to-USB converter
AC2100	Soft carrying case for instrument
HCTEK4321	Hard plastic carrying case for instrument (requires AC2100)
RM2000B	Rackmount kit
077-0444-xx	Programmer manual – English only
077-0772-xx	Service manual – English only
174-4401-xx	USB host to device cable, 3 ft. long

Recommended probes

Probe	Description
TPP0101	10X passive probe, 100 MHz bandwidth
TPP0201	10X passive probe, 200 MHz bandwidth
P2220	1X/10X passive probe, 200 MHz bandwidth
P6101B	1X passive probe (15 MHz, 300 V_{RMS} CAT II rating)
P6015A	1000X high-voltage passive probe (75 MHz)
P5100A	100X high-voltage passive probe (500 MHz)
P5200A	50 MHz, 50X/500X high-voltage differential probe
P6021A	15 A, 60 MHz AC current probe
P6022	6 A, 120 MHz AC current probe
A621	2000 A, 5 to 50 kHz AC current probe
A622	100 A, 100 kHz AC/DC current probe/BNC
TCP303/TCPA300	150 A, 15 MHz AC/DC current probe/amplifier
TCP305A/TCPA300	50 A, 50 MHz AC/DC current probe/amplifier
TCP312A/TCPA300	30 A, 100 MHz AC/DC current probe/amplifier
TCP404XL/TCPA400	500 A, 2 MHz AC/DC current probe/amplifier

CE

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.

Tektronix®