TELEDYNE TEST TOOLS
Everywhereyoulook™

T3DAQ1-16 Data Sheet

Data Acquisition System

Broad Measurement Range

DC: up to 1000 Volts
AC: up to 750 Volts
Current: up to 10A

Tools for Improved Debugging

• **16 Multi-purpose Data Acquisition Channels** built on a 6½ digit digital multimeter platform.	✓ More flexible measurements without losing accuracy.
• **Wide range of measurements** – DC/AC voltage and Current, Resistance, Capacitance, Frequency, Period.	✓ More application coverage from a single system.
• **True-RMS measurements** – All ACVoltage and Current ranges give True-RMS readings.	✓ Excellent accuracy regardless of the waveform shape.
• **Built-in cold terminal thermocouple compensation.**	✓ Accurate Temperature measurements.
• **USB Device, USB Host and LAN support.**	✓ Remote control of your measurements.
• **3 Years Warranty as standard.**	✓ Reliable product gives peace of mind.

Key Specifications

Specification	Scanner	Front Panel Connector
Number of Channels	12 Multi-Purpose and 4 Current Channels	1 Multi-Purpose channel
DC/AC Voltage Range	200 mV to 200 V	200 mV to 1000 V
DC/AC Current Range	2A fixed	200 µA to 10 A
2/4 Wire Resistance Range	200 Ohms to 100 MOhms	

PRODUCT OVERVIEW

Teledyne Test Tools T3DAQ1-16 is a 16 channel Data Acquisition System incorporating the latest 4.3 inch (10.92 cm) dual-display technology which can be configured to show Data Histograms, Data fluctuation Trends, Bar Graph, Statistics or the traditional Number mode, all in an easy to use interface. The T3DAQ features 12 multi-purpose + 4 current channels and supports various measurement functions. It provides a convenient and versatile solution for test applications that require multiple measurement points or signals and is an ideal tool for R&D burn-in and production testing.

A great feature of the Teledyne Test Tools T3DAQ is its ability to make highly accurate True RMS AC Voltage and Current measurements, meaning no loss of accuracy even when measuring complex voltage and current waveforms.

The T3DAQ provides various measurement modes to satisfy a wide range of application requirements.
12 Multi-purpose channels can be configured individually for various scan requirements. The Channel configuration function allows user to configure different parameters such as measurement type, range, scan mode, number of scan cycles, and duration of scan. Similarly, the scan control menu provides flexibility to schedule, start, and stop the scan. Scanning data can be viewed live during a scan and can also be saved for future use. An internal 1 GB flash memory is available for data logging and to save configuration files. The T3DAQ also features a USB Host interface to use a USB flash drive to collect data without being connected to a PC.

The T3DAQ is equipped with LAN and USBTMC interfaces for remote control of the device. The device can be controlled remotely using EasyDMM software. The graphical interface of the software makes it easy to configure measurements, setup and execute scans or troubleshoot the design. Live measurement data can be viewed in numeric digits or graphically by trend chart, bar graph and histogram. The data can be manually or automatically exported as CSV files for further analysis.

Panel Introduction

1. 4.3" Large TFT LCD Displays function menus and various other parameters.
2. USB Host interface for Data Storage
3. Power Button
4. Softkeys Provide More Intutive And Fast Operation
5. Measurement and Assistant Function Keys
6. Signal input Terminals
7. 16-Channel Data Acquisition Module
8. External Trigger
9. VMC Output
10. LAN Port
11. USBTMC Port
12. Power Socket

FEATURES

Features

- 4.3" TFT-LCD Display
- Dual display, Chinese and English Menu
- Built-in front panel accessible help system
- File management (support for U-disc and local storage)
- Real 6-5 digit (2,200,000 count) readings resolution
- True-RMS AC Voltage and AC Current measuring
- 1 GB flash memory for mass storage configuration files and data files
- Built-in cold terminal compensation for thermocouple
- Standard interface: USB Device, USB Host, LAN
- USB & LAN remote interfaces support common SCPI command set.

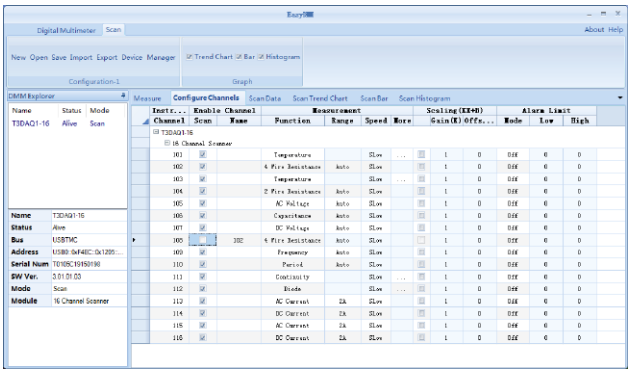
Application Fields

- Research Laboratory
- Development Laboratory
- Repair and Maintenance
- Calibration Laboratory
- Automatic Production Test
- General bench-top use

EasyDMM Software

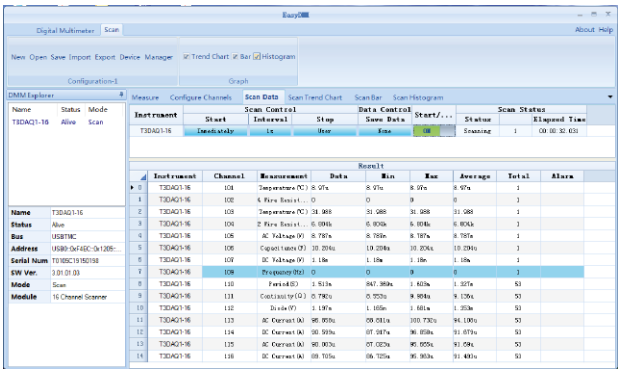
The T3DAQ can be remotely operated by the EasyDMM software. The software provides user friendly graphical interface to operate the DAQ.

Channel Configuration



Configure Channels menu in the Scan mode can be used to enable channels as well as to configure various settings such as measurement function, range, speed of measurement. Channels can also be monitored within the defined limits by using Alarm Limit feature.

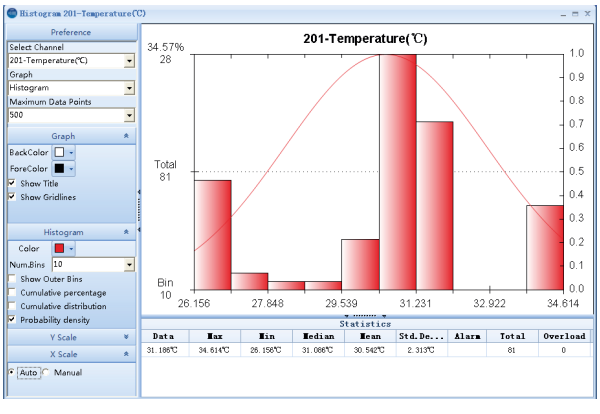
Data Acquisition



Different measurement settings such as Scan interval, Start and Stop time can be set from the Scan Data menu. The Result section provides the live measurement data along with min, max and average values. It also provides total number of scans and number of Alarm for every channel.

Trend Chart

Histogram

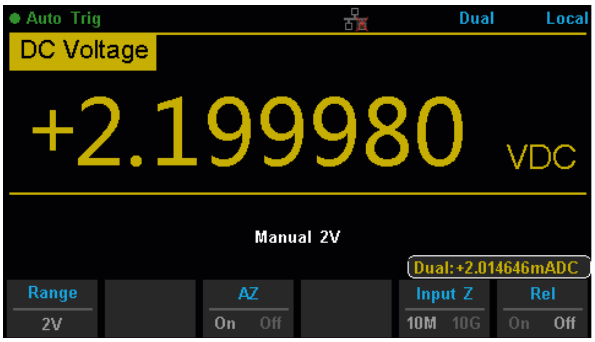


To view the scanned data visually, the software has Trend Chart, Histogram and Bar graph.
All the graphs also has user customizable options such as colour, axis scales, type of curve etc.

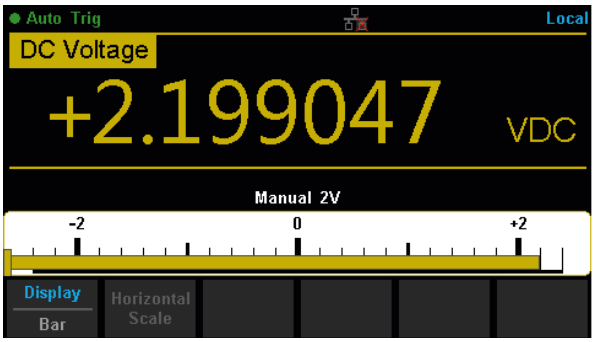
FEATURES

The T3DAQ has a 6½ Digit DMM functionality built in. DMM functionality can be used with the front panel connector and is useful when making quick measurements. The DMM supports all the functions offered by the scanner with some additional ranges in Voltage and Current measurements.

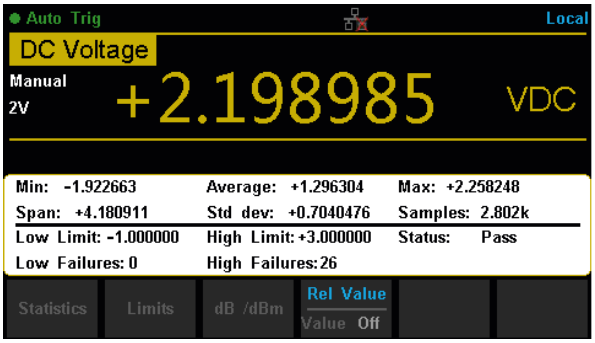
Dual Display



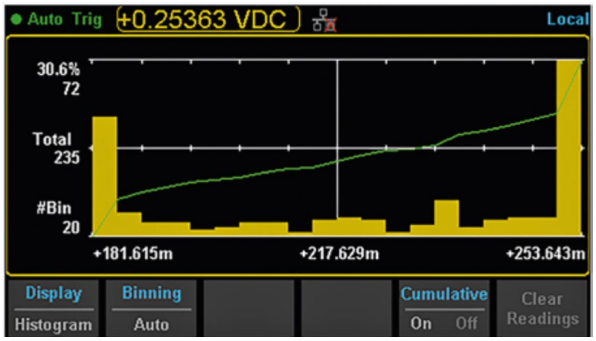
Bar Chart



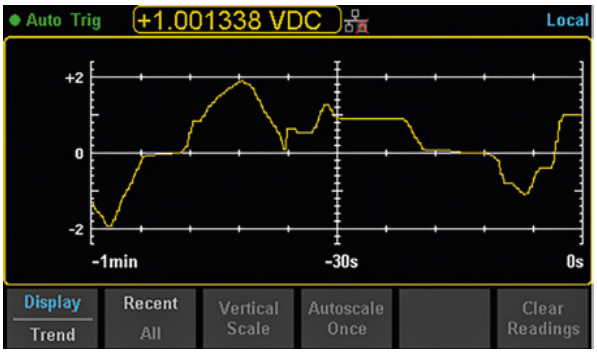
Statistics



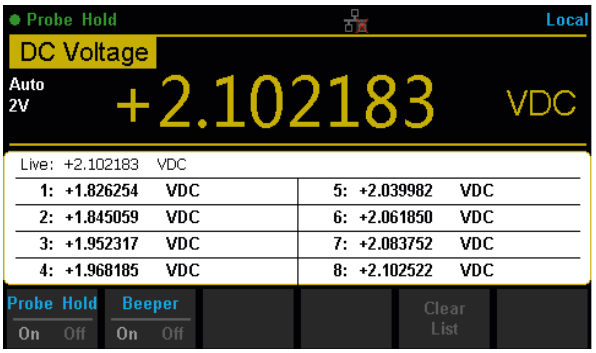
Histogram



Trend Chart



Hold Measurement



SPECIFICATIONS

Scanner Specifications[1)]

Max AC Voltage	125 rms or 175 V peak, 100kHz, 0.3 A switched, 125VA (resistive load)
Contact Life	> 10,0000 operations, at 1 A 30 VDC (at 0.5 Hz) > 100,000 operation, at 0.3 A 125 VDC (at 0.5 Hz)
Contact Resistance	75 mΩ (maximum at 6 VDC, 1A)
Channel to channel switching time	280 ms (typical)
Maximum switching voltage	250 VAC, 220 VDC
Maximum switching power	62.5 VA / 30 W
Insulation Resistance	Minimum 1 GΩ
Connect Type	Clamp terminal, # 24 AWG wire size

[1)] Valid when the instrument is used in Scan Mode. For full specifications refer to the tabels below.

NOTE: Do not remove the scanner card while the measurements are in progress to avoid damage.

Channel Capabilities

Item	No. of wires	No. of channels
DCV , ACV[1)]	2 wires (H, L)	12 (CH1 ~ CH12)
DCI , ACI[2)]	2 wires (H, L)	4 (CH13 ~ CH16) (2A Range Only)
2W Resistance	2 wires (H, L)	12 (CH1 ~ CH12)
4W Resistance	4 wires (Input H, L + sense H, L)	6 pairs (CH1 [input] & CH7[sense], 2&8, •••, 6&12)
Capacitance	2 wires (H, L)	12 (CH1 ~ CH12)
Diode/Continuity	2 wires (H, L)	12 (CH1 ~ CH12)
Period/Frequency	2 wires (H, L)	12 (CH1 ~ CH12)
Temp (Thermocouple) Temp (RTD)	2 wires (H, L) 2 wires (H, L)	12 (CH1 ~ CH12) 12 (CH1 ~ CH12)

[1)] Voltage range: < 2.2 VAC, 110 VDC
[2)] For continuous current < 2.2 A, Accuracy ± (% 3 (reading) + 0.02 % (range)).

DC Characteristics

Accuracy ± (% of reading + % of range) [1]

Function	Range [2]	Test Current Or Burden Voltage	24 Hour [3] TCAL °C ±1 °C	90 day TCAL °C ±5 °C	1 Year TCAL °C ±5 °C	Temperature coefficient 0 °C to (TCAL °C - 5 °C) (TCAL °C +5 °C) to 50 °C
DC Voltage	200.0000 mV		0.0020 + 0.0015	0.0030 + 0.0020	0.0040 + 0.0023	0.0005 + 0.0003
	2.000000 V		0.0015 + 0.0004	0.0020 + 0.0004	0.0035 + 0.0006	0.0005 + 0.0001
	20.00000 V		0.0020 + 0.0003	0.0030 + 0.0004	0.0040 + 0.0004	0.0005 + 0.0001
	200.0000 V		0.0020 + 0.0005	0.0040 + 0.0004	0.0050 + 0.0005	0.0005 + 0.0001
	1000.000 V [4] [8]		0.0020 + 0.0005	0.0040 + 0.0008	0.0055 + 0.0008	0.0005 + 0.0001
DC Current [9]	200.0000 µA	< 0.03 V	0.009 + 0.010	0.040 + 0.005	0.050 + 0.005	0.0020 + 0.0026
	2.000000 mA	< 0.25 V	0.007 + 0.001	0.030 + 0.001	0.050 + 0.002	0.0020 + 0.0001
	20.00000 mA	< 0.07 V	0.006 + 0.008	0.030 + 0.005	0.050 + 0.005	0.0020 + 0.0015
	200.0000 mA	< 0.7V	0.009 + 0.001	0.030 + 0.001	0.050 + 0.002	0.0020 + 0.0001
	2.000000 A	< 0.12 V	0.045 + 0.015	0.080 + 0.005	0.100 + 0.012	0.0050 + 0.0008
	10.00000 A [5]	< 0.6 V	0.090 + 0.002	0.120 + 0.005	0.150 + 0.005	0.0050 + 0.0018
	200.0000 Ω	1 mA	0.0030 + 0.0031	0.008 + 0.005	0.010 + 0.004	0.0006 + 0.0006
	2.000000 KΩ	1 mA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	20.00000 KΩ	100 µA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
Resistance [6]	200.0000 KΩ	10 µA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	1.000000 MΩ [8]	2 µA	0.0020 + 0.0010	0.010 + 0.001	0.012 + 0.001	0.0010 + 0.0002
	10.00000 MΩ	200 nA	0.015 + 0.001	0.030 + 0.001	0.040 + 0.001	0.0030 + 0.0005
	100.0000 MΩ	200 nA || 10 MΩ	0.300 + 0.010	0.800 + 0.010	0.800 + 0.010	0.1500 + 0.0002
Diode Test [7]	0 ~ 2 V	1 mA	0.002 + 0.009	0.008 + 0.020	0.010 + 0.020	0.0010 + 0.0020
	2 ~ 4 V	1 mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.0010 + 0.0020
Continuity Test	2000.0 Ω	1 mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.0010 + 0.0020

[1] Specifications are for 90-minute warm-up and 100NPLC integration time. For integration time <100NPLC, add the appropriate "RMS Noise Adder" listed in the following table.
[2] 10 % over range on all ranges except DCV 1000 V and DCI 10 A range.
[3] Relative to calibration standards.
[4] For each additional volt over ± 500 V, add 0.03 mV error.
[5] For continuous current > 7 A DC or 7 A AC RMS, 30 seconds ON and 30 seconds OFF.
[6] Specifications are for 4-wire resistance measurement or 2-wire resistance measurement using REL operation. Without REL operation, add 0.2 Ω additional error in 2-wire resistance measurement.
[7] Accuracy specifications for the voltage measured at the input terminal only. 1 mA test current is typical. Variation in the current source will create some variation in the voltage drop across a diode junction. Adjustable voltage range : 0 ~ 4 V.
[8] This range is only available when the the front panel connectors are used and not when the instrument is in Scan mode.
[9] Only 2A fixed range is available when the instrument is used in Scan mode.

Performance Versus Integration Time – 50 Hz (60 Hz) Power-line Frequency [1)]

Integration Time	Resolution [2)]	NMRR [3)]	Readings/s [4)]		RMS Noise Adder [5)] (% of Range)			
Number of Power line Cycles [6)] (NPLC)	(ppm Range)	(dB)	50 Hz	60 Hz	DCV 20 V	DCV 2 V 200 V Resistance 2 KΩ 20 KΩ	DCV 1000 V DCI 2 mA 200 mA	DCV 200 mV Resistance 200 Ω DCI 10 A
0.005 (0.006)	2.7	0	10,000	10,000	0.0006	0.0008	0.0015	0.0040
0.05 (0.06)	1.6	0	1,000	1,000	0.0004	0.0005	0.0008	0.0025
0.5 (0.6)	1	0	100	100	0.0003	0.0003	0.0006	0.0025
1	0.22	60	50	60	0	0.0001	0.0002	0.0005
10	0.08	60	5	6	0	0	0	0.0002
100	0.035	60	0.5	0.6	0	0	0	0

[1)] Only 1 NPLC and 10 NPLC ranges are available as Fast and Slow modes respectively when the instrument is used in Scan mode.
[2)] Typical value. Resolution is defined as the typical 20 V range RMS noise.
[3)] Normal mode rejection ratio for power-line frequency ± 0.1 %. For power-line frequency ± 1 %, subtract 20 dB. For ± 3 %, subtract 30 dB.
[4)] Maximum rate for DCV, DCI, 2-wire resistance and 4-wire resistance functions.
[5)] The basic DC accuracy specifications include RMS noise at 100 NPLC. For < 100 NPLC, add "RMS Noise Adder" to the basic DC accuracy specifications.
[6)] When Power Supply of frequency is 60 Hz, the cycles is 0.006, 0.06, 0.6, 1, 10, 100 NPLC.

SFDR & SINAD [1)]

Function	Range	Spurious-Free Dynamic Range (SFDR)	Signal-to-Noise-and-Distortion (SINAD)
DCV	200 mV	80	75
	2 V	76	80
	20 V	78	72
	200 V	80	78
	1,000 V	82	80
DCI	200 µA	90	70
	2 mA	90	80
	20 mA	85	70
	200 mA	80	75
	2 A	70	60

[1)] Typical value. -1 dBFS, 1 kHz single tone. 100 µs aperture time and auto zero off.

AC Characteristics

Accuracy ± (% of reading + % of range) [1]

Function	Range [2]	Frequency Range	24 Hour [3] TCAL °C ±1 °C	90 day TCAL °C ±5 °C	1 Year TCAL °C ±5 °C	Temperature coefficient 0 °C to (TCAL °C - 5 °C) (TCAL °C +5 °C) to 50 °C
True-RMS AC Voltage [4]	200.0000 mV	3 Hz – 5 Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
		5 Hz – 10 Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.005
		10 Hz – 20 kHz	0.04 + 0.03	0.05 + 0.04	0.06 + 0.04	0.005 + 0.004
		20 kHz – 50 kHz	0.10 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50 kHz – 100 kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz – 300 kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	2.000000 V	3 Hz – 5 Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5 Hz – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
		20 kHz – 50 kHz	0.10 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50 kHz – 100 kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz – 300 kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	20.00000 V	3 Hz – 5 Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
		5 Hz – 10 Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
		10 Hz – 20 kHz	0.04 + 0.04	0.07 + 0.04	0.08 + 0.04	0.008 + 0.004
		20 kHz – 50 kHz	0.10 + 0.05	0.12 + 0.05	0.15 + 0.05	0.012 + 0.005
		50 kHz – 100 kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz – 300 kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	200.0000 V	3 Hz – 5 Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5 Hz – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10 Hz – 20 kHz	0.04 + 0.02	0.07 + 0.03	0.08 + 0.03	0.008 + 0.003
		20 kHz – 50 kHz	0.10 + 0.04	0.12 + 0.05	0.15 + 0.05	0.012 + 0.005
		50 kHz – 100 kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz – 300 kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	750.0000 V [5] [9]	3 Hz – 5 Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5 Hz – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10 Hz – 20 kHz	0.04 + 0.02	0.07 + 0.03	0.08 + 0.03	0.008 + 0.003
		20 kHz – 50 kHz	0.10 + 0.04	0.12 + 0.05	0.15 + 0.05	0.012 + 0.005
		50 kHz – 100 kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz – 300 kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02

[1] Specifications are for 90-minute warm-up, > 3 Hz ac filter and sine wave input.
[2] 10 % over range on all ranges except ACV 750 V and ACI 10 A ranges.
[3] Relative to calibration standards.
[4] Specifications are for sine wave input > 5 % of range. For inputs within 1 % and 5 % of range and < 50 kHz, add 0.1 % of range additional error. For 50 kHz to 100k Hz, add 0.13 % of range additional error.
[5] ACV 750 range limited to 8 x 107 Volt-Hz. For input over 300 V rms, add 0.7 mV error for each additional volt.
[6] For continuous current > DC 7A or AC RMS 7A, 30 seconds ON and 30 seconds OFF.
[7] For frequency beow 100 Hz, the specification of slow filter is only for sine wave input.
[8] Specifications are for sine wave input > 5 % of range. For inputs within 1 % to 5 % of range, add 0.1 % of range additional error. Specifications are typical values for 200 µA and 2 mA, 2 A and 10 A ranges when frequency >1 kHz.
[9] This range is only available when the front panel connectors are used and not when the instrument is in Scan mode.
[10] Only 2A fixed range is available when the instrument is used in Scan mode.

AC Characteristics

Accuracy ± (% of reading + % of range) [1]

Function	Range [2]	Frequency Range	24 Hour [3] TCAL °C ±1 °C	90 day TCAL °C ±5 °C	1 Year TCAL °C ±5 °C	Temperature coefficient 0 °C to (TCAL °C - 5 °C) (TCAL °C +5 °C) to 50 °C
True-RMS AC Current [8] [10]	200.0000 µA	3 Hz – 5 Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.005
		5 Hz – 10 Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.005
		10 Hz – 5 kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.005
		5 kHz – 10 kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.005
	2.000000 mA	3 Hz – 5 Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.005
		5 Hz – 10 Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.005
		10 Hz – 5 kHz	0.12 + 0.04	0.12 + 0.04	0.12 + 0.04	0.015 + 0.005
		5 kHz – 10 kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.005
	20.00000 mA	3 Hz – 5 Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.005
		5 Hz – 10 Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.005
		10 Hz – 5 kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.005
		5 kHz – 10 kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.005
	200.0000 mA	3 Hz – 5 Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		5 Hz – 10 Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10 Hz – 5 kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
		5 kHz – 10 kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.006
	2.000000 A	3 Hz – 5 Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.100 + 0.006
		5 Hz – 10 Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.035 + 0.006
		10 Hz – 5 kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
		5 kHz – 10 kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
	10.00000 A [6]	3 Hz – 5 Hz	1.10 + 0.08	1.10 + 0.10	1.10 + 0.10	0.100 + 0.008
		5 Hz – 10 Hz	0.35 + 0.08	0.35 + 0.10	0.35 + 0.10	0.035 + 0.008
		10 Hz – 5 kHz	0.15 + 0.08	0.15 + 0.10	0.15 + 0.10	0.015 + 0.008

Additional Low Frequency Errors (% of reading)				Additional Crest Factor Errors (non-sine wave) [7]	
Frequency	AC Filter			Crest Factor	error (% of reading)
	> 3 Hz	> 20 Hz	> 200 Hz		
10 Hz – 20 Hz	0	0.74	–	1 – 2	0.05
20 Hz – 40 Hz	0	0.22	–	2 – 3	0.2
40 Hz – 100 Hz	0	0.06	0.73	3 – 4	0.4
100 Hz – 200 Hz	0	0.01	0.22	4 – 5	0.5
200 Hz – 1 kHz	0	0	0.18		
> 1 kHz	0	0	0		

[1] Specifications are for 90-minute warm-up, > 3 Hz ac filter and sine wave input.
[2] 10 % over range on all ranges except ACV 750 V and ACI 10 A ranges.
[3] Relative to calibration standards.
[4] Specifications are for sine wave input > 5 % of range. For inputs within 1 % and 5 % of range and < 50 kHz, add 0.1 % of range additional error. For 50 kHz to 100k Hz, add 0.13 % of range additional error.
[5] ACV 750 range limited to 8 x 107 Volt-Hz. For input over 300 V rms, add 0.7 mV error for each additional volt.
[6] For continuous current > DC 7A or AC RMS 7A, 30 seconds ON and 30 seconds OFF.
[7] For frequency beow 100 Hz, the specification of slow filter is only for sine wave input.
[8] Specifications are for sine wave input > 5 % of range. For inputs within 1 % to 5 % of range, add 0.1 % of range additional error. Specifications are typical values for 200 µA and 2 mA, 2 A and 10 A ranges when frequency >1 kHz.
[9] This range is only available when the front panel connectors are used and not when the instrument is in Scan mode.
[10] Only 2A fixed range is available when the instrument is used in Scan mode.

Frequency and Period Characteristics

Accuracy ± (% of Reading) [1) 2)]

Function	Range [2)]	Frequency Range	24 Hour [3)] TCAL °C ±1 °C	90 day TCAL °C ±5 °C	1 Year TCAL °C ±5 °C	Temperature coefficient 0 °C to (TCAL °C - 5 °C) (TCAL °C +5 °C) to 50 °C
Frequency, Period	200 mV to 750 V	3 Hz – 5Hz	0.07	0.07	0.07	0.005
		5 Hz – 10 Hz	0.04	0.04	0.04	0.005
		10 Hz – 40 Hz	0.02	0.02	0.02	0.001
		40 Hz –300 KHz	0.005	0.006	0.007	0.001
		300 KHz – 1 MHz	0.005	0.006	0.007	0.001

Frequency	Gate Time (Resolution)			
	1 s (0.1 ppm)	0.1 s (1 ppm)	0.01 s (10 ppm)	0.001 s (100 ppm)
3 Hz – 5Hz	0	0.12	0.12	0.12
5 Hz – 10 Hz	0	0.17	0.17	0.17
10 Hz – 40 Hz	0	0.20	0.20	0.20
40 Hz – 100 Hz	0	0.06	0.21	0.21
100 Hz – 300 Hz	0	0.03	0.21	0.21
300 Hz – 1 KHz	0	0.01	0.07	0.07
> 1 K Hz	0	0	0.02	0.02

[1)] Specifications are for 90 minutes warm-up, using 1 s gate time.
[2)] For frequency ≤ 300 kHz, the specification is the 10 % to 110 % of range of the AC input voltage. For frequency > 300 kHz, the specification is the 20 % to 110 % of range of the AC input voltage. The maximum input is limited to 750 V rms or 8 ×107 Volts-Hz (whichever is less). The 200 mV range is full range input or input that is larger than the full range. For 20 mV to 200 mV, multiply % of reading error ×10.
[3)] Relative to calibration standards.

Capacitance Characteristic

Accuracy ± (% of Reading + % of Range) [1)]

Function	Range [2)]	Test Current	1 Year TCAL °C ±5 °C	Temperature coefficient 0 °C to (TCAL °C - 5 °C) (TCAL °C +5 °C) to 50 °C
Capacitance	2.0000 nF	10 µA	2 + 2.4	0.05 + 0.06
	20.000 nF	10 µA	1 + 0.1	0.05 + 0.01
	200.00 nF	100 µA	1 + 0.1	0.01 + 0.01
	2.0000 µF	100 µA	1 + 0.1	0.01 + 0.01
	20.000 µF	1 mA	1 + 0.1	0.01 + 0.01
	200.00 µF	1 mA	1 + 0.1	0.01 + 0.01
	2.0000 mF [3)]	1 mA	1 + 0.1	0.01 + 0.01
	20.000 mF [3)]	1 mA	1 + 0.1	0.01 + 0.01
	100.00 mF [3)]	1 mA	3 + 0.1	0.05 + 0.02

[1)] Specifications are for 90 minutes warm-up and using REL operation. Additional errors may be caused by non-film capacitors.
[2)] Specifications are the 1% to 110 % of range on 2 nF range and 10 % to 110 % of range on all other ranges
[3)] This range is only available when the front panel connectors are used and not when the instrument is in Scan mode

Temperature Characteristics

Accuracy ± (% of Reading) [1]

Function	Probe Type	Type	Optimum Range	1 Year TCAL °C ±5 °C	Temperature coefficient 0 °C to (TCAL °C - 5 °C) (TCAL °C +5 °C) to 50 °C
Temperature	RTD [2] (R0 is 49 Ω to 2.1 kΩ)	α = 0.00385	-200 °C ~ 660 °C	0.16 °C	0.01 °C
	Thermocouple [3]	B	0 °C ~ 1,820 °C	0.76 °C	0.14 °C
		E	-270 °C ~ 1,000 °C	0.5 °C	0.02 °C
		J	-210 °C ~ 1,200 °C	0.5 °C	0.02 °C
		K	-270 °C ~ 1,370 °C	0.5 °C	0.03 °C
		N	-270 °C ~ 1,300 °C	0.5 °C	0.04 °C
		R	-270 °C ~ 1,760 °C	0.5 °C	0.09 °C
		S	-270 °C ~ 1,760 °C	0.6 °C	0.11 °C
		T	-270 °C ~ 400 °C	0.5 °C	0.03 °C

[1] Specifications are for 90 minutes warm-up. Exclusive of sensor error.
[2] Specification is for 4WR sensor measurement or 2WR measurement using REL operation.
[3] Relative to cold junction temperature, accuracy is based on ITS-90.
Built-in cold junction temperature refers to the temperature inside the banana jack and its accuracy is ± 2.5 °C.

Measurement Rate [1]

Measurement rate [4]

Function	Setting	Integration	Readings/s 50 Hz (60 Hz)
DC Voltage DC Current 2-wire Resistance 4-wire Resistance	0.005 (0.006) NPLC	100 (100) µs	10,000 (10,000)
	0.05 (0.06) NPLC	1 (1) ms	1,000 (1,000)
	0.5 (0.5) NPLC	4 (4) ms	100 (100)
	1 NPLC	20 (16.7) ms	50 (60)
	10 NPLC	200 (167) ms	5 (6)
	100 NPLC	2 (1.67) s	0.5 (0.6)
AC Voltage AC Current	3 Hz AC Filter		0.5
	20 Hz		2
	200 Hz		50
Frequency and Period [2]	1 s Gate time		1
	0.1 s		10
	0.01 s		100
	0.001 s		500
Capacitance [3]	100 mF Range		0.5

[1] Only 1 NPLC (Fast mode) and 10 NPLC (slow mode) settings are available when the instrument is in Scan mode.
All other settings are only available for the front panel connectors.
[2] 20 V range, 1 kHz input.
[3] The measurement period changes with the capacitance under test.
[4] Auto zero off, auto range off.

Measuring Method and other Characteristics

DC Voltage	
Input Resistance	200 mV, 2 V, 20 V ranges: Selectable 10 MΩ or > 10 GΩ (For these ranges, input beyond ± 26 V are clamped through 106 kΩ (typical)
	200 V and 1,000 V ranges: 10 MΩ ± 1 %
Input Offset Current	50 pA, 25 °C ,typical
Input Protection	1,000 V
CMRR (common mode rejection ratio)	140 dB for 1 kΩ unbalance in LO lead, ± 500 VDC peak maximum
Resistance	
Measurement Method	Selectable 4-wire or 2-wire resistance
	Current source referenced to LO input
Open-circuit Voltage	Limited to <10 V
Max. Lead Resistance (4-wire)	10 % of range per lead for 200 Ω, 2 k Ω ranges, 1 kΩ per lead on all other ranges
Offset Compensation	Available on 200 Ω, 2 kΩ and 20 kΩ ranges
Input Protection	1,000 V on all ranges
DC Current	
Shunt Resistor	100 Ω for 200 µA, 2 mA
	1 Ω for 20 mA, 200 mA
	0.01 Ω for 2 A, 10 A
Input Protection	Rear panel: accessible 10 A, 250 V Time-Lag fuse
	Internal 12 A, 250 V Time-Lag fuse
Continuity / Diode Test	
Measurement Method	1 mA ± 5 % constant-current source or open-circuit voltage
Response Time	300 samples/sec, with audible tone
Beeper	Yes
Diode Threshold	Adjustable from 0 to 4 V
Continuity Threshold	Adjustable from 1 Ω to 2 KΩ
Input Protection	1,000 V
Settling Time Considerations	
Reading settling times are affected by source impedance, cable dielectric characteristics and input signal changes. The default measurement delay is selected to the correct reading for most measurements.	
Measurement Considerations	
Teflon or other high-impedance, low-dielectric absorption wire insulation is recommended for these measurements	
True RMS AC Voltage	
Measurement Method	AC-coupled True-RMS measurement with up to 400 V DC of bias at on any range.
Crest Factor	≤ 5 at full range
Input Impedance	1 MΩ ± 2 % in parallel with <150 pF capacitance on any range
Input Protection	750 V rms on all ranges
AC Filter Bandwidth	Slow: 3 Hz ~ 300 KHz
	Medium: 20 Hz ~ 300 KHz
	Fast: 200 Hz ~ 300 KHz
CMRR (common mode rejection ratio)	70 dB, for the 1 kΩ unbalance in LO lead, < 60 Hz, ± 500 VDC peak maximum

Measuring Method and other Characteristics

True RMS AC Current	
Measurement Method	Direct coupled to the fuse and shunt; AC-coupled True RMS measurement (Measure the AC componentonly).
Crest Factor	≤ 3 at full range
Max. Input	DC + AC current peak value < 300 % of range. The RMS current < 10 A rms including the DC component.
Shunt Resistor	100 Ω for 200 µA, 2 mA
	1Ω for 20 mA, 200 mA
	0.01 Ω for 2 A, 10 A
Input Protection	Externally accessible 10 A, 250 V Time-Lag fuse
	Internal 12 A, 250 V Time-Lag fuse

Settling Time Considerations

The default measurement delay is selected to give the correct reading for most measurements. Make sure the RC circuit of the input terminal has fully settled (about 1 s) before taking higher accuracy measurements.
Applying > 300 Vrms (or > 5 Arms) will cause self-heating of signal-conditioning components and these error are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be lower than 0.02 % of reading and will generally dissipate within a few minutes as the signal-conditioning components return to normal operating temperature.

Frequency and Period	
Measurement Method	Reciprocal-counting technique, AC-coupled input using the AC voltage function.
Input Impedance	1 MΩ ± 2 % in parallel with < 150 pF capacitance on any range
Input Protection	750 V rms on all ranges
Measurement Considerations	All frequency counters are susceptible to error when measuring low-voltage, low-frequency signals. Shielding inputs from external noise is recommended.
Settling Time Considerations	Errors will occur when attempting to measure the frequency or period of an input following a dc offset voltage change. Make sure the RC circuit of input terminal has been fully settled (about 1 s) before reading the accurate measurement.
Capacitance Measurement	
Measurement Method	Apply constant current into the capacitance, and measure the voltage changing rate.
Connection Type	2-wire
Input Protection	1,000 V on all ranges
Measurement considerations	Since small capacitance measurements are susceptible to the external noise, shielding inputs from external noise is critical for minimizing measurement errors.
Temperature Measurement	
Measurement Method	Support for TC and RTD types of sensor
Measurement considerations	The built-in cold junction temperature tracks the temperature inside the banana jack. The change of the temperature in banana jack may cause additional error. When using the built-in cold junction compensation, connect the sensor terminal of the thermocouple to the banana jack and allow it warm up for more than 3 minutes to minimize error.

Measuring Method and other Characteristics

Triggering and Storage		
Trigger	Pre-trigger or Post-trigger, Internal Trigger or External Trigger, Rising Edge Trigger or Falling Edge Trigger	
Time Base Resolution	40 µs, 0.01 % Accuracy	
Trigger Delay	0 to 1,000 s	
Reading Sensitivity	0.01 %, 0.1 %, 1 % or 10 % reading	
Single Trigger Samples	1 to 599999999	
External Trigger Input	Level:	TTL compatible
	Trigger:	Selectable rising edge or falling edge
	Input Impedance:	≥ 30 KΩ//500 pF
	Delay:	< 50 µs
	Maximum Rate:	300/s
	Minimum Pulse Width:	2 µs
	Level:	5 V TTL Compatible
VMC Output	Output Polarity:	Positive and negative optional
	Output Impedance:	200 Ω, typical
	Pulse Width:	about 2 µs
History Records		
Volatile Memory	10 K reading of history records	
Nonvolatile Memory	1 Gb Nand Flash, Mass storage configuration files and data files, Supports U-disk external storage	
Math Functions		
Min/Max/Average, dBm, dB, Pass/Fail, Relative, Standard deviation, Hold, Histogram, Trend chart, Bar chart		

General Specifications

Power Supply	
AC 100 V ~ 120 V	45 Hz ~ 66 Hz
AC 200 V ~ 240 V	45 Hz ~ 66 Hz
Detect the power-line frequency automatically at power-on, 400 Hz defaults to 50 Hz	
Power Consumption	25 VA max
Mechanism	
Dimension	(length × width × height): 345.45 mm × 260.29 mm × 107.21 mm
Weight	3.377 Kg (Net weight)
Other characteristics	
Display Screen	4.3" TFT-LCD with resolution 480*272
Working Environment	Full accuracy for 0 °C to 50 °C
	Full accuracy to 40 °C, 80 % R.H., Non-coagulation
	Storage Temperature -20 °C to 70 °C
	Shock and Vibration: conforming to MIL-T-28800E, III, 5 level (only for sine)
	Height above sea level: up to 3,000 meters
EMC	Conforming to EMC (2004/108/EC) and EN 61326-1:2013
Safety	IEC 61010-1; EN 61010-1; UL 61010-1; CAN/CSA-C22.2 No. 61010-1 Measurement CAT I 1000 V/CAT II 600 V
Remote Interface	10/100Mbit LAN, USB2.0 Full Speed Device, Host
Programming Language	Standard SCPI, compatible with commands of main stream multimeters
Warm Up Time	90 minutes

Ordering information

Models	**T3DAQ1-16** 16 Channel Data Acquisition System
Standard Accessories	Power Cord that fits the Destination Country
	Two Test Leads, Two Alligator Clips
	USB Cable
	Quick Start Guide
	Calibration Certificate

ABOUT TELEDYNE TEST TOOLS

TELEDYNE TEST TOOLS
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Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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T3 stands for Teledyne Test Tools.

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