TELEDYNE TEST TOOLS
Everywhereyoulook™

T3DAQ1-16 Data Acquisition System Datasheet

Broad Measurement Range

DC: up to 1000 Volts
AC: up tp 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 loosing 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 AC Voltage 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 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 (10.92cm) 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 1GB 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.

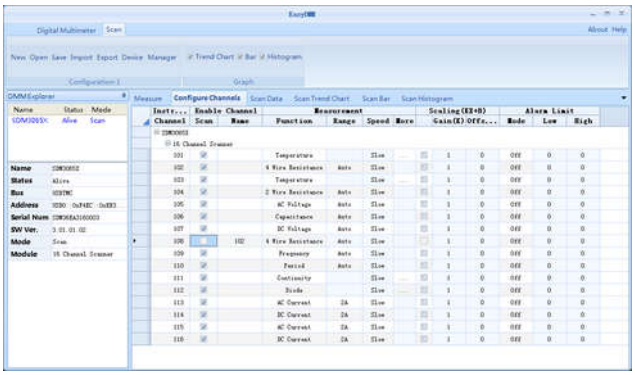
Application Fields

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

EASYDMM SOFTWARE

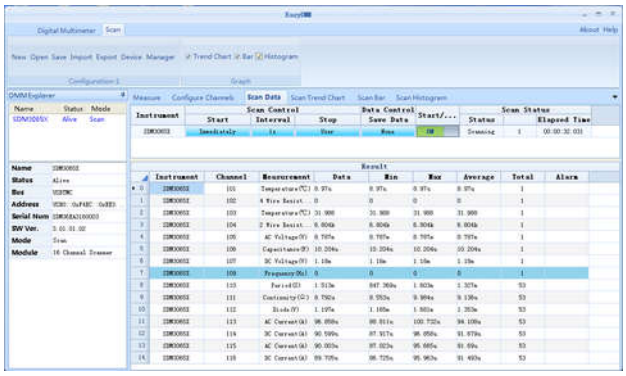
The T3DAQ can be remotely operated by the EasyDMM software. The software provides user friendly graphical interface to operate the DAQ.

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.

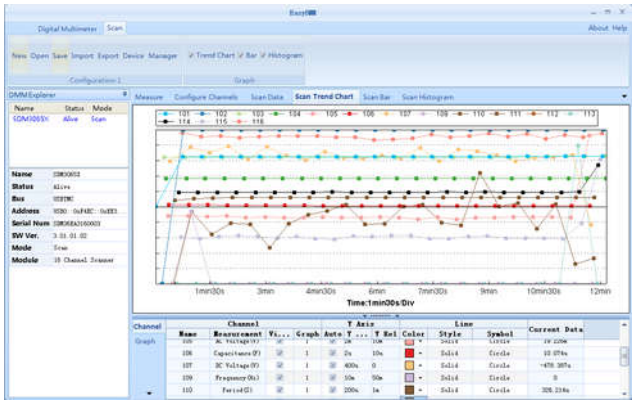
Data Acquisition



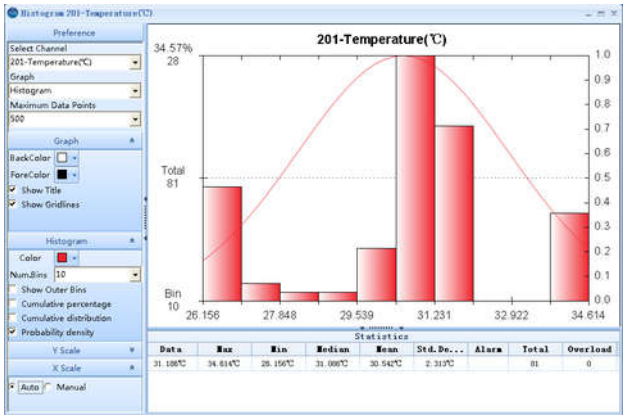
Different measurement settings such as Scan interval, Start and Stop time can be set from the Scan Data menu. The Result section provides the live measurement data along with min, max and average values. It also provides total number of scans and number of Alarm for every channel.

FEATURES

Trend Chart



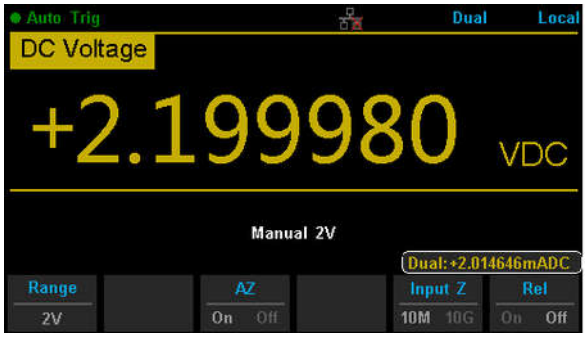
Histogram



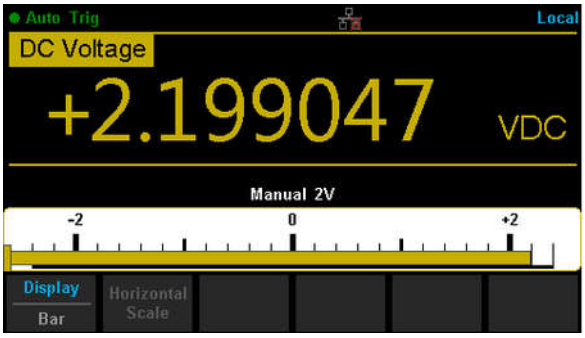
To view the scanned data visually, the software has Trend Chart, Histogram and Bar graph. All the graphs also has user customizable options such as colour, axis scales, type of curve etc.

The T3DAQ has a 6½ Digit DMM functionality built in. DMM functionality can be used using 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.

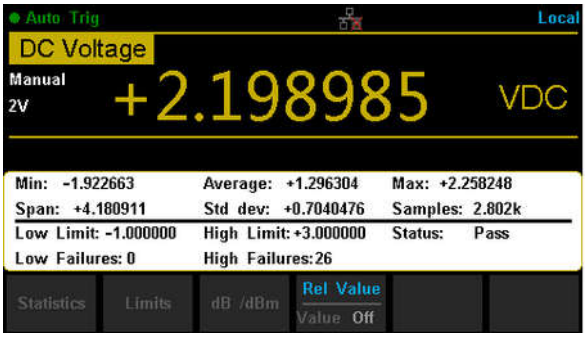
Dual Display



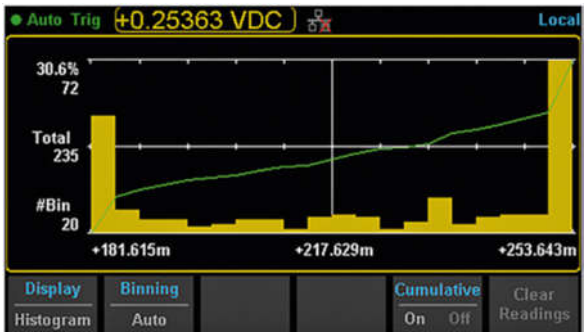
Bar Chart



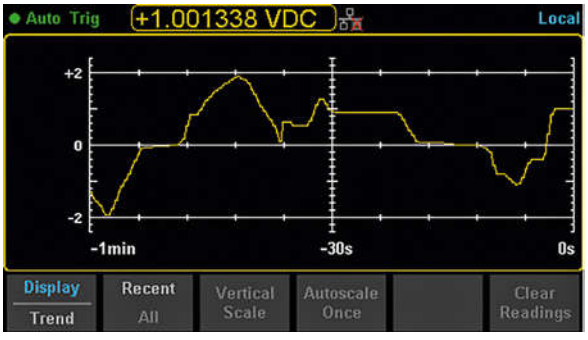
Statistics



Histogram



Trend Chart



Hold Measurement



Scanner Specifications[1]

Max AC Voltage	125 rms or 175 V peak, 100kHz, 0.3 A switched, 125VA (resistive load)
Contact Life	> 100000 operations, at 1 A 30VDC (at 0.5Hz) > 100000 operation, at 0.3 A 125VDC (at 0.5Hz)
Contact Resistance	75 mΩ (maximum at 6 VDC, 1A)
Channel to channel switching time	280ms (typical)
Maximum switching voltage	250 VAC, 220 VDC
Maximum switching power	62.5 VA / 30W
Insulation Resistance	Minimum 1 GΩ
Connect Type	Clamp terminal, # 24 AWG wire size

Remark: [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)	2 wires (H , L)	12 (CH1 ~ CH12)
Temp (RTD)	2 wires (H , L)	12 (CH1 ~ CH12)

Remarks:

[1] Voltage range: < 2.2VAC, 110VDC

[2] For continuous current < 2.2A, Accuracy ± (% 3 (reading) + 0.02% (range)).

DC Characteristics

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

Function	Range [2]	Test Current Or Burden Voltage	24Hour[3] TCAL℃ ±1℃	90day TCAL℃ ±5℃	1Year TCAL℃ ±5℃	Temperature coefficient 0℃ to（TCAL℃ -5℃） （TCAL℃ +5℃）to50℃
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	< 0.03V	0.009 + 0.010	0.040 + 0.005	0.050 + 0.005	0.0020 + 0.0026
	2.000000 mA	< 0.25V	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
Resistance[6]	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
	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~ 2V	1 mA	0.002 + 0.009	0.008 + 0.020	0.010 + 0.020	0.0010 + 0.0020
	2~ 4V	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

Remarks:

[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 1000V and DCI 10A range.

[3] Relative to calibration standards.

[4] For each additional volt over ± 500 V, add 0.03mV error.

[5] For continuous current > 7A DC or 7A 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~ 4V.

[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)	50Hz	60Hz	DCV 20V	DCV 2V 200V Resistance 2KΩ 20KΩ	DCV 1000V DCI 2 mA 200mA	DCV 200mV Resistance 200Ω DCI 10A
0.005(0.006)	2.7	0	10000	10000	0.0006	0.0008	0.0015	0.0040
0.05 (0.06)	1.6	0	1000	1000	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

Remarks:

[1] Only 1 NPLC and 10 NPLC ranges are avalible as Fast and Slow modes respectively when the instrument is used in Scan mode.

[2] Typical value. Resolution is defined as the typical 20V 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 30dB.

[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 60Hz, 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	200mV	80	75
	2V	76	80
	20V	78	72
	200V	80	78
	1000V	82	80
DCI	200uA	90	70
	2mA	90	80
	20mA	85	70
	200mA	80	75
	2A	70	60

[1] Typical value. -1dBFS, 1k Hz single tone. 100 us aperture time and auto zero off.

AC Characteristics

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

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

Remarks:

[1] Specifications are for 90-minute warm-up, ＞ 3Hz 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 $8x10^7$ Volt-Hz. For input over 300V rms, add 0.7mV 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 200uA and 2mA, 2A and 10A ranges when frequency >1k Hz.

[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.

Function	Range [2]	Frequency Range	24 Hour[3] TCAL ℃ ±1℃	90 Day TCAL ℃ ±5℃	1Year TCAL ℃ ±5℃	Temperature coefficient 0℃ to （TCAL℃ -5℃） ）TCAL℃ +5℃）to 50℃
True-RMS AC Current [8][10]	200.0000 uA	3Hz- 5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.005
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.005
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.005
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.005
	2.000000mA	3Hz- 5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.005
		5Hz-10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.005
		10Hz-5kHz	0.12 + 0.04	0.12 + 0.04	0.12 + 0.04	0.015 + 0.005
		5kHz-10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.005
	20.00000mA	3Hz- 5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.005
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.005
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.005
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.005
	200.0000mA	3Hz- 5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		5Hz-10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10Hz-5kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
		5kHz-10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.006
	2.000000 A	3Hz- 5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.100 + 0.006
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.035 + 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
	10.00000A[6]	3Hz- 5Hz	1.10 + 0.08	1.10 + 0.10	1.10 + 0.10	0.100 + 0.008
		5Hz-10Hz	0.35 + 0.08	0.35 + 0.10	0.35 + 0.10	0.035 + 0.008
		10Hz-5kHz	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)
	＞ 3Hz	＞ 20 Hz	＞ 200Hz		
10Hz-20Hz	0	0.74	--	1 - 2	0.05
20Hz-40Hz	0	0.22	--	2 - 3	0.2
40Hz-100Hz	0	0.06	0.73	3 - 4	0.4
100Hz- 200Hz	0	0.01	0.22	4 - 5	0.5
200Hz-1kHz	0	0	0.18		
＞ 1kHz	0	0	0		

Remarks:

[1] Specifications are for 90-minute warm-up, ＞ 3Hz 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 $8x10^7$ Volt-Hz. For input over 300V rms, add 0.7mV 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 200uA and 2mA, 2A and 10A ranges when frequency >1k Hz.

[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	Frequency Range	24 Hour[3] TCAL℃ ±1℃	90 Day TCAL℃ ±5℃	1 Year TCAL℃ ±5℃	Temperature coefficient 0℃ to（TCAL℃ -5℃）（TCAL℃ +5℃）to 50℃
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)			
	1s (0.1ppm)	0.1 s (1ppm)	0.01 s (10ppm)	0.001 s (100ppm)
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
300Hz–1 KHz	0	0.01	0.07	0.07
＞1 K Hz	0	0	0.02	0.02

Remarks:

[1] Specifications are for 90 minutes warm-up, using 1s 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 750V rms or 8 $\times 10^7$ Volts-Hz (whichever is less). The 200 mV range is full range input or input that is larger than the full range. For 20mV to 200mV, 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℃ ±5℃	Temperature coefficient 0℃ to（TCAL℃ - 5℃）（TCAL℃ + 5℃）to 50℃
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	100μA	1 + 0.1	0.01 + 0.01
	2.0000μF	100μA	1 + 0.1	0.01 + 0.01
	20.000μF	1 mA	1 + 0.1	0.01 + 0.01
	200.00μF	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

Remarks:

[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 2nF 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℃ ±5℃	Temperature coefficient 0℃ to（TCAL℃ - 5℃）（TCAL℃ + 5℃） to 50℃
Temperature	RTD[2] (R0 is 49Ω to 2.1kΩ)	α=0.00385	-200℃ ~ 660℃	0.16℃	0.01℃
	Thermocouple [3]	B	0℃～ 1820℃	0.76 ℃	0.14℃
		E	-270℃～ 1000℃	0.5℃	0.02℃
		J	-210℃～ 1200℃	0.5℃	0.02℃
		K	-270℃～ 1370℃	0.5℃	0.03℃
		N	-270℃～ 1300℃	0.5℃	0.04℃
		R	-270℃～ 1760℃	0.5℃	0.09℃
		S	-270℃～ 1760℃	0.6℃	0.11℃
		T	-270℃～ 400℃	0.5℃	0.03℃

Remarks:

[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 ℃ .

Measurement Rate[1]

Measurement rate[4]

Function	Setting	Integration	Readings/s 50Hz（60Hz）
DC Voltage DC Current 2 - wire Resistance 4 - wire Resistance	0.005（0.006） NPLC	100(100)us	10000 (10000)
	0.05（0.06） NPLC	1 (1)ms	1000 (1000)
	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	3Hz AC Filter		0.5
	20Hz		2
	200Hz		50
Frequency and Period [2]	1s Gate time		1
	0.1s		10
	0.01s		100
	0.001s		500
Capacitance[3]	100mF Range		0.5

Remarks:

[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, 1k Hz 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 ±26V are clamped through 106 k Ω (typical)
	200 V and 1000 V ranges； 10 MΩ ± 1%
Input Offset Current	50 pA, 25°C ,typical
Input Protection	1000 V
CMRR (common mode rejection ratio)	140 dB for 1 k Ω 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 <10V
Max. Lead Resistance (4-wire)	10% of range per lead for 200 Ω, 2 k Ω ranges, 1 k Ω per lead on all other ranges
Offset Compensation	Available on 200 Ω, 2kΩ and 20 k Ω ranges
Input Protection	1000 V on all ranges
DC Current	
Shunt Resistor	100 Ω for 200 u A, 2 m A
	1 Ω for 20 m A , 200 m A
	0.01 Ω for 2 A, 10 A
Input Protection	Rear panel : accessible 10 A,250 V Time-Lag fuse
	Internal 12A, 250V Time-Lag fuse
Continuity / Diode Test	
Measurement Method	1 m A ±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 1Ω to 2 KΩ
Input Protection	1000 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	1MΩ ± 2% in parallel with <150pF capacitance on any range
Input Protection	750V 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 k Ω unbalance in LO lead, < 60 Hz, ± 500 VDC peak maximum

True RMS AC Current	
Measurement Method	Direct coupled to the fuse and shunt; AC-coupled True RMS measurement (Measure the AC component only).
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	100Ω for 200uA , 2mA
	1Ω for 20mA,200mA
	0.01Ω for 2A,10A
Input Protection	Externally accessible 10A,250V Time-Lag fuse
	Internal 12A, 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 1s) 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 1s) 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	1000 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.

Triggering and Storage	
Trigger	Pre-trigger or Post-trigger, Internal Trigger or External Trigger, Rising Edge Trigger or Falling Edge Trigger
Time Base Resolution	40us，0.01％ Accuracy
Trigger Delay	0 to 1000s
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： ≥30KΩ//500pF
	Delay: < 50 μs
	Maximum Rate: 300/s
	Minimum Pulse Width: 2 μs
VMC Output	Level ： 5V TTL Compatible
	Output Polarity：Positive and negative optional
	Output Impedance：200Ω，typical
	Pulse Width: about 2μs
History Records	
Volatile Memory	10K reading of history records
Nonvolatile Memory	1Gb 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, 400Hz defaults to 50Hz	
Power Consumption	25VA max
Mechanism	
Dimension	(length×width×height): 345.45mm×260.29mm×107.21mm
Weight	3.377Kg (Net weight)
Other characteristics	
Display Screen	4.3 ”TFT-LCD with resolution 480*272
Working Environment	Full accuracy for 0 ℃ to 50 ℃ Full accuracy to 40 ℃ , 80% R.H., Non-coagulation
	Storage Temperature — 20℃ to 70℃
	Shock and Vibration: conforming to MIL-T-28800E, III, 5 level（only for sine）
	Height above sea level: up to 3000 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.

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