



Advanced Test Equipment Corp.

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AMETEK[®]
PROGRAMMABLE POWER



**California
Instruments**[™]

TAHOE SERIES

Precision Programmable AC and DC Sources

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PRECISION PROGRAMMABLE AC AND DC SOURCES



THE MOST ADVANCED PLATFORM OF POWERFUL AC SOLUTIONS

The California Instruments Tahoe Series combines intelligence and flexibility with high power to create an advanced platform of AC solutions. Using a state-of-the-art SiC power switching architecture and Digital Signal Processing, the Tahoe Series combines a robust, high-power AC/DC source with an advanced power analyzer in a single floor standing chassis.

This easy-to-configure power product covers a wide spectrum of single and multi-phase AC or single channel and multi-channel DC power applications at an affordable cost. With add-on test application routines for military and commercial avionics testing, the Tahoe Series can fulfill your power test requirement.

LXI | CE

FEATURES AND CAPABILITIES

- High Power AC and DC Power Source
- Auto paralleling for higher power system expansion
- Single and three phase modes
- Arbitrary & Harmonic Waveform Generation
- Standard LXI LAN, USB, and RS-232, Optional GPIB
- 500uS time resolution for Transients
- Complete avionics test suites
- 15kVA to 1MVA Power Levels
- Intuitive 5" color display for ease of navigation
- Internationally accepted test routines for EMI/EMC, Safety compliance

KEY BENEFITS

Simple Operation

The Tahoe Series can be operated completely from its menu driven front panel controller. The full color-touch display shows menus, setup data, and read-back measurements. RS-232C, USB and LAN remote control interfaces and instrument drivers for popular ATE programming environments are available. This allows the Tahoe Series to be easily integrated into an automated test system. With the programmable arbitrary waveform generator, the user can generate application specific waveforms, obtain time and frequency domain measurements, and capture actual voltage and current waveforms.

Configurations

The Tahoe Series offers five single chassis configurations: 15kVA, 22.5kVA, 30kVA, 45kVA and 90kVA. For higher power requirements, multi-cabinet models are available. These systems offer Reflex capability, allowing flexible user reconfiguration as needed. This ability to reconfigure the system greatly expands your test coverage and is not commonly found in power systems.

Choice of Voltage Ranges

The Tahoe Series offers dual range 0 - 166V & 0 - 333V line to neutral direct coupled output. These models provide a maximum 3 phase output capability of 287 VAC & 576 VAC line to line respectively. For applications requiring more than 333 V L-N (or 576 V L-L), the optional -XVC400 output transformer provides an additional 0 - 442 V L-N and 0 - 766 V L-L output range for use in AC mode only. For custom applications, the user defined XVC option is available.



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KEY BENEFITS

High Crest Factor

With support for high crest factor loads, the Tahoe can drive difficult nonlinear loads with ease. Since many modern products use switching power supplies, they tend to pull high repetitive peak currents. The TA30 with a crest factor rating of 4.5, for example, can deliver up to 300 Amps of repetitive peak current (166 V AC range) per phase to handle three phase loads. Refer to the specifications for peak repetitive currents for each model.

Remote Control

Standard RS232C, USB, and LAN, along with optional GPIB remote control interfaces, allow programming of all instrument functions from an external computer. The popular SCPI command protocol is used for programming.

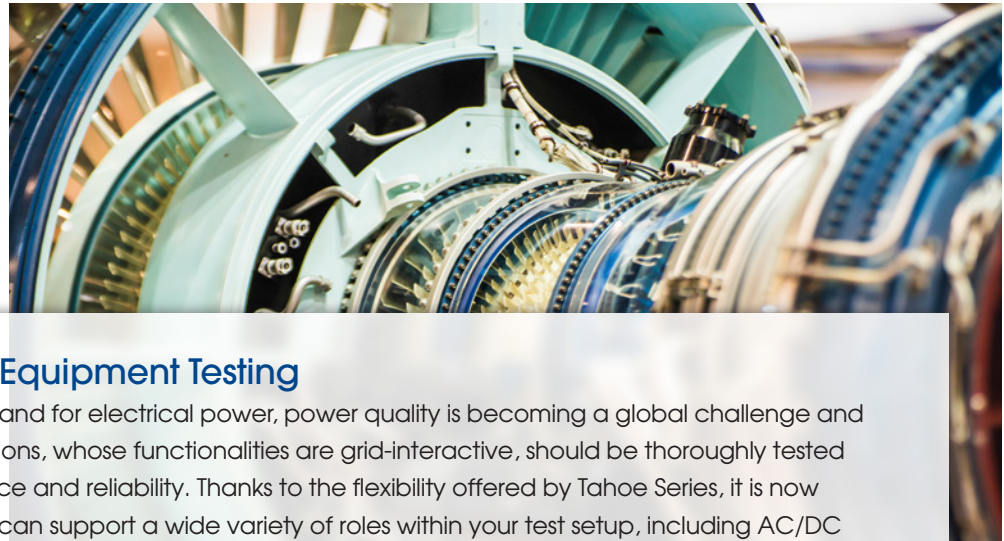
Hardware In the Loop

The External Drive (-EXTD) feature allows external analog signal control of the source while in AC operation, turning the source into a high bandwidth amplifier. Most common applications include hardware in the loop (HIL) simulation of power plants, hybrid electric vehicles, and renewable energy generation and their effect on the utility grid. Combining an HIL simulator with the Tahoe grid simulator results in as little as 100uS delay, meaning the overall solution is real time.

Tahoe Series Back Panel



TESTING APPLICATIONS



Power Conditioning Equipment Testing

With the ever-increasing demand for electrical power, power quality is becoming a global challenge and many power conversion solutions, whose functionalities are grid-interactive, should be thoroughly tested to ensure product performance and reliability. Thanks to the flexibility offered by Tahoe Series, it is now possible that a single solution can support a wide variety of roles within your test setup, including AC/DC Programmable Power source, AC/DC Grid Simulator, or AC/DC Resistive or Complex Electronic load. With the ability to change most parameters during the test and the ability to synchronize the waveform with internal or external drive signals, Tahoe provides multiple methods of validation for R&D Testing.



Avionics & Shipboard Electronics Testing

Optional test suites for avionics power quality standards like MIL-STD 704, RTCA DO-160, and MIL STD 1399 shipboard power bus emulation save time in creation of test cases and help to quickly pre-validate the product compliance. With fundamental frequency support up to 905Hz with the high frequency (HF) option, Tahoe can simulate a wide array of electrical power supplies in most aircrafts and shipboard electrical systems. With the ability to sink power from DC to 500Hz incoming frequency and programmability of load current waveform, the optional eLoad mode is your solution for validating onboard power conversion systems.

TESTING APPLICATIONS



Regulatory Compliance Testing

As governments and regulatory bodies expand enforcement of product quality standards, regulatory compliance testing has become a requirement for manufacturers. The Tahoe Series is designed to meet AC source requirements for use in compliance testing such as IEC 61000-3-2, 3-3, 3-11, 3-12, to name a few. Tight integration with Virtual Panels software facilitates easy generation of test sequence for various safety, compliance and EMI tests, as per various UL, IEC, IEEE standards, and national electric grid code of conduct/compatibility.



Manufacturing Line Testers

The Tahoe Series are a good fit for end of production line functional testers, as they offer many benefits for test developers, operators, and quality team. The automatic paralleling option helps to scale-up / scale-down the power capacities, dynamically, to safeguard the investment on infrastructure. Full support for SCPI commands, availability of NI LabVIEW drivers, and IVI Drivers, helps test automation developers to choose their comfortable development environment. Load dependent variable fans help reduce the acoustic noise and improve occupational health.

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OUTPUT SPECIFICATIONS					
PARAMETER	TA0015	TA0022	TA0030	TA0045	TA0090
Power	15kVA / 15kW 1 ϕ	22.5kVA / 22.5kW 1 or 3 ϕ	30kVA / 30kW 1 or 3 ϕ	45kVA / 45kW 1 or 3 ϕ	90kVA / 90kW 3 ϕ
Modes	AC, DC, AC+DC (Source mode only)				
Voltage Range (AC)	Low Range: 0-166 Vrms L-N High Range: 0-333Vrms L-N				
Voltage Range (DC)	Low Range: 0-220VDC High Range: 0-440VDC				
Output Coupling	Standard configurations: DC coupled. Optional 3rd AC coupled range: 0- 440, 550, 660, or 715Vrms L-N				
Voltage Accuracy	AC Mode: $\pm 0.3\% \leq 100\text{Hz}$, $\pm 0.6\% > 100\text{Hz}$ DC Mode: $\pm 1\text{V}$				
Voltage Resolution	0.1V, AC, DC, AC + DC modes				
Voltage Distortion	$< 66\text{Hz}$: 0.5%, $66\text{-}500\text{Hz}$: 1%, $> 500\text{Hz}$: 1.5%				
Current per ϕ (max)	125/62.5 Arms 85/42.5 Adc	62.5/31.2 Arms 42/21 Adc	83/41 Arms 57/28 Adc	125/62.5 Arms 85/42.5 Adc	250/125 Arms 170/85 Adc
Load Regulation (Source Mode)	DC, $\leq 100\text{Hz}$: 0.25% FS $> 100\text{Hz}$: 0.5%				
Line Regulation	0.1% for a 10% line change				
Phase Programming Accuracy	$\leq 100\text{Hz}$: $\pm 1.5^\circ$, $100\text{-}500\text{Hz}$: $\pm 2^\circ$, $> 500\text{Hz}$: $\pm 4^\circ$				
Phase Programming Resolution	0.1 $^\circ$				
Frequency Range	DC, 16-550Hz, DC, 16-905Hz with HF Option				
Frequency Accuracy	$\pm 0.01\%$ + (resolution/2)				
Frequency Resolution	$\leq 81.91\text{Hz}$: 0.01Hz, 82.0 to 819.1Hz: 0.1Hz, $> 819.1\text{Hz}$: 1Hz (With LKM/LKS option, 1Hz from 16 Hz to 905 Hz)				
Voltage Stability	0.25% over 8 hours at constant line, load, & temperature, with external sense leads connected				

MEASUREMENT SPECIFICATIONS			
PARAMETER	RANGE	ACCURACY (\pm) 1	RESOLUTION
Frequency	16.00 - 905.0 Hz	0.01% + 0.01 Hz	0.01 to 81.91 Hz, 0.1 to 905 Hz
RMS Voltage	0 - 400 Volts	0.05V + 0.02%, $< 100\text{ Hz}$, 0.1V + 0.02%, 100-820 Hz	0.01 Volt
DC Voltage	0 - 500 Volts	0.5 V	0.1 V
RMS Current	0 - 150 Amps	0.15A + 0.02%, $< 100\text{ Hz}$, 0.3A + 0.02%, 100-820 Hz	0.01 Amp
DC Current	0 - 400 Amps	0.5 Amps	0.01 Amp
Peak Current	0 - 400 Amps	0.15A + 0.02%, $< 100\text{ Hz}$, 0.3A + 0.02%, 100-820 Hz	0.01 Amp
DC Current	0 - 400 Amps	0.5 Amp	0.01 Amp
VA Power	0 - 15 kVA	30 VA + 0.1%, $< 100\text{ Hz}$, 60 VA + 0.1%, 100-820 Hz	10 VA
Real Power	0 - 15 kW	30 W + 0.1%, $< 100\text{ Hz}$, 60 W + 0.1%, 100-820 Hz	10 W
DC Power	0 - 15 kW	1% FS	10 W
Power Factor ($> 0.2\text{kVA}$) ²	0.00 - 1.00	0.01, $< 100\text{ Hz}$, 0.02, 100-820 Hz	0.01

1. Accuracy specifications are valid above 100 counts. For current and power measurements, specifications apply from 2% to 100% of measurement range. Current and Power range and accuracy specifications are times three for TA22.5, TA30, TA45 operated in single phase mode. For the multi chassis models the current and power range accuracy specifications are to be multiplied by No of chassis.

2. Power factor accuracy applies for PF > 0.5 and VA $> 50\%$ of max.

HARMONIC MEASUREMENTS			
PARAMETER	RANGE ²	ACCURACY (±) 1	RESOLUTION
Frequency Fundamental	16.00 - 905 Hz	0.03% + 0.03 Hz	0.01 Hz
Frequency Harmonics	32.00 Hz – 16 KHz	0.03% + 0.03 Hz	0.01 Hz
Phase	0.0 - 360.0°	2° typ.	0.5°
Voltage	Fundamental	0.75V	0.01V
	Harmonic 2 - 50	0.75V + 0.3% + 0.3%/kHz	0.01V
Current	Fundamental	0.5A	0.1A
	Harmonic 2 - 50	0.15A + 0.3% + 0.3%/kHz	0.1A

1. Accuracy specifications are valid above 100 counts. For current and power measurements, specifications apply from 2% to 100% of measurement range. Current and Power range and accuracy specifications are times three for TA22.5, TA30, TA45 operated in single phase mode.

2. For the multi chassis models the current and power range accuracy specifications are to be multiplied by No of chassis.

INPUT SPECIFICATIONS						
PARAMETER	TA0015	TA0022	TA0030	TA0045	TA0090	
Line Voltage (3-Φ, 3-wire + ground (PE))	208 V _{LL} ±10%, 230 V _{LL} ±10%, 380 V _{LL} ±10%, 400 V _{LL} ±10%, 480 V _{LL} ±10%, 600V L-L ±10%					
Frequency	47 - 63Hz					
Line VA	18kVA	26kVA	37kVA	53kVA	106kVA	
Line Current (Arms)	187V _{L-L}	58	89	116	175	350
	207V _{L-L}	52	79	105	157	314
	342V _{L-L}	Not available	49	64	95	190
	360V _{L-L}	30	46	60	90	180
	432V _{L-L}	25	38	50	75	150
Efficiency	85% (typical) depending on line and load					
Power Factor	0.95 (typical) / 0.99 at full power					
Inrush Current (A _{pk})	208V _{L-L}	77	153	230	230	460
	230V _{L-L}	73	146	220	220	440
	342V _{L-L}	Not available	94	140	140	280
	400V _{L-L}	44	87	132	132	264
	480V _{L-L}	37	73	110	110	220
Hold-up Time	>10mSec					
Isolation Voltage	2200VAC Input-to-Output, 1350VAC Input-to-Chassis					

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OPERATIONAL CHARACTERISTICS	
PARAMETER	CHARACTERISTIC
Parallel Operation	Multi-chassis configurations are automatically accomplished when the chassis are interconnected with the interface cables, and require no user setup, except to wire the inputs and outputs. Maximum power is limited to 270 kVA with the TA45 and 1.08MVA with the TA90.
Output Relays	Isolation and range relays are provided internally to automatically configure the outputs, turn the output on/off, and disconnect the load from the output amplifier when in the off state.
1-Phase and 3-Phase mode selection	Switches between 1 and 3 phase outputs. This mode is available TA22.5, TA30 and TA45 models only.
Non-Volatile Memory	16 complete instrument setups and transient lists, 100 events per list.
Waveform Management	TA series employs independent arbitrary waveform generator for each phase, this allows the user to create custom waveforms. In addition, three standard waveforms sine, square and clipped are always available.
Fault Identification	On-board diagnostics identify when an assembly has experienced a fault.
Emergency Stop	This mushroom style switch is installed on the front panel of each chassis. When pushed in, the amplifiers will be disabled, the voltage will be programmed to 0V and the output relay(s) will open. Note that the controller (and front panel display) will still be powered up, but no power is available to the amplifiers and there will be no output power.
Calibration	Calibration interval is 1 year; calibration is firmware-based through the digital interface or Virtual Panels.
Current Limit Modes	Two selectable modes of operation: Constant Voltage (CV) & Constant Current (CC). In CC mode, the voltage folds back with automatic recovery during an over-current event. In CV mode, the output is programmed to 0V and the output relays open with an over current event.
Automatic Level Control (ALC)	User-selectable ALC operation enables a digitally implemented feedback control loop to precisely regulate the RMS value of the output voltage.
Transient Generator	Output could be controlled to produce transient events with 500 μ s programming resolution: Voltage: drop, step, sag, surge, sweep; Frequency: step, sag, surge, sweep; Voltage and Frequency: step, sweep.
External Drive	0-7.00Vrms aux input.

OPTIONS	DESCRIPTION
HF	Increases the maximum output frequency range to 905Hz
HF-FC	This option adds the HF option and changes the frequency accuracy to $\pm 0.25\%$ of program frequency
LKM	Clock and Lock, Master
LKS	Clock and Lock, Auxilliary
AVSTD	Includes RTCA/DO160 E/F/G, MIL-STD 704 A/B/C/D/E/F, Airbus ADB100.1.8 D/E, Airbus ADB100.1.8.1 B/C
AVALL	Includes RTCA/DO160 E/F/G, MIL-STD 704 A/B/C/D/E/F, Airbus ADB100.1.8 D/E, Airbus ADB100.1.8.1 B/C, B787B3-0147, AMD24C
MIL1399	MIL-STD 1399-300B Shipboard Power Test
LNS	Synchronizes the output frequency to the input line frequency
GPIB	GPIB Interface
XVC	Optional AC coupled voltage range (specifications on next sheet)

XVC440 SPECIFICATIONS					
PARAMETER	TA0015	TA0022	TA0030	TA0045	TA0090
Voltage Range	0-440 Vrms L-N				
Voltage Resolution	0.1 V				
Voltage Accuracy	± 1 Vrms				
Power	15kVA	22.5kVA	30kVA	45kVA	90kVA
Current per Φ (max)	42 Arms	21 Arms	28 Arms	42 Arms	85 Arms

ENVIRONMENTAL SPECIFICATIONS	
PARAMETER	SPECIFICATIONS
Operating Temperature	0° to +40° C. (0° to +32° C in the Constant Power mode).
Storage Temperature	-40° to +85 °C (-40° to +185° F).
Altitude	< 2000 meters
Relative Humidity	0-95 % RAH, non-condensing maximum for temperatures up to 31°C decreasing linearly to 50% at 40°C.
Vibration	Designed to meet ISTA 1A transportation levels.
Shock	Designed to meet ISTA 1A transportation levels.
Transportation integrity	ISTA Test Procedure 1A

REGULATORY AGENCY COMPLIANCE	
PARAMETER	SPECIFICATIONS
EMC	CE marked for EMC Directive 2014/30/EU per EN 61326-1:2013 Class A for Emissions and Industrial Immunity levels as required.
Safety	CSA NRTL certified for US and Canada to CAN/CSA-C22.2 No. 61010-1-12, UL 61010-1 Third Edition. CE marked for LVD compliance 2014/35/EU to EN 61010-1 Third Edition as required for the EU CE mark.
CE Mark LVD Categories	Installation Overvoltage Category: II; Pollution Degree: 2; indoor use only.
RoHS	CE marked for compliance with RoHS3 EU Directive 2015/863/EU for Restriction of Hazardous Substances in Electrical and Electronic Equipment.

ORDERING INFORMATION

SERIES
TAHOE

TA **XXXX** **A** **X** **X** **X** - **X** **X** **X** **X** **X** **0**

POWER
0015 - 15KVA
0022 - 22.5KVA
0030 - 30KVA
0045 - 45KVA
0090 - 90KVA

NUMBER OF CHASSIS

INPUT
C - 208V L-L
D - 400V L-L
E - 480V L-L
F - 230V L-L
G - 380V L-L^[2]
H - 600V L-L^[1]

OPTIONAL OUTPUT AC VRANGE
1 - NONE
2 - XVC440
3 - XVC550^[1]
4 - XVC660^[1]
5 - XVC715^[1]

INTERFACE OPTIONS
0 - STANDARD
1 - GPIB
2 - GPIB-MC

FREQUENCY OPTIONS
0 - STANDARD
1 - HF
2 - HF-FC

REGULATORY TEST OPTIONS
0 - NONE
A - IEC
B - IEC-MC
C - LNS, LINE SYNC
D - LNS-MC
E - IEC+LNS
F - IEC+LNS-MC

CLOCK/LOCK OPTIONS
0 - NONE
A - LKM, CLOCK/LOCK LEADER
B - LKS, CLOCK/LOCK FOLLOWER

POWER QUALITY TEST OPTIONS
0 - NONE
A - AVSTD
B - AVSTD-MC
C - AVALL
D - AVALL-MC
E - MIL1399
F - MIL1399-MC
G - MIL1399+AVSTD
H - MIL1399+AVSTD-MC
J - MIL1399+AVALL
K - MIL1399+AVALL-MC

NOTES: [1] Available only on Tahoe 90 Configurations [2] Not available on Tahoe 15 Configurations

