

BCTer – Trinity Series – Battery Cell Tester with energy recovery

The Wattical BCTer (Battery Cell Tester with energy recovery) offers the ability to precisely analyze battery-technologies such as lead-acid, Li-ion and their derivatives as well as next-generation battery systems. Using advanced microprocessor-controlled controllers, they adapt to evolving battery testing needs, supporting nearly any test standard. With an AC/DC converter on the mains-side (AFE) and a DC/DC converter on the battery side, our cell tester ensures efficient, eco-friendly operation through regenerative hardware design.

As a Sub-Series under BCTer, the Trinity – Series (BCTer -T) enables precise simulation and measurement of the effects caused by sinusoidal ripple-currents applied to battery cells, supporting standard and advanced tests for battery-health and its degradation.

Thanks to its programmable controls, it can infeed sine wave ripple-currents across a wide frequency range while maintaining high accuracy, regardless of the charging or discharging test protocols. Our system is unique in that it integrates ripple infeed and regular charge/ discharge in a single-channel unit. The ripple feature is embedded in the hardware itself, rather than being added in parallel to conventional test channels.

We are proud to offer integrated E.I.S. Measurement as another unique feature. In addition to the standard charge/discharge and ripple functions, this E.I.S. feature is also uniquely integrated directly into the test channel unit.

Robust hardware and adaptable management ensure compliance with international standards and deliver reliable results for current and next-generation battery systems.

Generally, the product configuration can be reflected by the product name and the optional features. The product line of Battery Cell Tester Naming consists of several components as follows:

- BCTer-<Series>-<Voltage>-<Current>-<NumberOfChannels>
 - Series
 - T-Trinity, Ripple, E.I.S.
 - Voltage: per Configuration
 - (-8 to 8V, -10 to +10V, -20 to +20V, -60 to +60V)
 - Optional Features
 - A-Accuracy: 0.02% Full Scale
 - F-Fast: 1ms Response Time



Features of the Synchronous AC Impedance Analyzing Trinity Series

Charge/ Discharge Battery Cycling	Ripple Function (DC+AC Output)	E.I.S. Function (Static)	Synchronous E.I.S. Measurement
Wide Current Range	Ripple Current	High Accuracy	Impedance during Cycling
<ul style="list-style-type: none"> • 100-600A (Customized Ranges) 0.02% Full Scale 	<ul style="list-style-type: none"> • 500A_{pp} for 0.01-1 kHz (300A Channel) (derating after 1kHz) • 1000A_{pp} for 0.01-1 kHz (600A Channel) (derating after 1kHz) 	<ul style="list-style-type: none"> • Current: ±0.02% F.S. • Voltage: ±0.02% F.S. 	<ul style="list-style-type: none"> • Dynamic E.I.S. Measuring • Improve Real Battery Use Application
Fast Response	Ripple Current Test	E.I.S. Application	Cycling Synchronous E.I.S. Application
<ul style="list-style-type: none"> • 1ms (10% to 90%) • 2ms (-90% to 90%) • DCIR Measure (1ms/1kHz DAQ) 	<ul style="list-style-type: none"> • Pulse Current Heating • Validation Source System • Ripple Emulator 	<ul style="list-style-type: none"> • SOH Sorting • Cell Temperature • Battery Identification Sorting 	<ul style="list-style-type: none"> • Overcharging Warning • Li-plating/DRT • Li-plating/Cs • ISC Warning

General Parameters										
Protection Level	IP21									
Operating Temperature	0°C to 40°C									
Operating Humidity	<90% Relative Humidity (non-condensing)									
Device Noise	≤75dB									
Cooling Method	Forced Air Cooling									
Max. Operation Altitude	<2000m									
Mains-AC Parameters										
Mains Connection	Three-Phase five-wire supply: 3~ N PE									
Input Frequency	47-63Hz									
Energy Recuperation	Yes									
Regenerative Efficiency	70% (peak value)									
Power Factor	>0.99									
Input Voltage	+360V to +440V									
Total Harmonic Distortion (THD)	<5%									
DC Parameters										
Voltage Range	-8V to +8V (equipment terminal voltage) -10V to +10V (equipment terminal voltage) -20V to +20V (equipment terminal voltage) -60V to +60V (equipment terminal voltage)									
Voltage Accuracy	±0.02% Full Scale at 25 °C±5°C (Accuracy Option)									
Voltage Resolution	18bit (0,0009% of max voltage)									
Current Range	±300A/±600A									
Current Accuracy	±0.02% Full Scale at 25 °C±5°C (Accuracy Option)									
Current range increment typ.	100A/ 200A									
Accuracy for ranges	±0.02% Full Scale at 25 °C±5°C (Accuracy Option)									
Current Resolution	18bit (0,0009% of max current)									
Channel Power	per Configuration									
No. Of Channels	per Configuration									
Channel Parallel	Supported, No degradation in Data Integrity and Communication Speed.									
Current Response Time	≤1ms (10% to 90% Full Scale)									
Current Switching Time	≤2ms (-90% to 90% Full Scale)									
Minimum Pulse Width	10ms									
Testing Parameters										
Charge/Discharge Mode	Constant Current, Constant Voltage, Constant Current Constant Voltage, Constant Power, Constant Resistance, Constant Current Pulse, Constant Current Ramp, Road Profile, Matrix, etc.									
Data Record Frequency	333Hz (3ms), support 1000Hz(1ms) in some cases ^{Note 1}									
Data Record Condition	Time (Δt), Voltage (ΔV), Current (ΔI), etc.									
External Interface	CAN FD, RS-485 (AUX-Channels, Climate Chamber, Chiller, Pressure Sensor, etc.)									
Communication Method	Ethernet									
Ripple Parameters										
Frequency Range	10 to 5000Hz									
Max Ripple A_{pp} ^{Note 2} -300A Channel (5m DC Cable)	Frequency-kHz	0.01-1	1.5	2	2.5	3	3.5	4	4.5	5
	A_{pp} -A	500	310	310	145	110	70	55	43	40
Max Ripple A_{pp} ^{Note 2} - 600A Channel (5m DC Cable)	Frequency-kHz	0.01-1	1.5	2	2.5	3	3.5	4	4.5	5
	A_{pp} -A	1000	620	480	290	220	140	110	86	80
Max Peak Value per Channel (DC+AC Peak)	300A/600A									
Ripple Accuracy (A_{pp}) - 300A Channel	±1% Full Scale (500 A_{pp})									
Ripple Accuracy (A_{pp}) - 600A Channel	±1% Full Scale (1000 A_{pp})									
Frequency Accuracy	±0.1% Full Scale (5000Hz)									
DC Offset	±1A									
E.I.S. Parameters										
AC Output	Current Output Range 10App to 60App									
Frequency Range	<ul style="list-style-type: none"> Synchronous E.I.S. Measuring 1Hz to 5kHz Static Testing: 0.01Hz to 5kHz 									
Waveform	Sinusoidal									
Impedance Range Z_i, Z_{re}	0.01mΩ to 800mΩ									
Impedance Accuracy	2mΩ: +1% Full Scale									
	80mΩ: +0.1% Full Scale									
	800mΩ: +0.1% Full Scale									
Frequency Accuracy	±0.1% Full Scale (5000Hz)									

Note 1:1ms in some cases depended by Controller Buffer Limit

Note 2: App means Amperes Peak to Peak