

Energy Storage System & Power Conversion System Test Solutions

PCS/PV Inverter/Battery Pack



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Chroma ATE Inc. was founded in 1984 and has since become one of the world's leading suppliers of automated test equipment, providing test and measurement instrumentation and automated test systems (ATS) for the electronics industry. Advanced technological capabilities combined with production line automation and manufacturing execution systems (MES) enable us to develop Test and Automation Turnkey Solutions that satisfy and exceed customer demands.

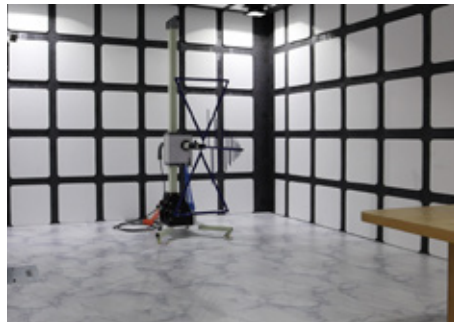
With nearly four decades of experience in power electronics testing, Chroma provides industry-leading test instruments and systems for solar and storage applications. Our solutions enable users to achieve systematic performance verification of energy storage inverters, PV inverters, PV power optimizers, battery modules, and electrical safety compliance testing. Besides research and development, design verification, and regulatory testing, our systems are also suitable for high-volume production testing.

In addition to maintaining a large and diverse group of research engineers, Chroma invests heavily in R&D each year to ensure its continued technological leadership. Core technologies in power electronics and optics have fueled Chroma's drive forward into various new markets and enable us to provide innovative test solutions with precision, reliability, and uniqueness. For almost 40 years and counting, our dedication to excellence in quality and service continues to earn Chroma the support and trust of our valued customers.

Manufacturing Capability and Service Support



Temperature & Humidity Cycle Test Chamber



EMC Lab - Electromagnetic Wave Testing



Highly Accelerated Life Testing Equipment



Smart Auto Production Line



High Power Burn-In Testing



Customized Assembly



Automated Test Equipment and Software



Calibration Lab



Local Support and Services

Power Conversion System (PCS) ATS | 8000

Chroma's PCS test solution covers a wide range of test requirements, including GB/T 34120, GB/T 34133, IEC 62933, SGSF-04, as well as Distributed Energy Resource (DER) Interconnection standards such as UL 1741, IEEE 1547, Germany's low-voltage grid standard VDE-AR-N 4105, and New Zealand/Australia's inverter energy system grid standard AS/NZS 4777.2. The solution covers more than 20 test items under 5 categories: PCS grid, performance, input/output characteristics, protection characteristics, and photovoltaic characteristics.

Chroma has developed a unique testing method that meets the short-circuit current measurement requirements of the VDE standard. This helps to avoid conflicts as to whether the safety mechanisms of the grid simulator or the device under test should be the first to activate, and mitigates the risk of power outage caused by short circuits occurring on the grid. Building on the Chroma 8000 ATS and complemented by Chroma's 61800, 62000D and 17040 grid/battery simulators and measurement equipment, the system can perform over 20 automated tests for PCS. Users need only input the desired test conditions and specifications, and the PCS ATS will proceed to perform fully optimized and automated PCS tests.

Optimized Equipment & Test Items

PCS On-grid Tests

- Current harmonic test in grid mode
- Power factor control test
- Over-frequency active power feeding control test
- Low voltage ride through capability
- Anti-islanding protection test

PCS Performance Tests

- Charge/discharge transfer time test
- Active grid mode and islanded mode switching test
- Power grid voltage distortion waveform adaptability test

PCS Input and Output Characteristics Tests

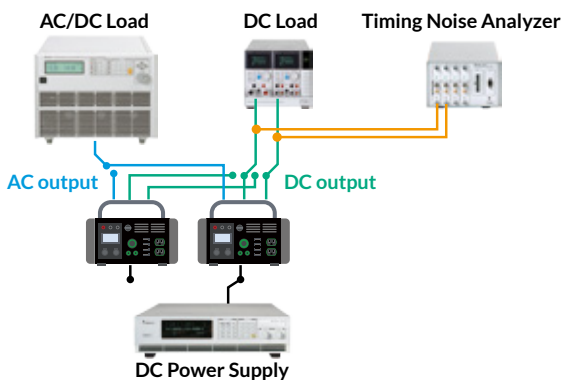
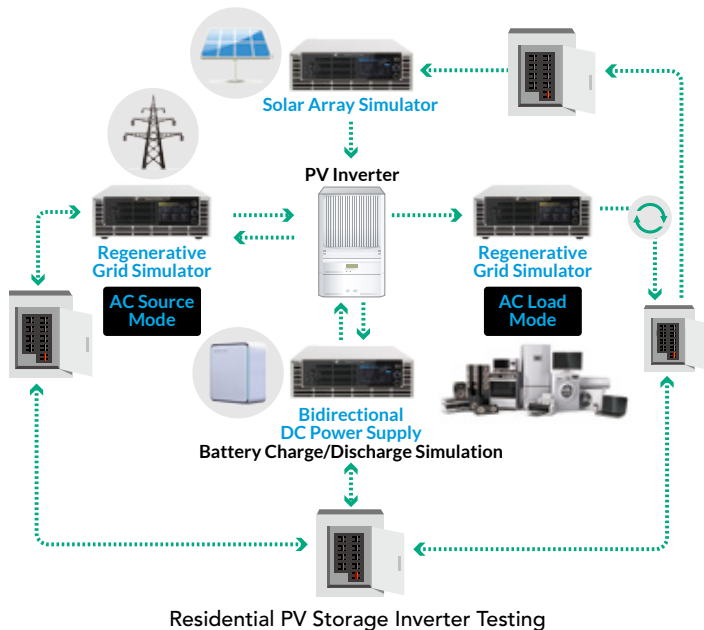
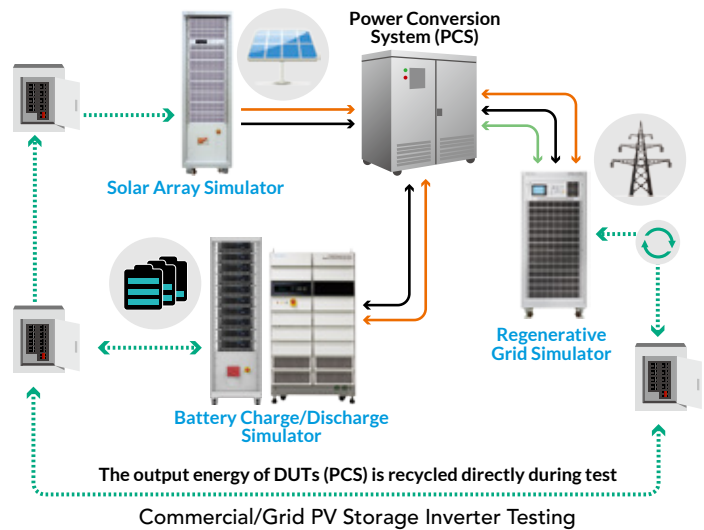
- Rectified charging efficiency test
- PCS efficiency test in grid mode
- PCS efficiency test in islanded mode
- Standby loss test
- No-load loss test
- Power factor test
- DC component measurement
- Stabilized current precision and current ripple during CC charging
- Stabilized voltage precision and voltage ripple during CV charging
- Voltage total harmonic distortion test in islanded mode

PV Characteristics Tests

- MPPT efficiency test
- PV conversion efficiency test
- Anti-discharge protection test



PCS ATS 8000





PV Inverter ATS | 8000

The Chroma 8000 ATS comes equipped with optimized standard test items for PV inverters and meets EN50530, Sandia Lab, IEEE1547, 1547.1, UL1741, GB/T 19939 & CGC/ GF004 (NB/T 32004-2013) preliminary test requirements. To perform the test, the user only needs to define the test conditions and specifications for the standard test items, and the automated system will take it from there.

Optimized Equipment & Test Items

Output Performances

- Output Voltage
- Output Current
- Output Power
- Output Power Factor
- EFF (CEC/European/Conversion/Max)
- DC Injection Current
- THD
- Current Harmonic Test
- Night Time Power Consumptio

Input Characteristics

- Input Voltage
- Input MPPT Voltage
- Input Current
- Input Power
- Input MPPT Power

Timing & Transient

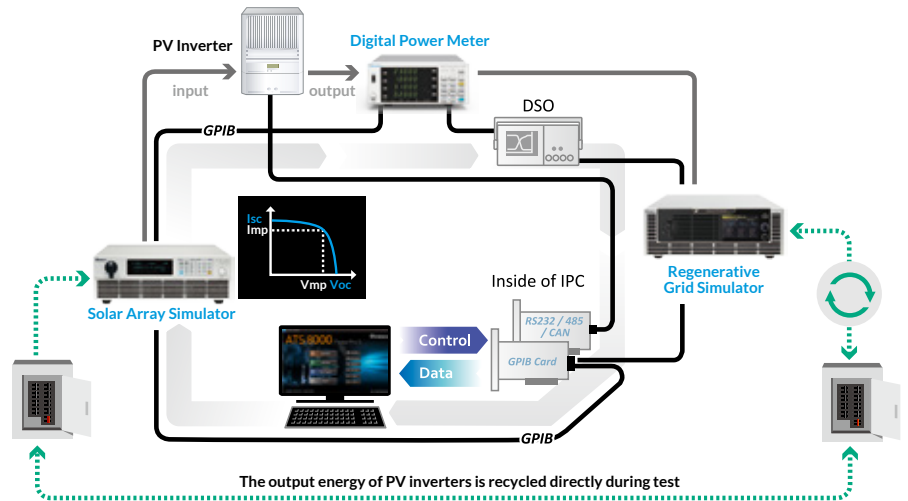
- OVP/UVF Trip Time
- OFF/UFV Trip Time
- Anti-Islanding Trip Time
- Re On-Grid Time

Protection Tests

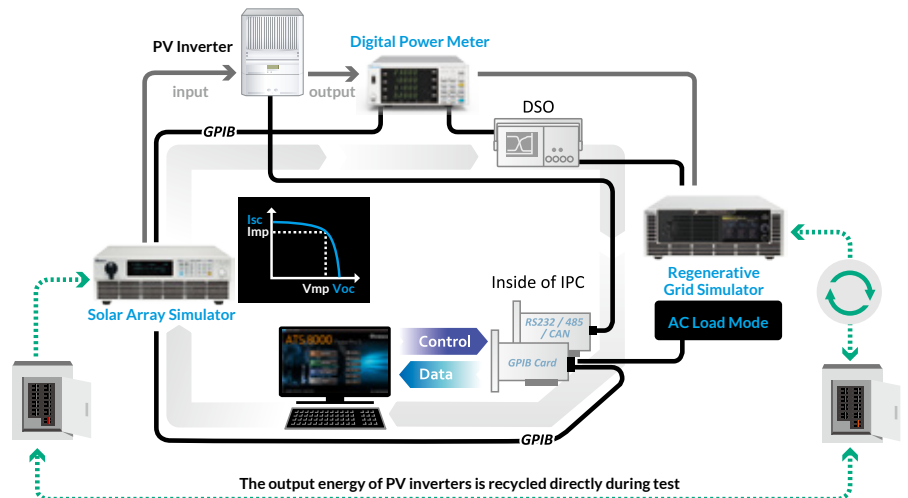
- OV/UV Protection
- OF/UF Protection

Special Tests

- MPPT Efficiency
- MPPT Time
- MPPT Record
- RS232/485/CAN communication



Grid-tied PV inverter testing

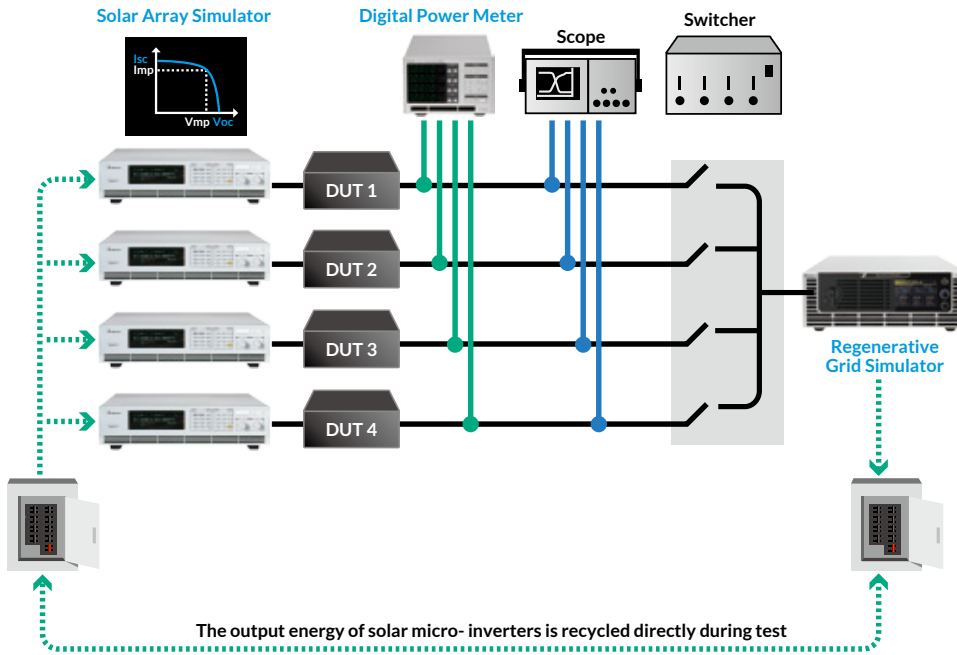


Standalone PV Inverter testing

instrumentos
de medida

Micro Inverter ATS | 8000

Based on the Chroma 8000 ATS, this customized system allows simultaneous testing of multiple micro PV inverters. By incorporating Chroma 61800 regenerative grid simulators, the system is capable of feeding the energy output by the devices under test directly back to the grid during testing, rather than dissipating it as heat. This approach helps save space, conserve energy, and reduce carbon emissions.



Test multiple micro-inverters at once

Power Test System Software Platform | Power Pro

The Chroma 8000 ATS is equipped with Power Pro, Chroma's industry-leading software platform that runs on Windows 7/10/11 and provides users with open software architecture. Test engineers can configure the hardware as desired, program the test items, perform PASS/FAIL tests automatically, and generate reports for analysis.

Key Features

- Expandable hardware support
- Supports GPIB/RS232 instruments and RS485/CAN Bus interface
- Editable test items
- Editable test programs
- User authority and release control
- Editable reports
- Operation log
- Supports Shop Floor Control
- Remote monitoring via internet



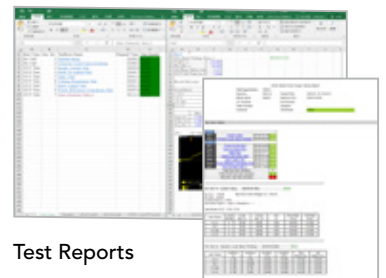
Software Main Screen



Customizable Operation Interface



CAN Monitor



Test Reports





Power Electronics Test Instruments

Regenerative Grid Simulator 61800 Series



- ☑ Output characteristics: 9kW~105kW / 1 or 3-phase
 - 61809/61812/61815: 0~350V, DC, 30Hz~100Hz
 - 61830/61845/61860: 0~300V(Optional 400V/800V), DC, 30Hz-100Hz
 - 61800-100: 0~300V(Optional 500V/900V), DC, 30Hz-100Hz
 - 61800-100HF: 0~300V, DC, 30Hz~1000Hz
- ☑ Up to 840kVA in parallel
- ☑ Four-quadrant AC power supply with efficient energy recycling
- ☑ AC grid simulation and optional regenerative AC load, suitable for grid-tied/off-grid inverter testing
- ☑ Meets IEEE 1547, IEC 61000-3-15, IEC 62116 test requirements
- ☑ Meets Low Voltage Ride Through (LVRT) & High Voltage Ride Through (HVRT) test requirements

Programmable Bidirectional DC Power Supply 62000D Series



- ☑ Output characteristics:
 - 6kW~18kW/0~100V,600V, 1200V, 1800V/0~540A
- ☑ 3U/18KW high power density
- ☑ Simulation of I-V curves for photovoltaics, batteries and fuel cells
- ☑ Battery Simulation function
- ☑ Easy master/slave parallel & series operation up to 540kW
- ☑ Two-quadrant operation: source and load functions
- ☑ 3-phase 4-wire universal AC power: 200~480 Vac
- ☑ High-voltage 1500V string-type PV inverter testing
- ☑ Applications: Charge-discharge testing and durability testing after BOBC, DC-DC converter, PCS, regenerative tests

Solar Array Simulator 62000H-S Series



- ☑ Output characteristics:
 - 0~150V/600V/1000V/1800V
- ☑ 3U/18kW high power density model with easy master/slave parallel operation
- ☑ 2U/2kW high transient response model for micro inverter testing
- ☑ Solar array I-V curve simulation function (built-in EN50530 and Sandia SAS model)
- ☑ Simulation of multiple solar cell material I-V characteristics (fill factor)
- ☑ Shadowed I-V curve output simulation (up to 4096 points)
- ☑ Auto I-V program: 100 I-V curves & Dwell time 1-15,000s
- ☑ Built-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004, CGC/GF035 and NB/T 32004
- ☑ Supports up to ten-channel SAS control for multi-MPPT testing

Regenerative DC Electronic Load 63700 Series



- ☑ Output characteristics:
 - 6kW-18kW / 0-1800V / 0-540A
- ☑ High power density: 18kW in 3U
- ☑ CC, CR, CV, CP modes
- ☑ Master/Slave parallel control mode with power up to 180kW*
- ☑ Regenerative with up to 93% efficiency
- ☑ 3-phase 4-wire universal AC power: 200~480 Vac
- ☑ Suitable for long-term durability testing of on-board chargers and fuel cell systems
- ☑ Suitable for long-term reliability testing of electric vehicle battery discharge, energy storage systems

Regenerative AC Electronic Load 63800R Series



- ☑ Output characteristics: 9kVA-15kVA
 - 30Vrms-350Vrms 30-100Hz
- ☑ Choose between Single-phase and three-phase modes
- ☑ Constant Current (CC), Constant Power (CP), Constant Resistance (CR), Constant Apparent Power (CS) modes
- ☑ Rectified Mode simulates nonlinear impedance loading characteristics
- ☑ Lead/Lag Mode simulates inductive and capacitive impedance loading characteristics
- ☑ Master/Slave up to 45kVA in 3-phase mode
- ☑ For off-grid type of residential energy storage inverters and long term product reliability testing

Programmable AC/DC Electronic Load 63800 Series



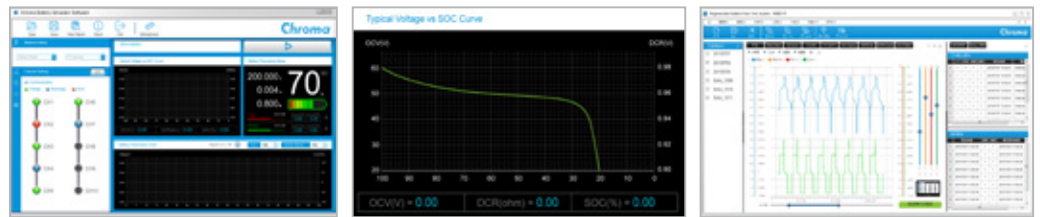
- ☑ Output characteristics:
 - 1.8kW-4.5kW
 - 50Vrms-350Vrms
 - 45-440Hz
- ☑ Measurement: V, I, PF, CF, P, Q, S, F, R, Ip+/-, THDv
- ☑ Master / Slave up to 67.5kW in 3-phase mode
- ☑ Can simulate rectified RLC loads, suitable for testing voltage distortion (VTHD%), dynamic parameters, and protection parameters of inverters sourcing AC voltage

Battery Simulator | 17020/17040/17040E/62000D

The 17020/17040/17040E regenerative battery charge-discharge systems and the 62000D programmable bidirectional power supply with built-in battery simulator can be used for testing battery modules and products connected to battery packs. Users can set and simulate battery pack characteristics through the battery simulator software. The software allows the user to set the battery pack's capacity (SOC), load battery characteristics curves, and set up battery pack configurations in series and parallel. This solution is particularly suitable for testing and evaluating storage inverters combined with batteries.

Key Features

- ☑ Battery pack output voltage control
 - Simulate and control the battery pack output voltage by setting voltage, capacity and SOC
 - Intelligent efficiency calculation function
 - Battery pack pre-charge simulation
- ☑ Battery pack configuration: Set the configuration of the battery pack to simulate different voltages and capacities
- ☑ Battery cell curve importing: Import cell data into the software to simulate battery characteristics
- ☑ Pair with Chroma Battery Pro Charge/Discharge software to convert battery test data to battery characteristic data with one click



Battery Simulator SoftPanel Software

Electrical Safety Test Solutions

Partial Discharge Tester 19501 Series



- ☑ Built-in AC hipot (ACW) test and Partial Discharge (PD) Detection
 - 19501: 0.1kVac~5kVac, 0.1 μ A~3000 μ A, PD measurement range 1pC~6000pC
 - 19501-K001: 0.1kVac ~ 10kVac, 0.01 μ A~300 μ A, PD measurement range 1pC~2000pC
- ☑ Comply with the PD measurement requirement of IEC60270-1 regulation
- ☑ Built-in test methods of IEC60747-5-5, VDE0884 regulations.
- ☑ Applications: Digital Isolator, Optocoupler/Photo-coupler, IGBT, Sic-MOSFET, HV switch, etc.

Hipot Analyzer 19055-C



- ☑ Built-in ACW (0.05~5kVac), DCW (0.05~6kVdc), IR (0.1M Ω ~ 50G Ω)
- ☑ Corona Discharge Detection
- ☑ Breakdown Voltage (BDV) Analysis
 - Corona discharge Start Voltage (CSV)
 - Flashover Start Voltage (FSV)
 - Breakdown Voltage (BDV)
- ☑ Floating output design (comply with EN50191 regulation)
- ☑ Applications: Transformer, HV Capacitor, Optocoupler/Photo-coupler, Insulation material, etc.

Electrical Safety Analyzer 19032-P



- ☑ Built-in ACW (0.05~5kVac), DCW (0.05~6kVdc), IR (0.05~6kVdc), GB (3~40 Aac.), LC (AC: 1 μ A~100mA, DC: 0.1 μ A~25mA), and Flashover detection.
- ☑ Twinport™ function allows both hipot and ground bond to be tested simultaneously, reducing test time
- ☑ Floating output Function (compliant with EN50191)
- ☑ Applications: solar/PV inverter, battery pack, electrical product, lab/test equipment, medical equipment, etc.

Electrical Equipment ATS 8900

- ☑ Supports electrical safety test and function test: ACW, DCW, IR, GB and LC
- ☑ Integrates various programmable instruments for various test items and multi-points test/measurement. All test items can be done by a single trigger for higher speed and efficiency
- ☑ Applications: UPS, solar/PV inverter, electrical product, lab/test equipment, medical equipment, etc.





Charge/Discharge Test Solutions for Battery Modules, Packs, and BMS

Chroma 17020, 17020E, 17040, and 17040E series battery charge and discharge test systems are designed for testing secondary batteries. Used in the electric vehicle industry, they are capable of simulating VCU (Vehicle Control Unit) behavior and sending diagnostic service ID. During the test, the fully automatic and independent process can power-on the device under test (DUT), unlock (seed & key) and start the relay, and then start charging/discharging the battery pack.

Users can configure the battery charge/discharge test systems according to the testing needs, quantity, and specifications of the DUT. These systems are designed to perform complete product verification at different stages for various battery test equipment. They can execute fully automated testing procedures, offer fully BMS integrated and automated testing solutions, and support various BMS communication interfaces, incl. CANbus, LINBus, RS232, RS485, and MODBUS. With fast testing times and accurate results, our charge/discharge test systems provide reliable and worry-free testing solutions for your battery packs, modules, and battery management systems.

High-Power Regenerative Battery Pack Test System | 17040 & 17040E

The 17040/17040E Regenerative Battery Test System offers dual functionality, serving as both a battery pack tester and a battery simulator. The 17040 system has a voltage operating range of up to 1000V and can be paralleled up to 600kW. The 17040E system has two operating ranges: 1700V/400A and 850V/800A, parallelable up to 1.6MW. Both systems are suitable for testing electric vehicles and energy storage systems. This equipment features highly efficient energy recovery capability which significantly reduces power consumption and cooling costs. The simulated operating conditions meet international testing standards such as ISO, IEC, UL, and GB.

17040 Specifications

1000V/150A/60kW/1CH
 1000V/150A/60kW/2CH
 1000V/300A/120kW/1CH
 1000V/450A/180kW/1CH
 1000V/300A/125kW/2CH
 1000V/600A/250kW/1CH
 1000V/750A/300kW/1CH
 1000V/450A/180kW/2CH
 1000V/600A/250kW/2CH
 1000V/750A/300kW/2CH
 (Max. 600kW paralleled)
 (Parallel limit: 2 channels of the same specification)

17040E Specifications

1700V/800A/200kW/1CH
 ((Max. 1.6MW paralleled)
 (Parallel limit: 6 channels of the same specification)



17040 250kW



17040E 200kW

Key Features

- ☑ High accuracy measurement:
 - Voltage: $\pm(0.02\% \text{ rdg.} + 0.02\% \text{ F.S.})$ (17040)
 - Current: $\pm(0.05\% \text{ rdg.} + 0.05\% \text{ F.S.})$ (17040)
 - Voltage: $\pm(0.02\% \text{ rdg.} + 0.02\% \text{ F.S.})$ (17040E)
 - Current: $\pm(0.05\% \text{ r.n.g.})$ (17040E)
- ☑ Current response speed (0 to 90%): 1ms
- ☑ Current switching process without interruption, 0 seconds delay time
- ☑ Supports CC/CV/CP/DCIR charging/discharging modes
- ☑ Software/firmware two-stage protection ensures the safety of the test process
- ☑ Power and current charging/discharging profiles for driving simulation test
- ☑ Built-in standard test functions: ISO12405, GBT31467, GBT31484
- ☑ Battery discharge energy recovery function: power saving, environmental protection, low heat energy production; when the rated power exceeds 20%, the recovery efficiency can reach up to 85% (recovery to the grid)

Regenerative Battery Pack Test System | 17020 & 17020E

The 17020 and 17020E series are Chroma's battery pack charge/discharge systems with a choice between versatility (17020) and affordability (17020E). The 17020 can be customized for channel power and quantity according to the testing needs of the DUT, ideal for R&D and accreditation teams. The 17020E can be configured with a minimum unit of 10kW, particularly suitable for battery pack life cycle testing or production line EOL ATS.

17020 Specifications

20V/65A/1.25kW/4CH
 60V/13A/0.6kW/8CH
 60V/62.5A/1.25kW/4CH
 60V/62.5A/2.5kW/4CH
 100V/50A/2.5kW/4CH
 200V/30A/2.5kW/4CH
 500V/13A/2.5kW/4CH
 (Max. 150kW Paralleled)
 (parallel limit: 60 channels)

17020E Specifications

60V/180A/10kW/2CH
 60V/360A/20kW/2CH
 60V/180A/10kW/4CH
 100V/100A/10kW/2CH
 100V/100A/10kW/4CH
 200V/100A/10kW/2CH
 200V/100A/10kW/4CH
 (Max. 200kW Paralleled)
 (parallel limit: 8 channels)



17020 System
48CH

17020E System

Key Features

- High precision voltage and current measurements:
 - Voltage: 0.02% rdg. + 0.02% rng.
 - Current: 0.05% rdg. + 0.05% rng.
- Charge/discharge modes: CC, CV, CP
- Two-stage software and firmware protection for optimal safety
- Driving cycle simulation with current and power state of real driving conditions
 - Trip time between maximum charge and maximum discharge current only 10 ms
 - Smooth current conversion without overshoot, delay time 0 sec
- Built-in various standard test functions: IEC61960 DCIR, IEC-62391 EDLC Capacitance & DCR, IEC 60896 short circuit current and Ri
- Battery discharge energy recovery function: when the rated power exceeds 20%, the recovery efficiency can reach 85% (feedback to the grid)

Test Software Platform | Battery Pro

Battery Pro is a software platform specifically developed for testing secondary battery packs and can be applied to Chroma 17040, 17040E, 17020, and 17020E systems. It is equipped with multilingual interface support (Traditional Chinese/Simplified Chinese/English), real-time status monitor and icon manager, authority management, fault record tracking and security detection, and functions for data storage and recovery during power failure.

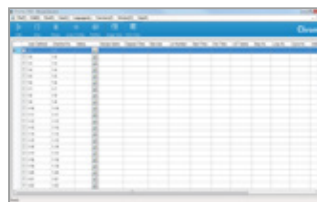


BatteryPro Main Screen



Recipe Executor

- Data display is updated in real-time, without a click
- Graphical and list mode display switching, flexible display depending on number of channels



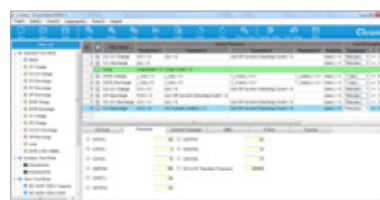
Data Analyzer

- One-click drafting of test diagrams
- User-defined chart and favorite features
- Comparison of multiple DUTs



BMS Function

- Automatically adjust the power output of the device according to BMS instructions with the BMS performance prediction function
- Configurable power-on program function, which can be combined with the Chroma multi-function box for heartbeat transmission and executing UDS SID to switch the battery pack relay



Recipe Editor

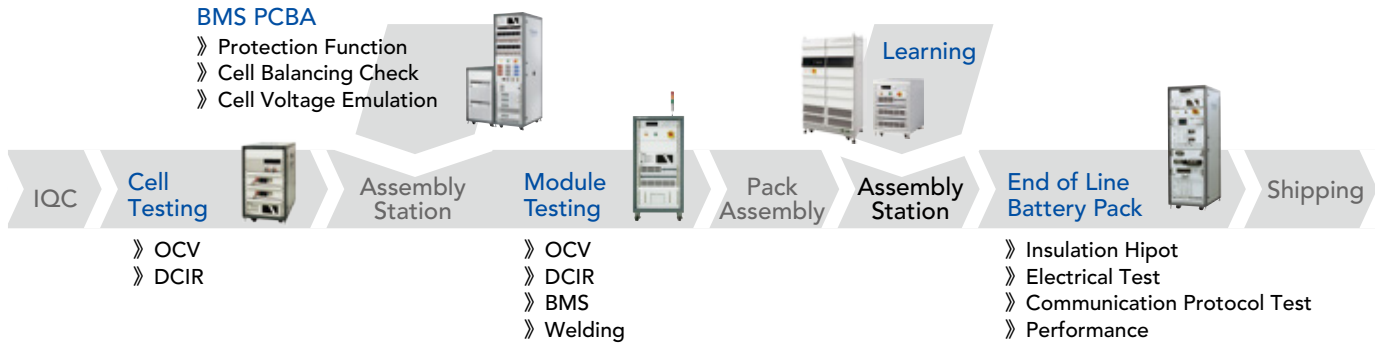
- Test curves include ISO12405, GBT31467, GBT31484, and IEC61960 DCIR
- BMS data control charge/discharge settings interface
- Equipped with variable editing, external parameter importing, if-then procedure, and judgement functions





Battery Module/Pack Production Line Solutions

Chroma offers customized automated test systems for battery pack production lines, designed to test welding quality as well as semi-finished and finished battery modules. Integrated with third-party automation equipment for efficient production verification, these solutions ensure the quality of battery pack assembly at the end of the production line (EOL). This includes battery cell capacity assessment as well as module welding, BMS PCBA functional, module functional, and pack functional inspections.



Battery Pack End-of-Line ATS | 8720

The 8720 automated test system can be applied to the battery pack production line to perform the following pass/fail test items: insulation voltage, BMS communications, internal power switches, battery balancing consistency, and temperature distribution.

The application of this test solution is not limited to production lines. It also covers the final stages of R&D, incoming quality control (IQC) of battery packs for EVs/ESS, and the routine battery pack inspection in battery swap mode. Automated test procedures prevent human errors and ensure personnel safety for applications such as battery packs for electric vehicles, electric scooters and energy storage systems.

Key Features

- ✓ For battery module production line or R&D unit testing and verification
- ✓ Improves product inspection efficiency and significantly reduces test time
- ✓ Charge and discharge power range: 5kW~600kW
- ✓ Standard test items: insulation test, version detection, software refresh, controller addressing, fault code detection, battery pack mode switching, temperature sensor detection, battery voltage detection, read and clear, insulation monitoring detection, voltage withstand test, signal line function detection, insulation resistance test, AC EVSE charging test, DC EVSE charging test, Y capacitance test
- ✓ Automated switch for testing in an automated production line
- ✓ Automatically upload traceability report when integrated with Manufacturing Execution System (MES)



16CH Battery Cell Simulator | 87001

- ✓ Battery cell simulator mode: Can simulate 240 cells in series/2 cells in parallel battery pack configurations
 - Channel power 25W; channel voltage 5V (in series); channel current 5A (up to 10A in parallel)
- ✓ 2 current ranges (0~250uA/0~500mA/0~5A/0~9A super modes)
 - 0~250uA: Used to determine whether the leakage current is too large
 - 0~500mA: For passive balanced line test requirements
 - 0~5A/9A: For active balanced line test requirements
- ✓ Control the battery cell simulator remotely with the SoftPanel software
 - Individually adjust the voltage of each battery cell string
 - Set the voltage change procedure: OVP/UVP/OVP release/UVP release test
- ✓ Control commands and interfaces:
 - SCPI command via Ethernet port
 - CANbus commands via CAN bus cable
 - Command delivery time: 10ms (varies depending on unit configuration)



Multi-channel real-time monitoring screen

Battery Management System ATS | 8700

The Chroma 8700 BMS ATS is a test system for functional verification of battery pack BMS. It is equipped with a multi-channel battery cell simulator, high-precision real current and high voltage source, programmable temperature simulator and insulation resistance simulator. The system can be configured to support master/slave and centralized architecture based on the DUT's specific needs.

Key Features

- ☑ Battery cell simulator
 - Cell state simulation test and calibration: 5V/ 5A/ 16CH
- ☑ High-precision real current source
 - Current testing and calibration: charge/discharge current 600A or larger
- ☑ High-precision voltage source
 - High voltage testing and calibration: 450V/600V/1000V
- ☑ Temperature simulator
 - Temperature testing and calibration
- ☑ Insulation resistance simulator
 - Insulation measurement circuit test and calibration:
insulation resistance simulation under high voltage 1000V
- ☑ On-board Charger signal simulation: CC, CC2, CP signals
- ☑ Customizable test items
- ☑ BMS communication tests



Integrated BMS Test System (32S)



Distributed BMS Test System (96S)



BMS Power HIL Testbed | 8630

The Chroma 8630 BMS Power HIL Testbed is a test platform that includes related modules such as real-time systems, high and low voltage instruments, human-machine interfaces, test project editing, system wiring and fixture integration. It can simulate various BMS input and output signals to perform a closed-loop test for real-time response requirements, as well as verification of various single functions of the BMS (e.g. monitoring and power calculation). The testbed's open software and hardware architecture provides high convenience and flexibility for system function adjustment and scalability.

Key Features

- ☑ Built-in equipment up to max. current 900A for accurate SOC calculations
- ☑ Integrated Fault Injection Unit hardware injects simulated faults for comprehensive ISO 26262 functional safety testing
- ☑ Integration of the battery cell and current simulator enables real-time changes in dynamic cell voltage, balance current, and large actual current in the battery system
- ☑ The battery cell simulator is equipped with 5V/5A power to deliver the range of energy required for the cell's passive and active balancing functions
- ☑ Integrated Hi-Pot withstand voltage test equipment can measure and compare BMS insulation and grounding status





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