

REGENERATIVE BATTERY PACK TEST SYSTEM MODEL 17040

The Chroma 17040 Regenerative Battery Pack Test System is a high precision system specifically designed for secondary battery module and pack tests. It has an energy regenerative function to greatly reduce power consumption during discharge, and ensure a stable power grid without generating harmonic pollution on other devices - even in dynamic charge and discharge conditions. It is capable of recycling the electric energy discharged by the battery module back to the grid reducing wasted energy that is discharged by traditional equipment in the form of heat, thus reducing the HVAC requirements.

The Chroma 17040 system has built in parallel channels and dynamic profile simulation functions. The parallel capability increases the charge and discharge current and power to its maximum, thus increasing the efficiency and flexibility of device usage. The dynamic profile simulation allows the user to load a battery waveform of a given drive profile in either current or power mode to meet the NEDC/FUDS requirements. Its bi-directional architecture ensures that the current will

not be interrupted during the charge and discharge transient state so that the driving conditions can be accurately simulated to be in line with the ISO, IEC, UL and GB/T international testing standards.

Equipped with Chroma's powerful "Battery Pro" software, the 17040 system has flexible test editing functions to perform independent channel tests, and conforms to the diversified requirements for testing secondary battery packs with high safety and stability. It also supports power failure recovery functions that ensure test data is not interrupted.

The test system has multiple safety features including Over Voltage Protection, Over Current Protection Check, Over Temperature Protection, and external parameter detection to ensure protected charge/discharge testing on the batteries. Furthermore data loss, storage and recovery are protected against power failure.



MODEL 17040

KEY FEATURES

- Conforms to international standards for battery testing: IEC, ISO, UL, and GB/T, etc.
- Regenerative battery energy discharge (Eff. >90%, PF >0.95, I_THD <5%)
- Multiple voltage and current ranges for auto ranging function to provide optimum resolution
- High accuracy current/voltage measurement ($\pm 0.05\%FS/\pm 0.02\%FS$)
- 2ms current slew rate (10%~90%)
- Dynamic (current/power) driving profile simulation tests for NEDC, FUDS, HPPC
- Test channel parallel function
- Test data analysis function
- Data recovery protection (after power failure)
- Automatic protection for error condition
- Battery simulator (option)
- High power testing equipment
 - Voltage range : 60~1000V
 - Current range : 0~750A
 - Power range : 0~300kW
- Customized integration functions
 - Integrated temperature chamber
 - BMS data analysis
 - Multi-channel voltage/temperature recording

FIELDS OF APPLICATION

- Power battery module
- Energy storage system
- Motor driver
- Power control system



Chroma

SYSTEM FEATURES

Security - Reinforce Risk Management

- Able to load test, cut-off, and protection criteria to a charging/discharging device directly for execution to achieve multi-layer protection through internal software and hardware
- Able to integrate external hardware to get real-time monitoring parameters from BMS, Data Logger, Chamber, and I/O signals to execute warning/cut-off/power off protection
- Able to monitor various voltage and temperature values of battery packs through readings from BMS and measurements on Data Logger; also able to perform instant judgment and protection based on set values
- Built-in multiple warning and protection modes : OVP, UVP, OTP, WIR_LOSS, CAL_ERR, POW_ERR, RMT_RVS

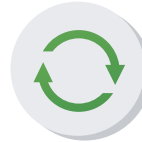
Security



Precision - Improve Product Quality

- High frequency sampling measurement technology: Max. sampling rate 50kHz to ensure dynamic measurement accuracy
- Voltage accuracy: $\pm (0.02\% \text{ of rdg. } \pm 0.02\% \text{ of r.n.g.})$
- Current accuracy: $\pm (0.05\% \text{ of rdg. } \pm 0.05\% \text{ of r.n.g.})$
- Quick response test technology: 5ms (-90% to 90%) current switching time applicable for various test applications
- Auto voltage/current range switch function: multiple ranges are varied with current change that will be automatically adjusted to optimize the measurement accuracy
- Support dynamic driving profile simulation (waveform), which simulates the current and power state of real driving conditions to comply with the NEDC, FUDS and HPPC standards

Efficiency



Precision



Regenerative Battery Pack Test System



Energy



Channel



Parallelable



High



Driving Cycle

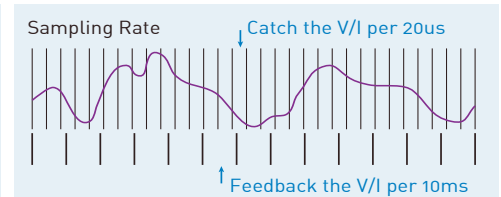
High frequency sampling measurement technology

Generally, battery chargers/dischargers use software to read current values for power computing; however, limited data sampling speed could result in large errors when calculating the dynamic current capacity. By increasing the V/I sampling rate and double integrating method, Chroma is able to provide capacity calculation with much higher accuracy. When the current changes, the data is not lost and the transmission speed is not affected.

- V/I sampling rate: 50KHz (per 20 μ s)
- Integrate calculus: I for capacity; VxI for energy



General charger/discharger sampling rate

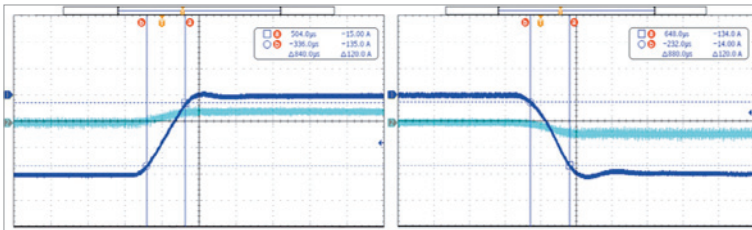


Chroma charger/discharger sampling rate

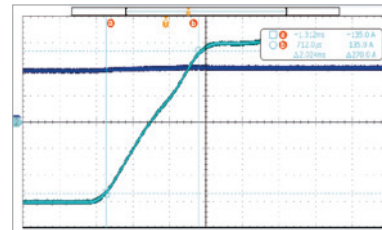
Quick response test technology

In quick response mode, the current is smooth without overshoot to avoid damaging the battery

- Current ripple noise <0.5%, Overshoot <1%



Current slew rate < 2ms (10% to 90%)

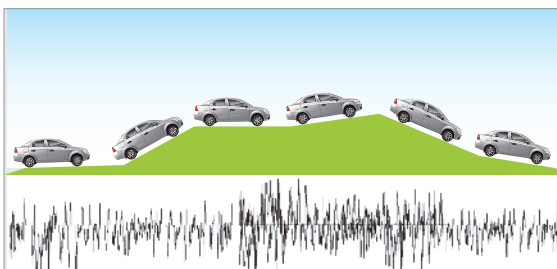


Current switching time < 5ms (-90% to 90%)

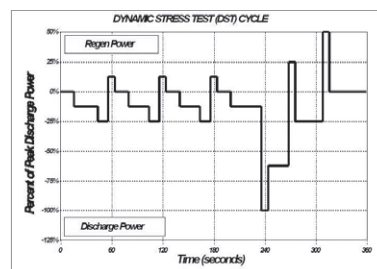
Dynamic driving profile simulation

Battery packs are used under quick and irregular current conditions. The 17040 system simulates real conditions on the battery pack via the working condition simulator

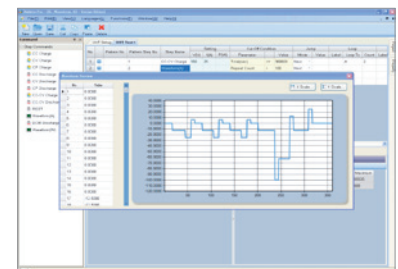
- Dynamic charge/discharge power or current waveforms simulate the drive cycle or any real world application. In the dynamic current mode (waveform), the current transition time for maximum discharge and charge requires only 5ms
- Test steps can specify an Excel file from which to read the stored current/power waveform
- 720,000 points of driving profile memory available to save the waveform profile in each channel



Driving profile simulation



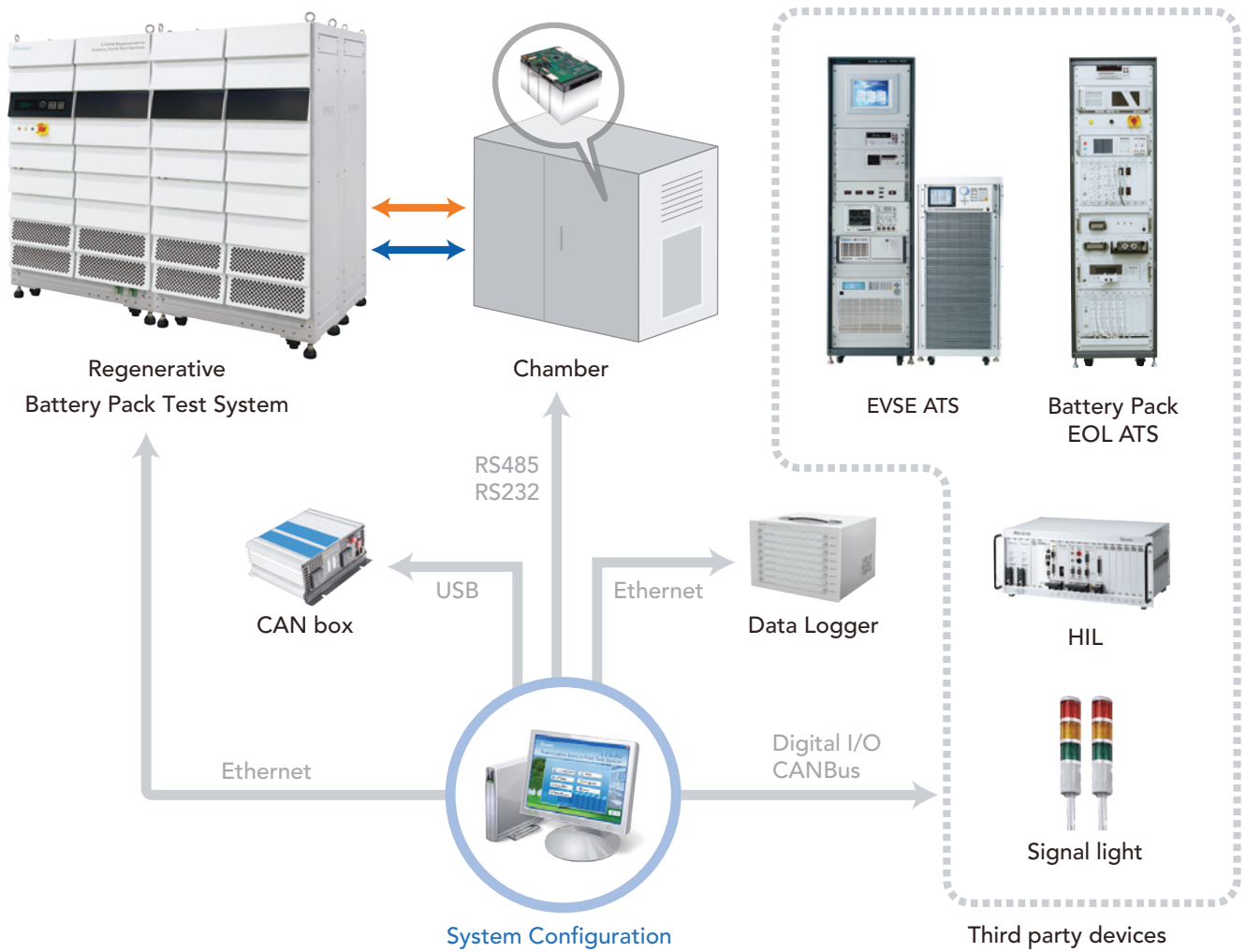
Regulatory compliance testing standards



Profile simulation data loading equipment

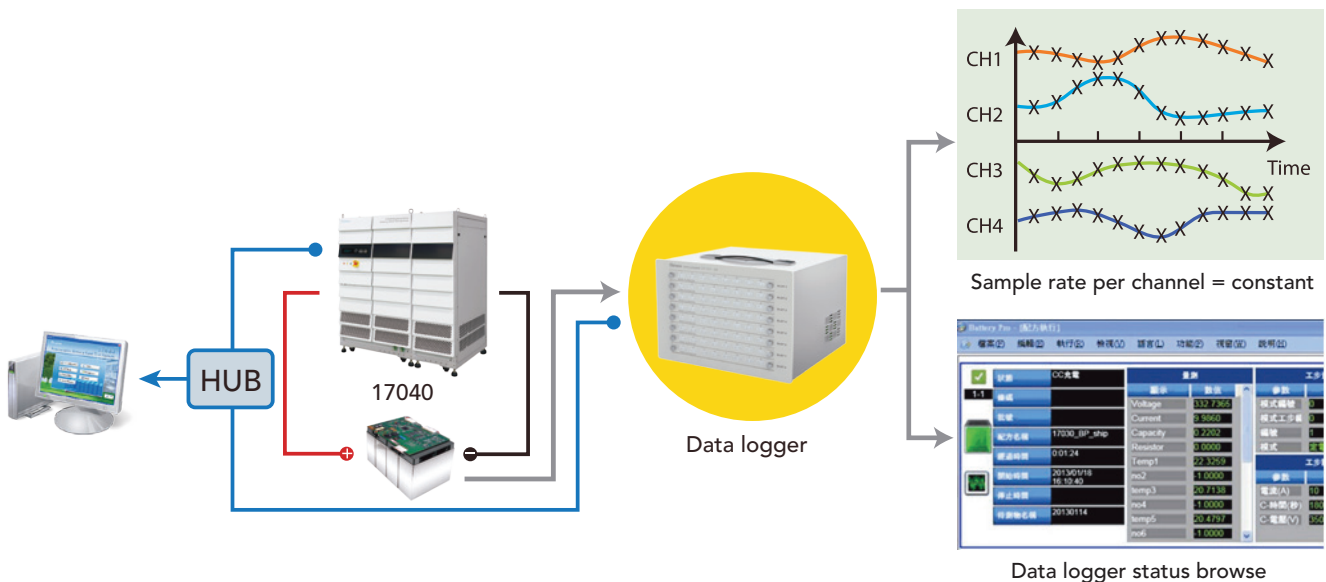
Efficiency - Reduce Operating Costs

- Software and hardware integration and customization capabilities including BMS, Data logger, Chamber, external signals, and HIL (HIL, Hardware in the Loop)
- Provides various signal interfaces for a variety of external devices (CANbus, Ethernet, Analog I/O) to support HIL
- Parallel function within the system up to a maximum of 360kW, 900A (option)
- Equipped with battery charger/discharger and simulator functions
- Embedded with high efficiency discharge energy regeneration technology



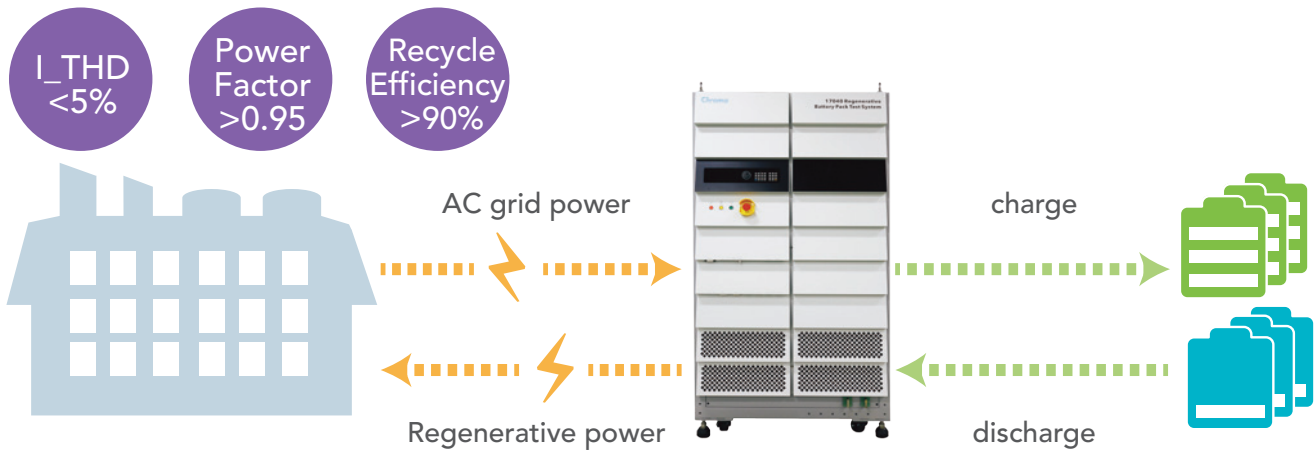
Data logger integration technology

The 17040 system uses software to integrate with the data logger to read multiple voltage and temperature records which can be used for setting cut-off and protection conditions. The data logger is able to perform sampling simultaneously on each channel, and the data acquisition speed can up to 10ms. The 17040 system supported by the data logger has 120 channels.

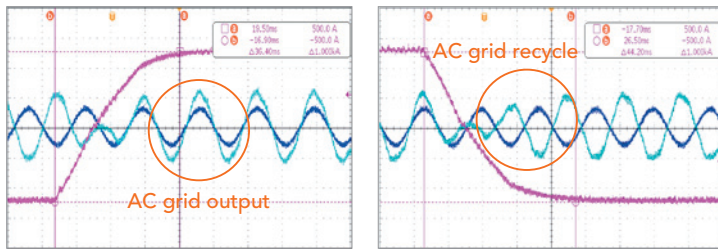


Discharge energy recycling technology

- Bidirectional circuit architecture to accurately control reverse current change
- Regenerative battery energy discharge (efficiency > 90%.)
- Static regenerative energy: In compliance with regenerative grid standards for solar energy, current THD < 5%, PF > 0.95
- Dynamic regenerative energy: Real-time transient current phase transitions avoid contaminating the grid



- Smooth AC current waveform and real-time phase transition when energy is regenerated to the grid. This prevents other equipment from being affected by false test results or a contaminated grid

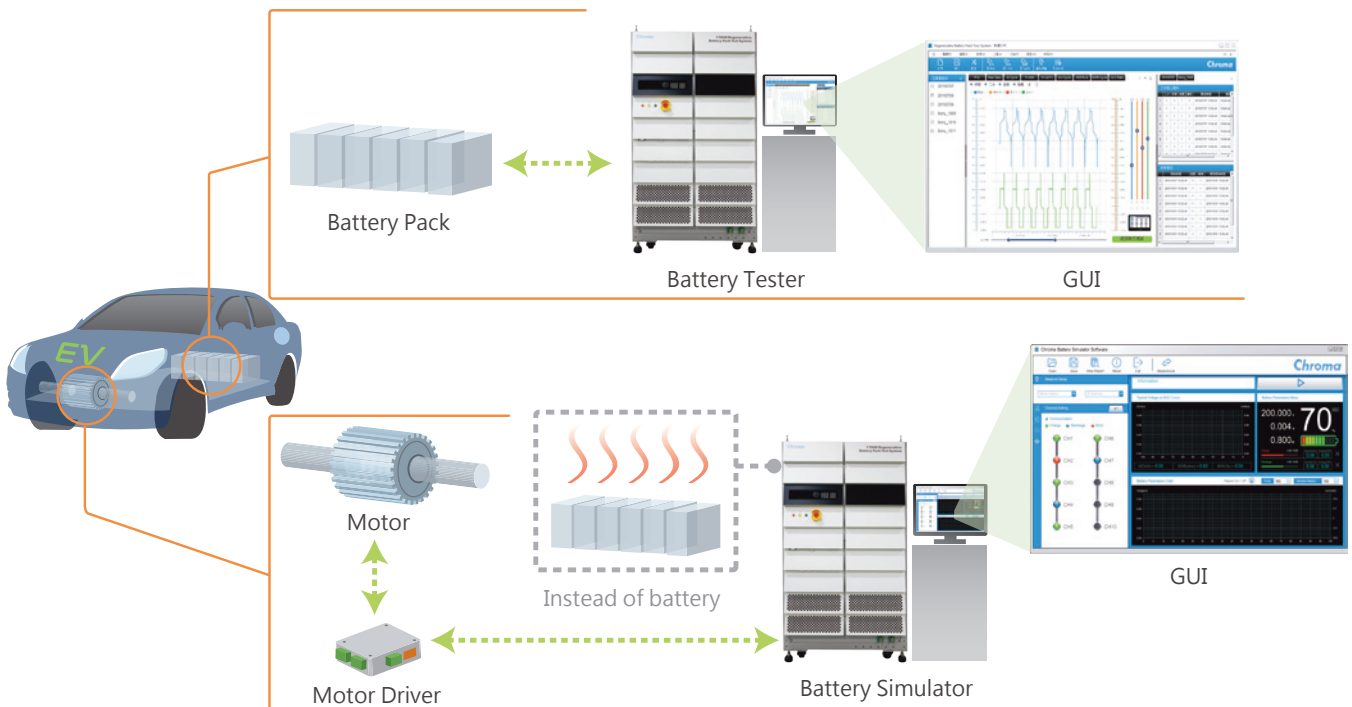


Discharge state changes to charge state

Charge state changes to discharge state

DUAL MODE APPLICATION

- Charger/discharger mode: applicable to battery pack testing via Battery Pro operating interface
- Battery simulator mode: applicable to motor driver/charging pile via Battery Simulator operating interface



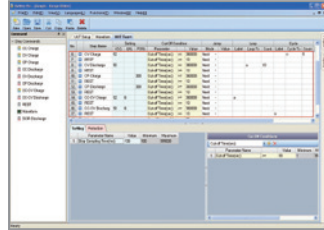
BATTERY CHARGE/DISCHARGE SOFTWARE - BATTERY PRO

The software platform "Battery Pro" when used with the Chroma 17040 conforms to the diversified requirements for testing secondary battery packs with high margins of safety and stability. It supports a power failure recovery function to guard against potential data loss.

- Real-time monitoring: Real-time browsing of the system test status without any waiting period. The test data and system integrated data can both be viewed at the same time
- Icon manager: Test status of each channel is managed through different icons, easy to read and understand
- Authority management: Sets the user's authority for operation
- Fault record tracking: Records any abnormal state for each channel independently



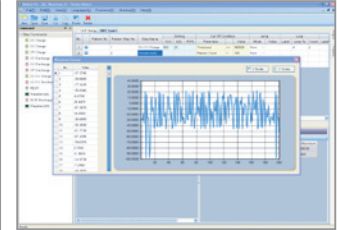
Battery Pro main panel



Charge/Discharge test program



Editor Real time monitoring



Waveform current test editor

Integrated CANbus/SMBus/LIN communications

- Import the Vector.dbc file directly to complete BMS monitoring setup quickly and easily
- Follow the BMS communication protocol to set the message desired
- The BMS data can be set in the conditions for cut-off or protection during testing

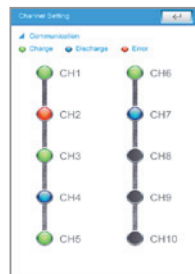


BATTERY SIMULATION FUNCTION

The Chroma 17040, Battery Charge/Discharge Tester and Battery Simulator, can test battery pack and battery pack connected products. When a product is still under development and the supplier's battery is not available, the 17040 can simulate the battery to verify whether or not the system is functioning normally. In addition, the 17040 can control the SOC status of different batteries. Users can download different battery curves to the 17040 to test the DUT for charge and discharge status. The 17040 can also perform battery and DUT collocation evaluation tests in advance that apply to the motor driver for vehicle start-stop systems, light EV electric controllers, car-mounted chargers, etc.

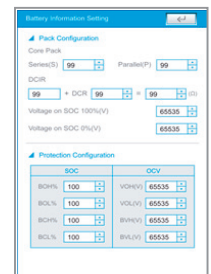
Battery Pack Simulating Function

- Multi-channel battery pack simulation
- Battery pack charge/discharge simulation
- Battery behavior curve setting
- Starting voltage and capacity initializing
- Battery pack total capacity setting
- Charge and discharge efficiency setting
- Battery DCR simulation
- Battery pack initialization cycle simulation
- Single channel bidirectional power supply



Battery Pack Protection

- OCP
- OVP
- Battery high voltage/power warning
- Battery low voltage/power warning
- Battery OVP/OPP
- Battery LVP/LPP



Single Channel Bidirectional Power Supply

- Voltage/Current/Power display
- Voltage/Current setting
- Pre-charge function : set the time required to generate voltage



Real Time Test Data Display

- Voltage/Current/Power Value display
- Voltage/Current/Power Picture display
- Battery Pack charge/discharge curve display
- Testing report output function



Battery Pro - Operation Interface of the Battery Simulator

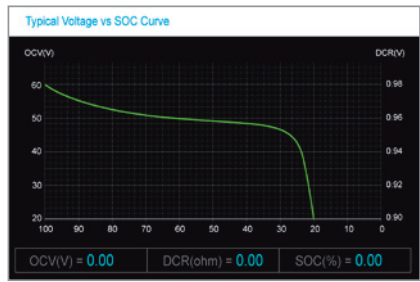
An optional battery simulator can be used with the 17040 to charge and discharge the bidirectional power supply. Furthermore, it can be used to set the battery capacity, DCR, and V-SOC curve to be downloaded to the charger, inverter, and motor driver tests via the proprietary software included.



Battery simulator main panel

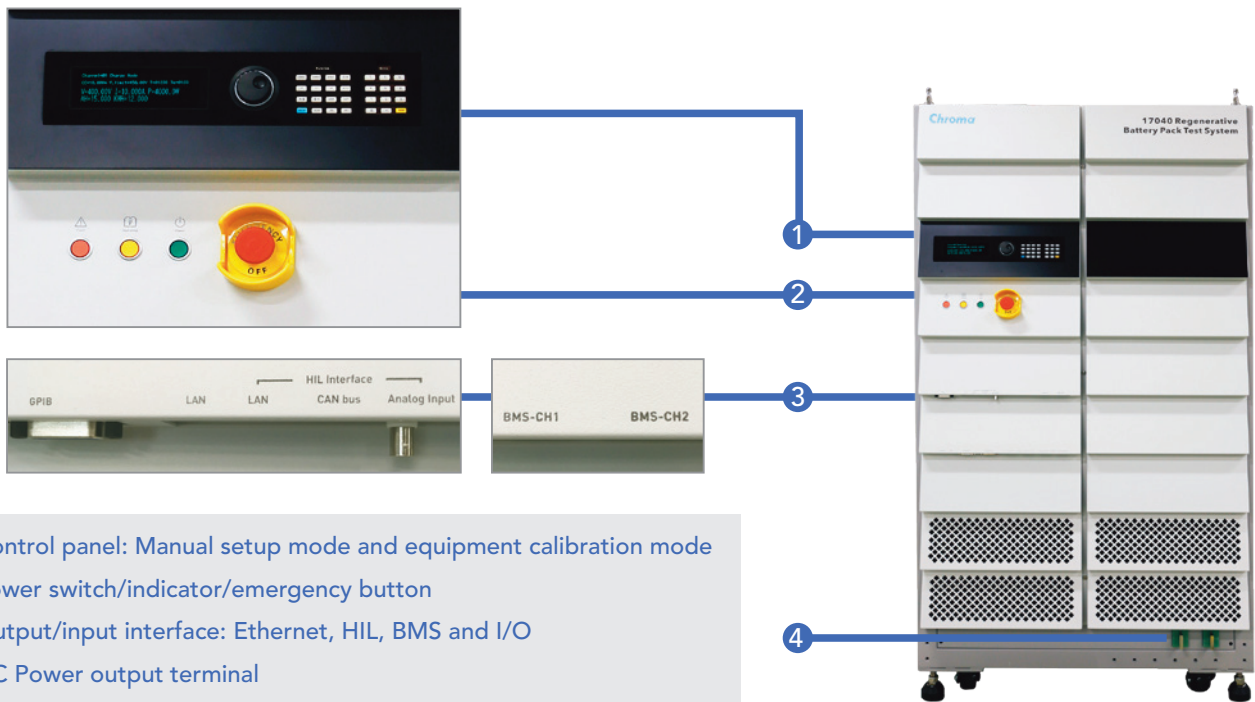


DCR setting



Battery characteristics V-SOC curve setting screen

HARDWARE CONFIGURATION



1. Control panel: Manual setup mode and equipment calibration mode
2. Power switch/indicator/emergency button
3. Output/input interface: Ethernet, HIL, BMS and I/O
4. DC Power output terminal

17040 STANDARD SYSTEM CONFIGURATION



120kW

180kW

250kW

SPECIFICATIONS

Model	17040		
Max. Power	60kW	120kW	180kW
Max. Voltage	1000V	1000V	1000V
Max. Current	150A	300A	450A
Channel	1	1	1
Constant Voltage Mode			
Voltage Range	60~1000V	60~1000V	60~1000V
Voltage Accuracy	±0.1%FS	±0.1%FS	±0.1%FS
Voltage Resolution	20mV	20mV	20mV
Constant Current Mode			
Current Accuracy	±0.1%FS	±0.1%FS	±0.1%FS
Current Resolution	10mA	20mA	30mA
Constant Power Mode			
Power Accuracy	±0.2%FS	±0.2%FS	±0.2%FS
Power Resolution	100mW	100mW	100mW
Battery Simulator Mode			
Voltage Range	60~1000V	60~1000V	60~1000V
Voltage Accuracy	±0.1%FS	±0.1%FS	±0.1%FS
Voltage Ripple (rms)	< 1%FS	< 1%FS	< 1%FS
Measurement			
Voltage Range (3 Scales as F.S.)	1	60~1000V	60~1000V
	2	700V	700V
	3	450V	450V
Voltage Accuracy		±(0.02% rdg + 0.02% FS)	±(0.02% rdg + 0.02% FS)
Current Range (4 Scales as F.S.)	1	150A	300A
	2	75A	150A
	3	30A	60A
	4	10A	20A
Current Accuracy		±(0.05% rdg + 0.05% FS)	±(0.05% rdg + 0.05% FS)
Power Accuracy		±0.15% FS	±0.15% FS

Model	17040		
Max. Power	250kW	300kW	
Max. Voltage	1000V	1000V	
Max. Current	600A	750A	
Channel	1	1	
Constant Voltage Mode			
Voltage Range	60~1000V	60~1000V	
Voltage Accuracy	±0.1%FS	±0.1%FS	
Voltage Resolution	20mV	20mV	
Constant Current Mode			
Current Accuracy	±0.1%FS	±0.1%FS	
Current Resolution	40mA	50mA	
Constant Power Mode			
Power Accuracy	±0.2%FS	±0.2%FS	
Power Resolution	1W	1W	
Battery Simulator Mode			
Voltage Range	60~1000V	60~1000V	
Voltage Accuracy	±0.1%FS	±0.1%FS	
Voltage Ripple (rms)	< 1%FS	< 1%FS	
Measurement			
Voltage Range (3 Scales as F.S.)	1	1000V	1000V
	2	700V	700V
	3	450V	450V
Voltage Accuracy		±(0.02%rdg+0.02% FS)	±(0.02%rdg+0.02% FS)
Current Range (4 Scales as F.S.)	1	600A	750A
	2	300A	375A
	3	120A	150A
	4	40A	50A
Current Accuracy		±(0.05% rdg + 0.05% FS)	±(0.05% rdg + 0.05% FS)
Power Accuracy		±0.15% FS	±0.15% FS

GENERAL SPECIFICATIONS

Battery Charge & Discharge Test System			
Operating Mode	Charge	CC, CV, CP, Waveform Power, Waveform Current, DCIR	
	Discharge	CC, CV, CP, CR, Waveform Power, Waveform Current, DCIR	
Current Rising/Falling Time (when > 50% full load)		2ms (10% to 90%)	
Current Ripple		<0.5%F.S.	
Overshoot		<1%F.S.	
Temperature Coefficient (Voltage/Current)		<50 ppm/°C	
AC Input			
Line Voltage / Frequency (3 phase/4 wire with earth ground)		Input 200~220V _{ac} ± 10% V _{LL} , 47-63Hz Input 380~400V _{ac} ± 10% V _{LL} , 47-63Hz Input 440~480V _{ac} ± 10% V _{LL} , 47-63Hz	
Power Factor		> 0.95 (at rated power)	
I_T.H.D		< 5% (at rated power)	
Others			
Efficiency		>90% (at rated power)	
PC Interface		Ethernet	
Operating Temperature		0°C~40°C	
Protection		UVP, OCP, OPP, OTP, FAN, Short	
Safety & EMC		CE	
Noise Level		<70dB	
Interface		Standard : Ethernet, I/O control Option : HIL(Ethernet, CAN, Analog), BMS read/write	
Dimension and Weight			
	Cabinet (H x W xD) / Weight	Front / Rear / Right side for heat dissipation	Front / Rear / Right side for maintenance
60kW	190cm x 100cm x 50cm / 900 kg	30cm / -- / --	60cm / -- / --
120kW	190cm x 100cm x 100cm / 1800 kg	30cm / 30cm / --	60cm / 60cm / --
180kW	190cm x 150cm x 100cm / 2700 kg	30cm / 30cm / 30cm	60cm / 60cm / 60cm
250kW	190cm x 200cm x 100cm / 3600 kg	30cm / 30cm / --	60cm / 60cm / --
300kW	190cm x 250cm x 100cm / 4500 kg	30cm / 30cm / 30cm	60cm / 60cm / 60cm

* All specifications are subject to change without notice.

ORDERING INFORMATION

Regenerative Battery Pack Test System Model 17040			
Power Range	Voltage	Current	Channels
60kW	1000V	150A	1
120kW	1000V	300A	1
180kW	1000V	450A	1
250kW	1000V	600A	1
300kW	1000V	750A	1

Others and Options	
A170201	IPC for battery test system
A170202	Battery simulator softpanel
A170400	Battery Pro software
Vector VN1610	CAN bus interface card

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Search Keyword

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HEADQUARTERS
CHROMA ATE INC.
66 Huaya 1st Road,
Guishan, Taoyuan
33383, Taiwan
T +886-3-327-9999
F +886-3-327-8898
www.chromaate.com
info@chromaate.com

U.S.A.
CHROMA SYSTEMS
SOLUTIONS, INC.
19772 Pauling,
Foothill Ranch,
CA 92610
T +1-949-600-6400
F +1-949-600-6401
www.chromausa.com
sales@chromausa.com

EUROPE
CHROMA ATE EUROPE B.V.
Morsestraat 32, 6716 AH
Ede, The Netherlands
T +31-318-648282
F +31-318-648288
www.chromaeu.com
sales@chromaeu.com

CHROMA GERMANY GMBH
Südtiroler Str. 9, 86165,
Augsburg, Germany
T +49-821-790967-0
F +49-821-790967-600
www.chromaeu.com
sales@chromaeu.com

JAPAN
CHROMA JAPAN
CORP.
888 Nippa-cho,
Kouhoku-ku,
Yokohama-shi,
Kanagawa,
223-0057 Japan
T +81-45-542-1118
F +81-45-542-1080
www.chroma.co.jp
info@chroma.co.jp

KOREA
CHROMA ATE
KOREA BRANCH
3F Richtogether
Center, 14,
Pangyooyeok-ro 192,
Bundang-gu,
Seongnam-si,
Gyeonggi-do
13524, Korea
T +82-31-781-1025
F +82-31-8017-6614
www.chromaate.com
erica.shih@chromaate.co.kr

CHINA
CHROMA ELECTRONICS
(SHENZHEN) CO., LTD.
8F, No.4, Nanyou Tian
An Industrial Estate,
Shenzhen, China
T +86-755-2664-4598
F +86-755-2641-9620
www.chroma.com.cn
info@chromaate.com

SOUTHEAST ASIA
QUANTEL PTE LTD.
(A company of Chroma Group)
46 Lorong 17 Geylang # 05-02
Enterprise Industrial Building,
Singapore 388568
T +65-6745-3200
F +65-6745-9764
www.quantel-global.com
sales@quantel-global.com

17040-E-201906-1000