MODEL 17040E

KEY FEATURES

- Meets international standards for battery testing: IEC, ISO, UL, and GB/T, etc.
- Regenerative battery energy discharge (Eff. >90%, PF >0.95, I_THD <5%)
- Auto-ranges with multiple voltage and current ranges for optimal resolution
- High accuracy current/voltage measurement
  $\pm$(0.05% of r.n.g.)
  $\pm$0.02% r.d.g. + 0.02% r.n.g.
- Current slew rate (10%~90%)
  1ms (100kW~600kW)
  10ms (800kW~1.6MW)
- 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 abnormalities
- Battery simulator (option)
- High power test equipment
  Voltage range: 5~1700V
  Current range: 0~4800A
  Power range: 0~1.6MW
- Customized integration functions
  - Integrated temperature chamber
  - BMS data analysis
  - Multi-channel voltage/temp. recording

FIELDS OF APPLICATION

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

Energy Regeneration Channel Expandable Parallelable High Power High Accuracy Driving Cycle Simulation

0.05%

REGENERATIVE BATTERY PACK TEST SYSTEM   MODEL 17040E

Chroma 17040E Regenerative Battery Pack Test System is a high-precision system specifically designed for secondary battery module and pack tests. The energy regenerative function greatly reduces power consumption during discharge, and ensures a stable power grid without generating harmonic pollution on other devices - even under dynamic charge and discharge conditions. Where traditional equipment discharges waste energy in the form of heat, Chroma 17040E can recycle the electric energy discharged by the battery module back to the grid, thus reducing waste energy and alleviating HVAC requirements.

The 17040E has built-in parallel channels and dynamic profile simulation functions. The parallel capability maximizes the charge and discharge current and power, thus increasing the efficiency and flexibility of equipment utilization. The dynamic profile simulation allows users to load a battery waveform of a given drive profile in either current or power mode to meet the NEDC/FUDS requirements.

Its bidirectional architecture assures uninterrupted current during the charge and discharge transient state so that the driving conditions can be accurately simulated in line with the ISO, IEC, UL, and GB/T international test standards.

Equipped with Chroma's powerful Battery Pro software, the test system offers flexible test editing functions to perform independent channel tests, and conforms to various requirements for testing secondary battery packs with high safety and stability.

Chroma 17040E ensures protected charge/ discharge testing through multiple safety features including Over Voltage Protection, Over Current Protection, Over Temperature Protection, and external parameter detection. The recovery functions prevent that test data is interrupted or lost in the case of power failure.
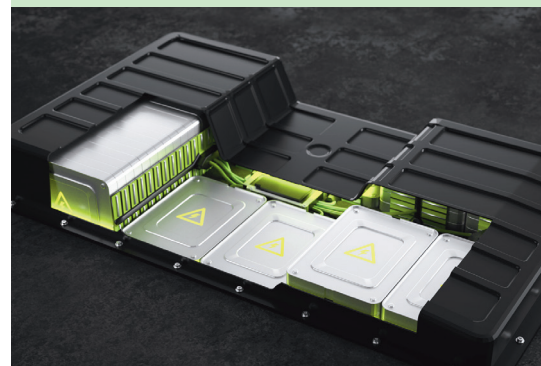
Ethernet   CE

Chroma
Advancing Excellence

Specifically designed for secondary battery module and pack tests, Chroma 17040E Regenerative Battery Pack Test System offers ultimate precision, safety, and efficiency. The main features include recycled energy, parallel channels, high power for battery applications, and high accuracy in voltage and current measurement as well as drive cycle simulation.

Precision

Efficiency

Security

Precision

High-precision Measurements for Improved Product Quality
The auto voltage/current range function switches between multiple ranges. When there is a dynamic change between large or small currents, the test system automatically adjusts to the right range to optimize the measurement accuracy.
- Voltage accuracy: $\pm$(0.02% of rdg. $\pm$0.02% of F.S.)
- Current accuracy: $\pm$(0.05% of r.n.g.)

Auto voltage ranges   Auto current ranges

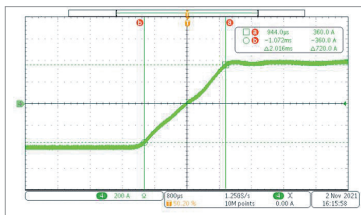### High-frequency Sampling for Battery Pack Capacity Capture
The high-frequency sampling measurement technology reaches a 50kHz sampling rate to ensure dynamic measurement accuracy. Other battery chargers and dischargers use software to read current values for power computing; however, limited data sampling speed could result in large errors when calculating the dynamic current capacity. Chroma increased the V/I sampling rate and added a double-sampling integrator, so the 17040E test system 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 20μs)

Sampling Rate   Catch the V/I per 20 us
Chroma's : Feedback the V/I per 1 ms

Chroma charging/discharging sampling speed

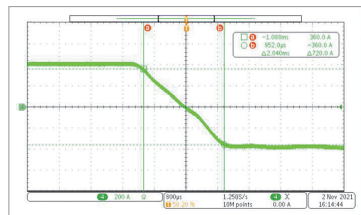### Quick Response Testing for Battery Pack Limit Verification
Chroma 17040E supports dynamic driving profile simulation (waveform), which simulates the current and power states of actual driving conditions to comply with NEDC, FUDS, and HPPC standards. The quick current response enables optimized charge/discharge switch control; the current is smooth without overshoot to avoid damage to the battery.
- Current slew rate: 2ms (-90% to 90%)

Sampling Rate
Others :
Feedback the V/I is same as sampling rate

Others' charging/discharging sampling speed

Discharge to charge:
Current slew rate < 2ms (-90% to 90%)

Charge to discharge:
Current slew rate < 2ms (-90% to 90%)

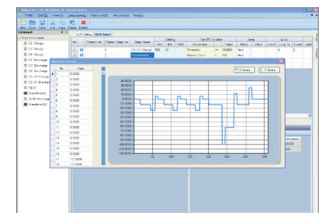start   climb   drive forward   speed up   descent   brake

Actual driving profile simulation

Dynamic Driving Profiles for Actual Use Simulation
Battery packs are used under quick and irregular current conditions. Chroma 17040E performs actual dynamic charge/discharge waveforms to simulate working conditions and verify the response of the battery pack in real-life applications. Users can set the test steps to read a specific Excel file with stored current/power waveforms.
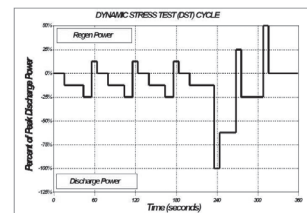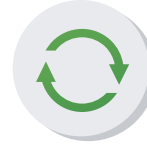

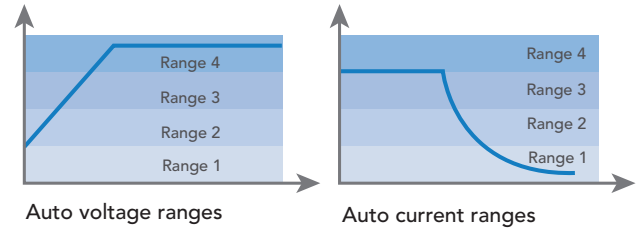Compliant with test standards   Profile simulation data loading

Safety
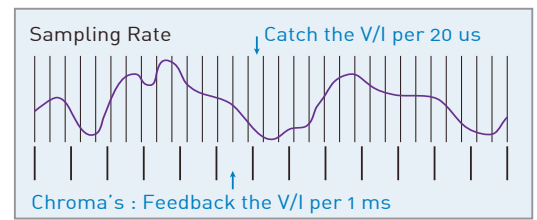
Bidirectional Circuit for Power Supply Protection

The bidirectional circuit architecture allows highly efficient recycling of the discharge energy. Chroma 17040E accurately controls reverse current changes, the AC current waveforms are smooth and show changes in real time, and the design meets the grid requirements without contaminating other equipment on the grid. When any abnormalities on the power grid are detected, the test system will swiftly cut off the main circuit power supply to protect its safety.

■ Regenerative discharge efficiency > 90%
■ Total Harmonic Distortion (THD) < 5%
■ Power Factor (PF) > 0.95
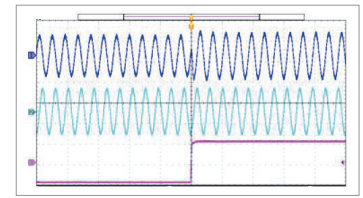
Transition from discharging to charging
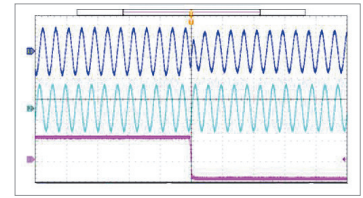
Transition from charging to discharging

I_THD <5% Power Factor >0.95 Recycle Efficiency >90%

Energy Recovery Design for Personnel Safety (Option)

VDE test requirements, in short, are the main items to consider when the generator is connected to a low-voltage distribution network on the grid. Even when using multiple devices, they can maintain the safe and reliable operation of the grid in accordance with the German Energy Industry Law and with the voltage limits in the DIN EN 50160 regulations. The optional equipment meets the VDE-4105-AE test requirements with the following protection functions:

■ Voltage protection: V < 0.8Un, < 0.2s / V > 1.1Un, < 0.2 s / V > 1.15Un, < 0.2s
■ Frequency protection: f < 47.5Hz, < 0.2s / f > 1.5Hz, <0.2s
■ Islanding detection: < 5 sec

## Multiple Output Protections for Battery Test Risk Control

Chroma 17040E meets the test requirements for secondary battery packs and offers a high degree of stability and safety. The charge/discharge protection will stop the test when it detects any abnormal test status. The internal firmware and hardware provide multi-layered protection. And the protection parameter of test procedure is loaded into them directly to provide a variety of alarm and protection modes.

■ Voltage protection: over charge / over discharge / delta voltage change
■ Current protection: over current / over capacity / delta current change
■ Other protections: over temperature / wire loss / over power / CC-CV transition time / Abnormal DC output insulation protection (optional)

Software and Hardware Protections for Battery Cells (Option)

The Chroma BatteryPro software can integrate third-party hardware with charge/discharge protections that will stop the test when detecting any abnormal conditions. A designated datalogger can read the charge/discharge voltage and temperature of multiple cells and use the measured data to set the protection conditions. Similarly, a designated battery management system (BMS) data acquisition system can read multiple sets of BMS data through CAN bus and RS-485 interfaces, and then convert the data for protection conditions. An additional Isolated DIO Card can be integrated in Chroma test system for controlling the high-side/low-side driver signals of device, the function support digital output, digital input, safety channel output, safety input from external devices, and digital input and output for alarms, cut-off, and power off.

■ Data logger with test data protection
■ BMS data acquisition system with test data protection
■ Digital I/O card with signal control

HUB   17040E   Data logger   Battery Pack   BMS   Battery Tester   BMS Status Browse
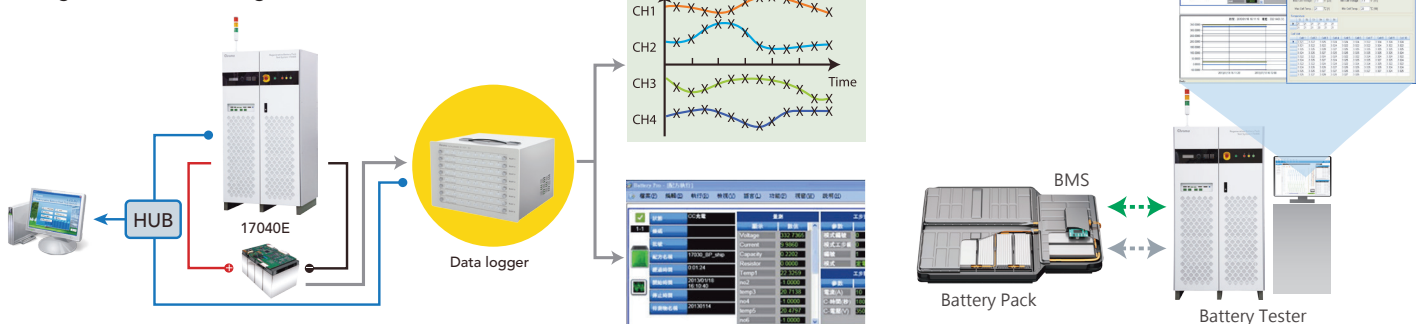
Efficiency

Flexible Integration for Complete Test Solution

The Chroma BatteryPro software integrates third-party software and hardware, such as BMS communication devices, data loggers, and thermostats; and uses their data to control the test programs and create complete test solutions.

■ Thermostat: temperature and humidity control combined with charge/discharge procedures
■ Data logger: temperature and voltage status of single battery cells or modules
■ MS data recorder: reading BMS data
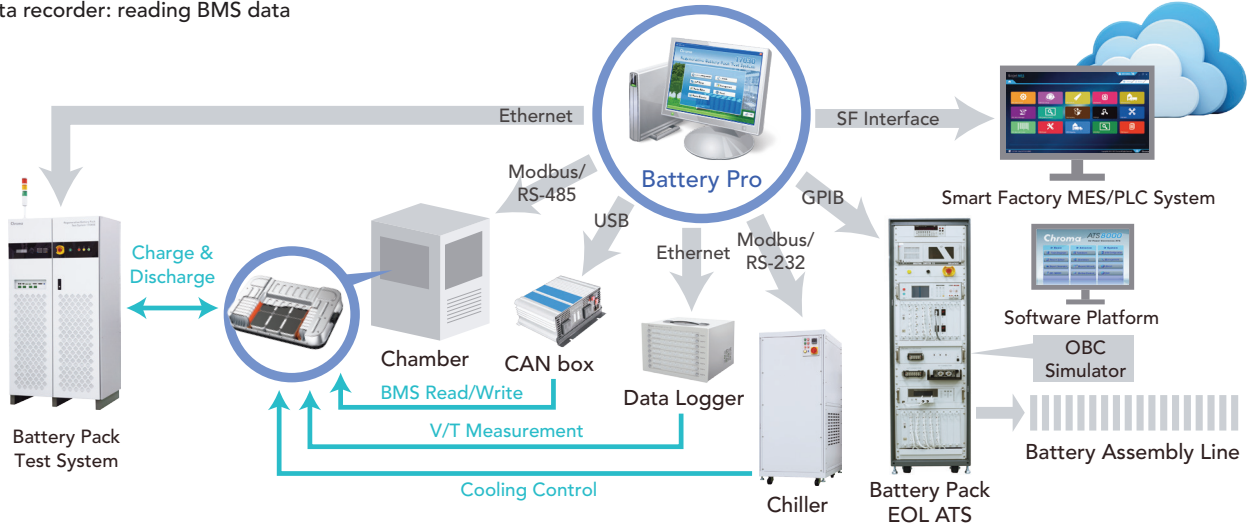
Multiple Control Commands for Test System Expansion

Users can apply languages such as SCPI and CAN bus commands as well as LabVIEW and LabWindow driver programs to tailor the application software for operating Chroma 17040E. The powerful, versatile architecture allows users to customize and integrate into the automated battery pack test system. The variety of integrational interfaces are for hardware-in-the-loop (HIL) test platform. Such as CAN bus, Ethernet, Analog I/O.

The VCU simulation function for Battery Pack Verification

Chroma 17040E offers the function which is vehicle control unit (VCU) simulation to communicate with Battery management system (BMS) during battery pack test. The test system can send SID to control the main relay of battery pack before do charging or discharging


17040E 200kW type

Parallel Synchronization for High Power Charging (HPC)

Chroma 17040 uses parallel synchronization to perform high-power testing with instant current slew synchronization. There is no delay in the slew time between the main channel and the auxiliary channel, which prevents current staircase waveforms from being generated. Users can connect up to two devices of the same model in parallel, and can operate the channels independently or in parallel. The test system provides customizable fixtures and allows parallel running of the output channels.

■ Max. power 1.2MW; max. current 4,800A
■ In dynamic current mode (waveform), rated power <600kW, current rise time is 1ms (10%~90%)
■ In dynamic current mode (waveform), rated power 800kW~1.2mW, current rise time is 10ms (10%~90%)

Ib Master   Ib Slave
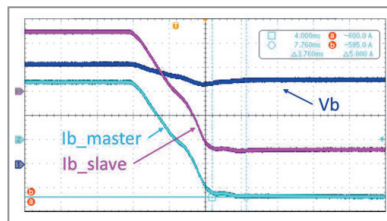
Current Rise Time Waveform
in CC Discharge

Parallel Test Fixture

DUAL MODE APPLICATION

Chroma 17040 is equipped with a battery charge/ discharge tester and a battery simulator, which can test battery packs and their connected products.

■ Charger/discharger mode: applicable to battery pack testing via Battery Pro user interface

■ Battery simulator mode: applicable to motor driver and charger via Battery Simulator user interface
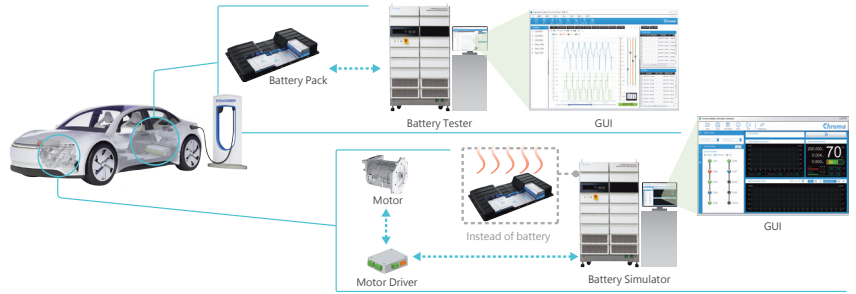
BATTERY CHARGE/DISCHARGE SOFTWARE - BATTERY PRO

The software platform Battery Pro applies to Chroma 17040E and conforms to the diverse requirements for testing secondary battery packs with a high degree of safety and stability. It can save and restore data when the power is cut off to guard against potential data loss. The real-time monitor manages the test status through a variety of icons for clear multi-channel battery pack status browse. And have the operation and fault records with independent channel abnormalities.

■ Multilingual interface: English and Chinese (Mandarin)

■ User permission setup: easy management of user operation authorities

Step Editing

■ 255 editable charge and discharge conditions

■ Dual layer loops (cycle & loop) with 9,999 per layer

■ Editable dynamic charge and discharge waveforms

■ Editable charge/discharge conditions incl. CV, CC, CP, CV, with current limit, waveform current, DCIR

■ Cut-off conditions: time, power, voltage, current, temperature

■ Step completed: next, end, jump, rest

Report Wizard

■ Customized report formats, exports in PDF, CSV, and XLS

■ Users can determine the X- and Y-axis parameters for report drawing and analysis, and directly produce the necessary test reports

■ Reports generated: channel, cut-off, life-cycle, Q-V, V/I/T, etc.

BatteryPro main window
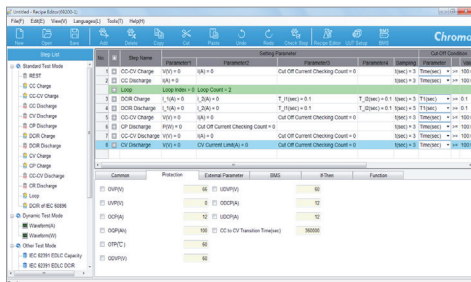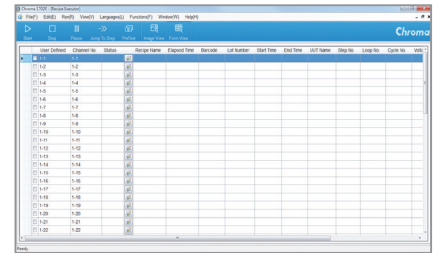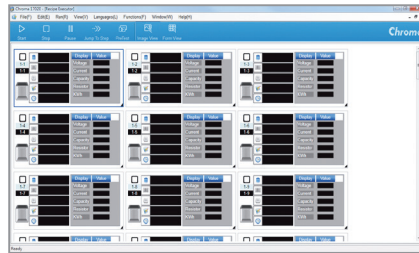
Recipe Executor

☑ Data display updates automatically in real time

☑ Flexible graphic and toolbar display based on the number of channels

Data Analyzer

☑ Draw test charts at one click

☑ Define chart and favorite functions

☑ Compare multiple test objects

Recipe Editor

☑ ISO 12405, GB/T 31467, GB/T 31484, IEC 61960 DCIR and other test curves

☑ Interface for setting BMS data control charge/discharge equipment

☑ Variable editing functions, external parameters, if-then judgment functions

SPECIFICATIONS

Model		17040E
Max Power / CH		200kW
Voltage Range*4		30~1700V 5~850V
Max Current / CH		400A at 1700V range 800A at 850V range
Channel		1CH*17
Max Power in Parallel Mode*14		400kW (2 units) 1.6MW *14
Control		
Constant Voltage Mode		
Voltage Range *4		30~1700V 5~850V
Voltage Accuracy		0.1%F.S.
Voltage Resolution		40mV
Constant Current Mode		
Max. Current / CH		400A/800A
Current Accuracy		0.1%F.S.
Current Resolution / CH		10mA
Max. Current / System*14		2,400A
Constant Power Mode		
Max Power / CH		200kW
Power Accuracy		0.2%F.S.
Power Resolution / CH		1W
Measurement		
Voltage Accuracy		$\pm$0.02% rdg + 0.02% rng
Voltage Range & Voltage Resolution (4 Scales as F.S.)	1	0~1700V / 850V | 15mV
	2	0~1200V / 400V | 15mV
	3	0~600V / 200V | 15mV
	4	0~150V / 100V | 15mV
Current Accuracy		$\pm$(0.05% of r.n.g.)
Current Accuracy & Current Resolution (4 Scales as F.S.)	1	400A / 800A | 10mA
	2	200A / 400A | 10mA
	3	100A / 200A | 10mA
	4	50A / 100A | 10mA
Power Accuracy		$\pm$0.02% rdg + 0.07% rng
Current Rising / Falling Time (10% to 90%)		
Max. Power 800~1.6MW		10ms
Max. Power 100~600kW		1ms
Current Switching Time (-90% to 90% w/o dead time)		
Max. Power 800~1.6MW		20ms
Max. Power 100~600kW		2ms
Data Acquisition Time (HW sampling rate)		
Max. Power 100~1.6MW		1ms at waveform mode 10ms at CC, CV, CP mode
Current Ripple		<0.5% *17
Overshoot		<1%
Over Current Capability*5		Over 20%, 30 sec. *14
Operating Mode (Charge / Discharge)		Rest, CC charge, CC-CV charge, CC discharge, CV discharge, CP discharge, DCIR charge, DCIR discharge, CV charge, CP charge, CC-CV charge, CR discharge, CPCC charge, CPCC discharge, waveform power, waveform current, CV source, Chamber control, CAN write data, digital output control, wait digital input state
Line Voltage / Frequency (3 phase/4 wire with earth ground)		380~400Vac $\pm$10% VLL , 50/60Hz 440~480Vac $\pm$10% VLL , 50/60Hz
Cabinet Dimension (W x D x H)		230cm x 100cm x 190cm
Cabinet Weight		≒2,500kg
Front / Top side for heat dissipation		60cm
Front / Rear / Right / Left side for maintenance *6		60cm
Battery Simulator, CV source		
Internal resistance setting		0 to 400mΩ
Voltage Ripple (P-P) , (0~20MHz)		<0.5 % FS
Voltage Ripple (rms) , (0~20MHz)		<0.5 % FS
Transient Response Time *4 (Loading time < 600A/msec, based on equipment power)		10 ms
Bi-directional Transient Response Time *5		20 ms
Road Regulation (@ 10A/msec) (Current sink with Transient Response Time)		<65V, recover time is within 100ms
Program time *6		
Voltage Slew rate (Fall)		50ms @ No load
Voltage Slew rate (Rise)		50ms @ No load

GENERAL SPECIFICATIONS

Model	17040E
Power Factor	> 0.95 (at rated power)
I_T.H.D	< 5% (at rated power)
Regenerate Efficiency at >50% of rated power	>92%
Leakage current protection (AC input Leakage Current)	Yes, >30mA
Temperature Coefficient (Voltage/Current)	<200 ppm/°C
Operating Temperature	0°C~40°C
Storage Temperature	-20°C~60°C
Operating Humidity	5~80%, non-condensing
Protection	OVP, UVP (6V to 1720V), OCP, OPP, OTP, FAN
Safety & EMC	CE UKCA*10
The Test of Regenerative Certification (option) *11	VDE-AR-N 4110 *15
Isolate Protection (option) *12	Follow iso685 setting Automatic adaptation to the existing system leakage capacitance Two separately adjustable response value ranges of 1 kΩ to 10 MΩ Locating current injection for selective insulation fault location
Communication Interface*13	Ethernet (RJ45 x 2)
Noise Level (Standby / Operating)	<80dB
Cooling Type	Air
Control Interface for System integrator	
Communication Interface	CANbus
Connector	1 x DB9 male connector
Channels	1CH
Protocol	CAN 2.0A (11-bit) / Extended CAN 2.0B (29-bit)
Data Transfer Rate	Up to 1 Mbit/s via CANbus
CAN Transceiver	ADM3054 (compatible with ISO 11898-2)
Signal Support	CAN_H, CAN_L
Isolation Protection	4 kV rms signal isolated CAN transceiver
Communication Interface	Analog programming interface *14
Analog Output (Measurement Volt. & Current)	2 ports (2 wires)
Voltage and Current Monitor/ Programming (Resolution/ Voltage Range/ Response time/ Input Impedance)	16 bit / ±10V / <3ms / 10Mohm
Analog Input (Current Control)	1 port (2 wires)
Analog Input (Voltage Control)	1 port (2 wires)
Latency Time	5ms
Safety Interface	Digital input / output interface for safety *14
Isolated Digital I/O	32 ports input pin 32 ports output pin
Isolated Digital Input	Logic 0 (VIL): 0~0.8V Logic 1 (VIH): 1.2Vmin (24 V max.)
Isolated Digital Output	Output Type: Dry Contact Open: high ; Close: Low) Output Voltage 5~24 VDC / Sink Current 1A max.

*1*2*3: All specifications are subject to change without notice.

*4: The output range of voltage is referred by the cabling. The connection between the device and battery is 10 meters long as standard accessory.

*5: User have to reduce the power load of the test system from 115% to 25% of the power and rest for 10 minutes after finishing the "over current capability".

*6: Please reserve distance of maintenance space for equipment placement.

*7: When the rated load change from 10% to 90%, the item is stability time of voltage.

*8: When the bi-directional rated load change from -90% to 90%, the item is stability time of voltage.

*9: The spending time from zero to the maximum voltage is at no-load condition.

*10: UKCA certification is applying.

*11: Please refer to the Chroma User Manual for the announcement content.

*12: The core part of isolated states is via Bender ISO685.

*13: The interface between BatteryPro (IPC) to 17040E is through Ethernet.
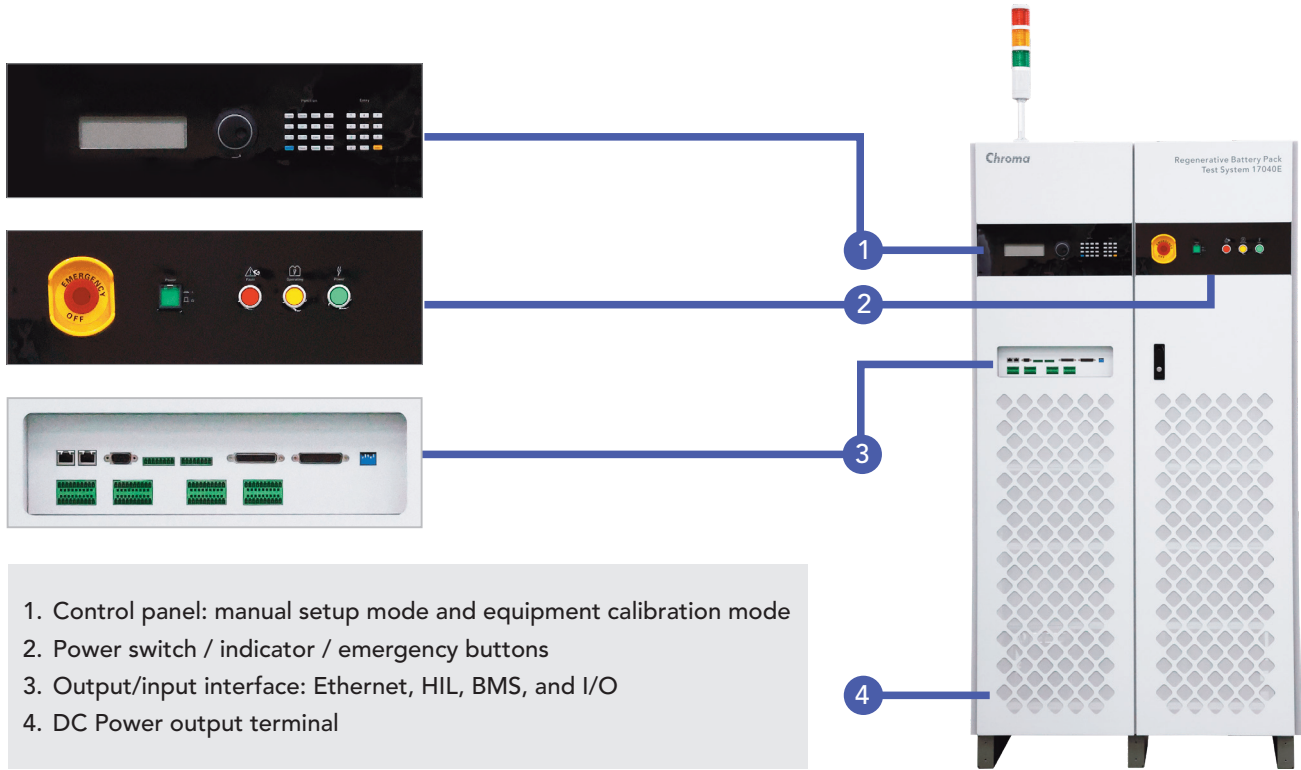
*14: This is used for specific application, please contact Chroma's sales representative.

*15 The voltage accuracy is 0.1%rdg + 0.1%FS at operating voltage is closer to 30V

*16 0.7% at operating voltage is closer to 30V

*17 The BatteryPro software can control up to 4 channels when multiple stand-alone machines are used simultaneously.

HARDWARE CONFIGURATION

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

ORDER INFORMATION

Regenerative Battery Pack Test System Model 17040E				
Power Range	Voltage	Current	Channels	AC Input
200kW	1,700V	800A	1	AC input 380Vac ; AC input 480Vac

Options	
A170201	IPC for Battery Test System
A170202	Battery Simulator SoftPanel
A170402	Battery Pro Software - Battery Pro
Vector 1630 / 1640	CAN Bus Interface Card
L11-005779	VDE protection function
L11-005780	Insulation resistance protection function

Get more product & global distributor information in Chroma ATE APP

iOS   Android

Search Keyword

17040E