

B2C+ Series



Regenerative DC Converters

B2C+ is CINERGIA's flexible solution for Regenerative and Bidirectional DC Test Platforms, a growing field of applications with multiple applications, among others, in Renewable Energy Sources, Energy Storage Systems, Batteries, Electrical Vehicles, Traction Converters and Charging Infrastructure.

Key features

Bidirectional and Regenerative
2 quadrants and 4 quadrants configurations
Clean grid current: THDi < 3% and PF > 0.98

13 models from 6.75kW to 160kW
Parallelization of units to increase the power
Voltage Range: up to 750/800V
Serialization of units to increase voltage up to 1500V

CV, CC, CP, CR modes
Battery Testing (charge/discharge/cycling)
Automated Test profiles (csv file)
Battery Emulation (option)
PV Panel Emulation (option)

3 channels / 1 channel / Multichannel / Bipolar
Power Amplifier mode for PHIL applications

Intuitive Graphical User Interface
Modbus/Ethernet Open protocol, Labview drivers



Highlights

Efficiency and Flexibility

B2C+ efficiently converts AC to DC bringing significant energy and power savings thanks to its Regenerative capability. Different hardware configurations, seven operation modes, a comprehensive set of parameters, alarms and limits and an intuitive user interface allows this unit to address the most complex tests.

Regenerative Battery Testing

This function gives the user a fine control for an accurate and safe Battery Charging, Discharging and Cycling. Transitions can be triggered by voltage, current, time or Ah while the Battery will be safely protected by the integrated over/under voltage and current protections.

Hardware Configurations

The B2C+ model has been designed for the highest flexibility allowing the following configurations:

Unipolar Independent: three 2Q channels with independent setpoint settings and same operation mode

Unipolar Parallel: one 2Q channel with three times current capacity by paralleling the three output channels

Bipolar: to create DC three wire systems + / 0 / -
Multichannel (Separated Channel)

three 2Q channels with independent setpoint settings, different operation mode (CV, CC, CP, CR, Batt Test, etc...) and separated start/stop/alarm status

Serialization

To increase the voltage up to 1500Vdc

Parallelization

To increase the current/power of the platform

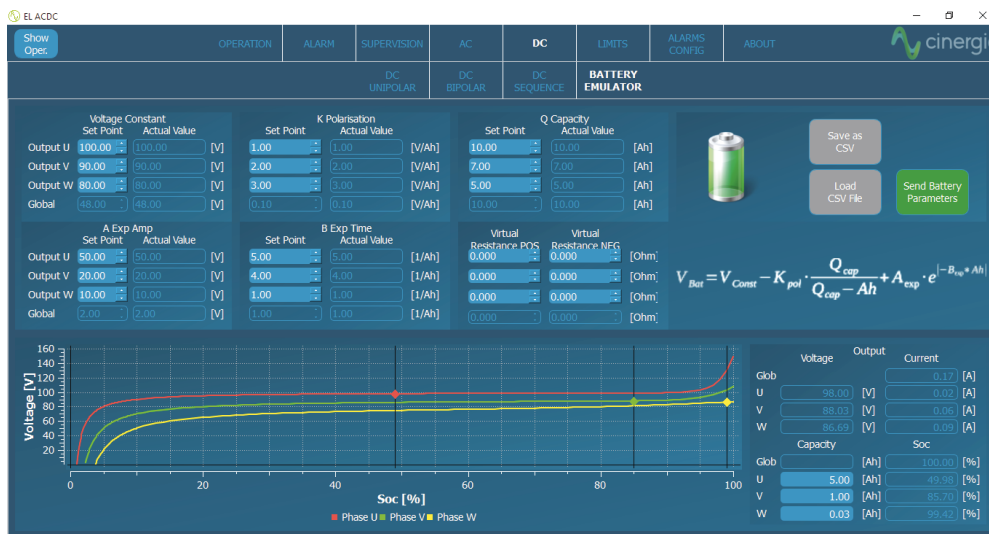
Special DC Applications

Battery Testing, Battery Emulation and PV Panel Emulation require specialised control algorithms and configuration parameters. For these applications, CINERGIA has included advanced control algorithms, real-time processed in the DSP, as: constant Current / constant Voltage profiles (IUoU) for Battery Charge-Discharge-Cycle: as a Battery Model or a PV Panel Model. For the PLUS family of products, each of these functionalities is controlled from a dedicated panel in the User Interface. The Battery Testing panel is included in the standard B2C+ and, as an option, is available for versions AC/DC of the GE+ and EL+. The Battery Emulation and PV Panel Emulation are Software Options that can be added to the B2C+, GE+ and EL+ version AC/DC.



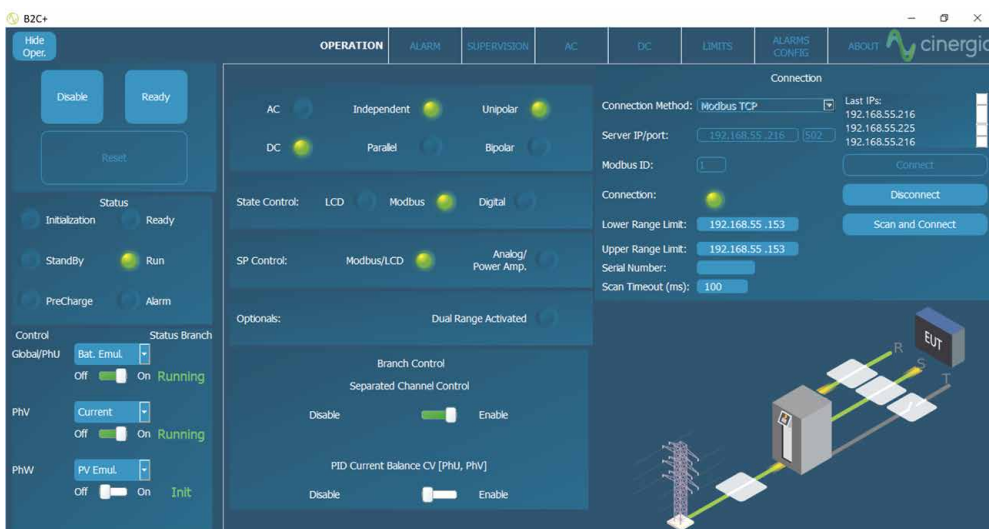
Battery Testing

This functionality enables the user to precisely control the charge, discharge and cycling of a Battery. Basic parameters include the charge/discharge current, fast charge and floating voltages while Advanced parameters add Energy (Ah) and Time as transition conditions. Profiles for each Battery technology can be saved and imported in CSV files.



Battery Emulation

The B2C+ integrates a mathematical model to emulate the voltage behaviour of a real battery pack. The output voltage will change as a function of the SOC and Current. By configuring the provided parameters, the voltage profile can be adjusted to match different technologies: Lilon, NiMH, NiCd, Pb, Flux, etc...



Multichannel

Enabling the Separated Channel Control converts the B2C+ in three functionally independent DC Bidirectional Power Supplies, sharing the common negative rail. Each channel can have a different status (ON, OFF, Warning, Alarm), Mode of Operation (see Range and Specifications table), Setpoint, Ramp and Limits.

Range and specifications

Input side (GRID side)

AC Voltage

Rated: 3x400Vrms + Neutral + Earth

Range: +15% / -20%

Rated AC Current

Depends on model (see Wiring Manual)

Frequency

48-62Hz

Current Harmonic Distortion

THDi < 3% at rated power

Current Power factor

PF > 0.98 at rated power

Efficiency

≥ 89% (7.5&10), ≥ 91% (15 to 30), ≥ 92% (40 to 200)

Output side (EUT side)

Terminals

Number: 6 (3 positive + 3 negative)

Configuration of Channels

Unipolar Independent: 2Q, independent setpoints per channel

Unipolar Parallel: 2Q, one global setpoint for all channels

Multichannel: 2Q, independent start/stop, mode and setpoints per channel (note: multichannel is an option for ≥ 80kVA)

Bipolar (4Q, two independent setpoints)

Voltage Mode (CV)

Range: 2Q: 20⁽¹⁾ to 750V (800V with HV option)

4Q: 0 to +350V / 0 / 0 to -350V (+ rail / 0 / - rail)

Setpoint Resolution: 10mV

Effective Resolution⁽²⁾: < 0.05% of FS⁽³⁾

Setpoint Accuracy⁽⁴⁾: ± 0.1% of FS⁽³⁾

Transient Time⁽⁵⁾: < 1ms (10% to 90% at a step to Vrated)

Ripple⁽⁶⁾ (peak-peak): < 0.55% of FS⁽³⁾

Current mode (CC)

Range: from 0 to ± 110% of Irated (see models table)

Setpoint Resolution: 10mA

Effective Resolution⁽²⁾: < 0.05% of FS⁽³⁾ (< 0.1% models 7.5&10)

Setpoint Accuracy⁽⁴⁾: ± 0.2% of FS⁽³⁾

Transient Time⁽⁵⁾: < 1ms (10% to 90% at a step to Irated)

Ripple⁽⁶⁾ (peak-peak): < 0.7% of FS⁽³⁾

Power mode (CP)

Range: from 0 to ± 200% of Prated (see models table)

Derived current setpoint: Psetpoint / Vmeasured

Setpoint Resolution: 1W

Effective Resolution⁽²⁾: < 0.1% of FS⁽³⁾ (< 0.25% models 7.5&10)

Setpoint Accuracy⁽⁴⁾: ± 0.4% of FS⁽³⁾

Transient Time⁽⁵⁾: < 2.5ms (10% to 90% at a step to Prated)

All specifications are subject to change without notice.

(1) Minimum voltage setpoint is 0V. The recommended minimum long-term setpoint is 20V

(2) Effective resolution measured with a 400ms window

(3) FS Range of voltage is 800V

FS Range of current is 2|110% · Irated| (see models table)

FS Range of power is 2|200% · Prated| (see models table)

(4) Accuracies are valid for settings above 10% of FS

(5) Measured with the rated resistive load and high-dynamics controllers configuration

(6) Consult us for lower voltage/current ripple requirements

(7) Accuracy of Measurements is ±0.1% of FS for rms voltage, ±0.2% of FS for rms current, ±0.4% of FS for active power (valid only above 10% of FS)

Resistance Mode (CR)

Range: from 0.1 to 1000ohm

Derived current: Vmeasured / Rsetpoint

Setpoint Resolution: 0.01 ohm

Setpoint Accuracy⁽⁴⁾: see current accuracy

Transient Time⁽⁵⁾: < 2ms (10% to 90% at a step to Rrated)

Modes of Operation

CV: programmable constant voltage

CC: programmable constant current

CP: programmable constant power

CR: programmable constant resistance

Automated testing from .csv file

BTest: Battery Testing (charge/discharge/cycling)

BEmu: Battery Emulation (software option)

PVEmu: PV Panel Emulation (software option)

Protections

Overvoltage, Overcurrent⁽¹⁰⁾, Overload⁽⁹⁾, Shortcircuit, Emergency Stop, Watchdog, Heart Beat, Output Contactor

Alarms and Limits are user configurable and can be saved in a password protected EEPROM

Measurements(7)

Grid Voltage (rms), Current (rms), Power (P,Q) and Frequency

Output Voltage (avg), Current (avg), Active Power (P)

Heatsink Temperatures (x2) and DC Link Voltage

Datalogging available through FTP connection

User Interface

Local Control (4.3" Touchscreen panel)

Isolated Digital IO port: 6 inputs, 4 outputs

Isolated Analogue IO port: 6 inputs, 6 outputs

Interlock IO port: 1 input, 1 output

Emergency Stop pushbutton

Remote Control port:

LAN Ethernet with Open Modbus-TCP protocol

RS485, RS232, CANbus (optionals)

Software:

Graphical User Interface for Windows 7/10

LabView drivers and basic Labview interface example

Ambient

Operating temperature⁽⁸⁾: 5-40°C

Relative Humidity: up to 95%, non-condensing

Cooling: Forced air

Acoustic noise at 1m: < 52dB(A) (7.5 to 60), < 65dB(A) (80 to 120),

< 70dB(A) (160 and 200)

Standards

CE Marking

Operation: EN-50178

Safety: EN-60950-1, EN-62040-1-2

EMC: EN-62040-2

(8) Rated power figures are given at 20°C. See (9) for admissible Overloads

(9) Admissible overloads are: 125% of rated value during 10min, 150% of rated value during 1min, 200% of rated value during 2s. Overload levels can be configured by the user (to values below the factory ones) and saved in a EEPROM (password protected). It is possible to configure different admissible overload levels for power sourcing and power absorbing

(10) Admissible DC Overcurrent is 110% during 1 minute

Models

| Reference | DC Power Rated ⁹ | DC Voltage Normal Range / HV option | Rated DC Current ⁽¹⁰⁾ | | | Operation Modes |
|-----------|--------------------------------|--|----------------------------------|---------------------------|------------------------------|--|
| | | | Independent Unipolar Mode | Parallel Unipolar Mode | + / 0 / - Bipolar 4Q Mode | |
| B2C+7.5 | 7.5 kW | 10-750 / 800V | ±10A | ±30A | ±10A | All models Programmable Voltage (CV) Programmable Current (CC) Programmable Power (CP) Programmable Resistance (CRI) Power Amplifier (for Power HIL) Automatic Sequence (csv file) Battery Test / Cyclers |
| B2C+10 | 10 kW | 10-750 / 800V | ±15A | ±45A | ±15A | |
| B2C+15 | 15 kW | 10-750 / 800V | ±20A | ±60A | ±20A | |
| B2C+20 | 20 kW | 10-750 / 800V | ±25A | ±75A | ±25A | |
| B2C+30 | 27 kW | 10-750 / 800V | ±30A | ±90A | ±30A | |
| B2C+40 | 40 kW | 10-750 / 800V | ±40A | ±120A | ±40A | |
| B2C+50 | 50 kW | 10-750 / 800V | ±50A | ±150A | ±50A | |
| B2C+60 | 54 kW | 10-750 / 800V | ±57A | ±171A | ±57A | |
| B2C+80 | 80 kW | 20-750 / 800V | ±105A | ±315A | ±105A | |
| B2C+100 | 100 kW | 20-750 / 800V | ±130A | ±390A | ±130A | |
| B2C+120 | 108 kW | 20-750 / 800V | ±130A | ±390A | ±130A | |
| B2C+160 | 145 kW | 20-750 / 800V | ±155A | ±465A | ±155A | |
| B2C+200 | 160 kW | 20-750 / 800V | ±185A | ±555A | ±185A | |

All specifications are subject to change without notice.

Mechanical

| Model | WEIGHT kg | DIMENSIONS DxWxH (mm) |
|---------|--------------|--------------------------|
| B2C+7.5 | 155 kg | 770x450x1100 mm |
| B2C+10 | 155 kg | 770x450x1100 mm |
| B2C+15 | 155 kg | 770x450x1100 mm |
| B2C+20 | 155 kg | 770x450x1100 mm |
| B2C+30 | 155 kg | 770x450x1100 mm |
| B2C+40 | 190 kg | 770x450x1100 mm |
| B2C+50 | 190 kg | 770x450x1100 mm |
| B2C+60 | 190 kg | 770x450x1100 mm |
| B2C+80 | 270 kg | 880x590x1320 mm |
| B2C+100 | 295 kg | 880x590x1320 mm |
| B2C+120 | 295 kg | 880x590x1320 mm |
| B2C+160 | 545 kg | 850x900x2000 mm |
| B2C+200 | 555 kg | 850x900x2000 mm |

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Galvanic Isolation (optional)

| Model | Circuit Breaker Recommended | WEIGHT kg | DIMENSIONS DxWxH (mm) |
|--------|--------------------------------|--------------|--------------------------|
| IT7.5i | Type C - 25A | 145 kg | Inside the cabinet |
| IT10i | Type C - 25A | 145 kg | Inside the cabinet |
| IT15i | Type C - 32A | 145 kg | Inside the cabinet |
| IT20i | Type C - 40A | 145 kg | Inside the cabinet |
| IT30i | Type C - 50A | 195 kg | Inside the cabinet |
| IT30e | Type D - 80A | 174 kg | 595x415x708 |
| IT40e | Type D - 100A | 217 kg | 789x490x865 |
| IT50e | Type D - 125A | 280 kg | 789x490x865 |
| IT60e | Type D - 160A | 381 kg | 789x490x865 |
| IT80e | Type D - 200A | 435 kg | 964x684x1252 |
| IT100e | Type D - 250A | 458 kg | 964x684x1252 |
| IT120e | Type D - 315A | 514 kg | 964x684x1252 |
| IT160e | Type D - 400A | 612 kg | 964x684x1252 |
| IT200e | Type D - 500A | 753 kg | 1192x744x1430 |

Note: 'i' stands for internal transformer, 'e' stands for external transformer (delivered in a stand-alone cabinet IP23)
All specifications are subject to change without notice.

Options

Galvanic Isolation: recommended in all test platforms, provides isolated output via low frequency transformer

Multichannel: allows separated on/off/alarm status and a different operation mode for each channel. It is an option for units ≥ 80 kW (included in all models from 7.5 to 60)

30kHz Switching Frequency: only available for models B2C+15, 20 and 30. Power is derated to 7.5kW, 7.5kW and 10kW respectively.

Low Ripple Capacitance: reduce the output voltage ripple at requested value (bandwidth of the unit may vary)

Isolation monitor / Anti-islanding monitor: commercial isolation and/or anti-islanding relays can be installed for safety

High Voltage (HV): the high voltage option allows a maximum voltage of 295Vrms p-n

Communications: RS485, RS232, CAN