

# Bidirectional Battery Charger

CINERGIA's Bidirectional Battery Chargers are Programmable DC Power Supplies designed specifically to charge and discharge batteries or other storage systems. Based on the DCPS hardware and firmware, the B2C add a IU Battery Charge mode to the Voltage, Current, Power and Resistance modes.

The equipment is regenerative so the energy discharged from the battery will be injected back to the electrical grid.

## FUNCTIONAL DESCRIPTION

### Operation modes:

- Battery Charge (BC)
- Constant Voltage (CV)
- Constant Current (CC)
- Constant Power (CP)
- Constant Resistance (CR)
- Automatic test from Excel file

### It provides three DC channels:

- The three channels can be controlled independently, allowing different charge parameters, voltage, current or power setpoints
- The three channels can be controlled in parallel, sharing the same setpoint and providing 3 times the current

**Battery charge** is controlled with an IU algorithm. Equalization, Boost and Float charge are possible. **Battery discharge** can be done at constant current, power, resistance or by programming a sequence in an Excel file.



## KEY FEATURES

**6.75 – 160 kW**

**2 Quadrant Power Supply**

**Regenerative up to 100% rated power**

**1 channel Output:**  
0 to 750V, 0 to  $\pm 690A$

**3 channels Output:**  
0 to 750V, 0 to  $\pm 230A/ch$

**BC, CV, CC, CP, CR modes**

**Equalization, Boost and Float charge**

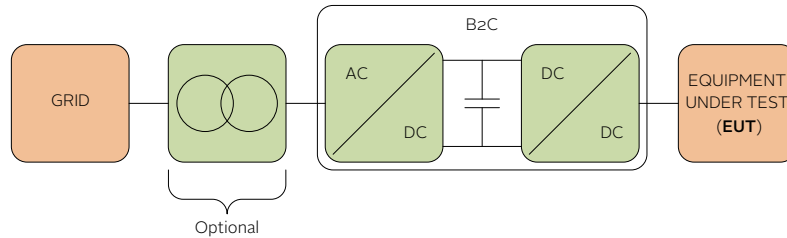
**Constant current or power discharge**

### CINERGIA

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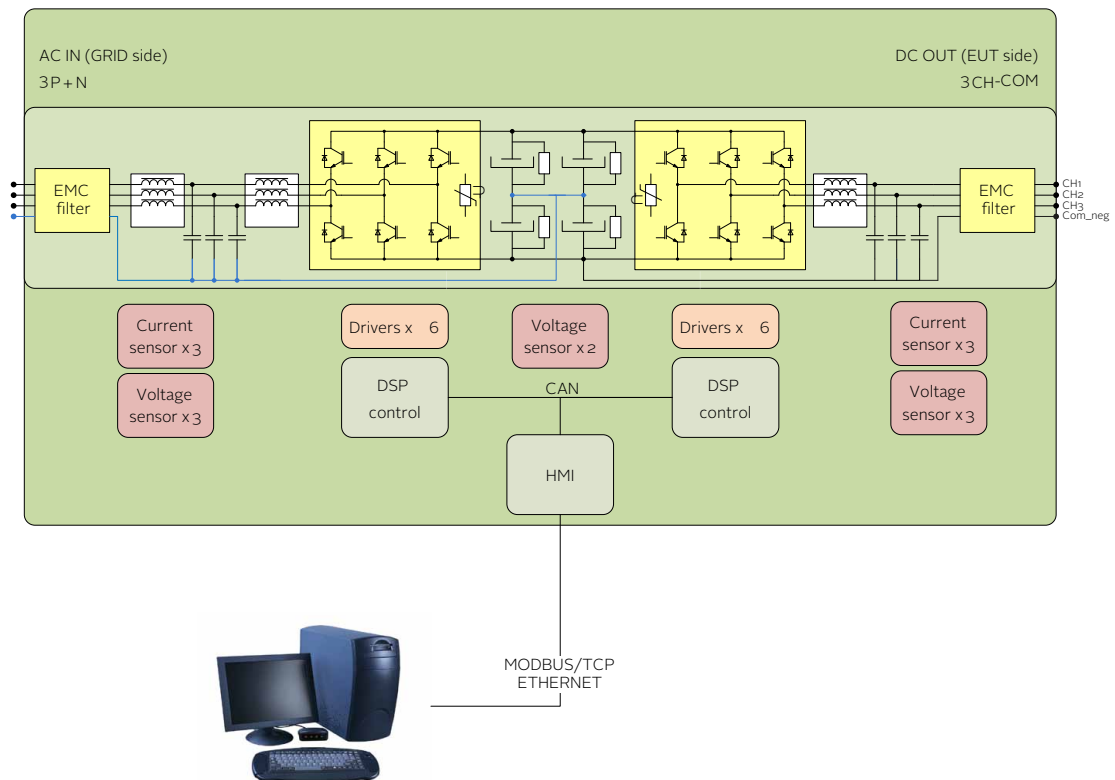
## CONCEPTUAL SCHEMATIC



## BACK-TO-BACK TOPOLOGY

The converter is formed by a grid-side Active Rectifier and an output DCDC converter sharing a DC-link. The Active Rectifier allows sinusoidal current consumption with low harmonic distortion and unity power factor. The DCDC converter generates three independent DC voltages controlling the voltage, current or power.

## TECHNICAL DIAGRAM



AC Input is connected to the grid (neutral connection is required). Galvanic isolation is recommended.

AC Output is connected to the Equipment Under Test (EUT) and can be used as:

- Three independent 2Q channels
- One 2Q channel (3 times rated current)

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## USER INTERFACE

### Local 3.2" Touchscreen panel

#### Local control port:

- 1 analog input 0-10V
- 3 analog outputs 0-10V
- 4 digital inputs
- 3 relay outputs
- 1 Emergency stop

Note: all inputs/outputs are isolated

#### Communications port:

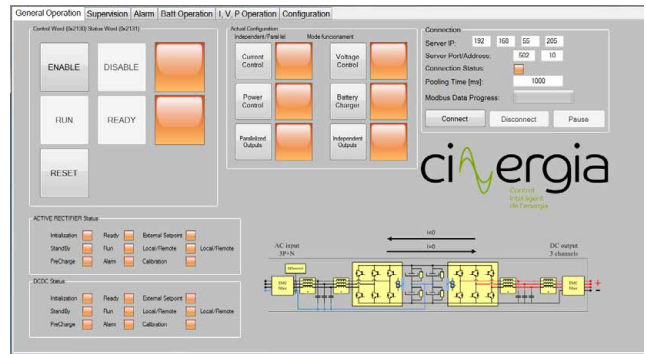
LAN Ethernet with Modbus/TCP protocol.

#### Optional communications:

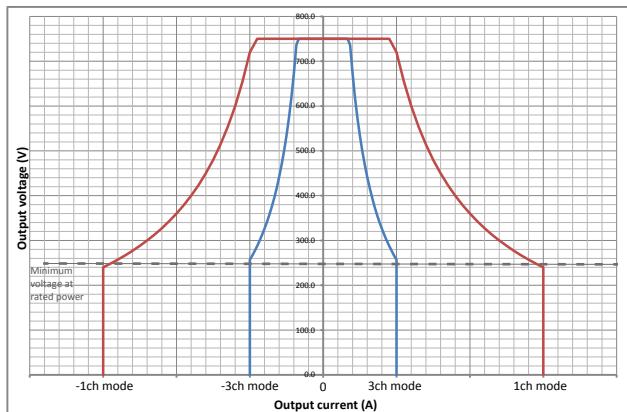
RS485, RS232, CAN, LabView

## SOFTWARE FEATURES

Windows 7 user interface for remote operation and data acquisition.



## OPERATION AREA: 1/3 CHANNELS



## BATTERY CHARGE MODE

		GLOBAL	PHASE A	PHASE B	PHASE C	GLOBAL	PHASE A	PHASE B	PH
Battery Charger	Bat High V Alarm	60 [M]	60 [M]	60 [M]	60 [M]	Bat Boost V	0 [M]	0 [M]	0 [M]
	Bat Low V Alarm	35 [M]	35 [M]	35 [M]	35 [M]	Bat Full V	0 [M]	0 [M]	0 [M]
	Bat Max Charging I Alarm	20 [A]	20 [A]	20 [A]	20 [A]	Max Time in Boost	0 [M]	0 [M]	0 [M]
	Bat Max Discharging I Alarm	110 [A]	110 [A]	110 [A]	110 [A]	Max Time in Full	0 [M]	0 [M]	0 [M]
	Recommended Charging I	17 [A]	17 [A]	17 [A]	17 [A]	Max Time Equalizing	0 [M]	0 [M]	0 [M]
	Equalization Bat V	57.6 [V]	57.6 [V]	57.6 [V]	57.6 [V]	[A] to leave boost mode	0 [M]	0 [M]	0 [M]
	Float V	54.4 [V]	54.4 [V]	54.4 [V]	54.4 [V]	[A] to leave full mode	0 [M]	0 [M]	0 [M]
	Bat Capacity	48 [Ah]	48 [Ah]	48 [Ah]	48 [Ah]	[A] to leave equalizing mode	0 [M]	0 [M]	0 [M]
	Bat State of Charge	a [M]	a [M]	a [M]	a [M]	CW for equalization mode	0 [M]	0 [M]	0 [M]
	Bat DC V Measured	a [M]	a [M]	a [M]	a [M]				
	Bat Drain I Measured	a [A]	a [A]	a [A]	a [A]				
	Ah Measured	a [Ah]	a [Ah]	a [Ah]	a [Ah]				
	Time Measured [s]	a	a	a	a				
	Bat Error Word	a	a	a	a				
	Bat Status Word	a	a	a	a				

### Cooling

The power supply is air-cooled internally.

### Mechanical housing

The power supplies are housed in compact cabinets with wheels up to 120kVA for easier transportation.

### Options

- Galvanic Isolation
- Isolation monitor
- Isolated analog inputs
- RS485, RS232, CAN
- Labview drivers

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## RANGE AND SPECIFICATIONS

MAGNITUDE		VALUE
<b>Power</b>		7.5kVA-200kVA
<b>Input side (GRID side)</b>		
AC Voltage	Rated	3x400Vrms+Neutral+Earth
Voltage range		+15% / -20 %
AC Current	(at rated power)	10-290Arms
Frequency		48-62Hz
THDi	(at rated power)	<3%
Power Factor	Typical at rated power Configurable by user	≥0.99 0-1 (capacitive/inductive)
Efficiency	(at rated power)	>92%
Overload		125% for 10 min / 150% for 60 s
<b>Output side (EUT side)</b>		
DC Voltage	Channel-Com_neg Channel-Channel	0-750V -750 to 750V
Minimum voltage	at rated power <sup>†</sup>	220V
DC Current	1 channel output 3 channels output Bipolar output	0 to ±690A 0 to ±230A/ch 0 to ±230A
<b>Modes of operation</b>		
	Range	Resolution      Ripple
Constant Voltage	0-100%	<±0.1%      <1%
Constant Current	0-±100%	<±0.1%      <1%
Constant Power	0-±100%	<±0.1%      <1%
Constant Resistance	Min.-100%	<±0.1%      <1%
Battery Charge	0-±100%	<±0.1%      <1%
<b>Response time</b>	Rated resistance load	1-5ms (10-90%)
<b>General</b>		
Measurements	Input Voltage (Vrms) and Current (Irms) Input and Output Power Output Voltage and Current Temperatures	
User interface	3,2" Touchscreen Local Control port: 1 analog input, 3 analog outputs, 4 inputs, 3 relays Communication Port: Ethernet (Optionals: RS485, RS232, CAN) Communication Protocol: Modbus/TCP	
Humidity	10-90% (Absolute maximum, without condensation)	
Temperature	5-35 °C (Absolute maximum)	
Cooling	Forced air	
Protections	Over Current, Over Voltage, Shortcircuit, Overtemperature	
<b>Standards</b>		
CE Marking		
Safety	EN-62040-1-2, EN-60950-1	
EMC	EMC: EN-62040-2	

<sup>†</sup> Below minimum voltage the power is derated due to the current limitation. See operation area for further detail  
All specifications are subject to change without notice.

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## MODELS

REFERENCE	RATED		RATED CURRENT		WEIGHT kg	DIMENSIONS DxWxH (mm)
	kVA	kW	3channels / 0-750V	1channel / 0-750V		
<b>B2C7.5</b>	7.5	6.75	±10A	±30A	100	770x450x1100
<b>B2C10</b>	10	9	±15A	±45A	100	
<b>B2C15</b>	15	13.5	±20A	±60A	102	
<b>B2C20</b>	20	18	±25A	±75A	105	
<b>B2C30</b>	30	27	±40A	±120A	150	
<b>B2C40</b>	40	36	±50A	±150A	175	880x590x1320
<b>B2C50</b>	50	45	±65A	±195A	185	
<b>B2C60</b>	60	54	±80A	±240A	185	
<b>B2C80</b>	80	72	±105A	±315A	265	850x900x2000
<b>B2C100</b>	100	90	±130A	±390A	290	
<b>B2C120</b>	120	108	±130A	±390A	290	
<b>B2C160</b>	160	128	±155A	±465A	540	
<b>B2C200</b>	200	160	±185A	±555A	550	

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## GALVANIC ISOLATION (optional)

REFERENCE	RECOMMENDED CIRCUIT BREAKER	WEIGHT kg	DIMENSIONS DxWxH (mm)
<b>IT7.5</b>	Type D - 25A	67	Inside the cabinet
<b>IT10</b>	Type D - 32A	94	
<b>IT15</b>	Type D - 50A	125	
<b>IT20</b>	Type D - 63A	145	
<b>IT30</b>	Type D - 80A	174	595x415x708 (*)
<b>IT40</b>	Type D - 100A	217	789x490x865 (*)
<b>IT50</b>	Type D - 125A	280	
<b>IT60</b>	Type D - 160A	381	
<b>IT80</b>	Type D - 200A	435	964x684x1252 (*)
<b>IT100</b>	Type D - 250A	458	
<b>IT120</b>	Type D - 315A	514	
<b>IT160</b>	Type D - 400A	612	
<b>IT200</b>	Type D - 500A	753	1192x744x1430 (*)

(\*) The transformer is delivered in a stand-alone cabinet IP23  
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