

# GE-AC

## Grid Emulator

CINERGIA's Grid Emulators are AC programmable voltage sources specially designed to create AC grids and emulate its disturbances. Thanks to its bidirectional power hardware, the test energy can be regenerated to the electrical grid.

### FUNCTIONAL DESCRIPTION

#### Generation of AC grid systems:

- Three-phase system (3F+N) up to 480Vrms line-line
- Single-phase system (F+N) up to 277Vrms line-neutral
- Programmable frequency from 10 to 400Hz
- Programmable phase angle
- Programmable internal resistance

#### Generation of grid disturbances:

- Voltage harmonics up to 780Hz (except 8,10, 12 and 14th)
- Flicker
- Over and Undervoltage
- Interruptions
- Voltage dips symmetric and unsymmetric (*types A, B, C, D*).
- Frequency fluctuations.
- Automatic test files (\*.csv)

All disturbances can be configured in amplitude, duration and repetition time.

#### Applications:

Test of UPS, Photovoltaic and Eolic Inverters, EV Quick Battery Chargers, Vehicle to Grid (V2G), Energy Storage Systems (ESS) and other AC devices.



### KEY FEATURES

**7.5 kVA – 200 kVA**

**4 Quadrant Power Supply**

**Regenerative up to 100% rated power**

#### AC Output:

25 to 277 Vrms, phase-neutral  
43 to 480 Vrms, phase-phase  
up to 230Arms per phase  
10-400Hz

#### Independent configuration per phase:

- Voltage magnitude
- Phase angle
- Harmonics (up to 780Hz)

#### Disturbance generation:

Interruptions and voltage dips, Flicker, Over and Undervoltage, Frequency Fluctuation

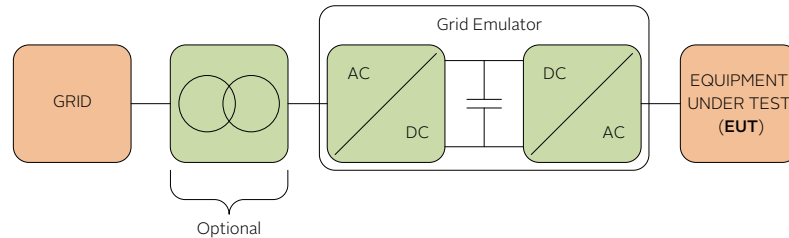
**AC&DC version** available

#### CINERGIA

*Pintor Roig i Soler, 10  
08916, Badalona, BARCELONA  
www.cinergia.coop  
cinergia@cinergia.coop  
T. +34 934 864 358*

# GE-AC Grid Emulator

## CONCEPTUAL SCHEMATIC

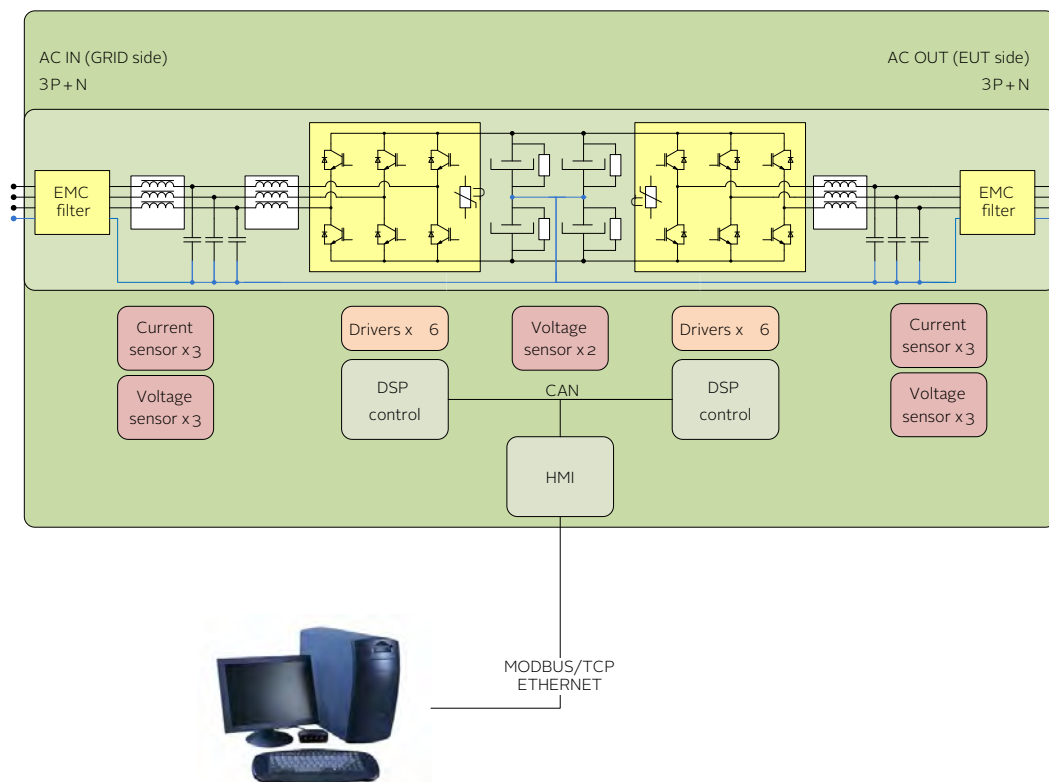


## BACK-TO-BACK TOPOLOGY

The equipment is formed by two IGBT-based power stages: a grid-side Active Rectifier producing sinusoidal currents with low harmonic distortion and close to unity power factor; and an output side AC Inverter generating three independent AC voltages with programmable amplitude, phase angle and harmonic content by using a digital resonant control algorithm.

Thanks to the bidirectionality of this topology the test energy can be injected back to the grid.

## TECHNICAL DIAGRAM OF GE



AC Input is connected to the grid (neutral wire or DYN isolation transformer is required)

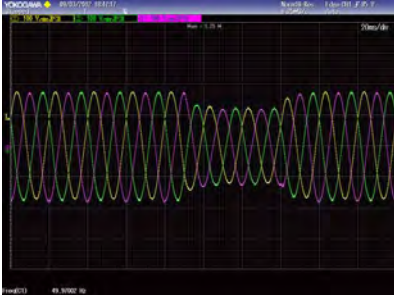
AC Output is connected to the Equipment Under Test (EUT) and can be used as:

- Three-phase AC system
- Three independent Single-phase AC systems (same frequency)
- One parallelized Single-phase AC system (3 times rated current per phase)

# GE-AC Grid Emulator

## FUNCTIONALITIES

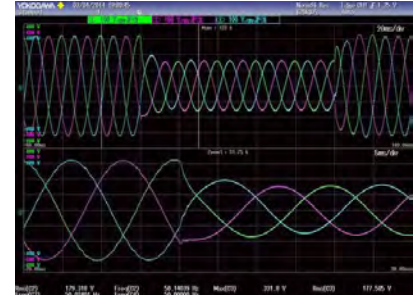
Undervoltage



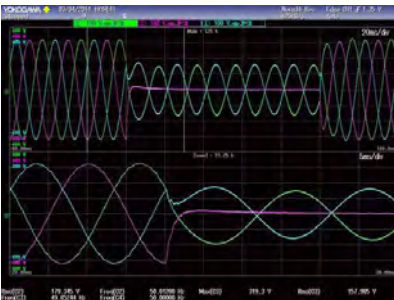
Voltage interruptions



Balanced voltage dips



Unbalanced voltage dips



Voltage Harmonics



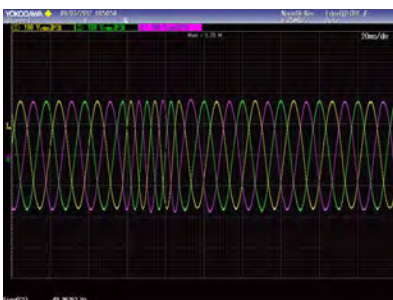
Independent phase harmonics



400Hz Aeronautics Grid



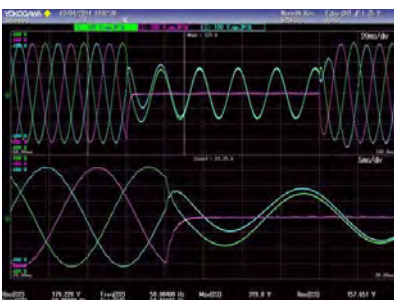
Frequency fluctuation



Flicker



Transient time 2-5ms



# GE-AC Grid Emulator

## USER INTERFACE

**Local 3.2" Touchscreen panel**

**Remote Control port:**

LAN Ethernet with Modbus/TCP protocol.

**Digital IO port:**

- 4 digital inputs
- 3 relay outputs
- 1 Emergency stop

**Optional analog port:**

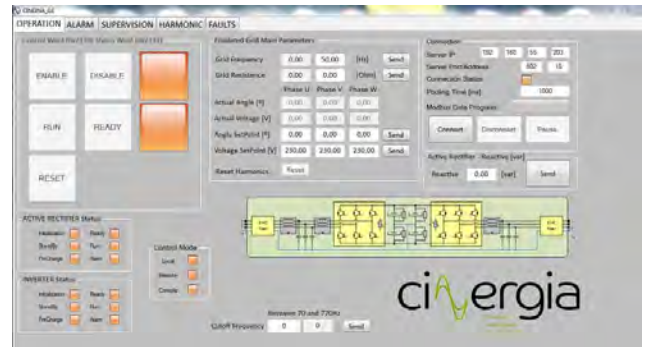
- 1 analog input 0-10V
- 3 analog outputs 0-10V

**Optional communications:**

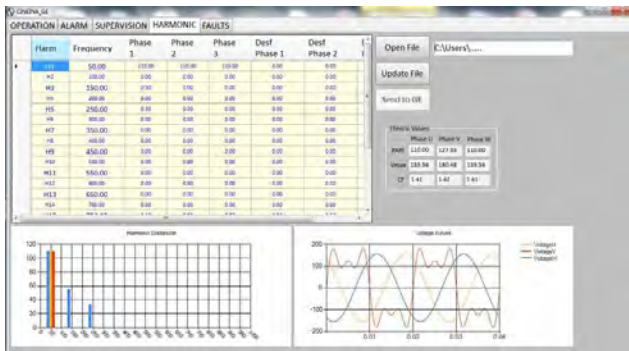
RS485, RS232, CAN, LabView

## SOFTWARE FEATURES

Windows 7/10 user interface for remote operation and data acquisition.



## Configuration of harmonics



## Configuration of disturbances



## 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
- High Voltage (up to 295Vrms, p-n)
- Analog Input/Output Port
- RS485, RS232, CAN
- Labview drivers

## 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 %
Rated AC Current	Depends on model (see table)	10-290Arms per phase
Frequency		48-62Hz
THDi	(at rated power)	<3%
Power Factor	Typical at rated power	≥0.99
	Configurable by user	0-1 (capacitive/inductive)
Efficiency	(at rated power)	>92%
Overload		125% for 10 min / 150% for 60 s
<b>Output side (EUT side)</b>		
AC Voltage	Phase-neutral	25-277Vrms (10-100Hz) 25-210Vrms (101-200Hz) 25-150Vrms (201-400Hz)
Rated AC Current <sup>1</sup>	Depends on model (see table)	10-230Arms
Frequency	Fundamental voltage	10-400Hz (0.1Hz resolution)
Harmonics	Per phase	1st - 15th at 50Hz (except 8,10,12 & 14) 1st - 13th at 60Hz (except 8,10&12) 1st above 100Hz
Harmonic content	Maximum %	1st: 100% 2nd-11th: 50%, 13th-15th:10%
<b>Modes of operation</b>		
Constant Voltage	Range <sup>2</sup>	Resolution <sup>3</sup> Ripple <sup>3</sup>
	9-100%	<0.1%       <1%
Disturbance Generation	Voltage dip and interruptions	
	Over and Undervoltage	
	Frequency variation	
	Flicker	
	Harmonic sequence	
<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: 4 digital inputs, 3 relay outputs (Option for AIO)	
	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>1</sup> Rated AC Current depends on model (see table) and defines the maximum permanent current allowed. Minimum current is 0A.

<sup>2</sup> Range is related to rated values of each model as defined in table MODELS

<sup>3</sup> Resolution and ripple are related to the FS of each model. Contact us for further information.

All specifications are subject to change without notice.



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### GE MODELS

REFERENCE	RATED		RATED CURRENT		WEIGHT kg	DIMENSIONS DxWxH (mm)	
	kVA	kW	AC rms / phase Independent mode	AC rms/ global Parallel mode			
<b>GE7.5-AC</b>	7.5	6.75	10A	30A	150	770x450x1100	
<b>GE10-AC</b>	10	9	15A	45A	150		
<b>GE15-AC</b>	15	13.5	20A	60A	150		
<b>GE20-AC</b>	20	18	25A	75A	150		
<b>GE30-AC</b>	30	27	40A	120A	150		
<b>GE40-AC</b>	40	36	50A	150A	185		
<b>GE50-AC</b>	50	45	65A	195A	185		
<b>GE60-AC</b>	60	54	80A	240A	185		
<b>GE80-AC</b>	80	72	105A	315A	265		880x590x1320
<b>GE100-AC</b>	100	90	130A	390A	290		
<b>GE120-AC</b>	120	108	155A	465A	290	850x900x2000	
<b>GE160-AC</b>	160	128	185A	555A	540		
<b>GE200-AC</b>	200	160	230A	690A	550		

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### GALVANIC ISOLATION (optional)

REFERENCE	RECOMMENDED CIRCUIT BREAKER	WEIGHT kg	DIMENSIONS DxWxH (mm)
<b>IT7.5</b>	Type C - 25A	145	Inside the cabinet
<b>IT10</b>	Type C - 25A	145	
<b>IT15</b>	Type C - 32A	145	
<b>IT20</b>	Type C - 40A	145	
<b>IT30</b>	Type D - 80A	174	595x415x708 (*)
<b>IT40</b>	Type D - 100A	217	789x490x865 (*)
<b>IT50</b>	Type D - 125A	280	964x684x1252 (*)
<b>IT60</b>	Type D - 160A	381	
<b>IT80</b>	Type D - 200A	435	
<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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United Kingdom

Tel: +44 (0) 1483 302 700

Fax: +44 (0) 1483 300 562

**[sales@caltest.co.uk](mailto:sales@caltest.co.uk)**

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