



High Power Density



Wide Voltage Output



Parallel Capability



Universal AC Input



Regenerative Capability



Touch Panel

## REGENERATIVE GRID SIMULATOR MODEL 61809/61812/61815

Chroma 61800 3U high series of regenerative grid simulators include three models with power ratings of 9kVA, 12kVA, and 15kVA and include single phase and 3-phase operation. With output voltage ranges up to 350V<sub>LN</sub> and 606V<sub>L-L</sub>, each model can achieve 700V<sub>LN</sub> by a single phase 3-wire setup. Users are able to increase output power by configuring up to three units in parallel.

Chroma 61809/61812/61815 models are regenerative providing a complete energy-saving solution. The power generated by the DUT during the test can be easily fed back to the grid, rather than dissipated as heat, which protects the environment and lowers the cost of operation. With this capability, these models can be applied to applications in green energy products, such as PV inverters, energy storage systems (ESS), power conditioning systems (PCS), micro grids, power hardware-in-the-loop (PHIL), electric vehicle power supply equipment (EVSE), on-board charger (OBC) and bidirectional on-board charger (BOBC), etc.

For regulatory testing, 61809/61812/61815 models can be applied to IEC 61000-3-2/-3-3/-3-11/-3-12 (international regulations for AC voltage testing), IEEE 1547/IEC 62116 (international regulations related to green power generation), electric vehicle to grid (V2G) testing, electric vehicle to load (V2L) testing, electric vehicle to home (V2H) testing, energy storage system (ESS) testing.

By using full digital control technology, these models provide a maximum 350V<sub>LN</sub> output voltage and 30Hz to 100Hz output frequency. The total harmonic distortion rate is less than 0.5% at full load and 50Hz/60Hz output frequency. In addition to AC output, a DC output mode and AC plus DC output mode is included which can be expanded to DC test and AC test with DC bias voltage. The current output capability can provide 3 times the RMS peak current, which is suitable for a DUT input inrush current test.

These models are also able to provide precision measurements such as RMS voltage, RMS current, true power, power factor, current crest factor and many others. By applying advanced DSP technology, they can easily simulate power line disturbance (PLD) using LIST, PULSE and STEP modes. Additional features such as the waveform synthesis function allows users to program various distorted harmonic waveforms required by some regulatory standards.

With the intuitive 5" LCD touch screen interface, users can quickly get familiar with the instrument's operation. Remote interfaces include standard USB, LAN, and optional GPIB, CAN interface. Instruments can be controlled by computer and Chroma Softpanel software for fast digital operation. In addition, Chroma also provides control drivers where users can use LabVIEW software to program integration applications of the control system.



## MODEL 61809/61812/61815

### KEY FEATURES

- Output Power
  - 61809: 9kVA
  - 61812: 12kVA
  - 61815: 15kVA
- Output voltage: 0~350V
- Output frequency: 30Hz~100Hz/DC
- High Power Density 15kVA in 3UH
- Intuitive Touch Panel Interface
- User selectable single phase or three phase output
- Full 4 quadrant, fully regenerative up to 100% of output current rating
- Specifically designed for EV, PV inverter and Smart Grid related test applications
- Programmable slew rate settings for voltage and frequency
- Programmable voltage and current limits
- Turn on, turn off phase angle control
- Synchronize TTL signal of voltage changing
- LIST, PULSE, STEP mode functions for testing Power Line Disturbance (PLD) simulation
- Harmonics, inter-harmonics waveform synthesizer
- Comprehensive measurement capability, including current harmonics
- Universal AC Input Range
- Standard USB, LAN Interface
- Optional CAN, GPIB Interface
- Parallel output for higher power applications (Three phase only)

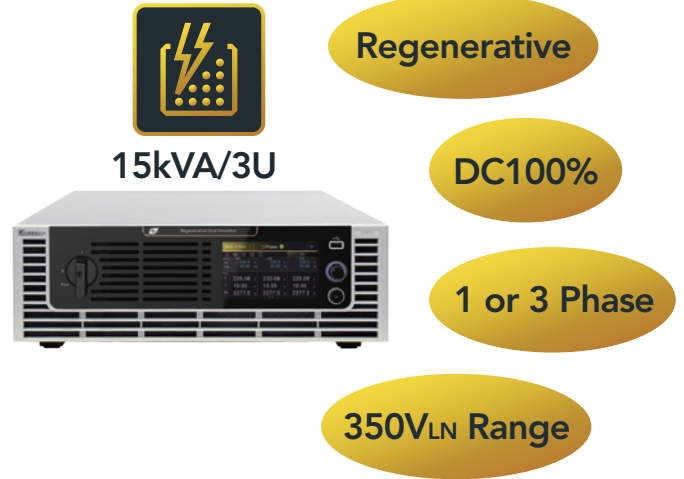


**Chroma**

## HIGH POWER DENSITY

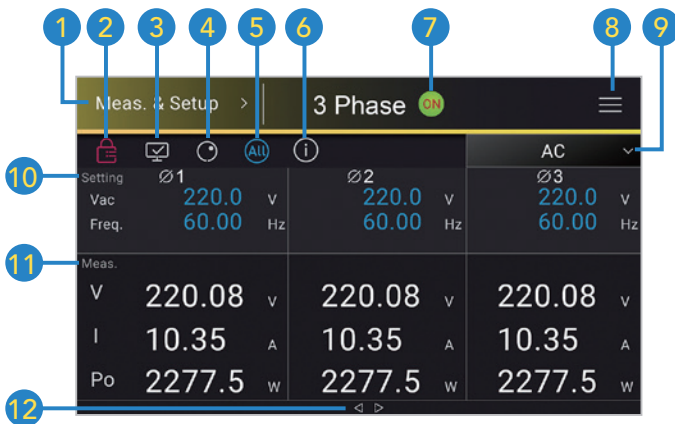
An advanced digital control system and cooling technology allows for a form factor at 3U height as well as achieving outstanding hardware capabilities like 15kVA output power, 350V<sub>LN</sub> wide output voltage range, 1-phase / 3-phase output mode, 100% DC output, and regenerative function. Chroma has also improved transient capabilities, like rising / falling slew rate of output voltage, providing even a better power test solution for users.

For system applications, the 3U height form factor of the 61809/61812/61815 occupies less space in the system cabinet, which can provide more space and flexibility for users. In addition, they also can be placed on a lab bench which is a source of convenience for the user.

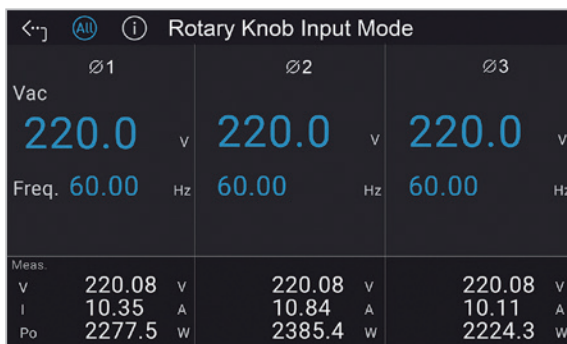


## INTUITIVE TOUCH SCREEN

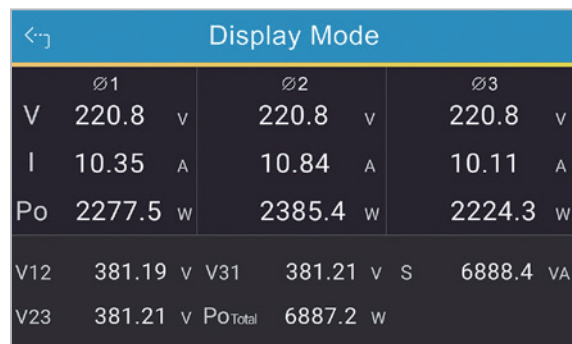
Chroma 61809/61812/61815 models are equipped with a 5" LCD touch screen interface providing users with an intuitive UI interface to quickly perform multiple settings and operations. The rotary knob can enlarge the display for the setting parameters of operation for fine-tuning of parameters. The display mode can expand the measurement value to full screen, making it easy to observe.



1. Screen Lock
2. Display Mode
3. Rotary Knob Input Mode
4. Function Menu
5. 3-Phase Unified setting
6. Total Output Power
7. Output Switch On
8. Advanced Setting Options
9. Output Mode Selection
10. Output Voltage & Frequency Setting
11. Measurement
12. More Measurement (Right/Left Swipe)



Rotary Knob Input Mode



Display Mode

## Universal AC Input Voltage Range

The 61809/61812/61815 support wide AC input voltage range and is capable of supporting three phase input voltage ranging from 200VLL to 480VLL ± 10%. Applicable for most of the three phase 200VLL, 380VLL, 400VLL, 480VLL systems implemented around the world.

## POWER LINE DISTURBANCE (PLD) FUNCTIONS

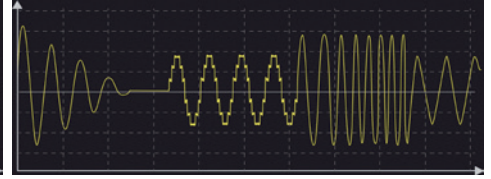
Chroma 61809/61812/61815 models include Power Line Disturbance (PLD) advanced programming functions and are capable of simulating various types of distorted voltage waveforms and transient conditions required by product validation testing. PLD functions include STEP, PULSE, LIST mode, and SYNTHESIS, Inter-harmonic, and Harmonic Measurement. The STEP and PULSE functions allow users to perform single or continuous step changes of output voltage. The LIST mode is a more versatile function as it allows users to compose complex waveforms of up to 100 sequences. With these programming modes, voltage waveforms required by immunity specifications such as IEC 61000-4-11/-4-13/-4-14/-4-28 can be easily achieved.



STEP Mode



PULSE Mode



LIST Mode

In addition, these advanced programming modes are easily set using the touch screen interface. For example, in LIST mode, the editing page can directly take the settings of all sequences and the search function can help quickly find the sequence if an adjustment is needed. Moreover, users can get more intuitive and convenient smartphone like programming as well as copying and pasting functions.

Advance >		3 Phase			Trigger
		List Mode			
Setting	Ø1	Ø2	Ø3		
Vac	220.0 V	220.0 V	220.0 V		
Freq.	60.00 Hz	60.00 Hz	60.00 Hz		
Meas.					
V	220.08 V	220.08 V	200.7 V		
I	10.35 A	10.84 A	10.11 A		
Po	2277.5 W	2385.4 W	2224.3 W		

Main Page of LIST Mode

SEQ No.	Vac (V) Start End	Vdc (V) Start End	F (Hz) Start End	Degree	Waveform	Time (ms)	SEQ No.
0	0.0 200.0	317.5 317.5	60.00 60.00	0.0	A	6.0	<<·
1	0.0 0.0	317.5 400.0	60.00 60.00	0.0	A	8.2	<<·
2	0.0 0.0	400.0 400.0	60.00 60.00	0.0	A	1.0	<<·
3	0.0 0.0	400.0 385.0	60.00 60.00	0.0	A	0.1	<<·

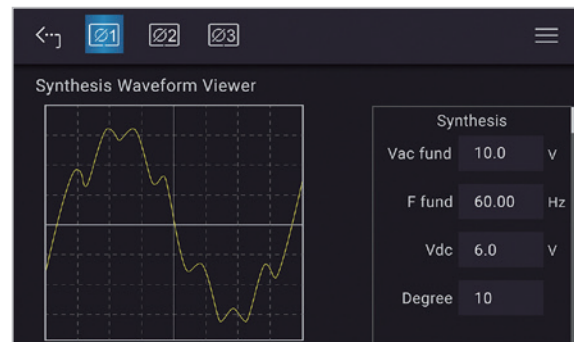
Sequence Editing Page of LIST Mode

The SYNTHESIS function allows users to create periodic harmonic voltage waveforms up to 50 orders based on a 50/60Hz fundamental frequency. The Inter-harmonic function allows users to perform frequency sweeps ranging from 0.01Hz to 2400Hz on top of the 50/60Hz fundamental frequency. This special function assists users in locating resonance points. The Harmonic Measurement function can measure 50th order harmonics of voltage or current and display values such as fundamental voltage, DC component, and total harmonic distortion.

N	%	θ	N	%	θ	N	%	θ
2	0.00	0.0	3	2.30	0.0	4	0.00	0.0
5	0.00	0.0	6	9.8	0.0	7	0.00	0.0
8	15.80	0.0	9	2.5	0.0	10	0.00	0.0
11	0.00	0.0	12	0.00	0.0	13	0.00	0.0
14	0.00	0.0	15	0.00	0.0	16	0.00	0.0

Synthesis	
Vac fund	100.0 V
F fund	60.00 Hz
Vdc	0.0 V
Degree	0.0

SYNTHESIS Function



Waveform Viewer of SYNTHESIS Function

Inter-Harmonic Waveform Setting		Trigger
Ø1	Ø2	Ø3
F Start 0.0 Hz	0.0 Hz	0.0 Hz
F End 0.0 Hz	0.0 Hz	0.0 Hz
Time 0.0 Sec	0.0 Sec	0.0 Sec
Level 0.0 %	0.0 %	0.0 %

Inter-harmonic Function

Advance >		3 Phase			Trigger
		Harmonic Meas.			
N	%	N	%	N	%
2	0.00	3	0.03	4	2.53
5	0.00	6	1.94	7	0.00
8	2.61	9	0.03	10	0.00
11	0.01	12	0.00	13	0.00
14	0.00	15	0.00	16	0.00

Harmonic Meas.	
THD	0.0 %
DC	60.00 V
Fund.	0.0 Hz

Harmonic Measurement Function

## MASTER-SLAVE PARALLEL OUTPUT FUNCTION

The 61809/61812/61815 provide master-slave parallel output functions, which can extend the output power when configuring up to 3 units in parallel. By connecting three 61815 regenerative grid simulators in a master-slave parallel setup, users can achieve a high power density configuration with a total output power of 45kVA at 9U height space.

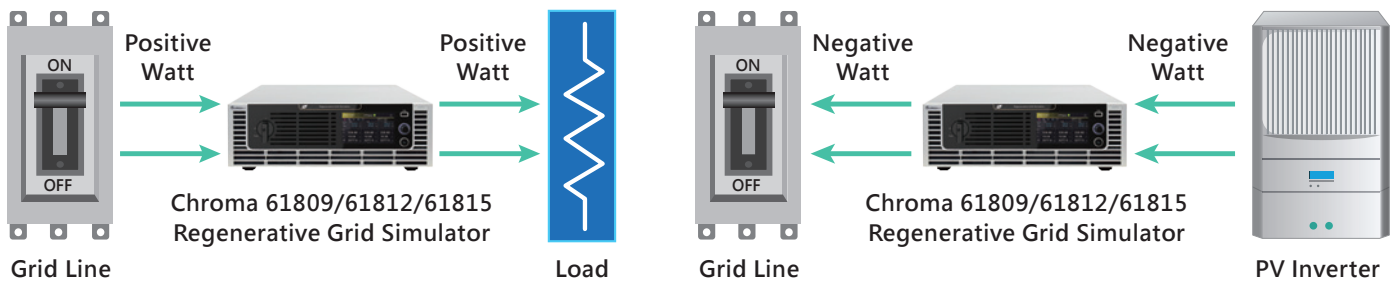


45kVA  
in 9UH

## KEY APPLICATIONS

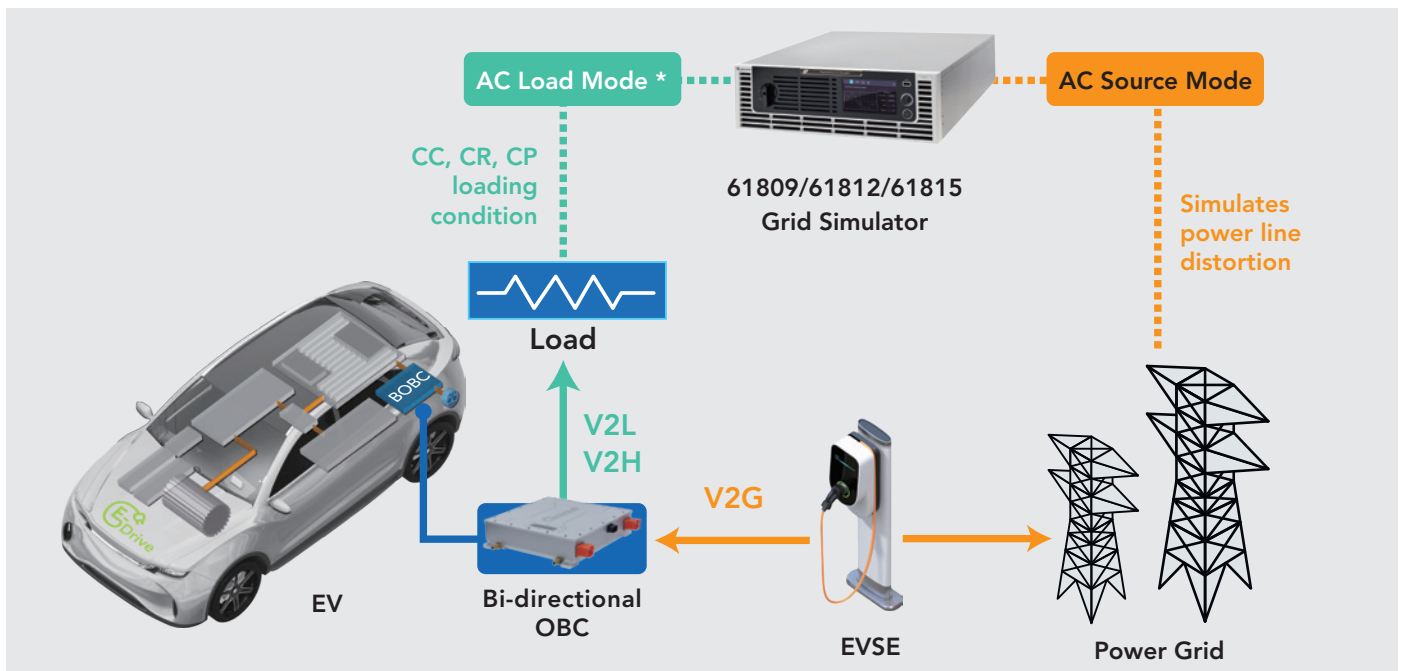
### Common Power Test and Power Grid Related Test

The Grid Simulators are a full 4 quadrant, full regenerative, AC power sources designed for common electrical power testing such as home appliances and industrial electronics needing a programmable input source. In addition, they are designed to simulate grid characteristics for testing PV inverter and on-line UPSs. As shown below, power can be both sink and source from the DUT seamlessly to support many different applications. In cases where the DUT sources current a detection circuit will sense the excess power and recycle it back to the grid.



### Electric Vehicle Related Test

Chroma 61809/61812/61815 models can provide complete power test solutions for electric vehicle industry related products such as electric vehicle supply equipment (EVSE), on board charger (OBC), and can also be compliant with EVSE test regulation SAE J1772 (AC Level 1, AC Level 2), China OBC test regulation QC / T 895. In addition, the development trend of OBC is moving towards bi-directional charge and discharge applications, such as V2G (Vehicle to Grid), V2L (Vehicle to Load) and V2H (Vehicle to Home) technologies. With the regenerative function, optional AC load function and advanced programming PLD function, these models can meet the requirements of test application related to this bi-directional on board charger (BOBC).



Note \*: Call for availability.

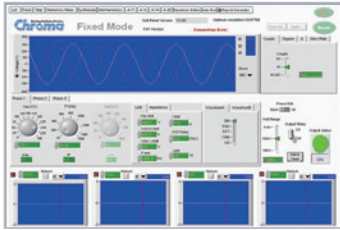
## SPECIFICATIONS

Model	61809	61812	61815
<b>AC Output Rating</b>			
Output Phase	1 or 3 selectable	1 or 3 selectable	1 or 3 selectable
Max. Power	9kVA	12kVA	15kVA
Per Phase	3kVA	4kVA	5kVA
<b>Voltage</b>			
Range	0~350V <sub>LN</sub> / 0~606V <sub>LL</sub>	0~350V <sub>LN</sub> / 0~606V <sub>LL</sub>	0~350V <sub>LN</sub> / 0~606V <sub>LL</sub>
Setting Accuracy	0.1%+0.2%F.S.	0.1%+0.2%F.S.	0.1%+0.2%F.S.
Resolution	0.1 V	0.1 V	0.1 V
Distortion	< 0.5% @50/60Hz < 0.8% @30Hz~100Hz	< 0.5% @50/60Hz < 0.8% @30Hz~100Hz	< 0.5% @50/60Hz < 0.8% @30Hz~100Hz
Line Regulation	0.10%	0.10%	0.10%
Load Regulation	0.20%	0.20%	0.20%
<b>Maximum Current (1-phase mode)</b>			
RMS	87A	96A	105A
Peak	261A	288A	315A
<b>Maximum Current (each phase in 3-phase mode)</b>			
RMS	29A	32A	35A
Peak	87A	96A	105A
<b>Frequency</b>			
Range	30Hz~100Hz	30Hz~100Hz	30Hz~100Hz
Accuracy	0.01%	0.01%	0.01%
<b>DC Output (1-phase mode)</b>			
Power	9kW	12kW	15kW
Voltage	495V	495V	495V
Maximum Current	65.25A	72A	78.75A
<b>DC Output (each phase in 3-phase mode)</b>			
Power	3kW	4kW	5kW
Voltage	495V	495V	495V
Maximum Current	21.75A	24A	26.25A
<b>Harmonic Synthesis Function</b>			
Harmonic Range	up to 50 Harmonic order @50/60Hz fundamental frequency		
<b>Input Rating</b>			
Voltage Operating Range	3 $\Phi$ 200V~220V $\pm$ 10%V <sub>LL</sub> /47~63Hz (100% output power) 3 $\Phi$ 380V~480V $\pm$ 10%V <sub>LL</sub> /47~63Hz (100% output power)		3 $\Phi$ 200V~220V $\pm$ 10%V <sub>LL</sub> /47~63Hz (80% output power) 3 $\Phi$ 380V~480V $\pm$ 10%V <sub>LL</sub> /47~63Hz (100% output power)
Current	39A Max./Phase (3 $\Phi$ 200~240V $\pm$ 10%V <sub>LL</sub> ) 21A Max./Phase (3 $\Phi$ 380~480V $\pm$ 10%V <sub>LL</sub> )	51A Max./Phase (3 $\Phi$ 200~240V $\pm$ 10%V <sub>LL</sub> ) 27A Max./Phase (3 $\Phi$ 380~480V $\pm$ 10%V <sub>LL</sub> )	51A Max./Phase (3 $\Phi$ 200~240V $\pm$ 10%V <sub>LL</sub> ) 34A Max./Phase (3 $\Phi$ 380~480V $\pm$ 10%V <sub>LL</sub> )
Power Factor	0.98 (Typical)	0.98 (Typical)	0.98 (Typical)
<b>Measurement</b>			
<b>Voltage</b>			
Range	0~350V <sub>LN</sub>	0~350V <sub>LN</sub>	0~350V <sub>LN</sub>
Accuracy	0.1%+0.2%F.S.	0.1%+0.2%F.S.	0.1%+0.2%F.S.
<b>Current</b>			
Range (Peak)	261A	288A	315A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (Peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.
<b>Power</b>			
Accuracy	0.4%+0.4% F.S.	0.4%+0.4% F.S.	0.4%+0.4% F.S.
<b>Others</b>			
Efficiency	87%(Typical)		
Protection	OVP, OCP, OPP, OTP, FAN		
Safety & EMC	CE (include EMC & LVD)		
Dimension (H x W x D)	132.8 x 428 x 700 mm/5.23 x 16.85 x 27.55 inch		
Weight	50 kg/99.21 lbs	50 kg/99.21 lbs	50 kg/99.21 lbs

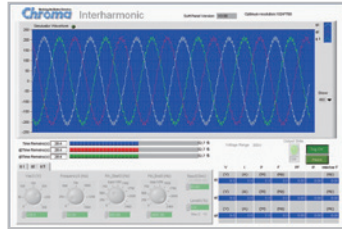
\* All specifications are subject to change without notice.

## SOFTPANEL

The 61800 series Softpanel is designed specifically for users to control the regenerative grid simulator with a user friendly interface in a graphical, instrument like setting. Users are able to perform online and offline waveform editing and the Softpanel can also provide a test environment configured specifically for conducting IEC regulation tests like IEC 61000-4-11, -4-13, -4-14, -4-28.



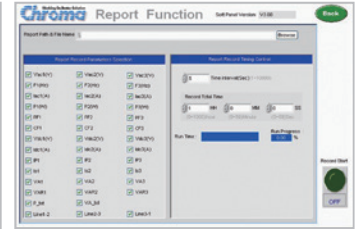
Main Operation Menu



Inter-harmonic Test

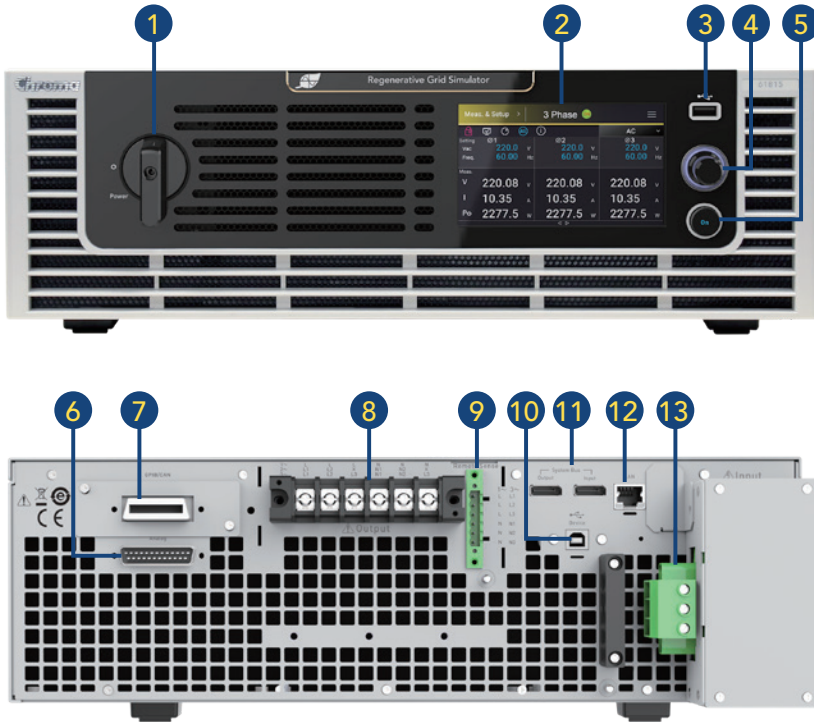


Transient Voltage Programming



Recording Function

## PANEL DESCRIPTION



1. Power ON/OFF Switch
2. 5" LCD Touch Panel  
Displays: measurements, setup, control, and status
3. USB HOST  
Screenshot, save / recall the setting parameters
4. Pushable Rotary Knob  
Rotate to edit screen and set values; push to change setting digits
5. Output ON/OFF Key  
Press the ON key: light indicates Output ON, dark indicates Output OFF
6. Analog Programming Interface (Ext. V Reference/TTL I/O Port)  
External analog signal for voltage control and signal for system integration
7. GPIB/CAN Interfaces Shared Slot (option)
8. AC Output Terminal
9. Remote Sense Terminal
10. USB Interface (standard)
11. System Bus  
For master-slave parallel output function
12. LAN Interface (standard)
13. AC Input Terminal

## Ordering Information

- 61809: Regenerative Grid Simulator 9kVA
- 61812: Regenerative Grid Simulator 12kVA
- 61815: Regenerative Grid Simulator 15kVA
- A618001: Softpanel for 61800 Series
- A620039: GPIB remote interface (option)
- A620045: CAN remote interface (option)

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