Product Overview

Oscilloscope

Real-time Data Logger

Arbitrary Waveform Generation

Electrochemical Impedance Spectroscopy

Bidirectional Regenerative High-Precision Digital Battery Cyclers/Testers

BatReg²

Your **DIGITAL POWER ELECTRONICS** Partner.

- **High-stability, low noise and fast response based on digital control loop**
- **Control and sampling of output current and voltage at 24-bit, 100 kSps**
- **Multiple regulation modes (CC/CV/CP/CR)**
- **Real-time temperature sensing via K-type thermocouple**
- **Remote voltage sensing and proprietary eLucs technology for current sensing**
- **Embedded web-server with Integrated Arbitrary Waveform Generator, Oscilloscope, Real-time Data Logger and EIS.**

FEATURES

- **19"-2U stand-alone crate**
- **Bidirectional and Regenerative**
- **Multiple regulation modes (CC/CV/CP/CR)**
- **Battery polarity detection circuit**
- **Models up to 100 V and up to 150 A**
- **Configurable digital control loop**
- **Maximum sampling at 100 ksps 24-bit**
- **Trigger Input, Aux ADC Input and K-type TC** - *optional*
- **Embedded Arbitrary Waveform Generator, 4-channel Oscilloscope at 100 kSps 24-bit, EIS and Real-time Data Logger**
- **Configurable acoustic alarm**
- **Configurable Interlocks and Status Signals**
- **Ethernet 10/100/1000 Mbps TCP-IP**
- **Parallel configuration supported**

APPLICATIONS

- **Battery Testing and Cycling**
- **Battery Simulation**
- **Electrochemical Impedance Spectroscopy**
- **Single cell / battery pack**

Batreg2. The BatReg2 (**Bat**tery **Reg**enerative **Reg**ulator) series represents the new generation of **bidirectional**, **regenerative** power supplies, specifically engineered to meet the most demanding requirements of precision battery testing and cycling.

Designed to **efficiently return absorbed energy to the grid**, BatReg2 units combine energy regeneration with state-of-the-art performance across all output control modes. Single units are available **up to 100 V** and **150 A**, with scalable solutions of parallel configurations.

The device integrates a **polarity detection circuit** that enables the output only when correct battery polarity is detected, preventing damage and safety hazards.

A built-in **Web Interface** enables intuitive control and configuration, providing access to advanced tools including a **4-channel Oscilloscope** (100 kSps per channel), an **Arbitrary Waveform Generator** (**AWG**) a **Real-time Data Logger**, and a frequency response analyzer for **Electrochemical Impedance Spectroscopy**.

Control is available via **10/100/1000 Mbps Ethernet** over TCP/IP, with support for SCPI-like commands.

The **fully digital control loop** ensures maximum flexibility and ease of configuration, supporting a wide range of battery types, from single cells to modules and full packs.

About Us

ELS Instruments (formely CAEN ELS) is a leading company in the design of power supplies and state-of-the-art complete electronic systems for the Physics research world, having its main focus on dedicated solutions for the particle accelerator community and high-end industrial applications.

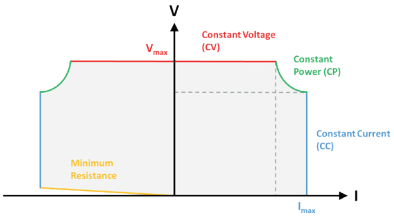
- Power Supply Systems
- Precision Current Measurements
- Beamline Electronics Instrumentation
- FMC and MicroTCA

ELS Instruments srl
Via Karl Ludwig von Bruck 32
34144 - Trieste (TS), Italy

info@caenels.com

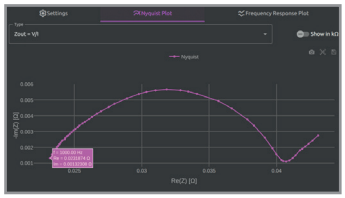
www.els-instruments.com

www.caenels.com



Bidirectional Operation for BatReg²

Web Interface with Oscilloscope, AWG, Real-time Data Logger and EIS



Technical Specifications — BatReg²

		10-150	20-100	40-50	50-30	100-20
Output Voltage Range		0 - 10 V	0 - 20 V	0 - 40 V	0 - 50 V	0 - 100 V
Output Current Range		±150 A	±100 A	±50 A	±30 A	±20 A
Rated Output Power		1.500 W	1.500 W	1.500 W	1.500 W	2.000 W
Output Topology		Bidirectional				
Regulation Mode		CC, CV, CP, CR				
EIS	**Frequency Range**	10 mHz to 2 kHz				
	Current Range	0 to Full Scale				
	Voltage Range	0 to Full Scale				
Current Setting/Readback		24 bit				
Voltage Setting/Readback		24 bit				
Equiv. Switching Frequency		400 kHz	400 kHz	200 kHz	200 kHz	200 kHz
Efficiency	**AC/DC**	> 86 %				
	DC/AC	> 80 %				
Power Factor	**AC/DC**	> 0.98				
	DC/AC	> 0.99				
Rise Time 10-90%*		< 65 µs				
Closed Loop Bandwidth (-3 dB)**		> 6 kHz				
Output Accuracy (RMS)		< 0.01 %/FS				
Temperature Stability		< 10 ppm/K/FS				
Long-Term Stability (8 h)		< 10 ppm/FS				
Cooling		Forced air convection				
Input Ratings		180 - 264 V_{AC} / 47 - 63 Hz				
Communication Interfaces		Ethernet 10/100/1000 Mbps TCP-IP				
External Signals		Acoustic alarm (enabled/disabled) 4 × External Interlock Inputs (configurable dry contacts) 1 × Status Output Relay (magnetic) 1 × Output Relay (solid state) 1 × Trigger Input (LVTTL, TTL) - *FB1K5OPT0001 option* 1 ×16-bit 100-kHz ADC Input for external sensors - *FB1K5OPT0001 option* 1× K-type thermocouple input - *FB1K5OPT0001 option*				
Hardware Protections		DC-Link Fault Overtemperature Output protections: Overcurrent, Overvoltage, Overpower Output Relay Fault 4 × Interlocks Battery Polarity Detection Circuit Input Fuses				
Operating Ambient Temperature		0 ... 50 °C				
Mechanical Dimensions		19" x 2U x 587 mm (including connectors)				
Weight		15 kg				

* determined from a step signal of 5% of the full-scale rated voltage applied on a resistive load in CV
** determined from a frequency sweep using a sine wave with an amplitude of 5% of the full-scale rated voltage on a resistive load in CV

Ordering Code	Acronym	Description
BREG2010150A	**BatReg² 10-150**	**BatReg² 10-150 - High-Precision Digital Battery Regenerative Regulator (10 V, ±150 A)**
BREG2020100A	**BatReg² 20-100**	**BatReg² 20-100 - High-Precision Digital Battery Regenerative Regulator (20 V, ±100 A)**
BREG2040050A	**BatReg² 40-50**	**BatReg² 40-50 - High-Precision Digital Battery Regenerative Regulator (40 V, ±50 A)**
BREG2050030A	**BatReg² 50-30**	**BatReg² 50-30 - High-Precision Digital Battery Regenerative Regulator (50 V, ±30 A)**
BREG2100020A	**BatReg² 100-20**	**BatReg² 100-20 - High-Precision Digital Battery Regenerative Regulator (100 V, ±20 A)**
Options		
FB1K5OPT0001	**AUX, TRIGGER, K-TYPE**	**Auxiliary ADC, Trigger and K-type thermocouple Inputs add-ons** - *optional for BatReg²*

Rev. 1.2 - Printed in April 2026.