Linux OS

Embedded WEB-SERVER

Waveform Generation

Embedded Oscilloscope

1.5-kW Bipolar
Bidirectional and Regenerative
Power Supply Series

FAST-Bi-1K5

Your **DIGITAL POWER ELECTRONICS** Partner.

- **Full Four-Quadrant, Bidirectional & Regenerative Power Supply Series with high-stability and fast response, ideal for magnets, superconducting magnets and as an active load**
- **Stand-alone unit with Local Display, Ethernet 10/100/1000 Mbps, SFP+ and Analog Control modes**
- **Digital control loop to adapt the power supply to any load condition in Constant Current (CC), Constant Voltage (CV) and Constant Resistance (CR) regulation modes**
- **Embedded Web-Server with Integrated Waveform Generation and Oscilloscope**

FEATURES

- **19"-2U stand-alone crate**
- **Bipolar, Regenerative and Bidirectional**
- **Models up to ±150 A and up to ±100 V**
- **Configurable digital control loop**
- **Multiple regulation modes (CC/CV/CR)**
- **<0.0002 %/K temperature stability**
- **<0.001 %/FS long-term stability (8h)**
- **Analog Control Input, Trigger Input, Aux ADC Input and K-type TC** *- optional*
- **Fast SFP+ interface (100-kHz update)**
- **Embedded Web-Server**
- **Waveform Generation at 100 kHz**
- **Embedded 4-channel Oscilloscope**
- **Embedded EPICS IOC**
- **Configurable Interlocks and Status Signals**
- **Local Display and Remote Control modes**
- **10/100/1000 Mbit Ethernet TCP-IP or UDP**
- **Parallel configuration supported**

APPLICATIONS

- **Superconducting Magnets**
- **Magnet Power Supply**
- **Configurable Active Load**

FAST-Bi-1K5. The FAST-Bi-1K5 series represents the new generation of fully **four-quadrant, regenerative** power supplies from ELS Instruments.

Designed to **safely return the absorbed energy to the grid**, these units deliver state-of-the-art performance across all output control modes (CC, CV, CR). Models **up to ±150 A** and **up to ±100 V** are available, with scalable parallel configurations for higher current requirements.

A built-in **web interface** enables intuitive control and configuration, providing access to advanced tools including a **4-channel Oscilloscope** (100 kSps per channel) and an **Arbitrary Waveform Generator** (**AWG**), eliminating the need for external instrumentation.

Remote control is supported via **10/100/1000 Mbit Ethernet** over TCP/IP with SCPI-like commands, as well as UDP over SFP+ and analog input interfaces.

The **fully digital control loop**, with tunable parameters, ensures maximum flexibility and ease of configuration, supporting a wide range of loads.

Hardware protections – e.g. overvoltage, overcurrent, overpower, crowbar and quench – ensure safe operation, complemented by configurable external interlocks, status signals (NO/NC), triggers and I/O for enhanced system integration.

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

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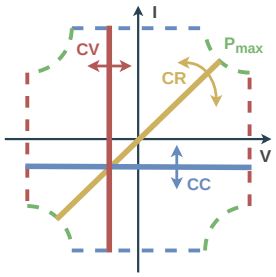

Full 4-Quadrant with CC/CV/CR regulation modes

Embedded WAVEFORM GENERATOR and 4-channel OSCILLOSCOPE

Technical Specifications — **FAST-Bi-1K5**

		15010	10020	5040	3050	20100
Output Current Range		±150 A	±100 A	±50 A	±30 A	±20 A
Output Voltage Range		±10 V	±20 V	±40 V	±50 V	±100 V
Rated Output Power		1.500 W	1.500 W	1.500 W	1.500 W	2.000 W
Output Topology		Full 4-Quadrant				
Regulation Mode		CC, CV, CR				
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**	> 83 %	> 86 %	> 86 %	> 86 %	> 87 %
	DC/AC	> 83 %	> 86 %	> 86 %	> 86 %	> 87 %
Rise Time 10-90%		< 70 µs	< 70 µs	< 70 µs	< 70 µs	< 70 µs
Closed Loop Bandwidth (-3 dB)		5 kHz				
Output Accuracy		< 0.01 %				
Temperature Stability		< 0.0002 %/K				
Long-Term Stability (8 h)		< 0.001 %/FS				
Cooling		Forced air convection				
Input Ratings		180 - 264 V_{AC} / 47 - 63 Hz				
Communication Interfaces		Ethernet 10/100/1000 Mbps TCP-IP and UDP 2 x Fast SFP ports				
External Signals		4 x External Interlock Inputs (configurable dry contacts) 1 x Status Output relay (magnetic) 1 x Output Relay (solid state) 1 x Persistent Switch Heater output 1 x Trigger Input (LVTTL, TTL) - *FB1K5OPT0001 option* 1 x Analog Control Input (±10 V) - *FB1K5OPT0001 option* 1 ×16-bit 100-kHz ADC Input for external sensors - *FB1K5OPT0001 option* 1× K-type thermocouple input - *FB1K5OPT0001 option*				
Hardware Protection		DC-Link Fault Overtemperature Output protections: Overcurrent, Overvoltage, Overpower Crowbar (overvoltage) 4 × Interlocks Quench Input Fuses				
Auxiliary Readbacks (12-bit)		DC-Link Voltage Ground Leakage Current Temperature				
Operating Ambient Temperature		0 ... 50 °C				
Mechanical Dimensions		19" x 2U x 587 mm (including connectors)				
Weight		15 kg				

Ordering Code	Acronym	Description
FB1K5150010X	FAST-Bi-1K5 150-10	FAST-Bi-1K5 - 1.5-kW Bipolar Bidirectional and Regenerative Digital Power Supply ±150 A@±10 V
FB1K5100020X	FAST-Bi-1K5 100-20	FAST-Bi-1K5 - 1.5-kW Bipolar Bidirectional and Regenerative Digital Power Supply ±100 A@±20 V
FB1K5050040X	FAST-Bi-1K5 50-40	FAST-Bi-1K5 - 1.5-kW Bipolar Bidirectional and Regenerative Digital Power Supply ±50 A@±40 V
FB1K5030050X	FAST-Bi-1K5 30-50	FAST-Bi-1K5 - 1.5-kW Bipolar Bidirectional and Regenerative Digital Power Supply ±30 A@±50 V
FB1K5020100X	FAST-Bi-1K5 20-100	FAST-Bi-1K5 - 1.5-kW Bipolar Bidirectional and Regenerative Digital Power Supply ±20 A@±100 V
Options		
FB1K5OPT0001	AIN, AUX, TRIGGER, K-TYPE	Analog Control, Auxiliary ADC, Trigger and K-type thermocouple Inputs add-ons - *optional for FAST-Bi-1K5*
FB1K5OPT0002	HIGH-BANDWIDTH	High-Bandwidth - *optional for FAST-Bi-1K5*
CABL-PSS0041	PARALLEL BUSBAR KIT CH2	FAST-Bi-1K5 BUSBAR KIT - 2-Channel Parallel Busbar and protection kit
CABL-PSS0042	PARALLEL BUSBAR KIT CH3	FAST-Bi-1K5 BUSBAR KIT - 3-Channel Parallel Busbar and protection kit
CABL-PSS0043	PARALLEL BUSBAR KIT CH4	FAST-Bi-1K5 BUSBAR KIT - 4-Channel Parallel Busbar and protection kit

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