

BS / BSA Series

Multichannel Precision Voltage Source with Readback



Datasheet



5-year warranty

Applications:

- Quantum Computing
- Semiconductor Testing Automation
- Cryoelectronic Biasing

Features:

- Precision DC source, 2 to 16 channels
- Few millisecc. response time
- +/-0.1V to +/-40V versions
- Precision Current Readback (Source-Meter)



Multi-Purpose Precision DC Sources

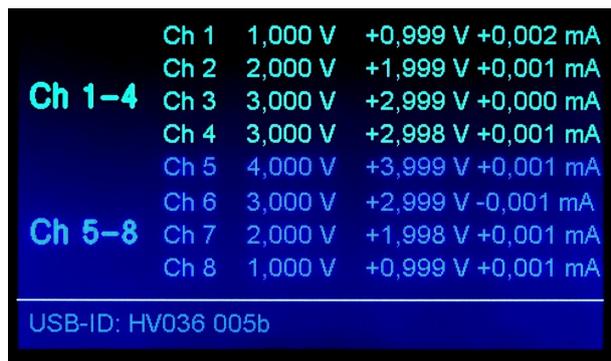
The BS/BSA series devices provide precision DC voltages up to +/- 40V (true bipolar, 4-quadrant outputs) for applications like Quantum Computing, Ion Traps and Precision Experiments. Unlike DC power supplies, the output currents are limited to small values and the outputs are optimized for excellent short and long term stability and low noise. The devices are housed in standard 19-inch rack-mount cases and feature up to 16 channel. Reading back voltage and current each allows for component testing (ATE) and Source meter functionality. User control of the device can be easily accomplished by PC control programs, using a USB link and a simple command set. A LabVIEW™ control program is provided by the manufacturer and other languages (e.g. Python, Delphi) are supported.



front plate containing LCD display and LED status indicators (outputs on rear side)

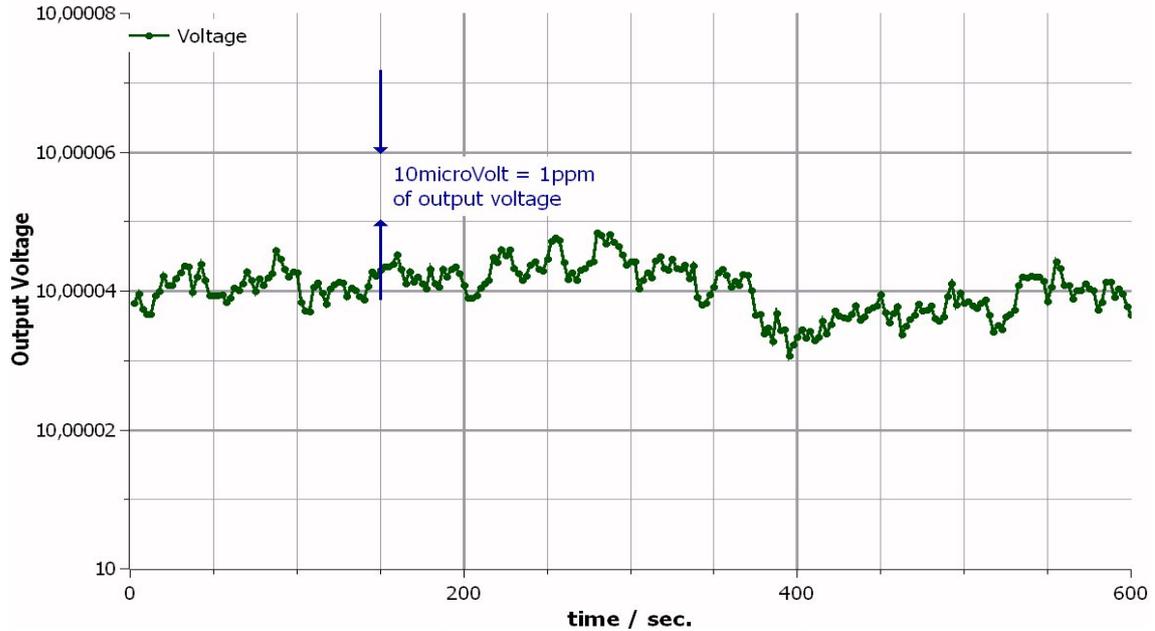
The **LCD display** on the front side shows information about received commands and voltage settings for the output channels. The actual output voltages, being read from every individual channel, are also displayed. Measured output currents appear in the outer right row, thus a Source-Meter functionality is provided.

Voltages are programmed with **16 Bits (BS)** or **19 Bits (BSA)** of resolution, reading of voltages and currents features **4½ digits**.



The rear side (8-channel device with rear outputs is shown) features a row of output channels (BNC) and a reference floating ground input, in case this option is installed. The galvanically isolated USB interface connects to a control PC.

Short Term Stability



This figure illustrates the typical stability of an output channel at +10V, BSA series, over a 10-minute interval (ppm-level). Further information, see below in specifications table and in the user manual.

Control Software

The LabVIEW™ based application program can be operated in a mostly intuitive style. In case several devices are connected, the user may select the device in a window at the left handside. The complete source code is openly accessible for quick and easy implementation into own programs.



Specifications

Output Specifications			
Output Voltage Range	Versions: +/-0.1V, +/-0.3V +/-1V, +/-2V +/-5V, +/-10V ±14V, ±20V, ±30V, ±40V	Note, that approx. 1V of overrange is provided in some devices, e.g. a +/-14V device actually delivers (at low output current) up to +/-15V	
Number of Outputs	1, 2, 4, 8, 10, 12 or 16 output lines, depending on device configuration		
Output Connectors	BNC sockets (standard), SubD 25pole female, others on request		
Output Current	per output	approx. +/-10mA (4-quadrant operation, $ U_{OUT} < 10V$) for ranges up to ±14V, approx. +/-2mA (4-quadrant operation) in case of higher output ranges; overload-indication above +/-8.6mA Note, 20V, 30V, 40V-range devices: max. output current <i>per device</i> : 10mA Note, that devices with output voltages ≤ 1V can be fitted with smaller current ranges on request	
Output Reference Ground	All outputs share a common GND, which can be floated up to +/-30V vs. case ground; voltage changes must be slower than +/-2V/μs to avoid damage.		
Output resistance	50 Ohm +/-3%, at I < 2mA, versions +/-1V to +/-14V 2 Ohm +/-15% , at I < 6mA, version +/-100mV. 100 Ohm +/-3%, versions +/-20V, +/-30V, +/-40V		
Programming Resolution	BS series: 16 Bits BSA series: 19 Bits		
Accuracy			
	typical error	maximum error	typical drift
% of Setting	0.014%	0.02%	0.001% per day
Offset error			
Version +/-40V	±2.2mV	±3.6mV	±0.35mV per day
+/-30V	±1.5mV	±2.9mV	±0.30mV per day
+/-20V	±1.0mV	±2.4mV	±0.16mV per day
+/-5V to +/-14V	±0.9mV	±1.8mV	±0.05mV per day
+/-2V	±0.31mV	±0.9mV	±0.02mV per day
+/-1V	±0.25mV	±0.8mV	±0.01mV per day
+/-100mV	±15μV	±50μV	±4μV per day
+/-300mV	±25μV	±100μV	±12μV per day
Temperature drift			
Version +/-1V to +/-40V related to Span	BS: 5ppm/K BSA: 2.5ppm/K		
related to Offset	15μV/K		
Version +/-100mV, +/-300mV related to Span	20ppm/K		
related to Offset	4μV/K		
Output Fluctuations			
(applies for devices produced after June 2018) Note that the Offset-GND input need to be tied to 0V, or Offset-GND selector switch set to 'grounded' to ensure low noise and a low level of fluctuations.			
	typical	maximum	conditions
Ripple (50Hz, 100Hz)			no output current
Version +/-5V to +/-14V	BS: < 5μV rms BSA: < 1μV rms	14μV rms 11μV rms	
Version +/-1V, +/-2V, BS/BSA	≤ 2μV rms	7μV rms	
Version +/-20V, BS/BSA	≤ 6μV rms	14μV rms	
Version +/-30V, +/-40V, BS/BSA	≤ 11μV rms	18μV rms	
Version +/-100mV, +/-300mV	≤ 2μV rms	4.5μV rms	
Noise, 10kHz...10MHz			
Version +/-20V, +/-30V, +/-40V	1mVrms		
Version +/-2V to +/-14V	≤ 0.5mV rms		
Version +/-100mV	≤ 0.06mV rms		

Low-Frequency Noise, 1Hz...10kHz Version +/-10V, +/-14V, +/-20V +/-30V, +/-40V	10µVrms 20µVrms		50ms internal filter activated
Short Term Fluctuations Version +/-30V, +/-40V @ output voltage 30V Version +/-20V, @ output voltage 20V Version +/-2V BS, BSA Version +/-5V to +/-14V @ output voltage 10V Version ±100mV @ output voltage 100mV	80µV pp 100µV pp 50µV pp 75µV pp 7µV pp 9µV pp BS: 21µV pp BSA: 8µV pp 80µV pp 0.9µV pp 20µV pp	140µV pp 180µV pp 110µV pp 160µV pp 15µV pp 22µV pp BS: 45µV pp BSA: 20µV pp 150µV pp	sampling interval 1s, T = const. observation period 100s observation period 24h observation period 100s observation period 24h observation period 100s observation period 24h observation period 100s observation period 100s observation period 24h observation period 100s observation period 24h
Channel separation Version +/-1V to +/-40V Version +/-100mV +/-300mV	typ. BS: 1.2ppm BSA: 0.6ppm 250ppm 10ppm	max. BS: 2ppm BSA: 1.5ppm 350ppm 65ppm	static channel crosstalk, no output current drawn, ratio of voltage change with respect to any other channel
LCD Screen Display and Voltmeter/Ampere-Meter Readback (Source-Meter)			
Range	+/-100mV to +/-40V, fixed range, depending on device version +/-100µA to +/-10mA, fixed range, depending on device version ¹⁾		
Accuracy ²⁾:	typical	maximum	
Scale error (both Volt- / Ampere- reading)	0.02%	0.05%	Note: channel to channel readback cross talk of 10 ⁻³ in devices with 100mV and 300mV range possible
Offset error <i>Voltmeter</i> Version +/-20V, +/-30V, +/-40V Version +/-10V, +/-14V Version +/-1V to +/-5V Version +/-100mV, +/-300mV <i>Ampere-Meter</i> Version +/-20V to +/-40V Version +/-2V to +/-14V Version +/-1V Version +/-100mV, +/-300mV	2mV 1.5mV 1mV 50µV 2µA 1µA 0.2µA 0.1µA	4mV 3.5mV 2mV 140µV 5µA 3µA 0.5µA 0.3µA	
Fluctuations full-scale-related	0.01%	0.017%	observation interval ΔT = 10s
<p>Note 1) Voltage/Current range assignment, unless customized: +/-2V to +/-40V ↔ +/-10mA current range +/-100mV to +/-1V ↔ +/-1mA current range, optionally +/-100µA current range Note 2) values mentioned apply for devices produced later Aug. 2021 (Ser.-Nr. 017257 and later)</p>			

Remote Control / Communication Parameter	
Remote Connection	USB 2.0 compatible connection to PCs, fully galvanic isolation provided. The device acts as RS232-controlled device (8N1 protocol, no handshake), communicating with either 9600 Baud, 115200 Baud or customized values. Remark: '8N1' = 8 data bits, no parity check, 1 stop bit.
USB Isolation Rating	max. +/-100V on USB socket vs. case GND
Command Language	clear ASCII code command codes see Appendix and Programmers Guide
Device Response Time	see Appendix
Software Support	USB drivers are required. Free LabVIEW™ based user surface and executable program is provided
Power Supply (contains linear regulators only, no switching circuitry)	
AC Supply Rating (country depending)	<u>Attention:</u> fixed AC input voltage 230V _{AC} at 50Hz; Fuse: medium fast blow 0.5A or: AC input voltage 115V _{AC} at 50 to 60Hz; Fuse: medium fast blow 1A Power Consumption typ. 15.6W to 20.0W Note that application of wrong mains supply voltage damages the device.
Environmental Conditions	
Storage Temperature	-10C° to +50C°.
Magnetic Field	max. 5 mT admissible
Humidity & Temperature	non-condensing humidity, temperatures between +10°C and +28°C
Miscellaneous	
Fan	life time typ. 50'000 to 100'000 hours; acoustic warning in case of failure and low speed.
Case dimensions	standard rack mount 19.00" wide x 12" deep. 2 height units. Front-panel mounting holes are configured for M6 rack bolts.
Weight	approximately 3.3 kg, configuration dependent

Further Information: www.Stahl-Electronics.com