HA51U Series

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±500V TO 6000V$_{PP}$, 15W – 20W
PROGRAMMABLE HIGH SPEED HIGH VOLTAGE AMPLIFIERS

FEATURES

- ±500V to 6000V$_{PP}$
- Bipolar, Unipolar and Unsymmetrical
- High Precision, High Speed
- Fully User Programmable: Compatible with Arduino IDE
- Modular / 3U Cassette
- Arbitrary Signal Generation
- Control - Feedback Applications

APPLICATIONS

- EAP
- Piezo
- ER Fluids
- Mirror Deflection / Deforming
- Electrophoresis
- Ion Beam Deflection
- Electro Optics
- MEMS
- Mass Spectrometry
- High Voltage Testing

The **HA51U** series is a family of single channel, bipolar, unipolar and unsymmetrical high voltage amplifiers. They feature high speed, high precision and high stability as well as very low ripple and noise. They are designed to drive capacitive and resistive loads. High peak output current facilitates easy driving of capacitive loads.

Each amplifier of the **HA51U** series is equipped with voltage and current monitor outputs, a TTL-compatible INHIBIT input and further monitoring outputs. The output stage is fed by internal high voltage sources. The amplifier output is protected against overcurrent, short circuit, overvoltage, overtemperature and high voltage flashover.
A safety interlock feature is provided to integrate the unit into a safety circuit.

An isolated USB interface is provided to control the amplifier by means of a simple command interface (setting of the output voltage, monitoring of output voltage, current, temperature and further operational parameters, configuring the amplifier).
Alternatively, the internal microcontroller can be used to run the user's own application code. This can be simple arbitrary waveform generation or direct control of the output voltage via USB.
More complex applications are possible too. General Purpose I/O lines and a separate analog input are provided to connect additional components to the amplifier that can be controlled.
Programming of the controller is possible e.g. by means of the free Arduino IDE.

The amplifiers are available in a robust modular metal case or as 3U cassette versions. The modular units can be used as a table-top device or built into an appliance.
Up to four 3U cassette version units can be plugged into a 19" subrack – see **HAR-51-4M**.

Output Voltage	Maximum Output Current DC / AC$_P$	Model		Signal Gain	Slew Rate (typ.)	Full Power Bandwidth	Small Signal Bandwidth
		Modular Case	3U Cassette				
-500V – +500V	±20mA / 40mA$_P$	**HA51U-0.5B20**	**HA51U-0.5B20-3**	50 ±1%	100V/µs	0 - 30kHz	0 – 100kHz
-200V – +800V	±20mA / 40mA$_P$		**HA51U-0.8P20-3**	80 ±1%	100V/µs	0 - 30kHz	0 – 100kHz
0 - +1000V	±20mA / 40mA$_P$	**HA51U-1P20**	**HA51U-1P20-3**	100 ±1%	100V/µs	0 - 30kHz	0 - 100kHz
-1000V – +1000V	±10mA / 20mA$_P$		**HA51U-1B10-3**	100 ±1%	80V/µs	0 – 15kHz	0 – 80kHz
-400V – +1600V	±10mA / 20mA$_P$		**HA51U-1.6P10-3**	160 ±1%	80V/µs	0 – 15kHz	0 – 80kHz
0 - +2000V	±10mA / 20mA$_P$		**HA51U-2P10-3**	200 ±1%	80V/µs	0 – 15kHz	0 – 80kHz
-1500V – +1500V	±5mA / 10mA$_P$	HA51U-1.5B5	HA51U-1.5B5-3	150 ±1%	40V/µs	0 – 5kHz	0 – 40kHz
0 - +3000V	±5mA / 10mA$_P$	**HA51U-3P5**	**HA51U-3P5-3**	300 ±1%	40V/µs	0 – 5kHz	0 – 40kHz
-2000V - +2000V	±4mA / 8mA$_P$	**HA51U-2B4**	**HA51U-2B4-3**	200 ±1%	25V/µs	0 – 3kHz	0 – 10kHz
-3000V – +3000V	±2.5mA / 5mA$_P$	**HA51U-3B2**	**HA51U-3B2-3**	300 ±1%	15V/µs	0 – 1kHz	0 – 10kHz
0 - +6000V	±2.5mA / 5mA$_P$	HA51U-6P2	HA51U-6P2-3	600 ±1%	25V/µs	0 – 1.5kHz	0 – 10kHz

Models shown in grey are under development and not yet available.

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SPECIFICATIONS

Control Input:	±10V (10V ≙ max. output voltage), differential	
Monitor Output (V):	±10V (10V ≙ max. output voltage)	
Monitor Output (I):	±10V	
Input Connector:	SMB, D-Sub	
Output Connector:	SHV	
Supply Voltage:	24Vdc ±10% / <1.6A at maximum output power	
Dimensions:	Modular Case:	ca. 105 x 59 x 230mm³
	Cassette:	3U x 16HP x ca. 230mm
Ambient Temperature:	-20 - +50°C	
Safety:	EN61010-1, CE	

Models **HA51U-1.5B5, HA51U-6P2**: status **PRELIMINARY** / under development

REMARKS

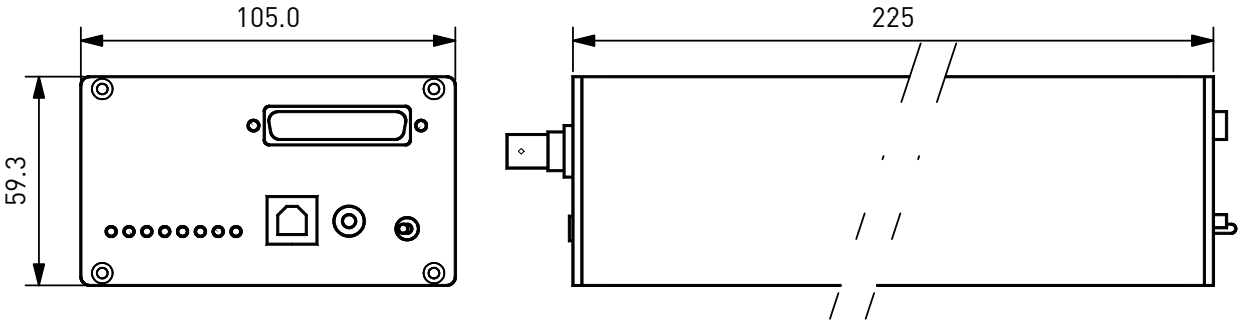
Slew rate and bandwidth measured at C_L = 100pF

Full power bandwidth: 1% distortion

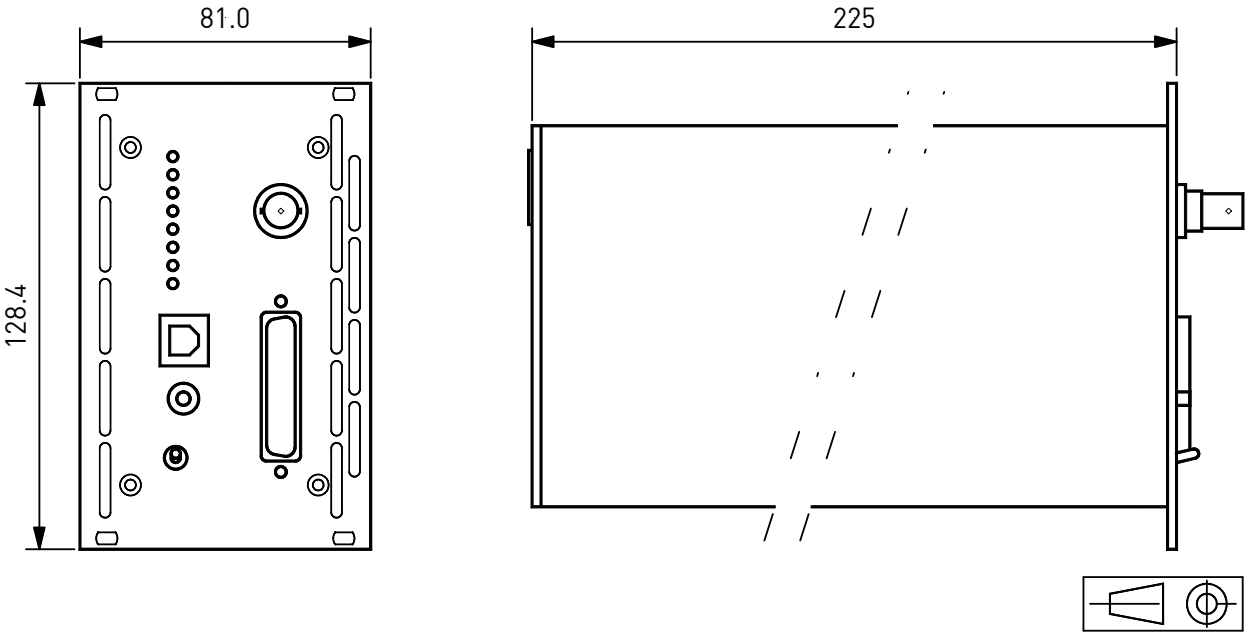
Small signal bandwidth: -3dB

DIMENSIONS

Modular Case



3U Cassette



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MAINFRAME HAR-51-4M

The **HAR-51-4M** is a 19"/3U subrack for up to 4 high voltage amplifier modules HA51...-3. It features internal power supplies, cooling fans, a common Interlock input for all channels and a HV OFF button.
Customized and full custom models are available on request.

SPECIFICATIONS HAR-51-4M

Line Voltage:	100 - 240V_{AC} ±10% 50/60Hz
Input Current:	1,9A_{RMS} at V_{Line}=115V_{AC}, nominal load 0,95A_{RMS} at V_{Line}=230V_{AC}, nominal load
Line Fuses F1, F2:	T6.3A, 250V, IEC127-2/V
External Fuse:	16A
Protection Class:	I
Dimensions (d x w x h):	376 x 447 x 140mm³ (housing) 419 x 482 x 140mm³ (overall, witout cable)
Weight:	ca. 5.1kg without amplifier modules

Disclaimer

The information given in this data sheet is technical data, not assured product characteristics. It has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies. The user has to ensure by adequate tests that the product is suitable for his application regarding safety and technical aspects.
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Safety Advice

Design, installation and inspection of machinery and devices carrying high voltage require accordingly trained and qualified personnel. Appropriate safety rules and directives must be complied with.
Improper handling of high voltage can mean severe injuries or death and may cause serious collateral damage!

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