

±4kV, ±10mA / 20mA_p

PRECISION PROGRAMMABLE HIGH VOLTAGE AMPLIFIER OPTIONALLY WITH INTEGRATED SIGNAL GENERATOR

▪ **FEATURES**

- ±4000V / ±10mA
- High Precision, High Stability
- Programmable Current Limit
- Optional Integrated DDS/ARB Signal Generator
- Low Noise
- High Speed
- Inhibit Input
- V/I Monitor Outputs
- Interlock Input and HV OFF Button

▪ **APPLICATIONS**

- Electrostatic Deflection
- Electro Optics
- EAP
- ER Fluids
- Emulsion separation
- Electrophoresis
- General High Voltage Testing



The **HA61-4B10** is a fast precision high voltage amplifier with an optionally integrated signal generator in a 19" rack mountable case. This single channel amplifier provides output voltages of -4000V to +4000V at ±10mA (static) and 20mA_p (dynamic). The dynamic output current is available for signal frequencies down to 1Hz. The amplifier's power bandwidth is 7kHz.

The amplifier features high precision, high stability and very low noise. It is suitable to drive capacitive and resistive-capacitive loads. The output is stable with any capacitive load and also stable at no load conditions. It can easily drive loads like EAP actuators, electrorheological fluid elements, electrostatic deflection electrodes and many other loads.

Power bandwidth and slew rate depend on the actual load capacitance.

A differential ±10V amplifier input prevents any ground loops and provides excellent noise suppression. The voltage gain is fixed to 400. Voltage and current monitor outputs and a TTL compatible INHIBIT input are provided.

The maximum output current can be limited to programmable values and programmable behavior. When the output current reaches the threshold, the output will either shut down or the output current will be limited to the set value.

Internal high voltage sources feed the output stage. The output stage is protected against overload, short circuit, over temperature and high voltage arcing. The amplifier output is made available via a SHV high voltage connector at the rear. Operational and overload conditions are displayed on the front panel.

A safety interlock circuit is provided to integrate the unit into an emergency shutdown circuit. When the interlock loop is opened, the internal high voltage sources are shut down. In addition to the interlock input a red HV OFF palm button is available on the front panel. The red indicator lamp HV ON signals that the internal high voltage sources are switched on.

A command interface is available via USB and Ethernet interfaces to control the amplifier. Monitor values of output voltage, output current as well as internal operational parameters can be read.

An implemented DDS/ARB signal generator is optionally provided (in HA61-4B10-G) to generate standard waveforms like sine wave, trapezoid, square wave, pulse, sawtooth and noise as well as fully arbitrary wave shapes. Parameters like waveform, amplitude, frequency, duty cycle, rise/fall time, offset, DC value, current limit and further functional parameters are controllable via the command interface.

The internal waveform generator can be triggered and synchronized to other generators or signal sources.

Customized and full custom models are available on request.

■ SPECIFICATIONS

Output Voltage:	-4000V ... +4000V
Output Current:	±10mA / ±20mA _P
Full Power Bandwidth:	> DC ... 7kHz @ C _L =50pF (1% distortion limit) *
Small Signal Bandwidth:	> DC ... 40kHz @ C _L =50pF *
Slew-Rate:	> 200V/μs @ C _L =50pF *
Noise:	< 35mV _{RMS} @ C _L =500pF (10Hz ... 50kHz) * < 10mV _{PP} switching noise (>150kHz)
Control Input:	±10V (10V ≅ 4000V), BNC, R _i = 50kΩ
DC-Gain:	400 ±0.3%
Offset Voltage (RTO):	< ±100mV
Monitor Output (V):	±10V (10V ≅ 4000V ±0.3%), BNC
Monitor Output (I):	±10V (10V ≅ 40mA ±0.5%), BNC
Interlock:	24V, internally fed, Combicon on rear panel
INHIBIT Input:	TTL compatible, BNC
SYNC I/O:	50Ω, BNC
Trigger Input:	TTL compatible, BNC
Ethernet Interface:	RJ45
USB Interface:	USB-B
Output Connector:	HC51 series HV Connector on rear panel, An output cable of 2m length is included.

Output GND is connected to the chassis and protective earth

Cooling: temperature controlled fans

Line Voltage: 100 - 240V_{AC} ±10% 50/60Hz
Power Consumption: ca. 180VA (8000V_{PP}, 20mA_P, C_L= 50pF)
Ambient Temperature: Operation: 0 - +40°C
Storage: -25 - +70°C
Dimensions (d x w x h): ca. 450 x 449/480 x 133mm³ (19" / 3U)
Weight: ca. 10kg

Safety: according to EN 61010-1, CE
EMC: according to EN 61326-1, CE

- * Bandwidth, slew rate and output noise are depending on the size of the capacitive load. The coaxial output cable is part of the capacitive load and will reduce slew rates and large signal bandwidth. A typical coaxial cable has a capacitance of approx. 100pF/m.
Increasing the load capacitance reduces output noise.

■ MODEL OVERVIEW

HA61-4B10-U
HA61-4B10-G

HV Amplifier with simple command interface via USB and Ethernet
HV Amplifier with integrated DDS/ARB signal generator and SCPI based command interface via USB and Ethernet

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!