ABOUT US
hivolt.de is an internationally operating specialist for professional high voltage components, amplifiers and power supplies. hivolt.de serves customers in D-A-CH, the whole of Europe and worldwide. Products which are delivered by hivolt.de are being used in a variety of applications, both in industry and in research. In order to find the optimal products for individual applications, we offer precise counsel to our established and potential customers. If desired, we are also able to support the integration into the customer’s end product. Our logistics cares for a smooth flow of goods and delivery on schedule – continuous and reliable.

Due to our inhouse design capabilities and our close cooperation with several leading manufacturers hivolt.de is able to offer custom-made high voltage products that match our customer’s specific applications. This includes variations of standard products or special full custom designs.

ABOUT THIS CATALOG
This catalog comprises a multitude of high voltage amplifiers, signal amplifiers and power amplifiers. The different models serve a variety of applications covering output voltages from ±30V to >10kV. Many models feature very low noise, high stability and high precision.

Typical applications include particle beam deflection, particle guidance, electrooptics, electrophoresis, mass spectrometry, high voltage testing, corona/plasma, MEMS, driving different types of actuators like piezos, electroactive polymers [EAP], electrorheological fluids [ER] and many more.

For applications requiring a large number of channels multichannel models with up to 64 individual amplifier channels are available. A typical application for multichannel amplifiers is the control of piezo based deformable mirrors.

Please refer to our catalog HIGH VOLTAGE CABLE & CONNECTORS for a wide range of high voltage cable, connectors and high voltage cable assemblies. Our website www.hivolt.de presents a complete range of high voltage power supplies as well.

DISCLAIMER
The information given in this catalog 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. All drawings and pictures are not to scale. All values and dimensions without given tolerances are nominal. The content is subject to change without notice. The user has to ensure by adequate tests that the product is suitable for his application regarding safety and technical aspects. hivolt.de GmbH & Co. KG does not assume any liability arising out of the application or use of any product described. The technical data is based on manufacturer’s information.

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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<tr>
<td>HA05B2</td>
<td>±500V</td>
<td>±2mA</td>
<td>500Hz</td>
<td>1</td>
<td>PCB</td>
<td>High stability, low noise, high precision, V/I monitor outputs; 12-ch. mainframe: HAR12S</td>
<td>16</td>
</tr>
<tr>
<td>HA05B2_BA</td>
<td>±500V</td>
<td>±2mA ±7mA</td>
<td>15kHz</td>
<td>1</td>
<td>PCB</td>
<td>High speed, high stability, low noise, high precision, V/I monitor outputs; 12-ch. mainframe: HAR12S</td>
<td>16</td>
</tr>
<tr>
<td>HA1.25B2-S</td>
<td>±1250V</td>
<td>±2mA</td>
<td>4kHz</td>
<td>1</td>
<td>PCB</td>
<td>High stability, low noise, high speed, high precision, V/I monitor outputs; 12-ch. mainframe: HAR12S</td>
<td>17</td>
</tr>
<tr>
<td>HA2B5-S</td>
<td>±2000V</td>
<td>±5mA</td>
<td>6kHz</td>
<td>1</td>
<td>PCB</td>
<td>High stability, low noise, high speed, high precision, V/I monitor outputs; 4-ch. subrack: HAR42-2</td>
<td>18</td>
</tr>
<tr>
<td>HA51U-0.5B20</td>
<td>±500V</td>
<td>±20mA ±40mA</td>
<td>30kHz</td>
<td>1</td>
<td>PCB</td>
<td>Tabletop or 3Ux16HP; USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-0.8P20</td>
<td>-200V - +800V</td>
<td>±20mA ±40mA</td>
<td>30kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-1P20</td>
<td>0 - +1000V</td>
<td>±20mA ±40mA</td>
<td>30kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-1B10</td>
<td>±1000V</td>
<td>±10mA ±20mA</td>
<td>15kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-1.6P10</td>
<td>-400V - +1600V</td>
<td>±10mA ±20mA</td>
<td>15kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-2P10</td>
<td>0 - +2000V</td>
<td>±10mA ±20mA</td>
<td>15kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-2B4</td>
<td>±2000V</td>
<td>±4mA ±8mA</td>
<td>2kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-1.5B5</td>
<td>±1500V</td>
<td>±5mA ±10mA</td>
<td>5kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-3P5</td>
<td>0 - +3000V</td>
<td>±5mA ±10mA</td>
<td>5kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-3B2</td>
<td>±3000V</td>
<td>±2.5mA ±5mA</td>
<td>1kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA51U-6P2</td>
<td>0 - +6000V</td>
<td>±2.5mA ±5mA</td>
<td>1.5kHz</td>
<td>1</td>
<td>PCB</td>
<td>USB programmable, precision, high speed, V/I monitor outputs, AUX I/O, interlock; 4-ch. mainframe: HAR-51-4M</td>
<td>9</td>
</tr>
<tr>
<td>HA61G-6B10</td>
<td>±6000V</td>
<td>±10mA ±20mA</td>
<td>5kHz</td>
<td>1</td>
<td>19” / 3U</td>
<td>High speed, high precision, USB/Ethernet programmable, DDS/ARB waveform generator, V/I monitor outputs, interlock</td>
<td>20</td>
</tr>
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<tr>
<th>MODEL</th>
<th>OUTPUT VOLTAGE</th>
<th>OUTPUT CURRENT</th>
<th>SPEED</th>
<th># CHANNEL</th>
<th>FORMAT</th>
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<tbody>
<tr>
<td>HA61GD-3B30</td>
<td>±3000V</td>
<td>±30mA ±40mA</td>
<td>15kHz</td>
<td>2</td>
<td>19” / 3U</td>
<td>High speed, high precision, USB/Ethernet programmable, DDS/ARB waveform generator, V/I monitor outputs, interlock</td>
<td>22</td>
</tr>
<tr>
<td>HA61U-4B10</td>
<td>±4000V</td>
<td>±10mA ±20mA</td>
<td>7kHz</td>
<td>1</td>
<td>19” / 2U</td>
<td>High speed, high precision, USB programmable, V/I monitor outputs, interlock</td>
<td>24</td>
</tr>
<tr>
<td>HA61U-6B20</td>
<td>±6000V</td>
<td>±20mA ±40mA</td>
<td>8kHz</td>
<td>1</td>
<td>19” / 3U</td>
<td>High speed, high precision, USB programmable, V/I monitor outputs, interlock</td>
<td>26</td>
</tr>
<tr>
<td>HA77GM-2B150</td>
<td>±2000V</td>
<td>±150mA</td>
<td>30kHz</td>
<td>1</td>
<td>19” / 6U</td>
<td>High power, high speed, high precision, USB/Ethernet programmable, DDS/ARB waveform generator with user interface, V/I monitor outputs, interlock</td>
<td>28</td>
</tr>
<tr>
<td>HAR-8X8A</td>
<td>-200V - +600V</td>
<td>±10mA</td>
<td>10kHz</td>
<td>64</td>
<td>19” / 7U</td>
<td>NI6723 compatible, voltage monitor outputs, interlock</td>
<td>12</td>
</tr>
<tr>
<td>HAR12A</td>
<td>±500V</td>
<td>±2mA</td>
<td>500Hz</td>
<td>1-12</td>
<td>19” / 3U</td>
<td>High stability, low noise, high precision, opt. high speed (15kHz), V/I monitor outputs, V/I DVMs</td>
<td>14</td>
</tr>
<tr>
<td>HVA-3B4</td>
<td>±3kV</td>
<td>2.5mA</td>
<td>1kHz</td>
<td>4</td>
<td>19” / 3U</td>
<td>Low noise, precision, independent or differential outputs, DVMs</td>
<td>30</td>
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<table>
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<tr>
<th>MODEL</th>
<th># CHANNEL</th>
<th>SUPPLY VOLTAGE</th>
<th>HV SOURCE</th>
<th>FORMAT</th>
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<tr>
<td>HAR2</td>
<td>1-2</td>
<td>24VDC</td>
<td>±540V</td>
<td>Tabletop unit</td>
<td>For 1 or 2 channels HA05B2/ HA05B2_BA, SHV outputs, V/I DVMs; opt. wall mountable</td>
<td>15</td>
</tr>
<tr>
<td>HAR12S</td>
<td>1-12</td>
<td>90 - 265VAC</td>
<td>±540V</td>
<td>19” / 3U</td>
<td>For up to 12 channels HA05B2/ HA05B2_BA, SHV outputs, V/I DVMs</td>
<td>14</td>
</tr>
<tr>
<td>HAR12-0</td>
<td>1-12</td>
<td>90 - 265VAC</td>
<td>-</td>
<td>19” / 4U</td>
<td>For up tp 12 channels 220mm deep HV amplifier PCBs, V/I DVMs, interlock</td>
<td>14</td>
</tr>
<tr>
<td>HAR12S-0</td>
<td>1-12</td>
<td>90 - 265VAC</td>
<td>-</td>
<td>19” / 4U</td>
<td>For up tp 12 channels 220mm deep HV amplifier PCBs, SHV outputs, V/I DVMs, interlock</td>
<td>14</td>
</tr>
<tr>
<td>HAR42-2</td>
<td>1-4</td>
<td>100 - 240VAC</td>
<td>-</td>
<td>½19” / 4U</td>
<td>For up to 4 channels HA2B5-S, interlock, tabletop housing</td>
<td>19</td>
</tr>
<tr>
<td>HAR-51-4M</td>
<td>1-4</td>
<td>90 - 265VAC</td>
<td>-</td>
<td>19” / 3U</td>
<td>For up to 4 channels HA51U-xxxx-3, interlock</td>
<td>11</td>
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<table>
<thead>
<tr>
<th>MODEL</th>
<th>OUTPUT VOLTAGE</th>
<th>OUTPUT CURRENT</th>
<th>SPEED</th>
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<tr>
<td>PA120A</td>
<td>±30V</td>
<td>±2ADC ±10AP</td>
<td>1.5MHz</td>
<td>250V/μs</td>
<td>1</td>
<td>Tabletop unit</td>
<td>High precision, high peak output current, 2 independently configurable input channels</td>
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</table>

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<thead>
<tr>
<th>MODEL</th>
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<tbody>
<tr>
<td>PAD01</td>
<td>±15V - ±50V 30V - 100V</td>
<td>5A 7AP</td>
<td>50W</td>
<td>100kHz 35V/μs</td>
<td>30x30mm, external compensation, programmable current limit</td>
<td>33</td>
</tr>
<tr>
<td>PAD04</td>
<td>±15V - ±100V 30V - 200V</td>
<td>5A 7AP</td>
<td>60W</td>
<td>350kHz 200V/μs</td>
<td>30x30mm, external compensation</td>
<td>33</td>
</tr>
<tr>
<td>PAD20</td>
<td>±15V - ±75V 30V - 150V</td>
<td>5A 7AP</td>
<td>80W</td>
<td>10kHz 5V/μs</td>
<td>40x40mm, temperature monitor, over-temp shutdown, 4-wire current limit</td>
<td>33</td>
</tr>
<tr>
<td>PAD38</td>
<td>±15V - ±100V 30V - 200V</td>
<td>10A 25AP</td>
<td>250W</td>
<td>33kHz 10V/μs</td>
<td>External compensation, programmable current limit</td>
<td>33</td>
</tr>
<tr>
<td>PAD39</td>
<td>±15V - ±50V 30V - 100V</td>
<td>10A 25AP</td>
<td>200W</td>
<td>80kHz 10V/μs</td>
<td>External compensation, programmable current limit</td>
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<tr>
<td>PAD108</td>
<td>±15V - ±100V 30V - 200V</td>
<td>10A 12AP</td>
<td>200W</td>
<td>300kHz 170V/μs</td>
<td>External compensation, programmable current limit</td>
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<tr>
<td>PAD111</td>
<td>±15V - ±50V 30V - 100V</td>
<td>15A 50AP</td>
<td>250W</td>
<td>500kHz 130V/μs</td>
<td>External compensation, programmable current limit</td>
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<tr>
<td>PAD112</td>
<td>±15V - ±75V 30V - 150V</td>
<td>5A 7AP</td>
<td>100W</td>
<td>30kHz 14V/μs</td>
<td>Temperature monitor, over-temp shutdown, 4-wire current limit</td>
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<tr>
<td>PAD113</td>
<td>±15V - ±250V 30V - 500V</td>
<td>1.5A 3AP</td>
<td>96W</td>
<td>15kHz 40V/μs</td>
<td>Temperature monitor, over-temp shutdown, 4-wire current limit</td>
<td>34</td>
</tr>
<tr>
<td>PAD115A</td>
<td>±10V - ±150V 20V - 300V</td>
<td>20A 30AP</td>
<td>400W</td>
<td>7kHz 8V/μs</td>
<td>Temperature monitor, over-temp shutdown</td>
<td>34</td>
</tr>
<tr>
<td>PAD117A</td>
<td>±5V - ±50V 10V - 100V</td>
<td>15A 20AP</td>
<td>250W</td>
<td>23kHz 8V/μs</td>
<td>RRIO, temperature monitor, over-temp shutdown, 4-wire current limit</td>
<td>34</td>
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<tr>
<td>PAD118</td>
<td>±10V - ±50V 20V - 100V</td>
<td>30A 40AP</td>
<td>400W</td>
<td>20kHz 8V/μs</td>
<td>Temperature monitor, over-temp shutdown</td>
<td>35</td>
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<tr>
<td>PAD119A</td>
<td>±10V - ±100V 20V - 200V</td>
<td>20A 30AP</td>
<td>400W</td>
<td>20kHz 8V/μs</td>
<td>Temperature monitor, over-temp shutdown</td>
<td>35</td>
</tr>
<tr>
<td>MODEL</td>
<td>SUPPLY VOLTAGE</td>
<td>OUTPUT CURRENT</td>
<td>OUTPUT POWER</td>
<td>SPEED</td>
<td>FEATURES</td>
<td>PAGE</td>
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<td>---------------------------------------------------------------------------</td>
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<tr>
<td>PAD126</td>
<td>±20V - ±250V 40V – 500V</td>
<td>10A</td>
<td>450W</td>
<td>25kHz 50V/μs</td>
<td>Temperature monitor, over-temp shutdown, 4-wire current limit</td>
<td>35</td>
</tr>
<tr>
<td>PAD127</td>
<td>±5V - ±50V 10V – 100V</td>
<td>30A</td>
<td>450W</td>
<td>10kHz 8V/μs</td>
<td>RRIO, temperature monitor, over-temp shutdown, 4-wire current limit</td>
<td>35</td>
</tr>
<tr>
<td>PAD128</td>
<td>±10V - ±50V 20V – 100V</td>
<td>20A</td>
<td>400W</td>
<td>20kHz 16V/μs</td>
<td>RRIO, temperature monitor, over-temp shutdown, 4-wire C/L, low distortion</td>
<td>35</td>
</tr>
<tr>
<td>PAD129</td>
<td>±10V - ±100V 20V – 200V</td>
<td>15A</td>
<td>400W</td>
<td>20kHz 37V/μs</td>
<td>RRIO, temperature monitor, over-temp shutdown, 4-wire C/L, high power bandw.</td>
<td>35</td>
</tr>
<tr>
<td>PAD135</td>
<td>±15V - ±100V 30V – 200V</td>
<td>5A</td>
<td>80W</td>
<td>350kHz 200V/μs</td>
<td>Low cost, small size 40x40mm</td>
<td>35</td>
</tr>
<tr>
<td>PAD136</td>
<td>±15V - ±100V 30V – 200V</td>
<td>7A</td>
<td>150W</td>
<td>350kHz 200V/μs</td>
<td>Low cost, small size 45x40mm</td>
<td>36</td>
</tr>
<tr>
<td>PAD137</td>
<td>±5V - ±50V 10V – 100V</td>
<td>20A</td>
<td>400W</td>
<td>23kHz 8V/μs</td>
<td>RRIO, temperature monitor, over-temp shutdown, 4-wire current limit</td>
<td>36</td>
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<tr>
<td>PAD138</td>
<td>±15V - ±100V 30V – 200V</td>
<td>10A</td>
<td>240W</td>
<td>30kHz 30V/μs</td>
<td>Low cost, small size 40x40mm</td>
<td>36</td>
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<tr>
<td>PAD141</td>
<td>±6V - ±50V 12V – 100V</td>
<td>10A</td>
<td>240W</td>
<td>28kHz 7V/μs</td>
<td>Low cost, small size 40x40mm, single supply operation</td>
<td>36</td>
</tr>
<tr>
<td>PAD149</td>
<td>±15V - ±100V 30V – 200V</td>
<td>10A</td>
<td>240W</td>
<td>150kHz 100V/μs</td>
<td>Low cost, temperature monitor, short circuit protection, external shutdown</td>
<td>36</td>
</tr>
<tr>
<td>PAD150</td>
<td>±15V - ±50V 30V – 100V</td>
<td>10A</td>
<td>200W</td>
<td>500kHz 200V/μs</td>
<td>Low cost, small size 45x40mm</td>
<td>36</td>
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<tr>
<td>PAD183</td>
<td>±15V - ±175V 30V – 350V</td>
<td>1.5A</td>
<td>70W</td>
<td>100kHz 100V/μs</td>
<td>Low cost, small size 40x40mm</td>
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</tr>
<tr>
<td>PAD188</td>
<td>±25V - ±262.5V 50V – 525V</td>
<td>0.1A</td>
<td>10W</td>
<td>2kHz 3V/μs</td>
<td>External compensation, programmable C/L, conformal coated, 1mA quiescent current</td>
<td>37</td>
</tr>
<tr>
<td>PAD189A</td>
<td>±50V - ±525V 100V – 1050V</td>
<td>1.5A</td>
<td>180W</td>
<td>10kHz 30V/μs</td>
<td>External compensation, 4-wire current limit, conformal coated</td>
<td>37</td>
</tr>
<tr>
<td>PAD195</td>
<td>±50V - ±520V 100V – 1040V</td>
<td>0.1A</td>
<td>40W</td>
<td>1kHz 20V/μs</td>
<td>External compensation, programmable C/L, conformal coated, 1mA quiescent current</td>
<td>37</td>
</tr>
<tr>
<td>PAD196</td>
<td>±50V - ±1025V 100V – 2050V</td>
<td>0.05A</td>
<td>24W</td>
<td>0.5kHz 5V/μs</td>
<td>External compensation, programmable C/L, conformal coated, 1mA quiescent current</td>
<td>37</td>
</tr>
<tr>
<td>PAD541</td>
<td>±10V - ±50V 20V – 100V</td>
<td>5A</td>
<td>100W</td>
<td>57kHz 14V/μs</td>
<td>Low cost SIP design, 16mm height, external compensation, programmable C/L</td>
<td>37</td>
</tr>
</tbody>
</table>
HA51U Series

±500V TO 6000VPP, 15W – 20W PROGRAMMABLE HIGH SPEED HIGH VOLTAGE AMPLIFIERS

**FEATURES**
- ±500V to 6000VPP
- 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.

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

Model HA51U-6P2: status PRELIMINARY

**REMARKS**

- Slew rate and bandwidth measured at CL = 100pF
- Full power bandwidth: 1% distortion
- Small signal bandwidth: -3dB

**DIMENSIONS**

**Modular Case**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>105.0</td>
</tr>
<tr>
<td>Width</td>
<td>59.3</td>
</tr>
</tbody>
</table>

**3U Cassette**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>81.0</td>
</tr>
<tr>
<td>Width</td>
<td>128.4</td>
</tr>
<tr>
<td>Height</td>
<td>225</td>
</tr>
</tbody>
</table>

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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 - 240VAC ±10% 50/60Hz
- **Input Current:** 1,9ARMS at VLine=115VAC, nominal load
  0,95ARMS at VLine=230VAC, 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, without cable)
- **Weight:** ca. 5.1kg without amplifier modules
-200V TO +600V, ±10mA
64 CHANNEL PRECISION HIGH VOLTAGE AMPLIFIER

FEATURES
- 64 Channels
- -200V to +600V, ±10mA per Channel
- Optimized for Capacitive Loads
- Voltage Monitor Outputs
- High Precision
- High Stability
- Fully Protected
- Interlock Inputs
- 19" / 7U Housing

APPLICATIONS
- Multichannel Actuator Drive
- EAP
- Piezo
- Mirror Deflection / Deforming
- Electrophoresis
- Ion Beam Deflection
- ER Fluids
- Electro Optics
- MEMS
- High Voltage Testing

Rack mountable Precision High Voltage Amplifier in a 19" 7U high subrack. Sixty-four independent amplifier channels provide output voltages in the range of -200V and +600V at output currents of ±10mA. The output voltage of each channel can be controlled by means of a setpoint input. Signal gain is 60, the control voltage ranges from -3,33V to +10V. Differential amplifiers on the setpoint inputs prevent any ground loops and provide excellent noise suppression. Each channel is equipped with an output voltage monitor.

The unit consists of 8 amplifier modules with 8 channels each. The amplifier channels feature high precision, high stability as well as very low ripple and noise. The amplifier outputs are protected against overload, short circuit and over-temperature.

The channels are grouped into eight standard 19” plug-in units HA8XB10A of 6U/6HP.

The amplifier is optimized for driving multi-channel capacitive or resistive-capacitive loads. It can easily drive electroactive polymer actuators, piezo elements, electrorheological fluids, ion beam deflectors and many other loads. The high voltage outputs are protected against overload, short circuit and overvoltage. Operating states and fault conditions are displayed on the front panels.

A safety interlock circuit is provided to integrate the unit into an emergency shutdown circuit. When the interlock loop is open, the internal high voltage sources are being shut down. Two interlock inputs and a red HV OFF palm button are available. The red indicator lamp HV ON signals that the internal high voltage sources are switched on. Using a TTL-compatible INHIBIT-input, the output voltage of each channel can be functionally set to zero very fast.

The robust metal case can be either mounted into a 19" rack or used as a table-top device. Temperature controlled fans are cooling the unit.

An external multi channel signal generator is needed to feed the setpoint inputs. The input signal interface of the HAR-8X8A matches the signal interface and the cabling of the National Instruments NI6723 arbitrary signal generators.

The standard output voltage range is -200V to +600V. Versions with output voltage ranges of ±500V or 0 to +1000V are available. Output voltage ranges can be installed mixed in a single mainframe in groups of eight.

Customized and full custom models are available on request.
**SPECIFICATIONS**

- Output Voltage: -200 – +600V, bipolar
- Output Current: ±10mA
- Full Power Bandwidth: DC → 10,000Hz @ CL=500pF
- Slew Rate: > 20V/μs @ CL=500pF
  > 3.2V/μs @ CL=3000pF
- Control Input: -3.33V – +10V (10V ≈ 600V); Rin=50kΩ
- Gain: 60 ±0,3%
- Offset Voltage (RTO): < 20mV
- Ripple / Noise: < 20mVpp @ CL=500pF, 1Hz – 20kHz
- Monitor Output (V): ±10V (10V ≈ 600V), SMB
- Line Voltage: 100 - 240VAC, ±10%, 50/60 Hz
- Ambient Temperature: 0 - 50°C (Derating from 40°C)
- Dimensions (h x w x d): 311 x 449/480 x 420/510mm³
- Weight: 20kg

**REAR VIEW**

All 64 high voltage outputs are brought out to a single multi pole ODU-MAC connector. Each channel features an output contact an individual output return contact. Coaxial output cables can easily be connected.

Fully assembled output cables and other types of output connectors are available on request.
±500V, 1W, 12 CHANNEL PRECISION HIGH VOLTAGE AMPLIFIER

- 12 Channels
- Output ±500V
- High Precision
- High Stability
- Low Noise
- Remote On / Off
- Monitor Outputs
- Displays for Output Voltage and Current

APPLICATIONS
- Electrostatic deflection
- HV Voltage Reference
- Testing
- Ion guidance

The high voltage amplifier HAR12A is a 19” rack-mountable unit of 3U. Twelve channels provide output voltages in the range of –500V to +500V at load current of ±2mA each.

Each output voltage is controlled by a control voltage which can be either provided via its nominal value input or set by a 10-turn potentiometer. The control voltage ranges from –10V to +10V and the gain is 50.

Monitor outputs for voltage and current are provided on each channel. Furthermore, each channel is equipped with a fast inhibit input effectively clamping the output voltage to 0V.

The amplifier channels feature high precision, very high stability and low noise, thereby making the HAR12A well suited even for voltage reference applications.

Both the output voltage and the load current of each channel can be displayed simultaneously on two 4-digit red LED-displays. A rotary switch for channel selecting is provided.

All amplifier outputs are protected against overload, short circuit and transient overvoltage.

High-Speed versions up to 15kHz bandwidth / 50V/μs slew rate are available on request.

The output connectors are alternatively BNC connectors (HAR12 mainframe) or SHV connectors (HAR12S mainframe).

SPECIFICATIONS

- Output Voltage: -500 V to +500 V
- Load Current: -2 mA to +2 mA
- Gain: 50 ±0.2%
- Temp. Coeff.: 5 ppm/K (typ.)
- Stability: < ±100 ppm
- Load Regulation: < 100 ppm (no load / full load)
- Ripple / Noise: < 10 mVpp / < 1 mVRMS
- Digital Panel Meters: 4-digit red LED displays
- Voltage Monitor: -10 - +10V == -500V - +500V ±0.2 %
- Current Monitor: -10 - +10V == -2mA - +2mA ±0.2 %
- Inhibit Input: Amplifier On: -15V - +1.5V
- Amplifier Off: +2.4V - +15V or open
- Inhibit Response Time: Amplifier On→Off: < 10 µs
- Amplifier Off→On: ca. 2.5 ms
- Power Bandwidth: > 500 Hz
- Slew Rate: > 2 V/μs
- Supply Voltage: 95 - 265 VAC , 47 - 63 Hz, 0.5 ARMS @230 VAC
- Operating Temp: 0 °C to +40 °C
- Dimensions (WxHxD): mm³
- Weight: 9.5 kg

BLOCK DIAGRAM (ONE CHANNEL SHOWN)
±500V, 1W, 2 CHANNEL PRECISION HIGH VOLTAGE AMPLIFIER MAINFRAME

- 2 Channels
- Output ±500V
- High Precision
- High Stability
- Low Noise
- Remote On / Off
- Monitor Outputs
- Displays for Output Voltage and Current

**APPLICATIONS**

- Electrostatic deflection
- HV Voltage Reference
- Testing
- Ion guidance

The HAR2 is a mainframe to be equipped with 1 or 2 high precision high voltage amplifier modules HA05B2 (3U high, 6 HP wide plug-in modules). The channels provide output voltages in the range of −500V to +500V at load current of ±2mA each. The following refers to a HAR2 mainframe equipped with HA05B2 HV amplifier modules.

The output voltage is controlled by a control voltage or set by a 10-turn potentiometer. The control voltage ranges from −10V to +10V, the gain is 50.

Monitor outputs for voltage and current are provided on each channel.

Furthermore, each channel is equipped with a fast inhibit input effectively clamping the output voltage to 0V. The amplifier channels feature high precision, very high stability and low noise, thereby making the HAR2 well suited even for voltage reference applications.

Both the output voltage and the load current of a selected channel can be displayed simultaneously on two 4-digit LED displays. All amplifier outputs are protected against overload, short circuit and transient overvoltage.

High-Speed versions up to 15kHz bandwidth / 50V/μs slew rate are available on request.

The HAR2 is available as a tabletop or a wall mountable model (HAR2-W).

**SPECIFICATIONS**

- **Output Voltage:** -500 V to +500 V
- **Load Current:** -2 mA to +2 mA
- **Gain:** 50 ±0,2%
- **Temp. Coeff.:** 5 ppm/K (typ.)
- **Stability:** < ±100 ppm
- **Load Regulation:** < 100 ppm (no load / full load)
- **Ripple / Noise:** ≤ 10 mVPP / ≤ 1 mVrms
- **Digital Panel Meters:** 4-digit red LED displays *
- **Voltage Monitor:** -10 - +10V == -500V - +500V ±0.2%
- **Current Monitor:** -10 - +10V == -2mA - +2mA ±0.2%
- **Output Protection:** overload, short circuit, transient overvoltage
- **Inhibit Response Time:** Amplifier On→Off: < 10 μs
- **Amplifier Off→On:** ca. 2.5 ms
- **Power Bandwidth:** > 500 Hz
- **Slew Rate:** > 2 V/μs
- **Supply Voltage:** 22.8 - 25.2 Vdc *
- **0.6 ADC @24 Vdc * **
- **Operating Temp:** 0 °C to +60 °C *
- **Dimensions HAR2:** 141x139x264 *
- **Dimensions HAR2W:** 177x134x264 *
- **[WxHxD]:** mm³
- **Weight:** 1.9 kg *

* refers to the HAR2 mainframe, all other data refers to HA05B2 modules

**BLOCK DIAGRAM (ONE CHANNEL SHOWN)**

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HA05B2

±500V, 1W, PRECISION HIGH VOLTAGE AMPLIFIER

**FEATURES**
- Output ±500V / ±2mA
- High Precision
- High Stability
- Low Noise
- Remote On / Off
- Monitor Outputs
- 19”-Plug-in Unit 3HU / 6HP

**APPLICATIONS**
- Electrostatic deflection
- HV Voltage Reference
- Testing
- Ion guidance

The high voltage amplifier HA05B2 is a standard 19” plug-in unit of 3U / 6HP. The output voltage is ±500V to +500V at load current of ±2mA. The control voltage ranges from –10V to +10V and the gain is 50.

The amplifier features high precision, very high stability and low noise, thereby making the unit well suited even for voltage reference applications.

The output voltage is controlled by a control voltage which can be either provided via its nominal value input or set by a 10-turn potentiometer. Monitor outputs for voltage and current are provided. Furthermore, the unit is equipped with a fast inhibit input effectively clamping the output voltage to 0V.

The output is protected against overload, short circuit and transient overvoltage. High-Speed versions up to 15kHz bandwidth / 50V/μs slew rate are available on request.

**SPECIFICATIONS**

Output Voltage: -500 V to +500 V  
Load Current: -2 mA to +2 mA  
Gain: 50 ±0.2%  
Temp. Coeff.: 5 ppm/K (typ.)  
Stability: < ±100 ppm  
Load Regulation: < 100 ppm (no load / full load)  
Ripple / Noise: ≤ 10 mVrms / ≤ 1 mVrms  
Voltage Monitor: -10 - +10V == -500V - +500V ±0.2 %  
Current Monitor: -10 - +10V == -2mA - +2mA ±0.2 %  
Inhibit Input: Amplifier On: -15V - +1.5V  
            Amplifier Off: +2.4V - +15V or open  
            Amplifier Off→On: < 10 μs  
            Amplifier On→Off: ca. 2.5 ms  

Supply Voltage +24V: +20 - +28 VDC , < 100 mA  
Supply Voltage ±540V: +530 - ±550 VDC , < 4 mA  
Supply Voltage -540V: -530 - ±550 VDC , < 4 mA  

Power Bandwidth: > 500 Hz  
Slew Rate: > 2 V/μs  
Operating Temp: 0 °C to +40 °C

**CONNECTORS**

Front panel: Inputs and monitor outputs via BNC connectors  
Back panel: Supply voltages and HV output via DIN41612 type F connector

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±1250V, ±2mA
PRECISION HIGH VOLTAGE AMPLIFIER MODULE

• FEATURES
  - ±1250V / ±2mA
  - High Precision, High Stability
  - Low Noise
  - High Speed
  - Inhibit Input
  - V/I Monitor Outputs
  - Local High Voltage Generation
  - Interlock Input

• APPLICATIONS
  - Electrostatic Deflection
  - EAP
  - Mirror Deflection / Deforming
  - Electrophoresis
  - Ion Beam Deflection
  - Electro Optics
  - MEMS
  - Mass Spectrometry
  - High Voltage Testing

The **HA1.25B2-S** is a high precision high voltage amplifier 3U / 8HP / 220mm plug-in card. It provides output voltages between -1250V and +1250V at ±2mA. The amplifier output is available via an SHV connector located on the front panel.

Signal gain is 125, the input voltage range is ±10V. The amplifier features high precision, very high stability, high speed as well as very low ripple and noise.

The output voltage can be controlled by means of a differential setpoint input. The amplifier is equipped with a voltage and current monitor and a TTL compatible INHIBIT input.

The amplifier output is protected against overcurrent, short circuit, overvoltage and high voltage flashover / arc.

External supply voltage is +24V. The high voltage generator is part of the module.

A safety interlock circuit is provided to integrate the unit into an emergency shutdown circuit. When the interlock loop is open, the internal high voltage sources are being shut down.

• TECHNICAL DATA
  - Output Voltage: -1250V ... +1250V, bipolar
  - Output Current: ±2mA
  - Full Power Bandwidth: DC ... >4kHz @ C_L=0
  - DC ... >1kHz @ C_L=200pF
  - Small Signal Bandwidth: DC ... >10kHz @ C_L=200pF
  - Control Input: ±10V (10V = 1250V), BNC, R = 50kΩ
  - DC Gain: 125 ±0,2%
  - Temperature Coefficient: typ. 10ppm/K
  - Load Regulation: < 50ppm
  - Ripple / Noise: < 30mVpp / < 4mVRMS @ CL=200pF
  - Monitor Output (V): ±10V (10V = 1250V), BNC
  - Monitor Output (I): ±10V (10V = 2mA), BNC
  - INHIBIT Input: TTL compatible, via rear connector
  - Output Connector: SHV
  - Supply Voltage: +24VDC ±10%
  - Ambient Temperature: Operation: 0 - +40°C
  - Storage: -25 - +70°C
  - Dimensions: 3U x 8HP x 220mm

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±2000V, ±5mA

PRECISION HIGH SPEED HIGH VOLTAGE AMPLIFIER MODULE

- **FEATURES**
  - ±2000V / ±5mA
  - High Precision, High Stability
  - Low Noise
  - High Speed
  - Differential Mode
  - Inhibit Input
  - V/I Monitor Outputs
  - Local High Voltage Generation
  - Interlock Input

- **APPLICATIONS**
  - Electrostatic Deflection
  - Mirror Deflection / Deforming
  - Electrophoresis
  - Ion Beam Deflection
  - Electro Optics
  - MEMS
  - Mass Spectrometry
  - High Voltage Testing

The **HA2B5-S** is a high precision high voltage amplifier 3U / 8HP / 220mm plug-in card. It provides output voltages between -2000V and +2000V at ±5mA. The amplifier output is available via an SHV connector located on the front panel.

Signal gain is 200, the input voltage range is ±10V. The amplifier features high precision, very high DC stability, high speed as well as very low ripple and noise. The amplifier output is driven by a linear four quadrant high voltage power stage featuring very low distortion. It easily drives capacitive and resistive/capacitive loads.

Optionally the amplifier modules are available with even lower noise at reduced bandwidth and slew rate.

Two amplifier modules can be configured to provide differential output voltages. In this case the input signal is fed to the master channel only. The slave channel provides the identical magnitude of the output voltage at inverse polarity.

The output voltage is controlled by means of a differential setpoint input. The amplifier is equipped with voltage and current monitor outputs and a TTL compatible INHIBIT input.

The amplifier output is protected against overcurrent, short circuit, overvoltage and high voltage flashover / arc.

External supply voltage is +24V. The high voltage generator is part of the module.

A safety interlock circuit is provided to integrate the unit into an emergency shutdown circuit. When the interlock loop is open, the internal high voltage sources are being shut down.

Mainframes / subracks are available to accommodate several amplifier plug-in cards.

Customized and full custom models of the high voltage amplifier modules and mainframes are available on request.
**SPECIFICATIONS**

Output Voltage: -2000V ... +2000V, bipolar  
Output Current: ±5mA  
Full Power Bandwidth (-3dB):  
DC ... >6kHz @ C_L=0 *  
DC ... >2kHz @ C_L=200pF *  
Small Signal Bandwidth (-3dB):  
DC ... >20kHz @ C_L=200pF *  
Slew Rate:  
typ. 50V/μs @ C_L=0 *  
typ. 18V/μs @ C_L=200pF *  
Control Input:  
±10V (10V ≡ 2000V), BNC, R_i = 50kΩ  
DC Gain: 200 ±0,2%  
Temperature Coefficient: typ. 25ppm/K  
Load Regulation: < 50ppm  
Ripple / Noise: < 20mVrms @ C_L=200pF *  
Monitor Output (V): ±10V (10V ≡ 2000V), BNC  
Monitor Output (I): ±10V (10V ≡ 10mA), BNC  
INHIBIT Input: TTL compatible, via rear connector  
Output Connector: SHV  
Supply Voltage: +24Vdc ±10%  
Ambient Temperature:  
Operation: -10 - +60°C  
Storage: -25 - +70°C  
Dimensions: 3U x 8HP x 220mm

* 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.

**SPECIFICATIONS HAR42-4 SUBRACK**

Model HAR42-4 is a 4U / 42HP subrack to accommodate up to four amplifier modules. It is equipped with internal power supplies, speed controlled cooling fans, a common Interlock input for all channels, and a HV OFF button.

Line Voltage: 100 - 240V AC ±10% 50/60Hz  
Input Current: 1,3A RMS at V Line =115V AC , nominal load  
0,65A 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 (h x w x d): ca. 177 x 249 x 382 mm³  
Weight: ca. 4kg without amplifier modules
HA61G-6B10

±6kV, ±10mA / ±20mA
PRECISION PROGRAMMABLE HIGH VOLTAGE AMPLIFIER
WITH INTEGRATED SIGNAL GENERATOR

• FEATURES
  - ±6000V / ±10mA
  - Programmable Current Limit
  - Integrated DDS/ARB Signal Generator
  - High Precision, High Stability
  - Low Noise
  - High Speed
  - Inhibit Input
  - V/I Monitor Outputs
  - Interlock Input and HV OFF Button

• APPLICATIONS
  - General High Voltage Testing
  - EAP
  - ER Fluids
  - Emulsion separation
  - Electrophoresis
  - Ion Beam Deflection
  - Electro Optics

The HA61G-6B10 is a fast precision high voltage amplifier with integrated signal generator in a 19" rack mountable case. This single channel amplifier provides output voltages of -6000V to +6000V at ±10mA (static) and 20mA (dynamic). The power bandwidth is 5kHz.

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 600, 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 high voltage connector on the rear. Operational and overload conditions are being 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 open, the internal high voltage sources are being 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 provided to generate standard waveforms like sinewave, trapezoid, squarewave, pulse, sawtooth and noise as well as fully arbitrary waveshapes. 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 synchronized to other generators or signal sources.

Customized and full custom models are available on request.
**TECHNICAL DATA**

Output Voltage: -6000V ... +6000V
Output Current: ±10mA / ±20mA
Full Power Bandwidth: > DC ... 5kHz @ C_L=50pF (1% distortion limit) *
Small Signal Bandwidth: > DC ... 30kHz @ C_L=50pF *
Slew-Rate: > 400V/µs @ C_L=50pF *
> 200V/µs @ C_L=50pF *
Noise: < 50mVRMS @ C_L=500pF (10Hz ... 50kHz) *
Control Input: ±10V (10V = 6000V), BNC, R_i = 50kΩ
DC-Gain: 600 ±0.3%
Offset Voltage (RTO): < ±100mV
Monitor Output (V): ±10V (10V = 6000V ±0.3%), BNC
Monitor Output (I): ±10V (10V = 40mA ±0.5%), BNC
Interlock: 24V, internally fed, Combicon
INHIBIT Input: TTL compatible, BNC
SYNC I/O: BNC
Output Connector: HV Connector

An output cable of 2m length is included.

Output GND is connected the chassis and protective earth

Cooling: temperature controlled fans

Line Voltage: 100 - 240VAC ±10% 50/60Hz
Power Consumption: ca. 180VA (12000Vpp, 5kHz, 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. 15kg

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

* 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.
HA61GD-3B30

DUAL CHANNEL ±3kV, ±30mA / ±40mA
PRECISION PROGRAMMABLE HIGH VOLTAGE AMPLIFIER WITH INTEGRATED SIGNAL GENERATOR

FEATURES
- Dual Channel
- ±3000V / ±30mA
- Integrated DDS/ARB Signal Generator
- High Precision, High Stability
- Programmable Current Limit
- High Speed
- Inhibit Input
- V/I Monitor Outputs
- Interlock Input and HV OFF Button

APPLICATIONS
- Materials Research
- Piezo Poling
- EAP
- ER Fluids
- Emulsion separation
- Electrostatic Deflection
- General High Voltage Testing

The HA61GD-3B30 is a dual channel fast precision high voltage amplifier with integrated signal generator in a 19” rack mountable case. This amplifier provides output voltages of -3000V to +3000V at ±30mA (static) and 40mA (dynamic). The dynamic output current is available for signal frequencies down to 1Hz.

The amplifier features high precision, high stability and 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 Piezo elements, EAP actuators, electrorheological fluid elements, electrostatic deflection electrodes and many other loads.

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

Both amplifier channels feature identical specifications and interfaces.

A differential ±10V amplifier input prevents any ground loops and provides excellent noise suppression. The voltage gain is fixed to 300, 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 outputs are made available via SHV high voltage connectors.

Operational and overload conditions are being 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 open, the internal high voltage sources are being 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 provided to generate standard waveforms like sinewave, trapezoid, squarewave, pulse, sawtooth and noise as well as fully arbitrary waveshapes. 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.

Customized and full custom models are available on request.
**TECHNICAL DATA**

Output Voltage: -3000V ... +3000V  
Output Current: ±30mA / ±40mA  
Full Power Bandwidth: > DC ... > 15kHz @ C_L=50pF (1% distortion limit) *  
Small Signal Bandwidth: > DC ... > 50kHz @ C_L=50pF  
Slew-Rate: > 500V/μs @ C_L=0*  
Noise: < 50mVrms @ C_L=500pF (10Hz ... 50kHz)  
Control Input: ±10V (10V ≈ 3000V), BNC, R_I = 50kΩ  
DC-Gain: 300 ±0.3%  
Offset Voltage (RTO): < ±50mV  
Monitor Output (V): ±10V (10V ≈ 3000V ±0.3%), BNC  
Monitor Output (I): ±10V (10V ≈ 100mA ±0.5%), BNC  
Interlock: 24V, internally fed, Combicon  
INHIBIT Input: TTL compatible, BNC  
Output Connector: HV Connector  

An output cable of 2m length is included.  

Output GND is connected the chassis and protective earth  

Cooling: temperature controlled fans  
Line Voltage: 100 - 240VAC ±10% 50/60Hz  
Power Consumption: ca. 400VA (6000Vpp, 15kHz, C_L=50pF)  
Ambient Temperature: Operation: 0 - +40°C  
Dimensions (d x w x h): ca. 450 x 449/480 x 133mm³ (19” / 3U)  
Weight: ca. 25kg  

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.
±4kV, ±10mA / ±20mA
PRECISION PROGRAMMABLE HIGH VOLTAGE AMPLIFIER

- FEATURES
  - ±4000V / ±10mA
  - High Precision, High Stability
  - Low Noise
  - Programmable Current Limit
  - 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 HA61U-4B10 is a fast precision high voltage amplifier with 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 (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 being 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 open, the internal high voltage sources are being 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 to control the amplifier and set static output voltage and current limit. Monitor values of output voltage, output current as well as internal operational parameters can be read.

Customized and full custom models are available on request.
**TECHNICAL DATA**

- **Output Voltage:** -4000V ... +4000V
- **Output Current:** ±10mA / ±20mA
- **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:**< 35mVrms @ C_L=500pF (10Hz ... 50kHz) *
  < 10mVpp 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
- **INHIBIT Input:** TTL compatible, BNC
- **Output Connector:** SHV Connector
  An output cable of 1m length is included.

Output GND is connected the chassis and protective earth

- **Cooling:** temperature controlled fans
- **Line Voltage:** 100 - 240VAC ±10% 50/60Hz
- **Power Consumption:** ca. 180VA (8000Vpp, 7kHz, 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 88mm³ (19” / 2U)
- **Weight:** ca. 10kg

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

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* 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.
±6kV, ±20mA / ±40mA
PRECISION PROGRAMMABLE HIGH VOLTAGE AMPLIFIER

**FEATURES**
- ±6000V / ±20mA
- High Precision, High Stability
- Low Noise
- Programmable Current Limit
- 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 **HA61U-6B20** is a fast precision high voltage amplifier in a 19" rack mountable case. This single channel amplifier provides output voltages of -6000V to +6000V at ±20mA (static) and 40mA (dynamic). The dynamic output current is available for signal frequencies down to 10Hz. The amplifier’s power bandwidth is 8kHz.

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 600, 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 high voltage connector at the rear. Operational and overload conditions are being 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 open, the internal high voltage sources are being 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 to control the amplifier and set static output voltage and current limit. Monitor values of output voltage, output current as well as internal operational parameters can be read.

Customized and full custom models are available on request.
**TECHNICAL DATA**

- **Output Voltage:** -6000V ... +6000V
- **Output Current:** ±20mA / ±40mA
- **Full Power Bandwidth:** > DC ... > 8kHz @ C_L=50pF (1% distortion limit) *
- **Small Signal Bandwidth:** > DC ... > 50kHz @ C_L=50pF *
- **Slew-Rate:**
  - > 500V/μs @ C_L=0 *
  - > 300V/μs @ C_L=50pF
- **Noise:** < 50mVRMS @ C_L=500pF (10Hz ... 50kHz) *
- **Control Input:** ±10V (10V = 6000V), BNC, R_L = 50kΩ
- **DC-Gain:** 600 ±0.3%
- **Offset Voltage (RTO):** < ±100mV
- **Monitor Output (V):** ±10V (10V = 6000V ±0.3%), BNC
- **Monitor Output (I):** ±10V (10V = 100mA ±0.5%), BNC
- **Interlock:** 24V, internally fed, Combicon
- **INHIBIT Input:** TTL compatible, BNC
- **Output Connector:** HV Connector
  - An output cable of 2m length is included.

**Output GND** is connected the chassis and protective earth

- **Cooling:** temperature controlled fans
- **Line Voltage:** 100 - 240VAC ±10% 50/60Hz
- **Power Consumption:** ca. 300VA (12000Vpp, 7kHz, 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. 20kg
- **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.*
HA77GM-2B150

±2kV, ±150mA, 30kHz
PRECISION PROGRAMMABLE HIGH VOLTAGE AMPLIFIER WITH INTEGRATED SIGNAL GENERATOR AND USER INTERFACE

FEATURES
- ±2000V / ±150mA
- Programmable Current Limit
- Integrated DDS/ARB Signal Generator
- Local User Interface w/ Display
- High Precision, High Stability
- Low Noise, High Speed
- Inhibit Input
- V/I Monitor Outputs
- Interlock Input and HV OFF Button

APPLICATIONS
- General High Voltage Testing
- EAP
- ER Fluids
- Emulsion separation
- Electrophoresis
- Ion Beam Deflection
- Electro Optics

The HA77GM-2B150 is a fast precision high voltage amplifier with integrated signal generator in a 19" rack mountable case. This single channel amplifier provides output voltages of -2000V to +2000V at ±150mA. The power bandwidth is 30kHz. For local operation a user interface with LC display is provided.

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 200, 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 an SHV connector on the rear. Operational and overload conditions are being 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 open, the internal high voltage sources are being 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 provided to generate standard waveforms like sinewave, trapezoid, squarewave, pulse, sawtooth and noise as well as fully arbitrary waveshapes. 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 or via the local control elements.

An implemented DDS/ARB signal generator can be synchronized to other generators or signal sources.

An LC display equipped with soft keys and a jog wheel allows for local operation of the signal generator and control of the amplifier.

Customized and full custom models are available on request.
**TECHNICAL DATA**

- **Output Voltage:** -2000V ... +2000V
- **Output Current:** ±150mA
- **Full Power Bandwidth:** > DC ... 30kHz @ C_L=300pF *
- **Small Signal Bandwidth:** > DC ... 100kHz @ C_L=300pF *
- **Slew-Rate:**
  - > 650V/μs @ C_L=0 *
  - > 400V/μs @ C_L=300pF *
- **Noise:** < 10mVRMS @ C_L=300pF *
- **Control Input:** ±10V (10V = 2000V), BNC, R_i = 50kΩ
- **DC-Gain:** 200 ±0.3%
- **Offset Voltage (RTO):** < ±50mV
- **Monitor Output (V):** ±10V (10V = 2000V ±0.3%), BNC
- **Monitor Output (I):** ±10V (10V = 200mA ±0.5%), BNC
- **Interlock:** 24V, internally fed, Combicon
- **INHIBIT Input:** TTL compatible, BNC
- **SYNC I/O:** BNC
- **Output Connector:** SHV
  
  An output cable of 2m length is included.

Output GND is connected the chassis and protective earth

- **Cooling:** temperature controlled fans
- **Line Voltage:** 100 - 240VAC ±10% 50/60Hz
- **Power Consumption:** ca. 500VA (4000Vpp, 30kHz, C_L=300pF)
- **Ambient Temperature:**
  - Operation: 0 - +40°C
  - Storage: -25 - +70°C
- **Dimensions (d x w x h):** ca. 450 x 449/480 x 266mm³ (19” / 6U)
- **Weight:** ca. 25kg
- **Safety:** according to EN 61010-1
- **EMC:** according to EN 61326-1

* 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.
±3kV, 3W, 4 CHANNEL HIGH SPEED, HIGH VOLTAGE AMPLIFIER

- **FEATURES**
  - 4 Channels
  - Output ±3kV
  - DC bias function
  - Differential Output Mode
  - Monitor Outputs
  - Remote On / Off
  - High speed response 12V/µs
  - DC output voltage monitor (4½ digit DVM)
  - Limit Displays
  - CE compliant

HVA-3B4 is rack-mountable type, fast response high voltage amplifier. It provides high voltage outputs in reference to its input wave forms such as Sine, Triangle, Saw Tooth and Square Wave Forms.

- **SPECIFICATIONS**
  - Supply Voltage: 95 - 265 VAC, 50/60Hz, 1Ø
  - Output Voltage Range: -3 kV - +3 kV
  - Output Current Range: -1 mA - +1 mA
  - Output Control: External voltage control -10 - +10V (input impedance: 10kΩ), BNC plug
  - Gain: 300
  - Slew-Rate: ≥ 12 V/µs
  - DC bias: 10 turn potentiometer -3kV - +3kV
  - Regulation: Line ±0.05% (±10% line change)
    Load 0.05% (10 - 100% load change)
  - Ripple: ≤ 1 Vrms
  - Digital Panel Meter: 4½ digit display (DC Output Voltage Monitor)
  - Voltage Monitor: -10 - +10V / -3 kV - +3 kV ±0.1% BNC plug
  - Protection: Protection against momentary Short Circuit, Arc discharge
  - Operating Temp.: 0°C - +40°C
  - Storage Temp.: -20°C - +60°C
  - Weight: 18 kg

- **BLOCK DIAGRAM (2 CHANNELS SHOWN)**

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PA120A

HIGH SPEED POWER AMPLIFIER
±30V, ±2ADC, ±10AP, 1.5MHz

- FEATURES
  - Bandwidth DC-1.5MHz
  - Slew-Rate 250V/μs
  - Load current >10AP
  - Offset <3mV
  - Sophisticated limiting and protection concept

- APPLICATIONS
  - Research
  - Development (in particular power electronics)
  - Pulse physics
  - Component testing
  - Quality assurance
  - Measurement and test engineering

PA120A is a high speed DC-coupled power amplifier featuring power bandwidth of 1.5MHz.

The output stage of PA120A provides output voltages ranging from -30V to +30V, whereas load currents of ±4A and peak load currents up to ±10A are available.

The amplifier comes with two input channels; their signals are added together. This allows e.g. for providing an AC signal with a DC offset. Another example would be superimposing of the wanted signal by a disturbing signal. Input resistance (50Ω / 10kΩ) as well as coupling mode (AC / GND / DC) and gain (x1 / x10) can be set for each input channel separately.

LED indicators at the inputs (LIMIT + / LIMIT -) signalise overmodulation of the input stage.

The power output stage is protected against overload and overtemperature. The supply voltage of the output stage is varied depending on junction temperature of its transistors (Tj LIMIT+ / Tj LIMIT-). This method allows for achieving high output currents even at small output voltages.

Monitoring of the junction temperature also makes a fast current limitation unnecessary, thus allowing for very high peak output currents (>10A). If either the junction temperature exceeds 125°C (Tj OVER) or the maximum heatsink temperature is exceeded (Ths OVER), the output of the amplifier will be disconnected.

If the output voltage level exceeds its positive or negative limit, the appropriate output limit indicator LED lights up (LIMIT+ / LIMIT-). The output voltage will be then reduced, preventing overmodulation of the power output stage.
## SPECIFICATIONS

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<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
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**PAD Series**

±5V – ±1025V, 10W – 450W
POWER OPERATIONAL AMPLIFIER MODULES

- **FEATURES**
  - Up to ±1025V / 2050V
  - Up to 30A / 40A
  - High Power Density
  - Up to 450W Output Power
  - High Speed up to 350kHz
  - External Compensation
  - PCB Mountable
  - Integrated Cooling Fans
  - Programmable Current Limit
  - Over Temperature Shutdown
  - Temperature Monitor
  - Evaluation Kits Available

- **APPLICATIONS**
  - Piezo Driver
  - Industrial Ink Jet Head Driver
  - Magnetic deflection
  - Semiconductor Testing
  - Ultrasound Transducer Driver

<table>
<thead>
<tr>
<th>MODEL</th>
<th>SUPPLY VOLTAGE</th>
<th>OUTPUT CURRENT</th>
<th>MAX. POWER DISSIPATION</th>
<th>POWER BANDW. SLEW RATE</th>
<th>DIMENSIONS L x W x H</th>
<th>FEATURES</th>
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<tbody>
<tr>
<td>PAD01</td>
<td>±15V - ±50V</td>
<td>5A / 7A^P</td>
<td>30W</td>
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<td>250W</td>
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<td>10V/μs</td>
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<td>OUTPUT CURRENT</td>
<td>MAX. POWER DISSIPATION</td>
<td>POWER BANDW.</td>
<td>SLEW RATE</td>
<td>DIMENSIONS L x W x H</td>
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<td>PAD39</td>
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<td>±5V - ±50V</td>
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## PAD Series

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<tr>
<th>MODEL</th>
<th>SUPPLY VOLTAGE</th>
<th>OUTPUT CURRENT</th>
<th>MAX. POWER DISSIPATION</th>
<th>POWER BANDW. SLEW RATE</th>
<th>DIMENSIONS L x W x H</th>
<th>FEATURES</th>
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<tr>
<td>PAD118</td>
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<td>30A / 40AP 400W</td>
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<td>PAD119A</td>
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<td>40.0 x 40.0 x 53.2mm³</td>
<td>Low cost, high power bandwidth, 200V/μs slew rate</td>
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<td>MODEL</td>
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<td>DIMENSIONS L x W x H</td>
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<td>Low cost, high power bandwidth, 200V/μs slew rate, small size</td>
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<td>OUTPUT POWER</td>
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<td>POWER BANDW.</td>
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