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**PRICE LIST JULY 2020 – SEPTEMBER 2020** (€-version), REV. B

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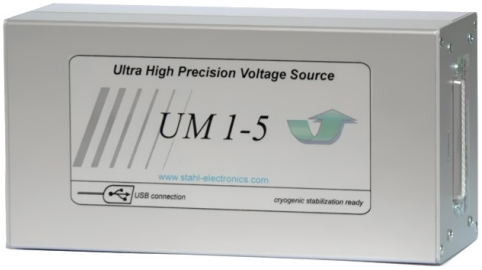
*Solutions for Quantum Computing and Precision Experiments*



| Device | Price* € | Lead Time weeks |
|---|---|---|
| # UM Series<br>  <br>***World's most precise Multichannel Voltage Source***<br>*for precision expriments, quantum computing*<br>- **$3 \cdot 10^{-8}$ short term stability (rms)**<br>- **1µV or better resolution**<br>- **ppm-grade absolute accuracy**<br>- **very simple to program**<br>  <br>  <br>**- Quality made in Germany -**<br>7 years of warranty | | |
| Versions:<br>all version: 3 ultra high precision channels (25 bit), 10 auxiliary channels (16 bit)<br><br>UM 1-14 unipolar range **-14V to 0V**, or **0V to +14V**<br>UM 1-14-LN extremely low noise and drift, see detailed specifications<br>UM 1-14-LN -SW switchable polarity **-14V to 0V** *and* **0V to +14V**<br><br>other voltage ranges on request | 40 500<br>43 020<br>46 800 | 18 to 26 |

*Stated prices include university/research discount of 10%
and do not include applicable VAT or other duties.

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|---|---|---|---|
| **BS/BSA Series**<br>***Quantum Computing, Cryo Biasing, STM***<br>High Precision, Multichannel, Low Noise DC sources and Source-Meter-Units | | | |
|  | | | |
| • very high accuracy and lowest noise<br>• excellent stability on **ppm level** (1 hour, 1 day)<br>• floatable ground, bipolar 4-quadrant outputs<br>• USB controlled, very easy to program (LabVIEW, Python)<br>• voltage and current readback (Source-Meter Functionality) | | | |
| **BS Series** *(**16 Bit** resolution)*<br>2, 4, 8, 10 or 16 output channels with common floatable ground;<br>available fixed output ranges **+/-100mV, +/-1V, +/-5V, +/-10V, +/-14V**,<br>up to +/-10mA output current | 2 channels<br>4 channels<br>8 channels<br>10 channels<br>16 channels | 5 310<br>5 490<br>6 570<br>7 920<br>9 900 | 5 to 7<br>5 to 7<br>5 to 7<br>5 to 7<br>6 to 9 |
| **BSA Series** (***19 Bit** resolution),*<br>output range / approx. resolution / max. output current<br>**+/-1V** 4µV +/-10mA<br>**+/-2V** 10µV +/-10mA<br>**+/-5V** 20µV +/-10mA<br>**+/-10V** 40µV +/-10mA<br>**+/-14V** 50µV +/-10mA<br>**+/-40V** 150µV +/- 5 mA | 1 channel<br>2 channels<br>4 channels | 5 490<br>6 975<br>9 450 | 4 to 9<br>4 to 9<br>5 to 10 |
| **- 5 years of warranty -** | | | |
| **Option MAN:** manual control elements on front side | | | |
|   | | | |
| Available in analog and digital version | analog buttons (10-turn)<br>digital steering wheel | 1 460<br>1 170 | |
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|---|---|---|
| **HV Series** (up to ± 400V)<br>**High Precision Multichannel DC Supplies, Low Noise**<br><br>- 5 years of warranty -<br><br>*PC controlled precision bipolar (4-quadrant) multi-channel high voltage sources with filtered low-noise outputs for*<br><br>• piezo elements, actuators<br>• beam lines / focussing elements<br>• ion optics and ion traps<br><br>**Featuring very low noise and ppm-grade stability**<br><br>  <br><br>• very high accuracy (typ. 0.015%), 24h stability on ppm level<br>• very low noise and very low ripple<br>• true bipolar range, continuous zero crossing<br>• common ground (floating optionally)<br><br>**including LabVIEW 8.2 user surface, and free source code modules; easy interfacing to C, Python and other languages** | | |
| Device Variants, 4 and 8 channels<br><br>HV 200-4 — 4 Channel Bipolar Version +/-200V — 6 300<br>HV 200-8 — 8 Channel Bipolar Version +/-200V — 6 660<br>HV 400-4 — 4 “ ” ” +/-400V — 6 354<br>HV 400-8 — 8 “ ” ” +/-400V — 7 920 | | 6 to 9 |
| Device Variants, 16 channels<br><br>HV 50 - 16 — 16 Channel Bipolar Version +/-50V — 8 100<br>HV 100-16 — ’’ ’’ ’’ +/-100V — 8 280<br>HV 200-16 — ’’ ’’ ’’ +/-200V — 8 604<br>HV 400-16 — ’’ ’’ ’’ +/-400V — 10 710 | | 10 to 13 |
| Additional Options:<br><br>Common Floating Ground +/-350V — 330<br>Common Floating Ground +/-1kV — 650<br>Common Floating Ground +/-2kV — 1 620<br>analog Modulation/Ramping Input — 3 150 | | |
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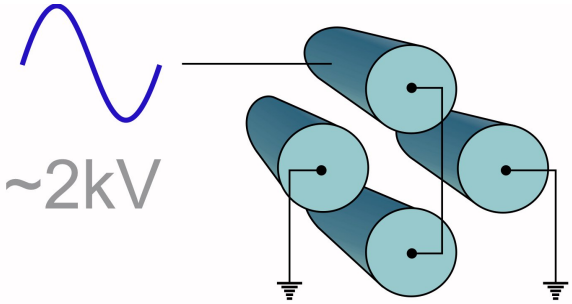
|---|---|---|
| **HF-DR Series**<br><br>**RF-Generators** for **ion traps, quadrupoles** (RFQs)<br>  <br><br>**- Resonant Version, Very High Precision -**<br>  <br>Key features:<br>● outstanding precise amplitude control, stability on **$5 \cdot 10^{-5}$ level**<br>● 1 ppm grade frequency accuracy (option)<br>● phase synch output, < 1µs shut-down to zero amplitude (option)<br>● USB control, easy software interfacing<br><br>type **HF-DR,** 1.0 to 6.0 MHz, up to 1800Vpp differentially<br>Option **FSO** fast amplitude-shut-down, for fast ion ejection (~300ns) | 18 450<br>4 140 | 10 to 11 |
| **Ion Guide / FAIMS Generator, rectangular wave**<br>**- medium power -**<br>  <br>Key features:<br>● rectangular output with variable duty cycle<br>● 500kHz to 1.4MHz, 500Vpp to 1200Vpp, depending on version | on request | 12 to 14 |
| **Broadband Ion-Trapping Voltage Generator**<br>**HR-DRB series**<br>  <br>Key features:<br>● simple and rugged design, no adjustments required (no resonance tuning)<br>● precise amplitude and phase control, optional PID regulated amplitude<br>● 2 x 180°-shifted outputs, sine wave<br>● for fast ion ejection/capturing<br>current models (other frequencies/amplitudes on request):<br>~10kHz to **400kHz, 2x 300Vpp**<br>~5kHz to **100kHz, 2x 600Vpp** | 9 450 | 8 to 11 |
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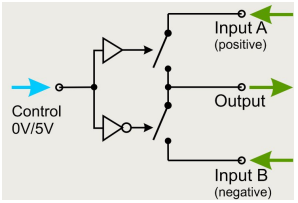
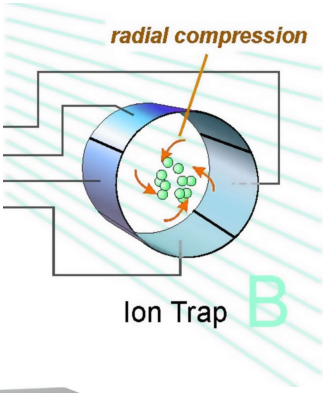
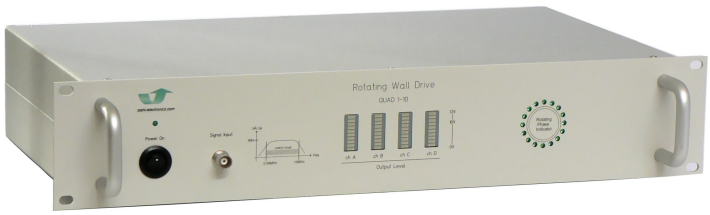
| **HS-Series** **Fast, low noise switches**<br><br>*for **Pulsing / Switching** of piezos, electrostatic elements*<br>*Single or Dual channel, 19" rack mount case*<br>***New 2020:** improved switching speed* | | |
|   SPDT circuit | | |
| **Single Switches** (SPDT) | | |
| max. 200V switching, 500V floating, 45ns rise time | 2 520 | 2 to 5 |
| max. 500V switching, 500V floating, 40ns rise time | 2 880 | 2 to 5 |
| max. 1000V switching, 800V floating, 80ns rise time | 3 510 | 2 to 5 |
| max. 2000V switching, 2000V floating, 80ns rise time | 3 960 | 2 to 5 |
| **Dual Switches** (2 independend SPDT switches per 19" case) | | |
| max. 200V switching, 500V floating, 45ns rise time | 3 150 | 4 to 6 |
| max. 500V switching, 500V floating, 40ns rise time | 3 510 | 4 to 6 |
| max. 1000V switching, 800V floating, 80ns rise time | 4 500 | 4 to 6 |
| max. 2000V switching, 2000V floating, 80ns rise time | 5 400 | 8 to 16 |
| **Rotating Wall Drive**<br><br>*for **Plasma Mode Ion Compression***  | | |
|  <br>• 4 phase-shifted outputs (90°) with $10V_{pp}$ amplitude (6x 60° and 8x 45° on request)<br>• Selectable frequency ranges: from 80 kHz to 50 MHz<br>• Output level display and rotation indicator | | |
| 0.08MHz … 10MHz: Type **QUAD 1-10**<br>1.5MHz … 50MHz: Type **QUAD 1-50** | 9 900<br>on request | 10 to 14 |
| Option: High Power Output Amplitudes max. 100Vpp (max. 5MHz) | 8 550 | |

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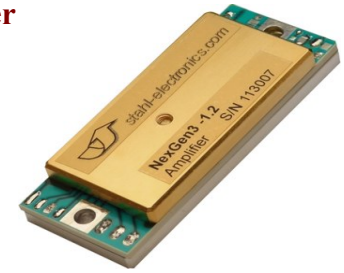
## Cryogenic and Amplifier Modules:

| Device | Price* € | Lead Time weeks |
|---|---|---|
| **Cryogenic Low Noise FET Amplifier**<br>*ultra low noise*<br>*& exceptional low power*<br>  <br>• Frequency range approx. 1.5 kHz to 4MHz<br>• Ultra low noise version (approx.. 0.3 nV/√Hz)<br>• Very low power consumption ~ 320µW/channel<br>• Operational at temperatures T = 4.2K to 50K, 300K (lowest noise achieved at 4.2K) | | |
| Single Channel **CX-4** super low noise incl. 300K controller | 94 500 | 11 to 18 |
| Dual Channel **CX-4** super low noise incl. 300K controller | 144 000 | 11 to 18 |
| **FT-ICR Vacuum Preamplifier FTICR-3**<br>  <br>• f = 450 Hz....28 MHz<br>• High Impedance Input $R_{In}$ = 24 MΩ, $R_{OUT}$ = 75Ω or 50Ω<br>• Low noise $u_n$ = 2 nV / √Hz (typ.)<br>• Temperature range T = 110K … 300K, $P_{DISS}$ = 40mW | 15 480 | 6 to 12 |
| **Super Low Noise Preamplifier PR-E 3** (room temperature)<br>*versatile 1 or 2-Channel Modules for applications requiring very high input impedance and outstanding low noise.*<br>• 0.9 to 0.6 nV/√Hz, $R_{IN}$ ≈ 75 MΩ<br>• Frequency range: ~ 2 kHz to 3 MHz or 40MHz<br>**4MHz** version, 2 channel, case style: SMA inputs & outputs<br>**40MHz** version, 1 channel, case style: SMA input & output<br>  <br>**Typical application: very low noise charge detection, general low-level amplification applications** | 2 520<br>3 330 | 3 to 4<br>3 to 5 |
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