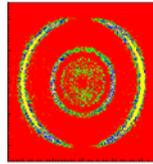


The HV 2/4 high-voltage power supply module



RoentDek
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Supersonic Gas Jets
Detection Techniques
Data Acquisition Systems
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The **RoentDek** 2x4kV Power Supply is especially designed for the use of biasing multi-channel-plate detectors or similar SEM devices, featuring low-ripple and regulated current limitation and protection. It is to be powered by a NIM crate or the **RoentDek** SPS2 mains adapter (**RoentDek** BIASET3). It is also possible to externally supply the operation voltage $\pm 24\text{V}$ (800mA) and $\pm 6\text{V}$ (100mA) DC (with low ripple as in NIM-crate standard) via the 9 pin socket on the rear panel, e.g. from the SPS2.

The switches on the side panel will set independently the respective channels to negative or positive output polarity, indicated by a LED on the front panel. If a channel of the power supply is switched on (indicated by a LED), and the “control” switch is set to upward position, the 10-turn potentiometers at the front panel can be used for manual voltage setting U_a (10 turns correspond to 4000V, linear progression).

The voltages can also be ramped externally with an analog voltage (0 to +10 V DC) input to the Lemo00-sockets on the rear panel (10V analog input corresponds to 4000V output, linear progression). For this the “control” switch must be set to “DAC”. The A/B switch will set the display to channel A/B, the V/I switch will enable voltage or current reading of the respective channel. The accuracy of the reading is within a few volts and a few μA (typically $1\mu\text{A}$), respectively.

The maximum current delivered is 3mA, the maximum voltage is $\pm 4\text{kV}$. Both can be restricted in 10% steps from 0.3mA to 3mA and 400 V to 4000 V.

RoentDek can also provide 6kV and 8kV versions (1mA) of this module.

If the trip protection switch is set to “enable kill” the voltage will be turned off in case of over-current or over-voltage, according to the settings of V_{max} and I_{max} . Otherwise the module will try to engage the voltage again after limiting the current for a while (and usually dropping the voltage), however it will trip again if the problem persists. It will under no circumstance deliver more voltage/current than pre-set.

A TTL signal (“high”) on the “inhibit” input will also deactivate the voltage, like the event of an over-current, according to the position of the “enable kill” switch.

The red “error” LED will indicate the event of an over-current, over-voltage or “inhibit”.

The hardware ramp speed is 500V/sec max. (power switch on/off).

Further specifications:

| | |
|-------------------------|---|
| Operation temperature: | 0 ... +50°C |
| Storing temperature* | -20 ... +60°C |
| Ripple (peak-to-peak) | < 50mV |
| Stability | $\Delta U_a < 2 \times 10^{-4}$ or 5×10^{-5} of ΔU_e |
| Temperature coefficient | $< 1 \times 10^{-4}/^\circ\text{C}$ |

A similar versions of this high voltage power supply for maximum voltage of 10kV is also available.

Note that the operation of all HV2/4 and similar units may need an adequate pull-up preventer circuit like the **RoentDek** HVT when operating two channels at the same polarity supplying resistive-coupled contacts such as the two sides of an MCP stack.



Figure: 2x4kV high-voltage power supply (front panel)

The Pseudo-floating power supply options PF+ and PF-:

For some applications it is beneficial to operate a detector in the *pseudo-floating* mode where the high voltage output of one **HV2/4**¹ channel (A, from the upper SHV-socket on the rear panel) is set to a certain potential via the corresponding upper manual dial on the front panel (or remote control) and the other manual dial (or remote control) defines the output potential difference between the SHV output sockets on the rear panel. Depending on the selected output polarities for both channels the potential on the lower SHV-socket on the rear panel corresponds the arithmetic sum (version **PF+**) or difference (version **PF-**) of the set values A and B:

$$B' = B + A \quad \text{and} \quad A' = A \quad \text{(for PF+, same polarity)}$$

$$B' = B - A \quad \text{and} \quad A' = A \quad \text{with } B > A \quad \text{(for PF-, different polarities)}$$

with A' , B' defining the absolute values (in the mathematical sense) of the effective output voltages from the SHV sockets (with positive or negative polarity depending on the respective switch positions) and A, B defining the set values on the front panel dials or adjusted by the remote control levels.

It is to note, however, that B' can never exceed the maximum rating of the specific high voltage supply, e.g. is always $< 4\text{kV}$ for **HV2/4PF+** even if $(B + A)$ would mathematically yield a higher value. For the **PF-** version the minimum value of B' is 0, i.e. the polarity of the output cannot change if $(B - A)$ would mathematically yield a negative value.

This option allows keeping the potential difference between the high voltage outputs constant (corresponding to the B set value) while the potential of channel A is changed: if the setting A (and A' output) is increased by (for example) 100V, B' output will also be increased (or reduced) by 100V, as if operating with a floating power supply. Changes of setting on B will only affect voltage output B' .

However, it is to note that the high voltage outputs of the **HV2/4PF** are not floating, only the function of a floating power supply channel as simulated by special voltage control circuits inside the **HV2/4PF**. Therefore it is not possible to reverse the output polarity of B' by changing set values from $A < B$ to $A > B$.

The **PF+** version is designed for operation with both output channels on same polarity only while the **PF-** version is required when the same pseudo-floating functionality is needed at different polarities on the two output channels.

| Examples for HV2/4PF+/- | pol. A | A set range and output | B set (diff.) | pol. B | output on lower SHV socket $B' = B + A$ (PF+) |
|-------------------------|--------|------------------------|---------------|--------|---|
| electron mode | + | 0V to 1300V (front) | 2700V | + | +2700V to +4000V (back) |
| pos. ion mode | - | 1300V to 0V (back) | 2700V | - | - 4000V to -2700V (front) |
| | | | | | $B' = B - A$ (PF+) |
| alternate mode | - | 2700V to 0V (front) | 2700V | + | 0V to +2700V (back) |

Note that the also the pseudo-floating high voltage units may need an adequate pull-up preventer circuit like in **RoentDek HVT** when operating two channels at the same polarity supplying resistive-coupled contacts such as the two sides of an MCP stack.

The operation modes **PF+** or **PF-** are factory-fixed and cannot be changed

The **HV2/4PF+/-** units are only available as N24 versions and require $\pm 24\text{V}$ Volt DC power input from a NIM bin or via the **RoentDek SPS2(mini)** mains adapter.



Figure: 2x4kV high-voltage power supply (front panel) as PF+ version

¹ The **HV2/6**, **HV2/8** and **HV2/10** units are also available with pseudo-floating control, **HV2/10** only as **PF+**.