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Quadrupole Power Supply Unit QPS400-3

Instruction Manual

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Quadrupole Power Supply Unit 3x400 V

QPS400-3

Version 1.00



Technical Data

Characteristics

- Precise high-voltage amplifier for electrodynamical quadrupole traps for micro- and nanoparticles
- DC accuracy
- Extremely low temperature coefficient of amplification
- High bandwidth
- Low noise
- Temporally short-circuit proof
- 19" case

Input

- Input voltage: ± 10 V max.
- Input impedance: 47 k Ω
- Signal inputs: 50 Ω BNC plug sockets

Output

- Amplification:
 - AC input: 40
 - DC inputs: 4
- Function:
 - $V_{\text{Top}} = -40V_{\text{AC}} - 4V_{\text{DC}}$
 - $V_{\text{Mid}} = +40V_{\text{AC}} - 4V_{\text{M}}$
 - $V_{\text{Bot}} = -40V_{\text{AC}} + 4V_{\text{DC}}$
- Output voltage: ± 400 V min. (> 800 V_{pp})
- Output current: ± 50 mA max.
- Output power: 10 W / channel max.
- Bandwidth:
 - AC input ($\pm 10\%$): 3.5 Hz ... > 1 MHz
 - DC inputs (-3dB): DC ... 100 kHz
- Power bandwidth: > 100 kHz (200 kHz typ.)
- Output offset voltage: < 100 μ V
- Drift of the output voltage: < 1 μ V/K
- Noise (DC-10 MHz): 3 mV_{eff} (typ.)
- Precision of the amplification at low frequencies:
 - < 200 ppm (100 ppm typ.)

- Temperature coefficient of the amplification at low frequencies:
 < 10 ppm/K (5 ppm/K typ.)
- Signal outputs: 93 Ω BNC plug sockets
- Output short circuit duration: 1 s max.

Monitor Output

- Attenuation: 1:40 of the output voltage
- Output voltage: ± 12 V min.
- Output current: ± 20 mA max.
- Output offset voltage: < 100 μ V
- Drift of the output voltage: < 25 μ V/K (5 μ V/K typ.)
- Precision of the attenuation at low frequencies:
 < 0.2% (0.1% typ.)
- Temperature coefficient of the attenuation at low frequencies:
 < 50 ppm/K (25 ppm/K typ.)
- Bandwidth ($\pm 10\%$): DC ... > 1 MHz
- Signal outputs: 50 Ω BNC plug sockets
- Output short circuit duration: indefinite

Power Supply

- Rated voltage: 230 V or 115 V $\pm 10\%$ (voltage selector switch)
- Rated frequency: 50/60 Hz
- Fuse: T 0.63 A at 230 V, T 1.25 A at 115 V
- Power consumption: about 70 VA without load, 130 VA max.
- Main connection: IEC inlet

General

- Dimensions:
 2 HU 19" plug-in box for mounting in a 19" cabinet
 (height: 88 mm, width: 483 mm)
 depth with heat sink without handles: 265 mm
- Weight: 6.8 kg

Shipment Content

- Quadrupole power supply unit QPS400-3 in 19" case
- Line cord (universal IEC mains lead, length 1.8 m)
- Output cables
(3 pcs. 93 Ω coaxial cable with 93 Ω BNC jacks, length 1.2 m each)
- Ground wire
(flexible wire 1 mm² with 4 mm cable eyes, length 2 m)
- Material for mounting in a 19" cabinet
(4 pcs. M6 screws with washers and cage nuts)
- Instruction manual

Terminals

The QPS400-3 device is equipped with 3×3 input and output BNC plug sockets and a ground socket (4 mm banana socket) on the front panel and an IEC inlet for the mains connection on the rear panel. Also on the rear panel, a voltage selector switch allows changing the rated mains voltage between 230 V and 115 V. The device fuse is integrated in the IEC inlet. When changing the rated mains voltage, the fuse must be exchanged for one with a value corresponding to the new mains voltage (see Technical Data: Power Supply).

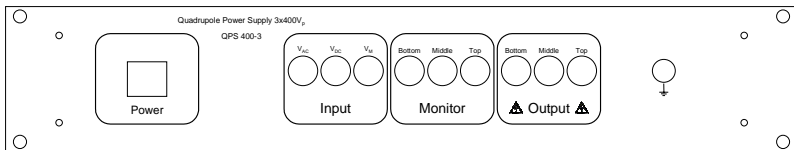


Fig. 1. The terminals and control elements on the front panel of the quadrupole power supply unit QPS400-3.

Power: mains switch with signal lamp

Input: signal inputs (V_{AC} , V_{DC} , V_M)

Monitor: monitor outputs (Bottom, Middle, Top)

Output: amplifier outputs (Bottom, Middle, Top)

⏏: device ground

Getting Started

Before turning on the device, the rated value of the mains voltage must be set and a corresponding fuse must be installed.

The device must be properly cooled. The heat sink at the rear panel must not be covered and the fan must be able to supply sufficiently cool air. The temperature of the cases of the amplifier ICs must never exceed 80°C.

Adjustment Elements

This device is shipped to you ready to use. Adjustments should not be necessary. They should be performed only for maintenance purposes or to optimize the frequency response in the case of a special load.

- ! **Attention:** Adjustments can be made by trained personnel only:
- A wrong setting can damage the device.
 - Manipulation of the device when the case is open is perilous. Even several minutes after turning off the device the capacitors of the power supply unit can be charged to high voltages.

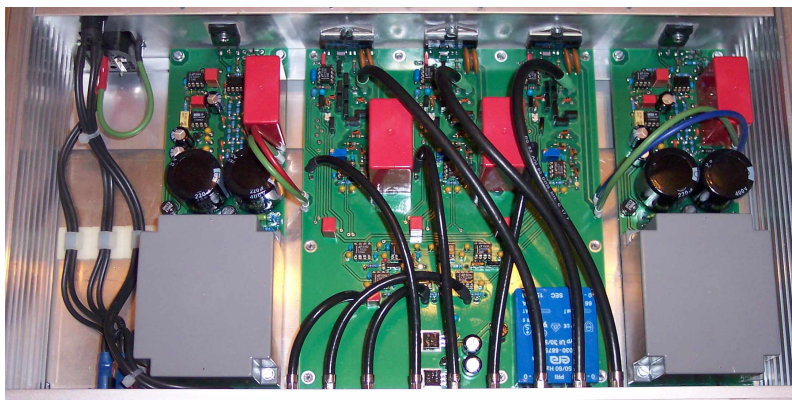


Fig. 2. The inner assembly of the quadrupole power supply unit QPS400-3. High-voltage power-supply units (Fig. 3.): left – positive, right – negative supply voltage, Amplifier (Fig. 4): center.

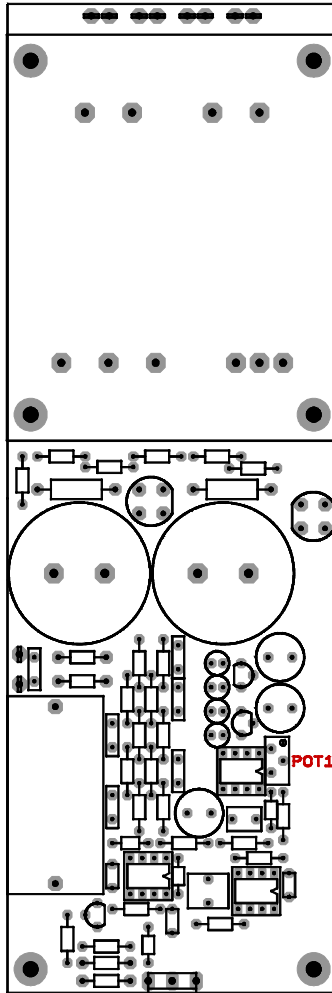


Fig. 3. Adjustment elements of the high-voltage power-supply units.
POT1: adjusting the value of the supply voltage

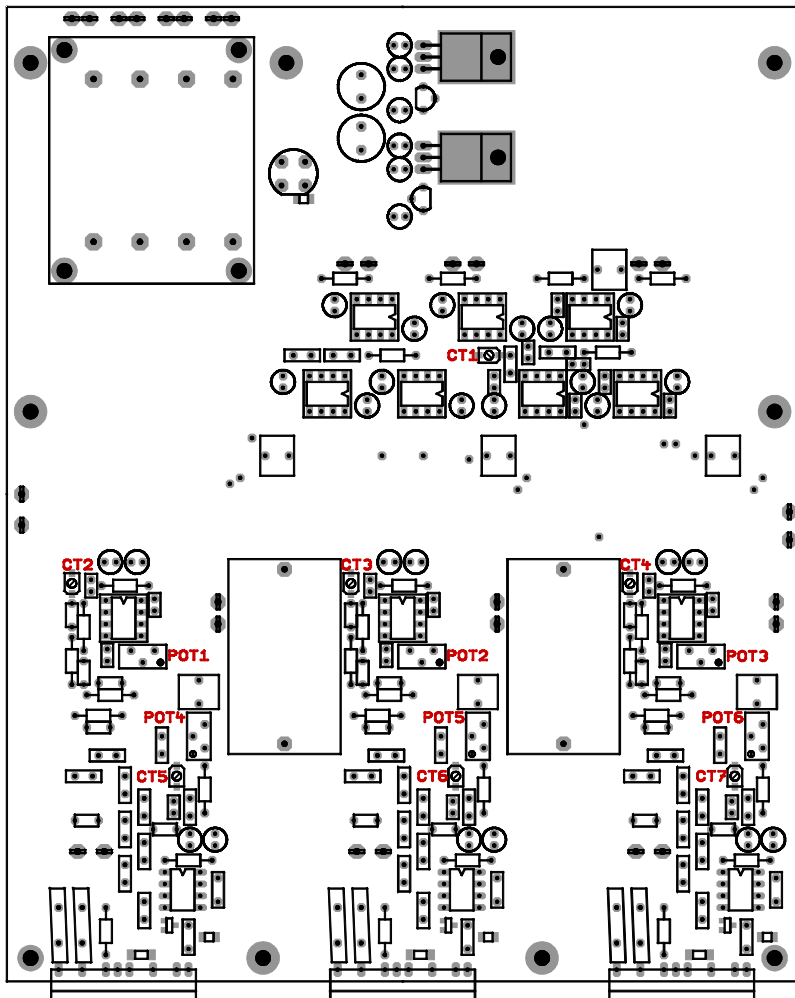


Fig. 4. Adjustment elements of the amplifier.

CT1: frequency compensation of the input stage (balancing the channels)

CT2-4: frequency compensation of the monitor outputs

POT1-3: compensation of the offset voltage of the monitor outputs

CT5-7, POT4-6: frequency compensation of the main amplifier