

PHYWE Systeme GmbH & Co. KG  
Robert-Bosch-Breite 10  
D-37079 Göttingen

Telefon +49 (0) 551 604-0  
Fax +49 (0) 551 604-107  
E-mail info@phywe.de  
Internet www.phywe.com

## Operating instructions

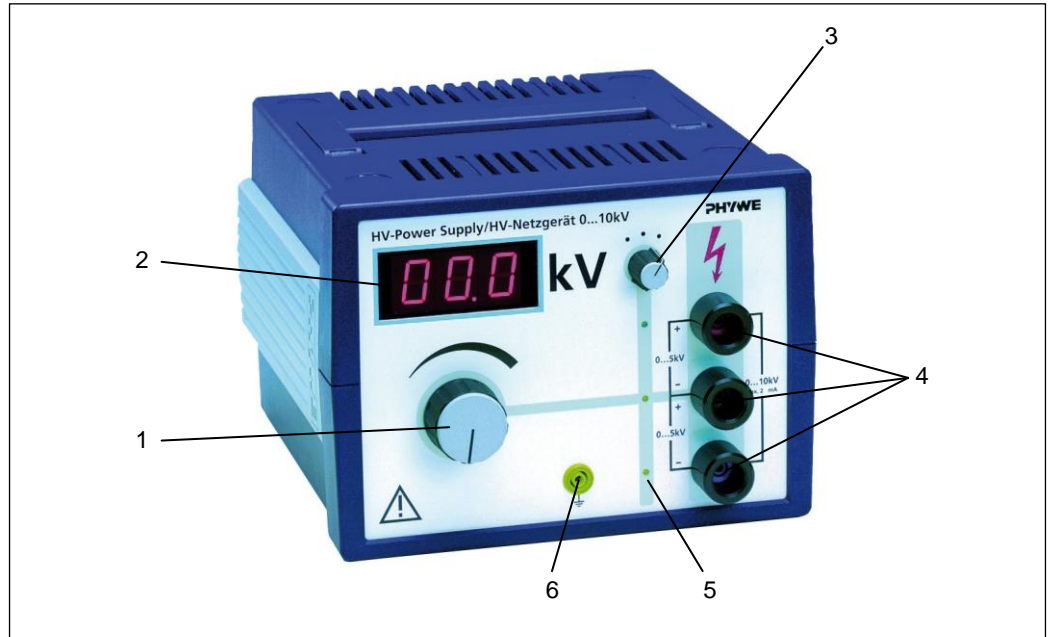
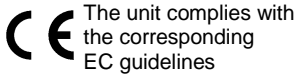


Fig. 1: Front view of the High voltage power supply unit 13673-93

## TABLE OF CONTENTS

- 1 SAFETY PRECAUTIONS
- 2 PURPOSE AND DESCRIPTION
- 3 FUNCTIONAL AND OPERATING ELEMENTS
- 4 HANDLING
- 5 NOTES ON OPERATION
- 6 TECHNICAL SPECIFICATION
- 7 ACCESSORIES
- 8 WARRANTY
- 9 WASTE DISPOSAL

### 1 SAFETY PRECAUTIONS



- Carefully read these operating instructions completely before operating this instrument. This is necessary to avoid damage to it, as well as for user-safety.
- Only use the instrument for the purpose for which it was designed.
- Check that your mains supply voltage corresponds to

that given on the type plate fixed to the instrument.

- Install the instrument so that the on/off switch and the mains connecting plug are easily accessible.
- Do not cover the ventilation slots.
- Take care that no liquids or objects enter in through the ventilation slots.
- Only use the instrument in dry rooms in which there is no risk of explosion.
- Do not connect high voltage power supplies in series.
- Do not start up this instrument in case of visible signs of damage to it or to the line cord.
- Use high-voltage-proof connecting cords.
- This instrument must only be connected to a socket with a protective earth (PE) connection.

### 2 PURPOSE AND DESCRIPTION

The high voltage power supply supplies an ungrounded direct voltage that is adjustable within the range from 0 to 10 kV. An additional middle tapping allows half of the voltage to be picked off. If required, the positive terminal, the negative terminal or the middle tap connection can be selectively earthed. By earthing the middle tap connection, a symmetrical high voltage relative to earth is obtained which is advantageous for many experiments.

The output is short-circuit proof. The shockproof output sockets prevent inadvertent nearing of hands to the arcing region of metal parts carrying high voltage.

The output voltage is non-hazardous. A voltage can be regarded as non-hazardous if it meets the following requirements (corresponding to norm EN 61010-1):

- the values are smaller than  $33 V_{rms}$  for alternating voltage, or
- smaller than 70 V for direct voltage, or

- the current (at termination with 2 k $\Omega$ ) is lower than 2 mA for direct current, or
- the value for a capacitive load is smaller than 45  $\mu$ C (holds for  $U < 15$  kV), or
- the value for stored energy is smaller than 350 mJ (holds for  $U > 15$  kV).

The present device follows these limits!

The output voltage can be read off from a three digit digital display. Either the total voltage or each of the two partial voltages can be displayed.

The instrument is particularly suitable for carrying out electrostatic experiments. The operation of gas discharge tubes without voltage dropping resistor is possible, whereby, for radiation safety reasons, it is to be ensured that their maintaining voltage, which is shown by the digital display, does not exceed 5 kV, unless the tubes are expressly approved for higher maintaining voltages.

### 3 FUNCTIONAL AND OPERATING ELEMENTS

The following functional elements and controls are situated on the front panel of the unit (see Fig. 1):

- 1 *Control knob*  
For setting the output voltage.
- 2 *Three figure LED display*  
For reading the output voltage between the two sockets marked with light emitting diodes.
- 3 *Three-position changeover switch*  
For selecting the output voltage to be measured and displayed, i.e. the upper and lower, upper and centre or centre and lower output sockets.
- 4 *Special safety sockets*  
For obtaining the output voltage.
- 5 *Light emitting diodes next to the output sockets*  
For identification of the sockets from which the output voltage is measured and displayed in the digital display.
- 6 *Earthing socket*  
is connected with the earth lead via the line cord.

### 4 HANDLING

The unit is enclosed in impact resistant plastic cases. A carrying handle which can be folded out is set into the case cover plate. The same part set into the base plate of the unit can be folded out towards the rear to hold the unit in a sloped position. Four rubber feet ensure stability. The power supply units can be stacked on top of other units of the same design during storage (not in operation). The rubber feet provide increased security against slipping when stacked because they locate in cup-shaped indentations in the unit underneath.

For connecting the unit to the AC mains, a 1.5 m long lead is supplied which is plugged into the equipment plug at the back of the unit.

#### Changing the primary safety fuse:

The fuse holder is in the upper part of the mains socket of the digital counter, and so is only accessible when the connecting cord is not plugged in. Unplug the connecting cord, open the fuse holder using a screwdriver, take out the defect fuse and replace it with a new one (first check the specification of this against the data on the type plate), then fit the fuse holder back in the mains socket.

Should this fuse blow when the instrument is switched on, never replace it with a more resistant fuse! A defect is indicated and the instrument must be returned to the Phywe service department for repair.

Before switching on the unit with the mains switch at the back of the unit, the setting up of the experimental arrangement should be completed and the apparatus connected up. The control knob (1) should be turned fully anticlockwise. If required, one of the high voltage sockets can be earthed by linking it with the yellow and green earth socket on the front panel.

The three-figure digital display indicates the high voltage supplied to the output sockets marked by the illuminated indicators. If necessary, the voltage allocation can be altered with the switch (3).

When the unit is used within the range of very high frequency fields, e.g. near a radio emitter, the digital display may be influenced. However, the output voltage is not influenced, but maintains the adjusted value.

The figure of 10 kV is only obtained with a current load of less than 0.1 mA. A collapse of the output voltage may be due to inadequate insulation on the connecting leads. When the high voltage is obtained from unearthed sockets, high-tension leads should therefore be used (order no. 07366-00 / 07367-00).



**Attention!**

**When the unit is switched off, there may be a voltage present on the output sockets for up to about 10 seconds.**

Even though the maximum persistent current that is available stays below 2 mA, relatively high current peaks can occur when touching a connected circuit. These peaks arise from the discharge of capacitors that are included in the system (instrument as well as experiment).

Because these current pulses can cause a serious impact, one should always – if it is not obstructive to the experimental set-up – connect the external circuit through sufficient high-resistive protective resistors (10 M $\Omega$ –50 M $\Omega$ ).

A protective resistor is necessary when voltage is to be drawn from one of the outer and the middle HV-sockets, or from the two outer HV-sockets (1 circuit).

When the symmetrical voltage (0... $\pm$ 5 kV, 3 sockets) is to be used, protective resistors must be fitted to the two outer sockets.

Protective resistors are always to be plugged to the high voltage outputs of the power supply and never to the output that is connected to earth.

Furthermore, the usual precautions that apply for working with hazardous electrical voltages should be followed. Take care to connect the circuit (the experimental set-up) only in a currentless state (mains fully disconnected, remove the plug!) and not until the circuit has completely assembled and checked again. After connecting the circuit, the mains plug can be inserted and the mains can be switched on. Therefore, interference or changes to the circuit must only be performed in the currentless state.



### Attention!

**Do not connect capacitors with capacities over 1.5 nF to the output sockets.** If the total capacity at 10 kV is higher than 4.5 nF (approx. 3 nF built-in), the abovementioned limits for non-hazardous voltages can be exceeded.

#### Measurement of high-voltage

For measuring high-voltage, it is suitable to use the Electrostatic voltmeter, 26 kV (item no. 11151-00).

## 5 NOTES ON OPERATION

This instrument is only to be put into operation under specialist supervision in a controlled electromagnetic environment in research, educational and training facilities (schools, universities, institutes and laboratories).

This means that in such an environment, no mobile phones etc. are to be used in the immediate vicinity. The individual connecting leads are each not to be longer than 2 m.

The instrument can be so influenced by electrostatic charges and other electromagnetic phenomena that it no longer functions within the given technical specifications. The following measures reduce or do away with disturbances:

Avoid fitted carpets; ensure potential equalization; carry out experiments on a conductive, earthed surface, use screened cables, do not operate high-frequency emitters (radios, mobile phones) in the immediate vicinity.

## 6 TECHNICAL SPECIFICATION

(typical for 25 °C)

Operating temperature range 5...40 °C  
Relative humidity < 65 %

### Mains supply

The instrument corresponds to protection class I. It must only be connected to a socket with a protective earth (PE) connection.

Connecting voltage (±10 %)	see type plate
Mains frequency	50/60 Hz
Power consumption	20 VA
Mains fuse (5 mm x 20 mm)	see type plate
Output voltage	0...10 kV DC or 0...±5 kV DC at a load current of 0.1 mA, continuously adjustable
Overload capability	short-circuit proof
Voltage display	LED display (3-figure) 20 mm high
Short-circuit current	< 2 mA
Internal resistance	approx. 5 MΩ
Residual ripple	< 6 %
Output sockets	special safety sockets
Housing dimensions (mm)	230 x 168 x 250 (W, H, D)
Weight	approx. 5.5 kg

## 7 ACCESSORIES

High-value resistor, 10 MΩ	07160-00
Connecting cord, 30 kV, 500 mm	07366-00
Connecting cord, 30 kV, 1000 mm	07367-00

## 8 WARRANTY

We guarantee the instrument supplied by us for a period of 24 months within the EU, or for 12 months outside of the EU. Excepted from the guarantee are damages that result from disregarding the Operating Instructions, from improper handling of the instrument or from natural wear.

The manufacturer can only be held responsible for the function and technical safety characteristics of the instrument, when maintenance, repairs and alterations to the instrument are only carried out by the manufacturer or by personnel who have been explicitly authorized by him to do so.

## 9 WASTE DISPOSAL

The packaging consists predominately of environmentally compatible materials that can be passed on for disposal by the local recycling service.



Should you no longer require this product, do not dispose of it with the household refuse.

Please return it to the address below for proper waste disposal.

PHYWE Systeme GmbH & Co. KG  
Customer Service  
Robert-Bosch-Breite 10  
D-37079 Göttingen  
Germany

Phone +49 (0) 551 604-274  
Fax +49 (0) 551 604-246