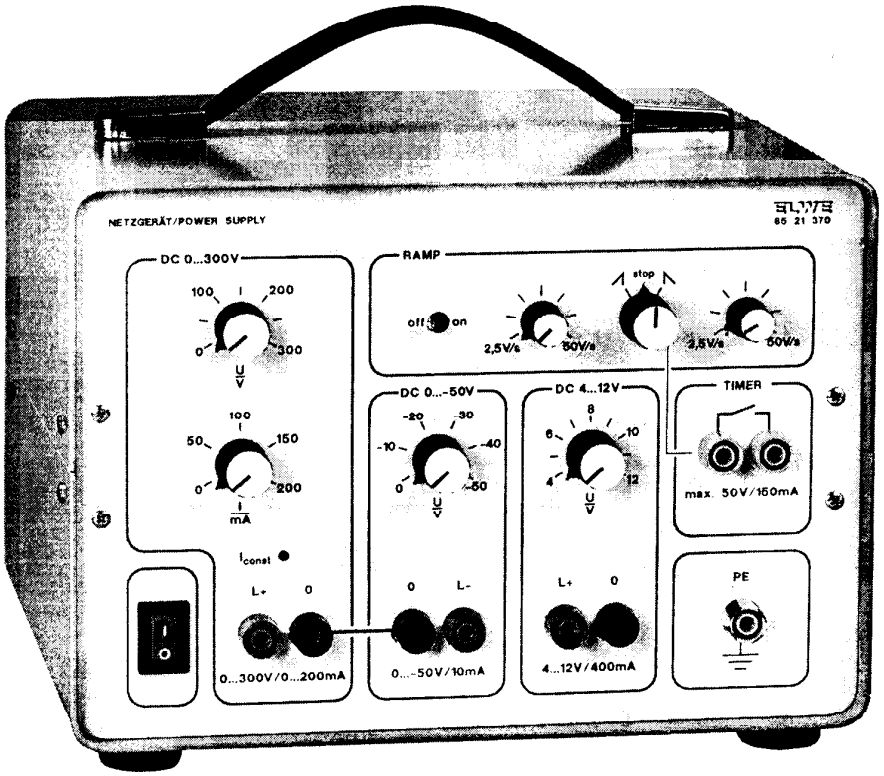
Klinger Educational Products Corp.

112-19 14th Road
College Point, New York 11356 USA

Telephone • 718 461-1822
Fax • 718 321-7756
E-mail • klinger_ed@prodigy.net
WEB SITE • www.KlingerEducational.com

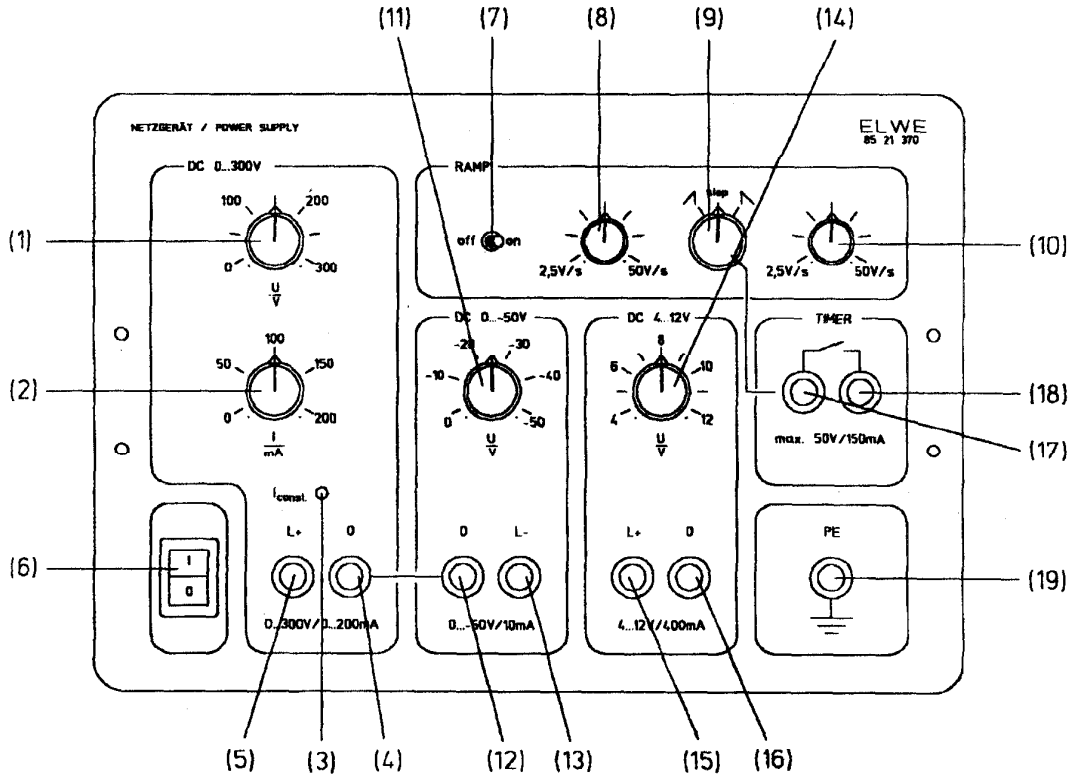
Operating Instructions

Regulated Power Supply



Item No. 85 21 371 (old: 5225)

2	Regulated Power Supply



Technical Data

DC Voltage:	4 ...12 V	I_{max} = 0.4 A
DC Voltage:	0 ... -50 V	I_{max} = 10 mA
DC Voltage:	0 ... 300 V	I_{max} = 200 mA, adjustable
with ramp generator turned on:	Linear rise and fall dV/dt: 2.5 ... 50 V/s	
Line input:	230 V / 115 V; 50 Hz / 60 Hz	
Power consumption:	75 VA	
Dimensions in mm:	240 x 230 x 70	
Mass:	approx. 3.7 kg	

3	Regulated Power Supply

No.	Description	Function
(1)	Adjustment knob	Set voltage between 0 ... 300 V (anode voltage)
(2)	Adjustment knob	Set current limit between 0 ... 200 mA at an output voltage of 0 ... 300 V (anode current)
(3)	LED	Illumination of the LED indicates activation of the current limiter
(4), (5)	Jack	Output voltage 0 ... 300 V, I_{max} = 200 mA (anode voltage)
(6)	Power switch	Turn supply voltage on and off
(7)	Switch "off"	Constant voltage
		Output voltage is adjustable between 0 ... 300 V with potentiometer (1)
	Switch "on"	Linearly rising or falling voltage
(8)	Adjustment knob	Set dV/dt between 2.5 ... 50 V/s for linearly rising voltage
(9)	Switch in left position	The linearly rising voltage assumes the maximum value previously set with the potentiometer (1) (with switch (7) in the "off" position)
	Switch in center position	The linearly rising or falling voltage remains at its present value.
	Switch in right position	The voltage drops to 0 V here.
(10)	Adjustment knob	Set dV/dt between 2.5 ... 50 V/s for linearly falling voltage
(11)	Adjustment knob	Set voltage between 0 ... -50 V (Wehnelt tube voltage) for focusing the electron beam
(12), (13)	Jack	Output voltage 0 ... -50 V
(14)	Adjustment knob	Set filament voltage for tubes between 4 ... 12 V **WARNING:** Before connecting the tube filament, set the adjustment knob (14) to 4 V to avoid overloading the filament.
(15), (16)	Jack	Output voltage 4 ... 12 V (filament voltage)
(17), (18)	Jack	Switch contact that is closed in the right and left positions of switch (9)
		Connection for electronic timer
(19)	Jack	Protective ground connection

The operation of the unit is described in detail in the individual experiment instructions.

4	Regulated Power Supply

General description

The precise execution of physical experiments requires voltages that are continuously adjustable and independent of variations in line voltage and load. Also needed are linearly rising and/or falling voltages, where the rate of change dV/dt should be variable across a wide adjustment range.

The power supply is primarily intended for experiments with electron beam tubes (for example, the Franck-Hertz experiment for measuring e/m and the demonstration oscilloscope). In addition, experiments on the law of inductance and on the charging and discharging of capacitors can be performed effectively using the adjustable, linearly rising and falling voltage.

The ELWE regulated power supply provides the following voltages:

Regulated DC voltage 0 ... 300 V
Continuously adjustable, max. continuous current 200 mA. Uses include voltage source for the accelerating voltage for electron beam tubes (e/m measurement, demonstration oscilloscope, etc.) and for other purposes.

Regulated linearly rising and/or falling DC voltage
Maximum voltage level continuously adjustable between 0 and +300 V. V/ t variable from 2/5 V/s to 50 V/s; maximum load 100 mA. Uses include voltage source for the quantitative investigation of induction processes with coreless coils, when using X-Y recorders, etc.

Regulated DC voltage, continuously adjustable from 0 to -50 V
Uses include voltage source for modulating [Wehnelt] voltage of electron beam tubes.

Regulated DC voltage, continuously adjustable from 4 to 12 V / 400 mA
Uses include the filament voltage source for electron beam tubes.

All voltage outputs are electronically current-limited and protected against continuous short circuits.

Ripple at full load:	< 20 mV
Voltage regulation	
at 10% line voltage variation:	< 0.2%
from no load to full load:	< 0.5 %

There are no conductive connections in the unit between the output jacks and the line or the housing. A ground connection can thus be connected to any desired output jack.

The filament voltage for electron beam tubes is continuously adjustable from 4 V to 12 V DC, so that even old tubes can still be used.

Two additional DC voltage outputs, continuously adjustable from 0 ... -50 V and 0 ... 300 V, have a common zero point, so that DC voltages up to 350 V can be obtained. Thus, when the two voltage outputs are connected in series, a maximum of 350 V can be set. There is no electrical connection between these two outputs and the 4 ... 12 V DC voltage. The zero points of these two voltage supplies can, if desired, be externally connected. The 0 ... 300 V DC voltage source is equipped with a current limiter that is continuously adjustable from 0 to 200 mA. Triggering of the current limiter is indicated by an LED.

Switching on a ramp generator in the 0 to 300 V DC supply causes the voltage to rise or fall linearly. The rates of rise and fall are separately and continuously adjustable from 2.5 V/s to 50 V/s. Using a toggle switch, a rise, fall or "freeze" (hold function) of the output voltage can be selected. The range of voltage variation is continuously adjustable from 0 to 300 V. An electronic timer can be connected to an additional timer input in order to measure the time difference dt occurring during the linear variation of voltage with time.

All voltage outputs are protected against continuous short circuits and are equipped with electronic voltage regulators and current limiters. In case of thermal overload, the unit automatically disconnects itself from the line, and switches back on automatically when a permissible temperature is reached.

Protective insulation and ground isolation of all 4 mm safety jacks ensures the highest level of safety.

Operating instructions

Connect the unit's line connection to line voltage (230 V AC) and switch on the green power switch at the lower left. The unit is immediately ready for use.

The desired voltages can be obtained from the appropriately labeled voltage sections on the front panels:

Voltage Section "DC 0 ... 300 V"

This section contains two adjustment knobs. The upper knob is used to set any desired voltage in the continuous range from 0 to 300 V. The lower knob is used to limit the maximum output current in a continuous range from 0 to 200 mA to protect sensitive equipment from overload. The maximum load capacity of this DC voltage is 200 mA. The positive DC voltage is obtained from the output jacks "L+" and "0".

Also located in this section is a red LED which lights bright red when the current limiter is activated.

Voltage Section "DC 0 ... -50 V"
This section contains an adjustment knob for selecting a DC voltage between 0 and -50 V. This DC voltage is obtained from the output jacks "0" and "L-" in this section. It has a maximum load capacity of 10 mA.
The ground jack "0" is electrically connected to the ground jack of the voltage section "DC 0 ... 300 V" so that series connection of the output jacks of the two adjacent sections allows the setting of a voltage between 0 and 350 V.

Voltage Section "DC 4 ... 12 V"
This section contains an adjustment knob for selecting a DC voltage between 4 and 12 V with a maximum load capacity of 400 mA. The voltage set in this way can be obtained from the output jacks "L+" and "0" of this section. The ground "0" point is electrically isolated from the other voltage sections.

Control Section "RAMP"
This section contains an on/off toggle switch, two adjustment knobs and a rotary switch. This control section operates in conjunction with the voltage section "DC 0 ... 300 V" and serves to generate a linearly rising or falling ramp voltage. The adjustment knobs are used to set the rates of rise and fall dV/dt of the ramp voltage in a range from 2.5 V/s to 50 V/s.
When the toggle switch is in the "off" position, the function of the RAMP section is switched off. In this case, the output jacks of the voltage section "DC 0 ... 300 V" produce the constant DC voltage that has been set with the upper adjustment knob.
When the toggle switch is in the "on" position and the rotary switch is set to "STOP", the final value of the voltage ramp is set between 0 and 300 V. This voltage can be measured at the output jacks of the voltage section "DC 0 ... 300 V" using a conventional voltmeter.

Immediately after the rotary switch is switched from "STOP" to "/|" (switch (9)), the voltage at the output jacks of the voltage section "DC 0 ... 300 V" rises linearly from 0 to the specified final value of the ramp voltage. After the switch is switched from "/|" through STOP to "|\", the voltage falls from the final value back to 0.
It is possible to hold an intermediate value by switching to "STOP". Thereafter, appropriately setting the switch will either continue the voltage rise, or initiate the drop to 0 V.
The rates of rise and fall of the ramp voltage can be set from 2.5 V/s to 50 V/s using the associated adjustment knobs.

7	Regulated Power Supply

Timer Section
This section contains a normally-open relay to which an electronic timer (8552360 / NEVA 5407.00) can be connected in order to precisely measure the rise and/or fall time of the ramp voltage. In this way it is possible to carry out quantitative investigations of such phenomena as induction processes.
The maximum load capacity of the relay is 50 V / 150 mA.

PE Section
This jack is connected to the case of the unit and the power line protective ground. Metallic shields can be connected to this jack in order to prevent possible hazards when working with low voltages.

Warning: Use extreme care when working with DC voltages above 60 V. Although the DC voltages provided by this unit have a relatively low load capacity, set-up and alteration of experiments should be carried out with the unit switched off. Furthermore, you should never directly contact exposed lines carrying voltages. Disconnect the unit from the power line before opening it. All repairs should be performed by qualified personnel only.

Experiments which use linearly varying voltages are described in the instructions "Versuche mit eisenlosen Spulen" [Experiments with Air Core Coils] (8492499.41 / NEVA 6533.01) and "Kondensatorversuche" [Capacitor Experiments] (8492300.31 / 5900.01). The unit provides the voltages required for recording characteristic curves and experimental results with recording instruments (X-Y-t recorders).