PHYSICS CHEMISTRY BIOLOGY ENGINEERING

LD DIDACTIC

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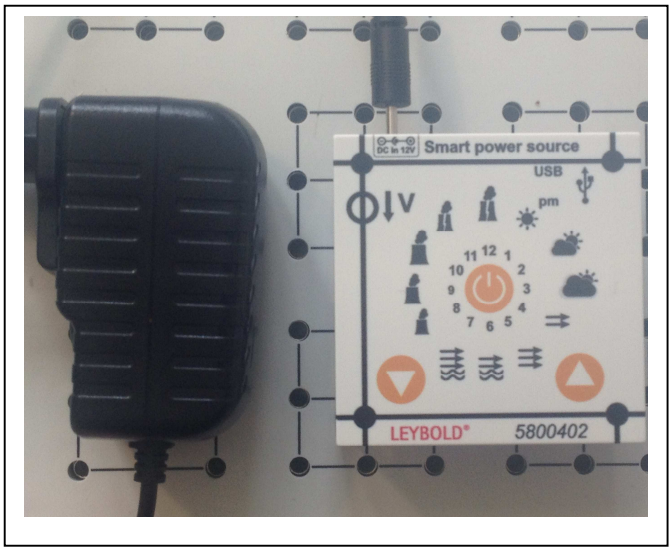


Instruction Sheet 5800 402

STE Smart Power Source 5800 402

1. Description

The STE Smart Power Source unit is a microcontroller controlled voltage and power supply with predefined profiles. The predefined profiles are simulating the behavior of various power plants, solar modules and wind power generators. In order to run the experiments within a certain time, an experiment hour is reduced to 10 seconds of experimental time, with the result that a day profile will take 240 seconds. Taking into account that there is some overhead time necessary, an experiment will take at least 5 minutes.

The STE Smart Power Source is equipped with fourteen LED indicators in order to allow the mode selection and to indicate the simulation time, during the experiment itself.

In experiment modes the STE Smart Power Source is varying the voltage until the predefined electrical power will be reached. The electrical power P_{out} is defined as the Product of Current and Voltage. In order to protect the device itself and connected units, the output voltage V_{max} is limited to 12 V DC. The maximum power is limited by the experiment mode. However, in order to avoid any damage to connected devices, take care about their maximum power consumption. If the maximum current of 2 A is reached, the system switches off. An alarm beep will appear and the experiment stops.

2. Technical Data

Output	P_{max} = 24 W (240 sec)
Maximum Current	I_{max} = 2 A
Maximum Voltage	V_{max} = 12 V DC
Experiment Time	250 sec / 10 sec equal to 1h
Input power supply	
Voltage Range	110 V – 250 V AC 50/60 Hz
Supported Main Standards	Germany, France, United Kingdom, US, ….

3. Set up with power supply

In order to set up the STE Smart Power Source, it is necessary to connect it to the power supply. Before connecting the power supply to the device, it is required to adapt it to the local standards.

- Check that the power supply is supporting the local network voltage.
- Choose the correct power plug adapter and attach it with to power supply
- Check that the power adapter is fixed to the power supply
- Plug in the power supply to the STE Smart Power Source (see figure 1)
- Plug in the power supply into a working main.

⇨ The power LED in the middle the unit will indicate that the STE smart power source is ready.

4. Operating touch keys

Configure STE power supply manually by using the three orange touch keys on the surface of the device. In order to select the modus, press the finger to the ▲ or ▼ keys. A short beep will appear, when the modus is changed.

The modus is indicated by the 12 red LEDs in the ring and the pictogram next to the illuminated LED is the valid modus.

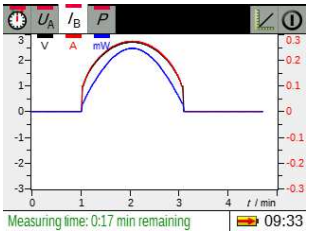
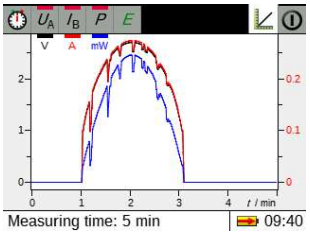
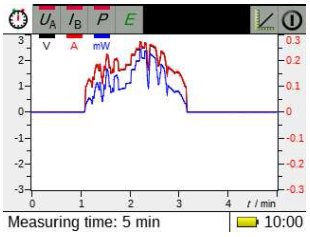
If it is necessary to stop an experiment run, just press the power touch button until the beep will indicate the reset.

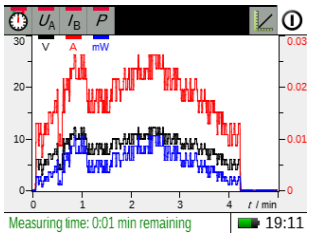
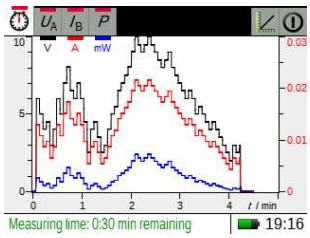
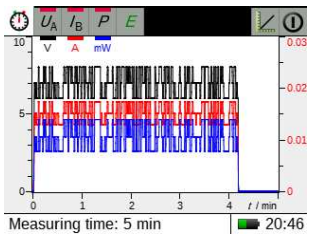
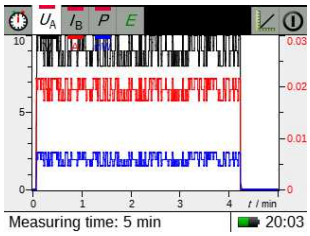
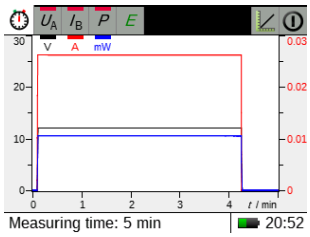
5. Operation

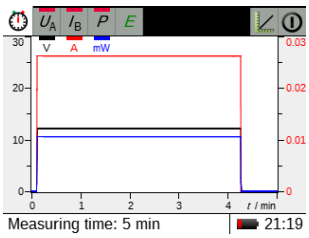
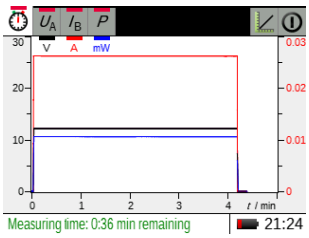
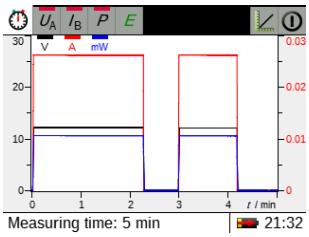
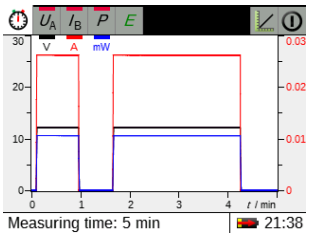
1. Start the experiment by pressing the power on touch button.
2. The module beeps once and power LED starts blinking.
3. The LED in the circle indicates the simulation time. A full hour is illuminated; the half hour is on half intensity.

4. The power output is controlled by the system for the cycle of 240 seconds - the equivalent of 24 hours day real life time.
5. In order to stop the experiment, press the power button for a longer time.

6. Operation modes

#	Name	Description
	The solar voltage profiles are designed for simulation of photovoltaic solar cells under various environmental conditions.	
1	Solar Power „Sunny“ 	Simulation of an active photovoltaic module on a sunny day. Night time P_{out} = 0 W • 0 s – 60 s (0:00 h - 6:00 h) and • 180 s - 240 s (18:00 h - 24:00 h) Day light P_{out} = f(T) • 60 s – 180 s (6:00 h - 18:00 h) a sinusoid function Pmax=650 mW at 120 s
2	Solar Power „Cloudy“ 	Simulation of an active photovoltaic module on a sunny day with some clouds. Night time P_{out} = 0 W • 0 s – 60 s (0:00 h - 6:00 h) and • 180 s – 240 s (18:00 h - 24:00 h) Day light P_{out} = f(T) • 60 s – 180 s (6:00 h-18:00 h) sunny with short downturns P_{max}=650 mW at 120 s
3	Solar Power „Rainy“ 	Simulation of an active photovoltaic module on a rainy day. Night time P_{out} = 0 W • 0 s – 60 s (0:00h - 6:00 h) and • 180 s -240 s (18:00 h - 24:00 h) Day light P_{out} = f(T) • 60 s - 180s (6:00 h-18:00 h) function with several downturns P_{max}=650 mW at 120 s

	The wind voltage profiles are designed for operating the wind generator. In order to apply the STE smart power source directly to a grid in a wind mode, use a resistor of 470 kOhm in serial in order to reduce the current to a comparable value.	
4	Moderate wind ashore 	The moderate wind on land represents a strongly fluctuating wind profile with relatively low peak powers.
5	Stormy day ashore 	The storm ashore represents a strongly fluctuating wind profile with relatively high peak powers.
6	Moderate wind onshore 	The moderate wind on the sea represents a low fluctuating wind profile with relatively low peak powers. The total energy of the wind profile at sea is higher than that of the country profiles.
7	Stormy day onshore 	The moderate wind on the sea represents a low fluctuating wind profile with relatively low peak powers. The total energy of the wind profile at sea is higher than that of the country profiles.
8	Small power plant 	Power characteristic of a small power plant. Standard operation full time P_{out} = 200 mW

9	Medium-sized power plant 	Power characteristic of a medium-sized power plant. Standard operation full time P_{out} = 600 mW
10	Large power plant 	Power characteristic of a large power plant. Standard operation full time P_{out} = 900 mW
11	Medium-sized power plant with black-out 	Power characteristic of a medium-sized power plant. Standard operation time P_{out} = 600 mW • 0 s–135 s (0:00h-13:30 h) and • 177 s – 240 s (17:40 h - 24:00 h) Black-out P_{out} = 0 mW • 135 s - 177 s (13:30 h - 17:40 h)
12	Large power plant with black-out 	Power characteristic of a large power plant. Standard operation time P_{out} = 900 mW • 0 s – 50 s (0:00h - 5:00 h) and • 90 s – 240 s (9:00 h - 24:00 h) Black-out P_{out} = 0 mW • 50 s - 90 s (5:00 h - 9:00 h)

7. Trouble shooting

If the touch is not reacting on pressure, reconnect power supply and try again.

If humidity is too high, the touch might select modes by random. Reconnect power supply and try again.