

DC Shocker

DCS-4x series
Single-channel Equipment

User Manual

SUPERTECH Instruments

General Description

DC Shocker DCS-4x is a research grade animal shocker. Its internal circuitry is based on a precision and fast, feedback regulated constant current generator. This shocker equipment has three security isolation barriers. Its output is totally isolated (floating output) for the sake of the safety of the operator and the subject. Furthermore it has isolation from other electronic devices such as physiological stimulators that may be in use concurrently on the subject. This isolation is performed by using a safety isolated power supply transformer. The third security barrier for the control equipment has been introduced as a 4 kV optical isolator at the inputs.

The output current range (0 to 10.0 mA) is quite wide to cover nearly every animal research application. This output current range is suitable even from small mice to huge experimental animals (e.g. sheep, pigs). There is a precise 10-turn helical potentiometer on the front plate to adjust the output current. It gives a great resolution to fine tune the level of the shocking current. The output circuit of the DC Shocker operates as a two-pole monopolar constant current square wave current generator.

DC Shocker DCS-4x is manufactured in two versions:

A) Modular version: as a part of the Modular Behavioral System. This version has no its own power supply. This version is powered by the Power Supply Module MBPS-3 of the Modular Behavioral System. In this arrangement (in the Modular Behavioral System) the time parameters are provided by the fully digital DC Shocker Controller PDC-x and the constant current source is implemented in the DC Shocker equipment. You should ask Supertech Instruments if you need the User Manual of the modular version of DC Shocker DCS-4x.

B) Stand alone version. This equipment contains a built-in mains power supply. This version of the DC Shocker can be used as a stand alone equipment. It can be connected to any animal behavioral conditioning system. Via its TTL inputs it can be controlled by any data acquisition system or any pulse sequence generator. This User Manual has been written to describe the stand alone version of DC Shocker DCS-4x.

Accessories

The effectiveness of the DC Shocker DCS-4x can be improved if you use it together with another product of Supertech Instruments. This accessory is DC Shocker Controller PDC-x. Certainly, the DC Shocker Controller PDC-x equipment should be ordered independently. It is a functional, but not a free accessory of the DC Shocker DCS-4x.

Mains cable, compatible with the selected mains voltage and wall socket.

Security Rules

The output of the DC Shocker is able to produce extremely large current and voltage on the biological subjects. From this virtue comes its disadvantage (which is by the way valid for all professional shocker devices): DC Shocker equipment in the case of unprofessional, incautious, or negligent usage can cause life threatening electric shock on the subject, or the person making the experiment (henceforward: the operator). Supertech Instruments manufactures all its products equipped with the most modern protecting and security circuits. However these methods do not protect in the case of errors committed by the operator. Against human errors it is not possible to defend the user with the help of circuitry methods.

DC Shocker equipment is able to apply a maximum 120 V of pulsing DC voltage and 10 mA of pulsing DC current. These data far exceed the life threatening or lethal limits.

The shocking grids are big, free and accessible by hand. Never touch the shocking grid!

Only good quality, highly isolated output cables should be used. The security of the output wiring made by the user is not the responsibility of Supertech Instruments.

The security of the shocking grid made by another manufacturer is not the responsibility of Supertech Instruments.

The electrical security aspects of the DC Shocker during normal usage are under the sole responsibility of the user!

Please always keep in mind and take care:

- 1) The device must only be handled by a person educated in the rules below, by whom it should be signed beforehand, that he knows these regulations, and he is going to work by keeping them. By this the operator takes responsibility for the possible outcomes of the intervention conducted by him.
- 2) The device should be kept away from the moist areas developing during the experiment or treatment.
- 3) Such persons onto whose body an outer or inner pacemaker is attached, or who has any implanted metal, are not allowed to operate the device.
- 4) During the operation of the device the operator must not touch the subject.
- 5) Before starting the treatment both output connectors of the equipment must be connected to the subject or to the shocking grid.
- 6) The contacts of the electrodes should be well prepared before the experiment or the treatment. Electrodes are not allowed to be moved during the operation of the device.

7) Before starting the treatment it is important to create good conducting, tight contacts between the electrodes and the body of the subject, on the whole surface of the electrodes, because local current density peaks may cause burn.

8) The output current must not flow through the heart, brain, or spinal cord of the subject. The electrodes should be placed according to this.

9) The output current must not flow through the heart, brain, or spinal cord of the operator. The electrodes should be placed according to this. The operator may only use his right hand; he is forbidden to use his left hand.

10) The device must not be turned off or on, when the electrodes are attached onto the subject. The electrodes must be attached or got down only when the device is turned on, but the output pulses' emission is not working (i.e. the device is ready to work, but inactive).

11) It is forbidden to cause an abrupt current change on the subject, except for the working (operational) shocking pulse emission. The device when creating operational pulses naturally changes output current and voltage with high slew rate; as this is its basic function. The protection against abrupt changes of the current must include the turning off the current. From this general restriction come the next two concrete rules:

11a) It is forbidden either to put on or off the cables of the device to the subject during an active output pulse.

11b) The front panel's potentiometer controlling the current may only be turned slowly either in a growing or a decreasing value.

12) Before beginning the treatment it should be determined (with the help of the front panel's current controlling potentiometer) with physiological salt solution on the electrodes the threshold of sensation or pain of the subject for electric current. The output current must not be set higher than the pain threshold.

Specifications

DC constant current generator at the output

Output waveform: monopolar square wave

Range of the output current: 0 to 10.0 mA

Accuracy of the output current: 1 %

Output load range: 0 Ohm (shortcut) to open circuit. Any ohmic load is allowed. Reactive (inductive or capacitive) load condition is not allowed.

Compliance (open circuit) voltage of the output current generator: 120 V DC

Working (shocking) frequency: 0.0001 Hz to 5 kHz

Minimal output pulse width: 100 microseconds

Maximal output pulse width: unlimited

Manual output current adjustment with a 10-turn helical potentiometer

External TTL control or computer-control from any pulse pattern generator or from any PC based data acquisition system.

Control input: Standard TTL level. Active level is High. TTL input is overvoltage protected up to 40 V.

Double security insulation from mains

Double security insulation of output

4 kV optically isolated TTL control input

Mains voltage: 100-120V or 220-230V (chosen by an internal selector switch, fixed in the factory)

Power consumption: 60 VA

Dimensions of the instrument: 290 x 250 x 90 mm

Weight: 2.5 kg

First Time Installation and Setup

Please connect all the cables:

- Mains cable to the power point (wall socket)

- TTL control cable from the DC Shocker Controller or from the PC-based data acquisition system to the TTL Input BNC jack

- Output cables from the DC Shocker to the shocking grid

After finishing the cabling switch on the DC Shocker DCS-4x and it is ready to operate.

Front Panel Controls

Floating Output: these 4 mm female banana jacks are the output connectors of the DC Shocker. The polarity of the connectors (Positive and Negative) is labeled.

Amplitude: 10-turn helical potentiometer to set the output current

TTL Input: optically isolated external control input. The external control input is TTL-compatible, with extended tolerance. The shocker can be activated with High level applied to this input. The internal circuit is designed to accept control voltage in the range from 2 V to 40 V. This feature gives the possibility to connect our shocker directly to the generally used animal behavioral conditioning systems using not only TTL, but higher control voltages, as well.

Active LED: it indicates the presence of the TTL high level at the TTL Input (the activity of the Shocker)

Mains switch

Connectors on the Back Side

Socket for the mains cable

GND screw connector: it should be connected to the common signal ground point of the lab.

Calibration

DC Shocker equipment is calibrated by the factory. You can check its calibration any time using a 4.5 digit multimeter in DC current meter mode and applying a suitably long (5 sec at least) TTL control pulse at the control input.

Warranty

Supertech Instruments gives you 5 years of full warranty for electronic products and 3 years of full warranty for mechanical products by default. Longer warranty periods can also be defined and agreed (the actual conditions should be discussed before placing the order).

Supertech Instruments gives you full warranty for its products against defects in materials or workmanship as long as the equipment has been subjected to normal and proper use. During the warranty period, faulty products will be repaired or replaced free of charge provided they are returned to our workshop. Postage of the warranty repair actions is paid by the Customer. The exceptions are the Vibration Isolation Tables. There are special conditions introduced for repairing of Vibration Isolation Tables (see the appropriate User Manual). Supertech Instruments will undertake the servicing and calibration after the expiration of the warranty period for a nominal fee.

The warranty does not cover the faults made by the user.

The measuring equipments manufactured by Supertech Instruments are for experimental and/or lab animal purposes only and are not intended for human use.

Electrical safety measurements of proper operation of the 115 / 230 V AC mains electric system (from the equipments have been supplied) is the sole responsibility of the user.

You can find the general commercial and warranty conditions in the beginning of the Services page of our website.

Further Information Sources

As the first step for further technical information please visit our website(s). On the website of Supertech Instruments you can find related products and further information.

On the Download page of our website you can find many more useful documents to support our products. Please check the list of the available documents.

Technical hotline via email (all of them work):

office@superte.ch

office@supertechinstruments.co.uk

office@super-tech.eu

International technical hotline on the phone: +36 20 923 4386

Supertech Instruments continuously uses several domain names (websites) with the same content. Please use that one, which is the easiest for you to remember:

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