

made to measure

OPERATING INSTRUCTIONS AND SYSTEM DESCRIPTION FOR THE

GIA-05X

GATING UNIT FOR THE SEC-05X AMPLIFIER



VERSION 1.1
npi 2013

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1. Safety Regulations

VERY IMPORTANT: Instruments and components supplied by npi electronic are **NOT** intended for clinical use or medical purposes (e.g. for diagnosis or treatment of humans), or for any other life-supporting system. npi electronic disclaims any warranties for such purpose. Equipment supplied by npi electronic must be operated only by selected, trained and adequately instructed personnel. For details please consult the **GENERAL TERMS OF DELIVERY AND CONDITIONS OF BUSINESS** of npi electronic, D-71732 Tamm, Germany.

- 1) **GENERAL:** This system is designed for use in scientific laboratories and must be operated by trained staff only. General safety regulations for operating electrical devices should be followed.
- 2) **AC MAINS CONNECTION:** While working with the npi systems, always adhere to the appropriate safety measures for handling electronic devices. Before using any device please read manuals and instructions carefully.
The device is to be operated only at 115/230 Volt 60/50 Hz AC. Please check for appropriate line voltage before connecting any system to mains.
Always use a three-wire line cord and a mains power-plug with a protection contact connected to ground (protective earth).
Before opening the cabinet, unplug the instrument.
Unplug the instrument when replacing the fuse or changing line voltage. Replace fuse only with an appropriate specified type.
- 3) **STATIC ELECTRICITY:** Electronic equipment is sensitive to static discharges. Some devices such as sensor inputs are equipped with very sensitive FET amplifiers, which can be damaged by electrostatic charge and must therefore be handled with care. Electrostatic discharge can be avoided by touching a grounded metal surface when changing or adjusting sensors. **Always turn power off when adding or removing modules, connecting or disconnecting sensors, headstages or other components from the instrument or 19" cabinet.**
- 4) **TEMPERATURE DRIFT / WARM-UP TIME:** All analog electronic systems are sensitive to temperature changes. Therefore, all electronic instruments containing analog circuits should be used only in a warmed-up condition (i.e. after internal temperature has reached steady-state values). In most cases a warm-up period of 20-30 minutes is sufficient.
- 5) **HANDLING:** Please protect the device from moisture, heat, radiation and corrosive chemicals.

2. GIA-05X

The GIA-05X is a two channel input unit for the SEC-05X or SEC-05LX single electrode amplifier. It allows gating of a stimulus whose amplitude is preselected by a digital potentiometer. One channel is used for a voltage command in **Voltage Clamp (VC)** mode and the other channel for a current stimulus in **Current Clamp (CC)** mode. It is housed in a small 19" rackmount cabinet with built-in power supply.

The unit is connected to the input BNCs of the SEC-05 system. Each channel has an analog input BNC, a GATE input and a digital control for the step size.

2.1. Description of the Front Panel

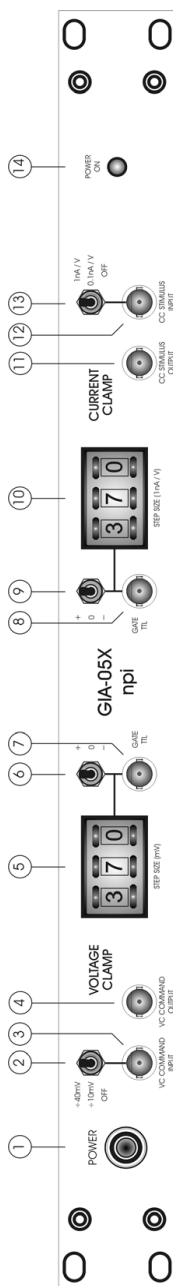


Figure 1: GIA-05X front panel view

In the following description of the front panel elements each element has a number that is related to that in Figure 1. The number is followed by the name (in uppercase letters) written on the front panel and the type of the element (in lowercase letters). Then, a short description of the element is given.

(1) POWER switch

Switch to set POWER to on or off.

(2) $\div 10$ mV / $\div 40$ mV / OFF switch

Switch for scaling the external voltage COMMAND INPUT in Voltage Clamp (VC) mode.

$\div 10$ mV: The voltage at VC COMMAND INPUT (#3) is divided by ten, i.e. 100 mV at BNC connector #3 is transformed to a 10 mV command

$\div 40$ mV: The voltage at VC COMMAND INPUT (#3) is divided by forty, i.e. 100 mV at BNC connector #3 is transformed to a 2.5 mV command

OFF: The external VC COMMAND INPUT (#3) is disabled.

Note: If no external command is used the switch should be set to OFF to avoid noise!

(3) VC COMMAND INPUT connector

BNC connector for connecting an external voltage COMMAND in Voltage Clamp (VC) mode. The voltage is internally divided by 10 or 40 depending on the position of switch #2.

(4) VC COMMAND OUTPUT connector

BNC connector providing the voltage COMMAND in Voltage Clamp (VC) mode.

Important: The scaling of the STEP SIZE (#5) is correct only if the VC COMMAND OUTPUT connector is linked to the connector VC COMMAND INPUT $\div 10$ mV at the front panel of the SEC-05X.

(5) STEP SIZE (mV) digital potentiometer

Control to set the amplitude of the voltage COMMAND in VC mode (digital potentiometer (XXX mV) range: ± 999 mV).

(6) + / 0 / - switch

+ / 0 / - toggle switch to disable the gated voltage COMMAND in VC mode, or to select the polarity of the gated stimulus (+: gated voltage COMMAND positive, 0: gated voltage COMMAND disabled, -: gated voltage COMMAND negative).

(7) GATE TTL connector (VC)

With this input a gated voltage COMMAND in VC mode can be generated set by the digital potentiometer STEP SIZE (5) and the polarity switch (6). This voltage step is gated by a positive TTL pulse (3-5 V) applied to the BNC connector.

(8) GATE TTL connector (CC)

With this input a gated stimulus in Current Clamp (CC) mode can be generated set by the digital potentiometer STEP SIZE (10) and the polarity switch (9). This current step is gated by a positive TTL pulse (3-5 V) applied to the BNC connector.

(9) + / 0 / - switch

+ / 0 / - toggle switch to disable the gated stimulus in CC mode, or to select the polarity of the gated stimulus (+: gated stimulus positive, 0: gated stimulus disabled, -: gated stimulus negative).

(10) STEP SIZE (1 nA / V) digital potentiometer

Control to set the amplitude of the gated stimulus in CC mode (digital potentiometer (X.XX mV) range: ± 9.99 nA, see also #11).

(11) CC STIMULUS OUTPUT connector

BNC connector providing the current STIMULUS in CC mode.

Important: The scaling of the STEP SIZE (#10) is correct only if CC STIMULUS OUTPUT connector is linked to the CURRENT STIMULUS INPUT 1 nA/V connector at the front panel of the SEC-05X.

(12) CC STIMULUS INPUT connector

BNC connector for connecting an external current STIMULUS in CC mode. The INPUT is scaled 1 nA/V or 0.1 nA/V depending on the position of switch #13.

(13) 1 nA/V / 0.1 nA/V / OFF switch

Switch for scaling the external current STIMULUS INPUT in CC mode.

- 1 nA/V: The voltage at CC STIMULUS INPUT (#12) is converted to a current with a scaling of 1 nA/V, i.e. 100 mV at BNC connector #12 is transformed to a 100 pA current
- 0.1 nA/V: The voltage at CC STIMULUS INPUT (#12) is converted to a current with a scaling of 0.1 nA/V, i.e. 100 mV at BNC connector #12 is transformed to a 10 pA current
- OFF: The external CC STIMULUS INPUT (#3) is disabled.

Note: If no external stimulus input is used the switch should be set to OFF to avoid noise!

(14) POWER ON LED

LED indicating that the GIA-05X is switched on.

2.2. Connections and Operation

Connections

The following connections are required for operation of the GIA-05X with an SEC-05X (SEC-05LX). The numbers are related to Figure 1.

Connect the analog output(s) of your data acquisition system or a function generator to VC COMMAND INPUT (#3) and to CC STIMULUS INPUT (#12).

Connect VC COMMAND OUTPUT (#4) to the connector VC COMMAND INPUT $\div 10$ mV at the front panel of the SEC-05X.

Connect CC STIMULUS OUTPUT (#11) to the CURRENT STIMULUS INPUT 1 nA/V connector at the front panel of the SEC-05X.

If you intend to use the gated steps in VC and/or CC mode connect TTL signals to both GATE TTL connectors (#7 and #8).

Operation

If you use your data acquisition system or a function generator to create voltage commands or current stimuli set the scaling according to the position of switch #2 and switch #13. Make sure that switch #6 and switch #9 are set to 0.

If you use the built-in function generator to apply gated voltage commands or current stimuli set the digital potentiometers #5 and #10 to the desired values, set the step polarity with switch #6 and switch #9, and apply a TTL signal to the GATE TTL connectors #7 and #8. The voltage commands or current stimuli are generated as long as the TTL signal is HI (3 to 5 V). Make sure that switch #2 and switch #13 are set to OFF.

Important: Gated and external commands/stimuli are added by the GIA-05X.

3. Technical Data

OPERATING RANGE:	± 10 Volt
INPUT:	BNC connector, impedance 100 k Ω , maximum voltage ± 10 V, scaling VC: $\div 10$ mV or $\div 40$ mV, selected by toggle switch scaling CC: 1 nA/V or 0.1 nA/V, selected by toggle switch
STEP SIZE:	VC: 1 mV – 999 mV; CC: 0.01 nA – 9.99 nA
OUTPUT:	BNC connector, impedance 50 Ω , maximum voltage ± 10 V
GATE TTL INPUT:	10 k Ω , LO: <2 V; HI: 3 V - 5 V
DIMENSIONS:	19" rackmount cabinet, 19" (483 mm), 10" (250 mm), 1.75" (44 mm)
POWER REQUIREMENTS:	115/230 V AC, 60/50 Hz, fuse 0.4/0.2 A, slow