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g·MOBILab⁺
MOBILE LABORATORY

Instructions for use

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Appendix 1: BLUETOOTH SOFTWARE AND DONGLE INSTALLATION

Instructions for use

Disclaimer

g.MOBllab+ is not a medical device. The product is not intended to be used as a medical device. Additional examinations are needed for diagnosis and no diagnosis must be done based on using this device.

However, the product meets the IEC 60601-1 standard as this is a more rigorous standard compared to other applicable standards.

Intended function

The intended function of the equipment is to measure EEG, EMG, EOG and ECG signals in humans for research purposes from the intact surface of the body.

Attention

- conductible parts of all electrodes must **not** have contact to earth or other conductible parts
- the device is **not** protected against the effect of cardiac defibrillator discharge
- the device must **not** be used in humans with pace-makers or electrical stimulators
- it is **not** allowed to use other power supply units than AA batteries
- the device **must not** be used directly on the heart.
- the device **must not** be used for patient monitoring. The device **must not** be used for the determination of brain death.

Warning and safety notice

If g.MOBllab+ is connected to other devices like a PC the following leakage currents have to be checked.

- Ground leakage current
- Enclosure leakage current
- Patient leakage current

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (e.g. IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all configurations shall comply with the system standard IEC 60601-1-1. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard IEC 60601-1-1. If in doubt, consult the technical service department or the local representative.

Inspection

For safety, performance and reliability of the device, the manufacturer will be responsible if:

- service, repair and changes are performed by the manufacturer only
- the device is used according to the instruction for use

The device and its accessories have to be checked in intervals of two years (in Austria according to ÖVE-E 8751-1/2000 + A1/2003).

The intended environment of use

The device must not be used in dangerous conditions such as wet rooms or explosive environments. The relative humidity must be between 25 % and 95 %. The device must not be used in combination with any other medical high-frequency device. The usage of a high frequency device together with g.MOBllab+ can result in burnings under the electrodes and could damage the biosignal amplifier.

Recommended electrodes for use

The manufacturer recommends EEG, EOG, ECG and EMG electrodes from g.tec medical engineering GmbH, Austria.

Introduction to g.MOBllab+

g[®].MOBllab+ - g.tec's portable biosignal acquisition system - is the perfect tool for recording biosignal data on a standard Pocket PC, PC or notebook. The system allows investigating brain-, heart-, muscle-activity, eye movement, respiration, galvanic skin response and other body signals. Additionally, digital inputs and digital output channels are available. A reaction switch can also be connected to the device.

Raw data can be logged directly on the device using a mini SD card or be transferred in real-time via a Bluetooth interface to the host for visualization and further online data processing.

Highlights

- acquire EEG, ECG, EOG, EMG simultaneously
- on-line visualization and storage of up to 8 analog channels and 8 digital channels
- real-time biosignal analysis with Highspeed On-line Processing for Simulink
- data acquisition location-independent due to implemented mini SD card
- signal acquisition and real-time analysis on the Pocket PC or PC (notebook)
- can be combined with g.BSanalyze for off-line biosignal analysis under MATLAB

g.MOBllab+ can be ordered in 2 versions:

1) Multi-Purpose version including 6 bipolar + 2 unipolar analog inputs, 4 digital inputs, 4 digital inputs and outputs.

The device settings are optimized to measure 4 EEG/EOG and 2 ECG/EMG type channels and 2 analog inputs which can be utilized for other sensors.

2) 8 channel monopolar EEG version including 8 monopolar EEG type channels, 4 digital inputs, 4 digital inputs and outputs.

The device settings are optimized to measure 8 monopolar EEG type channels.

Example g.MOBllab+ configuration:



*Multi-Purpose g.MOBllab+ version connected to a Pocket PC with the recording software.
g.MOBllab+ is connected to the ECG cable, the EEG/EOG electrode box and the switch box.
Via the g.tec electrode cap system EEG electrodes are mounted to the head*

The standard Multi-Purpose version includes

- portable biosignal amplifier g.MOBllab+ equipped with 4 EEG/EOG type, 2 ECG type and 2 analog input channels including a Bluetooth module for wireless connection
- EEG/EOG connector box for 4 bipolar channels (4 active, 1 common ground)
- ECG/EMG direct connection cable for 2 bipolar channels (2 active, 1 common ground)
- mini SD card
- 4 AA batteries
- documentation

The standard 8 channel monopolar EEG version includes

- portable biosignal amplifier g.MOBllab+ equipped with 8 EEG type analog channels including a Bluetooth module for wireless connection
- EEG connector box for 8 monopolar EEG channels (8 active, 1 common reference, 1 common ground)
- mini SD card
- 4 AA batteries
- documentation

Option: wireless Bluetooth connection for PC (notebook) use

- Bluetooth dongle

Option: wired serial interface connection for the Pocket PC / PC (notebook)

- serial cable to connect g.MOBllab+ via RS232 to Pocket PC / PC (notebook)

Optional connector boxes (note: not all options are available for both versions)

- ECG/EMG connector box for 2 bipolar channels (2 active, 1 ground)
- green/red light box for reaction time paradigm
- analog and digital input/output (AI DIO) connector box
- connectors for all sockets including 2 m cable (open end)

Other accessories

- Pocket PC (standard or ruggedized version), charging device, cradle and serial/USB cable
- EEG electrode cap with 64 electrode positions (small, medium or large)
- screw able EEG electrodes for the electrode cap (Au, sintered Ag/AgCl)
- switch box for external triggering
- EEG disk electrodes
- Disposable electrodes Ag/AgCl
- ECG electrode cables
- respiration sensor

- photoelectric pulse sensor
- galvanic skin response sensor (GSR)
- water-proof heavy duty case

For other sensors and available accessories, please contact g.tec via email office@gtec.at or via www.gtec.at.

Related Products

g.tec provides several biosignal analysis elements that are especially relevant to the kinds of tasks you perform with g.MOBllab+. Please visit our homepage www.gtec.at for further information.

Hardware and Software Requirements

g.MOBllab+ can be connected to a Pocket PC, PC or notebook via a serial cable connection or a wireless Bluetooth connection.

Pocket PC

The g.MOBllab+ amplifier unit can be connected to a Pocket PC running Microsoft Windows Mobile. The table below lists the necessary device requirements:

Hardware	Properties
CPU	ARM Intel XScale processor with 400 MHz
RAM	64 megabyte
Serial port interface	Bluetooth option
Serial port interface	RS232 type serial connector
USB port	1-free connector for data transmission

The g.MOBllab Pocket PC recording software requires the following software components. Make sure that the installation works correctly before installing the software.

Software	Version
Microsoft Pocket PC	Windows Mobile Version 5.0 or 6.0

PC or notebook

g.MOBllab+ requires a PC compatible desktop or notebook computer running a Microsoft Windows operating system (Windows XP 7 Professional English). The table below lists optimal settings:

Hardware	Properties
CPU	Pentium working at 2000 MHz
Hard disk	20-30 gigabyte
RAM	512 - 1024 megabyte
USB slot	Two free connectors for software hard lock and Bluetooth dongle

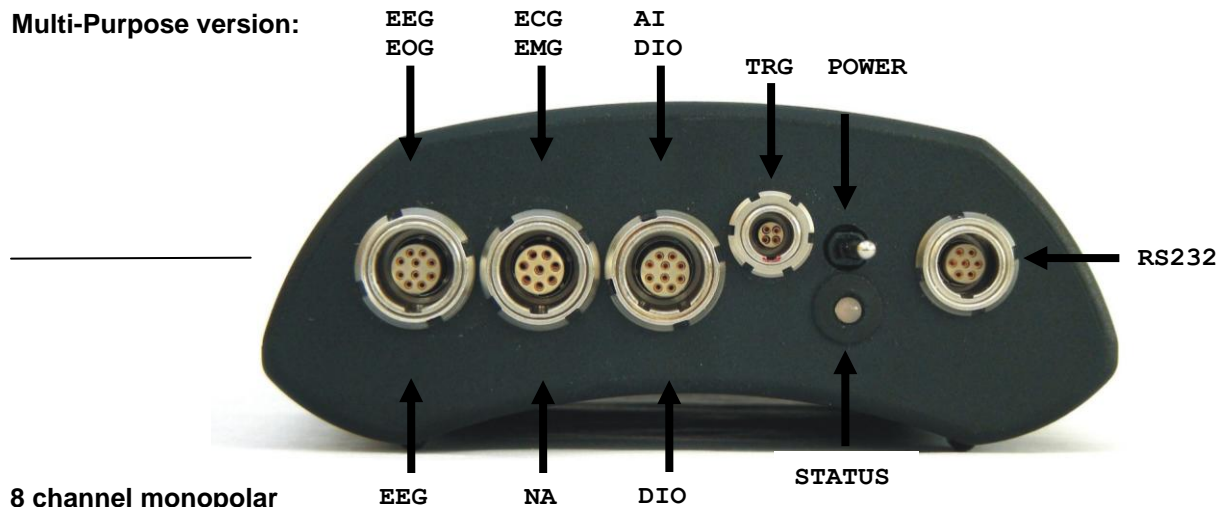
Help

The PDF help requires an actual Adobe Reader.

Labeling

Switches, connectors and LEDs

Multi-Purpose version:



8 channel monopolar
EEG version:

g.MOBllab+ has on the top-end side the following sockets, switches and connectors (see from right to left in the picture above):

Multi-Purpose version (see picture above, upper side)

RS232	Socket for serial cable if Bluetooth is not used
STATUS	A green blinking LED indicates the correct operation. A green glowing LED indicates an ongoing data acquisition. If the batteries empty during streaming data to mini SD card the LED turns to orange and g.MOBllab+ stops recording data after five minutes and the LED starts to blink red. A red blinking LED indicates that the batteries have to be exchanged. In case the LED does not operate at all exchange the batteries.
POWER	Switch for switching on/off the device
TRG	Socket for the connection of the switch box
AI DIO	Combined socket for the connection of external sensors and digital inputs and outputs
ECG EMG	Socket for the connection of the 2 bipolar channel ECG/EMG patient cable or 2 bipolar channel ECG/EMG electrode connector box
EEG EOG	Socket for the connection of the 4 bipolar channel EEG/EOG electrode connector box







8 channel monopolar EEG version (see picture above, lower side)

RS232	Socket for serial cable if Bluetooth is not used
STATUS	A green blinking LED indicates the correct operation. A green glowing LED indicates an ongoing data acquisition. If the batteries empty during streaming data to mini SD card the LED turns to orange and g.MOBilab+ stops recording data after five minutes and the LED starts to blink red. A red blinking LED indicates that the batteries have to be exchanged. In case the LED does not operate at all exchange the batteries.
POWER	Switch for switching on/off the device
TRG	Socket for the connection of the switch box
DI/O	Socket for the connection of digital inputs and outputs
NA	The ECG EMG socket is not available in the 8 channel monopolar EEG version
EEG	Socket for the connection of the 8 monopolar channel EEG electrode connector box

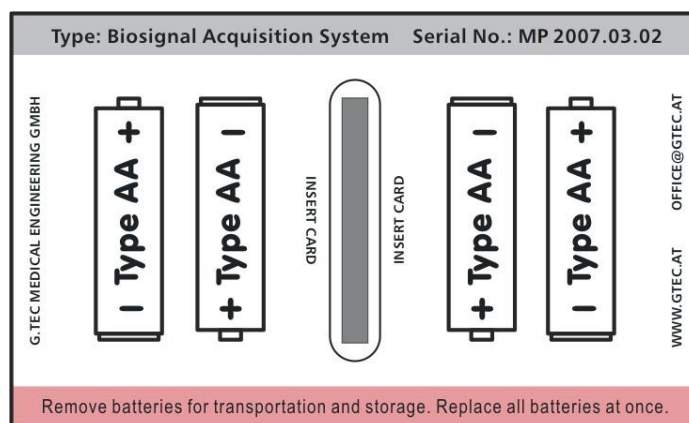
Labeling on the outside

The socket arrangement can be seen on the top side label of g.MOBilab+

Multi purpose version	8 channel monopolar EEG version
<p>DATA 2 Ch. 2 Ch. AI 2 Ch. 4 Ch. ext. 4 I/O 2 IN bipolar bipolar</p> <p>STATUS RS232 0 I TRG AI DI/O ECG EMG EEG EOG POWER</p> <p>g.MOBilab⁺ MOBILE LABORATORY</p> <p>+ wireless + data log</p> <p>gtec GUGER TECHNOLOGIES</p> <p>Type: Biosignal Acquisition System IP 40 S1</p> <p>g.tec medical engineering GmbH Sierningstrasse 14 A-4521 Schiedlberg, Austria http://www.gtec.at</p> <p>CE [Symbol] [Symbol]</p>	<p>DATA 2 Ch. 6 x DI/O 8 Ch. ext. mono</p> <p>STATUS RS232 0 I TRG DI/O EEG POWER</p> <p>g.MOBilab⁺ MOBILE LABORATORY</p> <p>+ wireless + data log</p> <p>gtec GUGER TECHNOLOGIES</p> <p>Type: Biosignal Acquisition System IP 40 S1</p> <p>g.tec medical engineering GmbH Sierningstrasse 14 A-4521 Schiedlberg, Austria http://www.gtec.at</p> <p>CE [Symbol] [Symbol]</p>

	Bluetooth enabled
	Mini SD card implemented
	Applied part of type BF
	Attention to instructions
	Device type
	CE marking
IP 40 S1	IP 40: Protected against mechanical wires with a diameter of 1 mm. No protection against liquids. S1: Permanent operation.

Labeling on the inside



Type	Biosignal Acquisition System
Serial No. MP YYYY.MM.NN	Serial number in the format Year.Month.Number
Battery Type: AA/Mignon	4 AA/Mignon batteries are required for the operation of the device
Insert card	Slot for the mini SD card

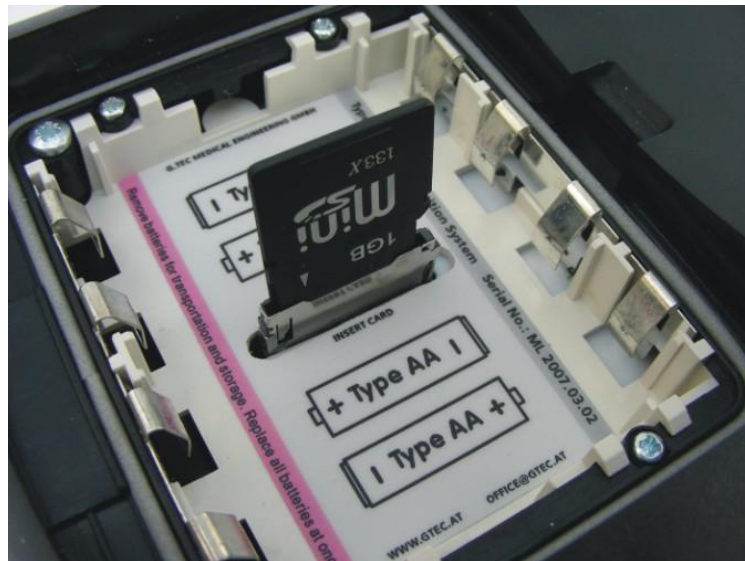
Safe operation of g.MOBllab+

Connecting and switching on g.MOBllab+

To start the Multi-Purpose Version of g.MOBllab+ perform the following steps:
(Starting the device for the 8 channel monopolar EEG version is similar except for the ECG/EMG connection)

Step 1: Open the battery box at the rear side of the device and insert 4 identical AA/Mignon batteries. Please insert the batteries according to the illustration at the bottom of the battery box. The battery voltage can be between 1.2 V and 1.5 V DC. The state of charge must be identical for all batteries.

If a mini SD card is used please insert the provided mini SD card into the card slot in the middle of the battery compartment before switching on g.MOBllab+. Before changing the mini SD card always switch off g.MOBllab+. Make sure that the mini SD card is formatted in the F16 format. See image below how to insert the mini SD card.



Step 2: Connect the **EEG/EOG electrode box** to the socket **EEG EOG** at the top-end side of g.MOBllab+.

Step 3: Connect the **ECG Cable** to the socket **ECG EMG**

Step 4: Connect the **Switch Box** to the socket **TRG**

Step 5: If you ordered the g.MOBllab+ for a PC connection via Bluetooth and your Bluetooth software is already installed then insert the Bluetooth dongle into a free USB slot of the PC. If you experience any problems during Bluetooth installation see Appendix 1: Bluetooth Software and Dongle installation for more information.

If you ordered the g.MOBllab+ with wired serial RS232 interface connect now the serial cable using a null-modem cable to the corresponding socket of the PC, use the ActiveSync cable to connect the g.MOBllab+ to the Pocket PC.

NOTE: g.MOBllab+ is connected with a **null-modem** cable to the PC. Otherwise the connection will NOT work.

Step 6: Switch on g.MOBllab+ with the switch on the top-end side (switch position I).
For Bluetooth connection: If g.MOBllab+ is started for the first time the connection via the Bluetooth interface has to be established correctly. Please refer to the corresponding manuals for the Pocket PC or PC.

The correct operation of g.MOBllab+ is indicated by a green blinking LED at the top-end side. If the LED is not blinking please check the batteries. If the LED is blinking red, please replace the batteries. See chapter Switches, connectors and LEDs for more information.

Measuring EEG and ECG Signals

In measuring mode, all analog input channels are amplified and every channel is sampled with a 16 bit analog to digital converter. The sampling rate is fixed and set to 256 Hz. The signals are transmitted via a serial connection to the Pocket PC / PC or stored to the mini SD card.

Using external sensor signals

Use the AI D I/O socket of the Multi-Purpose version to connect external sensors to g.MOBllab+. Note that the analog inputs can be in the range of -5 to 5 V. Signals with an amplitude of ± 5 mV can be connected to the ECG EMG amplifier socket, sensors with an output of ± 2 mV can be connected to the DC channels 3 and 4 of socket EEG EOG and sensors with ± 500 μ V to the channels 1 and 2 of socket EEG EOG.

Switching off and Storage of g.MOBllab+

To switch off g.MOBllab+ and to store the device correctly, please perform the following steps:

Step 1: Switch off the device with the switch on the top-end side (switch position 0). Then the green LED stops blinking.

Step 2: Disconnect the serial cable – if applicable- from the Pocket PC / PC

Step 3: Disconnect all other cables and electrode boxes from g.MOBllab+

Step 4: If the device is not used for a longer time period, please remove the batteries

Batteries and Fuse

Batteries

g.MOBllab+ is powered by 4 AA/Mignon batteries. The voltage of each cell must be between 1.2 and 1.5 V.

General notes on batteries

If you don't handle the batteries with care, fire and burns are possible. Don't open the batteries; protect the batteries against short-cuts, water and fire.

Storage of the batteries

Rated storage temperature: 0 ° C to 40 °C

Rated air humidity: 25 % to 95 % relative humidity

Waste disposal details

Batteries are small chemical waste. Throw away broken or used up batteries in a special container or hand them in to a recycling center or send it back to the manufacturer.

Internal Fuse

g.MOBllab+ has an internal 100 mA fast-acting fuse.

General Notes

Classification

Safety class	internal current supply
Degree of protection	BF
Protection against mechanical distortion and liquids	IP40
Operation mode	S1 (permanent operation)

Transportation and Storage conditions

The device can be stored at temperatures between –20 to +60 degrees Celsius. The relative humidity must be between 25 % and 95 %. Wait before usage of the device till condensed water disappeared (wait at least 1h in a heated room).

Location details

Do not use the device near a heating system or directly in the sun. The maximal temperature of the environment is 40 degrees Celsius.

Waste disposal details

Bring the device to a recycling center or sent it back to the manufacturer.

Cleaning

You can clean the device carefully with medical rubbing alcohol. Liquid must not enter the g.MOBllab+.

Declaration of conformity

Product name

g.MOBllab+

Manufacturer

g.tec medical engineering GmbH, Sierningstrasse 14, 4521 Schiedlberg, Austria

Classification

Safety class	internal current supply
Type of applied part	BF
Protection against mechanical distortion and liquids	IP40
Operation mode	S1 (permanent operation)

CE mark



The manufacturer declares in sole responsibility that g.MOBllab+ is in conformity with the general requirements for safety (low voltage directive) 73/23/EWG and 89/336/EWG (electromagnetic compatibility) and with the following standards:

EN60601-1: 1996 (+A1 +A2 +A12 +A13),
EN60601-2-26: 2004,
EN60601-1-2: 2003,
EN60601-2-25+A1: 2001,
EN 60601-2-40: 1998.

g.MOBllab+ is not a medical device. The product is NOT intended to be used as a medical device. However, the product meets the IEC 60601-1 standard as it is a more rigorous standard than other standards.



Dr. Christoph Guger
Chief Executive Officer



Dr. Günter Edlinger
Chief Executive Officer

Schiedlberg, 2009

Technical specifications

Rated power consumption	0.18 VA
Rated DC voltage	3 V DC
Rated current of fuse	100 mA fast-acting fuse
Rated voltage of fuse	250V≈
Produced	see serial number year
Producer	g.tec medical engineering GmbH Sierningstrasse 14 4521 Schiedlberg Austria http://www.gtec.at

Maximum voltages:

RS232 connector DATA	±15V DC
at socket TRG	5V DC
at socket AI D I/O / D I/O	5V DC

Multi-Purpose version:

Amplifier settings

EEG channels 1 and 2	Sensitivity: ± 500 µV
	Highpass: 0.5 Hz
	Lowpass: 100 Hz
EEG channels 3 and 4	Sensitivity: ± 2 mV
	Highpass: 0.01Hz
	Lowpass: 100 Hz
ECG channels 5 and 6	Sensitivity ± 5 mV
	Highpass 0.5 Hz
	Lowpass 100 Hz

Analog and digital inputs/outputs at socket
AI D I/O

Analog input	Sensitivity ± 5 V
	Highpass DC
	Lowpass 100 Hz
Digital inputs	0 - 5 V (TTL)
Digital outputs	0 - 5 V (TTL)

8 channel monopolar EEG version:

Amplifier settings

EEG channels 1 to 8

Sensitivity: $\pm 500 \mu\text{V}$

Highpass: 0.5 Hz

Lowpass: 100 Hz

Digital inputs/outputs at socket D I/O

Digital inputs

0 - 5 V (TTL)

Digital outputs

0 - 5 V (TTL)

General:

Digital input at socket TRG

Digital input

0 - 5 V (TTL)

Analog-Digital Converter (ADC):

ADC resolution

16 Bit

Sampling frequency

256 Hz per channel

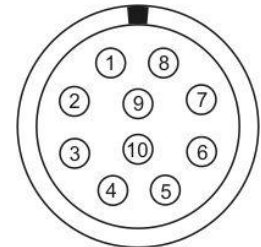
PIN assignment

Attention: Never connect signals outside the range of 0 to 5 V to Digital Inputs! This will damage g.MOBllab+.

PIN assignment Multi-Purpose version

Pin-assignment for the 10 pin socket **EEG EOG**

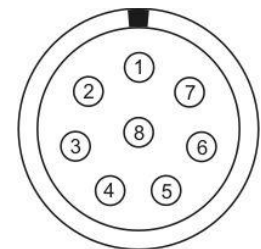
Pin 1	EEG/EOG Ch 1 -
Pin 2	EEG/EOG Ch 2 +
Pin 3	EEG/EOG Ch 2 -
Pin 4	EEG/EOG Ch 4 +
Pin 5	Analog GND (VCC/2)
Pin 6	EEG/EOG Ch 3 -
Pin 7	EEG/EOG Ch 3 +
Pin 8	EEG/EOG Ch 1 +
Pin 9	EEG/EOG Ch 4 -
Pin 10	Not used
Body	Not connected



Socket: EEG EOG

Pin-assignment for the 8 pin socket **ECG EMG**

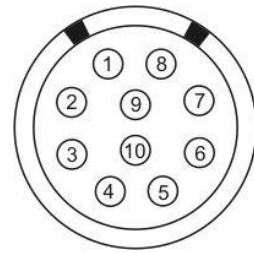
Pin 1	ECG/EMG Ch 5 +
Pin 2	ECG/EMG Ch 5 -
Pin 3	ECG/EMG Ch 6 -
Pin 4	ECG/EMG Ch 6 +
Pin 5	Analog GND (VCC/2)
Pin 6	Not connected
Pin 7	Not connected
Pin 8	Not connected
Body	Not connected



Socket: ECG EMG

Pin-assignment for the 10 pin socket **AI D I/O**

Pin 1	Analog Input Ch 1 +
Pin 2	Analog Input Ch 2 +
Pin 3	Digital In 1
Pin 4	Digital In 2
Pin 5	Digital In/Out 4
Pin 6	Digital In/Out 5
Pin 7	Digital In/Out 6
Pin 8	Digital In/Out 7
Pin 9	Analog GND (VCC/2)
Pin 10	Digital GND
Body	Not connected

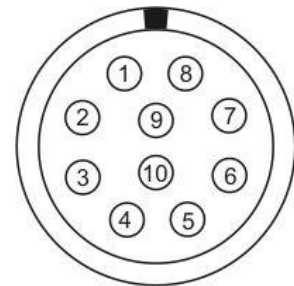


Socket: AI D I/O

PIN assignment 8 channel monopolar EEG version

Pin-assignment for the 10 pin socket **EEG**

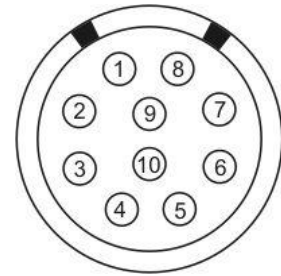
Pin 1	EEG Ch 5 +
Pin 2	EEG Ch 2 +
Pin 3	EEG Ch 6 +
Pin 4	EEG Ch 4 +
Pin 5	ANALOG GND (VCC/2)
Pin 6	EEG Ch 7 +
Pin 7	EEG Ch 3 +
Pin 8	EEG Ch 1 +
Pin 9	EEG Ch 8 +
Pin 10	EEG Ch x – (reference)
Body	Not connected



Socket: EEG

Pin-assignment for the 10 pin socket **D I/O**

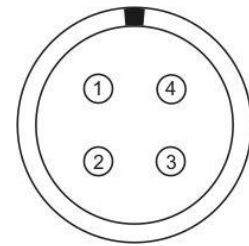
Pin 1	Not connected
Pin 2	Not connected
Pin 3	Digital In 1
Pin 4	Digital In 2
Pin 5	Digital In/Out 4
Pin 6	Digital In/Out 5
Pin 7	Digital In/Out 6
Pin 8	Digital In/Out 7
Pin 9	Analog GND (VCC/2)
Pin 10	Digital GND
Body	Not connected



Socket: D I/O

Pin-assignment for the 4 pin socket **TRG**

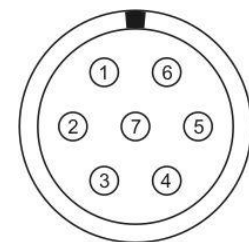
Pin 1	Digital In 3
Pin 2	Digital In 8
Pin 3	Digital GND
Pin 4	+5 V
Body	Not connected



Socket: TRG

Pin-assignment for the 7 pin socket **RS232 DATA**

Pin 1	RX data line
Pin 2	Digital GND
Pin 3	DTR line
Pin 4	RTS line
Pin 5	Digital GND
Pin 6	TX data line
Pin 7	Enable <u>RS232</u> / Bluetooth line



Socket: DATA



contact information

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