

Technical Manual

# **GA-1, GA-2**

Gas Analyzers



TM051.01.001.000  
(10.04.2012)

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## Introduction

The present technical manual (hereinafter referred to as “manual”) is the combined document describing operation and servicing of GA-1 and GA-2 gas analyzers (hereinafter referred to as “gas analyzers”).

The document certifies technical parameters of the gas analyzers, which are guaranteed by the manufacturer.

**Before starting to work, read the manual carefully!**

You can send your responses and recommendations to the following address:

**Post Office Box 10, Ivanovo, 153000, Russia**

or by e-mail:

**help@neurosoft.ru**

You can find additional information on **Neurosoft** products on our website:

**www.neurosoft.ru**

or ask questions by phone:

**+7 (4932) 24-04-37 (Service Department)**

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# 1. Description and operation

## 1.1. Function

The gas analyzers are used together with digital EEG systems of **Neuron-Spectrum** series manufactured by **Neurosoft** Ltd. and are intended for measuring the carbon dioxide (CO<sub>2</sub>) concentration (GA-1) and carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>) concentration (GA-2) in the inhaled and exhaled air by means of continuous gas sample acquisition from the patient breath monitoring system.

## 1.2. Main specification

Table 1. Main Specifications of Gas Analyzers

Parameters	Values
CO <sub>2</sub> measuring technique	IR spectroscopy
CO <sub>2</sub> concentration measuring range	from 0 to 99 mm Hg. (from 0 to 13%)
CO <sub>2</sub> concentration measurement deviation (at respiratory rate of 80 breath/min.):	± 2 mm Hg. ± 5% from the measured value ± 10% from the measured value
• within the range of (0–38) mm Hg.	
• within the range of (38–70) mm Hg.	
• within the range of (70–99) mm Hg.	
CO <sub>2</sub> concentration measurement deviation (at the respiratory rate from 81 to 120 breath/min.)	± 15% from the measured value
CO <sub>2</sub> concentration measurement deviation (at the respiratory rate from 121 to 150 breath/min.)	not defined
Capnogram rise time	240 ms
System response time	from 1 to 3 s
Respiratory rate measuring range	from 3 to 150 breath/min.

Table 1. Continued

Parameters	Values
Warmup time (to provide the specified deviations)	15 min.
PC connection	USB
Supply voltage	(4.75–5.15) V
Consumption current (with sensor)	not more than 350 mA
Electronic unit dimensions	160×95×45 mm
Electronic unit weight	not more than 700 g
USB cable length	3 m

### Safety and Electromagnetic Compatibility

Electromagnetic compatibility (EMC) is provided by IEC 60601-1-2:2001 requirements fulfillment.

The gas analyzers are intended for operation in electromagnetic environment, which special features are specified in the appendixes to digital EEG systems technical manuals.

As for safety, the gas analyzer satisfies IEC 601-1-88 and IEC 601-1-1-96 requirements. The electronic units are supplied by regulated power supply through USB interface, have double isolation and BF type work parts according to IEC 60601-1.

### Interpretation of Symbols on Electronic Units:



– Attention: consult user and technical manuals.



– Work parts of BF type according to IEC 60601-1.

## 1.3. Delivery Set

Table 2. Base delivery set of GA-1 and GA-2 gas analyzers

Name	Document code or main specifications	Number, pcs.	
		GA-1	GA-2
GA-1 gas analyzer unit	NSFT 051201.001	1	–
GA-2 gas analyzer unit	NSFT 051201.001-01	–	1
Technical manual	TM051.01.001.000	1	1

Table 3. Equipment included in delivery set at customer's request

Name	Document code or main specifications	Number, pcs.	
		GA-1	GA-2
Anesthesia mask	adult	1	1
Anesthesia mask	pediatric	1	1
Breath sampling line with hydrophobic filter and airway adapter	FilterLine H Set	1	1
O <sub>2</sub> sensor	OOM109-EMLF2	–	1

## 1.4. Arrangement and Operation

The GA-2 gas analyzer pneumatic circuit is shown in fig. 1. The GA-1 gas analyzer pneumatic circuit does not contain O<sub>2</sub> sensor.

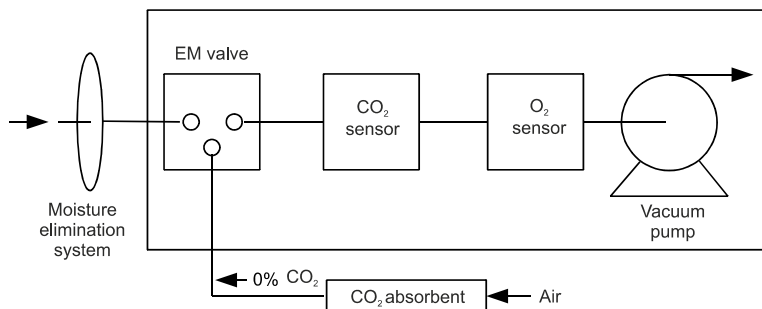


Fig. 1. GA-2 gas analyzer pneumatic circuit.

To analyze the gas mixture the vacuum pump performs gas probe acquisition through the moisture elimination system, connected to the input fitting. During the gas probe acquisition the system monitors the line condition (obstruction degree). If the obstruction degree is high (or the line is filled with water) and gas can not pass through the line with the desired speed, the system tries to clean it by means of voltage increase at the vacuum pump. In case of failure the gas analyzer stops the operation automatically and signals an error.

The gas analyzers provide an opportunity to calibrate zero CO<sub>2</sub> concentration in order to eliminate temperature, air pressure or system components heating errors. To calibrate zero CO<sub>2</sub> concentration electromagnetic valve switch periodically the sampling line from the patient to the outer air with zero CO<sub>2</sub> concentration. The purification is performed with the use of special CO<sub>2</sub> absorbents. At the output of such absorbents CO<sub>2</sub> concentration is zero and this gas can be used for accurate calibration. Calibration duration is less than 1 second and practically unnotice-



able for a system user. For CO<sub>2</sub> concentration measurement infrared spectroscopy is used.

If you use GA-2 gas analyzer gas mixture from the CO<sub>2</sub> sensor outlet going to the O<sub>2</sub> sensor inlet.

Data about CO<sub>2</sub> and O<sub>2</sub> concentration are processed by gas analyzer and exported to the computer via USB for the further analysis and displaying in the corresponding program.

## 1.5. Function of Controls

The front panels of GA-1 and GA-2 gas analyzers are shown in fig. 2 and fig. 3.

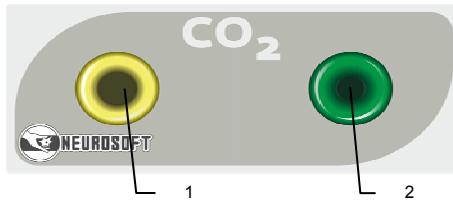


Fig. 2. GA-1 gas analyzer front panel.

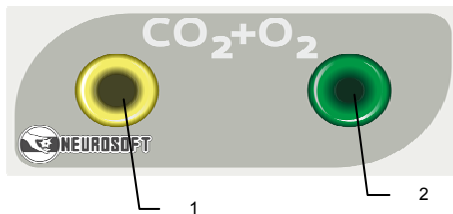


Fig. 3. GA-2 gas analyzer front panel.

1. Inlet fitting for probe sampling.

The inlet fitting is intended for gas probe acquisition.

## 2. Outlet fitting.

The outlet fitting is intended for gas withdrawal after the analysis.

To prevent the room air pollution with anesthetic gases gas from the output fitting should be withdrawn (through the special tube) to the extraction ventilation.

The general view of GA-2 gas analyzer with components is shown in fig. 4.



Fig. 4. The general view of GA-2 gas analyzer with components.

## 3. USB cable.

USB cable is used for gas analyzer connection to the computer, for power supply and software control.

## 4. FilterLine H Set breath sampling line with hydrophobic filter (moisture eliminator) and airway adapter.

The system is connected to the probe sampling outlet fitting and ensure the measurement accuracy of the gas mixture

which should go to the analysis in completely dried state. The presence of water in the CO<sub>2</sub> sensor measurement chamber can be resulted in sensor damage.

5. Anesthesia mask.

## 2. Operational Guideline

Gas analyzers and digital EEG systems of **Neuron-Spectrum** series are connected to the computer USB ports.

Connect the breath sampling line with hydrophobic filter to the inlet gas analyzer port.

The adapter should be placed at the patient's mouth as close as possible in order to exclude the "death zone" between sampling line and patient's mouth. If this case measured EtCO<sub>2</sub> concentration conforms to alveolar CO<sub>2</sub> level. The airway adapter should be installed in such a way to direct the hydrophobic filter upwards. It should be directed upwards in order to diminish the quantity of moisture got into the CO<sub>2</sub> monitoring line and to extend its life.

To connect the gas analyzer to the digital EEG system manufactured by **Neurosoft** Ltd. use typical connection scheme shown in fig. 5.

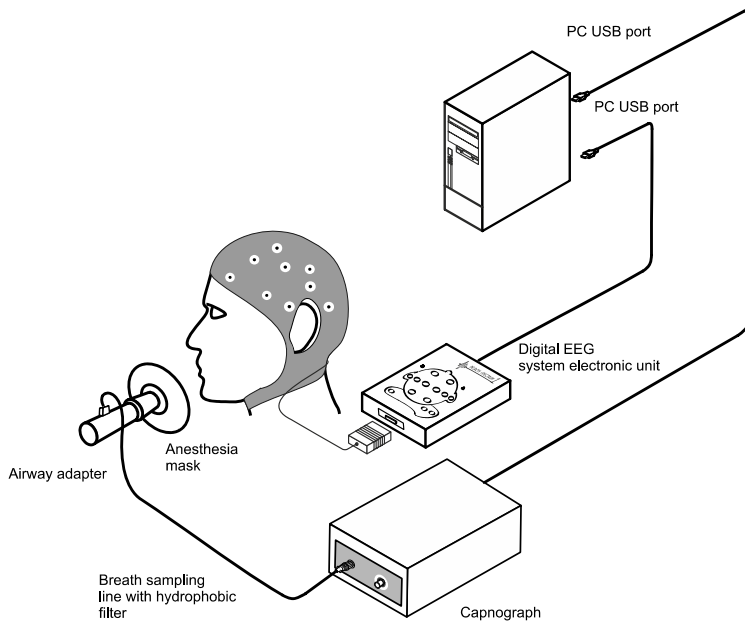


Fig. 5. Gas analyzer connection scheme.

Before starting to work make sure that gas analyzer and sensor cases have no mechanical damages which can be resulted in danger situations.

Recommended operational restrictions:

- air temperature — (0–40)°C;
- air pressure — (550–795) mm. Hg;
- relative humidity — (10–90)% (without condensate).

### 3. Servicing

The gas analyzer can be completed with accessories which require timely maintenance.

- Breath sampling line with hydrophobic filter (fig. 4, item 4). It is used for sample moisture elimination (dehydration) and is connected to the inlet fitting for probe sampling (fig. 4, item 1). In case the line filled with water **Neuron-Spectrum.NET** software shows the corresponding warning.

**Warning! Do not use gas analyzer without hydrophobic filter! In case moisture got into the gas analyzer case, the gas analyzer can broke down!**

- CO<sub>2</sub> absorbent (fig. 6, item 1). Has rather long life (not less than 1 year) and should be checked every 12 months. If absorbent reaches the end of its service life it changes its color to dark lilac.
- O<sub>2</sub> sensor (only for GA-2) (fig. 6, item 2). When the sensor reaches the end of its service life (12 months) it is necessary to replace it. To replace the sensor cut the collar, detach the connector (fig. 6, item 3) and extract the sensor. The new sensor placement should be performed in the reverse order.

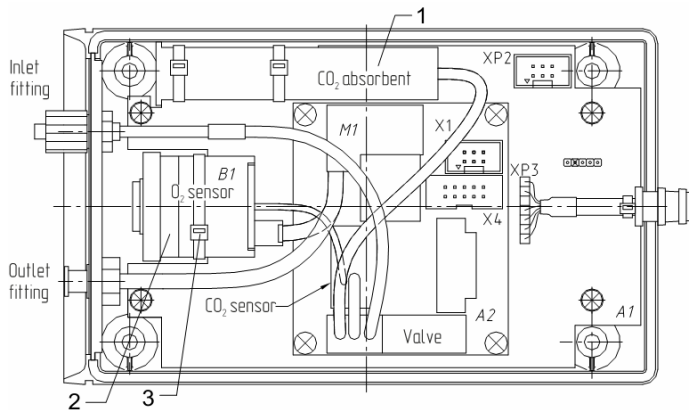


Fig. 6. Location of elements which required timely maintenance.

## 4. Packing and Transportation

The gas analyzer package should conform to the accepted one when manufacturing and delivering. In case the factory package is damaged, but the long-term stimulator storage and transportation is expected, respect the following recommendations:

- The gas analyzer with operational documentation should be packed in plastic sachets and cardboard boxes.
- The cardboard boxes should be covered by the paper tape or pressure sensitive adhesive tape.
- The gas analyzers are transported by all kinds of covered carries (except non-heated airplane pods) according to rules of goods transportation for each mode of transport.

The gas analyzer should be transported at temperature from +50 to -50°C and 90% maximal relative humidity (measured at 25°C temperature).

The gas analyzer portage by sea transport should be done according to “Safety Regulations for Sea Transport of General Cargoes”.

The shipment type is by containers and part-load consignment.

## 5. Utilization

The gas analyzer utilization is performed according to current legislation of your region. The special conditions of gas analyzer utilization are not provided by the manufacturer.

## 6. Delivery Set and Package Data<sup>1</sup>

Gas analyzer

GA-1

GA-2

is collected and packed according to the NSFT 051201.001 construction documentation requirements.

Package report number \_\_\_\_\_

Package report date \_\_\_\_\_

Detailed information about the delivery set is given in the package report which is the essential part of the present manual and should be stored together with it.

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<sup>1</sup> The section is not completed if the gas analyzers are supplied together with the finished product.

## 7. Acceptance Certificate

The gas analyzer corresponds to design documentation requirements NSFT 051201.001 and is ready for operation.

Delivery service representative \_\_\_\_\_  
signature

## 8. Delivery Certificate

The gas analyzer is delivered to the customer \_\_\_\_\_  
signature

Gas analyzer was handed \_\_\_\_\_  
signature

Gas analyzer was accepted \_\_\_\_\_  
signature

## 9. Storage Regulations

The gas analyzers should be stored in the manufacturer package in an enclosed room at temperature from +5 to +40°C and 80% maximal relative humidity (measured at 25°C temperature). The air in the storage room should be free of impurities resulting in corrosion.

Information about the gas analyzers storage before and in the process of operation is registered in Table 4.



Table 4. Information Concerning Gas Analyzers Storage at Customer

Date		Storage conditions	Position, name and signature of person responsible for the storage
beginning of storage	end of storage		

## 10. Warranty

10.1. The manufacturer guarantees the gas analyzer quality conformance to NSFT 051201.001 design documentation requirements if the rules of operation, storage, transportation and mounting prescribed in the operational documentation are observed.

10.2. Warranty period is 24 months from the delivery date to the customer. The delivery date is the date of invoice for the

gas analyzers or finished product including the gas analyzers.

10.3. The warranty period can be prolonged for the period from reclamation submission up to repair completion (chapters 11, 12).

10.4. The operation of guarantee commitment is stopped if:

- the rules of operation, storage, transportation and mounting prescribed in the operational documentation are not observed;
- the warranty period is expired;
- a user breaks the seal without permission of the manufacturer.

10.5. The manufacturer is obliged to repair the gas analyzer in case of breakdown during the warranty period free of charge. The repair is carried out in the service center of Neurosoft Company (5, Voronin str., Ivanovo, 153032, Russia).

## 11. Reclamation Data

11.1. In case of gas analyzer breakdown or faultiness in the period of warranty and also product defect detected when primary acceptance, the consumer should send written notification to **Neurosoft** Ltd. address indicating the following information:

- the consumer's name and the address;
- gas analyzer serial number;

- copy of the 6 chapter of the present manual or the number and the date of the invoice or other document confirming the gas analyzer purchase.
- the detailed description of failures, if possible indicate the reasons and circumstances preceding the fault detection (it is recommended to add the test report, the exam data, photos and other materials allowing to solve the problem as soon as possible).

11.2. In case of gas analyzer return to the service center for the repair or the replacement, the following rules should be observed:

- gas analyzer should be packed in such a way to exclude the possibility of its damage during the transportation;
- the notice (see p. 11.1 of chapter 11) and the present manual must be added to the gas analyzer posting.

All reclamations, its description and taken measures are registered in Table. 5.

Table 5. Reclamation Data

<b>Data of failure of trouble occurring</b>	<b>Brief description of failure</b>	<b>Date of reclamation sending</b>	<b>Taken measures</b>	<b>Notes</b>

## 12. Repair Data

Table 6. Repair Data

Name and code of faulty unit	Degree of imperfection	Date		Name of repair works	Position, name, signature of	
		completion of work	arrival for repairing		carried out the repair	accepted from the repair

