N_2-Generator

USER MANUAL

G.A.S. Gesellschaft für
analytische Sensorsysteme mbH

CE-Marking according to:

International Standard EN ISO 17050-1:2004
Directive 2014/35/EU (Low voltage directive);
Directive 2014/30/EU (Electromagnetic compatibility);
Directive 2011/65/EU (RoHS);
Directive 2012/19/EU on waste disposal (Waste Electrical and Electronic Equipment – WEEE)

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Table of Content

1 General Information

1.1 Information about the Manual

This manual describes a safe and adequate handling of the device. Following the instructions of the indicated safety aspects and instructions as well as the national and/or local rules and general safety regulations concerning the prevention of accidents are absolutely imperative.

Before starting the work with the device read the manual completely and thoroughly particularly the chapter security and respective safety references. Assure that you/the operator comprehend the terms described.

The manual is part of the device. It must be stored together with and next to the device at any time.

INFORMATION!

The graphics in this user manual are schematic and may differ from the actual conditions. The firmware and PC software screenshots in this user manual may differ from the actual conditions.

1.2 Explanation of Symbols

Important and safety-relevant references in this manual are characterized by symbols. These indications which are in-line with industrial safety must be respected and followed at any time.

INFORMATION

This symbol calls information, which are to be considered for efficient and perfect handling of the equipment.

WARNING

This symbol indicates references, which can lead to damages, malfunctioning and/or loss of the device.

DANGER

This symbol marks references, which can lead to health impairments, injuries, lasting body damages or to death due to electric current.

1.3 Notation for dialogs, elements and references

Example Dialog:

System › Connections › LAN File Transfer › Settings... › Test Connection

Example Elements:

Gas Out, Sample gas in

Example: References

Advanced User Manual, Chapter 5.1 Installation Reguirements

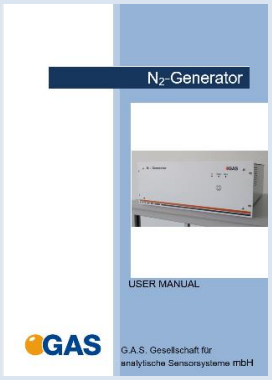
Example: Information

keep the transport box

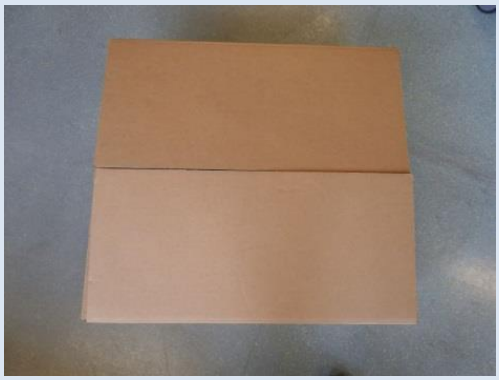
1.4 Scope of Supply

Assure that you have received the full scope of supply. If there is any part missing, please contact the GAS-hotline immediately.

Standard Scope of Supply	
	**N2 Generator** (1 piece)
	**Power plug** (1 piece)
	USB-Stick Box with Documents (1 piece)



User Manual (1 piece)



Transport box (1 piece)

Transport palett (60 x 80 cm)

INFORMATION!

It is recommended to **keep the transport box** for a safety return transport.

1.5 Liability and Guarantee

This user manual describes the safe and proper handling of the device.

All data and reference within this manual are compiled under the valid regulations, the state-of-the-art as well as G.A.S. experiences of several years.

This user manual must be stored together with and close to the device at any time and accessible to all persons, who operate or handle the device at any time.

This user manual must be read carefully before starting to work with the device. G.A.S. does not assume any liability for damage and disturbances, resulting from disregard of the instructions contained in this user manual. All claims of any kind related to damage from a not intended use of the device will be rejected.

G.A.S. reserves the right to realize technical changes of the product due to improvements without explicitly mentioning them.

1.6 Copyright

The manual is confidential. It is beyond doubt exclusively made and also meant for the personnel directly dealing with the equipment. All data, texts, designs, pictures and other representations within this manual are protected in the sense of the copyright law and are subject to further commercial patent rights. Each abusive is punishable by law.

Passing it on to third persons as well as duplications in any kind and form - also in part - as well as the use and/or report of contents are not permitted without written agreement of the manufacturer. Offences lead to payment of damages. We reserve ourselves all rights of the practice of commercial patent rights.

1.7 Return and Disposal

For an adequate disposal, the device or/and its equipment must be returned to the G.A.S. or to a third party authorized by the G.A.S.! For questions please contact G.A.S.

1.8 Customer Service

For questions concerning G.A.S. products a customer service is available:

G.A.S. Gesellschaft für analytische Sensorsysteme mbH

Otto-Hahn-Straße 15

44227 Dortmund

Germany

Phone: +49 (0) 231 / 97 42 - 65 50

Fax: +49 (0) 231 / 97 42 - 65 55

support@gas-dortmund.de

The telephone hotline is available from monday to friday from 9:00 to 16:00 hours. In urgent cases or if you use fax or email please provide a telephone number for callbacks.

2 Safety

2.1 Intended Use Only

WARNING!

Usage other than described in this manual may damage the device and/or harm persons involved.

Do not use the device for other purposes. Damages due to misuse are not covered by the guarantee. Such damage claims will be rejected.

The device and its equipment are not certified for the employment in areas with explosive gas air mixtures.

All claims or requirements of any kind against the manufacturer and/or its authorized persons that arise due to damages from a not intended use of the device will be

rejected. All damages that arise from a not intended use are of the operator's responsibility.

The intended use of the equipment and its correct handling according are described in the operating instructions of this manual. Other parts than the parts belonging to the scope of supply, may only be used after G.A.S. approval.

2.2 Responsibility of Operator

The device may only be operated in a perfect technical condition. Before putting the device into operation the condition of the device and its equipment must be checked. The information and instructions provided in this manual have to be followed at any time.

Besides the instructions provided in this manual the local rules for the prevention of accidents, general safety regulations - valid for the area of application of the device - as well as the valid environmental-protection regulations must be considered and respected.

The responsible technicians and operators have to make sure a failure-free use of the device. Responsibilities among the involved persons regarding installation, operation, maintenance and cleaning must be made clear.

2.3 Requirements of Personnel

Only authorized and trained technical personnel may work with the instruments. The operator must have received an instruction over existing and all possible dangers and should be regularly instructed in safety procedures and environmental protection and that the personnel is fully aware of the complete operating instructions and particularly the safety notes. Personnel that might be under the influence of drugs or alcohol are to be kept off the device at any time.

Technical personnel in this context are defined as skilled employees who are knowledgeable due to their educational background. In case the foreseen personnel do not have the necessary qualifications to operate the instrument, it must be trained. Further to that non-authorized personnel should not operate the device.

The competencies for the work on and with the device must be specified and kept undoubtedly at any time so that with respect to security issues no unclear situation might come up.

Any changes of the equipment, which impair security of the personnel, must immediately be reported to the operator and every person dealing with it.

2.4 Dangers

The device and its equipment is subject to an endangerment analysis. The construction and execution of the device corresponds to the today's state-of-the-art. The device is reliable in service when operated according to its intended use.

DANGER

Exercise great care in handling current-carrying parts like the power supply cord. Do not get directly in touch with current-carrying parts. Do not open the housing. Do not use damaged parts.

INFORMATION!

If the housing of the device is damaged, the device must not be used anymore and must be returned to the G.A.S. by using the original transportation case.

DANGER

Exercise great care in handling current-carrying parts like the power supply cord. Do not get directly in touch with current-carrying parts. Do not open the housing. Do not use damaged parts.

3 Transport, Packing and Storage

3.1 Inspection after Transport

Check the supply immediately after delivery concerning its completeness and/or transport damages. If you detect externally visible transport damage, do not receive the supply, or only under reservation. State the extent of the damage on the provided delivery note and/or the transportation documents of the feeder. Generate a complaint. Lodge a complaint of covered defect immediately after recognizing, as claims due to transport damages can only be made valid within the complaint periods (usually 7 days).

3.2 Packing

If no return agreement regarding the packing was agreed upon dispose the packaging material always in an environmentally friendly way and according to valid local regulations. If necessary, ask a recycling company.

INFORMATION!

It is recommended to **keep the transport box** for a safety return transport.

3.3 Storage and Transport

Store the device only under the following conditions:

- **When not in use store the equipment in the supplied casing**
- **Prevent unauthorized access**
- **Do not store outside**
- **Protect the equipment from moisture and dust**
- **Put protective caps on all gas sockets**
- **Avoid mechanical vibrations**
- **Do not expose the equipment to aggressive substances**
- **Protect the equipment from direct sun light**
- **Storage temperature: 5 to 35 °C**
- **Relative Air Humidity: <80%Rh, non condensing**
- **Instrument's position: Horizontal**

The equipment should be moved only within the provided carrying case. By this means, transport damages can be avoided. The above mentioned values are considered for an instrument transported in its original new packing.

WARNING!

Protective caps should be put on gas sockets in case the device is stored or transported.

4 Cleaning and Maintenance

Natural aging and the wear of certain components of the equipment require a regular cleaning and maintenance.

4.1 Cleaning

Clean the device only with a dry or easily damp cloth.

WARNING!

Do not use cleaning agents, which contain solvents, acids or bases.

4.2 Maintenance

INFORMATION!

Maintenance of the device should only be carried out at G.A.S. or through specially trained and by G.A.S. authorized personnel.

The recommended **maintenance interval is 12 months.**

5 Description of the N2-Generator unit

5.1 Purpose of the device

The purpose of the N2-Generator is generating high purified nitrogen for supply of G.A.S. measuring devices used typically in positive ion mode.

Nitrogen generators replace the use of inconvenient cumbersome high pressure gas cylinders as a source of hydrocarbon-free air. Eliminating the use of gas cylinders allows to reduce annual operating costs.

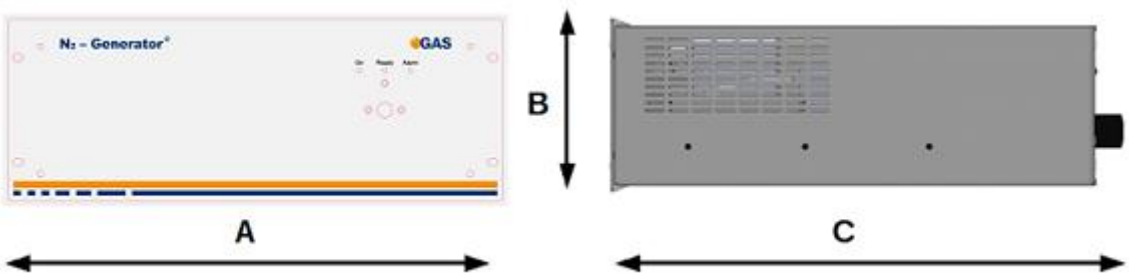
This system is engineered to be easy to install, requires only little annual maintenance and can be used in laboratories and/or light industrial environments.

INFORMATION

Any use of the device, that differs from the intended purpose will be regarded as “out of purpose”. Any claims of any kind against G.A.S. or her associates that are related to damages from use not covered by the aforesaid will be rejected.

5.2 Dimensions

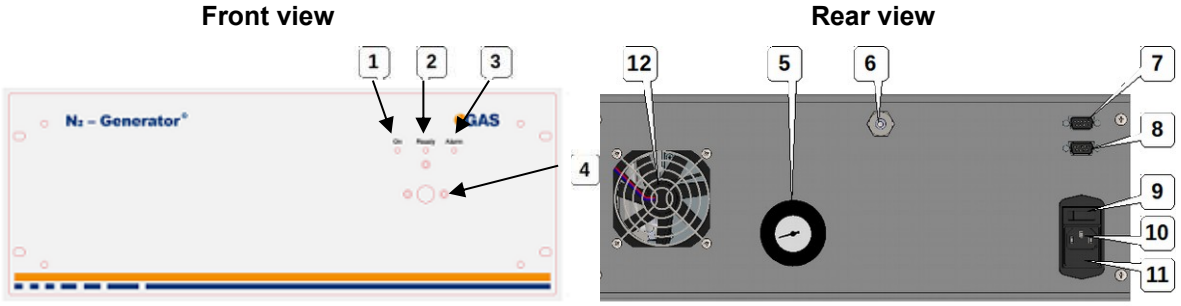
Model	Net weight (kg)	Gross weight (kg)
N2-Generator	27	30



A	48 cm	19”
B	18 cm	7.1”
C	54cm	21.1”
	56 cm with front handles	22”

5.3 Overview of the appliance

All connections, electric and air, are made at the back panel. Refer to the figure below.



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#		Description
1	**Front panel**	ON/OFF LED START/STOP button
2		Status LED
3		Alarm LED
4		START/STOP button

5	**Rear panel**	N2 Outlet pressure regulator with gauge
6		N_2 Outlet
7		RS485
8		RS 232
9		Power switch
10		Power connector
11		Fuse
12		Cooling fan air

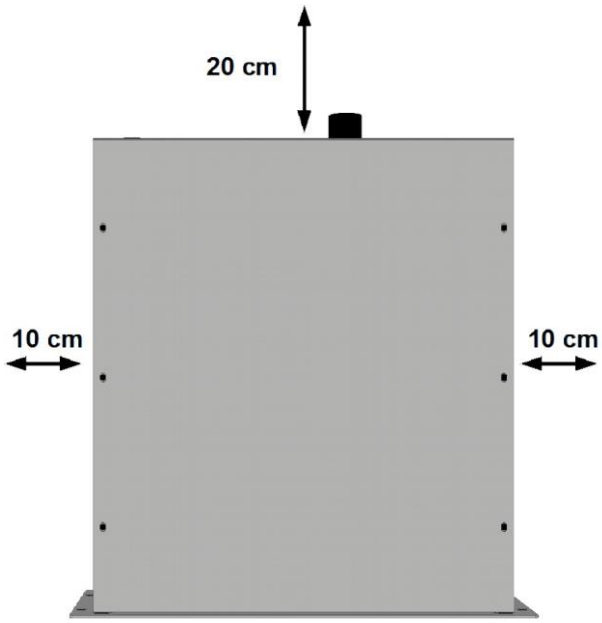
5.4 Installation and operation requirements

INFORMATION!

- The nitrogen generator should be positioned on a flat surface that is not exposed to vibrations and able to withstand a weight greater than 50 kg

WARNING!

- Do not position the generator near flames or other heat sources
- Always leave sufficient clearance for the circulation of air around the appliance (about 10 cm), above all at the rear (about 20 cm), where the ventilation air intake is located (as shown in the picture below).
- Do not use the generator in a sealed environment or without suitable ventilation
- Do not use the appliance in temperature and humidity conditions outside of the limits specified for operation



DANGER

- Make sure that the characteristics of the mains power supply are adequate for the power ratings indicated in the table of technical specifications
- Power to the appliance must be turned on only after installation

work has been completed
- The power line should be fitted upstream with a suitable device to protect against short-circuits and earth leakage and isolate the appliance from other equipment
- Use cables with double insulation, in accordance with the standards in force in the country concerned
- The appliance must be earthed.

INFORMATION!

The manufacturer is not liable for any damage caused by failure to earth the appliance.

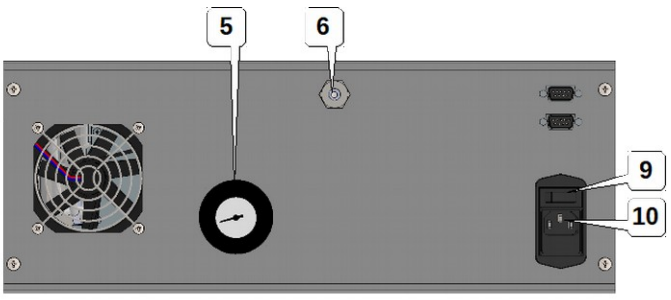
6 Commissioning

6.1 Starting the operation the first time

INFORMATION!

Before operating the N_2-Generator for the first time, proceed as follows:

- Remove the cap on the N_2 outlet on the rear of the generator **(6)**
- Connect the power cable to the power socket **(10)**
- Turn the appliance on at the power switch **(9)**
- Start production pressing the Start / Stop button. After a delay time of 90 sec the device starts.
- If necessary, set the outlet pressure at the outlet pressure regulator **(5)**
- Run the device for about 10 min before connecting the nitrogen outlet **(6)** to a device**.**
- Up to 48 h purging time is necessary for the initial installation.
- It is recommended to run the system for about 16h before starting a measurement.



6.2 Shutting down

INFORMATION!

List of operations to be performed before powering off the generator at the power switch:

- Hold the Start / Stop button to stop the Nitrogen generation
- **Wait at least 4 minutes**
- Turn off the power switch **(9)**
- Disconnect the power cable **(10)**

6.3 Returning the appliance for service and/or repairs

INFORMATION!

List of operations to be performed before packaging the appliance and sending it to service:

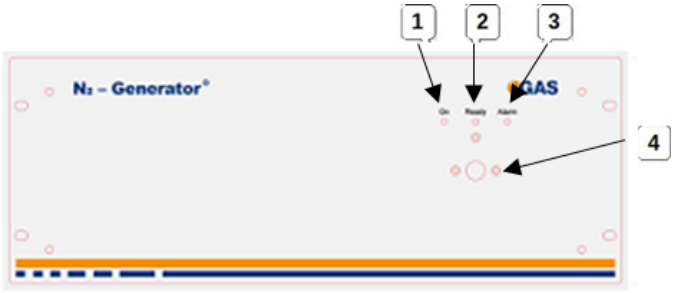
- Switch the generator OFF pressing the START / STOP button
- **Wait at least 4 minutes to de-pressurize all internal nitrogen circuits**
- **Wait at least 60 minutes *(the Generator is powered-on but it does not produce nitrogen)* to allow the complete cooling of the internal oven *(where expected)***
- Turn off the power switch **(9)**
- Unplug the power cable **(10)**
- Disconnect the nitrogen tubing **(6)**
- Insert the cap **(6)**
- Place the generator in the original packing.

WARNING!

- **The generator contains hot elements. Make sure it has fully cooled down before packing and sending it.**

7 Operation

7.1 User Interface



The front panel has **three LEDs**: **GREEN (1)**, **YELLOW (2)**, **RED (3)** and **START/STOP button** (4)

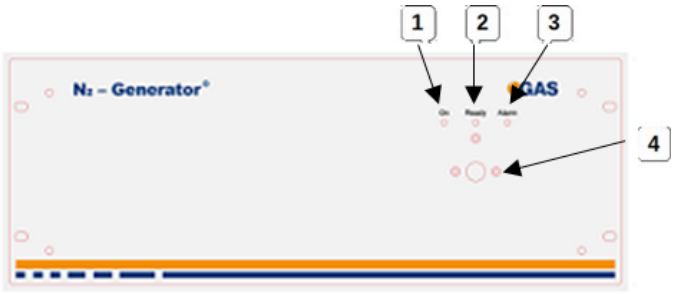
Press the **START/STOP** button (4) to turn ON/OFF the heat oven catalyst.

The following table shows the link between LED status and unit status.

Status	Green LED (1)	Yellow LED (2)	Red LED (3)
POWER ON	FLASHING	FLASHING	FLASHING*
STOP	ON	OFF	OFF*
READY	ON	OFF	OFF*
PRE-ALARM	ON	ON	FLASHING
ALARM	FLASHING	OFF	FLASHING

**In case of errors the RED led (3) flashes to signal pre-alarm or alarms, to identify the type of error see Alarm and pre-alarm signal*

7.2 Alarms and Signals



During normal operation the **red LED (3)** is OFF and the system carries out several automatic checks.

In the event of minor anomalies or services request the yellow LED is ON when the red LED flashes to signal a **pre-alarm** message *(the flashes number of red LED identifies the type of founded problem)* in these cases the unit does not stop the N2 production.

In the case of serious anomalies, the red LED flashes to signal an **alarm** message *(the flashes number identifies the type of founded problem)* and nitrogen production stops immediately.

The difference between pre-alarm and alarm signal is shown as follows:
Pre-alarm → yellow LED on steady when the red LED flashes.
Alarm → yellow LED off and red LED flashing.

7.2.1 Pre-alarm

When a pre-alarm is activated, the green LED in On steady, the yellow LED is On steady when the red LED comes on in the following sequence:

Flashes *(to indicate the pre-alarm)* **– Off – On for 4 seconds.**

The signal depends on the number of flashes, as shown in the table below:

Flashes	Description	Pre-alarm
2	Column charge	x

3	Charging time under the threshold	x
4	Column discharged	x
5	N_2 pressure too low	x
6	Service 1 required	
7	Service 2 required	x
8	Service 3 required	x
9	Internal temperature	x
10	Zero-Air module error	x

7.2.2 Alarm

When an alarm is activated, the green LED in On steady, the yellow LED is OFF and the red LED comes on in the following sequence:

Flashes *(to indicate the alarm)* **– Off – On for 4 seconds.**

The signal depends on the number of flashes, as shown in the table below:

Flashes	Description	Pre-alarm
2	Pressure sensors damage (Compressor – N_2 column)	x

3	Tank pressure sensor damage	x
4	Over pressure	x
5	Discharge error	x
6	Memory error	
7	Memory damage	x

8 Workflow: Installation of N_2-Generator

INFORMATION!

Please note that the N2-Generator should be switched on minimum 48 hours before it is connected to the device. This due to the necessary self cleaning of the integrated pressure swing (PSA) technology that needs to get rid off the oxigen that typically gets into the gas ways and needs to fully flushed out after a transport or a longer time of the device when being switched off.

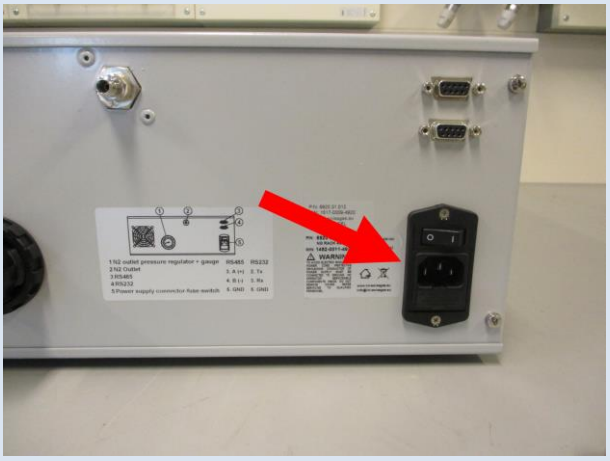
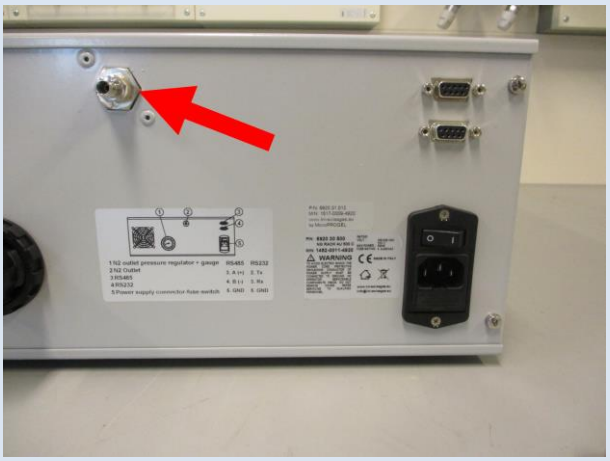
1

Place the N_2-Generator on a robust table.

2

Connect the **power plug** (1)

Remove the **red cap** from the mounted moisture trap (2)

3		Switch on the Generator.
4		Start **Generator.** Allow the generator to idle for 10 minutes before connecting any equipment. Up to 48 h purging time is necessary for the initial installation.
5		Connect the output to the device input (Drift gas/Carrier gas adapter) using a 3 mm (Swagelok) tube.

9 Maintenance

Natural aging and the wear of certain components of the equipment require regular cleaning and maintenance. With proper care and maintenance, the nitrogen N2-Generator should provide years of trouble-free operation. There are no adjustments to be made to the generator. There are routine service operations as described below.

Regardless the aforementioned, the generator should be inspected every year.

INFORMATION!

Other maintenance of the equipment than mentioned in this manual must be carried out by G.A.S. or personnel authorized by G.A.S.

Please contact G.A.S. 6-8 weeks in advance to optimize the turn-around time!

The following section describes the maintenance operations required for the correct operation of the nitrogen generator.

The fluidics of the generator are mainly composed of fittings, filters, electro-valves, transducer, and pressure regulator. These components do not need any adjustment by the user. It is nevertheless recommended to regularly proceed a check-up of the functionalities of the instrument.

We encourage the user to directly purchase through G.A.S. or its distributors, the tested original spares parts and consumables. We decline all responsibilities of bad functioning or damaged caused by spares parts and consumables not tested or not conform to G.A.S. standards.

DANGER

Before any work on the device switch off the device and pull out the power plugs!

INFORMATION!

Prior to servicing of the N_2-Generator, turn off the compressed air and power supplies to the generator, and ensure that the system is de-pressurized.

To ensure consistent product performance and reliability only use genuine replacement parts and filter cartridges.

9.1 N_2-Generator

The primary maintenance task required is:

Operation	Interval
Check for abnormal noise and vibrations	24 h
Replace Filter elements	1 year
Replace Catalyst oven	3 year

Perform maintenance operation (change the INLET filter cartridge)

INFORMATION!

All the maintenance operations that involve handling parts into the unit, must only be carried out by suitably trained personnel and in full compliance with all safety standards.

Moreover, these operations must only be performed with the unit turned off, unplugged and electrically isolated.

Contact service to perform every operation that involve internal parts of the appliance and to perform the relative service reset.

10 Appendix

10.1 Technical Data N_2-Generator

Model: N_2-Generator	
N_2 outlet	
Flow rate (Max)	450 ml/min
Outlet pressure (Min)	1.0 bar (14.5 psi)
Outlet pressure (Max)	4 bar (58 psi)
Nitrogen purity *1	>99.999%
Outlet Dew-point *2	<-60°C (-76°F)
Hydrocarbon content *3	< 0.05 ppm
Communication	
LED interface	Standard
RS232	Standard
RS485	Standard
General data	
Supply rating	100-240Vac (±10%) 47..63Hz

Connection type	IEC320-C14
Nominal power (Max)	200W (320 W)
Fuse rating (5x20mm)	4A (250Vac – T)
Net weight	27 kg
Dimensions	Standard 19” Rack 4U-deep 54 cm
Connections	
Outlet port	1/8" female
Operating conditions	
Temperature	5-35°C (41-95°F)
Humidity (max, non condensing)	80 % at 25°C (77°F)
Noise	<55dB(A)
IP rating	IP20
Pollution degree rating	2 (with no aromatic compounds)
Altitude	< 2000m

*1 The purity refers to the residual oxygen
*2 Atmospheric Dew-point (ADP) with optional Desiccant column 6920.31.012
*3 *With optional Catalyst oven 6920.31.011*

10.2 Troubleshooting

INFORMATION!

This chapter is a collection of possible practical problems and serves as a guide for making an initial assessment. It makes no claim to be complete.

Symptom	**Device does not start**
Possible Cause	*Problem with the electrical power supply*
Action	Check the current power supply and restart the system. If that still does not help contact the G.A.S. service hotline.
Symptom	**No or small RIP**
Possible Cause	Gas quality not good enough.
Action	When generator is switched ON for the first time or after some time in OFF mode it needs some time to generate high quality gas. Wait at least 10 minutes. If this does not solve the problem maybe the moisture traps or the media filter must be exchanged.