# NM-GEN
# Membrane nitrogen generator


2-50

75-500

Please read the following instructions carefully before installing filter into service. Trouble free and safe operating of the filter can only be guaranteed if recommendations and conditions stated in this manual are respected.

CE

# Index

# 1 General information

## 1.1 Device information

| | |
|---|---|
| Device model: | |
| Serial number: | |
| Year of production: | |
| Commissioning date: | |

Please fill in the fields accordingly. Correct information enables proper and efficient maintenance of the device, selection of spare parts and technical support.

Some of the information listed here and other important data can be found on the type plate of the device and vessels.

## 1.2 Supplier information

| | |
|---|---|
| Name: | Omega Air d.o.o. Ljubljana |
| Address: | Cesta Dolomitskega odreda 10, 1000 Ljubljana, Slovenia |
| Telephone/Fax: | +386 (1) 200 68 00 |
| e-mail: | info@omega-air.si |

## 1.3 About this operating manual

This operating manual contains all the technical information for transport, installation, operation, maintenance and decommissioning of the device.

## 1.4 Using the operating manual

Please read the operating manual and the additional documents carefully prior to installation/operation and follow the notes and instructions. Safe and proper operation of the device can only be guaranteed if the instructions are observed and followed. The safety notes must be observed in particular.

It is good practice to keep the operating manual in the vicinity of the device so as to be easily accessible.

The manufacturer accepts no liability for damages resulting from disregard of the operating manual.

All the information in this operational manual is valid at the time of publishing. Due to component or workflow modifications at any time affecting device maintenance, please make sure that the latest information is available prior to maintenance work.

**Signs and symbols used**

- Dots are used for bulleted lists.

→ Cross references refer to information on a different page or in a different document.

**Note!**
This symbol refers to matters that should be given special attention.
Observing the notes helps to ensure safe handling of the product.

**Tips and hints!**
This symbol refers to matters that should be given special attention.
Observing these advisory notes helps to ensure particular efficient operation of the product.

**CAUTION!**
This symbol indicates a possible harmful situation.
When not avoiding this situation, there is a danger of injury or damage to the product or to adjacent system components.

**WARNING!**
This symbol indicates a possible dangerous situation.
When not avoiding this situation, there is a danger of injury or death.

**DANGER!**
This symbol indicates an immediate impending danger.
Not avoiding this danger could result in serious injury or death.

**DANGER! Pressure**
This symbol indicates an immediate impending danger due to pressure.
Not avoiding this danger could result in serious injury or death.

**DANGER! High voltage**
This symbol indicates an immediate impending danger due to electricity.
Not avoiding this danger could result in serious injury or death.

## 1.5 Basic description

The NM-GEN membrane nitrogen generators extract the available nitrogen from the compressed air. Generator use hollow fiber membrane technology to separate nitrogen from other components in compressed air. The membrane uses the principle of selective permeation to produce purity nitrogen. Each gas has a characteristic permeation rate, which is a function of its ability to diffuse through a membrane. Oxygen is a fast gas and is selectively diffused through the membrane wall, while nitrogen is allowed to travel along the inside of the fiber, thus creating a nitrogen-rich product stream. The oxygen-enriched gas, or permeate, is vented from the membrane separator at atmospheric pressure. The driving force for the separation is the difference between the partial pressure of the gas on the inside of the hollow fiber and that on the outside. In the membrane separator, compressed air flows down the inside of hollow fibers.
Fast gases—oxygen, carbon dioxide, and water vapor - and a small amount of slow gases, pass through the membrane wall to the outside of the fibers. They are collected at atmospheric pressure as the permeate exhaust from the membrane.
Most of the slow gases and a very small amount of the fast gases continue to travel through the fiber until they reach the end of the membrane separator, where the product nitrogen gas is piped to the application.

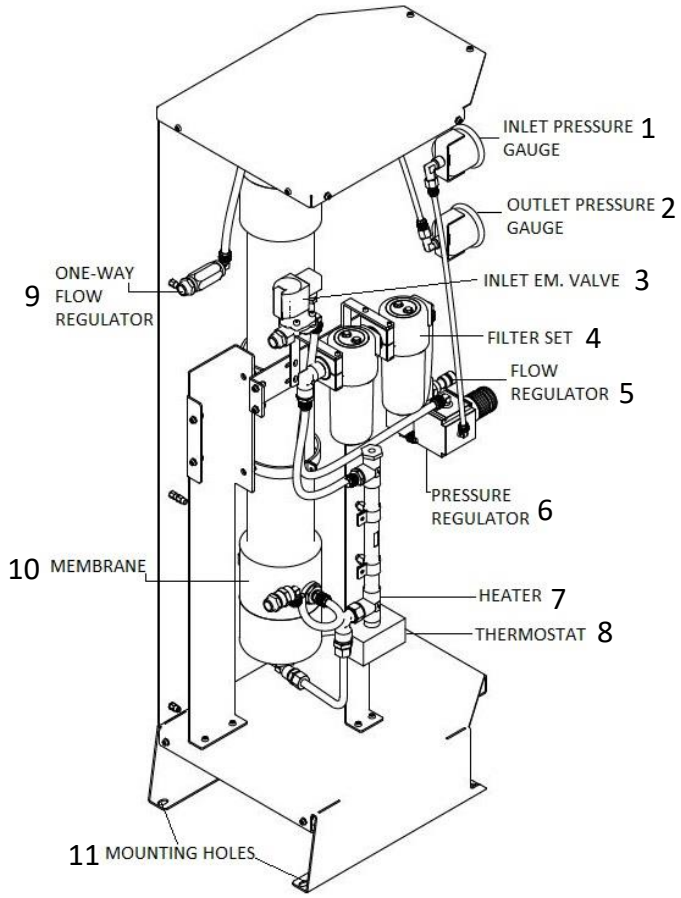
## 1.6 Applications

- Blanketing of Chemicals and Pharmaceuticals
- Inerting of Flammable Liquids
- Laser Cutting

- Re-flow and Wave Soldering of PCBs
- UV-Curing of Coatings
- Food processing

# 2 Technical data

## 2.1 Components




| | Part |
|---|---|
| **1** | Inlet pressure gauge |
| **2** | Outlet pressure gauge |
| **3** | Inlet EM. valve |
| **4** | Filter set AK-1/2'' |
| **5** | Flow regulator |
| **6** | Pressure regulator |
| **7** | Heater |
| **8** | Thermostat |
| **9** | One-way flow regulator |
| **10** | Membrane |
| **11** | Mounting holes |

## 2.2 Technical data

| | |
|---|---|
| Nitrogen pressure | 5– 16 barg |
| Operating temperature (feed air) | 35 °C to 55 °C |
| Dew point (at ambient pressure) | better than -50°C |
| Voltage, Frequency | 110–230 V / 50–60 Hz |
| Power consumption | <35 W |
| Sound level | 65 dB(A) |
| Protection class (controller) | IP 65 |
| Compressed air quality (inlet) | Class 1.X.1 acc. to ISO 8573-1 (0,1um ; bellow saturation ; <0,01mg/m3/h) |
| Inlet filter | Super fine coalescing and activated carbon |

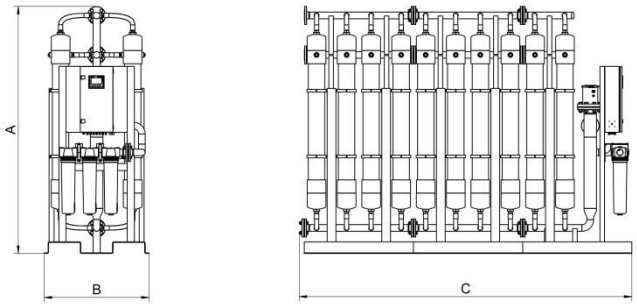
## 2.3 Materials

| | |
|---|---|
| Membrane housing | Aluminium and (or) PA |
| Supporting frame | Carbon steel |
| Valves | Brass, aluminium |
| Flexible connection | Nylon |
| Fittings, Screws, plugs | INOX, brass, steel-zinc plated, PA |
| Outside protection (frame, cabinet) | Powder paint coated (Epoxy-polyester base) |

## 2.4 Sizes

| Model | Connection IN | Connection OUT | Purge Connection | Height A [mm] | Width B [mm] | Depth C [mm] | Mass [kg] | No. of membranes | |
|---|---|---|---|---|---|---|---|---|---|
| NM-GEN 75 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 291 | 3 | Master unit |
| NM-GEN 100 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 310 | 4 | |
| NM-GEN 125 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 520 | 5 | Slave unit |
| NM-GEN 150 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 539 | 6 | |
| NM-GEN 175 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 557 | 7 | |
| NM-GEN 200 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 576 | 8 | |
| NM-GEN 225 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 594 | 9 | |
| NM-GEN 250 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 613 | 10 | |
| NM-GEN 275 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 631 | 11 | |
| NM-GEN 300 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 650 | 12 | |
| NM-GEN 325 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 860 | 13 | Slave unit |
| NM-GEN 350 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 879 | 14 | |
| NM-GEN 375 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 897 | 15 | |
| NM-GEN 400 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 916 | 16 | |
| NM-GEN 425 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 934 | 17 | |
| NM-GEN 450 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 953 | 18 | |
| NM-GEN 475 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 971 | 19 | |
| NM-GEN 500 | 2″ | 2″ | 2″ | 2253 | 960 | 1000 | 990 | 20 | |

(1)Volume of 1 vessel



## 2.5 Performance

Nitrogen flow capacity in $Nm^3/h$ at compressed air temperature 55°C and 9 barg

| | 99,5 % Purity | | 99 % Purity | | 98 % Purity | | 97 % Purity | | 96 % Purity | | 95 % Purity | | Heater power (W) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet | |
| NM-GEN 75 | 176,4 | 29,7 | 190,8 | 41,7 | 211,8 | 60,9 | 232,2 | 78,9 | 252,3 | 97,2 | 273,6 | 117,0 | 2400 |
| NM-GEN 100 | 235,2 | 39,6 | 254,4 | 55,6 | 282,4 | 81,2 | 309,6 | 105,2 | 336,4 | 129,6 | 364,8 | 156,0 | 2400 |
| NM-GEN 125 | 294,0 | 49,5 | 318,0 | 69,5 | 353,0 | 101,5 | 387,0 | 131,5 | 420,5 | 162,0 | 456,0 | 195,0 | 4800 |
| NM-GEN 150 | 352,8 | 59,4 | 381,6 | 83,4 | 423,6 | 121,8 | 464,4 | 157,8 | 504,6 | 194,4 | 547,2 | 234,0 | 4800 |
| NM-GEN 175 | 411,6 | 69,3 | 445,2 | 97,3 | 494,2 | 142,1 | 541,8 | 184,1 | 588,7 | 226,8 | 638,4 | 273,0 | 4800 |
| NM-GEN 200 | 470,4 | 79,2 | 508,8 | 111,2 | 564,8 | 162,4 | 619,2 | 210,4 | 672,8 | 259,2 | 729,6 | 312,0 | 4800 |
| NM-GEN 225 | 529,2 | 89,1 | 572,4 | 125,1 | 635,4 | 182,7 | 696,6 | 236,7 | 756,9 | 291,6 | 820,8 | 351,0 | 7200 |
| NM-GEN 250 | 588,0 | 99,0 | 636,0 | 139,0 | 706,0 | 203,0 | 774,0 | 263,0 | 841,0 | 324,0 | 912,0 | 390,0 | 7200 |
| NM-GEN 275 | 646,8 | 108,9 | 699,6 | 152,9 | 776,6 | 223,3 | 851,4 | 289,3 | 925,1 | 356,4 | 1003,2 | 429,0 | 7200 |
| NM-GEN 300 | 705,6 | 118,8 | 763,2 | 166,8 | 847,2 | 243,6 | 928,8 | 315,6 | 1009,2 | 388,8 | 1094,4 | 468,0 | 7200 |
| NM-GEN 325 | 764,4 | 128,7 | 826,8 | 180,7 | 917,8 | 263,9 | 1006,2 | 341,9 | 1093,3 | 421,2 | 1185,6 | 507,0 | 9600 |
| NM-GEN 350 | 823,2 | 138,6 | 890,4 | 194,6 | 988,4 | 284,2 | 1083,6 | 368,2 | 1177,4 | 453,6 | 1276,8 | 546,0 | 9600 |
| NM-GEN 375 | 882,0 | 148,5 | 954,0 | 208,5 | 1059,0 | 304,5 | 1161,0 | 394,5 | 1261,5 | 486,0 | 1368,0 | 585,0 | 9600 |
| NM-GEN 400 | 940,8 | 158,4 | 1017,6 | 222,4 | 1129,6 | 324,8 | 1238,4 | 420,8 | 1345,6 | 518,4 | 1459,2 | 624,0 | 9600 |
| NM-GEN 425 | 999,6 | 168,3 | 1081,2 | 236,3 | 1200,2 | 345,1 | 1315,8 | 447,1 | 1429,7 | 550,8 | 1550,4 | 663,0 | 12000 |
| NM-GEN 450 | 1058,4 | 178,2 | 1144,8 | 250,2 | 1270,8 | 365,4 | 1393,2 | 473,4 | 1513,8 | 583,2 | 1641,6 | 702,0 | 12000 |
| NM-GEN 475 | 1117,2 | 188,1 | 1208,4 | 264,1 | 1341,4 | 385,7 | 1470,6 | 499,7 | 1597,9 | 615,6 | 1732,8 | 741,0 | 12000 |
| NM-GEN 500 | 1176,0 | 198,0 | 1272,0 | 278,0 | 1412,0 | 406,0 | 1548,0 | 526,0 | 1682,0 | 648,0 | 1824,0 | 780,0 | 12000 |

For nitrogen flow capacity at other conditions please contact manufacturer.
Performance +/- 3%.

# 3 Safety instructions

Improper handling of compressed air systems/equipment and electric installations/equipment may result in a serious injury or death.

Improper handling (transportation, installation, use/operation, maintenance) of NM-GEN series nitrogen generator may result in serious injury or death. As a result of improper handling damage or reduced performance can occur.

The relevant safety at work and accident prevention regulations, plus operating instructions, shall apply for operating the nitrogen generator. The nitrogen generator has been designed in accordance with the generally recognized rules of engineering. It complies with the requirements of directive 97/23/EC concerning pressure equipment.

Ensure that installation complies with local laws for operation and routine testing of pressure equipment at the place of installation.

Operator/user of the nitrogen generator should make himself familiar with the function, installation and start-up of the unit.

All the safety information is always intended to ensure your personal safety. If you are not experienced in such systems please contact your local representative or manufacturer of the generator for help.

- Before any kind of work on the generator make sure that it is depressurized (in addition to the generator this also refers to the nearest upstream and downstream part of the installation) and disconnected from power supply.

- Do not exceed maximum operating pressure or operating temperature range (see the technical data in this manual or the data sheet).

- The permissible working temperatures and pressures for the nitrogen generator add-on parts are given under Technical data for those add-ons. Maximum temperature and pressure for assembled system is the lowest of any individual part.

- It is necessary to ensure that the nitrogen generator is equipped with the corresponding safety and test devices to prevent the permissible operating parameters from being exceeded.

- Ensure that the nitrogen generator is not subject to vibrations that could cause fatigue fractures.

- Nitrogen generator is not to be subjected to mechanical stresses.

- The medium used may not have any corrosive components that could attack the materials of the nitrogen generator in a way that is not permitted. Do not use the nitrogen generator in hazardous areas with potentially explosive atmospheres.

- All installation and maintenance work on the nitrogen generator may only be carried out by trained and experienced specialists.

- It is forbidden to carry out any kind of work on the nitrogen generator, including welding and constructional changes, etc.

- Depressurize the system before carrying out the installation work.

- Ensure that the nitrogen generator is installed as specified and without any stresses.

- Use the original spare parts only.

- Use the device for the intended purpose only.

- Centre of gravity is positioned relatively high meaning there is a risk of tilting the nitrogen generator, which can cause serious injury.

- For transportation, please check and follow local regulations for lifting and transporting heavy objects.

- Do not climb on the nitrogen generator.

- Do not use water to extinguish fire on the nitrogen generator or surrounding objects.

- Wear proper personal safety equipment (earplugs, earmuffs, safety goggles, safety helmet, safety gloves, safety shoes etc.).

# 4 Installation

## 4.1 Initial inspection

Nitrogen generator could be damaged during transportation. Putting a damaged nitrogen generator into operation can result in injury or death! Check the nitrogen generator for any visible damage after removing the packaging. If the nitrogen generator is damaged contact the transportation contractor and supplier. Damaged nitrogen generator should not be put into operation!

## 4.2 General installation requirements

NM-GEN series nitrogen membrane generator is designed to be installed in a place that meets the following requirements:

- Indoor installation (clean and dry)
- Non aggressive atmosphere
- Well ventilated
- Ambient temperature 5°C to 45°C
- Non explosive environment (Standard version DOES NOT COMPLY WITH ATEX)
- Vibration free installation (refers to floor and piping)

Compressed air which is supplied to the NM-GEN series needs to meet the following minimum requirements:

- Filtration grade: Class 1.4.1 as per ISO 8573-1:2010
- Temperature: min. +5°C / max + 40 °C
- Free from aggressive substances

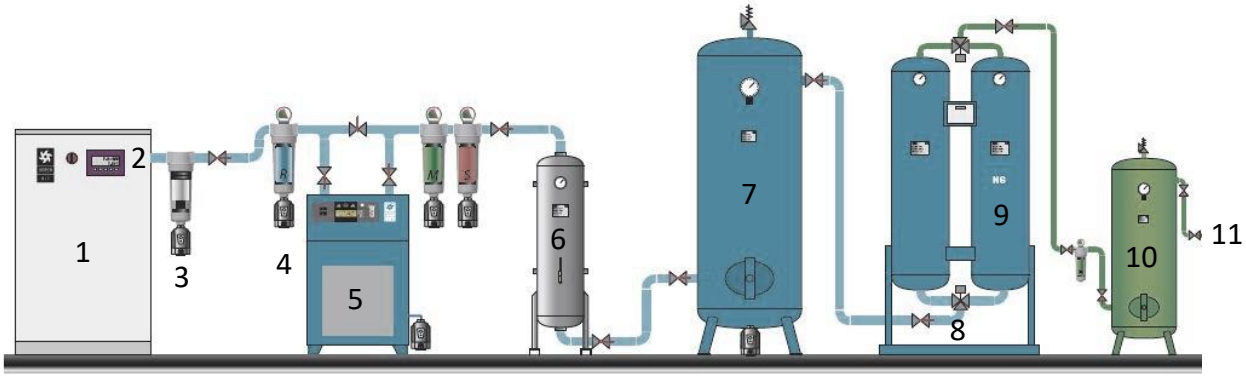
Feed air quality and stable pressure is essential for correct functioning of your NM-GEN nitrogen generator series. Please ensure filter cartridges replacement according to the intervals indicated in the maintenance table.
Manufacturer recommends use of oil free air compressor to ensure maximum quality of delivered compressed air. If use of oil free compressor is not possible, an oil lubricated air compressor may be used. The oil content in compressed air should not exceed 0,01 mg/$m^3$. In this case the use of activated carbon filter or even better, activated carbon tower is necessary.

## 4.3 Installation layout

Below is the most common installation layout for nitrogen generator. The scheme specified bellow is not obligatory but only provided as an example. Different arrangement of certain components is always possible.

1. Compressor
2. Aftercooler
3. Cyclone separator with Automatic condensate drain
4. Pre-filter (e.g. 3 µm)
5. Refrigeration dryer
6. Active carbon tower
7. Pressure vessel
8. Fine filter (e.g. 0,1 µm)
9. Nitrogen membrane generator
10. Nitrogen pressure vessel
11. Outlet with flow regulator

Suggested layout:

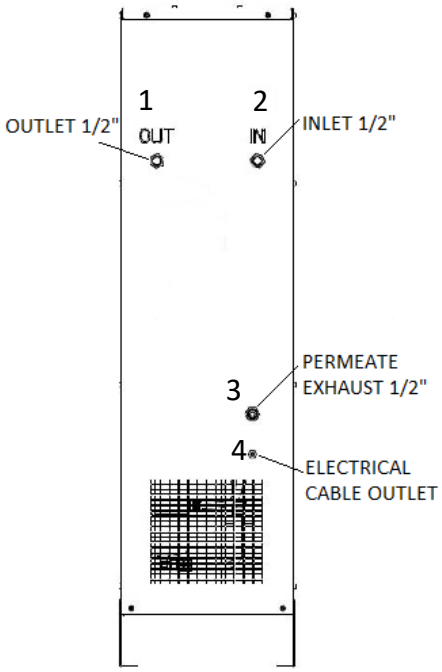



## 4.4 Installation

- Nitrogen generator should be installed in such a way that it is protected from environmental influences (compressor station).
- Positioned in well ventilated area.
- Install the generator in the area where people are normally not present because of noise emissions.
- Make sure that the nitrogen generator is protected against vibrations and other mechanical stress.

- Nitrogen generator should stand firmly on the horizontal surface. The inclination of the unit must not exceed ±5°. If system is not installed correctly it could not be working properly. Best way to achieve this requirement is by fastening the nitrogen generator to such a surface through the appropriate openings on bottom consoles.

- It is recommended to include shut-off valve with removable coupling and integrated bleed point for depressurization at the air inlet and outlet for easier maintenance.
- Additionally, check that upstream from the generator sufficient air treatment is provided (e.g. aftercooler, cyclone separator, filter, condensate drains …).
- Connect the air supply to the inlet of the generator (1).
- Connect the downstream piping line to the outlet of generator (2).
- Do not block or pressurize permeate exhaust, however, if necessary, it can be connected to piping and guided outside (3)
- Connect electric cable to power terminals. It is obligatory to provide connection to the ground terminal. Make sure the voltage and the frequency on the mains correspond to the data on the type plate of the generator (±5% tolerance is acceptable for voltage). (4)
- After the installation or maintenance, the NM-GEN nitrogen membrane generator piping must be checked for leakage.
- Make sure that pressure of supplied inlet air matches or is higher than specified operating generator pressure.




*BACKSIDE VIEW*

In case an air compressor, dryer and generator are included scope in supply, please consult the separate user manuals of this equipment for the dimensioning of sufficient forced ventilation system in order to avoid an excessive heat accumulation in the installation room.

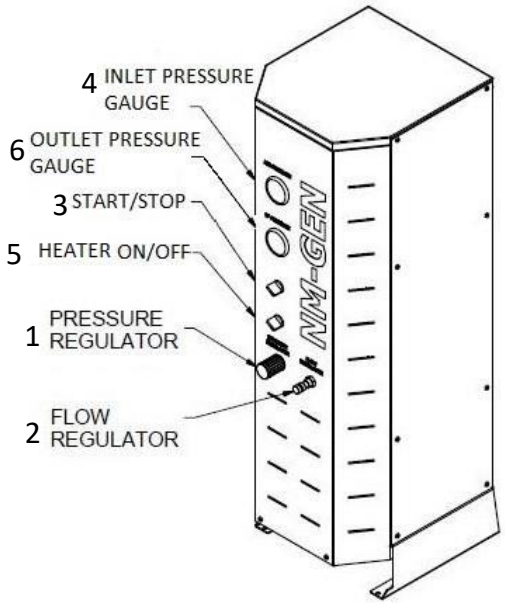
# 5 Commissioning

## 5.1 Start-up

After the installation the NM-GEN series start-up procedure can be initiated.

Follow the start-up procedure:

- Visually re-check the installation.
- Make certain that the shut-off inlet valve is opened (installation recommended).
- Make certain that the shut-off outlet valve is opened (installation recommended).
- Listen for any leaking sound.
- Make certain the nitrogen vessel outlet valve is closed to build up pressure.
- Pressure regulator (1) and flow regulator (2) are pre-set to operating conditions found on NM-gen label
- Plug in the NM-GEN generator and turn on START/STOP switch (3)
- Inlet pressure gauge should indicate pre-set operating pressure (4)
- Turn on HEATER switch (5) – START/STOP switch must be in ON position, otherwise, because there is no airflow, heater thermal overheating protection switch will trigger (look page 17 for reset instruction)
- Generator should start producing nitrogen, outlet pressure gauge (6) will raise to operating outlet pressure
- Open nitrogen outlet vessel valve with $N_2$ consumption in sync with generator production
- Pre-set purity is reached after continuous operation at working conditions and nominal consumption flow from nitrogen vessel in a couple of hours (depends on vessel size)




Purge gas from NM-GEN nitrogen generator contains an average oxygen concentration of cca. 33% vol. The highest oxygen concentration can reach 36% vol.

Accumulation of this exhaust gas is dangerous due to explosion hazard. Installation site must be sufficiently ventilated and air exchange rate must be at least two times the overall consumption of the NM-GEN nitrogen generator.

## 6 Decommissioning

To decommission NM-GEN nitrogen generator follow the decommissioning procedure:

- Turn off HEATER switch.
- Turn off START/STOP switch.
- Close shut-off inlet and outlet valve (if installed, not supplied with generator) upstream / downstream from the generator.
- Proceed with the depressurization.
- Make sure that the generator is depressurized by inspecting pressure gauges on generator front panel
- Disconnect the generator from electric power supply.

## 7 Transportation

- Transportation should be done by appropriately qualified personnel.
- For transportation, please check and follow local regulations for lifting and transportation of heavy cargo.
- Provide adequate lifting and transportation equipment.
- The device should only be transported in a vertical position.
- The center of gravity is positioned relatively high resulting in a heightened risk of toppling the device due to tilting, which can cause serious injury or even death.

The device could get damaged during transportation. Putting a damaged device into operation can result in injury or death! Check the device for any visible damage after removing the packaging. If the device is damaged contact the transportation contractor and supplier. A damaged device must not be put into operation!

## 9 Storage

In order to prevent damage to the device during storage make sure that the following requirements are fulfilled:

- The device can only be stored in a dry and clean indoor location.
- During storage the ambient temperature must not exceed the 1,5°C – 66°C range. For other storage temperatures please contact the manufacturer.
- To protect the membrane and piping from contamination during storage, seal the inlet and the outlet of the device.
- Use appropriate cover to protect the device from the dust.

## 10 Maintenance

The control valves, solenoid valves, filter elements and thermostats are subject to wear and need to be replaced according to the service intervals specified bellow.

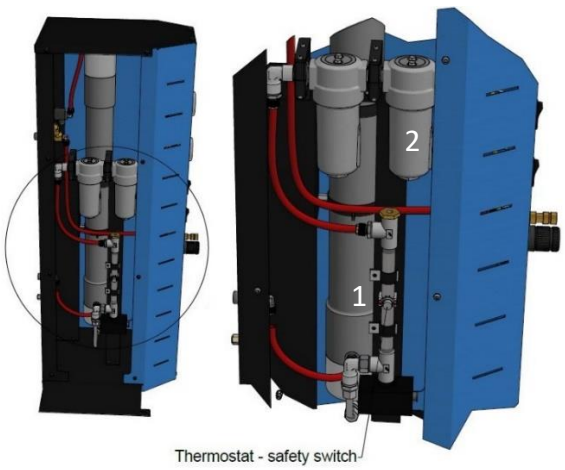
| PART | MAINTENANCE | 1 day | 1 month | 1 year or 4000 hours | Failure |
|---|---|---|---|---|---|
| Generator operation | INSPECTION | x | | | |
| Complete generator | VISUAL INSPECTION | | x | | |
| Pre/After filter element | REPLACE | | | x | |
| Heater | REPLACE | | | | x |
| Membrane | REPLACE | | | | x |
| EM Valve | REPLACE | | | | x |

In order to maintain the system efficiency, optimal performance, best nitrogen quality and safety these additional rules of proper maintenance should be followed:

- Disconnect the nitrogen generator from the compressed air system and the electrical power before conducting any maintenance.
- Make certain that the nitrogen generator is depressurised before conducting any maintenance, check pressure gauges on front panel of the nitrogen generator.
- The damaged components are to be replaced by the new ones supplied from manufacturer.
- Carry out a check for leaks once the maintenance work has been finished.

### 10.1 Thermostat safety reset

When there is no air flow over the heating element e.g closed inlet valve, compressor pressure loss while heating element is ON it will start overheating. To protect the heating element, there is safety thermostat installed that will at 90°C break the circuit to protect the heating element from overheating.
When airflow is restored, safety thermostat needs to be manually reset, so electrical circuit is back in function. To do that, left side panel needs to be unscrewed and safety thermostat button (1) pushed back in to close the circuit.



### 10.2 Filter element replacement

Filter elements in filter set (2) needs to be changed in regular intervals to ensure proper air quality (check service interval table). To change filter element, depressurize the system, unscrew lower body of the filter housing, clean any particles / residues in filter housing, lubricate the O-ring and the sealing surfaces of the filter head and cartridge (silicone free multipurpose grease), insert new filter element, screw lower body of filter housing back, slowly pressurize and check for leaks.

## 11 Warranty Exclusion

The warranty shall be void if:

1. The operating instructions were not followed
2. The unit was not operated properly and appropriately.
3. The unit was operated when it was clearly defective.
4. Non-original spare parts or replacement parts were used.
5. The unit was not operated within the permissible technical parameters.
6. Unauthorized constructional changes were made to the unit or if parts of the unit that may not be opened were dismantled.

## 12 Maintenance record

| TYPE OF MAINTENANCE | DATE | SIGNATURE | NOTES |
|---|---|---|---|
| Commissioned | | | |
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**OMEGA AIR d.o.o. Ljubljana**
Cesta Dolomitskega odreda 10
SI-1000 Ljubljana, Slovenia
T: +386 (0)1 200 68 00
F: +386 (0)1 200 68 50
info@omega-air.si
**www.omega-air.si**