



**NEVYANSKY
MACHINE-BUILDING
PLANT**

Compressor equipment

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Air compressor stations based on screw and reciprocating compressors



Modular air compressor stations are designed to supply the different pneumatic systems of industrial and energy companies as well as railway facilities with compressed air of 0.7–1.3 MPa (7–13 kgf/cm²) pressure. It is possible to increase compression pressure up to 40 MPa (400 kgf/cm²) when the station is equipped with booster compressor.



The station includes air handling systems, fire-extinguishing systems, self-contained heating systems, power supply systems and automatic control system. Design, dimensions and infrastructure of the station provide easy operation and maintenance at any season as well as under extremely low temperatures. The station is sheltered with modern “sandwich” panels with thermal insulation of high performance based on profile metal frame. The upper part of block-box has coastwise hooks for lifting the station with hoisting machines.

The station is supplied as a block-container and is suitable for transporting on a trailer or truck that has appropriate dimensions of load platform and lifting capacity.

Advantages of air compressor stations:

- Cost savings at construction stage.**
 Air compressor stations do not require separate accommodation and solid foundation, thereby one can avoid capital construction costs, costs for design works and installation.
- Delivery of ready to use plant.**
 The station includes filters, water and oil separators, after-coolers, dryers of compressed air, pipe manifold systems, automatic control system.
- Decentralization of the compressed air supply.**
 Shortening of pneumatic pipeline to minimum length allows avoiding inevitable compressed air losses due to leakage and to get rid of the problems connected with condensate in branched pipeline system, icing during winter time and the rest. Installing the compressor close to consumption point allows excluding these losses.
- Ease operation and maintenance.**
 Maintenance of compressor units is performed without dismantling them. All equipment of compressor station is easily accessible for maintenance or repair.
- Easy transportation of the station.**
 Thanks to installation of equipment within the dimensions of standard railway containers it is possible to transport the station by any type of vehicle with corresponding fixturing points.

Air compressing is performed with screw or reciprocating compressors.

After the air is compressed it is supplied to the adsorption dryer that removes the water. The cooling of compressor units is performed by axial fan driven by an electric motor.

The control system of compressor station uses microprocessor control units. For remote control of the equipment one can use data transfer via cable to PC (RS-485 protocol) that can be located at the distance of one kilometer from the station.

Specifications

	Value
Input operating environment	atmosphere air
Air volumetric capacity reduced to suction conditions, m ³ /min.	
from	1
to	50
Final, terminal air pressure, MPa (kgf/cm ²)	
from	0.7 (7)
to	1.3 (13)
Compression pressure in case of using the booster compressor, MPa (kgf/cm ²)	
to	40 (400)
Dew point temperature of compressed air, °C	
from	+3
to	minus 70
Cleanliness level of compressed air acc. to DIN ISO 8573-1:2001	
to	1





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Membrane nitrogen plants based on screw and reciprocating compressors

Membrane nitrogen plants (container type) are designed to receive inert-gas mixture on the base of nitrogen from the compressed air and to supply nitrogen gas under pressure to different facilities in order to prevent (extinguish) fires in mine tunnels and to fill the free spaces with inert gas and to perform manufacturing operation under conditions of fire and explosion safety when repairing oil and gas pipelines, tanks and equipment operated with explosive gases.



The station includes air preparation systems, membrane gas separation systems, fire-extinguishing systems, self-contained heating systems, power supply systems and automatic control system. Design, dimensions and infrastructure of the station provide easy operation and maintenance at any season as well as under extreme low temperatures. The station is sheltered with modern "sandwich" panels with thermal insulation of high performance based on profile metal frame. The upper part of block-box has coastwise hooks for lifting the station with hoisting machines.

The station is supplied as a block-container and is suitable for transporting on a trailer or truck that has appropriate dimensions of load platform and lifting capacity.

Operation control of the stations is carried out by remote control. The main parameters of the controlled station are displayed on the panel of instruments and controls. The station has interior lighting.

The gas-separating block is based on the hollow fiber membranes, that are characterized by high selectivity for gas separation and thus allow to create the most efficient gas separation technology for producing nitrogen. The membranes are able to operate without replacement for 10–15 years of continuous use without significant reduction of air separation characteristics. Useful life of gas-separating unit is 180000 hours.

Nitrogen membrane stations are widespread and are used in many industries (oil and gas industry, metallurgy, petrochemical, refining, coal industries, etc.) where inert gas (nitrogen) is necessary for processing.

Nevyansky machine-building plant serially produces nitrogen compressor stations of MAKC series operating on the principle of membrane separation.

Membrane nitrogen plants are manufactured according to dimensions of 20" and 40" railway containers, modified for placing the compressor unit, optional equipment, membrane unit, ventilation system, supply industrial pipelines system, fire-extinguishing system, and electrical equipment.

The screw and reciprocating compressors from the leading manufacturers in Europe, USA and Asia are used for air and gas compression.

It is possible to use electric motors with capacity of 380 or 6000 V, diesel-engine drive, reciprocating gas engines as drive unit of compressor station.

The station automation and control system foresees autonomous operation (does not require constant operator assistance) and designed on the base of highly reliable microprocessor units from leading global manufacturers, and foresees the ability to transfer data about station operation to the remote control panel, the ability to back up commercial accounting data and to combine the station automation system and processing line system of the customer.

Specifications

Value

Input operating environment	atmosphere air
Composition of inert nitrogen gas mixture at the outlet, % (by volume)	
from	90
to	99.9
Nitrogen volumetric capacity reduced to suction conditions, m ³ /min.	
from	1
to	30
Final, terminal nitrogen pressure, MPa (kgf/cm ²)	
from	1.0 (10)
to	2.5 (25)
Compression pressure in case of using the booster compressor, MPa (kgf/cm ²)	
to	35 (350)
Final nitrogen temperature, °C, max	+50





Mobile nitrogen compressor stations



Oil and gas production companies and coal mining companies are among the main customers for mobile nitrogen compressor stations. Drilling operations, development and repair of oil and gas wells, coiled tubing operations, testing and purging of oil and gas pipelines, removal of hazardous hydrocarbon environment and substances out of tanks and reservoirs, underground fire prevention and extinguishing – this is an incomplete list of fields of application for mobile nitrogen compressor stations.



Depending on the modification, nitrogen compressor stations of MAKC series are manufactured as mobile units (on the base of standard trailers, two-wheel trailers, truck chassis of high-traction), on a sled.

Structurally nitrogen station is a self-contained unit, which consists of compressor with diesel-engine drive, gas separation unit and control system mounted on the chassis or sled. The equipment of nitrogen compressor station is closed with heat insulated body.

Mobile nitrogen compressor stations are available in different climatic modifications – from the tropical, taking into account high temperature and humidity, to the northern designed for operation at low temperatures and under the toughest conditions. The installed equipment preheating system ensures reliable operation of the station at low temperatures.

Power stations on the base of diesel engines from the leading global manufacturers – Deutz, Volvo, Cummins and others – are used as the station compressor drives.

The stations are equipped with different optional equipment: fuel consumption electronic inspection systems, chassis GPS-navigation system and other options at the request of the customer based on his customized technical specification.

One of the fields of application of mobile nitrogen compressor stations is nitrogen fire-extinguishing, for example, in closed mines.

Main advantages of nitrogen fire-extinguishing:

- Does not harm the equipment.
- The effectiveness of nitrogen fire-extinguishing does not depend on the location of fire source.
- Operating process of the station is automated so that the nitrogen can be supplied automatically in case of fire.
- Flexibility in station application and low costs of nitrogen.

The properties that define these mobile nitrogen compressor stations of MAKC series are the following:

- Smaller size and weight of the station compared to analogues.
- Fully automatic control including manual control.
- Use of highly reliable compressor units and imported drive diesel engines.
- Efficient layout of the station equipment that facilitates maintenance and repair.
- Service life of the components and assemblies of the station is twice as higher in compare with domestic equivalents.
- Thermal insulating box van (shelter) of the station provides reliable operation at low temperatures.

Specifications

	Value
Input operating environment	atmosphere air
Composition of inert nitrogen gas mixture at the outlet, % (by volume)	
from	90
to	99.9
Nitrogen volumetric capacity reduced to suction conditions, m ³ /min.	
from	1
to	30
Final, terminal nitrogen pressure, MPa (kgf/cm ²)	
from	1.0 (10)
to	2.5 (25)
Compression pressure in case of using the booster compressor, MPa (kgf/cm ²)	
to	35 (350)
Final nitrogen temperature, °C, max	+50





Small size mobile nitrogen and air compressor stations



Many companies when choosing a gas, air, nitrogen, or compressor stations of other types of small performance come to the decision to purchase standard station based on the dimensions of 20" shipping container, that requires considerable space for accommodation and trawling for transportation.

However, the specific of compressor equipment operating for these customers has restrictions on places of permanent placement of equipment, the possibility of its transportation, installation and deployment, or on the "seasonality" of operation of the compressor equipment.

Especially for such customers our company has developed and performs mass manufacturing of any types of compressor stations (gas, air, nitrogen, etc.), designed on a small size trailer or own transport base.

Nitrogen compressor station MAKC-2.5/11-99.5

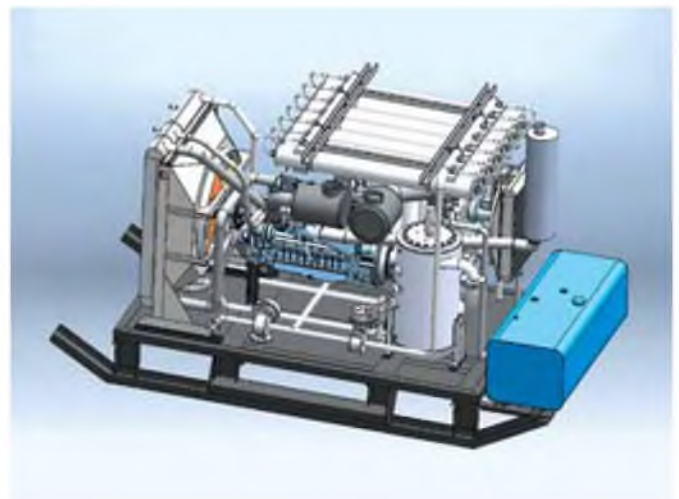
The station is designed, manufactured and supplied for a large oil refinery. The station is designed to displace flammable hydrocarbon atmosphere prior to repair process of manufacturing equipment of the company. One of the requirements of the customer was necessary easy transportation of the station by truck for operating on different work sites of the company.

Nitrogen compressor stations MAKC-7/13-95

The stations are designed, manufactured and supplied for oil company of Azerbaijan Republic. Stations are designed for offshore deposit pressuring in the Caspian Sea. According to the customer's specifications stations must meet the requirements of transportation with easy-load custom vehicles within the station site, respectively, have small dimensions and weight while having rated technological parameters.

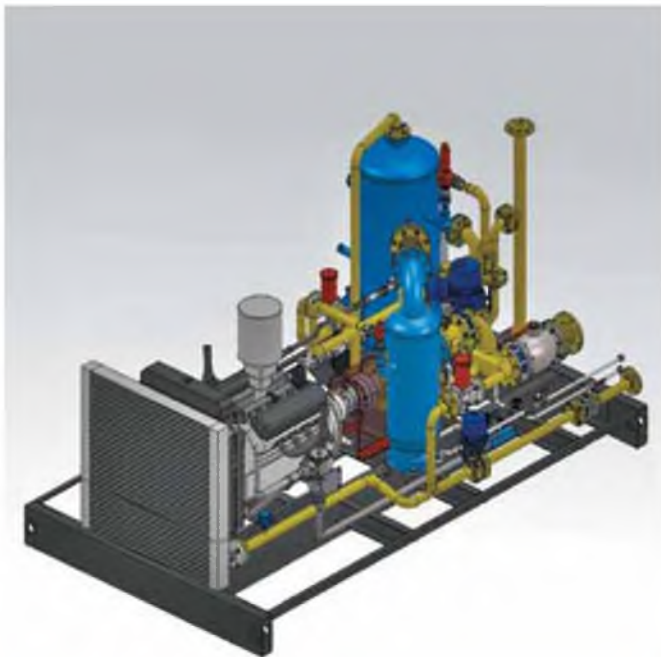
Mobile nitrogen compressor stations MAKC-10/10-95 designed on chassis Iveco (wheel formula 4x4, off-road chassis pattern)

The stations are designed for operations of smaller volume to displace the hydrocarbon atmosphere from the maintenance areas of oil and gas pipelines. Station design allows installing of a screw compressor GHH-Rand powered by Deutz diesel engine and the installing the fuel tanks with total volume of 900 liters.



Air compressor station MKC-2.5/300 designed on the trailer

The station is manufactured on request of large oil refining company and is designed to perform air tests of manufacturing refinery equipment. The station is designed on its own transport base. The station uses independent diesel engine (or electric drive, 400 V) and it is possible to be transported within the working site. High technological parameters of the station were appreciated by the customer.



Gas mobile stations

Mobile gas compressor stations for oil and gas industry are used for the following purposes:

- Reducing the injection pressure at the wellhead.
- Water breakthrough fighting.
- Gas collection and its subsequent utilization.
- Reducing the pressure in the hole clearance to increase production.
- Vapor recovery.
- Well cleanout.
- Reducing the pressure at the wellhead.

Results of the application are:

- Production increase.
- Period of well production increase.
- Stock build.

Nevyansky machine-building plant has designed the modular mobile compressor stations with their own transport bases or on a trailer.

Nowadays there is an important question on the agenda that is about evacuation and utilization of associated petroleum gas (APG) at the wells located far from the place of production site and that have low production rate.

Among the possible ways of utilization of APG is the following: injection into formation for increasing the bottom-hole pressure and electricity production for the need of oil fields.

The manufacturing of fully-featured fixed site gas compressor stations at these facilities is economically unprofitable, including but not limited to mandatory costs for design, station spacing layout, connecting and conducting expert and approval procedures.

Advantages of mobile gas compressor stations:

- No need for expensive and long approval procedures for commissioning and operating.
- Full autonomy – reciprocating engine (powered directly “from the pipeline”) is used as the drive of compressor unit.
- Mobility. Low weight of a station and its own transport base make it easy to transport the station, including off-road conditions.
- Significant maintenance intervals and the possibility of non-stop operating. High unification of parts, supplies and spare parts to cars and custom vehicles.
- Fully automated control system does not require the constant presence of personnel.
- Low cost.



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Gas compressor stations on the base of screw compressor units

Nowadays the question about preparation, transporting and processing of natural gas, associated petroleum gas, biogases and coalmine methane is a special technological problem while oil and gas producing and during different manufacturing processes.

Gas compressor stations are used in the oil and gas industry in the following fields: collection and transportation of APG for processing by commercial installations or gas treatment stations (GTS); APG compression, that is supplied to gas turbine electricity generating units; gas-lift oil extraction; APG injection into formation for enhanced oil recovery or temporary gas storage.

The engineers of Nevyansky machine-building plant have developed and mastered the modular gas compressor stations (МГКС) of different types and sizes, designed to compress different gases: associated petroleum gas, flare gas, dry stripping gas, natural gas, etc.

We offer booster compressor stations with different types of drives, including gas reciprocating engines, designed for location in compressor building (shopfloor location) and modular gas compressor stations.

Modular gas compressor stations of МГКС series based on gas screw compressors are the block-containers modified for placement of the compressor unit, equipped with life support systems –

heating system, gas analysis system, fire-extinguishing system, lighting system and ventilation system.

Stations are available as ready for start-up. The standard completing units of station includes all systems that are necessary for high-quality and reliable operation: automation and control system that allows to transfer the signals to the remote control, station heating systems, lighting systems, heat recovery systems, fire security equipment and also gas analysis systems and mechanical ventilation systems. All stations that are manufactured for compression of hydrocarbon gases are supplied in explosion-proof housing. The stations can be equipped with capacity control systems on the request of the customer.

The screw compressor units with the following characteristics are used in the stations as the machines for gas compressing:

- Unit capacity range of screws gas units – from 15 to 300 kW.
- Discharge pressure range – from 1 to 40 kgf/cm².
- Suction pressure range – from 1 to 15 kgf/cm².
- Units modifications: oil-injected or “dry”.
- Compression of various explosive gases.

The electric motor with explosion-proof performance can be used as the drive. Besides, on request of the customer the gas reciprocating engine (GRE), both domestic and imported (Caterpillar, Cummins, etc.), can be used.

Each МГКС is equipped with modern automation system that meets the current safety regulations and designed according to customer requirements. The control system provides the ability to transfer data about station operations “to the upper level”, the simultaneous management of multiple stations, the ability to integrate with customer’s manufacturing line

Specifications

	Value
Input operating environment	associated petroleum gas
Volumetric capacity reduced to suction conditions, m ³ /min. from to	1 65
Suction pressure, excessive, MPa (kgf/cm ²) from to	0.1 (1) 1.5 (15)
Discharge pressure, excessive, MPa (kgf/cm ²) from to	0.6 (6) 4 (40)
Consume power, kW from to	5 700
Final gas temperature, °C. max	+60





Adsorption nitrogen plants



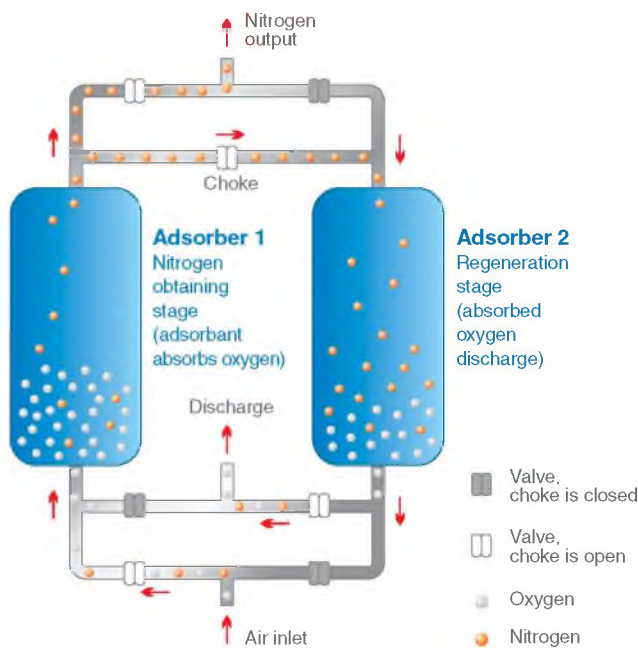
Gas separation technology based on different dependence of absorption of individual components of the gas mixture rate on the pressure and temperature, is widespread throughout the world. Among several types of adsorption units producing nitrogen, oxygen or other high-purity gases the most globally widespread are the stations on the base of pressure swing adsorption (PSA-stations).



Stations on the base of pressure swing adsorption used for separation of gas mixtures and producing nitrogen, oxygen and other high-purity gases (from 95 to 99.9999%) allow to separate almost any gas with high performance.

Nevyansky machine-building plant has concluded the agreement with one of the biggest European manufacturers of adsorption gas separation stations and components, that allows us to design and produce PSA-stations up to the world manufacturers' standards.

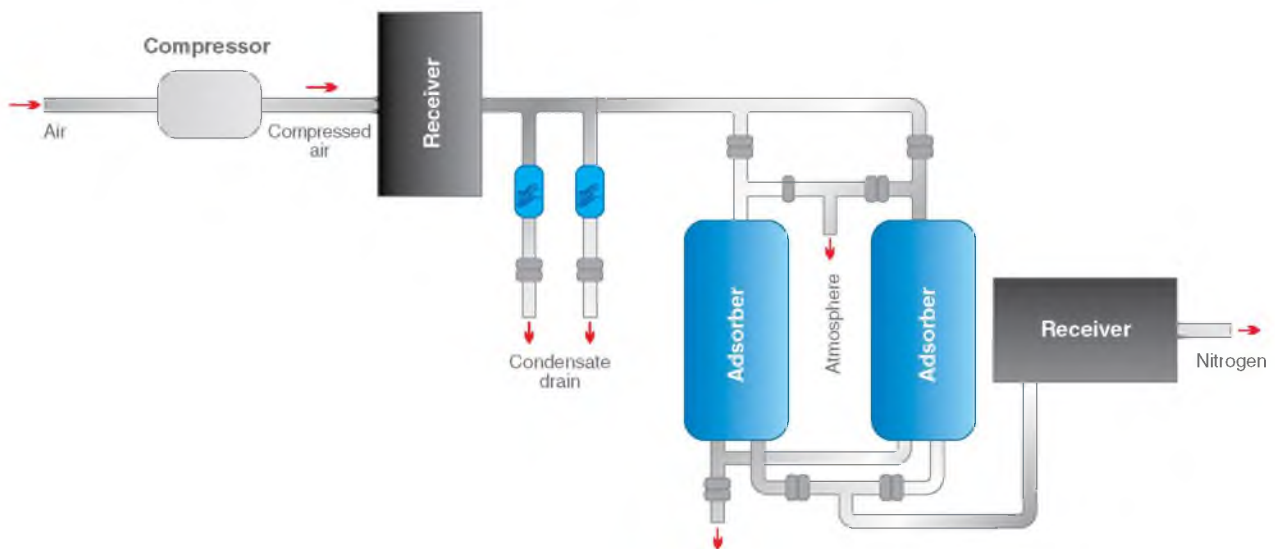
Operating principle of adsorption nitrogen unit



Advantages of gas separation units on the base of pressure swing adsorption:

- High selectivity for adsorbed components and, accordingly, high product concentration.
- Quick start and stop of the unit compared to cryogenic units.
- Adjustment range of unit capacity from 5 to 100%.
- Greater flexibility of settings, i.e. the ability to change quickly the operation mode, productivity and purity, depending on the needs.
- Automatic regulation of operation mode.
- Available remote control with operation data transfer to the upper level.
- Low energy consumption compared to cryogenic units.
- Low maintenance costs, low units cost compared to cryogenic technologies.

Operation scheme of adsorption nitrogen unit



Adsorption units can be designed for both indoors and outdoors operations. In the latter case the equipment is performed in block design and is a virtually self-contained source of nitrogen gas. Adsorption units are suitable for a very wide range of applications, especially for those fields that demand rather high purity of nitrogen. The units are used in chemical, petrochemical, oil and gas, food and pharmaceutical industries, microelectronics, etc.

Allowing getting high-purity nitrogen out of air, that previously was available by using cryogenic technologies, the adsorption units are often more preferable compared to complicated and huge cryogenic units.

The standard fixed site adsorption unit consists of two adsorbers filled with several layers of specially selected adsorbent, valves system, air handling unit, compressor unit and control system.

Modular compressor station makeup





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A new detachment “Nevyansky machine-building plant – Compressor equipment” Ltd was established by the group of companies “Nevyansky machine-building plant” as part of the project of manufacture diversification.

Having a powerful design-engineering potential, experimental and industrial base, including machining, welding, assembling, forging productions, heat-treating department and sites, laboratories, test facilities, the organization of a new direction for the production of compressor equipment fully complies with the strategy of the group of companies “Nevyansky machine-building plant”. Our company has experience of successful projects realization in the field of development and delivery of integrated solutions for the oil and gas and other industries. The company provides a full cycle of production, based on its own perspective and world engineering, its own production facilities and reliable business partners.

Priority intentions and objectives of Nevyansky machine-building plant are high quality products, innovative technologies development, collaboration with leading research and design institutes, development, design and manufacturing of new products of high-performance, allowing to expand significantly the boundaries of business and implement comprehensive solutions on key markets with maximum efficiency for the customer.



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