OMEGA AIR

N-GEN

Nitrogen generators

NITROGEN

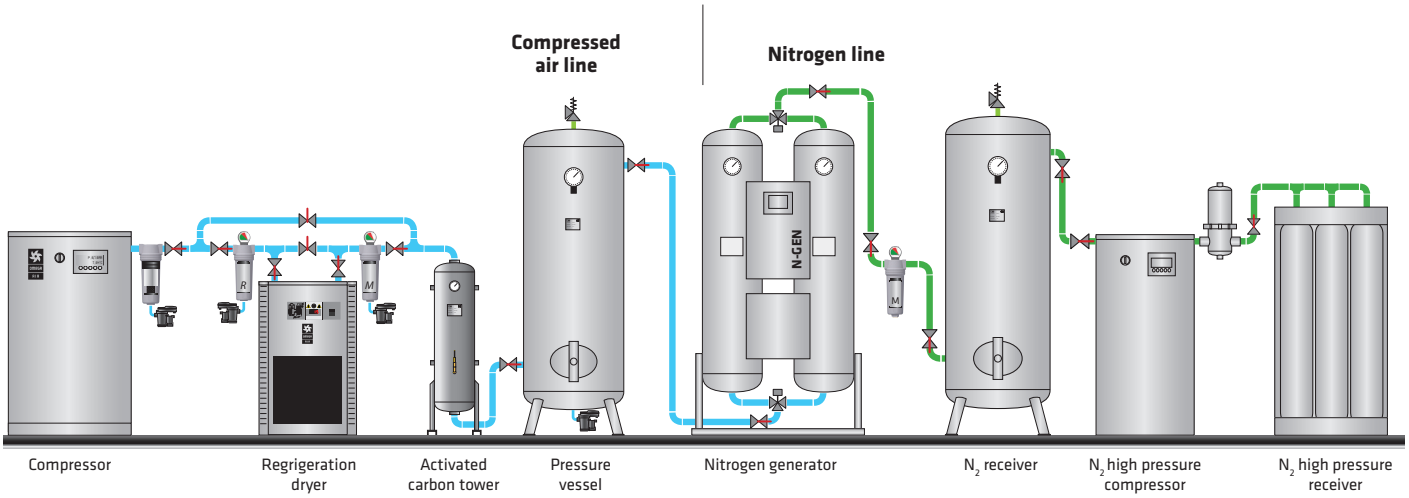
Nitrogen is an inert gas that is suitable for a wide range of applications, covering various aspects of chemical manufacturing, processing, handling, and shipping. Nitrogen has low reactivity and it is excellent for blanketing and is often used as purging gas. It can be used to remove contaminants from process streams through methods such as stripping and sparging. Due to its properties it can be used for protection of valuable products against harmful contaminants. It also enables safe storage, usage of flammable compounds and can help prevent combustible dust explosions.

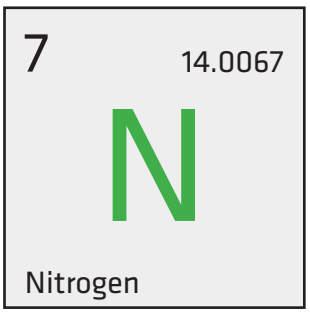
GENERATING NITROGEN GAS

Industrial nitrogen gas can be produced by either separation of gaseous air using adsorption (PSA) or fractional distillation of liquefied air using cryogenic methods.

PRESSURE SWING ADSORPTION

The first step in the PSA process is compressed air passing through a combination of filters and an activated carbon tower with the purpose of removing dust, entrained oil and water. The purified air is then directed to one of two adsorption vessels that are packed with carbon molecular sieves (CMS). The remaining impurities such as carbon dioxide and residual moisture are adsorbed by the CMS at the entrance of the adsorbent bed.
When the CMS is at high pressure, it selectively adsorbs oxygen, allowing nitrogen to pass through it at the desired purity level. While one vessel is at high pressure to produce nitrogen, the second vessel is depressurized to remove the adsorbed oxygen, which is then vented to the atmosphere. The automatic switching between adsorption and desorption between the two beds enables the continuous production of nitrogen. By adjusting the size of the air compressor and adsorption vessels containing the CMS, a large range of flow and purity combinations can be met. PSAs can economically produce nitrogen gas at flowrates from less than one cubic meter per hour to greater than a few thousand cubic meter per hour at purities ranging from 96% to 99.999%.





Nitrogen basics

Inert,
Colourless,
Odourless,
Tasteless Gas

- Nitrogen does not enter in chemical reactions

- Nitrogen prevents oxygen access

Applications

- Blanketing of Chemicals
- Pharmaceuticals
- Gas Assisted Injection Moulding (GAIM)
- Heat Treatment of Ferrous & Non-Ferrous Metals
- Inerting of Flammable Liquids
- Laser Cutting
- Prevention of Dust Explosions
- Re-flow and Wave Soldering of PCBs
- UV-Curing of Coatings
- Food processing

Processes

- Prevention of oxidation of metals, polymers and chemicals,

- Prevention of bacteriological growth (foodstuffs & beverage)

- Reduces the risk of combustion and explosion (chemicals, reactions, processes)

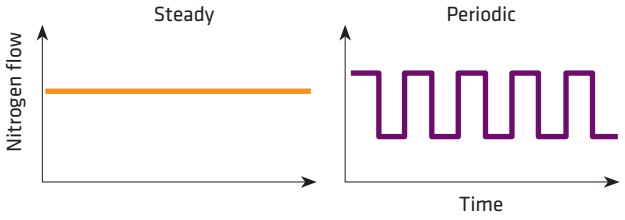
- Source of Nitrogen
  LIN = Liquid Nitrogen,
  GAN = Gaseous Nitrogen

High quality valves

Our generators are equipped with long life angled seated valves which are important due to high switch count. High flow valves have wide range of piston type actuators for maximum performance at minimum pressure.

NITROGEN DEMAND PATTERNS

Where the consumption rate as a function of time is essentially constant, a PSA nitrogen system is an excellent fit for a steady flow pattern. The PSA unit size can easily be matched to the measured or estimated consumption rate. Furthermore, nitrogen production will be most economical if the unit operates continuously near or at its full capacity.
A PSA system is not a good fit for processes with periodic flow pattern, where flow is characterized by peaks and valleys as a function of time. An onsite generator with such variable consumption, particularly if it is sized for a peak flow, will operate at partial capacity or idle for a significant amount of time. This will result in high operating costs and operational inefficiency. However, if the duration of the valleys is short, a PSA combined with a large product buffer tank may be sufficient. A PSA system can be sized to handle most of the nitrogen requirements, supplemented with liquid nitrogen during peak-demand periods.



USING NITROGEN SAFELY

Nitrogen is nontoxic and largely inert gas and that is why it is often mistakenly considered harmless. Notwithstanding by displacing oxygen in air to levels below those required for survival, nitrogen can act as an asphyxiate medium.

NITROGEN USE BY PURITY

PSA can produce nitrogen at variuos range of purities. The lower the purity, the lower is the cost of nitrogen production. For example, the quality of vegetable oil can be maintained by blanketing with 99,5% nitrogen purity. Normal nitrogen purity for food processing is in the range from 99% to 99,5%. Lower purity nitrogen in the range from 96% to 99% is often used in fire and explosion prevention. High purity with nitrogen content from 99,9 % to 99,999 % is typically used for laser cutting, electronics soldering and pharmaceutical applicatons.

Use of the nitrogen	Purity of the N_2
Food processing: - Wine blanketing - Beer dispense - Oil sparging - Fruit storage	99,0 % to 99,9 %
Fire prevention	95 %
Explosion prevention	95% to 98 %
Chemical blanketing	95 % to 99 %
Pressure testing	95 %
Injection molding	99 % to 99,5 %
Electronic soldering	99,95 % to 99,995 %
Laser cutting	99,95 % to 99,995 %
Pharmaceutical	99,95 to 99,999 %

CMS fixation

High quality carbon molecular sieve ensure long service interval. Molecular sieve is also protected from unexpected liquid intake.

Carbon molecular sieve material is fixed in the column to prevent fast aging and inconveniently dusting. Adsorbent is also protected from unexpected liquid intake.

Controller

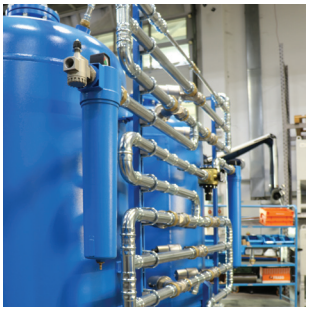
Robust SIEMENS PLC assures reliable and stable operation and offers variety of settings. The controller is equipped with LCD display which provides all the necessary information about the operation.

Oxygen sensors

Two types of high quality oxygen sensors are available as an option:

- zirconia sensors have fast response and high accuracy at low oxygen concentration,

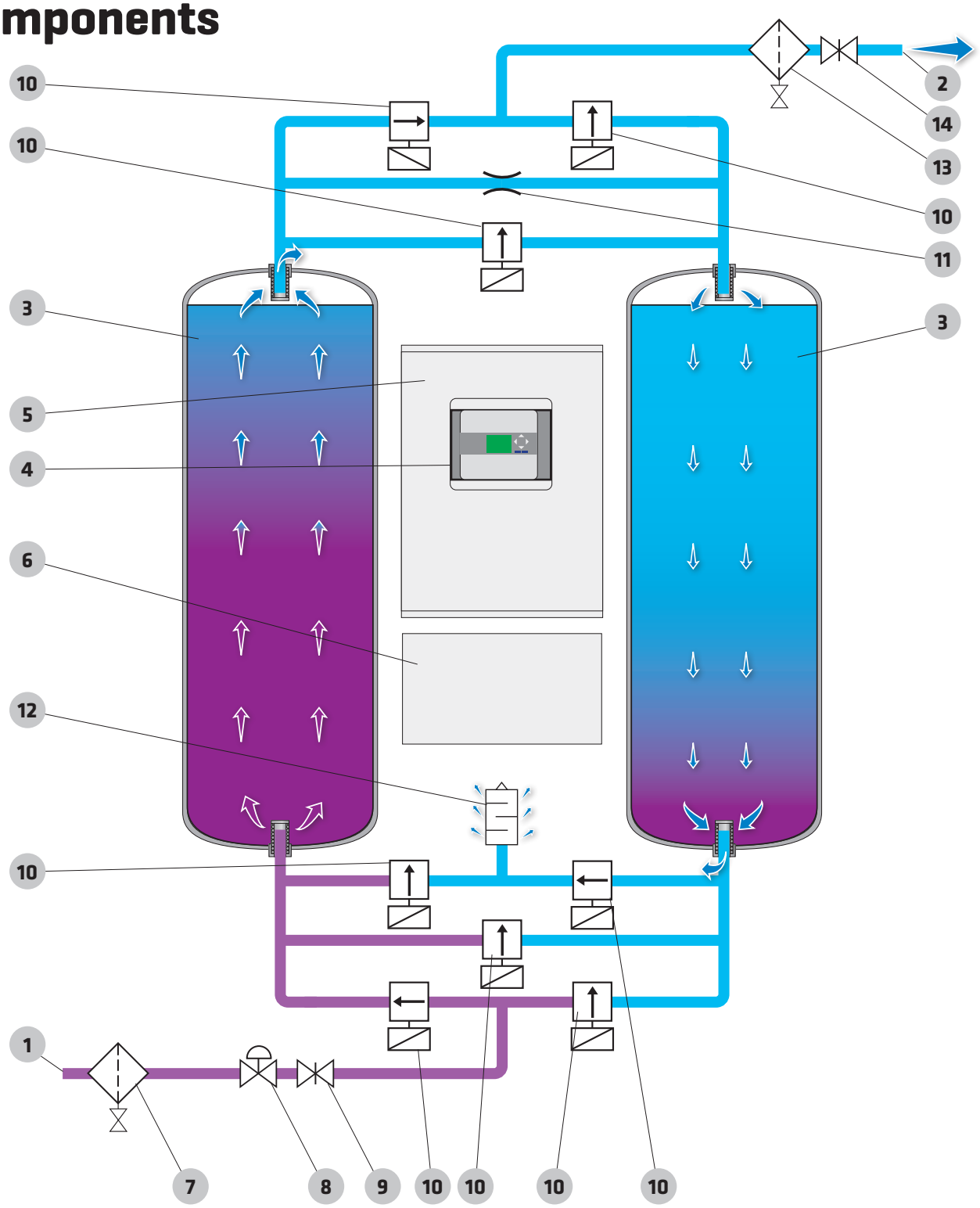
- electrochemical sensors are appropriate for lower purity's of the nitrogen.



High efficiency inlet and outlet filters

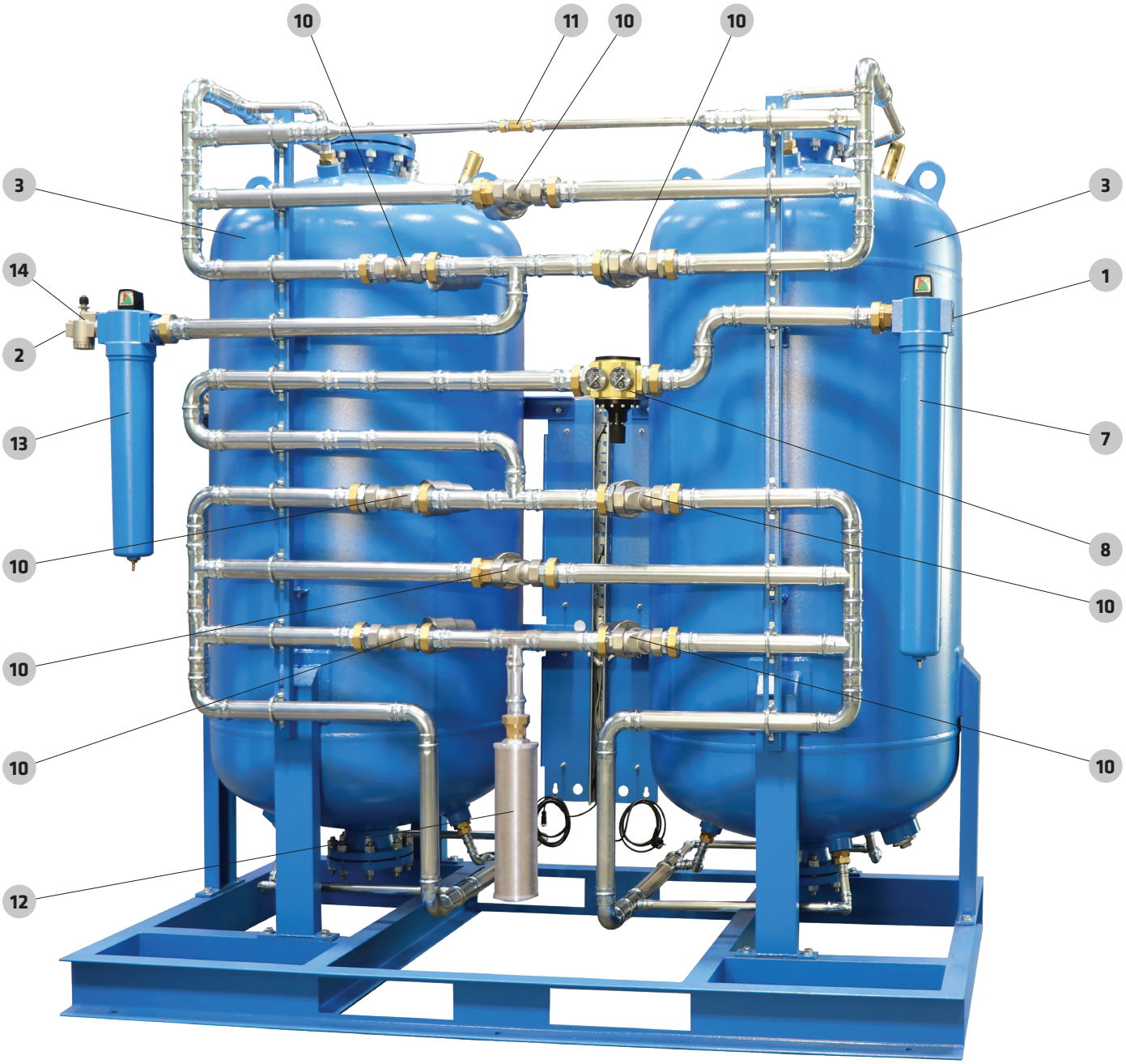
Standard version of N-GEN generators are equipped with high efficiency filters. Super fine coalescing filters at the inlet prevents contamination of the adsorbent material while a dust filter at the outlet intercepts the dust generated by the process.

Components



The N-GEN nitrogen generators extract the available nitrogen in the compressed ambient air from the other gases by applying the Pressure Swing Adsorption (PSA) technology.

During the PSA process compressed, cleaned compressed air is led to a molecular sieve bed, which allows the nitrogen to pass through as a product gas, but adsorbs other gases. The sieve releases the adsorbed gases to the atmosphere, when the outlet valve is closed and the bed pressure returns to ambient pressure.
Subsequently the bed will be purged with nitrogen before fresh compressed air will enter for a new production cycle. In order to guarantee a constant product flow NG nitrogen generators use two molecular sieve beds, which alternatively switch between the adsorption and the regeneration phase.



1 Cleaned compressed air inlet
2 Nitrogen outlet
3 Column filled with molecular sieve
4 Siemens Interface KTP 400
5 Electrical cabinet
6 Pneumatic cabinet
7 Microfilter
8 Pressure regulator
9 Compressed air flow regulator
10 Angle seated valve with pneumatic actuator
11 Purge nozzle
12 Exhaust silencer
13 Prefilter
14 Nitrogen flow regulator

How the generator works?

Generator contains two vessels with adsorbing sieve material:

1. As the high pressure air enters the first vessel, it moves through the sieve, and the oxygen is adsorbed.
2. Nitrogen is then channeled to a buffer tank.
3. Directly before the first vessel is completely saturated, the feed air is redirected to move through to the second vessel, where the same process occurs.
4. Once that process is complete, the first nitrogen generator vessel is vented out to the atmosphere, allowing the waste gas to release from the sieve.
5. Completing regeneration of the first vessel requires purging it with a small amount of process gas.

Oxygen sensors

Omega Air generators are equipped with two types of oxygen sensors; zirconia and electrochemical. High purity nitrogen generator use a zirconia based sensor. A zirconia oxygen sensor has a very fast response time coupled with extremely accurate readings at low oxygen levels. Zirconia sensors also work exceptionally well in pressurised gas. In addition to all of this, they are incredibly robust and have a long lifespan of over twenty-five thousand hours.
Low purity nitrogen generators use electrochemical based sensors. Electrochemical sensors have a fast response time and accurate reading at higher oxygen concentrations. Electrochemical sensors lifespan is over eighteen thousand hours.

	97 % vol N_2	98 % vol N_2	99 % vol N_2	99,5 % vol N_2	99,9 % vol N_2	99,99 % vol N_2	99,999 % vol N_2
Zirconia sensors					✓	✓	✓
Electrochemical sensors	✓	✓	✓	✓			

Energy saving (stand-by)

N-GEN series generators have an option to receive a stand-by signal from the compressor or other compressed air supply. While in the stand-by the air can flow freely through both towers in direction from the inlet to the outlet of the generator. Meanwhile the generator controller is in the stand-by mode and ready to resume with the normal operation as soon as it gets the appropriate signal. The stand-by signal is relayed to the N-GEN generator through a stand-by contact on the controller by a connected switch.

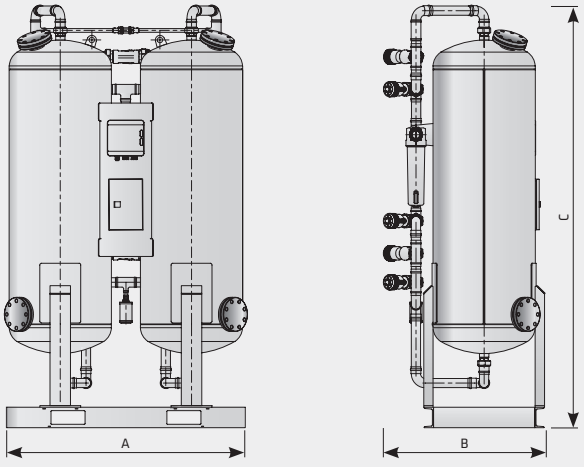
Standard equipment

- Set of external feed air filters
- Adsorber vessels in carbon steel
- Long life pneumatic valves
- Internal piping & fittings zinc plated carbon steel
- Nitrogen flow regulation
- Control system with SIEMENS PLC
- WebControl

Optional equipment

- Oxygen analyser with zirconium-oxide sensor
- Electronic product flow meter
- Feed air / product moisture analyser
- Feed air / product pressure transmitters
- Feed air / product temperature transmitters
- Nitrogen sterile filters
- Nitrogen booster
- Nitrogen cylinder filling system

Dimensions



TECHNICAL DATA

Type	Connection		Dimensions [mm]			Mass
	In	Out	A	B	C	kg
N-GEN 03	1/2"	1/2"	1097	550	1665	171
N-GEN 05	1/2"	1/2"	1126	550	1768	191
N-GEN 10	1/2"	1/2"	1100	550	1674	230
N-GEN 15	1/2"	1/2"	1102	550	1804	310
N-GEN 20	1"	1/2"	1152	550	1968	345
N-GEN 25	1"	1/2"	1282	760	2094	585
N-GEN 35	1"	1/2"	1398	760	2103	720
N-GEN 50	1"	1/2"	1450	760	2140	870
N-GEN 65	1"	1/2"	1650	860	2211	955
N-GEN 80	1"	1"	1749	860	2361	1215
N-GEN 100	2"	1"	2003	1010	2273	1660
N-GEN 150	2"	1"	2107	1180	2387	2540
N-GEN 200	2"	2"	2434	1325	2404	3035
N-GEN 250	2"	2"	2603	1425	2510	4100
N-GEN 300	2"	2"	2815	1630	2629	4998
N-GEN 400	DN65	DN40	3100	1690	2889	6850

PERFORMANCE at inlet temperature 30°C

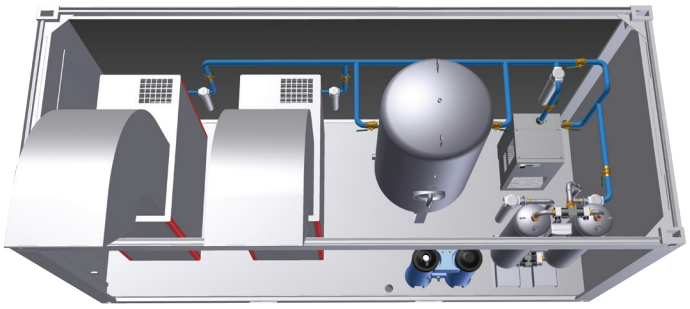
Type		Inlet pressure	Discharge pressure	Residual Oxygen [vol. %]						
		barg	barg	3	2	1	0,5	0,1	0,01	0,001
				Total inert gas purity [vol. %]						
				97	98	99	99,5	99,9	99,99	99,999
N-GEN 03	N_2 flow [Nm³/h]	7,5	6,3	5,84	5,58	5,13	3,63	2,74	1,61	0,90
	Feed air consumption [Nm³/h]			12,3	12,0	11,0	10,2	10,2	8,1	5,2
N-GEN 05	N_2 flow [Nm³/h]	7,5	6,3	9,34	8,91	8,21	5,80	4,39	2,58	1,44
	Feed air consumption [Nm³/h]			19,6	19,2	17,6	16,2	16,2	12,9	8,3
N-GEN 10	N_2 flow [Nm³/h]	7,5	6,3	14,4	13,7	12,6	8,9	6,8	4,0	2,2
	Feed air consumption [Nm³/h]			30,2	29,5	27,2	25,0	25,0	19,8	12,8
N-GEN 15	N_2 flow [Nm³/h]	7,5	6,3	23,8	22,7	20,9	14,8	11,2	6,6	3,7
	Feed air consumption [Nm³/h]			49,9	48,8	44,9	41,3	41,3	32,8	21,2
N-GEN 20	N_2 flow [Nm³/h]	7,5	6,3	28,6	27,3	25,1	17,7	13,4	7,9	4,4
	Feed air consumption [Nm³/h]			60,0	58,6	54,0	49,7	49,7	39,4	25,4
N-GEN 25	N_2 flow [Nm³/h]	7,5	6,3	42,7	40,7	37,5	26,5	20,0	11,8	6,6
	Feed air consumption [Nm³/h]			89,6	87,6	80,6	74,2	74,2	58,9	38,0
N-GEN 35	N_2 flow [Nm³/h]	7,5	6,3	67,7	64,6	59,5	42,0	31,8	18,7	10,5
	Feed air consumption [Nm³/h]			142,1	138,8	127,8	117,7	117,6	93,3	60,2
N-GEN 50	N_2 flow [Nm³/h]	7,5	6,3	86,9	82,9	76,3	54,0	40,8	24,0	13,4
	Feed air consumption [Nm³/h]			182,4	178,3	164,1	151,1	151,0	119,8	77,3
N-GEN 65	N_2 flow [Nm³/h]	7,5	6,3	106,6	101,7	93,6	66,2	50,1	29,4	16,5
	Feed air consumption [Nm³/h]			223,8	218,7	201,3	185,4	185,2	146,9	94,9
N-GEN 80	N_2 flow [Nm³/h]	7,5	6,3	118,8	113,4	104,4	73,8	55,8	32,8	18,4
	Feed air consumption [Nm³/h]			249,5	243,8	224,5	206,6	206,5	163,8	105,8
N-GEN 100	N_2 flow [Nm³/h]	7,5	6,3	178,2	170,1	156,6	110,7	83,7	49,2	27,5
	Feed air consumption [Nm³/h]			374,3	365,8	336,8	310,0	309,8	245,8	158,7
N-GEN 150	N_2 flow [Nm³/h]	7,5	6,3	273,9	261,4	240,7	170,1	128,6	75,5	42,3
	Feed air consumption [Nm³/h]			575,2	562,1	517,5	476,4	476,0	377,7	243,8
N-GEN 200	N_2 flow [Nm³/h]	7,5	6,3	344,3	328,6	302,5	213,9	161,7	94,9	53,2
	Feed air consumption [Nm³/h]			723,0	706,5	650,5	598,8	598,3	474,7	306,5
N-GEN 250	N_2 flow [Nm³/h]	7,5	6,3	419,2	400,2	368,4	260,4	196,9	115,6	64,8
	Feed air consumption [Nm³/h]			880,4	860,4	792,1	792,2	728,6	578,0	373,2
N-GEN 300	N_2 flow [Nm³/h]	7,5	6,3	534,6	510,3	469,8	332,1	251,1	147,4	82,6
	Feed air consumption [Nm³/h]			1.122,7	1.097,1	1.010,1	929,9	929,1	737,1	475,9
N-GEN 400	N_2 flow [Nm³/h]	7,5	6,3	727,8	694,7	639,6	452,1	341,8	200,7	112,5
	Feed air consumption [Nm³/h]			1.528,4	1.493,6	1.375,1	1.265,9	1.264,8	1.003,5	647,9

For concentrations at higher purity please contact manufacturer.
All flow rates valid for generator operation at ambient conditions 20 °C, 1.013,25 mbar and 60% RH.
Performance ±5%.

AIR BOX, N_2BOX, O_2BOX, MEDI BOX

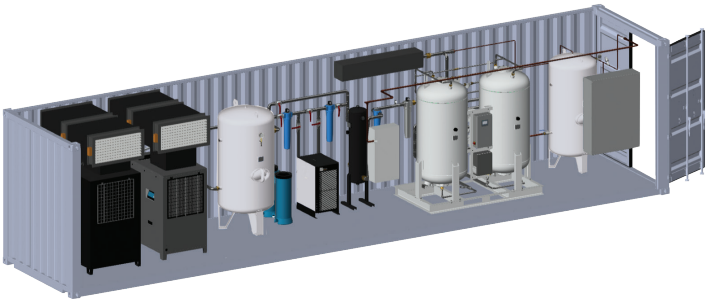
STANDARD CONTAINER COMPRESSED AIR STATIONS

Operating press.: up to 13 barg
PDP: +3°C / -40°C (lower on request)
Capacity: Up to 35 m3/min (higher on request)



CUSTOM MADE CONTAINER NITROGEN AND OXYGEN STATIONS

Operating press.: on request
PDP: on request
Capacity: on request



Stationary compressed air stations

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