BOGE AIR. THE AIR TO WORK.

BOGE

PN nitrogen generators

The efficient path to ultra-pure nitrogen

Family-made since 1907

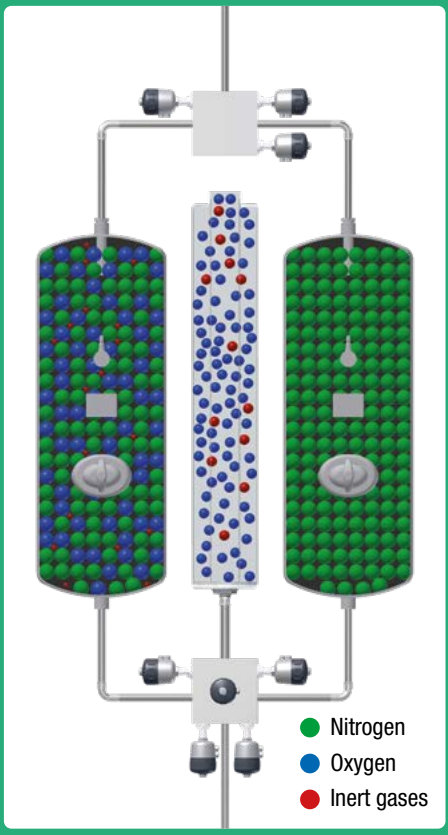
A declaration of independence that will pay off

No question: liquid nitrogen is expensive. High transport and storage costs as well as long-term supply contracts result in significant expenses. Generating nitrogen independently therefore has many advantages: First of all, it saves a lot of money in the long term. Second, you will not be dependent on any liquid gas manufacturer. Thanks to highly efficient on-site nitrogen generation, you will always produce nitrogen in exactly the purity your application needs. And the investment will pay off after just a few years.

Highly efficient and safe: PSA technology

The mode of action is based on the adsorption principle. For nitrogen generation, compressed air alternately flows through two receivers filled with CMS. The oxygen molecules of the ambient air, which is supplied under pressure, is absorbed on the surface of the CMS. The free nitrogen molecules pass through the CMS without being obstructed and are directed into a separate downstream product receiver. This is where the nitrogen is stored for subsequent use.

After the CMS in the first receiver have been saturated with oxygen molecules, the process is switched to the second receiver. While the CMS in the first receiver regenerate under pressure relief and by being flushed, the oxygen molecules are adsorbed under pressure in the second receiver. This generates a continuous flow of nitrogen.



Oxygen analysis (Zirconium oxide sensor)

The zirconium oxide sensor installed as standard is durable and particularly reliable. Temperature-resistance and quick response times guarantee continuous and reliable monitoring of purity.

Sensor and control technology

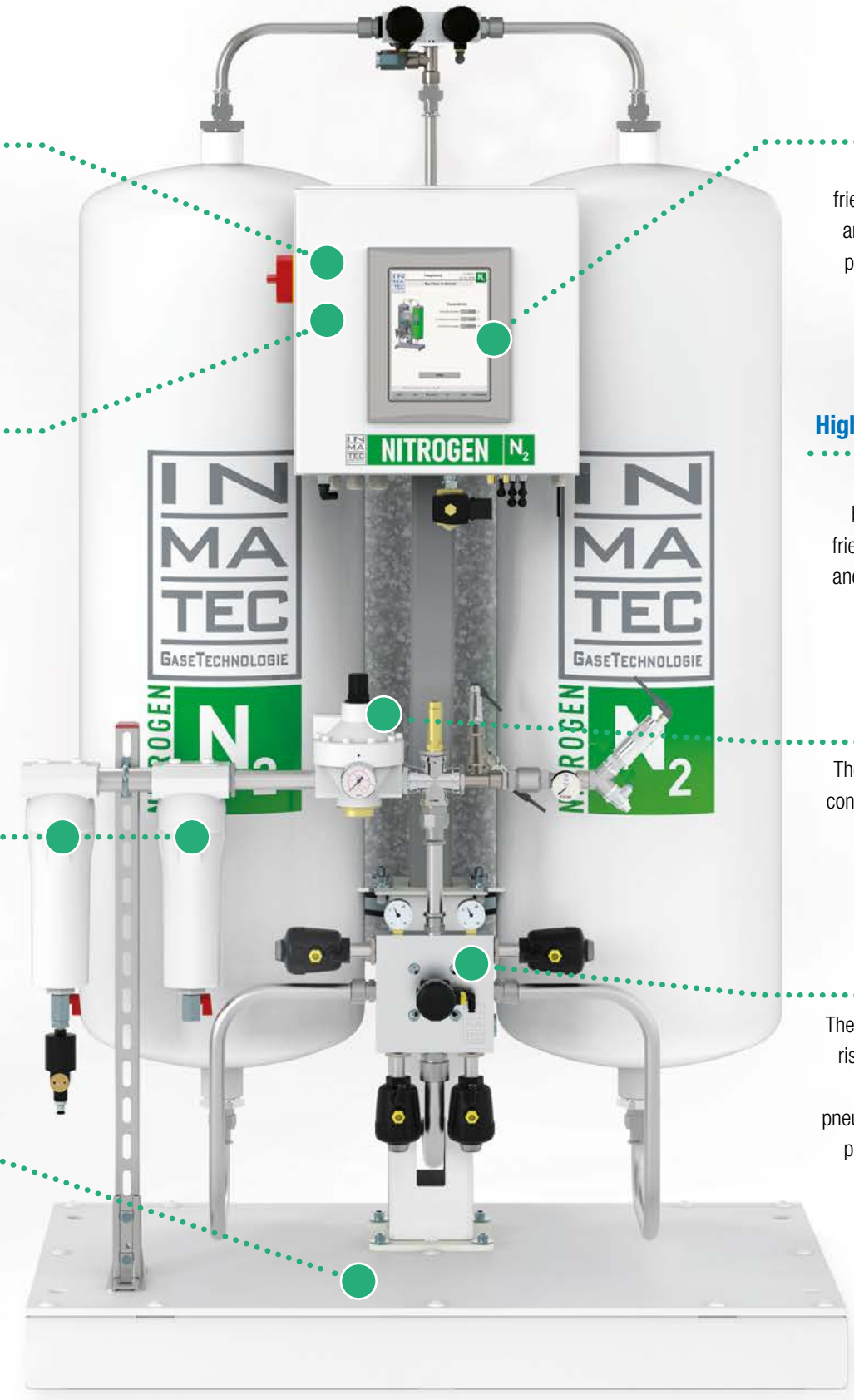
A pressure sensor and a flow control located at the outlet of the generator ensure efficient operation and continuous monitoring of the nitrogen quality. The perfect interaction between sensor and control technology is not just energy efficient and optimised for consumption but it also guarantees maximum operational safety and excellent product quality.

Micro and activated carbon filter

Two inlet and outlet filters ensure a high degree of compressed air quality, maximum protection of the molecular sieve used as well as a high level of nitrogen quality for the consumer. This is how the system stands out with a particularly long service life.

Console and receiver

All PSA receivers have been designed for ≥ 2 million load cycles in accordance with DGRL and feature fatigue strength. From series PN 220, high-quality sieve bottoms ensure a flow-optimised design. The integrated sinter filters prevent particle transfer from the CMS in use, increase service life and ensure the best possible product quality.



9" touchscreen control

The high-quality control offers maximum user friendliness. The entire process is presented visually and clearly. Numerous interfaces allow transparent process monitoring as well as easy integration into the customer's existing infrastructure.

High-quality CMS made of coconut shells

The carbon molecular sieve (CMS) made of biodegradable material is not just environmentally friendly, it is also characterised by a long service life and low air factors, thanks to exceptional adsorption properties. Sustainable, powerful and efficient.

Inlet and outlet pressure regulators

The inlet and outlet pressure regulators guarantee a constant flow of the incoming or outgoing gas, which increases process stability.

Valve block and high-quality pneumatic valves

The valve block's compact design minimises leakage risks and allows easy accessibility for maintenance. The efficient arrangement of the high-quality pneumatic valves results in quick response times and precise control. Reliable and maintenance-friendly.

PN 150 nitrogen generator

Our energy savings packages at an attractive price

PN 1000 nitrogen generator

AutoPure Technology: high purity, a long service life, maximum safety

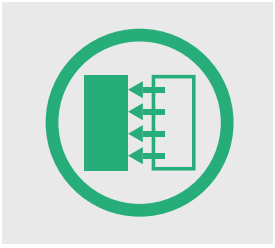
During start-up or a minor decrease in product purity, the receiver is flushed with nitrogen until the required purity class has been reached – until then, product gas of lower quality will be released via the purging valve. Only when the desired purity has been reached, will the generator open the nitrogen outlet. This ensures a constantly high and consistent product quality and is therefore particularly suitable for sensitive applications, in the food and pharma industry for example. At a great price, **Package Option 1** combines AutoPure Technology with a pressure sensor to monitor the generator's intake pressure and a flow sensor to continuously monitor the flow quantity.

Energy Efficiency Control: maximum energy savings guaranteed

Using various sensors (including zirconium oxide sensor), the EEC constantly monitors the nitrogen requirements and purity quality of the produced gas. The expected requirement is forecast based on the current requirement profile. At full load, the generator runs at continuously high capacity.
In the event of fluctuating consumption, the generator's control reduces power and switching cycles, which leads to a significant saving with regard to purge air losses, considerably lower air consumption and thus maximum energy savings. Energy-intensive applications (large-scale plants) with fluctuating demand in particular will benefit from this solution. At a great price, **Package Option 2** includes Package Option 1 supplemented with an additional temperature sensor and a pressure dew point sensor to continuously monitor compressed air temperature and humidity at the generator inlet.

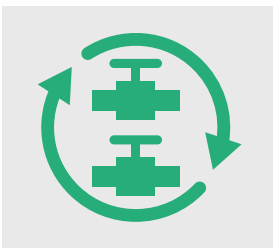
Base load switching: efficiency increase and stability during the production process

The base load switching function controls two redundant supply systems. One system is in charge of the master function, while the second system manages the slave function. Switching between the two systems is automatic and is controlled by pressure and flow. Thanks to this redundancy, supply is guaranteed at all times, and in the event of necessary surplus production, capacities can be flexibly adapted to the additional requirement and optimised. Furthermore, uniform utilisation increases generator service life. Even required servicing will not necessarily lead to downtimes because a backup system is available.



Redundant valve block: simple, maintenance-friendly and cost-effective

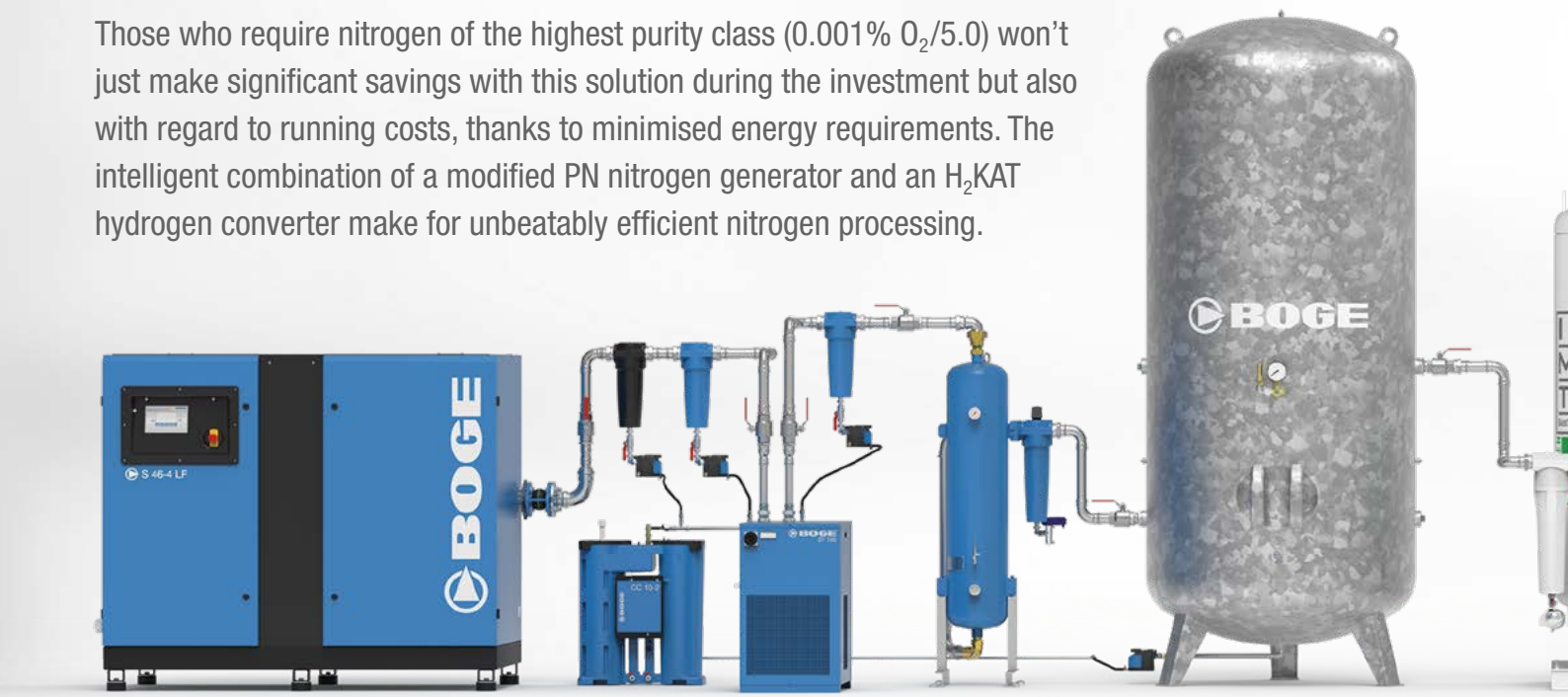
If needed, the availability or reliability of the system can be increased by using a redundant valve block in the generator's inlet and outlet. Ball valves allow switching to second (redundant) pipework during generator operation. In most cases, a fault involves the process valves. The valve block therefore covers redundancy in about nine out of ten cases. The switch takes place manually. Process valves can be cleaned or replaced without system downtimes. This results in easy, maintenance-friendly and cost-effective redundancy compared with two parallel systems.



PN nitrogen generators Efficiency with the highest purity

The unbeatable team: PNK and H_2KAT

Those who require nitrogen of the highest purity class (0.001% O_2/5.0) won't just make significant savings with this solution during the investment but also with regard to running costs, thanks to minimised energy requirements. The intelligent combination of a modified PN nitrogen generator and an H_2KAT hydrogen converter make for unbeatably efficient nitrogen processing.



PNK nitrogen generator

In a way, the PNK is the "right hand" of the H_2KAT. Technically perfectly synchronised, they are always used in this combination. The generator which has been designed for a specific purity of 0.1% (3.0) features an H_2KAT switch cabinet, oxygen analysis, pressure sensor as well as AutoPure Technology & Energy Efficiency Control. Eight PNK models (PNK 150 to PNK 2000) with flow rates from 20 to 375 Nm³/h cover a great range of delivery quantities. The pre-configured models are perfectly adapted to the relevant H_2KAT model and can be easily combined.

PNK model	Purity	H_2KAT model	Purity	Flow capacity N_2 Nm³/h
PNK 150	3.0	H_2KAT 20	5.0	20
PNK 220	3.0	H_2KAT 40	5.0	40
PNK 270	3.0	H_2KAT 50	5.0	50
PNK 350	3.0	H_2KAT 80	5.0	80
PNK 500	3.0	H_2KAT 100	5.0	100
PNK 750	3.0	H_2KAT 125	5.0	125
PNK 1000	3.0	H_2KAT 150	5.0	150
PNK 1500	3.0	H_2KAT 200	5.0	200
PNK 2000	3.0	H_2KAT 300	5.0	300

H_2KAT hydrogen catalytic converter

A downstream H_2KAT hydrogen catalytic converter is in charge of the energy optimisation during nitrogen generation. To do this, nitrogen provided by the generator, which has a residual oxygen purity of 0.1% (3.0), is purified in a specially developed reaction process (Deoxo). The H_2 and O_2 molecules in the H_2KAT are absorbed to create H_2O. This means that the remaining oxygen molecules are removed from the nitrogen in an energy efficient way by adding small quantities of hydrogen and released as water. This two-step process allows the generation of extremely pure nitrogen with a residual oxygen purity of 0.001% (5.0) with very low compressed air quantities.
This saves energy costs and up to 70% primary energy.

The H_2KAT is available in eight versions, with the highest purity of 0.001 % O_2 (5.0) and delivery quantities of up to 300 Nm³/h. It features oxygen analysis to continuously monitor purity, a flow sensor (N_2) as well as a temperature and pressure sensor. The H_2 hydrogen supply is not included in the delivery.

A clear winner in three categories

Reduction of compressed air consumption by about 40 to 50%?
Easy for the “dynamic duo” that is the PNK and H_2KAT.
At the same time, it requires significantly less space than a comparable, conventional nitrogen generator. The result speaks for itself: maximum savings in terms of energy, space and costs.

Cleverly combined

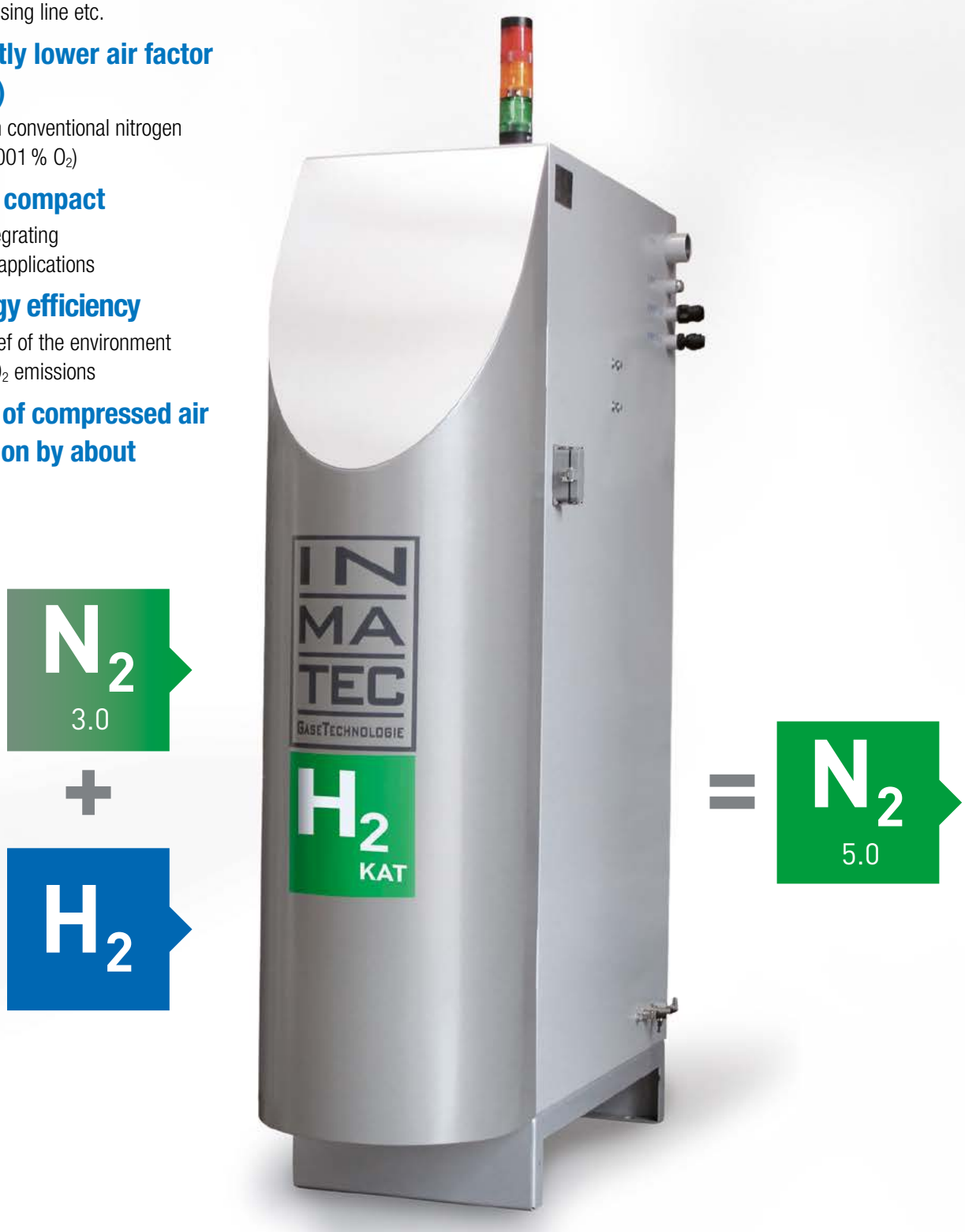
If the generator produces a residual oxygen purity of only 0.1% (instead of 0.001%), the air factor can be almost halved – the generator can therefore be much smaller and cost-effective in its design. This advantage lowers not only the procurement costs of the generator but also of upstream compressed air components: A significantly smaller compressor and less complex processing components also require less power, of course, which satisfyingly reduces operating costs.
Plus: The fact that little space is needed makes this the perfect solution for container applications. At the same time, the concept is particularly suitable for sophisticated applications that make high demands on purity.

Continuous purity monitoring and state-of-the-art 9" touchscreen control

The oxygen sensors installed as standard in both the PNK and H_2KAT make sure that deviation from the desired purity will not go unnoticed. Continuous monitoring of quality and purity takes place centrally via the PNK generator’s control. All readings can therefore be displayed and accessed via the state-of-the-art, convenient 9" touchscreen control of the upstream nitrogen generator (PNK). Not only does this show all relevant functional and quality parameters for both systems as a clear illustration but the control also provides numerous connection and integration options. This means the system can be flexibly expanded with a downstream high-pressure compressor as well as nitrogen storage up to 300 bar, for example, and connected to a photovoltaic system.

Key benefits of the design at a glance:

- **Significantly lower investment costs**
  Smaller compressor, smaller generator, smaller processing line etc.
- **Significantly lower air factor (2.9 to 3.3)**
  compared with conventional nitrogen generation (0.001 % O_2)
- **Extremely compact**
  Perfect for integrating into container applications
- **High energy efficiency**
  Long-term relief of the environment concerning CO_2 emissions
- **Reduction of compressed air consumption by about 40 to 50%**



The all-in-one solution, ready to use with great terms

Whether in electronics or semiconductor production, for tempering or laser cutting – we know all the areas where nitrogen is required and offer the relevant concept as a process-safe all-in-one solution.

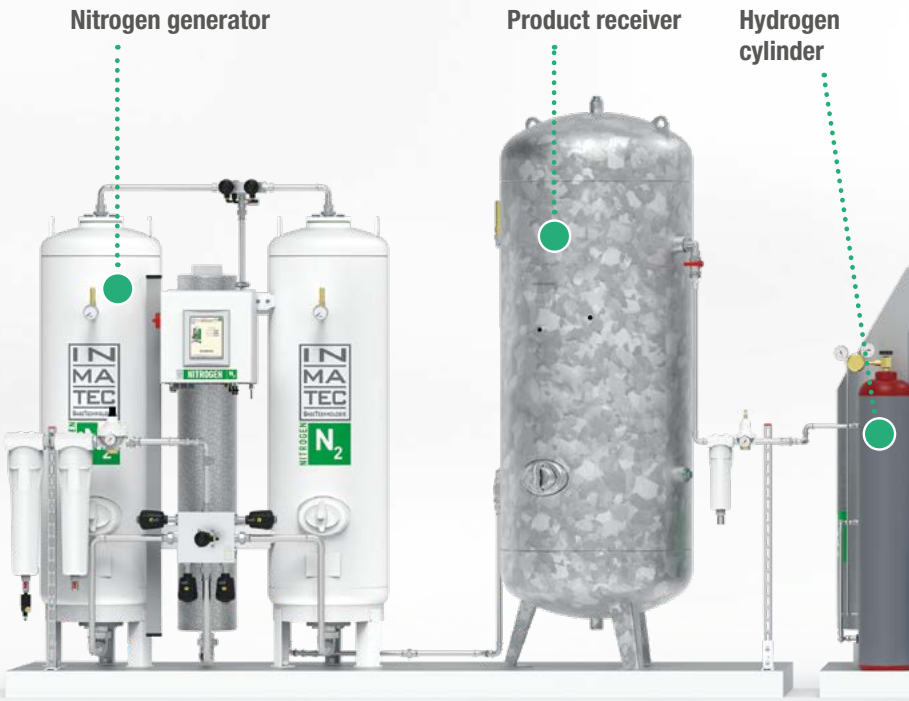
Typical areas of application

Electronics

Laser cutting

Tempering

Soldering

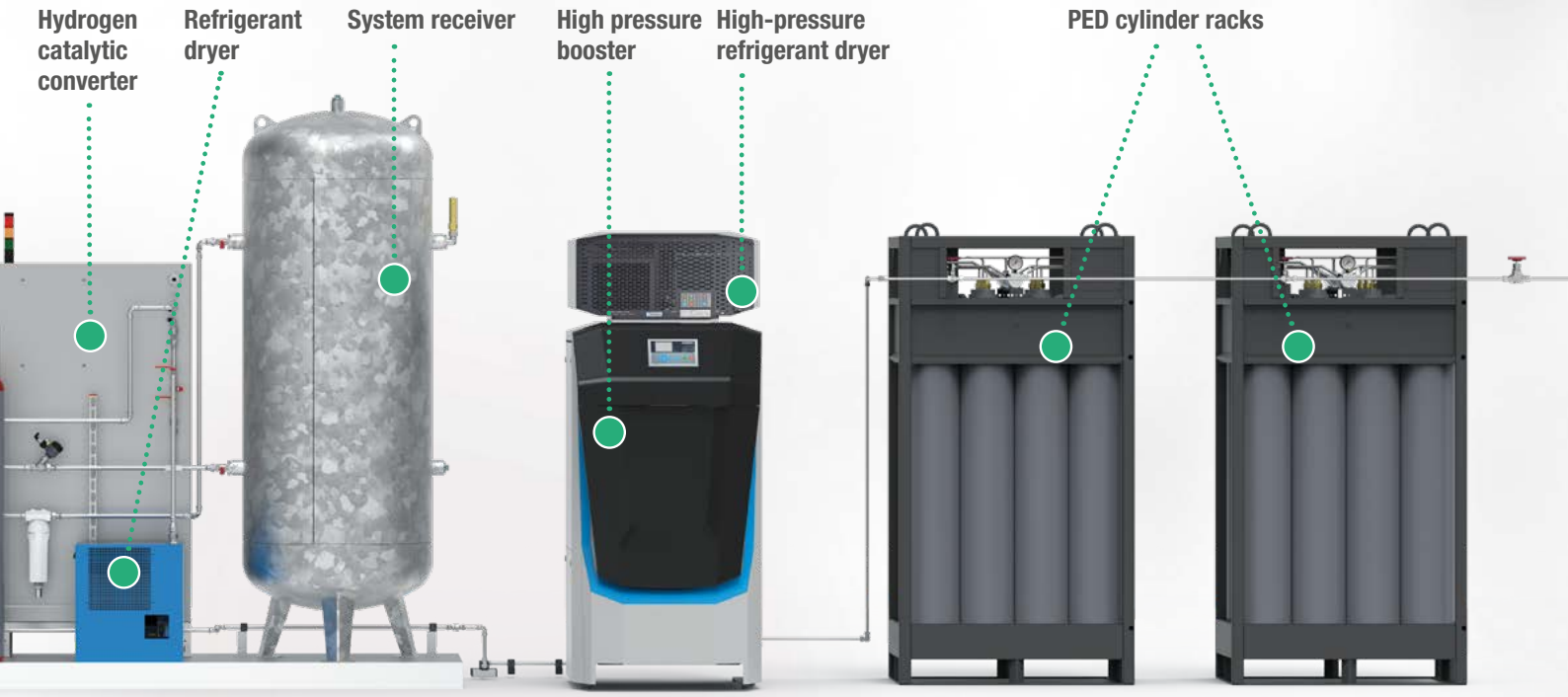


Platform 1

The easiest path to ultra-pure nitrogen

The benefits of a modular system are obvious: all conditions required in practice can be considered in your advance planning so that a customised solution can be created for all the different requirements. But that is not all: all components – with perfectly synchronised technology – are fully equipped with pipework and assembled on base plates ready for installation. Therefore, nothing will get in the way of rapid commissioning. Flexibility is key as these skids show: the two platforms are not just designed to save space, they can also optionally be arranged in-line or at 90° to each other which pre-destines them for container applications.

Both the generators and the H_2KATs are tried-and-tested standard components. The “turnkey” overall concept simplifies not only smooth integration into the production process but also meets the highest requirements when it comes to process stability and constant purity. Everything with the smallest footprint



Platform 2

Stand-alone high-pressure components

Maximum flexibility and effective cost savings

Typical laser cutting applications require operating pressures between 10 and 20 bar, depending on the material thickness. BOGE therefore offers the option of expanding Platforms 1 & 2 with stand-alone high-pressure components that are perfectly adapted to the relevant requirement. The 40 bar SCHV Booster has been designed for continuous demand where the system is delivering the required operating pressure. But what happens if demand keeps changing, which is the case with most applications? The alternative is a 300 bar booster which supplies the required pressure for cylinder charging. The PED bundles are for storage purposes, meaning the highly compressed nitrogen can be accessed when needed. This flexible 300 bar storage in cylinders allows maximum energy adjustment and sustainability because nitrogen can be produced when electricity is cost-effective or can be generated independently from solar energy (PV systems).

Whether you choose the RTC (Ready to connect) series, i.e. the combination of Platforms 1 & 2, or a “LaserPack”, i.e. expansion using stand-alone high-pressure components for laser cutting applications – you will certainly get price benefits with this modular concept.

Concept benefits at a glance:

- **Customised “All-in-one” solution**
- **Modular concept via “Plug & Play”**
- **Maximum flexibility for ongoing operation or energy storage if required**
- **Low carbon footprint & maximum sustainability**
- **Energy management via provis 3 platform**
- **Photovoltaic connection & energy storage**
- **Service and maintenance from one provider**

BOGE AIR. THE AIR TO WORK.

BOGE

Best Of German Engineering

Customers in more than 120 countries worldwide trust the BOGE brand. Already in its fourth generation, this family-run company directs all its experience into developing innovative solutions and exceptionally efficient products for the compressed air industry.

INMATEC GaseTechnologie — Member of the BOGE group

Supported by our subsidiary INMATEC, global leader in nitrogen and oxygen generators, the BOGE Group is continuing to sustainably expand its competitive edge in premium technology. After all: “Best of German Engineering” has been part of our DNA – since 1907.

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 = ISO 14001

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