



domnick hunter



MAXIGAS Nitrogen Supply

for heat treatment

www.domnickhunter.com

Heat treatment of metals

improved strength for higher quality components

Metals and alloys can be heat treated to enhance their strength as well as resistance to wear and corrosion. These attributes are particularly important for the production of high quality parts at competitive prices.

Several heat treatment techniques utilise nitrogen for blanketing to reduce oxidation and absorb hydrogen. Some applications are outlined here:



Carburising and carbonitriding

A hardening process that involves heating in a controlled atmosphere furnace to the point where alloys absorb carbon and nitrogen. Controlled cooling produces the desired hardened surface characteristics. This controlled reaction normally occurs at around 950°C and uses a hydrocarbon such as natural gas or cracked methanol while nitrogen accelerates the absorption of carbon into the treated metal. The nitrogen to cracked methanol ratio is typically 50:50 or 40:60.

Tempering and annealing

These stress relieving processes condition stainless steels, carbon steels and non-ferrous metals for further hardening processes. Metals are heated in a controlled atmosphere batch or continuous furnace to avoid oxidation. Nitrogen provides a suitably inert atmosphere that will help prevent exothermic reactions and dangerously overheated furnaces that would otherwise result in distorted components.

A nitrogen, hydrogen or hydrocarbon gas mixture can also be used. Hydrogen acts as a reducing agent to ensure a bright surface, while carbon controls decarburisation.

Gas quenching

This is an environmentally friendly and more easily controlled alternative to oil and salt baths. Primarily used to speed up cooling, it is widely used in vacuum furnaces but is suitable for all types of furnace. Nitrogen, hydrogen, argon and helium are suitable gases.

Neutral hardening

Involves heating components above their transformation temperature, then quenching them in salt or oil baths or in a gas quenching treatment. This style of hardening process requires a protective atmosphere to prevent oxidation and decarburisation.

Galvanising

This process uses nitrogen to gas wipe hot-dip galvanised metals, which achieves an improved surface finish with greater uniformity of the galvanised coating. Nitrogen also minimises zinc oxide formation in the bath, which can cause irregularities.

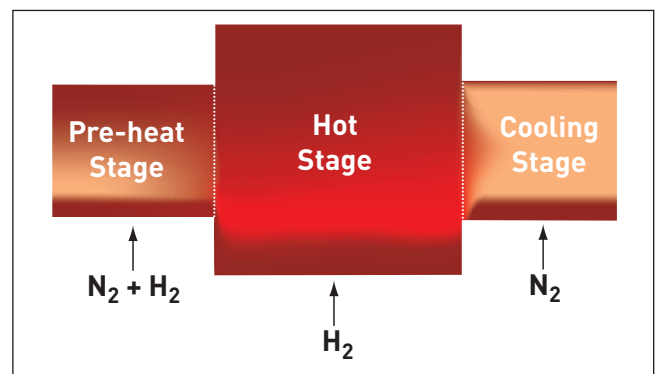
Normalising

Re-aligns the molecular structure of 'work hardened' materials to their 'normal' state to avoid differential hardening rates that cause distortion and premature component failure.

Nitrogen at 50ppm provides a blanket that prevents oxidation during slow heating to the normalising temperature of a particular metal. This means components do not require any secondary oxide removal operations.

Sintering

Carried out in several stages, each sintering stage requires a particular atmosphere. In the first instance an oxidising atmosphere is necessary to remove lubricants. Then a reducing atmosphere is required for decarburising and a good sintered result. Finally a reduced oxygen atmosphere is required in the cooling stage to prevent oxidation and any dullness of the metal surface, nitrogen gas provides the necessary atmosphere.



Furnace atmosphere zones

Non metallic materials

Manufacturing costs of composite materials such as kevlar and carbon fibre are high due to their long process times. There is a high oxidation rate at high temperatures; slow heating during carbonisation at 1000-1500°C and graphitisation heat treatments at temperatures up to 3000°C require protection against oxidation in an inert atmosphere to prevent fibres becoming too brittle.

Why MAXIGAS?

MAXIGAS is a cost effective alternative to other nitrogen gas sources, with no on-going costs such as refills, order processing or delivery charges. It is an effective gas delivery system for applications that require high flow rates and pressure levels. It is also a safer alternative that eliminates manhandling of high-pressure cylinders or cryogenic gas tanks.

Production downtime is minimised due to the permanent availability of an on-demand nitrogen supply.

Maxigas gives manufacturers increased control over flow rates and requires minimal maintenance. It can also bring valuable space saving advantages.

MAXIGAS deliverables

- Nitrogen purity of up to 10ppm oxygen content
- On-demand nitrogen
- Increased control
- No reliance on gas deliveries in remote or congested areas
- Modular space saving design
- Ability to add extra banks of generators
- Simplicity
- Innovative regeneration feature requires minimal maintenance
- domnick hunter global service and support
- Easily retrofitted



MAXIGAS model N2MAX116



Dependable nitrogen supply for improved occupational safety

How it works

MAXIGAS is constructed from pairs of extruded aluminium columns filled with carbon molecular sieve (CMS) and operates on the pressure swing adsorption (PSA) principle to produce a continuous stream of nitrogen gas from compressed air. Oxygen and other trace gases are preferentially adsorbed by the CMS, allowing nitrogen to pass through.

Carbon molecular sieve differs from ordinary activated carbons in that it has a much narrower range of pore openings. This allows small molecules such as oxygen to penetrate the pores and be separated from the air stream. The larger molecules of nitrogen by-pass the CMS and emerge as the product gas.

After a pre-set time when the online bed is almost saturated with adsorbed gases, the system automatically switches to regenerative mode, venting the contaminants from the CMS. The second CMS bed then comes online and takes over the separation process. The pair of CMS beds switch between separation and regeneration modes to ensure continuous and uninterrupted nitrogen production.



Carbon molecular sieve

Performance data

Model	With Compressor	Without Compressor	Nitrogen Outlet Flowrate - Nm ³ /hr (ATP) v Oxygen Content						
			10ppm	100ppm	0.1%	0.5%	1%	2%	3%
N2MID350		•	0.6	1.0	1.6	2.6	3.1	4.0	N/a
N2MID351	•								
N2MID600		•	0.9	1.5	2.6	3.9	4.6	6.1	N/a
N2MID601	•								
N2MAX104		•	1.3	2.2	4.5	7.6	9.0	11.8	13.8
N2MAX106		•	1.9	3.2	6.7	11.4	13.5	17.7	20.7
N2MAX108		•	2.6	4.4	9.0	15.3	18.0	23.6	27.6
N2MAX110		•	3.2	5.3	11.3	19.1	22.6	29.5	34.5
N2MAX112		•	5.2	8.4	18.4	30.8	36.4	41.2	47.8
N2MAX116		•	6.9	11.2	24.5	41.0	48.5	52.9	61.4



MAXIGAS installation

Performance data based on 6 barg (87psig) air inlet pressure, 20°-25°C (68°-77°F) ambient temperature. Consult domnick hunter for performance under other specific conditions.

Technical specifications

Ambient temp. range	5°-45°C (41-113°F)
Nitrogen outlet pressure	5 barg (72.5psig)
Min. air inlet pressure	6 barg (87psig)
Max. air inlet pressure	9.5 barg (138psig)
Inlet air quality	Dewpoint: -40°C (-40°F) Particulate: <0.1 micron Oil: <0.01 mg/m ³
Electrical supply	220V/1ph/50Hz or 110V/1ph/60Hz
Inlet/outlet connections	G½

Weights and dimensions

Model	Height (mm)	Width (mm)	Depth (mm)	Weight (Kg)
N2MID350	1100	590	600	145
N2MID600	1100	590	600	180
N2MAX104	1650	500	810	250
N2MAX106	1650	500	980	330
N2MAX108	1650	500	1150	410
N2MAX110	1650	500	1320	490
N2MAX112	1760	600	1717	674
N2MAX116	1760	600	2055	837

Standard accessories

Oxygen analyser for continuous monitoring of nitrogen purity.

Flow verification kit.

Analogue outputs for remote monitoring alarm connections.

Other dh products

- Compressed air filters
- Sterile air filters
- Compressed air dryers
- Laboratory gas generators
- Oil/water separators
- Condensate drains

MAXIGAS MIDI

The MAXIGAS MIDI range is designed to offer the most compact solution for smaller scale nitrogen requirements. These units are available with the option of an integral oil-free air compressor, giving a more flexible and convenient nitrogen supply.



MAXIGAS modular concept

For higher flow rate applications, MAXIGAS can be multibanked to offer the most cost effective solution.

The modular design of the MAXIGAS system means you can simply add extra banks as your business grows and your gas requirements increase.



dh and domnick hunter are registered trademarks of domnick hunter limited.

domnick hunter limited has a continuous policy of product development and although the Company reserves the right to change specifications, it attempts to keep customers informed of any alterations. This publication is for general information only and customers are requested to contact our Industrial Division Sales Department for detailed information and advice on a products suitability for specific applications. All products are sold subject to the Company's standard conditions of sale.



domnick hunter limited
 Dukesway, Team Valley Trading Estate,
 Gateshead, Tyne and Wear,
 England NE11 0PZ
 Tel: +44 (0)191 402 9000
 Telefax: +44 (0)191 482 6296
 gasgen@domnickhunter.com
 http://www.domnickhunter.com

www.domnickhunter.com

a member of the domnick hunter group plc

Copyright domnick hunter limited 2005
 Publication Reference: 795 05/05 Rev 000
 Stock No: 17 400 4795