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-ferous 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.

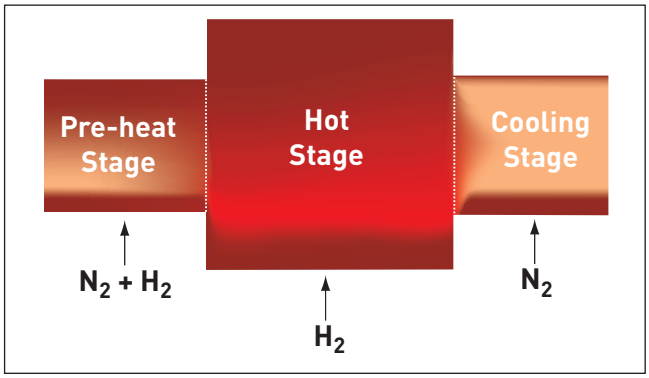
Normalising

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

Product Selection

Performance data is based on 7 bar g (100 psi g) air inlet pressure and 20º -25ºC (66º - 77ºF) ambient temperature. Consult Parker domnick hunter for performance under other specific conditions.

Nitrogen Outlet Capacity (Nm^3 / hour) V Oxygen Content

Model	10ppm	50ppm	100ppm	250ppm	500ppm	0.1%	0.5%	1.0%	2.0%	3.0%	4.0%	5.0%
MIDIGAS 2	0,55	-	1,2	1,5	1,9	2,4	3,4	4,3	5,8	7,2	8,4	9,4
MIDIGAS 4	1,2	-	2,4	3,2	3,9	4,7	6,9	8,5	11,6	14,3	16,7	18,8
MIDIGAS 6	1,5	-	3,2	4,2	5,3	6,5	9,5	11,5	15,2	18,7	21,7	24,5
MAXIGAS 104	2	3,8	5,5	7,1	8,6	9	14,1	17,8	22	25,8	29	32,2
MAXIGAS 106	3	5,7	8,3	10,7	13	13,4	21,2	26,6	32,8	38,7	43,5	48,3
MAXIGAS 108	4	7,6	11	14,3	17,3	18	28,3	35,5	43,8	51,6	58	64,4
MAXIGAS 110	5	9,5	13,8	17,8	21,6	22,4	35,3	44,4	54,7	64,5	72,5	80,4
MAXIGAS 112	6	11,3	16,5	21,4	25,9	26,8	42,4	53,3	65,7	77,4	87,1	96,5
MAXIGAS 116	7,9	14,4	20,9	27,1	32,8	34	53,7	67,5	83,2	98,1	110,3	122,3
MAXIGAS 120	9,8	17,4	25,3	32,8	39,7	41,2	65	81,7	100,7	118,7	133,5	148

Weights and Dimensions

Model	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
MIDIGAS 2	1034	450	471	98
MIDIGAS 4	1034	450	640	145
MIDIGAS 6	1034	450	809	196
MAXIGAS 104	1894	550	692	336
MAXIGAS 106	1894	550	861	394
MAXIGAS 108	1894	550	1029	488
MAXIGAS 110	1894	550	1198	582
MAXIGAS 112	1894	550	1368	676
MAXIGAS 116	1894	550	1765	864
MAXIGAS 120	1894	550	2043	1052

Technical Data

Ambient Temperature Range		: 5-50 °C
Max. Nitrogen Outlet Pressure		: 16,5 barg
Min. /Max. Air Inlet Pressure (MAXIGAS)		: 6-18 barg
Min. /Max. Air Inlet Pressure (MIDIGAS)		: 6-13 barg
Inlet Air Quality:	Dewpoint	: - 40 °C
	Particulate	: < 0,1 micron
	Oil	: < 0,01 mg/m3
Electrical Suply		: 220 V/1ph/50 Hz
Inlet /Outlet Connections		: Air G1 – Nitrogen G½

MIDIGAS Nitrogen Generator

MAXIGAS Nitrogen Generator