SECO/VACUUM
The North American Vacuum Furnace Company

Precision Gas Nitriding

Precision Gas Nitriding Using The ZeroFlow® Method

Gas nitriding and ferritic nitrocarburizing require ammonia gas. The ZeroFlow® method was developed by SECO/WARWICK to simplify the nitriding process through the economical use of only raw ammonia (NH_3). The control of the nitriding atmosphere chemical composition, and therefore the control of nitriding potential (Np), is performed automatically via the ZeroFlow software and hardware controls.

ZeroFlow® Gas Nitriding

To develop the ZeroFlow gas nitriding process, SECO/WARWICK worked with world-renowned, gas nitriding expert Professor Leszek Małdziński from the Institute of Work Machines and Vehicles of the Technical University in Poznan, Poland.

Typical Gas Nitriding Applications:

- Aluminum extrusion dies (H13)
- Nitriding of molds for aluminum pressure die casting
- Nitriding of crankshafts for engines of racing cars (4340)
- Nitriding of gears (4140, for various power transmission, like wind energy and turbines)
- Nitrocarburizing and post-oxidation of shafts (wear and corrosion resistance)
- Nitrocarburizing of gears for diesel engines and transmissions

SECO/VACUUM uses two basic types of furnaces for precision gas nitriding. One is a horizontal, front-loading retort furnace (Type HRN). The second is a vertically loaded (via crane) retort pit furnace (Type VRN).

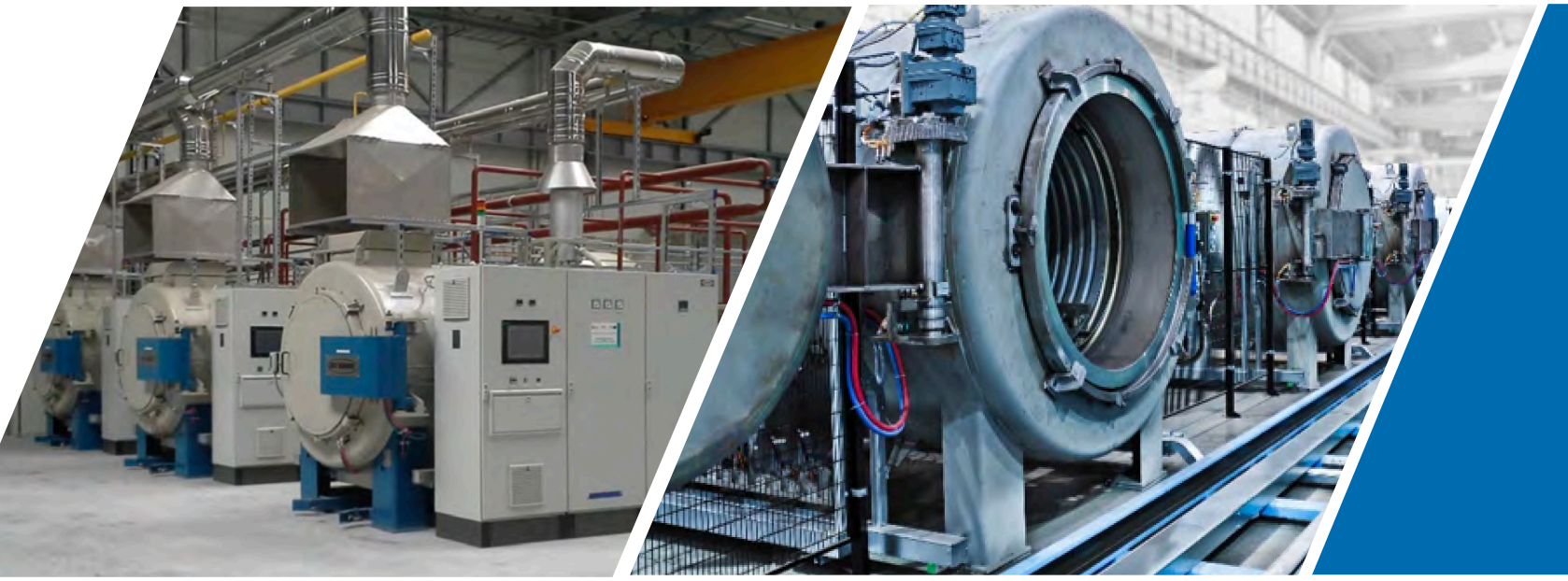
The table shows the most standard sizes of each, with other various sizes offered as required on a semi-custom basis. These multi-process furnaces are excellent for precision gas nitriding, but can also be used for other processes including nitrocarburizing, post-oxidation (black), stress relief, precipitation hardening, tempering, and annealing, all in nitrogen. Coupled with vacuum purge, even cleaner finishes are possible. Uniformity is excellent.

Benefits:

- Lowest consumption of gases among competing nitriding processes
- Simplified gas system
- Proper safety controls
- Options of nitrocarburizing and post-oxidation, sulfonitriding, and oxy-nitriding
- Highly accurate formation of the nitrided layer due to precise control and equilibrium character of the process
- Activation options for various materials used in precision gas nitriding
- Vacuum purging of the retort minimizes nitrogen gas use
- Quick and precise atmosphere analysis, automatically and in-situ (no sampling lines needed)
- Low operational and ownership costs

Features:

- Well over 100 retort units installed over many years
- Special sealing system for the cover, atmosphere motor and retort (as in vacuum furnaces)
- Vacuum purge system removes air at beginning of cycle [or mid-cycle for pre-oxidation (up to 700°F)].
  Vacuum can also be used for end of cycle
- Standard cooling via cold air blower on retort.
  Accelerated cooling with optional atmosphere "turbo" cooler (water cooled heat exchanger)
- Precise nitriding potential control and extensive data documentation via advanced controls
- Atmosphere exhaust burner



Standard Sizes:

Horizontal Model #	Useful Dimensions in (mm)	Gross Load Weight lbs (kg)	Working Temperature °F (°C)	Temperature Uniformity °F (°C)	Number of Heating Zones
HRNe*-60.60.90-750-6-ZF	24x24x36 (600x600x900)	1320 (600)	300-1380 (150-750)	±9° (±5°)	one
HRNe*-90.90.120-750-15-ZF	36x36x48 (900x900x1200)	3300 (1500)	300-1380 (150-750)	±9° (±5°)	three
HRNe*-100.100.150-750-25-ZF	40x40x60 (1000x1000x1500)	5500 (2500)	300-1380 (150-750)	±9° (±5°)	three

*HRNe - Horizontal Retort Nitrider - Electrically Heated

Note: HRNg natural gas heated models also available

Vertical Model #	Diameter in (mm)	Height in (mm)	Gross Load Weight lbs (kg)	Working Temperature °F (°C)	Temperature Uniformity °F (°C)	Number of Heating Zones
VRNe-100.200-650-25-ZF	39 (1000)	78 (2000)	5500 (2500)	300-1200 (150-650)	±9° (±5°)	three
VRNe-120.300-650-50-ZF	47 (1200)	118 (3000)	11000 (5000)	300-1200 (150-650)	±9° (±5°)	three

*VRNe - Vertical Retort Nitrider - Electrically Heated

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