



ALD Vacuum Technologies

High Tech is our Business

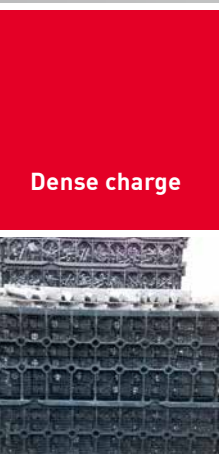
NiH-Vacuum Purged Nitriding Furnaces

The Equipment Customized to all Nitriding Requirements

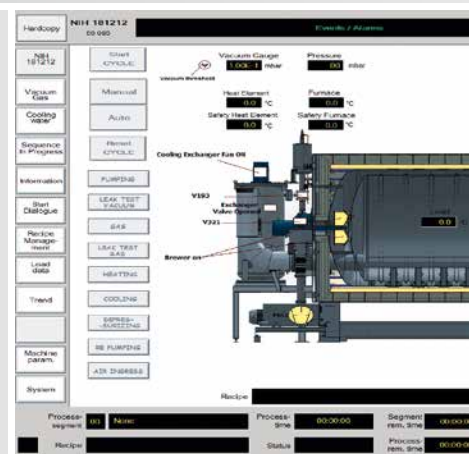
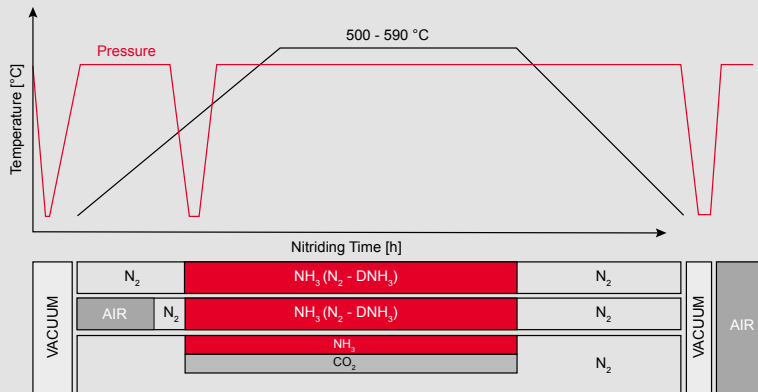


Process Control at any Stage

The Vacuum purged Furnace offers Higher Flexibility and more Productivity for Gas Nitriding



Dense charge



Processes

- Nitriding
- Nitro-carburizing
- Oxynitriding
- Post-oxidation
- Tempering

Nitriding Process

- Air or water pre-oxidation
- Nitrogen enrichment of the surface layer
- Compound (white) layer 0 to 50 μm
- Diffusion layer 0.025 to 0.8 mm
- Treatment temperature 480 to 580 °C
- Water post oxidation

Nitro-carburizing Process

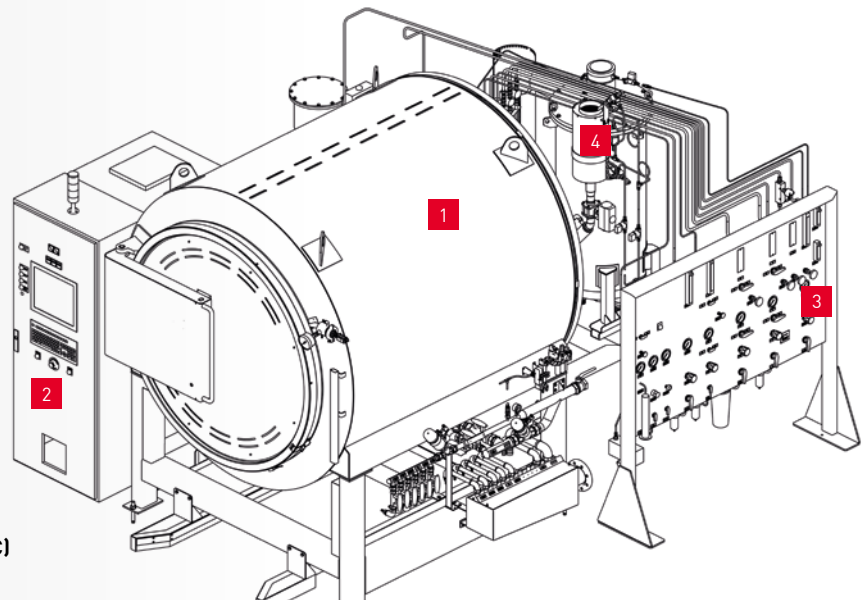
- Air or water pre-oxidation
- Surface enrichment in nitrogen and carbon
- Compound (white) layer 5 to 25 μm (ε)
- Diffusion layer 0.05 to 0.25 mm
- Processing temperature of 560 to 590 °C
- Water post oxidation

Controlling the nitriding process is achieved by controlling the nitriding potential $K_n = p(\text{NH}_3/p(\text{H}_2))^{3/2}$ or NH_3 dissociation rate of the furnace atmosphere to predict the conditions for obtaining:

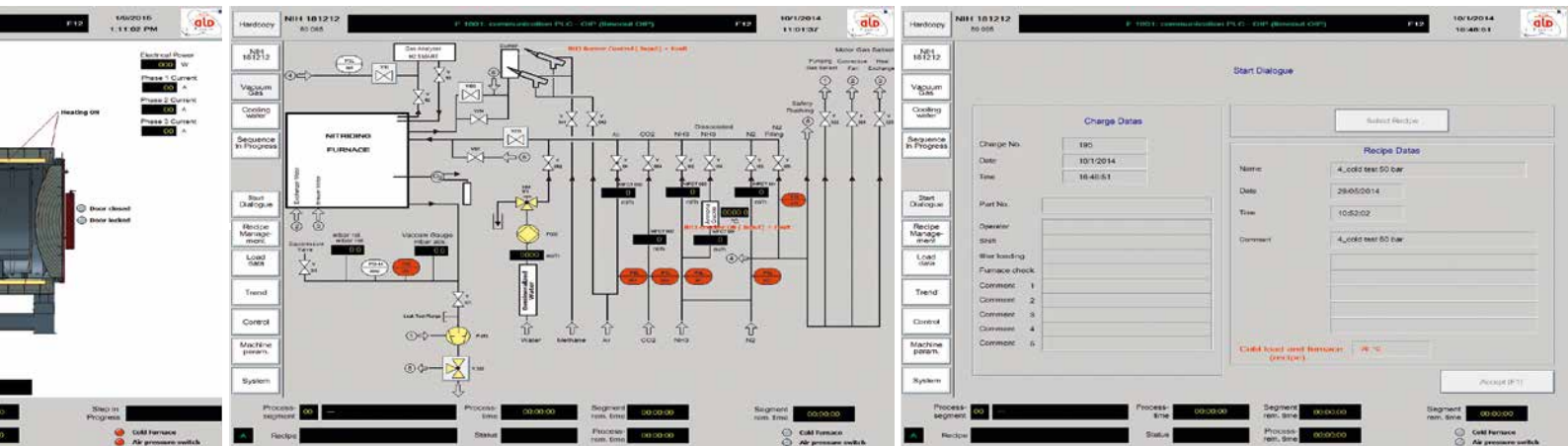
- the composition and thickness of the compound layer
- the depth of the diffusion layer.

To obtain the requested specification, the main parameters are:

- Temperature
- The gas flow rates, and composition
- Regulating K_n for nitriding
- Regulating $K_n - K_c$ nitro-carburizing
- Regulating $K_n - K_o$ for oxynitriding



1. Vacuum furnace
2. Control cabinet
3. Process gas distribution (MFC)
4. Burner



The recipe management allows the selection of process sequences

Field of Application

Nitriding and nitro-carburizing are thermochemical treatment of the surface layers. Tribological properties – which include abrasion, adhesion and surface fatigue, mechanical properties such as endurance limit - and improved resistance to corrosion is increased. These methods are used for machine parts and gears, tools, molds, dies, etc. They are also widely used when it is not possible to make a grinding operation or if only a small distortion is allowed.

In a vacuum purged furnace, pressure temperature and process gas composition can be controlled at any stage of the process to achieve expected nitrides and diffusion depth.

The vacuum purged furnace offers higher flexibility and more productivity for gas nitriding

- Semi bulk treatment in baskets
- Dense loads
- Excellent repeatability
- Control of layers type
- Compact white layer
- Cleanness of parts
- Friendly for environment

Technology at a Glance

The main characteristics are listed as follows:

Hot-Wall Design

- Vacuum purge up to 10^{-2} mbar
- Accurate temperature uniformity (less than +/- 5 °C)
- Convective heating up to 750 °C
- Very short cooling time/cycles as a result of ALD France' efficient heat exchanger
- Long service life retort 8 mm thickness
- Low maintenance costs as a result of the long service life of heating elements and simple cleaning
- Gas control by MFC
- Excellent process repeatability
- Very dense bulk load

Further Options

- K_n , K_c & K_o Control
- Inconel 600 retort
- AMS 2750, 2759/6/10/12
- NH_3 dissociator
- Gas exhaust cracking
- Analyzer NH_3

Applications

- Nitriding
- Nitro-carburizing
- Oxinitriding
- Post-oxidation
- Pre-oxidation with air, water vapor
- Annealing
- Tempering

Technical Data

| | | NIH 4.4.6 | NIH 6.6.9 | NIH 9.9.12 | NIH 12.12.18 |
|----------------------------|-------|-----------|-----------|------------|--------------|
| Charge dimension | | | | | |
| Width | [mm] | 400 | 600 | 900 | 1200 |
| Height | [mm] | 400 | 600 | 900 | 1200 |
| Length | [mm] | 600 | 900 | 1200 | 1800 |
| Gross charge weight | [kg] | 200 | 600 | 1200 | 2500 |
| Connection load | [kVA] | 50 | 100 | 190 | 335 |

For detailed information and price proposal please contact us:

ALD France

73D rue General Mangin
38030 Grenoble CEDEX 2
Sales: +33 (0) 4 76 33 47 10
E-Mail info@ald-france.eu
Internet www.ald-france.eu

ALD Vacuum Technologies GmbH

Wilhelm-Rohn-Strasse 35
D-63450 Hanau, Germany
Phone +49 (0) 6181 307-0
Fax +49 (0) 6181 307-3290
E-Mail info@ald-vt.de
Internet www.ald-vt.com