**PROCESS**

Gas Nitriding recipe designed for the deepest case depths.

**CASE DEPTHS**

![Graph showing case depths](image)

**MATERIAL CATALOGUE**

Nitriding results are strongly influenced by the composition of the component. The presence of nitride-forming elements such as Al, Ti, V, and Cr will strongly influence the achievable hardness and the rate at which the case depth increases.

**Typical Case Depths**

<table>
<thead>
<tr>
<th>Material</th>
<th>&gt;50 HRC</th>
<th>&gt;45HRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>4330V</td>
<td>0.006-0.015&quot; (0.15-0.4 mm)</td>
<td>0.012-0.025&quot; (0.3-0.6 mm)</td>
</tr>
<tr>
<td>4130</td>
<td>0.006-0.008&quot; (0.15-0.2 mm)</td>
<td>0.009-0.01&quot; (0.2-0.25 mm)</td>
</tr>
<tr>
<td>4140</td>
<td>0.004-0.009&quot; (0.1-0.2 mm)</td>
<td>0.009-0.012&quot; (0.2-0.3 mm)</td>
</tr>
<tr>
<td>4145</td>
<td>0.005-0.011&quot; (0.1-0.25 mm)</td>
<td>0.008-0.012&quot; (0.2-0.3 mm)</td>
</tr>
</tbody>
</table>

**Capable of case depths up to 0.033" (0.85mm).** Case depths can be tailored for cost or performance. Note that processing time, and therefore cost increase exponentially with case depth. While there is no theoretical cap on achievable case depth, economic constraints can make certain case depths undesirable.

**POST-REACTION OXIDATION (PRO™)**

For a sleek black finish, we recommend our PRO™ surface finish. Following nitriding a secondary process is used to produce a professional black surface finish. Those familiar with liquid nitriding will recognize this as an Fe₃O₄ oxide coating, but unlike liquid nitriding, this oxide layer doesn’t change the surface finish of the part (no polishing required).

**WHITE LAYER CONTROL**

![Image showing white layer control](image)

AlMax™ has been designed to keep the thickness of the compound layer to a minimum to avoid an overly brittle surface which could initiate surface cracking. Nitride networks are suppressed through careful recipe design in order to avoid creating crack propagation highways. Maintaining a thin white layer helps protect from chipping at sharp corners where nitriding occurs from 2 or more directions.
**PROCESS**

Thin-case gas nitriding recipe designed to replace liquid nitriding for applications where only minimal surface hardening is permissible.

**CASE DEPTHS**

![Graph showing case depths](image)

Case depths controlled to ensure they are less than 0.006” to conform to even the most stringent specifications. Process parameters are computer-controlled to ensure base material hardness is kept below 22HRC.

**DISTORTION**

<table>
<thead>
<tr>
<th>Material</th>
<th>Liquid (x10⁻³ in.)</th>
<th>NAISS™ (x10⁻³ in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4330</td>
<td>0.37</td>
<td>0.17</td>
</tr>
<tr>
<td>4145</td>
<td>0.35</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Relatively low process temperatures ensure minimal distortion due to nitriding. Let us handle your tightest tolerances.

**WHITE LAYER CONTROL**

NAISS™ has been designed to keep the thickness of the compound layer to a minimum to avoid an overly brittle surface which could initiate surface cracking. Nitride networks are suppressed through careful recipe design in order to avoid crack propagation highways. Maintaining a thin white layer helps protect from chipping at sharp corners where nitriding occurs from 2 or more directions.

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**TYPICAL MATERIALS**

- 41XX
- 43XX
- QT-100

780-998-7789  
www.aiheattreating.com
Gas Nitriding for Stainless Steels

**PROCESS**
Specialized Gas Nitriding procedure for stainless steels. Improvement over liquid nitriding for high Cr materials.

**CASE DEPTHS**

Capable of case depths up to 0.008” (0.2 mm). Stainless alloys are rich in nitride forming elements (most notably Cr), which results in high hardness, but limited case depth.

Gas nitriding is not only capable replicating the results of conventional salt-bath (liquid) methods, but can also achieve deeper case depths.

**TYPICAL MATERIALS**
- 13-8
- 15-5
- 17-4

**SURFACE ACTIVATION**
The greatest difficulty with nitriding stainless steels is removing the passivation layer which will otherwise inhibit the process. One of several physical or chemical methods can be used to “activate” the surface for nitriding. Some alloys are more difficult to activate than others, and may require more aggressive techniques. In most cases surface finish is unaffected.

**ADVANCED RECIPE DESIGN**
Stainless steels are much more complex alloys to nitride, and require expert process control to achieve quality results. Understanding process kinetics, and the development of metastable phases is important to ensure desirable results. If not properly controlled, stainless steels can be prone to forming brittle white layers, or inconsistent/non-existent cases. Certain grades can experience changes in their mechanical properties or can develop defects if treated at the wrong operating temperature including a reduction in corrosion resistance. Consult our experts to find a procedure that suits your application.

**POST-REACTION OXIDATION (PRO™)**
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**Recipe Development and Quality Control**

**Expert R&D Team**

Alberta Industrial is invested in providing timely, professional technical support to our customers. This is why AIHT is supported by a team of 5 engineers – 3 with Ph.D.’s in Metallurgy and 1 with a Masters in Materials Engineering.

Our experts have 50 years of combined experience in the field of engineering including an intimate understanding of materials, heat treatments, and surface engineering technologies. Such a level of technical expertise is rarely found even in much larger companies. With this powerhouse of experience and fundamental understanding, AIHT is confident that we can find a solution to even your most challenging projects.

**Recipe Design and Optimization**

Combining fundamental process understanding with the reliability of our automated furnaces gives unparalleled predictability and consistency. Process parameters are chosen based on fundamental materials science. This approach leads to shorter development cycles and improved control over our processes. **If we don’t have a suitable recipe in our catalogue, we will do the development work for you!!!**

**Metallurgical Lab**

Our metallurgical lab is **fully equipped**, allowing for internal development without relying on any third-party labs. Our facilities include:

- 2 Full time Technicians
- Wire EDM and machining capabilities
- Microhardness Testing and polishing capabilities
- ISO 9001:2015 3rd party calibration
- Optical Microscope
- Stereomicroscope
- Tensile/Compression Testing
- Charpy Impact Testing
- One-of-a kind large scale Fatigue Tester
- Residual Stress Testing
- ASTM G65 Testing

**Testing Policy**

Our state-of-the-art equipment removes the need for batch testing. We pass these cost savings on to our customers. Non-destructive testing methods are used where appropriate for quality screening. Test coupons are run with every load, and are subject to surveillance auditing. **Batch testing and comprehensive furnace charts available upon request.**
Recipe Development and Quality Control

You are only as good as your equipment! Our state-of-the-art nitriding furnaces utilize temperature and atmosphere sensors to control processing conditions in real time. Closed-loop feedback ensures operating conditions are representative of the recipes prescribed by our expert metallurgists.

Touchscreen controls and graphic-user-interface simplify operation and remove the need for manual intervention by an operator. Recipes are pre-programmed by the engineering team, and the process is fully automated.

Every recipe has been developed from fundamental material science, and has been tested to ensure compliance. State-of-the-art sensors and controls are used to ensure repeatability beyond what is possible with manual operation. Sensors are tested regularly to ensure they are functioning properly. Case depth analysis is done through random sampling. Batch testing is available upon request.

Quality Control

Our process features industry leading safety measures to protect both our staff and customer parts. In the unlikely event of a process interruption, our furnaces will undergo a nitrogen purge to ensure parts return to room temperature in an inert atmosphere. The process can then be resumed without any adverse effects. Our comprehensive Quality Management System ensures full traceability.

Technical Expertise

What sets our process apart is our focus on fundamental material science. With a team of 3 Ph.D. Materials Engineers, we are truly unique in the industry. We use this strength to design optimized procedures, and the highest quality results. With over 30 active recipes, we have something to fit every need.

Customer Service

At AIHT it isn’t just good enough to sell a process. We want to sell you the best process for your application. Our experts are here to serve you!