The information and the data presented herein are typical or average values and are not a guarantee of maximum or minimum values. Applications specifically suggested for material described herein are made solely for the purpose of illustration to enable the reader to make his own evaluation and are not intended as warranties, either express or implied, of fitness for these or other purposes. Aubert & Duval’s liability shall not extend, under any circumstances, to the choice of the Product and its consequences.

Non-magnetic retaining rings
Since the 70’s, Aubert & Duval produces non-magnetic retaining rings. With its strong experience, the company is one of the main actors on the market, supplying the biggest OEM’s and various actors worldwide. Aubert & Duval is committed to continuous innovation by spending more than 4% of its added economic value to Research & Development.

NMF18 a High Performance Steel

For more than 20 years, non-magnetic retaining rings have been exclusively produced in X8CrMnN18-18 (Aubert & Duval NMF18). Aubert & Duval participated in the design and development of this steel grade.

This grade offers an optimum combination of characteristics:

- Very good corrosion resistance
- High yield strength
- Low magnetic permeability
- Low coefficient of thermal expansion

Typical NMF18 steel grade chemical analysis is:

<table>
<thead>
<tr>
<th>Element</th>
<th>C</th>
<th>Mn</th>
<th>Ni</th>
<th>Si</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>0.1</td>
<td>18.0</td>
<td>average</td>
<td>18.0</td>
<td>average</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Quality & Certifications

From process design to manufacturing, the Aubert & Duval Quality Management System is integrated into all fields of the company and guarantees the quality of our products.

Aubert & Duval is certified ISO 9001 and ISO 14001.

Manufacturing process

Most of the manufacturers use mechanical expansion. Aubert & Duval is mainly using the hydraulic expansion for:

- Homogeneity of mechanical properties throughout the forging
- Production flexibility

This operation is performed with 40,000 tons or 65,000 tons presses according to the required sizes of non-magnetic retaining rings.

Applications

With more than 20,000 rings produced, Aubert & Duval is a leading supplier for:

- Nuclear power plant generators (900 to 1450 MW)
- Medium sized alternators for thermal power plant
- Small generators assembled to gas turbines or diesel engines.

DELIVERY DIMENSIONS

- Outer diameter: Up to 2000 mm
- Height: Up to 1000 mm
- Weight: Up to 3500 kg

MECHANICAL PROPERTIES

- 0.2% Yield Strength: Up to 1450 MPa

Beyond the above data, Aubert & Duval can propose a wide variety of sizes and levels of mechanical properties to meet our customers’ specific requirements.
Retaining rings process flow

Production of retaining rings is organized in an in-house continuous flow, from melting of material to machining profile delivery.

NMF18 a High Performance Steel

For more than 20 years, non-magnetic retaining rings have been exclusively produced in X8CrMnN18-18 (Aubert & Duval NMF18). Aubert & Duval participated in the design and development of this steel grade.

This grade offers an optimum combination of characteristics:
- Very good corrosion resistance
- High yield strength
- Low magnetic permeability
- Low coefficient of thermal expansion

Typical NMF18 steel grade chemical analysis is:

<table>
<thead>
<tr>
<th>Element</th>
<th>C</th>
<th>Cr</th>
<th>Mn</th>
<th>Ni</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>0.1</td>
<td>18.0</td>
<td>average</td>
<td>18.0</td>
<td>average</td>
<td>0.5</td>
<td>average</td>
<td>0.5</td>
</tr>
<tr>
<td>Min</td>
<td>0.5</td>
<td>min</td>
<td></td>
<td>0.5</td>
<td>min</td>
<td>0.05</td>
<td>max</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Quality & Certifications

From process design to manufacturing, the Aubert & Duval Quality Management System is integrated into all fields of the company and guarantees the quality of our products.

Aubert & Duval is certified ISO 9001 and ISO 14001.

Manufacturing process

Melting & Remelting → Forging → Heat treatment

Hydraulic expansion principle

PRESS

Most of the manufacturers use mechanical expansion. Aubert & Duval is mainly using the hydraulic expansion for:
- Homogeneity of mechanical properties throughout the forging
- Production flexibility

This operation is performed with 40,000 tons or 65,000 tons presses according to the required sizes of non-magnetic retaining rings.

Applications

With more than 20,000 rings produced, Aubert & Duval is a leading supplier for:
- Nuclear power plant generators (900 to 1,450 MW)
- Medium sized alternators for thermal power plant
- Small generators assembled to gas turbines or diesel engines

Product

Example of Aubert & Duval’s current experience:

DELIVERY DIMENSIONS

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Up to 2000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>Up to 1000 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Up to 3500 kg</td>
</tr>
</tbody>
</table>

MECHANICAL PROPERTIES

| St. % Yield Strength | Up to 1450 MPa |

Beyond the above data, Aubert & Duval can propose a wide variety of sizes and levels of mechanical properties to meet our customers’ specific requirements.
The information and the data presented herein are typical or average values and are not a guarantee of maximum or minimum values. Applications specifically suggested for material described herein are made solely for the purpose of illustration to enable the reader to make his own evaluation and are not intended as warranties, either express or implied, of fitness for these or other purposes. Aubert & Duval’s liability shall not extend, under any circumstances, to the choice of the Product and its consequences.