Stainless Steel: 
the perfect solution for sustainable development.
leadership
Introduction

Incorporated in 2011, as a result of the Spin-off of ArcelorMittal’s stainless steel business, Aperam appeared as a global player in the stainless and electrical steel and special nickel-based alloys sector with an installed production capacity of 2.5 million tons of stainless steel sheets per annum.

Always under high standards for social responsibility and sustainable development, the company produces steel for a variety of markets, including those for architecture, civil construction, automotive industry, household appliances, cutlery, home electronic equipment, sugar and ethanol, oil and gas, health and nourishment and for other capital goods.

Aperam is a company that was constituted to compete in a global and challenging environment, redefining ways of thinking, working and behaving to reach higher levels of performance.

Its slogan, “made for life”, is inspired on the properties featured in stainless steel, its flagship.

Aperam South America

Aperam South America is the sole integrated producer of stainless and electrical steel in Latin America, in addition to possessing highly developed technology in the production of carbon steel and alloys.

With over 70% market share in the domestic market, it also exports to more than 50 countries and has an installed, annual production capacity of 900,000 tons of liquid steel. It is a company possessing state-of-the-art technology and an advanced Research Center.

Aperam Acesita Foundation

The Aperam Acesita Foundation is a non-profit private institution directed to the development of the communities under Aperam South America’s influence.

The main focus of the Foundation’s actions is education. The projects it sponsors are own initiatives which count on the support of partners such as local city halls, the State government, companies in the “S” system (Sesc – Social Service for Commerce, Senai – National Service for Supporting Industry and Senar – National Service for Rural Apprenticeship) and local associations and entities. The other fronts in which it is active – environment, culture, social advancement and professional qualification – also work in partnerships with interested parties in multidisciplinary projects and complementary labor fronts, all of which contribute to the sustainability of the region and transform these communities’ tomorrow.

Products, services and distribution

Aperam South America’s steelworks are located in the city of Timóteo (MG – Minas Gerais state), just off the BR-381 highway, the main route between the states of São Paulo and the Brazilian Northeast. Moreover, it is on the edge of the Vitória-Minas railway which connects Minas Gerais to the port complex of the State of Espírito Santo. This location allows for easy transportation of products to all of Brazil and to the international market, as well as for supplies for the mill.

Aperam South America yet possesses, within its corporate structure, sales offices in Brazil, Argentina, Chile, Peru, Colombia, Ecuador and Venezuela. Furthermore it operates with a network of service and distribution centers and tube manufacturing units.
agility
Aperam South America’s stainless steel perfectly meets the requirements for sustainable development, which has become a priority for manufacturers, consumers and for society as a whole. This material is also recognized for its esthetic qualities and technical performance. For these reasons it is perfectly suitable to modern needs.

### Infinitely recyclable

As it is infinitely recyclable, stainless steel is an “ecological material” par excellence. Currently the largest portion of Aperam’s world production is sourced from its own recycling efforts, which contributes to the conservation of non-renewable resources.

### Ideal Quality for Health

Inert, hypoallergenic and easy to maintain, stainless steel meets the strictest requirements regarding human health.

### Aperam BioEnergy

Headquartered in Belo Horizonte, the company is engaged in the production of wood and vegetable coal for steelmaking purposes, through 188,000 acres of renewable eucalyptus forests throughout the State of Minas Gerais.

### Incomparable appearance

With its unparalleled appearance and large variety of surface finishes, stainless steel is an esthetically unique material.

### Excellent technical performance

Stainless steel is highly recommended for various market sectors due to its resistance to corrosion, its wide array of mechanical properties and its ease of processing.

### Stainless steel and sustainable development: a perfect combination

The company manages an estate of over 300,000 acres of forest of which 20% is an ecological sanctuary, in addition to an area of permanent preservation. Currently its production capacity is nearly 50 million cubic feet of wood and vegetable coal, with a potential of reaching 78 million cubic feet over the next years.
Aperam South America is always ready and able to meet its diverse clients’ and market needs.

The Company offers a complete line of products as it is aware that its clients seek competitive, stable and effective solutions in addition to superior service.

To help clients overcome their challenges in their extremely competitive markets, Aperam South America possesses a broad range of product-lines.

Get acquainted with the main attributes of stainless steel:

Inert, hypoallergenic and easy to maintain, stainless steel meets the strictest requirements regarding human health.

- Superior performance.
- Highly resistant to corrosion
- Durable.
- Resistant to high temperatures.
- Excellent performance when welded.
- Great drawability.
- 100% recyclable.
- Diversity in applications.
- Low cost of maintenance.
Aperam offers five stainless steel product lines that are differentiated by the alloy elements added to iron, carbon and chromium.

**Ferritic or 400 Series: The KARA ferritic solution**

Applications: exhaust systems in combustion engines, general stamping, household utensils (cookware, sinks and cutlery), industrial kitchens and petroleum refineries.

**Martensitic**

Applications: cutlery; measuring, hospital, odontological and surgical instruments; mining and steel making; shearing blades and brake disks.

**Austenitic or 300 Series**

Applications: equipment for the food, aviation, railway, naval, oil extraction and refining, pulp and paper, textile and chemical industries; distilleries, boiler factories, general and deep drawing, civil construction, pressure pipes and vessels, mining and refineries.

**Austenitic with low nickel content or 200 series**

Applications: sinks and tubes, tableware, household appliances, tubes for the furniture industry, elevator inside coverings, pipes for evaporators.

**Duplex**

Applications: oil and gas, pulp and paper industries; desalination sectors and chemical industries.

**Diversity of solutions**

The market has recently felt the effects of unstable nickel prices which, incorporated to several stainless steel categories, has oscillated over the last years. In the face of such instability many solutions have been proposed without a clear identification as to their effective fields of application.

Presently Aperam South America offers alternative and financially stable solutions. For this reason it has developed specific steels for each application.

We have selected from among our various product lines those that perfectly attend market needs:

- Our KARA ferritic solutions with zero nickel content: reliability, stability and technical performance;
- Our austenitic steels: excellent resistance to corrosion, stamping and welding capability;
- Our specialized solutions: custom-made products for each application.
Steel is an alloy composed of iron-ore and carbon. Stainless steel is steel with a maximum carbon content of 1.2%, at least a 10.5% chromium content and other alloy elements. The passive layer of chromium oxide that is formed on the surface in a natural and continuous manner provides lasting protection against corrosion.

Ferritic stainless steel in general contains little or no nickel; the KARA line is free from the price instability of this alloy element, which is a feature of austenitic stainless steel.

**KARA, synonymous with intelligence and performance**

Aperam possesses recognized expertise in ferritic stainless steel. Ahead of its competitors, it conducts extensive research to offer high-performance material which suits current needs. The KARA product line offers the same advantages as all other stainless steels in addition to other invaluable specific properties:

- Excellent resistance to stress corrosion cracking.
- Low thermal expansion.
- Deep drawing.
- Resistance to oxidation at high temperatures.
- Brightness similar to BA (Bright annealing) finishing.
- Excellent performance when welded.

What confers full value to the KARA line is its systematic performance combined with know-how: the understanding of each client’s problems, quality service, proximity, support and continuous commitment.

**MAGNETIC PROPERTY**

- Ferritic stainless steel has a distinct feature in relation to austenitic steels: it is magnetic.
- This property is exclusively due to its differentiated structure and does not affect in any way this steel’s performance.
- Stainless steel’s resistance to corrosion depends mainly on the amount of chromium and molybdenum in its chemical composition.

- **KARA** is the trademark of Aperam’s ferritic solutions. A brand with a strong conviction: ferritic steels stand out among the stainless variety. Suitable to modern requirements, they are durable and their prices are stable. Highly diversified to meet all needs, the KARA products are appreciated because they are always associated with service.
- **Performance, intelligence, precision and responsibility**: our brand shares these values with all of our clients, all over the world.
The KARA solutions are based on a large variety of ferritic product lines to perfectly meet our clients' needs.

PRE = % Cr + 3,3% Mo
Pitting Resistant Equivalent Index
Throughout the most diversified markets, the KARA solutions support clients in all phases of their projects.

- **Architecture and Civil Construction**
  facades fronts, roofing, interiors architecture, urban furniture, sinks and vats.

- **Cutlery**
  Tableware and professional knives.

- **Household utensils**
  Kitchenware, pots and pans.

- **Household appliances**
  Ovens, kitchen flues, cook tops, refrigerators, micro-wave ovens and washing machines.

- **Automotive industry**
  Exhaust systems (motorcycles, cars, buses and trucks), highways tanks, brake discs for motorcycles, bus structures, clamps and braces, fuel tanks, fuel and oil filters.

- **Pipes and Tubes**
  Washing machines, exhaust pipes, distilleries in addition to various applications in suggar mills.

- **Capital Goods**
  Boilers for solar heaters, water and alcohol fermentation and distillation vats, milk coolers, railway cars, magnetic separators, coins as well as various applications in suggar mills.
Together with chromium, nickel is essential in the manufacturing of austenitic stainless steel which is used frequently as it offers excellent resistance to corrosion and welding and drawing properties, in applications for more specific requirements.

The austenitic stainless steels may be used in a wide range of temperatures, from cryogenic up to extremely hot conditions (1,150°C / 2,100°F).

The applications for heat-resistant austenitic classes: equipment which requires greater resistance to high temperatures together with greater welding demands, heat-resistant components used in the electric industry.

Aperam South America places at its clients’ disposition, in addition to the traditional AISI 301, AISI 304, AISI 316 and AISI 321 austenitic stainless steel lines, other products designed to meet their needs, detailed as follows.
ingenuity
Aperam South America is always attentive to market movements and to clients’ needs and invests in the development of new solutions. In this manner it offers ever-more specialized solutions employed in the diverse applications requested by our clients.

Here are some of these solutions:

**AISI 310S - Refractory steel**

The 310S austenitic steel (UNS S31008/AISI 310S) is known for its corrosion-resistant properties at high temperatures, up to 1100°C in oxidized atmospheres. This steel can be easily welded. The alloy can also be used in slightly oxidized atmospheres, such as in nitration and cementing, as a sulfuring agent as well as with thermal cycles although the temperature should be lower.

The 310S steel is broadly used in the thermal treatment industry for equipping parts of ovens such as supports for refractory items, parts of burners, conveyor belts, oven linings, ventilators, hooks and pipes, etc. In the food industry it is applied in contact with heated citric and acetic acid typically used in aviation applications such as the collector rings in turbines, exhaust systems and expansion joints, and also for equipment used in high-temperature chemical processes. It also has been employed in the petroleum industry, specifically in the refinery process in the form of pipes, sleeves and sheets.

**AISI 317L - Resistance to Corrosion**

The 317 (AISI 317L) stainless steel's main feature is resistance to pitting and crevice corrosion, especially in acidic mediums that contain chlorides and sulfur compounds at high temperatures.

The main applications of this steel are in chemical and petrochemical industries, those engaged in the production of pulp and paper and of condensers used in energy generating stations that uses fossil or nuclear fuels.

**AISI 347/347H - Resistance to Corrosion**

The 347 steel features excellent resistance to intergranular corrosion, especially when exposed to temperature ranges of between 450°C and 850°C. It possesses excellent welding properties, typical of austenitic stainless steels, and mechanical properties that ensure outstanding shaping which favors cold-rolling processes.

The 347 steel is recommended for corrosive environments and those subject to high temperatures. It is the steel typically used in aviation applications such as the collector rings in turbines, exhaust systems and expansion joints, and also for equipment used in high-temperature chemical processes. It also has been employed in the petroleum industry, specifically in the refinery process in the form of pipes, sleeves and sheets.

**Duplex - Resistance to Corrosion and Mechanical Properties**

The Duplex stainless steel unites many of the beneficial properties of ferritic stainless steel with those of the austenitic variety. These steels offer good resistance to uniform and localized corrosion. The duplex microstructure contributes to high mechanical resistance and resistance to stress corrosion cracking. It also possesses good welding properties and its yield strength is greater than that for austenitic steel, which allows for undertaking projects requiring thinner layers at a more competitive cost vis-à-vis austenitic varieties.

Aperam South America produces two types of duplex steels: the UNS S32205, which features greater resistance to corrosion and mechanics properties compared to austenitic stainless steel; and the UNS S32304 duplex steel which offers greater resistance to corrosion in comparison with the AISI 316 steel. Its yield strength is approximately double that of austenitic stainless steel, so that projects which require thinner layers can be undertaken at a more competitive cost in relation to the 316L and 317L austenitic variety.

The main applications are: digesters used in the pulp and paper, chemical and petrochemical industries, bridges and viaducts, heat exchangers and pipes for handling oil and gas, storage tanks, cargo tanks for ships and trucks, sea water cisterns, equipment used in food processing, etc.

For other developments and applications, please contact us.
Technical Summary

Among all the product lines available, Aperam South America has selected the most suitable solutions do its clients’ needs.

You can be assured that you will find the product that exactly fits your requirements. There is only one prerequisite: the precise definition of what is needed.

In the graphs below is an example of the positioning of the various product lines offered by Aperam in terms of chemical composition, extra alloys and the ratio for equivalent resistance to pitting. Although the KARA line includes elements which feature lower degrees of alloy, it broadly attends the requirement for corrosion under tension and due to pitting. The other alternative solutions may furnish advantages in terms of mechanical performance and/or types of corrosion when required by the desired application.

Corrosion Performance:

- Pite Corrosion: Influence of Chromium, Molybdenum and Nitrogen;
- General and Galvanic Corrosion: Influence of Chromium, Molybdenum (begining) and Nickel (corrosion rate);
- Stress Cracking Corrosion: Only ferritic material is free from this kind of corrosion.
## Main Applications

<table>
<thead>
<tr>
<th>AISI</th>
<th>ASTM UNS</th>
<th>Aperam South America</th>
<th>Main Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>S30100</td>
<td>P301A</td>
<td>Used for structural purposes, in equipment for the food, aviation, railway and petrochemical industries; in the production of knives and blades, sinks and bowls; in boilemaking and general deep drawing.</td>
</tr>
<tr>
<td>301LN</td>
<td>S30153</td>
<td>P301F</td>
<td>Railway industry: train and subway cars for transporting passengers</td>
</tr>
<tr>
<td>304</td>
<td>S30400</td>
<td>P304A</td>
<td>Civil construction and architecture; equipment for the aviation, railway, naval, petrochemical, pulp and paper, textile, refrigeration and cold storage, hospital, food, dairy product, pharmaceutical, cosmetic, chemical industries; household utensils, cryogenic installations, distilleries, ethanol distilleries, photography, pipes and tanks in general, general, deep and precision drawing.</td>
</tr>
<tr>
<td>304</td>
<td>S30400</td>
<td>P304T.P304N(1)</td>
<td>Equipment for the aviation, railway, naval, petrochemical, pulp and paper, textile, refrigeration and cold storage, hospital, food, dairy product, pharmaceutical, cosmetic, chemical industries; household utensils, cryogenic installations, distilleries, photography, tubes and tanks in general, general, deep and precision drawing.</td>
</tr>
<tr>
<td>304L</td>
<td>S30403</td>
<td>P304C0</td>
<td>Equipment for the aviation, railway, naval, petrochemical, pulp and paper, textile, refrigeration and cold storage, hospital, food, dairy product, pharmaceutical, cosmetic, chemical industries; household utensils, cryogenic installations, distilleries, photography, tubes and tanks in general, general, deep and precision drawing.</td>
</tr>
<tr>
<td>304H</td>
<td>S30409</td>
<td>P304H</td>
<td>Equipment for the petrochemical, pulp and paper, textile, refrigeration and cold storage, hospital, food, dairy product, pharmaceutical, cosmetic, chemical industries; household utensils, cryogenic installations, distilleries, photography, tubes and tanks in general. Equipment which demands greater resistance at high temperatures together with greater welding capacity.</td>
</tr>
<tr>
<td>310S</td>
<td>S31008</td>
<td>P310A</td>
<td>Thermal treatment industry for oven parts such as supports for refractory items, burner parts, conveyor belts, oven linings, ventilators, hooks and pipes, etc. For the food industry, applied in contact with heated citric and acetic acid.</td>
</tr>
<tr>
<td>316</td>
<td>S31600</td>
<td>P316B</td>
<td>Civil construction and architecture; equipment for the aviation, railway, naval, chemical and petrochemical, pharmaceutical, cosmetic, rubber, paints, dairy products, hospital industries; mining and steel works; refrigeration and cold storage, refineries, production of pipes and pressure vessels, alcohol distilleries, ethanol distilleries, and boilemaking.</td>
</tr>
<tr>
<td>316L</td>
<td>S31603</td>
<td>P316B</td>
<td>Civil construction and architecture; equipment for the aviation, railway, naval, chemical and petrochemical, pharmaceutical, cosmetic, textile, rubber, paints, dairy products, hospital industries; mining and steel works; refrigeration and cold storage, refineries, production of pipes and pressure vessels, alcohol distilleries, ethanol distilleries, and boilemaking.</td>
</tr>
<tr>
<td>317L</td>
<td>S31703</td>
<td>P317A</td>
<td>Chemical and petrochemical, pulp and paper industries; as condensers in power plants that generate energy using fossil and nuclear fuels.</td>
</tr>
<tr>
<td>321</td>
<td>S32100</td>
<td>P321A</td>
<td>Heat-resistant components in the electric industry, welded components, food industry, tubes and tanks in general.</td>
</tr>
<tr>
<td>347/347H</td>
<td>S34709</td>
<td>P347A</td>
<td>Equipment for the aviation industry, such as the collector rings in turbines, exhaust systems and expansion joints and also for equipment used in high-temperature chemical processes. It has further been applied in the petroleum industry, specifically in the refinery process, in the form of tubes, sleeves and sheets.</td>
</tr>
<tr>
<td>409</td>
<td>S40910</td>
<td>K09</td>
<td>Exhaust systems in combustion engines and drawing in general, in addition to boxes for condensers.</td>
</tr>
<tr>
<td>430</td>
<td>S43000</td>
<td>K30</td>
<td>Civil construction and architecture; household utensils (cookware, sinks and cutlery), household appliances (stoves, refrigerators, microwave ovens, and washers), coin minting, refrigerated counters, and general drawing.</td>
</tr>
<tr>
<td>430S</td>
<td>S43000</td>
<td>K30MD(2)</td>
<td>Household utensils (cookware, sinks and cutlery), coin minting, refrigerated counters, and general or deep drawing.</td>
</tr>
<tr>
<td>439</td>
<td>S43932</td>
<td>K39MD</td>
<td>Civil construction and architecture; sugar Mills, exhaust systems (silencer pipes), household appliances (washing machines, stoves and microwave ovens) and general drawing.</td>
</tr>
<tr>
<td>444</td>
<td>S44400</td>
<td>K44</td>
<td>Civil construction and architecture; sugar Mills, water tanks, residential water heaters, applications in the chemical and petrochemical industries.</td>
</tr>
<tr>
<td>420</td>
<td>S42000</td>
<td>P420A</td>
<td>Cutlery; measuring, hospital, deontological and surgical instruments; areas of mining and steel making, in addition to shearing blades and brake disks, knives, blades and chains for bottle washers.</td>
</tr>
<tr>
<td>498</td>
<td>–</td>
<td>P498V</td>
<td>Professional cutlery (packing companies, abattoirs, butcheries).</td>
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<tr>
<td>532</td>
<td>S52304</td>
<td>P398A</td>
<td>Digesters used in the pulp and paper industry, chemical and petrochemical industries, bridges and viaducts, heat exchangers and tubes for handling oil and gas, storage tanks, cargo tanks for ships and trucks, sea water systems and equipment used in food processing.</td>
</tr>
<tr>
<td>532</td>
<td>S52205/ S521803</td>
<td>P399B</td>
<td>Digesters used in the pulp and paper industry, chemical and petrochemical industries, bridges and viaducts, heat exchangers and tubes for handling oil and gas, storage tanks, cargo tanks for ships and trucks, sea water systems and equipment used in food processing.</td>
</tr>
<tr>
<td>201</td>
<td>S20100</td>
<td>P298A</td>
<td>Sinks and tubs, tableware, washing machine baskets, dishwasher cabinets, oven tables, refrigerator cabinet coating, tubes for the furniture industry, internal casings in the construction industry, internal elevator pand, restaurants and industrial kitchens, pipes for evaporators, sugar mill kilns, evaporator bodies, kilns and other sugar mill equipment and escutcheons.</td>
</tr>
<tr>
<td>201S</td>
<td>–</td>
<td>P201F</td>
<td>Structural applications.</td>
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</table>

**Notes:**

1. 304N 304T = 304DDQ.
2. 430DDQ.
Technical Summary

In case you need further information about your product range, please refer to the below table.

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<th>Austenitic</th>
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<td>Aperam South America</td>
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<td>C</td>
<td>Mn</td>
<td>Si</td>
<td>P</td>
<td>S</td>
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<td>1.4310</td>
<td>0.05 ± 0.015</td>
<td>2.0</td>
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<td>0.03</td>
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<td>0.03</td>
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<td>0.04 ± 0.10</td>
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<td>0.04 ± 0.08</td>
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<tr>
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<tr>
<td>–</td>
<td>S43932</td>
<td>K39MD</td>
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Notes:
1. 304N: 304T = 304DDQ
2. 430DDQ
3. Chemical composition maximum values, except where indicated
4. Typical values
To confirm your preferred choice please contact us.
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