

Stainless Steel Applications - Aerospace

A short description of the various grades of stainless steel commonly used in aerospace applications. It has been written primarily from a European perspective and may not fully reflect the practice in other regions.

Materials for aerospace applications are required to maintain the integrity of the structure (i.e. to be sufficiently robust to withstand their service environment) and to be inert (i.e. corrosion resistant). Stainless steels are used in aerospace applications because they are resistant to corrosion and high temperature oxidation and maintain their mechanical properties over a wide temperature range.

In aerospace applications, materials for each application are selected on the basis of their resistance to corrosion or high temperature oxidation and mechanical properties in a specific service environment. The following examples may serve to indicate the considerations made in selecting a suitable grade of stainless steel for aerospace applications. For applications where corrosion resistance is of primary importance, austenitic stainless steel grade 1.4301 (AISI 304) and its derivatives are suitable for mild environments with less than 200 ppm chloride (eg cabin components, internal fuel tanks, etc). Grade 1.4401 and its derivatives are suited to service environments where chloride is present in the atmosphere. Grades 1.4301 (AISI 304), 1.4401 (AISI 316) and their respective derivatives exhibit moderate oxidation resistance and are suitable for temperatures up to 870°C. For applications where oxidation resistance is the primary feature, grades 1.4818 (ASTM S30415), 1.4835 (ASTM S30815), 1.4833 (AISI 309) and 1.4845 (AISI 310) may be used. These grades are suitable for temperatures up to 1150°C.

Typical applications for stainless steels in aerospace applications are shown in the table below.

Aerospace Applications – Applications and Grades

Application/Use	Stainless Steel	
	Type	EN 10088 Grade
Fuel tanks	Austenitic	1.4301 (AISI 304) 1.4307 (AISI 304L)



Exhaust components, high temperature engine and structural parts	Austenitic	1.4541 (AISI 321) 1.4401 (AISI 316) 1.4404 (AISI 316L) 1.4818 (ASTM S30415) [153 MA] 1.4835 (ASTM S30815) [253 MA] 1.4833 (AISI 309) 1.4845 (AISI 310)
Other structural components (ambient temperature)	Austenitic Ferritic	1.4301 (AISI 304) 1.4307 (AISI 304L) 1.4016 (AISI 430)

Footnote: The following information has been extracted from a document prepared by Tony Newson of Eurofer, Brussels, whose objective was to provide a summary of the basic grades of stainless steel commercially available and to indicate which grades are most commonly used in some of the principal application categories.

Broad categories of use (eg transport, consumer goods etc) are defined, along with the stainless steel grades most commonly used for those applications. Although this extract deals only with aerospace applications, similar summaries can be found under the following library headings:

- What can stainless steel do for... - Transport
 - Automotive
 - Shipbuilding/Marine
 - Railway
- Home & Office
 - Consumer applications