

# STAINLESS STEELS

 Roda Specialty Steel



 **Rodacciai**<sup>®</sup>  
SINCE 1959 ALL OVER THE WORLD

## STAINLESS STEELS

Stainless steels have a **resistance to corrosion** which is significantly higher than other carbon or alloy steels. Some stainless grades also exhibit excellent resistance to high temperatures.

These characteristics are obtained with the addition of Chromium and other alloying elements, which make Stainless Steel suitable for use in **aggressive corrosive environments** such as **chemical plants, marine**

**environments, offshore drilling, agriculture, food processing and also architectural applications.**

Stainless Steel can be supplied hot rolled or cold finished in an annealed, normalized or quenched & tempered condition.

Bars and wire in a variety of shapes and sizes are available.

	Condition	Profile	Range (inc)	Finish
Bars	Hot rolled	Round	0.75÷4.00	As rolled, rough peeled
	Cold-drawn	Round	0.08÷1.75	Bright
		Hexagonal	0.16÷2.625	
		Square	0.16÷2.00	
	Smooth-turned	Round	0.75÷3.00	Smooth and bright
	Ground	Round	0.12÷3.00	Smooth and bright
Coils	Cold-drawn	Round	0.04÷0.87	Bright Coated
		Hexagonal	0.12÷0.50	
		Square	0.16÷0.50	
		Special		

For all Imperial sizes - cold drawn & smooth turned, or cold drawn wire - tolerances: Per ASTM A484

For our RPM.Bar (imperial or decimal sizes) - cold drawn & smooth turned: J9 tolerance which is half of the tolerance listed in ASTM A484, Straightness of 1/32" per 5ft, Out of roundness - 1/2 the dia tolerance





## FERRITIC STAINLESS STEELS


Ferritic Stainless Steels cannot be heat treated and quenched. However, their mechanical properties can be increased by work hardening through cold drawing.

The corrosion resistance is ensured by the Chromium content and further

increased by the addition of Molybdenum.

To enhance machinability, Sulfur is added.

These steels are **magnetic** and commonly used in automotive applications, as well as appliances and a variety of industrial applications.

	AISI-UNS	C (max)	Si (max)	Mn (max)	P (max)	S	Cr	Mo	Other elements
<b>430</b>	430 S43000	0,08	1,00	1,00	0,040	≤ 0,030	16,0÷18,0	-	-
<b>430Nb</b>	-	0,05	1,00	1,00	0,040	≤ 0,030	16,0÷18,0	-	Nb=12xC ÷ 1,0
<b>1.4105</b>	430F S43020	0,08	1,50	1,50	0,040	0,15÷0,35	16,0÷18,0	0,20÷0,60	-
<b>430F M</b>	(430F S43020)	0,08	1,50	1,50	0,040	0,15÷0,35	16,0÷18,0	0,80÷1,10	Ni= ≤1,0
<b>1.4106</b>	-	0,03	2,00	1,00	0,040	0,25÷0,35	17,0÷19,0	1,50÷2,50	-
<b>434</b>	434 S43400	0,08	1,00	1,00	0,040	≤ 0,030	16,0÷18,0	0,90÷1,40	-
<b>1.4114</b>	(XM34 S18200)	0,08	1,00	2,50	0,040	0,15÷0,35	17,5÷19,5	1,50÷2,50	Ni= ≤0,75

\* There are no standard for this grade

## MARTENSITIC STAINLESS STEELS

Martensitic Stainless Steels typically have increased Chromium content as well as higher carbon levels.


These steels are suitable to be **heat treated**, quenched and tempered.

They can be offered in the annealed condition with good machinability, enhanced by the **addition of Sulfur**, or in the quenched and tempered

condition for increased mechanical properties and corrosion resistance.

High surface hardness can be achieved for these steels by induction hardening.

Typical applications include instruments and high strength components for pumps and valves.

	AISI-UNS	C	Si (max)	Mn (max)	P (max)	S	Cr	Other elements
<b>410</b>	410 S41000	0,08÷0,15	1,00	1,50	0,040	≤ 0,030	11,5÷13,5	Ni = ≤ 0,75
<b>416</b>	416 S41600	0,06÷0,15	1,00	1,50	0,040	0,15÷0,35	12,0÷14,0	Mo = ≤ 0,60
<b>420A</b>	420 S42000	0,16÷0,25	1,00	1,50	0,040	≤ 0,030	12,0÷14,0	-
<b>420B</b>	420 S42000	0,26÷0,35	1,00	1,50	0,040	≤ 0,030	12,0÷14,0	-
<b>420C</b>	420 S42000	0,36÷0,42	1,00	1,00	0,040	≤ 0,030	12,5÷14,5	-
<b>420C1</b>	420 S42000	0,43÷0,50	1,00	1,00	0,040	≤ 0,030	12,5÷14,5	-
<b>430F</b>	430F S43020	0,10÷0,17	1,00	1,50	0,040	0,15÷0,35	15,5÷17,5	Mo = 0,20÷0,60
<b>1.4122</b>	-	0,33÷0,45	1,00	1,50	0,040	≤ 0,030	15,5÷17,5	Ni = ≤ 1,00 Mo = 0,80÷1,30
<b>431</b>	431 S43100	0,12÷0,22	1,00	1,50	0,040	≤ 0,030	15,0÷17,0	Ni = 1,50÷2,50

## AUSTENITIC STAINLESS STEELS

In addition to Chromium (the common element of all Stainless Steel), Austenitic Stainless Steels contain high levels of Nickel, which significantly **improves the steels resistance to corrosion**. Varying by grade — other alloying elements include Molybdenum, Titanium, Niobium, Copper etc. — are added to achieve specific design properties & performance.

Heat treatment with quenching & tempering is not possible for these steels.

However — cold drawing will significantly change and increase mechanical properties, with the possibility to design the process to achieve specific

design values.


In the hot rolled condition — these steels are not magnetic, while in the cold drawn state they will exhibit slight residual magnetism.

Austenitic Stainless Steels are used in a great variety of applications from cold heading where the addition of copper enhances formability to the manufacture of air craft fittings & automotive parts.

Our Steels of the **PLUS series** are calcium treated and have added **Sulfur** which greatly enhances machinability.





	AISI-UNS	C	Si (max)	Mn (max)	P (max)	S	N (max)	Cr	Ni	Other elements
<b>RODINOX</b>	Patented grade	0,10	1,00	5,0÷9,0	0,045	0,030	0,20	16,0÷19,0	3,0÷6,0	Cu = 1,00÷4,00
<b>302</b>	302 S30200	0,05÷0,15	2,00	2,00	0,045	≤ 0,015	0,10	16,0÷19,0	6,0÷9,5	Mo = ≤ 0,80
<b>303Plus</b>	303 S30300	≤ 0,10	1,00	2,00	0,045	0,15÷0,35	0,10	17,0÷19,0	8,0÷10,0	Cu = ≤ 1,00
<b>GVR</b>	303+Cu S30331	≤ 0,08	1,00	2,00	0,045	0,15÷0,35	0,10	17,0÷19,0	8,0÷10,0	Mo = ≤ 0,60 Cu = 1,40÷1,80
<b>304</b>	304 S30400	≤ 0,07	1,00	2,00	0,045	≤ 0,030	0,10	17,5÷19,5	8,0÷10,5	-
<b>304Plus</b>	304L S30403	≤ 0,030	1,00	2,00	0,045	≤ 0,030	0,10	17,5÷19,5	8,0÷10,5	-
<b>321</b>	(321 S32100)	≤ 0,08	1,00	2,00	0,045	≤ 0,030	-	17,0÷19,0	9,0÷12,0	Ti = 5xC÷0,70
<b>304ST</b>	304L S30403	≤ 0,030	1,00	2,00	0,045	≤ 0,030	0,10	18,0÷20,0	10,0÷12,0	-
<b>304Cu</b>	302HQ S30430	≤ 0,04	1,00	2,00	0,045	≤ 0,030	0,10	17,0÷19,0	8,5÷10,5	Cu = 3,00÷4,00
<b>316</b>	316 S31600	≤ 0,07	1,00	2,00	0,045	≤ 0,030	0,10	16,5÷18,5	10,0÷13,0	Mo = 2,00÷2,50
<b>316Plus</b>	316L S31603	≤ 0,030	1,00	2,00	0,045	≤ 0,030	0,10	16,5÷18,5	10,0÷13,0	Mo = 2,00÷2,50
<b>316Ti</b>	(316Ti S31635)	≤ 0,08	1,00	2,00	0,045	≤ 0,030	-	16,5÷18,5	10,5÷13,5	Mo = 2,00÷2,50 Ti = 5xC÷0,70
<b>1.4435</b>	316L S31603	≤ 0,03	1,00	2,00	0,045	≤ 0,030	0,10	17,0÷19,0	12,5÷15,0	Mo = 2,50÷3,00
<b>316Cu</b>	316Cu	≤ 0,04	1,00	2,00	0,045	≤ 0,015	0,10	16,5÷17,5	10,0÷11,0	Mo = 2,00÷2,50 Cu = 3,00÷3,50
<b>204Cu</b>	-	≤ 0,15	1,00	6,5÷9,0	0,060	≤ 0,030	0,05÷0,25	15,5÷17,5	1,5÷3,5	Cu = 2,00÷4,00



## AUSTENITIC-FERRITIC STAINLESS STEELS (Duplex)

Duplex Stainless Steels have the two-phase **microstructure of Austenitic and Ferritic grades**.

Despite **lower Nickel** content they have excellent corrosion resistance, and can achieve high mechanical properties through cold drawing.

These steels lend themselves readily for **marine and off-shore oil explo-**

**ration**.

They are magnetic, can be welded but cannot be heat treated and quenched.

Duplex steels are still undergoing research and development to fully explore new uses and applications.

	AISI-UNS	C (max)	Si (max)	Mn (max)	P (max)	S (max)	Cr	Cu	Mo	N	Ni
<b>2304</b>	(2304 S32304)	0,03	1,00	2,00	0,035	0,015	22,0÷24,5	0,1÷0,6	0,1÷0,6	0,05÷0,20	3,5÷5,5
<b>1.4460</b>	(329 S32900)	0,05	1,00	2,00	0,035	0,030	25,0÷28,0	-	1,3÷2,0	0,05÷0,20	4,5÷6,5
<b>2205</b>	2205 S31803	0,03	1,00	2,00	0,035	0,015	21,0÷23,0	-	2,5÷3,5	0,10÷0,22	4,5÷6,5





## HEAT-RESISTANT STAINLESS STEELS


Heat-Resistant Stainless Steels have good strength and **corrosion resistance** at elevated **temperatures**.

This is achieved with high levels of Chromium and Nickel content.

These steels are used in mechanical applications such as **heat treating**

**furnace components** and coils of resistors for heat treating elements.

These characteristics ensure long service life at **elevated temperatures**, with excellent corrosion protection.

	AISI-UNS	C (max)	Si (max)	Mn (max)	P (max)	S (max)	N (max)	Cr	Ni	Nb
<b>310</b>	(310S S31008)	0,10	1,50	2,00	0,045	0,015	0,11	24,0÷26,0	19,0÷22,0	-
<b>314</b>	(314 S31400)	0,20	1,50÷2,50	2,00	0,045	0,015	0,11	24,0÷26,0	19,0÷22,0	-
<b>330Nb</b>	330Nb	0,15	1,00÷2,00	2,00	0,030	0,015	0,10	20,0÷23,0	33,0÷37,0	1,0÷1,5

## PRECIPITATION HARDENING STEELS


These steels will achieve very high hardness through the addition of copper and an **age hardening** process defined by specific temperature and times the steel is exposed to these temperatures.

Rodacciai's **precipitation hardening** steels are martensitic and depending on the age hardening time & temperature will achieve hardnesses

higher than quenched & tempered steels.

Parts are usually machined in the annealed condition and then agehardened to the desired properties.

Applications include **marine and medical use**.

	AISI-UNS	C (max)	Si (max)	Mn (max)	P (max)	S (max)	Cr	Ni	Mo (max)	Cu	Other elements
<b>17-4 PH</b>	17-4PH S17400	0,07	0,70	1,50	0,040	0,030	15,0÷17,0	3,0÷5,0	0,60	3,0÷5,0	Nb=5xC÷0,45
<b>631M</b>	17-7PH S17700	0,09	0,70	1,00	0,040	0,015	16,0÷18,0	6,5÷7,8	-	-	Al=0,70÷1,50





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