Steelinox BV

1.4542 630 17-4PH

Chemical Analysis	C	Si	Mn	Ni	Cr	Mo	Nb	P	S
	≤ 0,06	≤ 0,6	≤ 1,0	4 – 5	15,0 – 16,5	≤ 0,5	≥ 5 x C – 0,45	≤ 0,030	0,015 – 0,025

General Presentation

This stainless steel is unique in that it not only offers excellent corrosion resistance, comparable to that of type 1.4301/1.4307 (304/304L) austenitic stainless steels, but it also offers a wide range of mechanical properties once treated.
Its performance – based on its metallurgical conditions – means that it can meet demands for high levels of tensile strength as well as being suitable for applications that require high impact strength.
It is suitable for numerous and varied applications in fields as diverse as:

- Leisure marine craft (propeller shafts, fittings);
- Food processing (handling and transfer equipment);
- Energy production (atomic power plants);
- Construction and the automotive industry.

Classification

Improved machinability, precipitation hardened, martensitic stainless steel.

Standards

Steel designations			
Europe		**USA**	**Japan**
Number	**Symbol**	**UNS**	**JIS**
1.4542	X5CrNiCuNb16-4	S17400	SUS630

Other designations				
USA	**France**	**Germany**	**UK**	**Sweden**
AISI	**AFNOR**	**DIN**	**BS**	**SS**
630	Z6CNU17.04	1.4542		

Steelinox BV
NL 3281 NJ Numansdorp
Tel.: +31 186 651004
Fax.: +31 186 651952
www.steelinox.nl
info@steelinox.nl

Steelinox BV

1.4542 630 17-4PH

Chemical Analysis	C	Si	Mn	Ni	Cr	Mo	Nb	P	S
	≤ 0,06	≤ 0,6	≤ 1,0	4 – 5	15,0 – 16,5	≤ 0,5	≥ 5 x C – 0,45	≤ 0,030	0,015 – 0,025

Mechanical properties

Metallurgical state	Coding		Heat treatment applied	Guaranteed mechanical characteristics						
	Standards	Conditions		Rm (MPa)	$Rp_{0,2}$ (MPa)	A %	Z %	KV (J)	HRC	HB
Annealed	EN 10088-3	+AT	1030/1050ºC annealing	≤ 1200	–	–	–	–	–	≤ 360
	ASTM A564	Cond A		–	–	–	–	–	≤ 38	≤ 363
Hardened	ASTM A564	H900	1030/1050ºC annealing Air or oil cooling + hardening 1 h at 480ºC/Air cooling	≥ 1310	≥ 1170	≥ 10	≥ 40	–	≥ 40	≥ 388
		H925	1030/1050ºC annealing Air or oil cooling + hardening 4 h at 495ºC/Air cooling	≥ 1170	≥ 1070	≥ 10	≥ 44	≥ 6,8	≥ 38	≥ 375
Softened	EN 10088-3	+P1070	Annealing 1030/1050ºC/ Air or oil cooling + Tempering 4 h at 550ºC, Air cooling	1070/1270	≥ 1000	≥ 10	–	–	–	–
	ASTM A564	H1025		≥ 1070	≥ 1000	≥ 12	≥ 45	≥ 20	≥ 35	≥ 331
	ASTM A564	H1075	Annealing 1030/1050ºC/ Air or oil cooling + Tempering 4 h at 580ºC, Air cooling	≥ 1000	≥ 860	≥ 13	≥ 45	≥ 27	≥ 32	≥ 311
	EN 10088-3	+P960	Annealing 1030/1050ºC/ Air or oil cooling + Tempering 4 h at 590ºC, Air cooling	960/1160	≥ 790	≥ 12	–	–	–	–
	ASTM A564	H1100		≥ 965	≥ 795	≥ 14	≥ 45	≥ 34	≥ 31	≥ 302
	EN 10088-3	+P930	Annealing 1030/1050ºC/ Air or oil cooling + Tempering 4 h at 620ºC, Air cooling	930/1100	≥ 720	≥ 16	–	≥ 40	–	–
	ASTM A564	H1150		≥ 930	≥ 725	≥ 16	≥ 50	≥ 41	≥ 28	≥ 277
	EN 10088-3	+P800	Annealing 1030/1050ºC/ Air or oil cooling + Tempering 2 h at 760ºC, Air cooling + Tempering 4 h at 620ºC, Air cooling	800/950	≥ 520	≥ 18	–	≥ 75	–	–
	ASTM A564	H1150M		≥ 795	≥ 520	≥ 18	≥ 55	≥ 75	≥ 24	≥ 255
	ASTM A564	H1150D	Annealing 1030/1050ºC/ Air or oil cooling + Tempering 4 h at 620ºC, Air cooling	≥ 860	≥ 725	≥ 16	≥ 50	≥ 41	24/33	255/311

Cryogenic application (resilience):
Excellent results up to -60ºC

Fatigue resistance
Fatigue induced breaking point after a rotating flexing motion at 20ºC and 300ºC

State	TREATED+P930		TREATED+P1070	
Temperature	20ºC	300ºC	20ºC	300ºC
10^7 cycles	620 MPa	530 MPa	620 MPa	520 MPa
10^8 cycles	620 MPa	450 MPa	500 MPa	415 MPa

Steelinox BV
NL 3281 NJ Numansdorp
Tel.: +31 186 651004
Fax.: +31 186 651952
www.steelinox.nl
info@steelinox.nl

Steelinox BV

1.4542 630 17-4PH

Chemical Analysis	C	Si	Mn	Ni	Cr	Mo	Nb	P	S
	≤ 0,06	≤ 0,6	≤ 1,0	4 – 5	15,0 – 16,5	≤ 0,5	≥ 5 x C – 0,45	≤ 0,030	0,015 – 0,025

Physical Properties

These properties are dependent on the metallurgical condition which is ordered. For information purpose, the table below shows some typical values of an annealed (+AT) and softened (+P930) metallurgical condition.

	Specific gravity	**Thermal conducitivity**	**Thermal expansion coefficient**	**Modulus of Elasicity**
	(kg/m³)	**(W/m°C)**	**(/°C)**	**MPa**
(+AT)	7750	17	10.8×10^{-6}	197000
(+930)	7860	17	10.9×10^{-6}	197000

(for information only)

Magnetic and electrical properties

1.4542 is a ferro-magnetic grade with properties that differ depending on its metallurgical condition and therefore, the heat treatment applied.

For information purposes, in the SOFTEND +P930 state, the following values are obtained:

Residual induction	3800 Gauss
Coercive field	43 Oe
Magnetic permeability at 100 OE	59
Magnetic permeability at 200 OE	38
Electrical resistivity	77 µΩ-mm (at 20°C)

	(+AT)	(+930)
Weight of round bars (kg/m)	0,0062 x D^2 (D: diameter in mm)	0,0062 x D^2 (D: diameter in mm)
Weight of hexagonal bars (kg /m)	0,0068 x D^2 (D: diameter in mm)	0,0068 x D^2 (D: diameter in mm)

Corrosion resistance

1.4542 offers excellent corrosion resistance, similar to that of type 18 Cr-8Ni austenitic steels in most corrosive environments. The structure of this steel makes it insensitive to intergranular corrosion and highly resistant to fatiguecorrosion as well as to stress corrosion. Furthermore, excellent resistance to corrosion-erosion should be noted due to the association of high level mechanical properties and corrosion resistance. When assemblies of stainless steel and less noble materials (aluminium, mild steel) are applied in atmospheric use, there is no risk of galvanic corrosion, the absence of any environmental electrolyte making it impossible for this phenomena to develop and spread. In "critical" cases like those met in nautical applications (short term immersion of stainless steel/aluminium assemblies, areas and dips that retain liquids), insulating the assemblies using an inert silicon seal offers good results in terms of protection against this kind of corrosion.

1.4542 is pickled in the same way as 630 grade steel.

If necessary, the following decontamination treatment process is recommended:

- One volume of 52% nitric acid (36° Baumé),
- One volume water
- Ambient temperature
- Short duration
- Wash carefully when the process is completed

The corrosion resistance of a stainless steel depends on many factors related to the composition of the corrosive atmosphere (chloride concentration, presence or absence of oxidising agents, temperature, pH, agitation or no agitation, and so on), as well as to the preparation of the material (surfaces free from metal particles, surface finish, such as hardening, polishing, and so on). Precautionary measures should be taken for certain tests such as the sal
ine mist test (French standard NFX 41002): for example marking labels (that might cause corrosion run-outs and reduce the test resistance time) should not be used on the sample.The table below illustrates a performance scale in different environments:

Environment	**Behavior**
Nitric Acid	Good
Phosphoric Acid	Restricted use
Sulphuric Acid	Restricted use
Sodium carbonate	Average
NaCl (Saline mist)	Average
Humidity	**Excellent**
Sea Water	Restricted use
Oil/gas	Restricted use

Steelinox BV
NL 3281 NJ Numansdorp
Tel.: +31 186 651004
Fax.: +31 186 651952
www.steelinox.nl
info@steelinox.nl

Steelinox BV

1.4542 630 17-4PH

Chemical Analysis	C	Si	Mn	Ni	Cr	Mo	Nb	P	S
	≤ 0,06	≤ 0,6	≤ 1,0	4 – 5	15,0 – 16,5	≤ 0,5	≥ 5 x C – 0,45	≤ 0,030	0,015 – 0,025

Hot Processing

Forging
1.4542 is suitable for forging. Reheating takes place between 1150 and 1200°C, forging between 1200°C and 950°C. Cooling in air, water or oil. The parts obtained in this way can be used:

- Annealed (with an expansion treatment lasting 1 to 2 hours at 250°/300°C), or
- Hardened (with optional annealing + tempering for one hour at 480°C), or
- Softened (with optional annealing + tempering defined by the standards according to the desired level of mechanical properties).

Machinability

The performance of 1.4542 in machining is enhanced as a result of the optimization of the inclusion population

Welding

1.4542 can be welded, without preheating, using MIG and TIG techniques, with or without the use of filler material, or by laser, resistance or electron beam techniques. Welds, whether made with or without a filler material, have an annealed structure and should preferably be subject to expansion treatment (one to two hours at 250°C/300°C) or hardening or softening treatment (see above). For welding performed with no filler material or with a homogeneous filler material, the welding mechanical properties obtained in this way can be identical to that of the base metal. Furthermore, it should be restated that the welding design should make allowance for the care required with all high steels with high proof stress: avoiding cut outs and sudden changes in cross section.
Welding with a filler material:
For MIG welding, we recommend the use of a protective gas made up of Ar+1%CO2 or 1-2%O2; gasses containing H2 and N2 should be avoided. The welding wire used as filler metal can be ER308LSi (1.4316) or a homogeneous filler called 630 (17-4PH)

Heat Treatment

To ASTM A564/A564M and EN10088-3
After annealing from 1030°C to 1050°C, 1.4542 presents a soft martensitic structure with a hardness of around 35 HRC. After annealing, if the metal is to be used in this condition, we recommend an expansion treatment lasting one to two hours at 250/300°C, with no significant effect on its mechanical properties. This precipitation hardening steel is specific in that it can be hardened, after annealing, using a medium temperature hardening treatment. The maximum hardness, of around 42 HRC (impact strength of 3 daJ/cm²) is obtained by tempering to around 480°C (for one hour).
Softening: by tempering at 550-760°C depending on the instructions defined by the applicable standards. To harden the metal after this kind of softening, the metal needs to be annealed once again before performing the medium temperature hardening treatment. The annealed bars are suitable for medium temperature hardening, performed on parts. Parts taken from softened bars must, to harden, be subject once again to an annealing operation, then to the medium temperature hardening treatment.

Steelinox BV
NL 3281 NJ Numansdorp
Tel.: +31 186 651004
Fax.: +31 186 651952
www.steelinox.nl
info@steelinox.nl