



Mechanical properties: Fasteners from corrosion-resistant stainless steels

The mechanical properties of fasteners made from corrosion-resistant stainless steel as well as their quality inspection and marking are set in ISO 3506.

Table 4: Mechanical properties for fasteners of the steel groups A 1 - A 5 at approx. + 20 °C.

Property class	Diameter range	Screws				Nuts	
		Tensile strength R _m N/mm ² min	stress at 0.2% non-proportional elongation N/mm ² min		Elongation after fracture A mm min	Proof stress Sp N/mm ² min m ≥ 0.8 d	0.5 d ≤ m < 0.8 d
50 soft (turned)	≤ M39	500	210	Lower yield strength R _p or stress at 0.2% elongation at 100 °C = 85% at 200 °C = 80% at 300 °C = 75% at 400 °C = 70%	0.6 d	500	250 (Prop. cl. - 025)
70 cold-worked	≤ M24	700	450		0.4 d	700	350 (Prop. cl. - 035)
80 high strength	≤ M24	800	600		0.3 d	800	400 (Prop. cl. - 040)

For hexagon head, hexagon/hexalobular socket head cap and slotted/cross recessed screws, property class 70 is the usual. Fasteners made from stainless steels are tough and well suited for sub-zero temperatures (screws with head as low as -60 °C, screws without head as low as -200 °C according to DIN 267-13).

Austenitic materials cannot be hardened with heat treatment – Fasteners from austenitic materials (A 1 – A 5) have a different assembly behaviour than quenched and tempered steel fasteners. Improper assembly can lead to failure (cold shut/fretting/breakage).

Magnetic properties: The magnetic properties are described by their permeability μ_r . Fasteners made from stainless steels are generally not magnetisable – magnetisation can occur through the manufacturing process: when particular requirements of magnetisability are set, this needs to be arranged accordingly.

A 2:	$\mu_r \approx 1.8$
A 4:	$\mu_r \approx 1.015$
A 4L:	$\mu_r \approx 1.005$

Extract from ISO 3506-1 attachment H

Finish of fasteners made from stainless steels shall be supplied clean and bright. (passivation → ISO 16048)

Marking: Hexagon head screws/bolts, hexagon/hexalobular socket head cap screws, studs and nuts from a nominal thread diameter of ≥ M5 (studs from ≥ M6) are to be marked with the manufacturer's identification mark, the steel group and the property class.

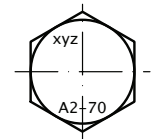


Table 5: Chemical composition in % acc. to ISO 3506/EN 10088-3.

Steel group	Usual materials for screws/bolts/studs/nuts		Cr	Ni	Mo	C	Si	Mn	P	S	Other additions (ISO 3506. Tab. 1)
	Material No. (AISI No.)	Material designation acc. EN 10088-3/DIN 17006. 17440									
A 1	1.4305 (303)	X8CrNiS 18-9	16-19	5-10	0.7	0.12	1.0	6.5	0.20	0.15-0.35	Cu, – Sulphur may be replaced by selenium
A 2	1.4301 (304) 1.4303 (305)	X5CrNi 18-10 X4CrNi 18-12	15-20	8-19	*	0.10	1.0	2.0	0.05	0.03	* Mo permitted
A 3	1.4541 (321)	X6CrNiTi 18-10	17-19	9-12	*	0.08	1.0	2.0	0.045	0.03	* Mo permitted - must contain Ti, Nb or Ta for stabilisation
A 4	1.4401 (316)	X5CrNiMo 17-12-2	16-18.5	10-15	2.0-3.0	0.08	1.0	2.0	0.045	0.03	
A 5	1.4571 (316 Ti)	X6CrNiMoTi 17-12-2	16-18.5	10.5-14	2.0-3.0	0.08	1.0	2.0	0.0450	0.03	
A –	1.4439	X2CrNiMoN 17-13-5	16.5-18.5	12.5-14.5	4.0-5.0	0.03	1.0	2.0	0.045	0.015	Must contain Ti, Nb or Ta for stabilisation
A –	1.4539	X1NiCrMoCu 25-20-5	19-21	24-26	4.0-5.0	0.02	0.7	2.0	0.03	0.01	Austenitic/Austenitic-ferritic steels with particular resistance against chloride-induced stress corrosion cracking e.g. in indoor swimming pools
A –	1.4529	X1NiCrMoCuN 25-20-7	19-21	24-26	6.0-7.0	0.02	0.5	1.0	0.03	0.01	
A/F – FA	1.4462	X2CrNiMoN 22-5-3	21-23	4.5-6.5	2.5-3.5	0.03	1.0	2.0	0.035	0.015	
C –	1.4034 (420)	X46Cr 13	12.5-14.5			0.43-0.50	1.0	1.0	0.040	0.03	Materials for spring parts – e.g. acc. to DIN 127, 128, 471, 472, 2093, 6797, 6798, 6799, 7967, 7980
C –	1.4122	X39CrMo 17-1	15.5-17.5	≤ 1.0	0.80-1.30	0.33-0.45	1.0	1.5	0.040	0.03	
A –	1.4310 (301)	X10CrNi 18-8	16-18	6-9.5	≤ 0.8	0.05-0.15	2.0	2.0	0.045	0.015	(Caution: Reduced spring load as opposed to spring steel)
C –	1.4568 (301)	X7GNiAl 17-7	16-18	6.5-7.8		0.09	0.7	1.0	0.040	0.015	Al 0.70-1.5