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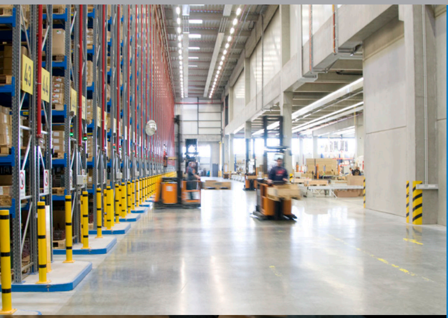
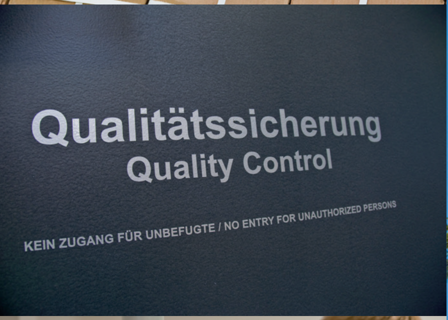




TECHNICAL INFORMATION

FOR STAINLESS STEEL FASTENERS

I. DIN and ISO standards and what they mean

a) The term standardisation

When components are standardised they are easier to work with because such components are interchangeable. For this to be possible the fundamental characteristics of standard parts must be defined by a central body and used by manufacturers and retailers.

b) The organisation and issuers of standards

Tab. 1: The diversity of standards

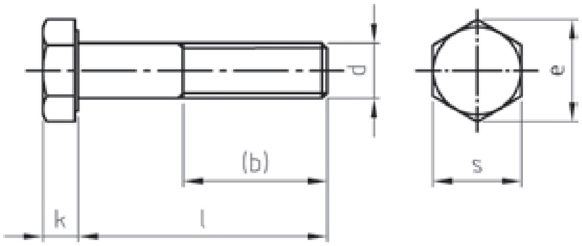
Standard	Information
DIN standard	Issuer: Deutsches Institut für Normung (German Institute for Standardisation) = national, German standard DIN standards are issued for electric components and organisational methods as well as fasteners. DIN standards remain common in Germany even though the changeover to ISO standards is gaining pace. DIN standards will remain in place for parts which do not have ISO/EN standards or for which there is no need for standardisation.
ISO standard	Issuer: ISO (International Organization for Standardization). = international standard The term „ISO“ comes from the Greek for „equal“. ISO standards apply around the world and are therefore suited for world trade. Even though ISO standardisation is gaining in importance, the German DIN standard was a world leader in standardisation for a long time.
EN standard	Issuer: European Committee for Standardization (CEN) = europäische Norm (European standard) The idea behind the EN standard was to establish „equal“ preconditions for trade within Europe. Unlike ISO standards, EN standards only apply within the European Union. The CEN endeavours to make EN and ISO standards the same. In principle existing ISO standards should be adopted unchanged as EN standards, retaining the same ISO standard number but starting with EN ISO. If this is not possible at European standardisation level, separate EN standards are produced with EN standard numbers different from the ISO numbers.
DIN-EN standard	= national German version of an EN standard adopted in unchanged form This is a combination of standards which indicates that the standard number (e.g. 12345) identifies the same object both in the DIN standard and the EN standard.
DIN-EN-ISO standard	= national German version of an EN standard adopted in unchanged form This is a combination of standards which indicates that the standard number (e.g. 12345) identifies the same object in the DIN standard, EN standard and ISO standard.
DIN-ISO-EN	= national German version of an ISO standard adopted in unchanged form.

c) What does a DIN standard reveal?

Just like any other standard, the DIN standard delivers standardisation and simplicity. For example, for a query it would suffice to say „DIN 933, M12 x 40, A4-70“ to define a multitude of features. This means that you don‘t always have to cross-check the requirements of a product and the customer can be sure that he or she receives precisely the goods they ordered.

Standards define at least one of the following features:

Head shape	(e.g. hexagon head, hexagonal socket, raised countersunk head)
Type of thread	(e.g. standard metric ISO thread M, sheet metal thread)
Thread length	
Thread pitch	
Material and strength class	
Possible coatings or strength characteristics	



b = thread length for screws whose thread does not extend to the head (partial thread screws)

d = thread diameter in mm

e = corner measurement on head

k = height of head

l = nominal length of screw – this also indicates how the length of a screw is measured.

S = width across flats

<u>The example below should explain what the following details mean:</u>

DIN 931, M 12 x 40, A4-70

DIN 931	=	hexagonal screw with shoulder
M	=	metric ISO thread
12	=	d… thread diameter of screw of 12 mm
X 40	=	l… nominal length in mm
A4	=	material class, stainless steel A4
- 70	=	strength class 70
P	=	the thread pitch is stated by a number. If this number is not provided, it is a standard thread. (M 12 x 40). The pitch is only stated for screws with a thread other than a standard thread, e.g. M 12 x 1 x 40 designates a

d) Change in standard (DIN > EN > ISO)

While the earlier DIN standards applied as standard specifications for Germany alone, the EN and ISO standards apply throughout Europe and the world. Many ISO standards were based on DIN standards; but many standards were only introduced when a relevant ISO standard was written (e.g. ISO 7380). Retailers are making a smooth changeover to ISO standards and DIN and ISO articles are manufactured side by side.

Tab. 2: An overview of changes to standards:

DIN → ISO
(one-to-one comparison)

ISO → DIN
(one-to-one comparison)

DIN	ISO	DIN	ISO	DIN	ISO	ISO	DIN	ISO	DIN	ISO	DIN
1	2339	916	4029	1481	8752	1051	660/661	4036	439	8673	934
7	2338	931	4014	6325	8734	1207	84	4161	6923	8673	971
84	1207	933	4017	6914	7412	1234	94	4762	912	8673	971-1
85	1580	934	4032	6915	7414	1479	7976	4766	551	8674	971-2
94	1234	934	8673	6916	7416	1481	7971	7038	937	8676	961
125	7089	937	7038	6921	8100	1482	7972	7040	982	8677	603
125	7090	960	8765	6923	4161	1483	7973	7040	6924	8733	7979
126	7091	961	8676	6924	7041	1580	85	7042	980	8734	6325
417	7435	963	2009	6925	7042	2009	963	7042	6925	8735	7979
427	2342	964	2010	7343	8750	2010	964	7045	7985	8736	7978
433	7092	965	7046	7343	8751	2338	7	7046	965	8737	7977
438	7436	966	7047	7344	8748	2339	1	7047	966	8738	1440
439-1	4036	971-1	8673	7346	13337	2341	1434	7049	7981	8740	1473
439-2	4035	971-2	8674	7971	1481	2341	1444	7050	7982	8741	1474
440	7094	980	7042	7972	1482	2342	427	7051	7983	8742	1475
551	4766	980	10513	7973	1483	2936	911	7072	11024	8744	1471
553	7434	982	7040	7976	1479	3266	580	7089	125	8745	1472
555	4034	982	10512	7977	8737	4014	931	7090	125	8746	1476
558	4018	985	10511	7978	8736	4016	601	7091	126	8747	1477
580	3266	1434	2341	7979	8733	4017	933	7092	433	8748	7344
601	4016	1440	8738	7979	8735	4018	558	7093	9021	8749	7346
603	8677	1444	2341	7981	7049	4026	913	7094	440	8750	7343
660	1051	1471	8744	7982	7050	4027	914	7412	6914	8751	7343
661	1051	1472	8745	7983	7051	4028	915	7414	6915	8752	1481
911	2936	1473	8740	7985	7045	4029	916	7416	6916	8765	960
912	4762	1474	8741	7991	10642	4032	934	7434	553	10642	7991
913	4026	1475	8742	9021	7093	4032	932	7435	417	10511	985
914	4027	1476	8746	11024	7072	4034	555	7436	438	10512	982
915	4028	1477	8747			4035	439	8102	6921	10513	980

Hex widths across flats	DIN	ISO
M 10	17 mm	16 mm
M 12	19 mm	18 mm
M 14	22 mm	21 mm
M 22	32 mm	34 mm

Tab. 3: Changes to hexagonal screws and nuts

DIN	ISO → (DIN ISO)	EN (DIN EN)	Range of dimensions[1]	Changes[2]
558	**4018**	24018	Ø M 10, 12, 14, 22	New ISO widths across flats
931	**4014**	24014		
933	**4017**	24017		
960	**8765**	28765	All other Ø	None = DIN and ISO are identical
961	**8676**	28676		
601	**4016**	24016	Ø M 10, 12, 14, 22	Screws: new ISO widths across flats Nuts: new ISO WAF + ISO heights
with 555 nuts	with 4034 nuts	24034		
28030	**4014**	24014	Other Ø up to M 39	Screws: none = DIN and ISO are identical Nuts: new ISO heights
with 555 nuts	with 4032 nuts	24032	Other Ø above M 39	None = DIN and ISO are identical
561	-	-	Ø M 12, 16	New ISO widths across flats
564	-	-	All other Ø	None
609	-	-	Ø M 10, 12, 14, 22	New ISO widths across flats
610	-	-	All other Ø	None
7968 Mu	Screws: -	-	M 12, 22	Screws: new ISO widths across flats
7990 Mu	Nuts acc. to ISO 4034	24034		Nuts: new ISO WAF + ISO heights
			All other Ø	Screws: none Nuts: new ISO heights
186/261	Screws: -		Ø M 10, 12, 14, 22	Screws: none Nuts: new ISO WAF + ISO heights
525	Nuts acc. to ISO 4034	24034		
603				
604				
605			All other Ø	Screws: none Nuts: new ISO heights
607				
608				
7969				
11014				
439 T1 (A=out bevel)	**4036**	24036	Ø M 10, 12, 14, 22	New ISO widths across flats (no change in height)
439 Tz (B=with evel)	**4035** = standard thread	24035	All other Ø	None = DIN and ISO are identical (no change in height)
	8675 = fine thread	28675		
555	**4034** (ISO-Typ 1)	24034	Ø M 10, 12, 14, 22	New ISO WAF + new ISO heights
934 Rd. 6, 8, 10	**4032** = standard thread (ISO-Typ 1)	24032		
Fkl. 12	**4033** = standard thread (ISO-Typ 2)	24033	All other Ø up to M 39	New ISO heights (no change to WAF)
Fkl. 6, 8, 10	= fine thread (ISO-Typ 1)	28673	Ø above M 39	None, DIN and ISO are identical
557	-	-	Ø M 10, 12, 14, 22	New ISO widths across flats
917	-	-		
935	-	-		

Technical Information
for stainless steel fasteners

Continuation of Tab. 3: Changes to hexagonal screws and nuts

DIN	ISO →	EN	Abmessungs-bereich[1]	Änderungen[2]
	(DIN ISO)	(DIN EN)		
986	-	-	All other Ø	None
1587	-	-		

[1] For comparison of WAFs and nut heights between DIN and ISO, see Table C
[2] For assignment of standards, mechanical properties for nuts made of steel, see Table C

Tab. 4: Dimensional changes to hexagonal screws and nuts

Nominal measurement d	Width across flat s		Nut height m min-max			
Sizes to be avoided	DIN	ISO	DIN	ISO	DIN	ISO
			555	4034	934	4032 (standard)
						8673 (fine th.)
				ISO type 1		ISO type 1
M 1	2,5	-	-	0,55-0,8	-	-
M 1,2	3		-	-	0,75-1	-
M 1,4	3		-	-	0,95-1,2	-
M 1,6	3,2		-	-	1,05-1,3	1,05-1,3
M 2	4		-	-	1,35-1,6	1,35-1,6
M 2,5	5		-	-	1,75-2	1,75-2
M 3	5,5		-	-	2,15-2,4	2,15-2,4
(M 3,5)	6		-	-	2,55-2,8	2,55-2,8
M 4	7		-	-	2,9-3,2	2,9-3,2
M 5	8		3,4-4,6	4,4-5,6	3,7-4	4,4-4,7
M 6	10		4,4-5,6	4,6-6,1	4,7-5	4,9-5,2
(M 7)	11		-	-	5,2-5,5	-
M 8	13		5,75-7,25	6,4-7,9	6,14-6,5	6,44-6,8
M 10	17	16	7,25-8,75	8-9,5	7,64-8	8,04-8,4
M 12	19	18	9,25-10,75	10,4-12,2	9,64-10	10,37-10,8
(M 14)	22	21	-	12,1-13,9	10,3-11	12,1-12,8
M 16	24		12,1-13,9	14,1-15,9	12,3-13	14,1-14,8
(M 18)	28		-	15,1-16,9	14,3-15	15,1-15,8
M 20	30		15,1-16,9	16,9-19	14,9-16	16,9-18
(M 22)	32	34	17,1-18,9	18,1-20,2	16,9-18	18,1-19,4
M 24	36		17,95-20,05	20,2-22,3	17,7-19	20,2-21,5
(M 27)	41		20,95-23,05	22,6-24,7	20,7-22	22,5-23,8
M 30	46		22,95-25,05	24,3-26,4	22,7-24	24,3-25,6
(M 33)	50		24,95-27,05	27,4-29,5	24,7-26	27,4-28,7
M 36	55		27,95-30,05	28-31,5	27,4-29	29,4-31
(M 39)	60		29,75-32,25	31,8-34,3	29,4-31	31,8-33,4
M 42	65		32,75-35,25	32,4-34,9	32,4-34	32,4-34
(M 45)	70		34,75-37,25	34,4-36,9	34,4-36	34,4-36
M 48	75		36,75-39,25	36,4-38,9	36,4-38	36,4-38
(M 52)	80		40,75-43,25	40,4-42,9	40,4-42	40,4-42
M 56	85		43,75-46,25	43,4-45,9	43,4-45	43,4-45
(M 60)	90		46,75-49,25	46,4-48,9	46,4-48	46,4-48
M 64	95		49,5-52,5	49,4-52,4	49,1-51	49,1-51
> M 64	-		Max. M 100 x 6	-	Max. M 160 x 6	-/-

Continuation of Tab. 4: Changes to the dimensions of hexagonal screws and nuts

Nominal measurement d	Width across flat s		Nut height m min-max			
Sizes to be avoided	**DIN**	**ISO**	**DIN**	**ISO**	**DIN**	**ISO**
			555	4034	934	4032 (standard)
						8673 (fine th.)
				ISO type 1		ISO type 1
Nut height factor	**m**	≤ M 4	-	-		0,8
	d approx.	M 5-M 39	0,8	0,83-1,12	0,8	0,84-0,93
		≥ M 42		~ 0,8		0,8
Product class			C (rough)		≤ M 16 = A (average) > M 16 = B (average roughness)	
Thread tolerance			7 H		6 H	
Strength class Steel		Core range	5		6, 8,10	
		~ M 5-39	**M 16 < d ≤ M 39 = 4,5**		(ISO 8673 = Fkl. 10 ≤ M 16)	
		> M 39	Following agreement		Following agreement	
Mechanical characteristics according to standard			DIN 267 Part 4	ISO 898 Part 2	DIN 267 Part 4	ISO 898 Part 2 (standard thread) Part 6 (fine thread)

Tab. 5: Changes to small metric screws

DIN (old)	ISO	DIN (new or DIN EN)	Title	Changes
84	1207	DIN EN 21207	Socket cap screws with slot; product class A (ISO 1207: 1992)	Head height and diameter in places
85	1580	DIN EN 21580	Flat-headed screws with slot; product class A	Head height and diameter in places
963	2009	DIN EN 22009	Countersunk screws with slot, shape A	Head height and diameter in places
964	2010	DIN EN 22010	Countersunk oval head screws with slot, shape A	Head height and diameter in places
965	7046-1	DIN EN 27046-1	Countersunk screws with cross recess (common head): product class A, strength class 4.8	Head height and diameter in places
965	7046-2	DIN EN 27046-2	Countersunk screws with cross recess (common head): product class A, strength class 4.8	Head height and diameter in places
966	7047	DIN EN 27047	Countersunk oval head screws with cross recess (common head): product class A	Head height and diameter in places
7985	7045	DIN EN 27045	Flat-headed screws with cross recess; product class A	Head height and diameter in places

Tab. 6: Changes to pins and bolts

DIN (old)	ISO	DIN (new or DIN EN)	Title	Changes
1	2339	DIN EN 22339	Tapered pins; unhardened (ISO 2339: 1986)	Length l incl. round ends
7	2338	DIN EN 22338	Cylindrical pins; unhardened (ISO 2338: 1986)	Length l incl. round ends
1440	8738	DIN EN 28738	Washers for bolts; product class A (ISO 8738: 1986)	Outer diameter in places
1443	2340	DIN EN 22340	Bolt without head (ISO 2340:1986)	Nothing noteworthy
1444	2341	DIN EN 22341	Bolt with head (ISO 2341:1986)	Nothing noteworthy
1470	8739	DIN EN 28739	Full length parallel grooved cylindrical pins with pilot (ISO 8739: 1986)	Increased shearing forces
1471	8744	DIN EN 28744	Full length taper grooved pins (ISO 8744: 1986)	Increased shearing forces
1472	8745	DIN EN 28745	Half length taper grooved pins	Increased shearing forces
1473	8740	DIN EN 28740	Full length parallel grooved cylindrical pins with bevel (ISO 8740: 1986)	Increased shearing forces
1474	8741	DIN EN 28741	Half length reverse grooved pins (ISO 8741: 1986)	Increased shearing forces
1475	8742	DIN EN 28742	Groove pins - 1/3 of length grooved (ISO 8742: 1986)	Increased shearing forces
1476	8746	DIN EN 28746	Semi round grooved pins (ISO 8746: 1986)	Nothing noteworthy
1477	8747	DIN EN 28747	Countersunk grooved pins (ISO 8747: 1986)	Nothing noteworthy
1481	8752	DIN EN 28752	Dowel pins; slotted (ISO 8752: 1987)	Nothing noteworthy
6325	8734	DIN EN 28734	Cylindrical pins; hardened (ISO 8734: 1987)	Nothing noteworthy
7977	8737	DIN EN 28737	Tapered pins with threaded peg; unhardened (ISO 8737: 1986)	Nothing noteworthy
7978	8736	DIN EN 28736	Tapered pins with female thread; unhardened (ISO 8736: 1986)	Nothing noteworthy
7979	8733	DIN EN 28733	Cylindrical pins with female thread; unhardened (ISO 8733: 1986)	Nothing noteworthy
7979	8735	DIN EN 28735	Cylindrical pins with female thread; hardened (ISO 8735: 1987)	Nothing noteworthy

Tab. 7: Changes to tapping screws

DIN (old)	ISO	DIN (new or DIN EN)	Title	Changes
7971	1481	DIN ISO 1481	Flat head tapping screws with slot (ISO 1481: 1983)	Head height and dia-meter in places
7972	1482	DIN ISO 1482	Tapping screws with slot, countersunk head	Head height and dia-meter in places
7973	1483	DIN ISO 1483	Tapping screws with slot, raised countersunk head	Head height and dia-meter in places
7976	1479	DIN ISO 1479	Tapping screws with hexagon head	Head height in places
7981	7049	DIN ISO 7049	Tapping screws with cross recess, fillister head	Head height and dia-meter in places
7982	7050	DIN ISO 7050	Tapping screws with cross recess, countersunk head	Head height and dia-meter in places
7983	7051	DIN ISO 7051	Tapping screws with cross recess, raised countersunk head	Head height and dia-meter in places

Tab. 8: Changes to threaded pins

DIN (old)	ISO	DIN (new or DIN EN)	Title	Changes
417	7435	DIN EN 27435	Threaded pins with slot and peg (ISO 7431: 1983)	Nothing noteworthy
438	7436	DIN EN 27436	Threaded pins with slot and cup point (ISO 7436: 1983)	Nothing noteworthy
551	4766	DIN EN 24766	Threaded pins with slot and flat point (ISO 4766: 1983)	Nothing noteworthy
553	7434	DIN EN 27434	Threaded pins with slot and tip (ISO 7431: 1983)	Nothing noteworthy
913	4026	DIN 913	Threaded pins with hexagonal socket and flat point	Nothing noteworthy
914	4027	DIN 914	Threaded pins with hexagonal socket and tip	Nothing noteworthy
915	4028	DIN 915	Threaded pins with hexagonal socket and peg	Nothing noteworthy
916	4029	DIN 916	Threaded pins with hexagonal socket and cup point	Nothing noteworthy

Tab. 9: Technical terms of delivery and basic standards

DIN (old)	ISO	DIN (new or DIN EN)	Title	Changes
267 Part 20	-	DIN EN 493	Fasteners, surface defects, nuts	None
267 Part 21	-	DIN EN 493	Fasteners, surface defects, nuts	None
DIN ISO 225	225	DIN EN 20225	Mech. fasteners, screws and nuts, dimensio-ning (ISO 225: 1991)	None
DIN ISO 273	273	DIN EN 20273	Mech. fasteners, clearance holes for screws (ISO 273: 1991)	None
DIN ISO 898 Part 1	898 1	DIN EN 20898 Part 1	Mech. properties of fasteners, screws (ISO 898-1: 1988)	None
267 Part 4	898 2	DIN ISO 898 Part 2	Mech. properties of fasteners, nuts with fixed test forces (ISO 898-2: 1992)	None
DIN ISO 898 Part 6	898 6	DIN EN 20898 Part 6	Mech. properties of fasteners, nuts with fixed test forces (ISO 898-6: 1988)	None
267 Part 19	6157-1	DIN EN 26157 Part 1	Fasteners, surface defects, screws for general requirements (ISO 6157-1:1988)	None
267 Part 19	6157-3	DIN EN 26157 Part 3	Fasteners, surface defects, screws for general requirements (ISO 6157-3:1988)	None
DIN ISO 7721	7721	DIN EN 27721	Countersunk screws; design and testing of countersunk heads (ISO 7721: 1983)	None
267 Part 9	-	DIN ISO 4042	Parts with threads – galvanic coatings	None
267 Part 1	-	DIN ISO 8992	General requirements for screws and nuts	None
267 Part 5	-	DIN ISO 3269	Mechanical fasteners acceptance inspection	None
267 Part 11	-	DIN ISO 3506	Stainless steel fasteners technical terms of delivery	None
267 Part 12	-	DIN EN ISO 2702	Heat-treated steel tapping screw - mechanical properties	None
267 Part 18	8839	DIN EN 28839	Mech. properties of fasteners, screws and nuts made from non ferrous metals (ISO 8839: 1986)	None

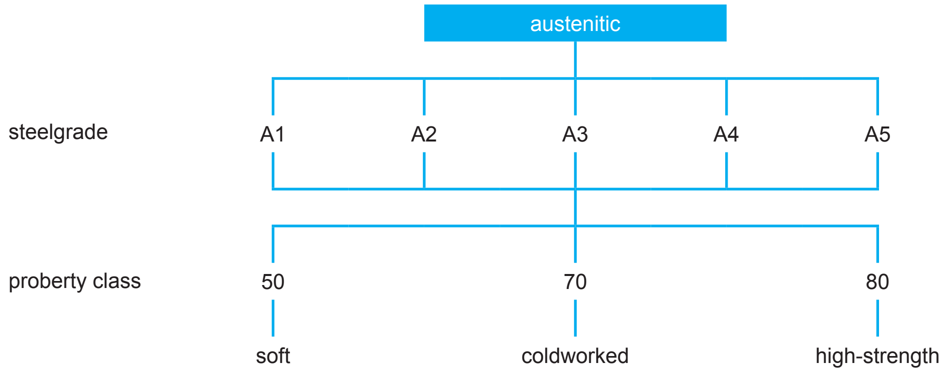
II. Mechanical properties of special-grade stainless steel

Stainless steels divide into three groups of steel - austenitic, ferritic and martensitic. Austenitic steel is by far the commonest and offers the greatest scope for use. The steel groups and strength classes are designated by a four-digit sequence of letters and numbers as shown in the following example. DIN EN ISO 3506 governs screws and nuts made from stainless steel.

<u>Example:</u>
A2 - 80
A = austenitic steel
2 = type of alloy within group A
80 = tensile strength of at least 800 N/mm2, cold work hardened

II. a) Labelling system for grades of stainless steels and their strength classes

Fig. A:



Tab. 10: Common stainless steels and their chemical composition

	Material designation	Material no.	C %	Si ≤ %	Mn ≤ %	Cr %	Mo %	Ni %	Altri %
A 2	X 5Cr Ni 1810	1.4301	≤ 0,07	1,0	2,0	17 bis 19	-	8,0 bis 10,5	-
	X 2 Cr Ni 1811	1.4306	≤ 0,03	1,0	2,0	18,0 bis 20,0	-	10,0 bis 12,0	-
	X 8 Cr Ni 19/10	1.4303	≤ 0,12	0,75	2,0	17,0 bis 19,0	-	11,0 bis 13,0	-
A 3	X 6 Cr Ni Ti 1811	1.4541	≤ 0,10	1,0	2,0	17,0 bis 19,0	-	9,0 bis 12,0	Ti ≥ 5 X % C
A 4	X 5 Cr Ni Mo 1712	1.4401	≤ 0,07	1,0	2,0	16,5 bis 18,5	2,0 bis 2,5	10,0 bis 13,0	-
	X 2 Cr Ni Mo 1712	1.4404 316L	≤ 0,03	1,0	2,0	16,5 bis 18,5	2,0 bis 2,5	10 bis 13	-
A 5	X 6 Cr Ni Mo Ti 1712	1.4571	≤ 0,10	1,0	2,0	16,5 bis 18,5	2,0 bis 2,5	10,5 bis 13,5	Ti ≥ 5 X % C

II. b) Subdivision of strengths of stainless steel screws

DIN ISO 3506 has summarised the recommended steel grades for fasteners. It is virtually only austenitic stainless steel A2 which is used here. On the other hand chrome nickel steels from steel group A4 tend to be used for very high corrosion requirements. Tab. 11 is based on screw connections made from austenitic steel in terms of mechanical strength values.

Mechanical properties of fasteners - austenitic steel grades

Tab. 11: Extract from DIN EN ISO 3506-1

Steel group	Steel grade	Strength class	Screws		
			Tensile strength Rm1) N/mm² min.	0,2 %-yield strength RP 0,21) N/mm² min.	Elongation at fracture A2) mm min.
Austenitic	A1, A2, A3 A4 und A5	50	500	210	0,6 *d*
		70	700	450	0,4 *d*
		80	800	600	0,3 *d*

1) The tensile stress is calculated with reference to the tensile stress area (see DIN EN ISO 3506-1).

2) The elongation at fracture should be calculated according to 7.2.4 at the corresponding screw length and not on the turned samples. d is the nominal diameter.

II. c) Yield strength loads for shoulder studs

Since austenitic chrome nickel steels cannot be hardened, a higher yield strength is only achieved through cold work hardening resulting from cold working (e.g. using threaded rollers). The yield strength loads for shoulder studs according to DIN EN ISO 3506 can be taken from Table 12.

Tab. 12: Yield strength loads for shoulder studs

Nominal diameter	**Yield strength loads of austenitic steels according to DIN EN ISO 3506 A 2 and A 4 in N**	
Strength class	50	70
M 5	2980	6390
M 6	4220	9045
M 8	7685	16470
M 10	12180	26100
M 12	17700	37935
M 16	32970	70650
M 20	51450	110250
M 24	74130	88250
M 27	96390	114750
M 30	117810	140250

II. d) Properties of stainless steel screws at increased temperatures

Tab. 13: Strength class 70

Nominal diameter	Warm yield strengths in N				
Strength class 70	+ 20 °C	+ 100 °C	+ 200 °C	+ 300 °C	+ 400 °C
M 5	6.390	5.432	5.112	4.793	4.473
M 6	9.045	7.688	7.236	6.784	6.332
M 8	16.740	14.000	13.176	12.353	11.529
M 10	26.100	22.185	20.880	19.575	18.270
M 12	37.935	32.245	30.348	28.451	26.555
M 16	70.650	60.053	56.520	52.988	49.455
M 20	110.250	93.713	88.200	82.688	77.175
M 24	88.250	75.013	70.600	66.188	61.775
M 27	114.750	97.538	91.800	86.063	80.325
M 30	140.250	119.213	112.200	105.188	98.175

The values in DIN 17440 apply for strength class 50

II. e) Reference values for the tightening torque of screws per DIN EN ISO 3506.

Fastenings of stainless, austenitic steel, need an optimal tightening torque for the processing.
As a guideline, we created a table for you, from which you can infer all the necessary torques in mutually depend on the friction value.

Fundamentally, you have to observe, that the values, which are shown in the table, are only guidelines (see VDI 2230).

The table 14a is a simplified explanation, which only shows again, the friction values from 0,10 to 0,20.
Depending on the lubricant, the friction value of screws, move between 0,12 and 0,18. Since the friction value does not only depend on the lubricant, it is essential to carry out a test under preconditions.

Tab. 14a: Simplify reference values for tightening torques for screws according to DIN EN ISO 3506 (mostly slide coating)

"Friction coefficient µges."	Tightening torque MA [Nm] für A2-70, A4-70							
	M4	M5	M6	M8	M10	M12	M16	M20
0,10	1,7	3,4	5,9	14,5	30,0	50,0	121,0	224,0
0,12	2,0	3,8	6,7	16,3	33,0	56,0	136,0	274,0
0,14	2,2	4,2	7,4	17,8	36,0	62,0	150,0	303,0
0,16	2,3	4,6	7,9	19,3	39,0	66,0	162,0	328,0
0,18	2,5	4,9	8,4	20,4	41,0	70,0	173,0	351,0
0,20	2,6	5,1	8,8	21,4	44,0	74,0	183,0	370,0

Tab. 14b: Reference values for tightening torques for screws according to DIN EN ISO 3506

Friction coefficient µtotal 0.10	Pretensioning forces $F_{vmax.}$ [kN]			Tightening torque M_A [Nm]		
	50	70	80	50	70	80
M 3	0,9	1	1,2	0,85	1	1,3
M 4	1,08	2,97	3,96	0,8	1,7	2,3
M 5	2,26	4,85	6,47	1,6	3,4	4,6
M 6	3,2	6,85	9,13	2,8	5,9	8
M 8	5,86	12,6	16,7	6,8	14,5	19,3
M 10	9,32	20	26,6	13,7	30	39,4
M 12	13,6	29,1	38,8	23,6	50	67
M 14	18,7	40	53,3	37,1	79	106
M 16	25,7	55	73,3	56	121	161
M 18	32,2	69	92	81	174	232
M 20	41,3	88,6	118,1	114	224	325
M 22	50	107	143	148	318	424
M 24	58	142	165	187	400	534
M 27	75			328		
M 30	91			445		
M 33	114			506		
M 36	135			651		
M 39	162			842		

Tab. 14c: Reference values for tightening torques for screws according to DIN EN ISO 3506

Friction coefficient µtotal 0.20	Pretensioning forces $F_{vmax.}$ [kN]			Tightening torque M_A [Nm]		
	50	70	80	50	70	80
M 3	0,6	0,65	0,95	1	1,1	1,6
M 4	1,12	2,4	3,2	1,3	2,6	3,5
M 5	1,83	3,93	5,24	2,4	5,1	6,9
M 6	2,59	5,54	7,39	4,1	8,8	11,8
M 8	4,75	10,2	13,6	10,1	21,5	28,7
M 10	7,58	16,2	21,7	20,3	44	58
M 12	11,1	23,7	31,6	34,8	74	100
M 14	15,2	32,6	43,4	56	119	159
M 16	20,9	44,9	59,8	86	183	245
M 18	26,2	56,2	74,9	122	260	346
M 20	33,8	72,4	96,5	173	370	494
M 22	41	88	118	227	488	650
M 24	47	101	135	284	608	810
M 27	61			502		
M 30	75			680		
M 33	94			779		
M 36	110			998		
M 39	133			1300		

Tab. 14d: Reference values for tightening torques for screws according to DIN EN ISO 3506

Friction coefficient µtotal 0.30	Pretensioning forces $F_{vmax.}$ [kN]			Tightening torque M_A [Nm]		
	50	70	80	50	70	80
M 3	0,4	0,45	0,7	1,25	1,35	1,85
M 4	0,9	1,94	2,59	1,5	3	4,1
M 5	1,49	3,19	4,25	2,8	6,1	8
M 6	2,09	4,49	5,98	4,8	10,4	13,9
M 8	3,85	8,85	11	11,9	25,5	33,9
M 10	6,14	13,1	17,5	24	51	69
M 12	9	19,2	25,6	41	88	117
M 14	12,3	26,4	35,2	66	141	188
M 16	17	36,4	48,6	102	218	291
M 18	21,1	45,5	60,7	144	308	411
M 20	27,4	58,7	78,3	205	439	586
M 22	34	72	96	272	582	776
M 24	39	83	110	338	724	966
M 27	50			599		
M 30	61			809		
M 33	76			929		
M 36	89			1189		
M 39	108			1553		

Tab. 14e: Reference values for tightening torques for screws according to DIN EN ISO 3506

Friction coefficient µtotal 0.30	Pretensioning forces $F_{vmax.}$ [kN]			Tightening torque M_A [Nm]		
	50	70	80	50	70	80
M 4	0,74	1,60	2,13	1,6	3,3	4,4
M 5	1,22	2,62	3,5	3,2	6,6	8,8
M 6	1,73	3,7	4,93	5,3	11,3	15,0
M 8	3,17	6,80	9,10	12,9	27,6	36,8
M 10	5,05	10,80	14,40	26,2	56,0	75,0
M 12	7,38	15,8	21,10	44,6	96,0	128,0
M 14	10,1	21,70	26,0	71,0	152,0	204,0
M 16	20,9	44,90	59,80	110	237	316
M 18	17,5	37,50	50,10	156	334	447
M 20	22,6	48,4	64,6	223	479	639
M 22	28,3			303		
M 24	32,6			385		
M 27	41,5			652		
M 30	50,3			881		
M 33	63,0			1013		
M 36	74,0			1296		
M 39	89,0			1694		

Friction coefficients μ_G and μ_K according to DIN 267 Part 11

Tab. 15: Friction coefficients µG and µK for screws made from stainless steel and anti-corrosion steel

Screw made from	Nut made from	μ_{total} When lubricated	
		No lubrication	MoS2 paste/lubricant
A 2 oder A 4	A 2 oder A 4	0,23 - 0,5	0,10 - 0,20
A 2 oder A 4	AlMgSi	0,28 - 0,35	0,08 - 0,16

Friction coefficients μ_{total} require the same friction value in the thread and under the head / nut support.

Tab. 16: Friction coefficients µG and µK for screws and nuts made from stainless steel and anti-corrosion steel

Screw made from	Nut made from	Lubricant		Resilience of connection	Friction coefficient	
		in thread	under head		in thread µG	under head µK
A 2	A 2	none	none	very high	0,26 bis 0,50	0,35 bis 0,50
		Special lubricant (chloroparaffin base)			0,12 bis 0,23	0,08 bis 0,12
		Anticorrosive grease			0,26 bis 0,45	0,25 bis 0,35
		none	none	low	0,23 bis 0,35	0,12 bis 0,16
		Special lubricant (chloroparaffin base)			0,10 bis 0,16	0,08 bis 0,12
	AlMgSi	none		very high	0,32 bis 0,43	0,08 bis 0,11
		Special lubricant (chloroparaffin base)			0,28 bis 0,35	0,08 bis 0,11

Fasteners from stainless steels tend to seize because of the high thread flank pressure as the thread moulds into the clamping part. Using a friction-reducing agent can remedy the situation. But this should be taken into account accordingly for friction values.

II. f) Magnetic properties of austenitic stainless steel

All fasteners made from austenitic stainless steels are generally non-magnetic; a certain magnetisability may occur after cold processing.
Each material, including stainless steel, is labelled by its ability to be magnetisable. In all probability only vacuums will be fully non-magnetic. The gauge for the material permeability in a magnetic field is the magnetic permeability value μr for this material in relation to a vacuum. The material has a low magnetic permeability when μr near is equal to 1.
Examples: A2: $\mu r \sim 1.8$ / A4: $\mu r \sim 1.015$ / A4L: $\mu r \sim 1.005$ / AF1: $\mu r \sim 5$

International comparison of material

Mat. no.	Short name	AISI[1]	UNS[2]	SS[3]	AFNOR[4]	BS[5]
1.4006	X12Cr13	410		2302	Z 10 C 13	410 S 21
1.4016	X6Cr17	430		2320	Z 8 C 17	430 S 17
1.4301	X5CrNi18-10	304	S 30400	2332	Z 6 CN 18.09	304 S 15
1.4303	X10CrNiS18-9	305	S 30500	x	Z5CNI 8-11FF	305 S 17/19
1.4305	X 10 CrNiS 18-9	303	S 30300	2346	Z 8 CNF 18.09	304 S 31
1.4306	X 2 CrNi 19-11	304 L	S 30403	2352	Z 2 CN 18.10	304 S 11
1.4307	X2CrNi18-9	304L	S 30403			
1.4310	X 12 CrNi 17 7	301	S 30100	2331	Z 12 CN 18.08	301 S 22
1.4567	X3CrNiCu18-9-4	304	x	x	x	x
1.4541	X6CrNiTi18-10	321				
1.4401	X5CrNiMo17-12-2	316	S 31600	2347	Z 7 CND 17.02.02	316 S 31
1.4404	X2CrNiMo17-12-2	316 L	S 31603	2353	Z 3 CND 18.14.03	316 S 11
1.4578	X3CrNiCuMo17-11-3-2	x				
1.4571	X6CrNiMoTi17-12-2	316Ti	S 31635	2350	Z 6 CNDT 17.12	320 S 31
1.4439	X2CrNiMoN17-13-5	317 LMN	S 31726	2562	Z 1 NCDU 25.20	
1.4541	X6CrNiTi 18-10	321		2337	Z 6 CNT 18-10	x
1.4362	X2CrNiN32-4	2304				
1.4462	X2CrNiMoN22-5-3	2205	S 31600	2377	(Z 5 CNDU 21.08)	
1.4539	X1NiCrMoCu25-20-5	904 L	N 08904			
1.4565	X2CrNiMnMoNbN25-18-5-4	x				
1.4529	X1NiCrMoCuN25-20-7	x	N 08926			

1 AISI = American Iron and Steel Institute
2 UNS = Unified Numbering System
3 SS = Swedish Standard
4 AFNOR = Association Francaise de Normalisation
5 BS = British Standard
ASTM = American Society for Testing and Materials

III. Corrosion resistance of A2 and A4

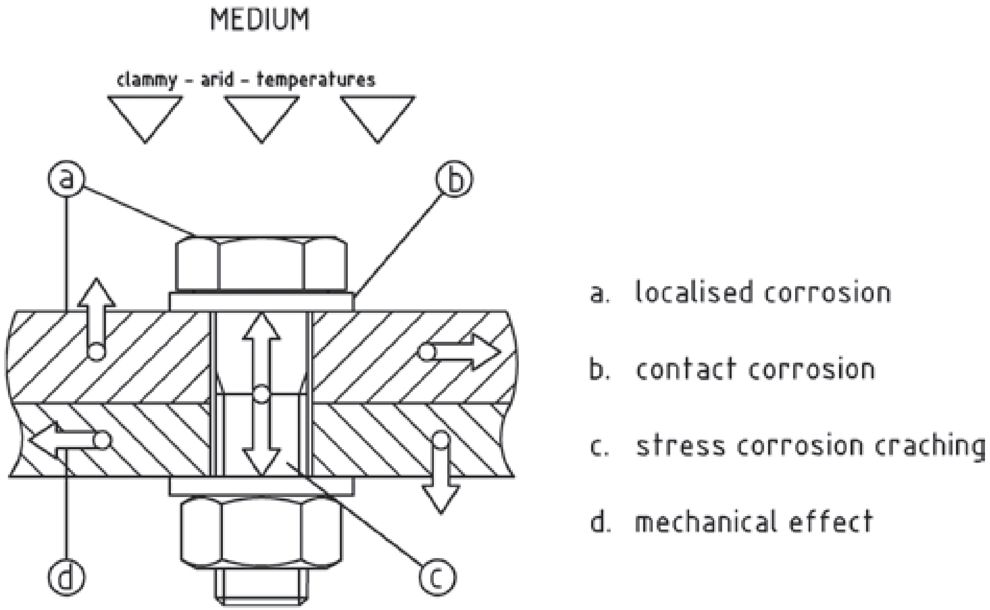
Because of their constituent parts, austenitic stainless steels such as A2 and A4 fall under the category of „active“ corrosion protection.

These high-grade stainless steels must contain at least 16 % chrome (Cr) and are resistant to oxidising corrosive agents. Increasing the Cr content and if necessary other alloy components such as nickel (Ni), molybdenum (Mo), titanium (Ti) and niobium (Nb) improves resistance to corrosion. These additives also affect the mechanical properties. Depending on use, this may have to be noted. Other alloy components are only added to improve the mechanical properties, e.g. nitrogen (N), or the chip-removing process, e.g. sulphur (S).

The fasteners may experience a certain degree of magnetisability during cold working. Austenitic stainless steels are not however generally magnetic. But the resistance to corrosion is not affected by this. The level of magnetisation produced by cold work hardening may even extend to the steel part sticking permanently to a magnet.

In practice it should be noted that a whole series of different types of corrosion may arise. The most common forms of corrosion for high-grade stainless steel are shown in the diagram below and detailed underneath:

Diagram of the most common types of corrosion in screw connections



III. a) Extraneous rust and how it forms

When particles of a carbon steel („normal steel") adhere to a stainless steel surface, this produces extraneous rust on the surface of the stainless steel which turns into rust under the action of oxygen. If these areas are not cleaned or removed, this rust can cause electro-chemical localised corrosion in austenitic stainless steel.

Extraneous rust is produced for example by:

- using tools which have previously been used with carbon steel.
- sparks when working with an angle grinder or grinding dust or during welding.
- objects that rust coming into contact with a stainless steel surface.
- water containing rust dripping onto a stainless steel surface.

III. b) Stress corrosion

Internal stresses from welding may result in stress corrosion. However stress corrosion usually occurs in components used in an industrial atmosphere which are subject to high levels of mechanical tensile and bending stress.

Austenitic steels in an atmosphere containing chlorine are particularly sensitive to stress corrosion. The influence of temperature is a major factor. 50 °C is the critical temperature.

III. c) Surface-eroding corrosion

Uniform surface corrosion, also known as eroding corrosion, describes a condition where the surface is being eroded in a uniform manner. This type of corrosion can be prevented by selecting the right material in the first place.

Factories have published resistance tables based on lab tests, which provide information on how the steel grades behave at different temperatures and in different concentrations in the individual media (see Section III f Tab.17 & 18).

III. d) Localised corrosion

Localised corrosion appears as surface corrosion with the additional formation of hollows and holes.

The passive layer is penetrated locally. When high-grade stainless steel comes into contact with an active medium containing chlorine, localised corrosion also occurs alone with pinprick notches in the material. Deposits and rust may also trigger localised corrosion. All fasteners should therefore be regularly cleaned of residue and deposits.

Austenitic steels such as A2 and A4 are more resistant to localised corrosion than ferritic chrome steels.

III. e) Contact corrosion

When two components with different compositions make metallic contact and there is dampness present in the form of an electrolyte, contact corrosion will occur. The more base element is attacked and destroyed.

Please note the following to prevent contact corrosion:

- Prevent the connection from coming into contact with an electrolytic medium.
- For example, metals should be insulated using rubber, plastic or coatings such that contact current cannot flow to the point of contact.
- Avoid pairing up different materials wherever possible. For example, screws, nuts and washers should be adapted to the components being joined.

III. f) Corrosive media in the presence of A2 and A4

Tables 17 and 18 provide an overview of the resistance of A2 and A4 in the presence of various corrosive media. This provides an optimum means of comparison. Do however note that the values stated are simply rough indications.

Tab. 17: Overview of the chemical resistance of A2 and A4

Corrosive agent	Concentration	Temperature in °C	Level of resistance	
			A 2	A 4
Acetone	all	all	A	A
Ethyl aether	-	all	A	A
Ethyl alcohol	all	20	A	A
Formic acid	10%	20 boiling	A B	A A
Ammonia	all	20 boiling	A A	A A
Any kind of benzine	-	all	A	A
Benzoic acid	all	all	A	A
Benzol	-	all	A	A
Beer	-	all	A	A
Hydrocyanic acid	-	20	A	A
Blood	-	20	A	A
Binder solution	-	98	A	A
Chlorine: dry gas damp gas	 - -	 20 alle	 A D	A D
Chloroform	all	all	A	A
Chromic acid	10% pure 50% pure	20 boiling 20 boiling	A C B D	A C B D
Developer (photogr.)	-	20	A	A
Acetic acid	10%	20 boiling	A A	A A
Fatty acid	technical	150 180 200-235	A B C	A A A
Fruit juices	-	all	A	A
Tannic acid	all	all	A	A
Glycerine	conz.	all	A	A
Industrial air	-	-	A	A
Potassium permanganate	10%	all	A	A
Lime milk	-	all	A	A
Carbon dioxide	-	-	A	A
Cupric acetate	-	all	A	A
Copper nitrate	-	-	A	A
Copper sulphate	all	all	A	A
Magnesium sulphate	approx 26%	all	A	A
Sea water	-	20	A	A
Methyl alcohol	all	all	A	A

Continuation of Tab. 17: Overview of the chemical resistance of A2 and A4

Corrosive agent	Concentration	Temperature in °C	Level of resistance	
			A 2	A 4
Lactic acid	1,5% 10%	all 20 boiling	A A C	A A A
Sodium carbonate	kalt gesättigt	all	A	A
Sodium hydroxide	20% 50%	20 boiling 120	A B C	A B C
Sodium nitrate	-	all	A	A
Sodium perchlorate	10%	all	A	A
Sodium sulphate	cold saturated	all	A	A
Fruit	-	-	A	A
Oils (mineral and vegetable)	-	all	A	A
Oxalic acid	10% 50%	20 boiling boiling	B C D	A C C
Petroleum	-	all	A	A
Phenol	pure	boiling	B	A
Phosphoric acid	10% 50% 80% conc.	boiling 20 boiling 20 boiling 20 boiling	A A C B D B D	A A B A C A D
Mercury	-	up to 50	A	A
Mercury nitrate	-	all	A	A
Salicylic acid	-	20	A	A
Nitric acid	up to 40% 50% 90%	all 20 boiling 20 boiling	A A B A C	A A B A C
Hydrochloric acid	0,2% 2% up to 10%	20 50 20 50 20	B C D D D	B B D D D
1% Sulphuric acid	up to 70 2,5% 5% 10% 60%	B boiling bis 70 boiling 20 > 70 20 70 all	A B B C B B C C D	 B A C A B B C D

Continuation of Tab. 17: Overview of the chemical resistance of A2 and A4

Corrosive agent	Concentration	Temperature in °C	Level of resistance	
			A 2	A 4
Sulphurous acid	watery solution	20	A	A
Sulphur dioxide	-	100-500 900	C D	A C
Tar	-	hot	A	A
Wine	-	20 and hot	A	A
Tartaric acid	up to 10% above 10% up to 50% 75%	20 boiling 20 boiling boiling	A B A C C	A A A C C
Lemon juice	-	20	A	A
Citric acid	up to 10% 50%	all 20 boiling	A A C	A A B
Sugar solution	-	all	A	A

Tab. 18: Subdivision of level of resistance into various groups

Level of resistance	Evaluation	Weight loss in g/m2h
A	Totally resistant	< 0,1
B	Virtually resistant	0,1 - 1,0
C	Less resistant	1,0 - 10
D	not resistant	> 10

IV. Extract from building-authority approval Z-30.3-6 from 20 April 2009 „Products, fasteners and parts made from stainless steels“

Tab. 19: Subdivision of steel grades by strength class and corrosion resistance class

Serial Nr.	Steel grade[1] Short name	Mat. no.	Structure[2]	Strength classes[3] and product shapes[4] S 235	S 275	S 355	S 460	S 690	Corrosion resistance class[5) 6)]
1	X2CrNi12	1.4003	F	B, Ba, H, P	D, H, S, W	D, S	D, S	--	I / low
2	X6Cr17	1.4016	F	D, S, W	--	--	--	--	
3	X5CrNi18-10	1.4301	A	B, Ba, D, H, P, S, W	B, Ba, D, H, P, S	B, Ba, D, H, S	Ba, D, H, S	S	
4	X2CrNi18-9	1.4307	A	B, Ba, D, H, P, S, W	B, Ba, D, H, P, S	Ba, D, H, S	Ba, D, S	S	
5	X3CrNiCu18-9-4	1.4567	A	D, S, W	D, S	D, S	D, S	--	II / moderate
6	X6CrNiTi18-10	1.4541	A	B, Ba, D, H, P, S, W	B, Ba, D H, P, S	Ba, D, H, S	Ba, D, H, S	--	
7	X2CrNiN18-7	1.4318	A	--	--	B, Ba, D, H, P, S	B, Ba, H	--	
8	X5CrNiMo17-12-2	1.4401	A	B, Ba, D, H, P, S, W	B, Ba, D, H, P, S	Ba, D, H, S	Ba, D, S	S	
9	X2CrNiMo17-12-2	1.4404	A	B, Ba, D, H, P, S, W	B, Ba, D, H, P, S	Ba, D, H, S	Ba, D, H, S	D, S	
10	X3CrNiCuMo17-11-3-2	1.4578	A	D, S, W	D, S	D, S	D, S	--	III / average
11	X6CrNiMoTi17-12-2	1.4571	A	B, Ba, D, H, P, S, W	B, Ba, D, H, P, S	Ba, D, H, S	Ba, D, H, S	D, S	
12	X2CrNHiMoN17-13-5	1.4439	A	--	B, Ba, D, H, S, W	--	--	--	
13	X2CrNiN23-4	1.4362	FA	--	--	--	B, Ba, D, S, W	D, S	
14	X2CrNiMN22-5-3	1.4462	FA	--	--	--	B, Ba, D, P, S, W	D, S	
15	X1NiCrMoCu25-20-5	1.4539	A	B, Ba, D, H, P, S, W	B, Ba, D, P, S	D, P, S	D, S	D, S	
16	X2CrNiMnMoNbN25-18-5-4	1.4565	A	--	--	--	B, Ba, D, S, W	--	IV / high
17	X1NiCrMoCuN25-20-7	1.4529	A	--	B, D, S, W	B, D, H, P, S	D, P, S	D, S	
18	X1CrNiMoCuN20-18-7	1.4547	A	--	B, Ba	B, Ba	--	--	

1) According to DIN EN 10088-1:2005-09
2) A = austenite; F = ferrite; FA = ferrite-austenite (duplex)
3) The strength classes following the lowest strength in each case are achieved through cold work hardening by means of cold working.
4) B = sheet; Ba = strip and sheets produced from it; D = wire, drawn; H = hollow profile; P = profile; S = bars; W = wire rod
5) Applies to metallically bare surfaces only. The more base of the metals is at risk in the event of potential contact corrosion.
6) For the corrosion resistance classes required, see Table 11.

Tab. 20: Material selection for atmospheric exposure

Impact	Exposure		Criteria and examples	Corrosion resistance class			
				I	II	III	IV
Dampness, annual average U of dampness	SF0	dry	U < 60%	X			
	SF1	rarely damp	60% ≤ U < 80%	X			
	SF2	frequently damp	80% ≤ U < 95%	X			
	SF3	permanently damp	95% < U		X		
Chloride content of surroundings, distance M from the sea, distance S from busy streets where road salt is used	SC0	low	Countryside, town, M > 10 km, S > 0,1 km	X			
	SC1	average	Industrial area, 10 km ≥ M > 1 km, 0,1 km ≥ S > 0,01 km		X		
	SC2	high	M ≤ 1 km S ≤ 0,01 km			X[1]	
	SC3	very high	Indoor swimming pools, road tunnel				X[2]
Pollution from redox active substances (e.g. SO_2, HOCl, Cl_2, H_2O_2)	SR0	low	Countryside, town	X			
	SR1	average	Industry			X[1]	
	SR2	high	Indoor swimming pools, road tunnel				X[2]
pH values on the surface	SH0	alkaline (e.g. contact with concrete)	9 < pH	X			
	SH1	neutral	5 < pH ≤ 9	X			
	SH2	slightly acidic (e.g. contact with wood)	3 < pH ≤ 5		X		
	SH3	acid (impact of acids)	pH ≤ 3			X	
Location of parts	SL0	inside	heated and unheated indoor rooms	X			
	SL1	outside, exposed to the rain	freestanding constructions		X[3]		
	SL2	outside, roofed	constructions with roofs		X[3]		
	SL3	outside, inaccessible[4], influx of ambient air	facades with ventilation at rear			X	
The impact which produces the highest corrosion resistance class is definitive. Higher requirements do not result from a combination of different impacts.							

[1] Regular cleaning of **accessible** construction or direct surface irrigation will significantly reduce exposure to corrosion such that the result can be reduced by one corrosion resistance class. If it is possible that the concentration of materials on the surfaces may increase, one corrosion resistance class higher should be selected.

[2] Regular cleaning of **accessible** construction can significantly reduce exposure to corrosion such that one corrosion resistance class lower is possible.

[3] If service life is limited to 20 years, reduction to corrosion resistance class I is possible if localised corrosion of 100 µm is tolerated (no visual requirements).

[4] Constructions are graded as **inaccessible** if their condition cannot be monitored or is very hard to monitor and if they can only be reconditioned at great cost in the event of fire.

Tab. 21: Steel grades for fasteners with assignment to steel groups following DIN EN ISO 3506 Parts 1 and 2 and labelling following Section 2.2.2 and maximum nominal diameter

Steel grade				resistance class1)	Labelling for screws with head based on DIN EN ISO 3506-1			Labelling for threaded rods, stud bolts, nuts and washers based on DIN EN ISO 3506-1+2		
					Strength class			Strength class		
Serial Nr.	Short name	Mat. no.	Group		50	70	80	50	70	80
3	X5CrNi18-10	1.4301	A2		≤ M 39	≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 24
4	X2CrNi18-9	1.4307	A2L	II / moderate	≤ M 39	≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 24
5	X3CrNiCu18-9-4	1.4567	A2L		≤ M 24	≤ M 16	≤ M 12	≤ M 24	≤ M 16	≤ M 12
6	X6CrNiTi18-10	1.4541	A3		≤ M 39	≤ M 20	≤ M 16	≤ M 64	≤ M 30	≤ M 24
8	X5CrNiMo17-12-2	1.4401	A4		≤ M 39	≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 24
9	X2CrNiMo17-12-2	1.4404	A4L		≤ M 39	≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 24
10	X3CrNiCuMo17-11-3-2	1.4578	A4L	III / average	≤ M 24	≤ M 16	≤ M 12	≤ M 24	≤ M 16	≤ M 12
11	X6CrNiMoTi17-12-2	1.4571	A5		≤ M 39	≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 24
12	X2CrNiMoN17-13-5	1.4439	2)		≤ M 20	--	--	≤ M 64	--	--
13	X2CrNiN32-4	1.4362	2)		--	≤ M 24	≤ M 20	--	≤ M 64	≤ M 20
14	X2CrNiMoN22-5-3	1.4462	2)		--	≤ M 24	≤ M 20	--	≤ M 64	≤ M 20
15	X1NiCrMoCu25-20-5	1.4539	2) 3)	IV / high	≤ M 39	≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 20
16	X2CrNiMnMoNbN25-18-5-4	1.4565	2) 3)		--	≤ M 24	≤ M 20	--	≤ M 64	≤ M 30
17	X1NiCrMoCuN25-20-7	1.4529	2) 3)			≤ M 24	≤ M 20	≤ M 64	≤ M 45	≤ M 45

1) According to Table 10
2) Since there are no standard definitions at present, these steels should be labelled with the material number.
3) Appendix 7 of the general building-authority approval Z-30-3.6 from 20 April 2009 applies to fasteners in indoor swimming pool atmospheres. See Table 10.

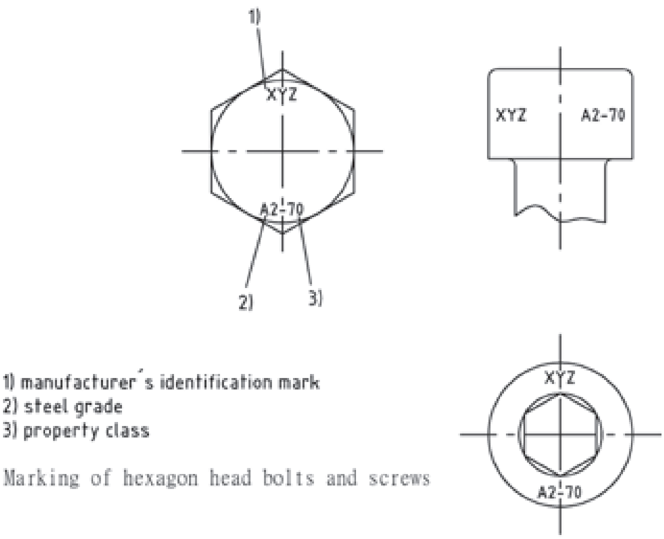
V. Marking of stainless screws and nuts

The marking of stainless screws and nuts must contain the steel group, strength class and manufacturer‘s sign.

Marking of screws according to DIN ISO 3506-1

Hexagonal screws and socket cap screws with hexagonal socket as of an M5 nominal diameter should be clearly marked according the marking system. Where at all possible, the marking should be placed on the screw head.

Fig. C: Extract from DIN EN ISO 3506-1



Marking of nuts according to DIN EN ISO 3506-2

Nuts with a thread nominal diameter as of 5 mm should be clearly marked according the following marking system. Marking on just one bearing surface is permitted and may only be used if recessed. Marking on the spanner flats is also possible.

Fig. D: Extract from DIN EN ISO 3506-2