

# COMPARISON OF STEELS ACC. TO DIFFERENT STANDARDS

A comparison of steels according to different national standards has to be considered with caution. Very often there are differences in the definition of e.g. chemical analysis, mechanical properties, heat treatment. Therefore this comparison is only to be considered as a help for orientation.

In the European standard the yield strength is indicated by the main number in [MPa] of the letter codes. All values mentioned below are the specified values of the European standard for plate thickness ≤ 16 mm.

Flat products made of steels for pressure purposes							Mechanical properties and letter codes acc. Europ. Standard						
Non-alloy steels with specified elevated temperature properties							R <sub>PL2</sub> yield point values at elevated temperatures:						
EN 10028-2	DIN 17155	ASTM	NF A36-205 NF A36-206	BS 1501 P. 1	UNI 5907	Mater. No	Tensile strength [MPa]	Steel grade	100 °C	200 °C	300 °C	400 °C	500 °C
P235GH	HI	A285Gr.A; A515Gr.55; Gr.60; A516Gr.55.	A37AP, CP	151-360; 161-360; 164-360	FeE235	1.0345	360-480	P235GH	190	170	130	110	
P265GH	HI	A285Gr.B; A515Gr.60; A516Gr.60; A662Gr.A	A42AP, CP	151-400; 161-400; 164-400	Fe410KG, KW, KT	1.0425	410-530	P265GH	215	195	155	130	
P295GH	17Mn4	A515Gr.70; A516Gr.70; A662Gr.B	A48AP, CP	224-460	FeE295	1.0481	460-580	P295GH	250	225	185	155	
P355GH	19Mn6	A299; A455; A515Gr.70; A516Gr.70; A612	A52AP, CP	224-490	FeE355-2	1.0473	510-650	P355GH	290	255	215	180	
16Mo3	15Mo3	A204Gr.A, Gr.B, Gr.C	15D3	243B		1.5415	440-590	16Mo3		215	170	150	140
13CrMo4-5	13CrMo4-4	A387Gr.11, Gr.12	15CD4-05	620; 621		1.7335		13CrMo4-5		230	205	180	165
10CrMo9-10	10CrMo9-10	A387Gr.22	10CD9-10	622/515		1.7380	480-630	10CrMo9-10		245	220	200	180
11CrMo9-10		A387Gr.22		622/690		1.7383	520-670	11CrMo9-10			235	215	195
Weldable fine-grain steels, normalized							Tensile strength [MPa]	P = pressure vessel steel N = normalized H = high operating temperature L = low operating temperature					
EN 10028-3	DIN 17102	ASTM	NF A36-207	BS 1501 P. 1	UNI 5907	Mater. No		390-510	R <sub>PL2</sub> yield point values at elevated temperatures:				
P275N	StE285	A516Gr.60; A662Gr.A		224-400A	FeE285KG, KW	1.0486	490-630		Steel grade	100 °C	150 °C	200 °C	300 °C
P275NH	WStE285	A516Gr.60		224-400B	FeE285KG, KW	1.0487		P275NH	245	226	196	147	108
P275NL1	TStE285	A516Gr.60; A529; A662Gr.A		224-400A	FeE285KT	1.0488	570-730	P355NH	304	284	245	216	167
P275NL2	EstE285			224-400A		1.1104		P460NH	402	373	333	294	235
P355N	StE355	A516Gr.70; A737Gr.B; A738Gr.A, Gr.C	A510AP	225-490A	FeE355KG, KW	1.0562	Impact energy:						
P355NH	WStE355		A510AP	225-490B	FeE355-2, FeE355KG, KW	1.0565	Steel grade	transverse	longitudinal				
P355NL1	TStE355	A299	A510FP	225-490A	FeE355-3, FeE355KT	1.0566	P...NH	T [°C]	K <sub>v</sub> [J]	T [°C]	K <sub>v</sub> [J]		
P355NL2	EstE355			225-490A	FeE355-3	1.1106	P...NL1	-20	27	-40	34		
P460N	StE460	A612; A737Gr.C	A590AP		FeE460KG, KW	1.8905	P...NL2	-50	27	-50	30		
P460NH	WStE460	A612	A590AP		FeE460KG, KW	1.8935							
P460NL1	TStE460	A612; A737Gr.C	A590FP		FeE460KT	1.8915							
P460NL2	EstE460					1.8918							
Nickel alloy steels with specified low temperature properties							Tensile strength [MPa]	Impact energy:					
EN 10028-4	DIN 17280	ASTM	NF A36-208	BS	UNI	Mater. No		Yield strength [MPa]	T [°C]	transverse	longitudinal		
11MnNi5-3	11MnNi5-3		0.5Ni285			1.6212	490-640	-80	27	40			
13MnNi6-3	13MnNi6-3		10N2-355			1.6217	640-610	-60	27	40			
15NiMn6	14NiMn6		15Ni6-355			1.6228	490-610	-60	27	40			
12Ni14	10Ni14	A203Gr.D, Gr.E, Gr.F	3.5Ni355	503		1.5637	490-640	-100	27	40			
12Ni19	12Ni19		5Ni			1.5680	530-710	-120	27	40			
X7NiMo6	X7NiMo6		9Ni585			1.6349	680-820	-170	27	40			
X8Ni9	X8Ni9	A353; A553Type1	9Ni490	510		1.5662	640-840	-196	27	40			
X7Ni9				510		1.5663	680-820	-196	80	100			
Weldable fine grain steels, quenched and tempered							Tensile strength [MPa]	Impact energy transverse:					
EN 10028-6	DIN	ASTM	NF	BS	UNI	Mater. No		T [°C]/K [J]	-60	-40	-20	0	+20
P355QH						1.8866	490-630	P...QH			27	40	60
P355QH						1.8867		P...QL1			27	40	60
P355QL1						1.8868	550-720	P...QL2			27	40	60
P355QL2						1.8869		P690QH	645	615	595	575	570
P460Q		A537Cl.2, Cl.3				1.8870	590-770	Impact energy transverse:					
P460QH						1.8871		T [°C]/K [J]	-60	-40	-20	0	+20
P460QL1						1.8872	770-940	P...QH			27	40	60
P460QL2						1.8864		P...QL1			27	40	60
P500Q						1.8873	770-940	P...QL2			27	40	60
P500QH						1.8874		P...QL2			27	40	60
P500QL1						1.8875							
P500QL2						1.8865							
P690Q		A517Gr.B, Gr.F, Gr.H, Gr.Q				1.8879							
P690QH						1.8880							
P690QL1						1.8881							
P690QL2						1.8888							

**Flat products made of steels for structural purposes**

**Hot rolled products of non-alloy steels**

EN 10025	DIN 17100	ASTM	NF A35-501	BS 4360	UNI 7070	Mater. No	Tensile strength [MPa]
S185	St33		A33	15HR, HS	Fe320	1.0035	290-510
S235JR	St37-2	A36; A283Gr.C	E24-2	40B	Fe360B	1.0037	340-470
S235JRG2	RS1 37-2			40B		1.0038	
S235J0	St37-3U		E24-3	40C	Fe360C	1.0114	
S235J2G3	St37-3N	A284Gr.C, Gr.D; A573Gr.65	E24-4	40D	Fe360D	1.0116	
S235J2G4			E24-4			1.0117	410-560
S275JR	St44-2	A283Gr.D	E28-2	43B	Fe430B	1.0044	
S275J0	St44-3U	A572Gr.r42	E28-3	43C	Fe430C	1.0143	
S275J2G3	St44-3N	A572Gr.42; A573Gr.70	E28-4	43D	Fe430D	1.0144	
S275J2G4			E28-4			1.0145	490-630
S355JR			E36-2	50B	Fe510B	1.0045	
S355J0	St52-3U	A572Gr.50	E36-3	50C	Fe510C	1.0553	
S355J2G3	St52-3N	A572Gr.50		50D	Fe510D	1.0570	
S355J2G4						1.0577	470-610
S355K2G3			E36-4	50DD	Fe510DD	1.0595	
S355K2G4						1.0596	
E295	St50-2		A50-2		Fe490	1.0050	
E335	St60-2		A60-2		Fe590	1.0060	570-710
E360	St70-2		A70-2		Fe690	1.0070	670-830

S = structural steel  
E = steel for engineering purpose

**Impact energy longitudinal:**

T [°C]	27 J	40 J
+20	JR	KR
0	J0	K0
-20	J2	K2
-40	J4	K4

G2 = unkilned not permitted supply condition as chosen by the manufacturer, unless otherwise agreed

G3 = killed with nitrogen fixing agents supply condition normalized or normalizing rolled

G4 = killed with nitrogen fixing agents supply condition as chosen by the manufacturer

**Structural steels with improved atmospheric corrosion resistance**

EN 10155	SEW 087	ASME	NF A35-502	BS 4360	UNI	Mater. No	Tensile strength [MPa]
S235J0W			E24W-3			1.8958	340-470
S235J2W	WTS137-3		E24W-4			1.8961	
S355J0W			E36W-B3	WR50B		1.8959	490-630
S355J2G1W	WTS152-3	A588Gr.A, Gr.B, Gr.C, Gr.K	E36W-B4	WR50C		1.8965	
S355K2G1W						1.8967	

W = weather resistant

G1 = supply condition normalized or normalizing rolled

**Hot-rolled products in weldable fine grain structural steels, normalized**

EN 10113-2	DIN 17102	ASTM	NF A36-201	BS 4360	UNI	Mater. No	Tensile strength [MPa]
S275N	StE285	A662Gr.A			FeE275KGN	1.0490	370-510
S275NL	TStE285	A662Gr.A		40EE	FeE275KTN	1.0491	
S355N	StE355	A588; A662Gr.B; A633D	E355R		FeE355KGN	1.0545	470-630
S355NL	TStE355	A662Gr.B; A633Gr.D	E355FP	50EE	FeE355KTN	1.0546	
S420N	StE420	A537; A633Gr.E; A737Gr.C	E420R			1.8902	520-680
S420NL	TStE420	A633Gr.E; A737Gr.C	E420FP			1.8912	
S460N	StE460	A572Gr.65; A633Gr.E	E460R		FE460KGN	1.8901	550-720
S460NL	TStE460	A633Gr.E	E460FP	55EE	FeE460KTN	1.8903	

N = normalized  
L = low operating temperature

**Impact energy:**

Kv [J]	transverse		longitudinal	
	N	NL	N	NL
T [°C]				
+20	31	40	55	63
0	27	34	47	55
-20	20	27	40	47
-40		20		31

**Hot-rolled products in weldable fine grain structural steels, thermomechanically rolled**

EN 10113-3	SEW 083 (EN 10113-3)	ASTM	NF	BS	UNI	Mater. No	Tensile strength [MPa]
S275M					FeE275KGNM	1.8818	360-510
S275ML					FeE275KTNM	1.8819	
S355M	BStE355TM				FeE355KGNM	1.8823	450-610
S355ML	BStE355TM				FeE355KTNM	1.8834	
S420M	BStE420TM					1.8825	500-660
S420ML	BStE420TM					1.8836	
S460M	BStE460TM				FeE460KGNM	1.8827	530-720
S460ML	BStE460TM				FeE460KTNM	1.8838	

N = normalized  
M = thermomechanically rolled

**Impact energy:**

Kv [J]	transverse		longitudinal	
	M	ML	M	ML
T [°C]				
+20	31	40	55	63
0	27	34	47	55
-20	20	27	40	47
-40		20		31

**Plates made of high yield strength structural steel in the quenched and tempered condition**

EN 10137-2	SEW 090	ASTM	NF A36-204	BS 4360	UNI	Mater. No	Tensile strength [MPa]
S460Q	StE460V		E460T-II			1.8908	550-720
S460QL	TStE460V			55 F		1.8906	
S460QL1	ESiE460V					1.8916	
S500Q	StE500V		E500T-II			1.8924	590-770
S500QL	TStE500V					1.8909	
S500QL1	ESiE500V					1.8984	
S690Q	StE690V	A514Gr.B, Gr.F, Gr.H, Gr.Q, Gr.S	E690T-II			1.8931	770-940
S690QL	TStE690V					1.8928	
S690QL1	ESiE960V					1.8988	
S960Q	StE960V		E960T-II			1.8941	980-1150
S960QL	TStE960V					1.8933	

Q = quenched and tempered  
L = low operating temperature

**Impact energy:**

Kv [J]	transverse			
	0	-20	-40	-60
T [°C]				
S...Q	30	27	0	0
S...QL	35	30	27	0
S...QL1	40	35	30	27
Kv [J] longitudinal				
T [°C]				
S...Q	40	30	0	0
S...QL	50	40	30	0
S...QL1	60	50	40	30