

Technical Specifications

Chemical Composition - Stainless Steels

	Steel designations for ordering		Chemical composition, average %							National steel designations superseded by EN			
	EN	ASTM	C	N	Cr	Ni	Mo	Others	BS	DIN	NF	SS	
WET CORROSION AND GENERAL SERVICE	Ferritic	1.4016	430	0.04	-	16.5	-	-	-	430S17	1.4016	Z8 C17	2320
		1.4510	S43035	0.04	-	18	-	-	Ti	-	1.4510	Z4 CT17	-
		1.4521	444	0.02	0.02	17.8	-	2.1	Ti	-	1.4521	Z3 CDT 18-02	2326
	Mart.	1.4021	420	0.20	-	13	-	-	-	420S29	1.4021	Z20 C13	2303
		1.4028	420	0.30	-	12.5	-	-	-	420S45	1.4028	Z33 C13	2304
		1.4418	-	0.03	0.04	16	5	1	-	-	1.4418	Z6 CND 16-05-01	2387
	Duplex	1.4362	S32304	0.02	0.10	23	4.8	0.3	-	-	1.4362	Z3 CN 23-04 Az	2327
		1.4460	329	0.02	0.09	25.2	5.6	1.4	-	-	1.4460	Z5 CND 27-05 Az	2324
		1.4462	S32205*	0.02	0.17	22	5.7	3.1	-	318S13	1.4462	Z3 CND 22-05 Az	2377
		1.4410	S32750	0.02	0.27	25	7	4	-	-	-	Z3 CND 25-06 Az	2328
	Austenitic	1.4310	301	0.10	0.03	17	7	-	-	301S21	1.4310	Z11 CN 18-08	2331
		1.4318	301LN	0.02	0.15	17	7	-	-	-	-	Z3 CN 18-07 Az	-
		1.4372	201	0.05	0.15	17	5	-	6.5Mn	-	-	Z12 CMN 17-07 Az	-
		1.4307	304L	0.02	0.06	18.1	8.3	-	-	304S11	-	Z3 CN 18-10	2352
		1.4301	304	0.04	0.05	18.1	8.3	-	-	304S31	1.4301	Z7 CN 18-09	2333
		1.4311	304LN	0.02	0.14	18.2	8.7	-	-	304S61	1.4311	Z3 CN 18-10 Az	2371
		1.4541	321	0.04	0.01	17.3	9.1	-	Ti	321S31	1.4541	Z6 CNT 18-10	2337
		1.4305	303	0.05	0.06	17.3	8.2	-	S	303S31	1.4305	Z8 CNF 18-09	2346
		1.4306	304L	0.02	0.04	18.2	10.1	-	-	304S11	1.4306	Z3 CN 18-10	2352
		1.4303	305	0.02	0.02	17.7	11.2	-	-	305S19	1.4303	Z1 CN 18-12	-
1.4567		S30430	0.01	0.02	17.7	9.7	-	3.3Cu	-	1.4567	Z3 CNU 18-09 FF	-	
1.4404		316L	0.02	0.04	17.2	10.2	2.1	-	316S11	1.4404	Z3 CND 17-11-02	2348	
1.4401		316	0.02	0.04	17.2	10.2	2.1	-	316S31	1.4401	Z7 CND 17-11-02	2347	
1.4406		316LN	0.02	0.14	17.2	10.3	2.1	-	316S61	1.4406	Z3 CND 17-11 Az	-	
1.4571		316Ti	0.04	0.01	16.8	10.9	2.1	Ti	320S31	1.4571	Z6 CNDT 17-12	2350	
1.4432		316L	0.02	0.05	16.9	10.7	2.6	-	316S13	-	Z3 CND 17-12-03	2353	
1.4436		316	0.02	0.05	16.9	10.7	2.6	-	316S33	1.4436	Z7 CND 18-12-03	2343	
1.4435	316L	0.02	0.06	17.3	12.6	2.6	-	316S13	1.4435	Z3 CND 18-14-03	2353		
1.4429	S31653	0.02	0.14	17.3	12.5	2.6	-	316S63	1.4429	Z3 CND 17-12 Az	2375		
1.4438	317L	0.02	0.07	18.2	13.7	3.1	-	317S12	1.4438	Z3 CND 19-15-04	2367		
1.4439	317LMN	0.02	0.14	17.8	12.7	4.1	-	-	1.4439	Z3 CND 18-14-05 Az	-		
HEAT AND CREEP	Austenitic	1.4539	904L	0.01	0.06	20	25	4.3	1.5Cu	904S13	1.4539	Z2 NCDU 25-20	2562
		1.4547	S31254	0.01	0.20	20	18	6.1	Cu	-	-	-	2378
		1.4652	S32654	0.01	0.50	24	22	7.3	3.5Mn, Cu	-	-	-	-
		1.4948	304H	0.05	0.06	18.1	8.3	-	-	304S51	1.4948	Z6 CN 18-09	2333
		1.4878	321H	0.05	0.01	17.3	9.1	-	Ti	321S51	1.4878	Z6 CNT 18-10	2337
		1.4818	S30415	0.05	0.15	18.5	9.5	-	1.3Si, Ce	-	-	-	2372
		1.4833	309S	0.06	0.08	22.3	12.6	-	-	309S16	1.4833	Z15 CN 24-13	-
		1.4828	-	0.04	0.04	20	12	-	2Si	-	1.4828	Z17 CNS 20-12	-
		1.4835	S30815	0.09	0.17	21	11	-	1.6Si, Ce	-	-	-	2368
		1.4845	310S	0.05	0.04	25	20	-	-	310S16	1.4845	Z8 CN 25-20	2361
1.4854	S35315	0.05	0.17	25	35	-	1.3Si, Ce	-	-	-	-		

Boiler and Pressure Vessel -

Comparisons and Equivalents

BOILER & PRESSURE VESSEL - COMPARISONS AND EQUIVALENTS

EQUIVALENT SPECIFICATIONS & STANDARDS				MECHANICAL VALUES		CHEMICAL COMPOSITION MAXIMUM (unless stated)													
B5	EN	ASTM / ASME	DIN	Tensile N / mm2	Yield / min N / mm2	C	Si	Mn	P	S	Al	Cr	Cu	Ni	Mo	Nb	Ti	V	
161-360A/B	P235GH	A 285 GR C	H 1	360 / 480	235	0.16	0.35	0.40/1.20	0.030	0.025	0.020	0.30	0.30	0.30	0.08	0.01	0.03	0.02	
161-430A/B	P265GH	A 516 - 60	H 11	410 / 530	265	0.20	0.40	0.50/1.40	0.030	0.025	0.020	0.30	0.30	0.30	0.08	0.01	0.03	0.02	
224-400A/B	P275N/NH			390 / 510	275	0.18	0.40	0.50/1.40	0.030	0.025	0.020	0.30	0.30	0.50	0.08	0.05	0.03	0.05	
224-460A/B	P295GH	A 516 - 65	17 MN 4	460 / 580	295	0.08/0.20	0.40	0.90/1.50	0.030	0.025	0.020	0.30	0.30	0.30	0.08	0.01	0.03	0.02	
224-490A/B	P355GH	A 516 - 70		510 / 650	355	0.10/0.22	0.60	1.00/1.70	0.030	0.025	0.020	0.30	0.30	0.30	0.08	0.01	0.03	0.02	
225-490A/B	P355N/NH		19 MN 6	490 / 630	355	0.20	0.50	0.90/1.70	0.030	0.025	0.020	0.30	0.30	0.50	0.08	0.05	0.03	0.10	
243	16 MO3	A 204 GR A	15 MO 3	440 / 590	275	0.12/0.20	0.35	0.40/0.90	0.030	0.025		0.30	0.30	0.30	0.25/0.35				
620 B	13CRMO45	A 387-12-2	13CRMO44	450 / 600	300	0.08/0.18	0.35	0.40/1.00	0.030	0.025		0.70/1.15	0.30		0.40/0.60				
621 B		A 387-11-2		515 / 690	340	0.09/0.17	0.50/0.80	0.40/0.65	0.025	0.015	0.020	1.00/1.50	0.30	0.30	0.45/0.60				
622-515B	10/11CRMO910	A387-22-2	10CRMO910	520 / 630	310	0.08/0.14	0.50	0.40/0.80	0.030	0.025		2.00/2.50	0.30		0.90/1.10				

Diameter and Nominal wall Thickness Schedule Pipes

Nominal Pipe Inch	Outside Diameter mm	Diameter & Nominal Wall Thickness Schedule - Pipes																	Nominal Pipe Inch
		5S	10S	10	20	30	40S	STD Wgt	40	60	80S	XS	80	100	120	140	160	XXS	
1/2	21.34	1.65	2.11				2.77	2.77	2.77		3.73	3.73	3.73				4.77	7.47	1/2
3/4	26.67	1.65	2.11				2.87	2.87	2.87		3.91	3.91	3.91				5.56	7.85	3/4
1	33.40	1.65	2.77				3.38	3.38	3.38		4.55	4.55	4.55				6.35	9.09	1
1 1/4	42.16	1.65	2.77				3.56	3.56	3.56		4.85	4.85	4.85				6.35	9.7	1 1/4
1 1/2	48.26	1.65	2.77				3.68	3.68	3.68		5.08	5.08	5.08				7.14	10.16	1 1/2
2	60.32	1.65	2.77				3.91	3.91	3.91		5.54	5.54	5.54				8.74	11.07	2
2 1/2	73.02	2.11	3.05				5.16	5.16	5.16		7.01	7.01	7.01				9.52	14.02	2 1/2
3	88.90	2.11	3.05				5.49	5.49	5.49		7.62	7.62	7.62				11.12	15.24	3
3 1/2	101.60	2.11	3.05				5.74	5.74	5.74		8.08	8.08	8.08						3 1/2
4	114.30	2.11	3.05				6.02	6.02	6.02		8.56	8.56	8.56		11.12		13.49	17.12	4
5	141.30	2.77	3.40				6.55	6.55	6.55		9.52	9.52	9.52		12.70		15.87	19.05	5
6	168.27	2.77	3.40				7.11	7.11	7.11		10.97	10.97	10.97		14.27		18.26	21.95	6
8	219.07	2.77	3.76		6.35	7.04	8.18	8.18	8.18	10.31	12.70	12.70	12.70	15.08	18.26	20.63	23.01	22.22	8
10	273.05	3.40	4.19		6.35	7.80	9.27	9.27	9.27	12.70	12.70	12.70	15.08	18.26	21.44	25.40	28.57	25.40	10
12	323.85	3.96	4.57		6.35	8.38	9.52	9.52	10.31	14.27	12.70	12.70	17.47	21.44	25.40	28.57	33.32	25.40	12
14	355.60	3.96	4.77	6.35	7.92	9.52		9.52	11.12	15.09		12.70	19.05	23.82	27.79	31.75	35.71		14
16	406.40	4.19	4.77	6.35	7.92	9.52		9.52	12.70	16.66		12.70	21.44	26.19	30.96	36.53	40.49		16
18	457.20	4.19	4.77	6.35	7.92	11.12		9.52	14.27	19.05		12.70	23.82	29.36	34.92	39.67	45.24		18
20	508.00	4.77	5.54	6.35	9.52	12.70		9.52	15.08	20.62		12.70	26.19	32.54	38.10	44.45	50.01		20
22	558.80	4.77	5.54	6.35	9.52	12.70		9.52	15.87	22.22		12.70	28.57	34.92	41.27	47.62	53.97		22
24	609.60	5.54	6.35	6.35	9.52	14.27		9.52	17.47	24.61		12.70	30.96	28.89	46.02	52.37	59.54		24
26	660.40			7.92	12.70			9.52				12.70							26
28	711.20			7.92	12.70	15.87		9.52											28
30	762.00	6.35		7.92	12.70	15.87		9.52				12.70							30
32	812.80			7.92	12.70	15.87		9.52	17.47			12.70							32
34	863.60			7.92	12.70	15.87		9.52	17.47			12.70							34
36	914.40			7.92	12.70	15.87		9.52	19.05			12.70							36

Chemical & Mechanical Properties BS 7191

BS 7191: 1989
Section 6Specific Requirements for the Chemical Composition and mechanical
Properties of weldable structural steel seamless tubulars

Grade	Chemical Composition												
	C Max	Si %	Mn %	S Max	P Max	Cr Max	Mo Max	Nb %	V %	Ti Max	Ni Max	Cu Max	Al (Total) Max
275D	0.18	0.10/0.50	1.50 max	0.040	0.040	-	-	-	-	-	-	-	-
275E	0.16	0.10/0.50	1.50 max	0.040	0.040	-	-	-	-	-	-	-	-
355D (3)	0.18 (4)	0.10/0.50	1.50 Max (4)	0.040	0.040	-	-	0.003/0.10	0.003/0.10	-	-	-	-
355EM (5)	0.18	0.25/0.55	1.60 Max	0.015	0.025	0.25	0.08	0.04 Max	0.08 Max	0.02	0.30	0.35	0.06 (6)
450EM (5)	0.18	0.25/0.55	1.00/1.65	0.015	0.025	0.30	0.25	0.03 Max	0.08 Max	0.04	0.65	0.30	0.06 (6)

(1) The chemical compositions apply to the following

(a) Ladle only in the case of grades 275D, 275E and 355D

(b) Ladle and products in the case of grades 355EM and 450EM

(2) For alternative supply conditions see clause 6

(3) Steels may be supplied with no niobium or vanadium. If grain refining elements other than aluminium, niobium or vanadium are used, the manufacturer shall inform the purchaser at the time of enquiry and order

(4) For each reduction of 0.01% carbon below the specified value an increase of 0.06% manganese above the specified value is permitted

(5) The carbon and manganese content may be varied (Ladle analysis) for grades 355D on the basis of 0.06% manganese content for each decrease of 0.01% carbon or vice versa up to a maximum manganese content of 1.80% and a maximum carbon content of 0.20%

(6) The levels of residual elements arsenic, tin, lead, bismuth and calcium shall not exceed 0.005% Ca, 0.010% for Sn and 0.02% for As. Boron (B) shall not exceed 0.0005%

These elements shall be reported as ladle analysis only and shall be checked once every 5000t at manufacturing location

(7) The soluble aluminium to nitrogen ratio shall be a minimum of 2:1. Soluble aluminium content is defined as 0.005% less than the total aluminium content

Mechanical Properties for seamless tubulars (Figures in parenthesis refer to the notes following this table)

Tensile Strength Rm (1)	Minimum Yield Strength, Re for thickness (in mm)	Over 16 up to and including 16	Over 20 up to and including 40	200mm (4)	5.65'So	Temp	Energy Min Value	Thickness	Grade
Nmm ² (2)	Nmm ² (2)	Nmm ² (2)	Nmm ² (2)	%	%	°C	J	mm	
430/580	275	265	-	20	22	-20	40	20	275D
430/580	275	265	265	20	22	-40	40	40	275E
490/640	275	345	345	18	22	-40	40	40	355D
490/620	355	345	-	18	20	-20	50	20	355EM
550/700	450	430	415	17	19	-40	50	150	450EM
(1) Up to and including 9mm thick 16% for grades 275D and 275E and 15% for grades 355D, 355EM and 450EM									
(2) 1 Nmm ² = 1 MPa									

Chemical & Mechanical Properties BS 7191

BS 7191: 1989
Section 5Specific Requirements for the Chemical Composition and mechanical
Properties of weldable structural steel sections

Grade	Chemical Composition																	Normal Supply Condition
	C Max	Si	Mn	S Max	P Max	Cr Max	Mo Max	Nb	V	Ti Max	Ni Max	Cu Max	Ai (Total) Max	N Max	Cr+Mo+ Ni+Cu Max	Nb+V Max	Nb+V+ Ti Max	
275D	% 0.18	% 0.50 Max	% 1.50	% 0.050	% 0.050	% -	% -	% -	% -	% -	% -	% -	% -	% -	% -	% -	% -	As rolled
275E	0.16	0.10/0.50	1.50	0.040	0.040	-	-	-	-	-	-	-	-	-	-	-	-	As rolled or Normalised
275EZ	0.16	0.10/0.50	1.50	0.008	0.025	-	-	-	-	-	-	-	-	-	-	-	-	As rolled or Normalised
355D (3)	0.18 (4/5)	0.10/0.50	1.50 (5)	0.040	0.040	-	-	0.003/0.10	0.003/0.10	-	-	-	-	-	-	0.10	-	As rolled
355EM (6)	0.18	0.25/0.55	1.60	0.015	0.025	0.25	0.08	0.04 Max	0.08 Max	0.02	0.30	0.35	0.06 (7)	0.014 (7)	0.80	0.10	0.12	As rolled or Normalised
355EMZ (6)	0.18	0.25/0.55	1.60	0.008	0.025	0.25	0.08	0.04 Max	0.08 Max	0.02	0.30	0.35	0.06 (7)	0.014 (7)	0.80	0.10	0.12	As rolled or Normalised

(1) The chemical compositions apply to the following

(a) Ladle only in the case of grades 275D, 275E, 275EZ, and 355D

(b) Ladle and products in the case of grades 355EM and 355EMZ

(2) For alternative supply conditions see clause 6

(3) Steels may be supplied with no niobium or vanadium. If grain refining elements other than aluminium, niobium or vanadium are used, the manufacturer shall inform the purchaser at the time of enquiry and order

(4) For grades 355D and over 16mm thick a maximum carbon content of 0.20% for ladle is permitted

(5) The carbon and manganese content may be varied (Ladle analysis) for grades 355D on the basis of 0.06% manganese content for each decrease of 0.01% carbon or vice versa up to a maximum manganese content of 1.60% and a maximum carbon content of 0.20%

(6) The levels of residual elements arsenic, tin, lead, bismuth and calcium shall not exceed 0.005% Ca, 0.010% for Sn and 0.02% for As. Boron (B) shall not exceed 0.0005%

These elements shall be reported as ladle analysis only and shall be checked once every 5000t at manufacturing location

(7) The soluble aluminium to nitrogen ratio shall be a minimum of 2:1. Soluble aluminium content is defined as 0.005% less than the total aluminium content

Mechanical Properties for sections (Figures in parenthesis refer to the notes following this table)

Tensile Strength Rm (1)	Minimum Yield Strength, Re for thickness (in mm)				Temp °C	Energy Min Value J	Thickness mm	Grade
	Up to and including 16	Over 16 up to and including 20	Over 20 up to and including 40	Over 40				
Nmm ² (2)	Nmm ² (2)	Nmm ² (2)	Nmm ² (2)	Nmm ² (2)	-20 -40 -40 -40	40 40 40 40	20 40 40 40	275D 275E 275EZ
430/580	275	265	-	22				
430/580	275	265	265	22				
430/580	275	265	265	22				
490/640	355	345	-	20	-20 -40 -40	50 50 50	20 150 150	355D 355EM 355EMZ
490/620	355	345	345	20				
490/620	355	345	345	20				

(1) Up to and including 9mm thick: 16% for grades 275D, 275E and 275EZ and 15% for grades 355D, 355EM and 355EMZ

(2) 1 Nmm² = 1 MPa

Chemical Properties BS 7191

Specific Requirements for the Chemical Composition and mechanical Properties of weldable structural steel plate

BS 7191: 1989
Section 4

General.

Grade	Chemical Composition																	Normal Supply Condition
	C Max	Si	Mn	S Max	P Max	Cr Max	Mo Max	Nb	V	Ti Max	Ni Max	Cu Max	Al (Total) Max	N Max	Cr+Mo+Ni+Cu Max	Nb+V Max	Nb+V+Ti Max	
275D	0.16	0.50 Max	1.50 Max	0.040	0.040	-	-	0.003/0.10	0.003/0.10	-	-	-	-	-	-	0.10	-	Normalized
275E	0.16	0.10/0.50	1.50 Max	0.030	0.040	-	-	-	-	-	-	-	-	-	-	-	-	Normalized
275EZ	0.16	0.10/0.50	1.50 Max	0.008	0.025	-	-	-	-	-	-	-	-	-	-	-	-	Normalized
355D (3/5)	0.18 (4)	0.10/0.50	1.50 Max (5)	0.040	0.040	-	-	0.003/0.10	0.003/0.10	-	-	-	-	-	-	0.10	-	Normalized
355D (3/5)	0.18 (4)	0.10/0.50	1.50 Max (5)	0.030	0.040	-	-	0.003/0.10	0.003/0.10	-	-	-	-	-	-	0.15	-	Normalized
355EM (6)	0.15	0.25/0.55	1.00/1.65	0.015	0.025	0.25	0.08	0.04 Max	0.015 Max	0.02	0.45	0.30	0.055 (7)	0.010 (7)	0.80	-	-	Normalized
355EMZ (6)	0.15	0.25/0.55	1.00/1.65	0.008	0.025	0.25	0.08	0.04 Max	0.015 Max	0.02	0.45	0.30	0.055 (7)	0.010 (7)	0.80	-	-	Normalized
450EM (6)	0.16	0.25/0.60	1.00/1.65	0.015	0.025	0.30	0.25	0.03 Max	0.08 Max	0.02	0.65	0.30	0.055 (7)	0.010 (7)	0.80	0.10	0.12	Quenched & Tempered
450EMZ (6)	0.16	0.25/0.60	1.00/1.65	0.008	0.025	0.30	0.25	0.03 Max	0.08 Max	0.02	0.65	0.30	0.055 (7)	0.010 (7)	0.80	0.10	0.12	Quenched & Tempered

- (1) The chemical compositions apply to the following
- (a) Ladle only in the case of grades 275D, 275E, 275EZ, 355D, 355E
- (b) Ladle and products in the case of grades 355EM, 355EMZ, 450EM, 450EMZ
- (2) For alternative supply conditions see clause 6
- (3) Steels may be supplied with no niobium or vanadium. If grain refining elements other than aluminium, niobium or vanadium are used, the manufacturer shall inform the purchaser at the time of enquiry and order
- (4) For grades 355D and 355E over 16mm thick a maximum carbon content of 0.20% for ladle is permitted
- (5) The carbon and manganese content may be varied (Ladle analysis) for grades 355D and 355E on the basis of 0.06% manganese content for each decrease of 0.01% carbon or vice versa up to a maximum manganese content of 1.60% and a maximum carbon content of 0.20%
- (6) The levels of residual elements arsenic, tin, lead, bismuth and calcium shall not exceed 0.005% Ca, 0.010% for Sn and 0.02% for As. Boron (B) shall not exceed 0.0005%
These elements shall be reported as ladle analysis only and shall be checked once every 5000t at manufacturing location
- (7) The soluble aluminium to nitrogen ratio shall be a minimum of 2:1. Soluble aluminium content is defined as 0.005% less than the total aluminium content

Mechanical Properties BS 7191

Specific Requirements for the Chemical Composition and mechanical Properties of weldable structural steel plate

BS 7191: 1989
Section 4

Mechanical Properties for plates (Figures in parenthesis refer to the notes following this table)													
Tensile Strength Rm (1)	Minimum Yield Strength, Re for thickness (in mm)							Minimum elongation, A on gauge length of (1)			Min Average Charpy V notch Impact test Value (2)		
	Up to and Including 16	Over 16 up to and Including 20	Over 20 up to and Including 40	Over 40 up to and Including 63	Over 63 up to and Including 100	Over 100 up to and Including 120	Over 120 up to and Including 150	80mm (3)	200mm (4)	5.65'So	Temp	Energy Min Value	Thickness
	Nmm ² (5)	Nmm ² (5)	Nmm ² (5)	Nmm ² (5)	Nmm ² (5)	Nmm ² (5)	Nmm ² (5)	%	%	%	°C	J	mm
430/580	275	265	-	-	-	-	-	23	20	22	-20	40	20
430/580	275	265	265	-	-	-	-	23	20	22	-40	40	40
430/580	275	265	265	-	-	-	-	23	20	22	-40	40	40
490/640	355	345	-	-	-	-	-	20	18	20	-20	50	20
490/640	355	345	345	-	-	-	-	20	18	20	-40	50	40
490/620	355	345	345	340	325	315	305	20	18	20	-40	50	150
490/620	355	345	345	340	325	315	305	20	18	20	-40	50	150
	Up to and Including 16	Over 16 up to and Including 25	Over 25 up to and Including 75										
550/700	450	430	415	-	-	-	-	19	17	19	-40	60	75
550/700	450	430	415	-	-	-	-	19	17	19	-40	60	75

- (1) Charpy tensile strength and elongation values apply to the maximum thickness for which the minimum yield strength values are specified
- (2) For the Charpy V-notch test, mid thickness tests are also required when thickness is over 40mm. In the case of piling material, the mid thickness impacts will be carried out at -30°C instead of -40°C
- (3) Up to and including 9mm thick: 17% for grades 275D, 275E, and 275EZ and 16% for grades 355D, 355E, 355EM, 355EMZ, 450EM and 450EMZ
- (4) Up to and including 9mm thick: 16% for grades 275D, 275E, and 275EZ and 15% for grades 355D, 355E, 355EM, 355EMZ, 450EM and 450EMZ
- (5) 1 Nmm² = 1 MPa

Comparison of EN10025 & BS4360

BS EN 10025: 1993								BS4360: 1986					
Grade	Former Grade	Tensile Strength >3mm <100mm N/mm ²	Min Yield Strength at 16mm N/mm ²	Max Thk for Specified Yield N/mm ²	Impact Energy (J°C)			Grade	Tensile Strength >3mm N/mm ²	Min Yield Strength at 16mm N/mm ²	Max Thk for Specified Yield N/mm ² (2)	Impact Energy (J°C)	
					Nominal Thickness							Nominal Thickness	
					Temp °C	<150mm (1)	>150mm <250mm (1)					Temp °C	<100mm (3)
S185 (4)	Fe 310-0 (4)	290/510	185	25	-	-	-	-	-	-	-	-	-
S235 (5)	Fe 360A (5)	340/470	235	250	-	-	-	40A	340/500	235	150	-	-
S235JR (4)	Fe 360B (4)	340/470	235	25	+20	27	-	-	-	-	-	-	-
S235JRG1 (4)	Fe 360B(FU) (4)	340/470	235	25	+20 (6)	27	-	-	-	-	-	-	-
S235JRG2	Fe 360B(FN)	340/470	235	250	+20 (6)	27	23	40B	340/500	235	150	+20 (6)	27
S235JO	Fe 360C	340/470	235	250	0	27	23	40C	340/500	235	150	0	27
S235J2G3	Fe 360D1	340/470	235	250	-20	27	23	40D	340/500	235	150	-20	27
S235J2G4	Fe 360D2	340/470	235	250	-20	27	23	40D	340/500	235	150	-20	27
S275 (5)	Fe 430A (5)	410/560	275	250	-	-	-	43A	430/580	275	150	-	-
S275JR	Fe 430B	410/560	275	250	+20 (6)	27	23	43B	430/580	275	150	+20 (6)	27
S275JO	Fe 430C	410/560	275	250	0	27	23	43C	430/580	275	150	0	27
S275J2G3	Fe 430D1	410/560	275	250	-20	27	23	43D	430/580	275	150	-20	27
S275J2G4	Fe 430D2	410/560	275	250	-20	27	23	43D	430/580	275	150	-20	27
S355 (5)	Fe 510A (5)	490/630	355	250	-	-	-	50A	490/640	355	150	-	-
S355JR	Fe 510B	490/630	355	250	+20 (6)	27	23	50B	490/640	355	150	+20 (6)	27
S355JO	Fe 510C	490/630	355	250	0	27	23	50C	490/640	355	150	0	27
S355J2G3	Fe 510D1	490/630	355	250	-20	27	23	50D	490/640	355	150	-20	27
S355J2G4	Fe 510D2	490/630	355	250	-20	27	23	50D	490/640	355	150	-20	27
S355K2G3	Fe 510DD1	490/630	355	250	-20	40	33	50DD	490/640	355	150	-30	27
S355K2G4	Fe 510DD2	490/630	355	250	-20	40	33	50DD	490/640	355	150	-30	27
E295	Fe490-2	470/610	295	250	-	-	-	-	-	-	-	-	-
E355	Fe 590-2	570/710	335	250	-	-	-	-	-	-	-	-	-
E360	Fe 690-2	670/830	360	250	-	-	-	-	-	-	-	-	-

Comparison Between Grades in BS EN 10 025: 1993 and BS 4360: 1986

- (1) For sections up to and including 100mm only
 (2) For wide flats and Sections up to and including 63mm and 100mm respectively
 (3) For wide flats up to and including 50mm and for sections no limit is stated
 (4) Only available up to and including 25mm thick
 (5) The Steel grades S235 (Fe 360A), S275 (Fe 430A), and S355 (Fe 510A) appear only in the English language version (BS EN 10025) as non conflicting additions and do not appear in European versions
 (6) Verification of the specified impact value is only carried out when agreed at time of enquiry and order

UK & International Equivalent Grades

Designation		Equivalent Former Designations in													
EN 10025: 1993 Designation		According EN 10025: 1990	Germany Din 17100	France NFA 35-501	UK BS4360	Spain	Italy	Belgium	Sweden	Portugal	Austria	Norway NS12101	USA ASTM	USA API	Japan JIS G3101/6
Steel Name	Steel Number														
S185	1.0035	Fe 310-0	St 33	A33		A3 10-0	Fe 320	A320	13 00-00	Fe 310-00	St 320				
S235JR	1.0037	Fe 360B	St 37-2	E24-2			Fe 360B	AE 235-B	13 11-00	Fe 360-B		NS 12 120	A283 GrC		SM41A SM41B
S235JRG1	1.0036	Fe 360BFU	U St 37-2		40B	AE 235 B-FU					U St 360 B	NS 12 122	A283 GrD		
S235JRG2	1.0038	Fe 360BFN	R St 37-2		40C	AE 235 B-FN			13 12-00		R St 360 B	NS 12 123			
S235JO	1.0114	Fe 360C	St 37-3U	E 24-3		AE 235 D	Fe 360C	Ae 235-C		Fe 360-C	St 360 C	St 430 B			
											St 360CE	NS 12 142			
S235J2G3	1.0116	S Fe 360 D1	St 37-3N	E 24-4	40D		Fe 360D	AE 236-D		Fe 360-D	St 360D	NS 12 124			
S234J2G4	1.0117	Fe 360 D2													
S275JR	1.0044	Fe 430B	ST 44-2	E 28-2	43B	AE 275 B	Fe 430 B	AE 255-B	14 12-00	Fe 430 B	ST 430 B	NS 12-142	A573 Gr65		SS400
S275JO	1.0143	Fe 430C	ST 44-3U	E 28-3	43C	AE 275 C	Fe 430 C	AE 255-C		Fe 430 C	ST 430 C	NS 12-143			
S275J2G3	1.0144	Fe 430D1	ST 430 D1	E 28-4	43D	AE 275 D	Fe 430 D	AE 255-D	14 14-00	Fe 430 D	ST 430 CE	NS 12-143	A633 GrA	2H Gr42	
S275J2G4	1.0145	Fe430D2							14 14-01		ST 430 D				
S355JR	1.0045	Fe 510 B	ST 52-3U	E 36-2	50B	AE 355B	Fe 310B	AE 355B		Fe 510-B			A572Gr50		SS490
S355JO	1.0553	Fe 510 C	ST 52-3N	E 36-3	50C	AE 355C	Fe 310C	AE 355C		Fe 510-C	St 510C	NS 12 153	A709Gr50	2H Gr 50	
S355J2G3	1.0570	Fe 510 D1			50D	AE 355D	Fe 310D	AE 355D		Fe 510-D	St 510D	NS 12 153	A678 Gr50	2W/YGr50	
S355J2G4	1.0577	Fe 510 D2													
S355K2G3	1.0595	Fe 510 DD1		E36-4	50DD			AE355DD		Fe 510DD			A633GrD		
S355K2G4	1.0596	Fe 510 DD2			50DD										
E 295	1.0050	Fe 490-2	ST 50-2	A 50-2		A 490	Fe 480	A 490-2	15 50-00 15 50-01	Fe 490-2	St490				
E355	Fe 590-2	St 590-2	St 60-2	A 60-2		A590	Fe 580	A590-2	16 50-00 16 50-01	Fe 590-2	St 590				
E 360	1.0070	Fe 690-2	St 70-2	A 70-2		A690	Fe 650	A690-2	16 55-00 16 55-01	Fe 690-2	St 690				