Structural steel

The good welding properties and guaranteed strength of hot-rolled structural steel make it suitable for many applications.

Typical applications

- transport
- chassis parts
- yellow goods
- building and construction
- tubes and pipes
- sections and warehouse shelving
- simple pressure vessels

Standards

Hot-rolled structural steel complies with European standard EN 10025 : 1993 shown in table 26 below. Weldable fine-grained structural steels are also available as shown in European standards EN 10113-2 : 1993 and EN 10113-3 : 1993 in tables 27 and 28 on page 18. Former national standards and nearest related grades are also shown in these tables. When ordering qualities EN 10025 : 1993 suitable for cold forming, add the letter “C” to the end of the grade, e.g. S355J0C. Corus does not supply steel with increased copper content.

Mechanical properties

The values shown for strength and elongation in tables 29-31 on pages 18 and 19 are for test pieces taken transverse to the rolling direction; those for the impact test are for test pieces taken in the rolling direction.

Chemical composition

Structural steel meets the requirements of the cast analysis in the standards, as shown in tables 32-34 on pages 19 and 20.

Dimensions

The width and thickness limits are shown in tables 35 and 36 on pages 20 and 21.

Table 26: Standards

European	National			
EN 10025 : 1993	**UK**	**Germany**	**France**	**Italy**
Grade	BS 4360 1986-R.U.	DIN 17100 1987-1	NFA 35-501 1987-4	UNI 7070
S185	–	St 33	A 33	Fe 320
S235	40 A	–	–	–
S235JR	40 B	St 37-2	E 24-2	Fe360B
S235J0	40 C	St 37-3U	E 24-3	Fe360C
S235J2G3	40 D	St 37-3N	E 24-4	Fe360D
S235J2G4	–	–	–	–
S275	43 A	–	–	–
S275JR	43 B	St 44-2	E 28-2	Fe430B
S275J0	43 C	St 44-3U	E 28-3	Fe430C
S275J2G3	43 D	St 44-3N	E 28-4	Fe430D
S275J2G4	–	–	–	–
S355	50 A	–	–	–
S355JR	50 B	St 52-3	E 36-2	Fe510B
S355J0	50 C	St 52-3U	E 36-3	Fe510C
S355J2G3	50 D	St 52-3N	–	Fe510D
S355J2G4	–	–	–	–
S355K2G3	50 DD	–	E 36-4	–
S355K2G4	–	–	–	–

Table 27: Standards: Weldable fine-grained structural steel

European	National			
EN 10113-2 : 1993	**UK**	**Germany**	**France**	**Italy**
Grade		DIN 17102	NFA 36-201	UNI 7382
S275N	–	StE285	–	FeE285KGN
S355N	–	StE355	E 355 R	FeE355KGN

Table 28: Standards: Weldable fine-grained structural steel

European	National	
EN 10113-3 : 1993	**Germany**	**Italy**
Grade	SEW 083	UNI 7382
S355M	StE355TM	FeE355KGTM
S420M	StE420TM	–
S460M	StE460TM	FeE460KGTM

Table 29: Mechanical properties: EN 10025 : 1993

Grade	R_{eL} (N/mm²)		R_m (N/mm²)		A (%)				Impact test	
	Min		Min-Max		Min					
					$L_0 = 80mm$			$L_0 = 5.65\sqrt{S_0}$	Temp	Min energy
	t≤16	16<t≤20	t≤3	3<t≤20	1.5<t≤2	2<t≤2.5	2.5<t<3	3≤t≤20	°C	J
S185	185	175	310-540	290-510	10	11	12	16	–	–
S235	235	225	360-510	340-470	17	18	19	24	–	–
S235JR	235	225	360-510	340-470	17	18	19	24	20	27
S235J0	235	225	360-510	340-470	17	18	19	24	0	27
S235J2G3/G4	235	225	360-510	340-470	17	18	19	24	-20	27
S275	275	265	430-580	410-560	14	15	16	20	–	–
S275JR	275	265	430-580	410-560	14	15	16	20	20	27
S275J0	275	265	430-580	410-560	14	15	16	20	0	27
S275J2G3/G4	275	265	430-580	410-560	14	15	16	20	-20	27
S355	355	345	510-680	490-630	14	15	16	20	–	–
S355JR	355	345	510-680	490-630	14	15	16	20	20	27
S355J0	355	345	510-680	490-630	14	15	16	20	0	27
S355J2G3/G4	355	345	510-680	490-630	14	15	16	20	-20	27
S355K2G3/G4	355	345	510-680	490-630	14	15	16	20	-20	40

Notes:

1. Material thickness, t, is in millimetres.
2. The impact properties of quality JR products are verified only when specified at the time of enquiry or order.
3. Impact strengths apply to thicknesses ≥6mm and are for standard test pieces only.

Table 30: Mechanical properties: EN 10113-2 : 1993

Grade	R_{eL} (N/mm²)		R_m (N/mm²)	A (%)	Impact test	
	Min		Min-max	Min		
				$L_0 = 5.65\sqrt{S_0}$	Temp	Min energy
	t≤16	16<t≤20	t≤20	3≤t≤20	°C	J
S275N	275	265	370-510	24	-20	40
S355N	355	345	470-630	22	-20	40

Note: Material thickness, t, is in millimetres.

Table 31: Mechanical properties: EN 10113-3 : 1993

Grade	R_{eL} (N/mm²)		R_m (N/mm²)	A (%)	Impact test	
	Min		Min-max	Min		
				$L_0 = 5.65\sqrt{S_0}$	Temp	Min energy
	t≤16	16<t≤20	t≤20	3≤t≤20	°C	J
S355M	355	345	450-610	22	-20	40
S420M	420	400	500-660	19	-20	40
S460M	460	440	530-720	17	-20	40

Note: Material thickness, t, is in millimetres.

Table 32: Chemical composition: EN 10025 : 1993

Grade	C	Mn	P	S	Si	N[1, 2]	Nb	V
	Max	Max	Max	Max	Max	Max	Min-max	Min-max
S185	–	–	–	–	–	–	–	–
S235	0.22	1.60	0.050	0.050	0.50	–	–	–
S235JR	0.17	1.40	0.045	0.045	–	0.009	–	–
S235J0	0.17	1.40	0.040	0.040	–	0.009	–	–
S235J2G3/G4	0.17	1.40	0.035	0.035	–	–	–	–
S275	0.25	1.60	0.050	0.050	0.50	–	–	–
S275JR	0.21	1.50	0.045	0.045	–	0.009	–	–
S275J0	0.18	1.50	0.040	0.040	–	0.009	–	–
S275J2G3/G4	0.18	1.50	0.035	0.035	–	–	–	–
S355	0.23	1.60	0.050	0.050	0.50	–	0.003-0.10	0.003-0.10
S355JR	0.24	1.60	0.045	0.045	0.55	0.009	–	–
S355J0	0.20	1.60	0.040	0.040	0.55	0.009	–	–
S355J2G3/G4	0.20	1.60	0.035	0.035	0.55	–	–	–
S355K2G3/G4	0.20	1.60	0.035	0.035	0.55	–	–	–

Notes:

1. It is permissible to exceed the specified values provided that for each increase of 0.001% nitrogen the phosphorus maximum content will be reduced by 0.005%; the nitrogen content of the ladle analysis, however, shall not be more than 0.012%.
2. The maximum value for nitrogen does not apply if the chemical composition shows a minimum total aluminium content of 0.020% or if sufficient other nitrogen-binding elements are present. The nitrogen-binding elements shall be mentioned in the inspection document.
3. Values are in weight percentages.

Table 33: Chemical composition: EN 10113-2 : 1993

Grade	C	Mn	P	S	Si	N
	Max	Min-max	Max	Max	Max	Max
S275N	0.18	0.50-1.40	0.035	0.030	0.400	0.015
S355N	0.20	0.90-1.65	0.035	0.030	0.500	0.015

Note: Values are in weight percentages.

Table 34: Chemical composition: EN 10113-3 : 1993

Grade	C	Mn	P	S	Si	N
	Max	Max	Max	Max	Max	Max
S355M	0.14	1.60	0.035	0.030	0.500	0.015
S420M	0.16	1.70	0.035	0.030	0.500	0.020
S460M	0.16	1.70	0.035	0.030	0.600	0.025

Note: Values are in weight percentages.

Table 35: Dimensions: Mill finish

Thickness		Width						
		Min	Max					
>	≤		S185	S235	S275	S355	S420M	S460M
1.47	1.49	700	1300	1300	–	–	–	–
1.49	1.50	700	1320	1320	1170	–	–	–
1.50	1.53	700	1330	1330	1250	1100	1100	–
1.53	1.57	700	1352	1352	1250	1100	1100	–
1.57	1.60	700	1382	1382	1250	1117	1100	–
1.60	1.70	700	1405	1425	1425	1250	1250	–
1.70	1.80	700	1480	1480	1425	1255	1250	910
1.80	2.00	700	1555	1555	1442	1330	1250	1030
2.00	2.20	700	1705	1705	1592	1480	1300	1180
2.20	2.40	700	1819	1819	1730	1607	1401	1300
2.40	2.60	700	1924	1924	1806	1734	1523	1420
2.60	2.70	700	2028	2028	1882	1789	1646	1540
2.70	2.80	700	2070	2070	1920	1816	1707	1600
2.80	3.00	700	2070	2070	1958	1844	1722	1660
3.00	3.20	700	2070	2070	2034	1900	1754	1716
3.20	3.50	700	2070	2070	2070	1955	1785	1744
3.50	3.65	700	2070	2070	2070	2038	1833	1786
3.65	4.00	700	2070	2070	2070	2070	1856	1807
4.00	4.40	700	2070	2070	2070	2070	1856	1785
4.40	5.00	700	2070	2070	2070	2070	2070	1840
5.00	5.60	700	2070	2070	2070	2070	2070	1923
5.60	6.00	700	2070	2070	2070	2070	2070	2005
6.00	12.70	700	2070	2070	2070	2070	2070	2070
12.70	20.00	700	2070	2070	2070	2070	–	–

Note: Dimensions are in millimetres.

Table 36: Dimensions: Pickled

Thickness		Width						
		Min	Max					
>	≤		S185	S235	S275	S355	S420M	S460M
1.50	1.53	735	1330	1330	1250	1100	1100	–
1.53	1.57	735	1352	1352	1250	1100	1100	–
1.57	1.60	735	1382	1382	1250	1117	1100	–
1.60	1.70	735	1405	1405	1425	1250	1250	–
1.70	1.80	735	1480	1480	1425	1255	1250	910
1.80	2.00	735	1555	1555	1442	1330	1250	1030
2.00	2.20	735	1705	1705	1592	1480	1300	1180
2.20	2.40	735	1819	1819	1730	1607	1401	1300
2.40	2.60	735	1924	1924	1806	1734	1523	1420
2.60	2.70	735	2028	2028	1882	1789	1646	1540
2.70	2.80	735	2070	2070	1920	1816	1707	1600
2.80	3.00	735	2070	2070	1958	1844	1722	1660
3.00	3.20	735	2070	2070	2034	1900	1754	1716
3.20	3.47	735	2070	2070	2070	1955	1785	1744
3.47	3.65	735	2070	2070	2070	1972	1833	1786
3.65	4.00	735	2070	2070	2070	1800	1800	1800
4.00	4.40	735	2070	2070	2070	1636	1636	1636
4.40	4.83	735	2070	2070	2070	1550	1490	1490
4.83	5.00	735	2000	2000	2000	1550	1440	1440
5.00	5.25	750	1904	1904	1904	1371	1371	1371
5.25	5.50	750	1818	1818	1818	1309	1309	1309
5.50	5.80	750	1724	1724	1724	–	–	–
5.80	6.00	750	1574	1574	1574	–	–	–

Note: Dimensions are in millimetres.