

Hot finished structural hollow section according to DIN EN 10210

Material Data Sheet

Steel designation:	Name	Material No.
	S235JRH	1.0039
	S275J0H	1.0149
	S355J0H	1.0547
	S355J2H	1.0576

Scope

This data sheet applies for hot finished structural hollow sections of non-alloyed steel.

Application

This steel is standard for general metal, civil engineering and bridge engineering as well as for water engineering, vehicle construction and mechanical engineering.

Chemical composition (Heat analysis in %)

Steel grade	Material number	Type of deoxidation ¹⁾	C for product thickness in mm		Si	Mn	P	S	N ²⁾³⁾
			≤ 40	> 40 ≤ 120					
S235JRH	1.0039	FN	0,17	0,20	-	≤ 1,40	≤ 0,040	≤ 0,040	≤ 0,009
S275J0H	1.0149		0,20	0,22	-	≤ 1,50	≤ 0,035	≤ 0,035	≤ 0,009
S355J0H	1.0547		0,22	0,22	≤ 0,55	≤ 1,60	≤ 0,035	≤ 0,035	≤ 0,009
S355J2H	1.0576	FF	0,22	0,22	≤ 0,55	≤ 1,60	≤ 0,030	≤ 0,030	-

¹⁾ FN = Rimmed steel not permitted.

FF = Fully killed steel containing nitrogen binding elements in amounts sufficient to bind available nitrogen (e. g. min. 0,020 % total Al or 0,015 % soluble Al).

²⁾ It is permissible to exceed the specific values provided that for each increase of 0,001 % N the P max. content is also reduced by 0,005 %. The N content of the cat analysis, however, shall not be more than 0,012 %.

³⁾ The maximum value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 % with a minimum Al/N ratio of 2:1, or if sufficient other N-binding elements are present. The N-binding elements shall be recorded in the Inspection Document.

Steel grade	Material number	Carbon equivalent in %, max. for nominal thickness in mm			
		≤ 16	> 16 - ≤ 40	> 40 - ≤ 65	> 65 - ≤ 120
S235JRH	1.0039	0,37	0,39	0,41	0,44
S275J0H	1.0149	0,41	0,43	0,45	0,48
S355J0H	1.0547	0,45	0,47	0,50	0,53
S355J2H	1.0576	0,45	0,47	0,50	0,53

For determination of the carbon equivalent the following formula should be applied:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

Mechanical properties at room temperature

Steel grade	Yield strength R_{eH} N/mm ²						Tensile strength R_m N/mm ²			Elongation A ¹⁾²⁾ min. in %				Impact energy KV ³⁾ J min. at a temperature °C of		
	Nominal wall thickness in mm						Nominal wall thickness in mm			Nominal thickness in mm						
(Material No.)	≤ 16	> 16 ≤ 40	> 40 ≤ 63	> 63 ≤ 80	> 80 ≤ 100	> 100 ≤ 120	< 3	≥ 3 ≤ 100	> 100 ≤ 120	≤ 40	> 40 ≤ 63	> 63 ≤ 100	> 100 ≤ 120	-20	0	+20
S235JRH (1.0039)	235	225	215	215	215	195	360 - 510	360 - 510	350 - 500	26	25	24	22	-	-	27
S275J0H (1.0149)	275	265	255	245	235	225	430 - 580	410 - 560	400 - 540	23	22	21	19	-	27	-
S355J0H (1.0547)	355	345	335	325	315	295	510	470	450	22	21	20	18	-	27	-
S355J2H (1.0576)							680	630	600					27	-	-

¹⁾ Longitudinal values. Transverse values are 2 % below.

²⁾ For thicknesses < 3 mm see DIN EN 10210-1:2006, 9.2.2

³⁾ For sections with a nominal thickness > 100 mm the values are to be agreed. If test pieces with a width lower than 10 mm are applied, the mentioned minimum values have to be decreased proportional corresponding to the cross-section of the test piece. With nominal thicknesses < 6 mm no impact test are required.

Reference data for some physical properties

Density at 20°C Kg/dm ³	Modulus elasticity kN/mm ² at				Thermal conductivity at 20 °C W/m K	spec. thermal capacity at 20 °C J/kg K	spec. electrical resistivity at 20 °C Ω mm ² /m
	20 °C	100 °C	200 °C	300 °C			
7,85	210	205	197	190	54	461	0,15

Linear coefficient 10⁻⁶ K⁻¹ of thermal expansion between 20 °C and

100 °C	200 °C	300 °C
11,1	12,1	12,9

Hot forming / Heat treatment (for guidance only)

Hot Forming		Heat Treatment		
Temperature °C	Cooling Type	Normalizing ¹⁾	Stress relieving anneal ²⁾	Cooling Type
700 - 750	Air	850 - 950 °C	580 - 630 °C	Air

¹⁾ Normalizing: Holding time 1 minute per mm plate thickness, minimum 30 minutes

²⁾ Stress relieving anneal: Holding time 1-2 minutes per mm plate thickness, minimum 30 minutes

Processing / Welding

Standard welding processes for these steel grades are:

TIG– welding

Arc welding (E)

MAG– welding massive wire

Submerged arc welding (SAW)

MAG– welding cored wire

For these steel grades as filler metal the following electrodes and welding wires are recommended:

Process	Filler metal	
TIG	Union I 52	
MAG solid wire	Union K 52 Union K56	
MAG cored wire	Union MV 70 Union BA 70 (Union RV 71)	
Arc welding (E)	Phoenix 120K Phoenix Special D	
SAW	Wire	Powder
	Union S 2 (Union S 2)	UV 400 (UV 306)

These steels can be welded within all thickness ranges according to the afore mentioned welding processes considering the general rules of technology by hand and automatically welding.

The mentioned filler metals apply for highest demands. The details in brackets are for lower demands.

Burning, preheating, welding and stress relieving annealing should occur under consideration of Stahl-Eisen-Material bulletin 088.

Specifications and standards concerning stress relieving anneal have to be observed.

Remark

The material is magnetizable.

References

ThyssenKrupp
DIN EN 10210-1:2006-07