

**Cold formed welded structural hollow sections acc. to DIN EN 10219**

**Material Data Sheet**

Steel designation:	Name	Material No.
	<b>S235JRH</b>	<b>1.0039</b>
	<b>S275J0H</b>	<b>1.0149</b>
	<b>S355J0H</b>	<b>1.0547</b>
	<b>S355J2H</b>	<b>1.0576</b>

**Scope**

This data sheet applies for cold formed welded structural hollow sections of non-alloy 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 for product thicknesses ≤ 40 mm (Heat analysis in %)**

Steel grade	Material number	Type of deoxidation <sup>1)</sup>	C	Si	Mn	P	S	N <sup>2)</sup>
S235JRH	1.0039	FF	≤ 0,17	-	≤ 1,40	≤ 0,040	≤ 0,040	≤ 0,009
S275J0H	1.0149		≤ 0,20	-	≤ 1,50	≤ 0,035	≤ 0,035	≤ 0,009
S355J0H	1.0547		≤ 0,22	≤ 0,55	≤ 1,60	≤ 0,035	≤ 0,035	≤ 0,009
S355J2H	1.0576		≤ 0,22	≤ 0,55	≤ 1,60	≤ 0,030	≤ 0,030	

<sup>1)</sup> 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).

<sup>2)</sup> 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 wall thickness ≤ 40 mm
S235JRH	1.0039	0,35
S275J0H	1.0149	0,40
S355J0H	1.0547	0,45
S355J2H	1.0576	0,45

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	Material number	Yield strength R <sub>eH</sub> N/mm <sup>2</sup> min.		Tensile strength R <sub>m</sub> N/mm <sup>2</sup>		Elongation A <sup>4)</sup> % min.  for nominal wall thickness in mm	Impact energy KV <sup>5)</sup> J min.  at a temperature °C of		
		for nominal wall thickness in mm ≤ 16	> 16 ≤ 40	for nominal wall thickness in mm < 3	≥ 3 ≤ 40		-20	0	+20
S235JRH <sup>1)</sup>	1.0039	235	225	360 - 510	360 - 510	24 <sup>2)</sup>	-	-	27
S275J0H <sup>1)</sup>	1.0149	275	265	430 - 580	410 - 560	20 <sup>3)</sup>	-	27	-
S355J0H	1.547	355	345	510 - 680	470 - 630	20 <sup>3)</sup>	-	27	-
S355J2H	1.0576						27	-	-

<sup>1)</sup> The impact test has to be proved only if option 1.3 is determined.

<sup>2)</sup> For wall thicknesses > 3 mm and section sizes  $D/T < 15$  (circular) and  $(B+H)/2T \times 12,5$  (square or rectangular) the minimum elongation is reduced by 2. For wall thicknesses ≤ 3 mm the minimum value for elongation is 17 %.

<sup>3)</sup> For section sizes  $D/T < 15$  (circular) and  $(B+H)/2T \times 12,5$  (square or rectangular) the minimum elongations is reduces by 2.

<sup>4)</sup> For wall thickness below 3 mm see DIN EN 10219-1, 9.2.2.

<sup>5)</sup> For impact tests with test pieces with reduced cross-section see DIN EN 10219-1, 6.7.2.

**Reference data for some physical properties**

Density at 20°C  Kg/dm <sup>3</sup>	Modulus of elasticity kN/mm <sup>2</sup> 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 <sup>2</sup> /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 <sup>1)</sup>	Stress relieving anneal <sup>2)</sup>	Cooling Type
700 - 750	Air	850 - 950 °C	580 - 630 °C	Air

<sup>1)</sup> Normalizing: Holding time 1 minute per mm plate thickness, minimum 30 minutes

<sup>2)</sup> 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
- MAG– welding massive wire
- MAG– welding cored wire
- Arc welding (E)
- Submerged arc welding (SAW)

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.

**Editor**

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**References**

DIN EN 10219-1:2006-07 Beuth Verlag GmbH, Postfach, D-10772 Berlin  
 STAHL-EISEN-Bulletin 088 Verlag Stahleisen GmbH, Postfach 10 51 64, D-40042 Düsseldorf  
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**Important Hint**

Information given in this data sheet about property or applicability of materials respective products are no assurance of characteristics but serve for description.

Information, with which we like to advise you, relate to the experience of the producers and our own. Warranty for the results of the treatment and application of the products cannot be granted.