

COLD BENT STEEL PRODUCT

COLD BENT STEEL SECTIONS ARE PRODUCED FROM SLIT COILS BY CONTINUOUS ROLLER BENDING, USING SECTION-SHAPED PAIRS OF ROLLS MOUNTED INTO STANDS BEHIND EACH OTHER. HOLLOW SECTIONS ARE PRODUCED BY WELDING THE TWO EDGES OF THE STRIP BENT TO A ROUND SECTION TO EACH OTHER BY HIGH-FREQUENCY INDUCTION WELDING. THE OUTER WELDING SEAM IS PLANED-OFF AND THEN THE SECTION IS CALIBRATED TO THE REQUIRED SHAPE AND DIMENSION. THE CUT-TO-LENGTH PROCESS IS PERFORMED BY SAWING-DISC.



LIBERTY

STEEL GRADES

The base material of cold bent steel sections is generally cold or hot rolled steel strip with specified tensile strength of at least 235 MPa.

Mostly applied steel grades	Relevant standards	
	Standard No.	Designation
S235JR	EN 10025-2	Hot rolled products of structural steels Part 2: Technical delivery conditions for non-alloy structural steels
E235	EN 10305-3	Steel tubes for precision applications Technical delivery conditions Part 3: Welded cold sized tubes
	EN 10305-5	Steel tubes for precision applications Technical delivery conditions Part 5: Welded cold sized square and rectangular tubes
S235JRH	EN 10219-1	Cold formed welded structural hollow sections of non-alloy and fine grain steels Part 1: Technical delivery conditions

MAIN PARAMETERS

STEEL SECTION DIMENSIONS

Hollow sections	Wall thickness; s (mm)	Overall dimensions of sections (mm)	Length; l (m)
Round	1.0 – 4.6	16 – 133	5 – 12
Square	1.0 – 4.6	15×15 – 100×100	5 – 12
Rectangular	1.0 – 4.6	20×10 – 150×60	5 – 12

Open sections	Wall thickness; s (mm)	Overall dimensions of sections (mm)	Length; l (m)
U	1.5 – 6.0	20×20 – 250×80	5 – 12
L	2.0 – 5.0	30×30 – 140×140	5 – 12
L	2.0 – 4.0	40×20 – 180×100	5 – 12
C	2.0 – 5.0	40×40 – 200×75	5 – 12
Z	2.0 – 4.0	50×25 – 180×60	5 – 12

Dimensional limits of sections cut to precise lengths

Outside dimension of section (mm)		With burring	Without burring
Outside diameter of round hollow steel section (mm)	min.	ø16	ø16
	max.	ø80	ø95
Outside diameter of square hollow steel section (b × b) (mm)	min.	15×15	15×15
	max.	60×60	80×80
Outside diameter of rectangular hollow steel section (h × b) (mm)	min.	20×10*	20×10
	max.	50×30*	90×70
Wall thickness		According to the assortment	

* The base side cannot be longer than twice the height.

Dimensional limits of the precise length: with burring 300 – 4 500 mm
without burring 300 – 4 500 mm

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TECHNICAL REQUIREMENTS

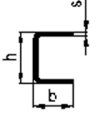




Product group		General technical requirements	Tolerances, dimensions and sectional properties
Open steel sections	For general purpose and for steel structures	The relevant standards are defined in EN 10162 point 5.1.	EN 10162 and according to this product catalogue or by agreement.
	For special purpose	Based on agreement	
Hollow steel sections	For general purpose	EN 10305-3; EN 10305-5	
	For steel structures	EN 10219-1	EN 10219-2
	For special purpose	Based on agreement	

PRODUCT GROUPS

For our products standards specifications of the latest validity date shall apply. Mechanical properties and chemical compositions in the tables are valid taking into consideration the additional requirements of the standards indicated.

GENERALLY USED OPEN STEEL SECTIONS

Typical applications: construction, automotive, mechanical engineering and other products (e.g. containers).

Hollow sections		Overall dimensions min. – max. (mm)			
		h	b	c	s
U Cold bent U-section		20-250	20-110	—	1.5-6.0
L Cold bent equal sided L-section		30-140	30-140	—	2.0-5.0
L Cold bent unequal sided L-section		40-180	20-100	—	2.0-4.0
C Cold bent C-section		40-200	25-75	10-45	2.0-5.0
Z Cold bent Z-section		50-180	25-60	—	2.0-4.0

ASSORTMENT OF ROUND HOLLOW SECTIONS FOR GENERAL PURPOSE AND FOR STEEL STRUCTURES

Typical applications: construction, automotive, mechanical engineering and other products (e.g. road poles and supporting structures).

Outside diameter (mm)	Unit weight (according to EN 10305-3 and EN 10219-2 standards) (kg/m) if thickness: s (mm)										
	1.0	1.25	1.5	1.8	2.0	2.5	3.0	3.2	3.6	4.0	4.6
16.0	0.370	0.455	0.536	0.630							
18.0	0.419	0.516	0.610	0.719							
19.0	0.444	0.547	0.647	0.764							
20.0	0.469	0.578	0.684	0.808							
21.3	0.501	0.618	0.732	0.866	0.952						
22.0	0.518	0.640	0.758	0.897	0.986						
25.0	0.592	0.732	0.869	1.030	1.134	1.387					
26.9	0.639	0.791	0.940	1.114	1.228	1.504					
28.0	0.666	0.825	0.980	1.163	1.282						
32.0	0.764	0.948	1.128	1.341	1.480	1.819					
33.7	0.806	1.000	1.191	1.416	1.564	1.924	2.271				
38.0	0.912	1.133	1.350	1.607	1.776	2.189	2.589				
39.8	0.957	1.188	1.417	1.687	1.864						
42.4			1.513	1.802	1.993	2.460	2.915	3.094			
44.5			1.591	1.895	2.096	2.589	3.070	3.259			
48.3			1.731	2.064	2.284	2.824	3.352	3.559			
49.8	1.203	1.497	1.787	2.131	2.358						
51.0			1.831	2.184	2.417	2.990	3.551	3.772	4.208	4.636	
57.0				2.450	2.713	3.360	3.995	4.246			
60.3			2.175	2.597	2.876	3.564	4.239	4.506	5.034	5.554	
63.5				2.739	3.033	3.761	4.476	4.759	5.318	5.869	
70.0					3.354	4.162	4.957	5.272	5.895	6.511	
76.1					3.655	4.538	5.408	5.753	6.437	7.112	8.111
88.9						5.327	6.355	6.763	7.573	8.375	9.563
95.0						5.703	6.806	7.244	8.114	8.977	10.255
101.6						6.110	7.295	7.765	8.700	9.628	11.004
108.0						6.504	7.768	8.270	9.269	10.259	11.730
114.3						6.893	8.234	8.767	9.828	10.881	12.445
127.0							9.174	9.770	10.955	12.133	13.885
133.0							9.618	10.243	11.488	12.725	14.566
133.0							9.618	10.243	11.488	12.725	14.566

The following limitations refer to the assortment of steel sections for steel structures (EN 10219). Round steel sections are made only of hot rolled base material with the thickness of minimum 1.2 mm.

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ASSORTMENT OF RECTANGULAR HOLLOW STEEL SECTIONS FOR GENERAL PURPOSE

Typical applications: automotive, mechanical engineering and other products (fence, container etc.).

h × b (mm)	Unit weight (according to EN 10305-5 standard) (kg/m), if thickness: s (mm)									
	1.0	1.25	1.5	1.8	2.0	2.5	3.0	3.6	4.0	4.6
15×15, 20×10	0.438	0.537	0.632	0.741						
20×15, 25×10	0.516	0.635	0.750	0.882	0.967					
20×20	0.595	0.733	0.868	1.023	1.124					
25×15, 30×10	0.595	0.733	0.868	1.023	1.124					
30×15	0.673	0.831	0.985	1.165	1.281					
25×25, 30×20	0.752	0.930	1.103	1.306	1.438	1.756				
40×10	0.752	0.930	1.103	1.306	1.438					
30×30, 40×20	0.909	1.126	1.339	1.588	1.752	2.148	2.392			
35×25	0.909	1.126	1.339	1.588	1.752					
35×35, 40×30	0.666	0.825	0.980	1.163	1.282					
50×20			1.574	1.871	2.066	2.541	2.863			
50×25			1.692	2.012	2.223	2.737	3.098			
40×40, 50×30			1.810	2.154	2.380	2.933	3.334	3.896	4.252	
60×20			1.810	2.154	2.380	2.933	3.334			
45×45, 50×40			1.513	1.802	1.993	2.460	2.915	3.094		
60×30				2.436	2.694	3.326	3.805			
50×50, 60×40			1.731	2.064	2.284	2.824	3.352	3.559		
70×30				2.719	3.008	3.718	4.276	5.027	5.508	
60×50, 70×40			1.831	2.184	2.417	2.990	3.551	3.772	4.208	4.636
80×30				3.001	3.322	4.111	4.747	5.592	6.136	
60×60, 70×50				3.284	3.636	4.503	5.218	6.157	6.764	7.646
80×40				3.284	3.636	4.503	5.218	6.157	6.764	
80×50					3.950	4.896	5.689	6.722	7.392	8.368
90×40					3.950	4.896	5.689	6.722	7.392	
70×70, 80×60						5.327	6.355	6.763	7.573	8.375
90×50						5.288	6.160	7.288	8.020	9.090
100×40						5.288	6.160	7.288	8.020	
90×60, 100×50						5.681	6.631	7.853	8.648	9.812
80×80, 90×70						6.893	8.234	8.767	9.828	10.881
100×60						6.073	7.102	8.418	9.276	10.534
120×40						6.073	7.102	8.418	9.276	
90×90, 100×80							9.618	10.243	11.488	12.725
120×60, 130×50						6.858	8.044	9.548	10.532	11.979
100×100, 120×80							8.986	10.679	11.788	13.423
150×60, 140×70							9.457	11.243	12.416	14.145

COLD BENT STEEL PRODUCTS

I ASSORTMENT OF RECTANGULAR HOLLOW STEEL SECTIONS FOR STEEL STRUCTURES

Typical applications: construction, automotive, mechanical engineering and other products (e.g. road poles and supporting structures).

h × b (mm)	Unit weight (according to EN 10219-2 standard) (kg/m) if thickness; s (mm)								
	0.704	0.826	0.963	1.050					
20×20	0.704	0.826	0.963	1.050					
25×25, 30×20	0.901	1.061	1.246	1.364	1.640				
30×30, 40×20		1.297	1.528	1.678	2.032	2.362			
35×35, 40×30	0.444	0.547	0.647	0.764					
50×20		1.532	1.811	1.992	2.425	2.833			
50×25		1.650	1.952	2.149	2.621	3.068			
40×40, 50×30		1.768	2.094	2.306	2.817	3.304	3.853	4.198	
60×20		1.768	2.094	2.306	2.817	3.304			
45×45, 50×40	0.639	0.791	0.940	1.114	1.228	1.504			
60×30			2.376	2.620	3.210	3.775			
50×50, 60×40	0.764	0.948	1.128	1.341	1.480	1.819			
70×30			2.659	2.934	3.602	4.246	4.983	5.454	
60×50, 70×40	0.912	1.133	1.350	1.607	1.776	2.189	2.589		
80×30			2.941	3.248	3.995	4.717	5.548	6.082	
60×60, 70×50			3.224	3.562	4.387	5.188	6.114	6.710	7.574
80×40			3.224	3.562	4.387	5.188	6.114	6.710	
80×50				3.876	4.780	5.659	6.679	7.338	8.297
90×40				3.876	4.780	5.659	6.679	7.338	
70×70, 80×60			1.831	2.184	2.417	2.990	3.551	3.772	4.208
90×50					5.172	6.130	7.244	7.966	9.019
100×40					5.172	6.130	7.244	7.966	
90×60, 100×50					5.565	6.601	7.809	8.594	9.741
80×80, 90×70					3.354	4.162	4.957	5.272	5.895
100×60					5.957	7.072	8.374	9.222	10.463
120×40					5.957	7.072	8.374	9.222	
90×90, 100×80						5.703	6.806	7.244	8.114
120×60, 130×50					6.742	8.014	9.505	10.478	11.908
100×100, 120×80						8.956	10.635	11.734	13.352
150×60, 140×70						9.427	11.200	12.362	14.074

I SPECIAL PRODUCTS

We undertake to meet special demands based on agreement.

SURFACE

The smoothness of the surface of cold bent steel sections is in accordance with the base material used for production. Visible cracks are not permitted on the surface of bent edges. Longitudinal scratches, impressions and roll-imprints on the surface of steel sections as a result of bending, not exceeding the section thickness tolerance value, cannot be claimed.

TOLERANCES

TOLERANCES OF OPEN STEEL SECTIONS

Dimension tolerances of open steel sections for general purpose and for steel structures according to the specification of EN 10162 are as follows:

Tolerance of side length (outside dimension of the section part between two bending):

Section wall thickness s (mm)	Tolerance of side length, if the nominal dimension of the side is (mm)			
	≤ 40	$> 40 \leq 100$	$> 100 \leq 200$	$> 200 \leq 400$
≤ 1.5	± 0.50	± 0.50	± 0.75	± 1.25
$> 1.5 \leq 3.0$	± 0.75	± 0.75	± 1.00	± 1.50
$> 3.0 \leq 6.0$	± 1.00	± 1.00	± 1.25	± 1.75

Tolerance of free side length (outside dimension of the section part between the edge of the free side and the closest bending):

Section wall thickness s (mm)	Tolerance of side length, if the nominal dimension of the side is (mm)		
	≤ 40	$> 40 \leq 100$	$> 100 \leq 150$
≤ 1.5	± 0.75	± 0.75	± 1.00
$> 1.5 \leq 3.0$	± 0.80	± 1.00	± 1.25
$> 3.0 \leq 6.0$	± 1.00	± 1.25	± 1.50

Tolerance of the bending angle:

Length of the smaller side, as well as the free side; l (mm)	Tolerance of the bending angle
≤ 10	$\pm 3^\circ$
$> 10 \leq 40$	$\pm 1^\circ 45'$
$> 40 \leq 80$	$\pm 1^\circ 15'$
$> 80 \leq 110$	$\pm 1^\circ$
> 110	$\pm 0^\circ 45'$

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Tolerance of the section thickness:

Nominal thickness (mm)		Thickness tolerance (mm), if the raw material is	
over	up to	cold rolled ($R_e < 260$ MPa) EN 10131	hot rolled ($R_e \leq 300$ MPa) EN 10051
	1.0	± 0.06	—
1.0	1.2	± 0.07	—
1.2	1.6	± 0.09	± 0.19
1.6	2.0	± 0.11	± 0.19
2.0	2.5	± 0.13	± 0.21
2.5	3.0	—	± 0.22
3.0	4.0	—	± 0.24
4.0	5.0	—	± 0.26
5.0	6.0	—	± 0.28

The value of inside bending radius depends on the grade and thickness of the used steel strip. In case of steels with a yield strength of minimum 235 MPa inside bending radius is generally equal to the nominal thickness of the section.

Tolerance of the inside bending radius: $\pm 20\%$, but min. 0.5 mm

Straightness:

Deviation from straightness of steel sections shall not exceed $0,002 \times l$, where „l“ is the measured length in mm.

Torsion:

Torsion of steel sections is maximum 1° /m.

Convexity, concavity:

Convexity and concavity of steel sections are allowed within the dimensional tolerances.

Dimension control:

Cross section dimensions of open steel sections are to be controlled at a distance of minimum 250 mm from the ends of the single profile due to the torsion of cutting.

I TOLERANCES OF THE HOLLOW STEEL SECTIONS

Tolerances of hollow steel sections with yield strength of minimum 235 MPa.

Parameters		Tolerances	
		For general purpose EN 10305-3; EN 10305-5	For steel structures EN 10219-2
Wall thickness s (mm)	s ≤ 1.5	± 0.15 mm	—
	1.5 < s < 2	±10 % of the thickness, but maximum ±0.35 mm	—
	s ≥ 2		±10 % of thickness
Round steel sections	Outside diameter (d)	±1 % of nominal dimension	±1 % of nominal dimension, but minimum ±0.5 mm
	Oval characteristics	2 %	2 %
	Straightness difference	0.20% of total length, max. 3 mm over any 1 m length	0.20% of total length
Rectangular steel sections	Edge (a) or outside radius (r)	Outside dimension of edge if s ≤ 2.5 a ≤ 1.5xs if s > 2.5 a ≤ 2.2xs	Outside radius r = 1.6xs – 2.4xs
	Side angle	90° ± 1°	90° ± 1°
	Convexity or concavity of the side	Within the dimensional tolerances of outside dimensions	0.8 %, but minimum 0.5 mm
	Torsion	If the side dimension is ≤ 30 mm, 3 mm; if side dimension is > 30 mm, 10 % of the side dimension	2 mm + 0.5 mm/m length
	Straightness difference	0.25% of total length, if the side length – the shorter side in case of rectangular steel section – is > 30 mm, maximum 3 mm on a length of 1 m, as well as 0.15% of total length, if the side length – the shorter side in case of rectangular steel section – is > 30 mm, max. 3 mm over any 1 m length	0.15% of total length, as well as 3 mm on any lengths of 1 m
	Outside dimensions (mm) h – longer side b – shorter side	Tolerances of dimensions „h” and „b”, if the value of „h” is: h ≤ 20 ±0.20 < h ≤ 35 ±0.25 < h ≤ 50 ±0.30 < h ≤ 60 ±0.35 < h ≤ 70 ±0.40 < h ≤ 80 ±0.50 < h ≤ 90 ±0.60 < h ≤ 100 ±0.65 < h ≤ 150 ±0.70	Side length: h, b < 100 100 ≤ h, b ≤ 200

Note: All outside dimensions of steel sections for steel structures are to be controlled - minimum „d” from the ends in case of round hollow steel sections; – minimum „b” from the ends in case of square hollow steel sections; – minimum „h” from the ends in case of rectangular steel sections, but minimum 100 mm from the ends due to the torsion of cutting.

All outside dimensions of hollow steel sections for general purposes are to be controlled at least 100 mm from the ends.

TOLERANCES OF HOLLOW STEEL SECTIONS CUT TO PRECISE LENGTH, WITH BURRING

Dimensional limits:

Nominal thickness (mm)	Thickness tolerance (mm), if the raw material is			
	Exact length (mm)	EN 10305-3 EN 10305-5	EN 10219-1 EN 10219-2	as requested
≤ 500	Based on agreement	0; + 5 mm	±0.5 mm or 0; + 1 mm	
	501 – 2 000			0; + 3 mm
	2 001 – 4 500			0; + 5 mm

DELIVERY CONDITION

Steel sections are not tempered after cold forming. The smoothness of the surface of cold bent steel sections is in accordance with the base material used for production. The welding bead of hollow steel sections is machined off outside and it is not removed inside. The welding seam of rectangular steel sections is on the longer side of the section.

On the outside and inside surface of steel sections emulsion residues deriving from manufacturing, as well as smaller iron stains are allowed. An oil coat providing temporary corrosion protection is applied during the manufacturing process on the outside surface of steel sections, the omission of which has to be agreed on separately. The fulfilment of any demand regarding hot-dip galvanizing or other special requirement has to be agreed.

PACKAGING

Unless otherwise agreed, the weight of the bundle in case of open and hollow steel sections is 1.0 – 2.5 t. Several bundles tied together can be conveyed by crane too. Possible packaging of bundles is subject to a separate agreement.

APPROBATED (CERTIFIED) PRODUCTS

Cold formed welded structural hollow sections of non-alloy steels

a) according to 305/2011/EU – CPR (EN 10219-1) Certified by: ÉMI TÜV SÜD

Cold formed welded structural hollow sections of non-alloy steels (UKCA)

a) according to 305/2011/EU – CPR (EN 10219-1) Certified by: ÉMI TÜV SÜD

Cold formed welded structural hollow sections of non-alloy steels for construction purposes with CE-mark

a) according to 305/2011/EU – CPR (EN 10025-1) Certified by: ÉMI TÜV SÜD

Cold formed welded structural hollow sections of non-alloy steels for construction purposes (UKCA)

a) according to 305/2011/EU – CPR (EN 10025-1) Certified by: ÉMI TÜV SÜD

Certifications are available on request.

The products made by LIBERTY Steel Group in Hungary are always supplied with a Conformity Statement of Producer and agreement shall be reached about the type of statement at the time of placing the order. The available types of statements are included by standard EN 10204.

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