SSAB Form Tube 320

General Product Description

Form Tube 320 is formable precision tube. It has 20% higher elongation values and very narrow tolerances compare to competing products. Available in circular, rectangular, square and special shapes, it comes with different coating and surface options including cold rolled, galvanized, galvannealed and galfan. Customized shapes and other tailoring options are available upon request. Typically uses include light engineering, where formability, uniform quality, different surface options and usability are important.

Dimension Range

SSAB Form Tube 320 is available at circular, square, rectangular, flat oval and oval shapes.

Circular	15- 133 mm
Square	19x19- 100x100 mm
Rectangular	20x15- 150x50 mm
Flat oval	25x15- 78x38 mm
Oval	22x16.5- 31x17.5 mm
Wall thickness	1.0- 3.0 mm
Mill length	5000- 8000 mm

Other shapes and sizes are available upon request.

Dimensions

Circular

Diameter	0.9 mm (kg/m)	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)	2.5 mm (kg/m)	3.0 mm (kg/m)
15 mm	0.313	0.345	0.424	0.499	0.641*		
16 mm	0.335	0.370	0.455	0.536	0.691*		
18 mm	0.380	0.419	0.516	0.610	0.789		
19 mm	0.402	0.444	0.547	0.647	0.838		
20 mm	0.424	0.469	0.578	0.684	0.888		
22 mm	0.468	0.518	0.640	0.758	0.986	1.20	1.41*
25 mm	0.535	0.592	0.732	0.869	1.13	1.39	1.63*
25.4 mm	0.544	0.602	0.744	0.884	1.15	1.41	1.66*
28 mm	0.601	0.666	0.825	0.980	1.28	1.57	1.85
30 mm	0.646	0.715	0.886	1.05	1.38	1.70	2.00
32 mm		0.765	0.948	1.13	1.48	1.82	2.15
34 mm		0.814	1.01	1.20	1.58	1.94	2.29
35 mm		0.838	1.04	1.24	1.63	2.00	2.37
38 mm		0.912	1.13	1.35	1.78	2.19	2.59
40 mm		0.962	1.20	1.42	1.87	2.31	2.74
41 mm		0.990	1.22	1.46	1.92	2.37	2.81
41.5 mm		0.999	1.24	1.48	1.95	2.40	2.85
44.5 mm		1.07	1.33	1.59	2.10	2.59	3.07
48 mm			1.44	1.72	2.27	2.81	3.33
50 mm			1.50	1.79	2.37	2.93	3.48
50.8 mm			1.53	1.82	2.41	2.98	3.54
55 mm			1.66	1.98	2.61	3.24	3.85
57 mm			1.72	2.05	2.71	3.36	4.00
60 mm			1.81	2.16	2.86	3.55	4.22
63.5 mm			1.92	2.29	3.03	3.76	4.48
70 mm				2.53	3.35	4.16	4.96
76.1 mm				2.76	3.65	4.54	5.41
88.9 mm				3.23	4.29	5.33	6.36
101.6 mm				3.70	4.91	6.11	7.29
108 mm				3.94	5.23	6.50	7.77
114.3 mm				4.17	5.54	6.89	8.23
127 mm				4.64	6.17	7.68	9.17
133 mm				4.86	6.46	8.05	9.62

* elongation A-value according to +CR2, 19%

Square

Height x Width	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)	2.5 mm (kg/m)	3.0 mm (kg/m)
19 x 19 mm	0.564	0.694	0.820	1.06*		
20 x 20 mm	0.595	0.733	0.868	1.12*		
22 x 22 mm	0.658	0.812	0.962	1.25	1.52	
25 x 25 mm	0.752	0.930	1.10	1.44	1.76	
25.4 x 25.4 mm	0.764	0.945	1.12	1.46	1.79	
30 x 30 mm	0.909	1.13	1.34	1.75	2.15	2.39
32 x 32 mm	0.972	1.20	1.43	1.88	2.31	2.58
35 x 35 mm	1.07	1.32	1.57	2.07	2.54	2.86
40 x 40 mm		1.52	1.81	2.38	2.93	3.33
50 x 50 mm		1.91	2.28	3.01	3.72	4.28
55 x 55 mm			2.52	3.32	4.11	4.47
60 x 60 mm			2.75	3.64	4.50	5.22
80 x 80 mm			3.69	4.89	6.07	7.10
100 x 100 mm			4.64	6.15	7.64	8.99

* elongation A-value according to +CR2, 19%

Rectangular

Height x Width	0.9 mm (kg/m)	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)	2.5 mm (kg/m)	3.0 mm (kg/m)
20 x 15 mm	0.468	0.516	0.635	0.750	0.976*		
25 x 15 mm		0.595	0.733	0.868	1.12*		
30 x 10 mm		0.595	0.733	0.868	1.12		
30 x 15 mm		0.673	0.831	0.985	1.28		
30 x 20 mm		0.752	0.930	1.10	1.44	1.76	
30 x 25 mm		0.830	1.03	1.22	1.59	1.95	
35 x 15 mm		0.752	0.930	1.10	1.44	1.76	
35 x 20 mm		0.830	1.03	1.22	1.59	1.95	2.16
40 x 20 mm		0.909	1.13	1.34	1.75	2.15	2.39
40 x 25 mm		0.987	1.22	1.46	1.91	2.34	2.63
40 x 30 mm		1.07	1.32	1.57	2.07	2.54	2.86
50 x 20 mm		1.07	1.32	1.57	2.07	2.54	2.86
50 x 25 mm			1.42	1.69	2.22	2.74	3.10
50 x 30 mm			1.52	1.81	2.38	2.93	3.33
50 x 40 mm			1.71	2.05	2.69	3.33	3.80
50.8 x 25.4 mm			1.44	1.72	2.26	2.78	3.15
60 x 20 mm			1.52	1.81	2.38	2.93	3.33
60 x 30 mm			1.71	2.05	2.69	3.33	3.80
60 x 40 mm			1.91	2.28	3.01	3.72	4.28
70 x 25 mm				2.16	2.85	3.52	4.04
70 x 30 mm				2.28	3.01	3.72	4.28
70 x 40 mm				2.52	3.32	4.11	4.74
70 x 50 mm				2.75	3.64	4.50	5.22
80 x 20 mm				2.28	3.01	3.72	4.28
80 x 30 mm				2.52	3.32	4.11	4.74
80 x 40 mm				2.75	3.64	4.50	5.22
80 x 60 mm				3.22	4.26	5.29	6.16
100 x 40 mm				3.22	4.26	5.29	6.16
100 x 60 mm				3.69	4.89	6.07	7.10
100 x 80 mm				4.16	5.52	6.86	8.04
120 x 40 mm				3.69	4.89	6.07	7.10
120 x 60 mm				4.16	5.52	6.86	8.04
120 x 80 mm				4.64	6.15	7.64	8.99
150 x 50 mm				4.64	6.15	7.64	8.99

* elongation A-value according to +CR2, 19%

Flat Oval

Height x Width	0.9 mm (kg/m)	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)	2.5 mm (kg/m)	3.0 mm (kg/m)
25 x 15 mm	0.454	0.502	0.620	0.735	0.955*		
30 x 15 mm	0.525	0.581	0.718	0.853	1.11		
35 x 15 mm	0.596	0.659	0.816	0.970	1.269		
38 x 16 mm	0.646	0.715	0.886	1.05	1.38		
38 x 20 mm	0.678	0.751	0.931	1.11	1.45		
40 x 20 mm		0.783	0.971	1.155	1.516		
40 x 25 mm		0.827	1.03	1.22	1.61		
45 x 25 mm		0.906	1.125	1.340	1.762	2.172	2.570
50 x 20 mm		0.940	1.167	1.391	1.830	2.256	2.671
50 x 30 mm		1.029	1.279	1.525	2.009	2.48	2.94
60 x 15 mm		1.052	1.307	1.559	2.054	2.537	3.007
70 x 9 mm		1.155	1.436	1.714	2.261		
78 x 38 mm			1.918	2.292	3.032	3.759	4.473

* elongation A-value according to +CR2, 19%

Oval

Height x Width	0.9 mm (kg/m)	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)
22 x 16.5 mm	0.407	0.450	0.555	0.657	0.851*
25 x 17 mm	0.446	0.493	0.609	0.721	0.927*
31 x 17.5 mm		0.573	0.709	0.842	1.097

* elongation A-value according to +CR2, 19%

Mechanical Properties

Yield Strength $R_{p0.2}$ (min MPa)	Tensile Strength R_m (min MPa)	Elongation A (min %)
320	410	**23**

Mechanical properties meet or **exceed** the requirements of EN 10305 (+CR2)

Chemical Composition

C (max %)	Si[1) 2)] (max %)	Mn (max %)	P [1) 2) 3)] (max %)	S[3)] (max %)	Al_{tot} [4)] (min %)
0.10	**0.35**	1.40	**0.020**	**0.020**	0.020

Chemical composition meets or exceeds the requirements of EN 10305.

If other chemical elements such as Ti, Nb or V are used, the content of these elements are reported in the inspection document.

1) SSAB Form Tube C grade is suitable for high quality hot-dip galvanizing **(Si < 0.03%, Si+2.5P < 0.06%)**

2) SSAB Form Tube H grade is suitable for high quality hot-dip galvanizing **(Si < 0.03%, Si+2.5 P < 0.06%)**

3) Low level of impurities ensure excellent formability and weldability

4) This requirement is not applicable provided the steel contains a sufficient amount of other nitrogen binding elements, such as Ti, Nb or V.

Tolerances

Characteristic	Circular precision tubes Tolerances meet or **exceed** the requirements of EN 10305-3
Outside diameter (D) [1]	
D< 20 20 ≤ D < 32 32 ≤ D < 44 44 ≤ D < 55 55 ≤ D < 70 70 ≤ D < 80 80 ≤ D < 100 100 ≤ D < 108 108 ≤ D < 127 127 ≤ D ≤ 133	±0.12 mm ±0.15 mm ±0.20 mm ±0.25 mm ±0.30 mm ±0.35 mm ±0.40 mm ±0.50 mm ±0.60 mm ±0.80 mm
Out-of-roundness	The diameter tolerances include the out-of-roundness
Thickness (T)	T≤ 1.5 mm: ±0.15 mm T>1.5 mm: ±10% of nominal thickness or ±0.35 mm whicever is the smaller
Straightness	Maximum 0.20% of measured length
Height of internal weld bead, g;	
Bead removed Bead not removed	**g ≤ 0.3 mm** **g < 0.6 mm, when T ≤ 1.5 mm** **g < 0.4 x T, when 1.5 mm < T ≤ 4.0 mm**
Mill length	0/+50 mm, 5000 ≤ L ≤ 8000 mm (standard length 6000 mm)
Exact length, single cutting	
30 ≤ L ≤ 1500 mm 1500 < L ≤ 4000 mm	**±0.5 mm** **±1.0 mm**
Exact length, bundle cutting	
1000 ≤ L ≤ 5000 mm 5000 < L ≤ 10000 mm	**±2 mm** **±3 mm**

1) For a maximum distance of 100 mm, the ends may, due to the cutting method, have diameters outside the tolerances

Characteristic	Square precision tubes Tolerances meet or **exceed** the requirements of EN 10305-5
Outside dimensions (H) and (B), longer side [1)]	
H < 25 mm 25 ≤ H < 40 mm 40 ≤ H < 60 mm 60 ≤ H <70 mm 70 ≤ H < 80 mm 80 ≤ H < 90 mm 90 ≤ H < 100 mm 100 ≤ H < 120 mm H ≥ 120 mm	±0.20 mm ±0.25 mm ±0.30 mm ±0.35 mm ±0.40 mm ±0.50 mm ±0.60 mm ±0.65 mm ±0.70 mm
Side concavity and convexity	Included in outside dimension tolerance
Thickness (T)	T≤ 1.5 mm: ±0.15 mm T>1.5 mm: ±10% of nominal thickness or ±0.35 mm whichever is the smaller
Straightness	Maximum 0.15% of measured tube length when shorter side length > 30 mm Maximum 0.25% of measured tube length when the shorter side length ≤ 30 mm
Location of weld seam from the centre line	On narrow side for square and rectangular, optionally on wide side. ± 10% of side length or ± 3 mm, whichever is greater.
Height of internal weld bead (g)	
Bead removed Bead not removed	**g ≤ 0.3 mm** **g < 0.6 mm, when T ≤ 1.5 mm** **g < 0.4 x T, when 1.5 mm < T ≤ 4.0 mm**
Squareness of sides	90° ± 1°
Corner profile	R < 1.5 x T, when T ≤ 2.5 mm R < 2.2 x T, when T > 2.5 mm
Twist (V)	V ≤ 3 mm for B and H ≤ 30 mm V ≤ B/10 or ≤ H/10 for B or H > 30 mm
Mill length	0/+50 mm, 5000 ≤ L ≤ 8000 mm (standard length 6000 mm)
Exact length, single cutting	
30 ≤ L ≤ 1500 mm 1500 < L ≤ 4000 mm	**±0.5 mm** **±1.0 mm**
Exact length, bundle cutting	
1000 ≤ L ≤ 5000 mm 5000 < L ≤ 10000 mm	**±2 mm** **±3 mm**

1) For a maximum distance of 100 mm, the ends may, due to the cutting method, have diameters outside the tolerances

Characteristic	Rectangular precision tubes Tolerances meet or **exceed** the requirements of EN 10305-5
Outside dimensions (H) and (B), longer side [1)]	
H < 25 mm 25 ≤ H < 40 mm 40 ≤ H < 60 mm 60 ≤ H <70 mm 70 ≤ H < 80 mm 80 ≤ H < 90 mm 90 ≤ H < 100 mm 100 ≤ H < 120 mm H ≥ 120 mm	±0.20 mm ±0.25 mm ±0.30 mm ±0.35 mm ±0.40 mm ±0.50 mm ±0.60 mm ±0.65 mm ±0.70 mm
Side concavity and convexity	Included in outside dimension tolerance
Thickness (T)	T≤ 1.5 mm: ±0.15 mm T>1.5 mm: ±10% of nominal thickness or ±0.35 mm whichever is the smaller
Straightness	Maximum 0.15% of measured tube length when shorter side length > 30 mm Maximum 0.25% of measured tube length when the shorter side length ≤ 30 mm
Location of weld seam from the centre line	On narrow side for square and rectangular, optionally on wide side. ± 10% of side length or ± 3 mm, whichever is greater.
Height of internal weld bead (g)	
Bead removed Bead not removed	**g ≤ 0.3 mm** **g < 0.6 mm, when T ≤ 1.5 mm** **g < 0.4 x T, when 1.5 mm < T ≤ 4.0 mm**
Squareness of sides	90° ± 1°
Corner profile	R < 1.5 x T, when T ≤ 2.5 mm R < 2.2 x T, when T > 2.5 mm
Twist (V)	V ≤ 3 mm for B and H ≤ 30 mm V ≤ B/10 or ≤ H/10 for B or H > 30 mm
Mill length	0/+50 mm, 5000 ≤ L ≤ 8000 mm (standard length 6000 mm)
Exact length, single cutting	
30 ≤ L ≤ 1500 mm 1500 < L ≤ 4000 mm	**±0.5 mm** **±1.0 mm**
Exact length, bundle cutting	
1000 ≤ L ≤ 5000 mm 5000 < L ≤ 10000 mm	**±2 mm** **±3 mm**

1) For a maximum distance of 100 mm, the ends may, due to the cutting method, have diameters outside the tolerances

Characteristic	Flat oval precision tubes Tolerances meet or **exceed** the requirements of EN 10305-5
Outside dimensions (H) and (B), longer side [1)]	
H < 25 mm 25 ≤ H < 40 mm 40 ≤ H < 60 mm 60 ≤ H <70 mm 70 ≤ H < 80 mm 80 ≤ H < 90 mm 90 ≤ H < 100 mm 100 ≤ H < 120 mm H ≥ 120 mm	±0.20 mm ±0.25 mm ±0.30 mm ±0.35 mm ±0.40 mm ±0.50 mm ±0.60 mm ±0.65 mm ±0.70 mm
Side concavity and convexity	Included in outside dimension tolerance
Thickness (T)	T≤ 1.5 mm: ±0.15 mm T>1.5 mm: ±10% of nominal thickness or ±0.35 mm whichever is the smaller
Straightness	Maximum 0.15% of measured tube length when shorter side length > 30 mm Maximum 0.25% of measured tube length when the shorter side length ≤ 30 mm
Location of weld seam from the centre line	On wide side for flat oval and ellipse. ± 10% of side length or ± 3 mm, whichever is greater.
Height of internal weld bead (g)	
Bead removed Bead not removed	**g ≤ 0.3 mm** **g < 0.6 mm, when T ≤ 1.5 mm** **g < 0.4 x T, when 1.5 mm < T ≤ 4.0 mm**
Mill length	0/+50 mm, 5000 ≤ L ≤ 8000 mm (standard length 6000 mm)
Exact length, single cutting	
30 ≤ L ≤ 1500 mm 1500 < L ≤ 4000 mm	**±0.5 mm** **±1.0 mm**
Exact length, bundle cutting	
1000 ≤ L ≤ 5000 mm 5000 < L ≤ 10000 mm	**±2 mm** **±3 mm**

1) For a maximum distance of 100 mm, the ends may, due to the cutting method, have diameters outside the tolerances

Characteristic	Ellipse precision tubes Tolerances meet or **exceed** the requirements of EN 10305-5
Outside dimensions (H) and (B), longer side [1)]	
H < 25 mm 25 ≤ H < 40 mm 40 ≤ H < 60 mm 60 ≤ H <70 mm 70 ≤ H < 80 mm 80 ≤ H < 90 mm 90 ≤ H < 100 mm 100 ≤ H < 120 mm H ≥ 120 mm	±0.20 mm ±0.25 mm ±0.30 mm ±0.35 mm ±0.40 mm ±0.50 mm ±0.60 mm ±0.65 mm ±0.70 mm
Side concavity and convexity	Included in outside dimension tolerance
Thickness (T)	T≤ 1.5 mm: ±0.15 mm T>1.5 mm: ±10% of nominal thickness or ±0.35 mm whichever is the smaller
Straightness	Maximum 0.15% of measured tube length when shorter side length > 30 mm Maximum 0.25% of measured tube length when the shorter side length ≤ 30 mm
Location of weld seam from the centre line	On wide side for flat oval and ellipse. ± 10% of side length or ± 3 mm, whichever is greater.
Height of internal weld bead (g)	
Bead removed Bead not removed	**g ≤ 0.3 mm** **g < 0.6 mm, when T ≤ 1.5 mm** **g < 0.4 x T, when 1.5 mm < T ≤ 4.0 mm**
Mill length	0/+50 mm, 5000 ≤ L ≤ 8000 mm (standard length 6000 mm)
Exact length, single cutting	
30 ≤ L ≤ 1500 mm 1500 < L ≤ 4000 mm	**±0.5 mm** **±1.0 mm**
Exact length, bundle cutting	
1000 ≤ L ≤ 5000 mm 5000 < L ≤ 10000 mm	**±2 mm** **±3 mm**

1) For a maximum distance of 100 mm, the ends may, due to the cutting method, have diameters outside the tolerances

Coatings and Surfaces

Surface designation and general usability		
C	Cold rolled	Paintabity or chromium plating are required
H	Hot rolled and pickled	Paintabity or hot-dip galvanizing are required
Z	Zinc coated (zinc 99%)	Corrosion resistance is required
ZA	Galfan coated (zinc 95%-aluminium 5%)	Corrosion resistance and demanding forming are required
ZF	Galvannealed coated (zinc 90%-iron 10%)	Corrosion resistance and paintability are required

Surface is slightly oiled to protect it from corrosion during transportation and short-term storaging. By request, tubes can be delivered dry, however in that case SSAB will not be responsible for any possible rust.

Surface roughness, Ra	
C	< 0,6 µm
H	< 2,0 µm

Different metal coatings and minimum coating mass			
Coating thickness	**Zinc (Z)**	**Galfan (ZA)**	**Galvannealed (ZF)**
µm [2]	g/m2 [1]	g/m2 [1]	g/m2 [1]
7	Z100		ZF100
8			ZF120
10	Z140	ZA130	ZF140
20	Z275	ZA255	
25	Z350	ZA300	
32	Z450		
42	Z600		

1) Minimum coating mass- g/m2 refers the total weight of coatings on both sides of a 1 m2 plate.

2) Theoretical guidance values for coating thickness per surface.

Indicative specification for proper coating selection			
Coating type	**Coating mass [g/m2]**	**Coating life - marine [year]**	**Properties**
Z	100	10	Good weldability and form-ability with tolerable corrosion resistance.
Z	275	25	Good combination of corrosion resistance and usability.
Z	350	30	Excellent corrosion resistance.
Z	450	40	Excellent corrosion resistance.
Z	600	60	Superior corrosion resistance.
ZA	130	40	Excellent corrosion resistance and formability.
ZA	255	80	Superior corrosion resistance in marine condition
ZA	300	95	Superior corrosion resistance in marine condition
ZF	100	15	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.
ZF	120	17	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.
ZF	140	20	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.

Coatings and Surfaces

Surface designation and general usability		
C	Cold rolled	Paintabity or chromium plating are required
H	Hot rolled and pickled	Paintabity or hot-dip galvanizing are required
Z	Zinc coated (zinc 99%)	Corrosion resistance is required
ZA	Galfan coated (zinc 95%-aluminium 5%)	Corrosion resistance and demanding forming are required
ZF	Galvannealed coated (zinc 90%-iron 10%)	Corrosion resistance and paintability are required

Surface is slightly oiled to protect it from corrosion during transportation and short-term storaging. By request, tubes can be delivered dry, however in that case SSAB will not be responsible for any possible rust.

Surface roughness, Ra	
C	< 0,6 µm
H	< 2,0 µm

Different metal coatings and minimum coating mass			
Coating thickness	**Zinc (Z)**	**Galfan (ZA)**	**Galvannealed (ZF)**
µm [2)]	g/m2 [1)]	g/m2 [1)]	g/m2 [1)]
7	Z100		ZF100
8			ZF120
10	Z140	ZA130	ZF140
20	Z275	ZA255	
25	Z350	ZA300	
32	Z450		
42	Z600		

1) Minimum coating mass- g/m2 refers the total weight of coatings on both sides of a 1 m2 plate.

2) Theoretical guidance values for coating thickness per surface.

Indicative specification for proper coating selection			
Coating type	**Coating mass [g/m2]**	**Coating life - marine [year]**	**Properties**
Z	100	10	Good weldability and form-ability with tolerable corrosion resistance.
Z	275	25	Good combination of corrosion resistance and usability.
Z	350	30	Excellent corrosion resistance.
Z	450	40	Excellent corrosion resistance.
Z	600	60	Superior corrosion resistance.
ZA	130	40	Excellent corrosion resistance and formability.
ZA	255	80	Superior corrosion resistance in marine condition
ZA	300	95	Superior corrosion resistance in marine condition
ZF	100	15	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.
ZF	120	17	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.
ZF	140	20	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.

Contact Information

www.ssab.com/contact