DOCOL®
THE AUTOMOTIVE STEEL

Docol Tube 780DP

General Product Description

Docol® Tube 780DP is advance high-strength formable precision tube made from dual-phase steel with high tensile strength, improved form-ability or enhanced proofed yield strength. Available in circular, rectangular and square shapes, it comes with different coating and surface options including cold rolled (uncoated), galvanized, galvannealed and galfan. Customized shapes and other tailoring options are available upon request. Typically used in automotive industry where durability, formability and energy absorption are important.

Dimension Range

Docol Tube 780DP is available at circular, square and rectangular shapes.

Circular	15- 76 mm
Square	15x15- 60x60 mm
Rectangular	20x10- 80x40 mm
Wall thickness	1.0- 2.0 mm
Mill length	5000- 8000 mm

Other shapes and sizes are available upon request.

Dimensions

Circular

Diameter	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)
15 mm	0.345	0.424	0.499	
16 mm	0.370	0.455	0.536	
18 mm	0.419	0.516	0.610	
19 mm	0.444	0.547	0.647	
20 mm	0.469	0.578	0.684	
22 mm	0.518	0.640	0.758	0.986
25 mm	0.592	0.732	0.869	1.13
28 mm	0.666	0.825	0.980	1.28
30 mm	0.715	0.886	1.05	1.38
32 mm	0.765	0.948	1.13	1.48
35 mm	0.838	1.04	1.24	1.63
36 mm	0.863	1.07	1.28	1.68
38 mm	0.912	1.13	1.35	1.78
40 mm	0.962	1.20	1.42	1.87
41 mm		1.22	1.46	1.92
44 mm		1.32	1.57	2.07
48 mm		1.44	1.72	2.27
50 mm		1.50	1.79	2.37
55 mm			1.98	2.61
57 mm			2.05	2.71
60 mm			2.16	2.86
63.5 mm			2.29	3.03
76 mm			2.76	3.65

SSAB

Square

Height x Width	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)
15 x 15 mm	0.419	0.508		
16 x 16 mm	0.451	0.547		
19 x 19 mm	0.545	0.665		
20 x 20 mm	0.576	0.704		
22 x 22 mm	0.639	x	0.783	
25 x 25 mm	0.733	0.901	1.06	1.36
25.4 x 25.4 mm	0.746	0.916	1.08	1.39
30 x 30 mm	0.890	1.10	1.30	1.68
32 x 32 mm		1.18	1.39	1.80
35 x 35 mm		1.29	1.53	1.99
40 x 40 mm		1.49	1.77	2.31
50 x 50 mm			2.24	2.93
60 x 60 mm				3.56

Rectangular

Height x Width	1.0 mm (kg/m)	1.25 mm (kg/m)	1.5 mm (kg/m)	2.0 mm (kg/m)
20 x 10 mm	0.419	0.508	0.590	
20 x 15 mm	0.498	0.606	0.708	
25 x 15 mm	0.576	0.704		
30 x 10 mm	0.576	0.704		
30 x 15 mm	0.655	0.802	0.944	
30 x 20 mm	0.733	0.901	1.06	1.36
30 x 25 mm	0.785	0.999	1.18	1.52
35 x 15 mm	0.733	0.901	1.06	
35 x 20 mm	0.812	0.999	1.18	1.52
40 x 20 mm	0.890	1.10	1.30	1.68
40 x 25 mm	0.969	1.20	1.42	1.84
40 x 30 mm		1.29	1.53	1.99
45 x 15 mm	0.890	1.10	1.30	1.68
50 x 20 mm		1.29	1.53	1.99
50 x 25 mm		1.39	1.65	2.15
50 x 30 mm		1.49	1.77	2.31
50 x 40 mm		1.69	2.00	2.62
50.8 x 25.4 mm		1.42	1.68	2.19
60 x 20 mm			1.77	2.31
60 x 30 mm			2.00	2.62
60 x 40 mm			2.24	2.93
70 x 25 mm			2.12	2.78
70 x 30 mm			2.24	2.93
70 x 50 mm				3.56
80 x 20 mm				2.93
80 x 40 mm				3.56

Mechanical Properties

Grade	Yield strength $R_{p0.2}$ (min MPa)	Tensile strength R_m (MPa)	Elongation A (max %)
CR600Y780T-DP	600	780	7
CR600Y780T-DH	600	780	12
CR700Y800T-DP	700	800	7

Chemical Composition

Grade	C (max %)	Si (max %)	Mn (max %)	P (max %)	S (max %)	Nb+Ti (max %)	Cr+Mo (max %)	B (max %)	Cu (max %)
	0.18	0.80	2.50	0.050	0.010	0.15	1.40	0.005	0.20
	0.18	0.80	2.50	0.050	0.010	0.15	1.40	0.005	0.20
	0.18	0.80	2.50	0.050	0.010	0.15	1.40	0.005	0.20

Chemical composition meets the requirements of VDA 239-100.

Tolerances

Circular

Characteristic	**Circular precision tubes** Tolerances based on 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 whichever 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 < 1.0 mm, when T ≤ 1.5 mm g < 0.8 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

Square

Characteristic	Square, rectangular, flat oval and ellipse precision tubes Tolerances based on 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. 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 < 1.0 mm, when T ≤ 1.5 mm g < 0.8 x T, when 1.5 mm < T ≤ 4.0 mm
Squareness of sides	90° ± 1°
Corner profile	R ≤ 4.0 x T, typically R ≤ 2.5 x T
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

Rectangular

Characteristic	Square, rectangular, flat oval and ellipse precision tubes Tolerances based on 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. On wide side for flat oval and ellipse. ± 10% of side length or ± 3 mm, whichever is greater.
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Exact length, bundle cutting	
1000 ≤ L ≤ 5000 mm 5000 < L ≤ 10000 mm	±2 mm ±3 mm

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Coatings and Surfaces

Surface designation and general usability		
UC	Uncoated (cold rolled)	Paintability or chromium plating are required
GI	Zinc coated (zinc 99%)	Corrosion resistance is required
ZA	Galfan coated (zinc 95%-aluminium 5%)	Superior corrosion resistance and demanding forming are required
GA	Galvannealed coated (zinc 90%-iron 10%)	Corrosion resistance and paintability are required

Surface is lightly 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	
UC	< 0,6 µm

Different metal coatings and minimum coating mass			
Coating thickness	**Zinc (GI)**	**Galfan (ZA)**	**Galvannealed (GA)**
µm [3]	g/m2 [1]	g/m2 [2]	g/m2 [1]
7	GI50/50		GA50/50
8	GI60/60		GA60/60
20	GI115/115	ZA255	

1) Minimum coating mass- g/m2 refers the coating mass for each side in g/m^2 according to VDA 239-100.

2) Minimum coating mass- g/m2 refers the total weight of coatings on both sides of a 1 m^2 plate.

3) 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**
GI	50/50	10	Good weldability and form-ability with tolerable corrosion resistance.
GI	115/115	25	Good combination of corrosion resistance and usability.
ZA	255	80	Superior corrosion resistance in marine condition
GA	50/50	15	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.
GA	60/60	17	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.
GA	140	20	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.

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GA	140	20	Superior paint adhesion and corrosion reistance as painted. Weldability in same level as cold rolled material under proper welding conditions.

Delivery Conditions

The tubes are not intended to undergo any heat treatment after welding and sizing as that may alter the mechanical properties of the material (+CR2 delivery condition according to EN10305-3 and-5).

The tubes are oiled with anti-corrosive oil (S4 condition according to EN 10305-3 and-5).

Fabrication and Other Recommendations

Further Fabrication

Pre-heating of the tubes before bending and welding may lower the strength of the material. Docol Tube 800 is not suitable for hot dip galvanizing. Outside the welded area the surface roughness (Ra) is typically 0.25-0.75 µm.

Bending

The bendability of Docol Tube 800 steels is good and the recommended minimum bending radius is 2.5 x tube diameter. The optimal radial gap between mandrel and inside wall of the tube should be in the range of 0.10 to 0.15 mm.

Welding

Docol Tube 800 tubes have very low content of alloying elements in relation to the high strength of the steels and the weldability of Docol Tube 800 is very good. Recommendations in accordance to Eurocode 3 apply for welding.

For information and recommendations for welding Docol Tube 800, see welding brochure for SSAB Docol products and Steelfacts at www.ssab.com.

For information concerning fabrication, see SSAB´s brochures on www.ssab.com or consult Tech Support. Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on the product.

Contact Information

www.ssab.com/contact

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