

endurance

ENDURANCE

Technical Data



ALL DETAILS IN A PRECISE LIST, CLEARLY STRUCTURED

In this brochure, you can find all the engineering details for endurance **smart**, **dynamic** and **extreme** in relation to standards EN 10219 Part 1 and 2 as well as EN 10305-5.

Do not hesitate to contact us if you have any questions concerning our new **endurance** hollow profiles. Get in touch with us right now!

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Mechanical Characteristics

Steel grade	Yield strength ReH (MPa)	Tensile strength Rm (Mpa)	Elongation at break A80 min. (up to 3 mm) <small>a) b)</small>	Charpy impact test V -20°C full sample min. (J) <small>b)</small>
S355MC	355	470 bis 630	19	40
S420MC	420	500 bis 660	16	40
S460MC	460	530 bis 720	14	40
S500MC	500	550 bis 750	12	40
S600MC	600	650 bis 870	11	40
S700MC	700	750 bis 950	10	40
S900MC	900	940 bis 110	10	40
S960MC	960	980 bis 1250	8	27

a) ...for section dimensions $(W+T)/2 T < 12.5$, minimum elongation decreases by a value of 2.

b) ...see EN10219-1 Item 6.7.2 for notch impact energy values for reduced-section samples.

Chemical composition

Steel grade	C max	Si a) max	Mn max	P max	S max	Al max	Nb max	V max	Ti max	Mo max	B max
S355MC	0.1000	0.0500	1.2000	0.0200	0.0100	0.0200	0.0500	0.0500	0.0500		
S420MC	0.1000	0.0500	1.4000	0.0200	0.0100	0.0200	0.0500	0.0500	0.0500		
S460MC	0.1000	0.0500	1.5000	0.0200	0.0080	0.0200	0.0700	0.0700	0.0700		
S500MC	0.1000	0.0500	1.6000	0.0200	0.0080	0.0200	0.0700	0.0700	0.0700		
S600MC	0.1200	0.3000	1.8000	0.0200	0.0080	0.0200	0.0700	0.0700	0.0700	0.3000	0.0050
S700MC	0.1200	0.3000	2.0000	0.0200	0.0080	0.0200	0.0700	0.0700	0.0700	0.3000	0.0050
S900MC	0.2000	0.5000	2.2000	0.0250	0.0100	-	0.0900	0.1200	0.0500	1.0000	0.0050
S960MC	0.2000	0.6000	2.2000	0.0250	0.0100	-	0.0900	0.2000	0.2500	1.0000	0.0050

a) For orders of steel grades up to and including S500MC specified as „suitable for galvanizing“, Si and P maximum values of 0.03% and 0.018% respectively apply.

Valid form- and dimensional deviation

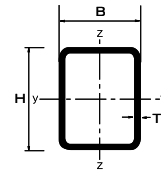
Relevant to the EN 10219 hollow section standard

Expection: Outer radii profile by S600MC and S700MC – as seen below

Characteristic	Hollow section with square or rectangular cross-section	
	Dimensions in mm	Tolerance
External dimensions (D, B, H)	H, B < 100 mm	± 1% with a minimum value
		of ± 0.5 mm
	100 ≤ H, B ≤ 200 mm	± 0.8 %
	H, B > 200 mm	± 0.6 %
Wall thickness (T)	T ≤ 5 mm:	± 10 %
	T > 5 mm:	± 0.5 mm
Ovality (O)	-	
Concavity/Convexity 1)	max. 0,8% with a minimum value of 0.5 mm	
Squareness of the sides	90°	± 1°
Radius	for S355MC to S500MC applies (acc. to EN 10219):	
	T ≤ 6 mm	1.6 bis 2.4 x T
	6 < T ≤ 10 mm	2.0 bis 3.0 x T
	for S600MC and S700MC applies:	
	2 ≤ T ≤ 10 mm	2.0 bis 3.0 x T
Twist (V)	≤ 2 mm plus 0.5 mm/m length	
Straightness	0.15% over the entire length	
Mass (M)	± 6% for the individual section	

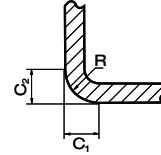
1) Limit deviation values for concavity and convexity apply irrespective of limit dimensions for external dimensions.

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Outer radii profile: $T < 6 \text{ mm}$ C oder $R = 1.6 T$ bis $2.4 T$
 $6 \text{ mm} < T < 10 \text{ mm}$ C oder $R = 2.0 T$ bis $3.0 T$

EN 10219 unpickled: Pickled or galvanised version (sendzimir galvanised or hot dip galvanised) in acc. with EN 10219 possible on request.



Edge execution:

see Comparison of Standards

Straightness tolerance:

maximum straightness deviation 0.15% over the overall length and 3 mm per m of length.

Length tolerance

EN 10219-2		
Type of length	Length range	Tolerance
Fixed length	≥ 4000	+50/-0 mm
Exact length	< 6000	+5/-0 mm
25	$\geq 6000 \leq 10000$	+15/-0 mm
25	> 10000	+5 mm + 1 mm/m
25	1.5	-0

At voestalpine Krems it is possible to produce precise lengths with significantly smaller tolerances (between 0.2 mm and 2 mm depending on dimensions).

Mass:

Deviation of the mass from the length-related mass acc. to Table C.2 and C.3 may be max. $\pm 6 \%$.

Concavity and convexity of the lateral surfaces:

Max. 0.8% with a minimum value of 0.5 mm. This tolerance is applicable regardless of the maximum dimensions for the external dimensions.

Options:

The customer may request the following additional options at the time of ordering:

- » Finished part analysis
- » Maximum value for carbon equivalent (acc. to Table A2) in non-alloy structural steels
- » Maximum value for carbon equivalent (acc. to Table B3) for fine-grain structural steels

- » Demonstration of notch bar impact work for quality groups J0 and JR
- » Suitability of material for hot dip galvanisation (voestalpine Krems standard)

Tests: e.g.:

- » 100% non-destructive testing of the weld in hollow sections that are to be delivered with specific testing.
- » Precise definition of which steel grades are to be subjected to specific testing and thus also which certificates are to be issued.
- » Precise definition regarding the type of tests to be performed per steel grade and the scope of testing.
- » The notch bar impact work must be demonstrated for quality group J2 and for all fine grain structural steels above a nominal thickness of 6 mm. Notch impact bending tests only on request for nominal wall thicknesses below 6 mm.

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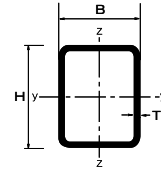
Dimensions		Wall thickness t mm	Cross-section A cm ²	Mass m kg/m	Outer circumferential surface As m ² /m	for flexible axis						for the torsion		Flexible axis	
h mm	b mm					y - y			z - z			It cm ⁴	Ct cm ³	Wpl. yy cm ³	Wpl. zz cm ³
						Iyy cm ⁴	Wel. yy cm ³	iyy cm	Izz cm ⁴	Wel. zz cm ³	izz cm				
20	20	1.5	1.05	0.83	0.075	0.58	0.58	0.74	0.58	0.58	0.74	0.98	0.88	0.72	0.72
20	20	2.0	1.34	1.05	0.073	0.69	0.69	0.72	0.69	0.69	0.72	1.21	1.06	0.88	0.88
25	15	1.5	1.05	0.83	0.075	0.80	0.64	0.87	0.36	0.48	0.58	0.85	0.81	0.82	0.57
25	15	2.0	1.34	1.05	0.073	0.95	0.76	0.84	0.42	0.56	0.56	1.03	0.96	1.01	0.70
25	25	1.5	1.35	1.06	0.095	1.22	0.97	0.95	1.22	0.97	0.95	2.01	1.47	1.17	1.17
25	25	2.0	1.74	1.36	0.093	1.48	1.19	0.92	1.48	1.19	0.92	2.53	1.80	1.47	1.47
25	25	2.5	2.09	1.64	0.091	1.69	1.35	0.90	1.69	1.35	0.90	2.97	2.07	1.71	1.71
25	25	3.0	2.41	1.89	0.090	1.84	1.47	0.87	1.84	1.47	0.87	3.33	2.27	1.91	1.91
28	28	4.0	3.43	2.69	0.098	3.07	2.19	0.95	3.07	2.19	0.95	5.73	3.43	2.94	2.94
30	10	1.5	1.05	0.83	0.075	0.98	0.65	0.96	0.16	0.32	0.39	0.49	0.59	0.89	0.39
30	10	2.0	1.34	1.05	0.073	1.15	0.77	0.93	0.18	0.36	0.37	0.58	0.68	1.09	0.47
30	15	1.5	1.20	0.94	0.085	1.28	0.85	1.03	0.42	0.57	0.59	1.09	0.99	1.10	0.67
30	15	2.0	1.54	1.21	0.083	1.54	1.03	1.00	0.50	0.67	0.57	1.34	1.19	1.37	0.83
30	20	1.5	1.35	1.06	0.095	1.59	1.06	1.08	0.84	0.84	0.79	1.83	1.40	1.32	0.99

Not all dimensions are produced for stock.

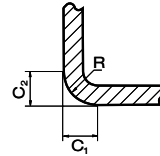
Dimensions		Wall thickness	Cross-section	Mass	Outer circumferential surface	for flexible axis						for the torsion		Flexible axis	
						Y - Y			z - z						
h mm	b mm	t mm	A cm ²	m kg/m	As m ² /m	Iyy cm ⁴	Wel, yy cm ³	Iyy cm	Izz cm ⁴	Wel, zz cm ³	Izz cm	It cm ⁴	Ct cm ³	Wpl, yy cm ³	Wpl, zz cm ³
30	20	2.0	1.74	1.36	0.093	1.94	1.29	1.06	1.02	1.02	0.77	2.29	1.71	1.65	1.24
30	20	3.0	2.41	1.89	0.090	2.41	1.60	1.00	1.25	1.25	0.72	2.99	2.13	2.15	1.61
30	25	1.5	1.50	1.18	0.105	1.89	1.26	1.12	1.42	1.14	0.97	2.66	1.80	1.53	1.35
30	25	2.0	1.94	1.52	0.103	2.33	1.55	1.10	1.75	1.40	0.95	3.37	2.23	1.93	1.70
30	30	1.5	1.65	1.30	0.115	2.20	1.46	1.15	2.20	1.46	1.15	3.57	2.21	1.74	1.74
30	30	2.0	2.14	1.68	0.113	2.72	1.81	1.13	2.72	1.81	1.13	4.54	2.75	2.21	2.21
30	30	2.5	2.59	2.03	0.111	3.16	2.10	1.10	3.16	2.10	1.10	5.40	3.20	2.61	2.61
30	30	3.0	3.01	2.36	0.110	3.50	2.34	1.08	3.50	2.34	1.08	6.15	3.58	2.96	2.96
30	30	4.0	3.75	2.94	0.106	3.97	2.64	1.03	3.97	2.64	1.03	7.31	4.11	3.50	3.50
35	20	1.5	1.50	1.18	0.105	2.33	1.33	1.25	0.97	0.97	0.80	2.28	1.65	1.67	1.13
35	20	2.0	1.94	1.52	0.103	2.87	1.64	1.22	1.18	1.18	0.78	2.87	2.03	2.10	1.42
35	25	1.5	1.65	1.30	0.115	2.75	1.57	1.29	1.63	1.31	0.99	3.35	2.13	1.92	1.53
35	25	2.0	2.14	1.68	0.113	3.42	1.95	1.26	2.01	1.61	0.97	4.25	2.65	2.43	1.93
35	35	1.5	1.95	1.53	0.135	3.60	2.05	1.36	3.60	2.05	1.36	5.78	3.09	2.43	2.43
35	35	2.0	2.54	1.99	0.133	4.51	2.58	1.33	4.51	2.58	1.33	7.41	3.89	3.09	3.09
35	35	3.0	3.61	2.83	0.130	5.95	3.40	1.28	5.95	3.40	1.28	10.22	5.18	4.23	4.23
35	35	4.0	4.55	3.57	0.126	6.93	3.96	1.23	6.93	3.96	1.23	12.42	6.10	5.11	5.11
40	20	1.5	1.65	1.30	0.115	3.27	1.63	1.41	1.10	1.10	0.81	2.74	1.91	2.07	1.27
40	20	2.0	2.14	1.68	0.113	4.05	2.02	1.38	1.34	1.34	0.79	3.45	2.36	2.61	1.60
40	20	2.5	2.59	2.03	0.111	4.69	2.35	1.35	1.54	1.54	0.77	4.06	2.72	3.09	1.88
40	20	3.0	3.01	2.36	0.110	5.21	2.60	1.32	1.68	1.68	0.75	4.57	3.00	3.50	2.12
40	30	1.5	1.95	1.53	0.135	4.38	2.19	1.50	2.81	1.87	1.20	5.52	3.02	2.64	2.17
40	30	2.0	2.54	1.99	0.133	5.49	2.75	1.47	3.51	2.34	1.18	7.07	3.79	3.37	2.77
40	30	2.5	3.09	2.42	0.131	6.45	3.23	1.45	4.10	2.74	1.15	8.47	4.46	4.03	3.30
40	30	3.0	3.61	2.83	0.130	7.27	3.63	1.42	4.60	3.07	1.13	9.72	5.03	4.61	3.77
40	40	1.5	2.25	1.77	0.155	5.49	2.75	1.56	5.49	2.75	1.56	8.75	4.13	3.22	3.22
40	40	2.0	2.94	2.31	0.153	6.94	3.47	1.54	6.94	3.47	1.54	11.28	5.23	4.13	4.13
40	40	2.5	3.59	2.82	0.151	8.22	4.11	1.51	8.22	4.11	1.51	13.61	6.21	4.97	4.97
40	40	3.0	4.21	3.30	0.150	9.32	4.66	1.49	9.32	4.66	1.49	15.75	7.07	5.72	5.72
40	40	4.0	5.35	4.20	0.146	11.07	5.54	1.44	11.07	5.54	1.44	19.44	8.48	7.01	7.01
40	40	5.0	6.36	4.99	0.143	12.26	6.13	1.39	12.26	6.13	1.39	22.31	9.49	8.02	8.02
45	25	2.0	2.54	1.99	0.133	6.42	2.85	1.59	2.54	2.04	1.00	6.11	3.50	3.60	2.39
50	20	1.5	1.95	1.53	0.135	5.77	2.31	1.72	1.35	1.35	0.83	3.69	2.42	2.97	1.55
50	20	2.0	2.54	1.99	0.133	7.23	2.89	1.69	1.67	1.67	0.81	4.66	3.00	3.78	1.96
50	20	2.5	3.09	2.42	0.131	8.48	3.39	1.66	1.92	1.92	0.79	5.50	3.49	4.51	2.32
50	20	3.0	3.61	2.83	0.130	9.51	3.81	1.62	2.12	2.12	0.77	6.20	3.88	5.16	2.63
50	25	1.5	2.10	1.65	0.145	6.65	2.66	1.78	2.25	1.80	1.04	5.54	3.13	3.33	2.05
50	25	2.0	2.74	2.15	0.143	8.38	3.35	1.75	2.81	2.25	1.01	7.06	3.92	4.26	2.62
50	25	2.5	3.34	2.62	0.141	9.89	3.95	1.72	3.28	2.62	0.99	8.43	4.60	5.11	3.12
50	25	3.0	3.91	3.07	0.140	11.17	4.47	1.69	3.67	2.93	0.97	9.64	5.18	5.86	3.56
50	30	1.5	2.25	1.77	0.155	7.54	3.01	1.83	3.42	2.28	1.23	7.60	3.83	3.70	2.60
50	30	2.0	2.94	2.31	0.153	9.54	3.81	1.80	4.29	2.86	1.21	9.77	4.84	4.74	3.33
50	30	2.5	3.59	2.82	0.151	11.30	4.52	1.77	5.05	3.37	1.19	11.74	5.72	5.70	3.98
50	30	3.0	4.21	3.30	0.150	12.83	5.13	1.75	5.70	3.80	1.16	13.53	6.49	6.57	4.58
50	30	4.0	5.35	4.20	0.146	15.25	6.10	1.69	6.69	4.46	1.12	16.53	7.71	8.05	5.58
50	40	1.5	2.55	2.00	0.175	9.30	3.72	1.91	6.60	3.30	1.61	12.26	5.24	4.42	3.80
50	40	2.0	3.34	2.62	0.173	11.84	4.74	1.88	8.39	4.19	1.59	15.86	6.67	5.70	4.89
50	40	2.5	4.09	3.21	0.171	14.12	5.65	1.86	9.98	4.99	1.56	19.22	7.96	6.89	5.90
50	40	3.0	4.81	3.77	0.170	16.15	6.46	1.83	11.38	5.69	1.54	22.34	9.12	7.98	6.83
50	50	1.5	2.85	2.24	0.195	11.07	4.43	1.97	11.07	4.43	1.97	17.42	6.65	5.15	5.15
50	50	2.0	3.74	2.93	0.193	14.15	5.66	1.95	14.15	5.66	1.95	22.63	8.51	6.66	6.66
50	50	2.5	4.59	3.60	0.191	16.94	6.78	1.92	16.94	6.78	1.92	27.53	10.22	8.07	8.07
50	50	3.0	5.41	4.25	0.190	19.47	7.79	1.90	19.47	7.79	1.90	32.13	11.76	9.39	9.39
50	50	4.0	6.95	5.45	0.186	23.74	9.49	1.85	23.74	9.49	1.85	40.42	14.43	11.73	11.76
50	50	5.0	8.36	6.56	0.183	27.04	10.82	1.80	27.04	10.82	1.80	47.46	16.56	13.70	13.70
51	51	3.0	5.53	4.34	0.194	20.77	8.14	1.94	20.77	8.14	1.94	34.21	12.30	9.80	9.80
51	51	4.0	7.11	5.58	0.190	25.37	9.95	1.89	25.37	9.95	1.89	43.09	15.11	12.27	12.27
60	20	1.5	2.25	1.77	0.155	9.25	3.08	2.03	1.61	1.61	0.85	4.66	2.94	4.02	1.83
60	20	2.0	2.94	2.31	0.153	11.68	3.89	1.99	1.99	1.99	0.82	5.89	3.65	5.15	2.32
60	30	2.0	3.34	2.62	0.173	15.05	5.02	2.12	5.08	3.39	1.23	12.57	5.88	6.31	3.89
60	30	3.0	4.81	3.77	0.170	20.50	6.83	2.06	6.80	4.53	1.19	17.48	7.95	8.82	5.39
60	30	4.0	6.15	4.83	0.166	24.70	8.23	2.00	8.06	5.37	1.14	21.47	9.52	10.92	6.62
60	40	1.5	2.85	2.24	0.195	14.39	4.80	2.25	7.71	3.86	1.64	15.97	6.35	5.77	4.38
60	40	2.0	3.74	2.93	0.193	18.41	6.14	2.22	9.83	4.92	1.62	20.70	8.12	7.47	5.65
60	40	3.0	5.41	4.25	0.190	25.38	8.46	2.17	13.44	6.72	1.58	29.28	11.17	10.53	7.94
60	40	4.0	6.95	5.45	0.186	30.99	10.33	2.11	16.28	8.14	1.53	36.67	13.65	13.16	9.89
60	40	5.0	8.36	6.56	0.183	35.33	11.78	2.06	18.43	9.21	1.48	42.85	15.60	15.38	11.52
60	50	2.0	4.14	3.25	0.213	21.78	7.26	2.29	16.45	6.58	1.99	29.87	10.35	8.63	7.62
60	50	2.5	5.09	3.99	0.211	26.21	8.74	2.27	19.77	7.91	1.97	36.43	12.47	10.49	9.26
60	50	3.0	6.01	4.72	0.210	30.26	10.09	2.24	22.79	9.11	1.95	42.63	14.41	12.24	10.80
60	50	4.0	7.75	6.08	0.206	37.27	12.42	2.19	27.98	11.19	1.90	53.92	17.81	15.40	13.57
60	50	5.0	9.36	7.34	0.203	42.91	14.30	2.14	32.12	12.85	1.85	63.72	20.60	18.13	15.95
60	60	2.0	4.54	3.56	0.233	25.14	8.38	2.35	25.14	8.38	2.35	39.79	12.59	9.79	9.79

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Outer radii profile: $T < 6 \text{ mm}$ $C \text{ oder } R = 1.6 T \text{ bis } 2.4 T$
 $6 \text{ mm} < T < 10 \text{ mm}$ $C \text{ oder } R = 2.0 T \text{ bis } 3.0 T$



EN 10219 unpickled: Pickled or galvanised version (sendzimir galvanised or hot dip galvanised) in acc. with EN 10219 possible on request.



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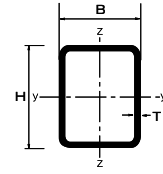
Dimensions		Wall thickness	Cross-section	Mass	Outer circumferential surface	for flexible axis						for the torsion		Flexible axis	
h mm	b mm	t mm	A cm ²	m kg/m	As m ² /m	y - y			z - z			It cm ⁴	Ct cm ³	Wpl, yy cm ²	Wpl, zz cm ²
						Iyy cm ⁴	Wel, yy cm ²	iyy cm	Izz cm ⁴	Wel, zz cm ²	izz cm				
60	60	2.5	5.59	4.39	0.231	30.34	10.11	2.33	30.34	10.11	2.33	48.66	15.22	11.93	11.93
60	60	3.0	6.61	5.19	0.230	35.13	11.71	2.31	35.13	11.71	2.31	57.09	17.65	13.95	13.95
60	60	3.5	7.59	5.96	0.228	39.53	13.18	2.28	39.53	13.18	2.28	65.09	19.90	15.86	15.86
60	60	4.0	8.55	6.71	0.226	43.55	14.52	2.26	43.55	14.52	2.26	72.64	21.97	17.64	17.64
60	60	5.0	10.36	8.13	0.223	50.49	16.83	2.21	50.49	16.83	2.21	86.42	25.61	20.88	20.88
60	60	6.0	12.03	9.45	0.219	56.07	18.69	2.16	56.07	18.69	2.16	98.41	28.62	23.68	23.68
70	40	2.0	4.14	3.25	0.213	26.85	7.67	2.55	11.28	5.64	1.65	25.72	9.56	9.44	6.41
70	40	2.5	5.09	3.99	0.211	32.32	9.23	2.52	13.50	6.75	1.63	31.28	11.48	11.48	7.78
70	40	3.0	6.01	4.72	0.210	37.31	10.66	2.49	15.50	7.75	1.61	36.49	13.23	13.39	9.05
70	40	4.0	7.75	6.08	0.206	45.95	13.13	2.44	18.88	9.44	1.56	45.84	16.25	16.84	11.33
70	40	5.0	936	7.34	0.203	52.88	15.11	2.38	21.51	10.75	1.52	53.77	18.67	19.81	13.27
70	50	2.0	4.54	3.56	0.233	31.48	8.99	2.63	18.76	7.50	2.03	37.45	12.20	10.80	8.58
70	50	2.5	5.59	4.39	0.231	36.01	10.86	2.61	22.59	9.04	2.01	45.75	14.72	13.16	10.45
70	50	3.0	6.61	5.19	0.230	44.05	12.59	2.58	26.10	10.44	1.99	53.62	17.06	15.40	12.21
70	50	4.0	8.55	6.71	0.226	54.67	15.62	2.53	32.22	12.89	1.94	68.07	21.19	19.48	15.41
70	50	5.0	10.36	8.13	0.223	63.46	18.13	2.48	37.20	14.88	1.90	80.77	24.64	23.06	18.20
70	50	6.0	12.03	9.45	0.219	70.52	20.15	2.42	41.14	16.46	1.85	91.71	27.47	26.15	20.60
70	70	2.0	5.37	4.19	0.273	40.73	11.64	2.76	40.73	11.64	2.76	63.96	17.48	13.52	13.52
70	70	2.5	6.59	5.17	0.271	49.41	14.12	2.74	49.41	14.12	2.74	78.49	21.22	16.54	16.54
70	70	3.0	7.81	6.13	0.270	57.53	16.44	2.71	57.53	16.44	2.71	92.42	24.74	19.42	19.42
70	70	3.5	8.99	7.06	0.268	65.09	18.60	2.69	65.09	18.60	2.69	105.77	28.03	22.15	22.15
70	70	4.0	10.15	7.97	0.266	72.12	20.61	2.67	72.12	20.61	2.67	118.52	31.11	24.76	24.76
70	70	5.0	12.36	9.70	0.263	84.63	24.18	2.62	84.63	24.18	2.62	142.21	36.65	29.56	29.56
70	70	6.0	14.43	11.33	0.259	95.17	27.19	2.57	95.17	27.19	2.57	163.49	41.41	33.83	33.83
70	70	7.0	15.96	12.53	0.250	98.70	28.20	2.49	98.70	28.20	2.49	180.04	44.62	36.10	36.10
75	50	3.0	6.91	5.42	0.240	52.17	13.91	2.75	27.76	11.10	2.00	59.27	18.38	17.09	12.91
80	25	3.0	5.71	4.48	0.200	38.90	9.73	2.61	5.86	4.69	1.01	17.90	8.68	13.07	5.54
80	30	2.0	4.14	3.25	0.213	31.27	7.82	2.75	6.65	4.43	1.27	18.37	7.97	10.05	5.01
80	30	2.5	5.09	3.99	0.211	37.60	9.40	2.72	7.90	5.26	1.25	22.17	9.51	12.21	6.05
80	30	3.0	6.01	4.72	0.210	43.35	10.84	2.69	8.99	6.00	1.22	25.65	10.87	14.23	7.01
80	30	4.0	7.75	6.08	0.206	53.23	13.31	2.62	10.78	7.19	1.18	31.67	13.15	17.87	8.70
80	40	2.0	4.54	3.56	0.233	37.36	9.34	2.87	12.72	6.36	1.67	30.88	11.00	11.61	7.17
80	40	2.5	5.59	4.39	0.231	45.11	11.28	2.84	15.26	7.63	1.65	37.58	13.24	14.15	8.72
80	40	3.0	6.61	5.19	0.230	52.25	13.06	2.81	17.56	8.78	1.63	43.88	15.28	16.54	10.16
80	40	4.0	8.55	6.71	0.226	64.79	16.20	2.75	21.49	10.74	1.59	55.24	18.84	20.91	12.77
80	40	5.0	10.36	8.13	0.223	75.11	18.78	2.69	24.59	12.30	1.54	64.97	21.74	24.74	15.02
80	50	2.0	4.94	3.88	0.253	43.44	10.86	2.97	21.06	8.43	2.07	45.31	14.04	13.17	9.54
80	50	2.5	6.09	4.78	0.251	52.62	13.15	2.94	25.41	10.17	2.04	55.40	16.98	16.08	11.64
80	50	3.0	7.21	5.66	0.250	61.15	15.29	2.91	29.42	11.77	2.02	65.00	19.71	18.85	13.62
80	50	4.0	9.35	7.34	0.246	76.36	19.09	2.86	36.46	14.59	1.98	82.70	24.57	23.95	17.25
80	50	5.0	11.36	8.91	0.243	89.19	22.30	2.80	42.29	16.92	1.93	98.40	28.69	28.49	20.45
80	50	6.0	13.23	10.39	0.239	99.78	24.95	2.75	46.99	18.79	1.88	112.08	32.12	32.47	23.24

Not all dimensions are produced for stock.

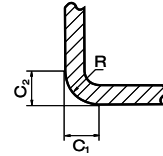
Dimensions		Wall thickness	Cross-section	Mass	Outer circumferential surface	for flexible axis						for the torsion		Flexible axis	
						y - y			z - z						
h mm	b mm	t mm	A cm ²	m kg/m	As m ² /m	Iyy cm ⁴	Wel, yy cm ³	Iyy cm	Izz cm ⁴	Wel, zz cm ³	Izz cm	It cm ⁴	Ct cm ³	Wpl, yy cm ²	Wpl, zz cm ²
80	60	2.5	6.59	5.17	0.271	60.13	15.03	3.02	38.61	12.87	2.42	75.07	20.73	18.02	14.81
80	60	3.0	7.81	6.13	0.270	70.05	17.51	3.00	44.89	14.96	2.40	88.35	24.14	21.16	17.37
80	60	3.5	8.99	7.06	0.268	79.30	19.83	2.97	50.72	16.91	2.37	101.03	27.34	24.15	19.81
80	60	4.0	10.15	7.97	0.266	87.92	21.98	2.94	56.12	18.71	2.35	113.12	30.32	26.99	22.12
80	60	5.0	12.36	9.70	0.263	103.28	25.82	2.89	65.66	21.89	2.31	135.53	35.67	32.24	26.38
80	60	6.0	14.43	11.33	0.259	116.25	29.06	2.84	73.63	24.54	2.26	155.55	40.25	36.91	30.16
80	80	3.0	9.01	7.07	0.310	87.84	21.96	3.12	87.84	21.96	3.12	139.93	33.02	25.78	25.78
80	80	3.5	10.39	8.16	0.308	99.80	24.95	3.10	99.80	24.95	3.10	160.57	37.56	29.50	29.50
80	80	4.0	11.75	9.22	0.306	111.04	27.76	3.07	111.04	27.76	3.07	180.44	41.84	33.07	33.07
80	80	5.0	14.36	11.27	0.303	131.44	32.86	3.03	131.44	32.86	3.03	217.83	49.68	39.74	39.74
80	80	6.0	16.83	13.21	0.299	149.18	37.29	2.98	149.18	37.29	2.98	252.07	56.59	45.79	45.79
80	80	7.0	18.76	14.72	0.290	157.61	39.40	2.90	157.61	39.40	2.90	281.36	61.81	49.54	49.54
80	80	8.0	20.84	16.36	0.286	168.38	42.09	2.84	168.38	42.09	2.84	307.14	66.61	53.89	53.89
90	45	2.5	6.34	4.98	0.261	65.48	14.55	3.21	22.23	9.88	1.87	54.32	17.12	18.16	11.21
90	45	3.0	7.51	5.89	0.260	76.17	16.93	3.19	25.71	11.43	1.85	63.64	19.85	21.30	13.11
90	50	3.0	7.81	6.13	0.270	81.85	18.19	3.24	32.74	13.10	2.05	76.67	22.36	22.60	15.03
90	50	4.0	10.15	7.97	0.266	102.71	22.82	3.18	40.71	16.28	2.00	97.70	27.96	28.82	19.09
90	50	5.0	12.36	9.70	0.263	120.60	26.80	3.12	47.37	18.95	1.96	116.47	32.75	34.41	22.70
90	50	6.0	14.43	11.33	0.259	135.66	30.15	3.07	52.83	21.13	1.91	132.94	36.77	39.38	25.88
90	60	5.0	13.36	10.48	0.283	138.68	30.82	3.22	73.24	24.41	2.34	161.39	40.71	38.66	29.13
90	60	6.0	15.63	12.27	0.279	156.87	34.86	3.17	82.42	27.47	2.30	185.64	46.08	44.42	33.40
90	70	4.0	11.75	9.22	0.306	132.32	29.40	3.36	89.57	25.59	2.76	174.23	41.05	35.70	30.04
90	70	5.0	14.36	11.27	0.303	156.77	34.84	3.30	105.80	30.23	2.71	210.13	48.70	42.91	36.06
90	90	3.0	10.21	8.01	0.350	127.28	28.29	3.53	127.28	28.29	3.53	201.42	42.51	33.04	33.04
90	90	3.5	11.79	9.26	0.348	145.06	32.24	3.51	145.06	32.24	3.51	231.60	48.49	37.90	37.90
90	90	4.0	13.35	10.48	0.346	161.92	35.98	3.48	161.92	35.98	3.48	260.80	54.17	42.58	42.58
90	60	5.0	16.36	12.84	0.343	192.93	42.87	3.43	192.93	42.87	3.43	316.26	64.70	51.41	51.41
90	90	6.0	19.23	15.10	0.339	220.48	48.99	3.39	220.48	48.99	3.39	367.76	74.16	59.54	59.54
90	90	7.0	21.56	16.92	0.330	236.13	52.47	3.31	236.13	52.47	3.31	414.19	81.78	65.08	65.08
90	90	8.0	24.04	18.87	0.326	254.59	56.58	3.25	254.59	56.58	3.25	455.59	88.83	71.27	71.27
100	34	2.0	5.10	4.00	0.261	59.61	11.92	3.42	10.87	6.39	1.46	30.79	11.60	15.37	7.13
100	40	2.0	5.34	4.19	0.273	65.38	13.08	3.50	15.61	7.81	1.71	41.47	13.89	16.54	8.69
100	40	2.5	6.59	5.17	0.271	79.32	15.86	3.47	18.78	9.39	1.69	50.52	16.76	20.23	10.59
100	40	3.0	7.81	6.13	0.270	92.34	18.47	3.44	21.67	10.84	1.67	59.05	19.39	23.75	12.38
100	40	4.0	10.15	7.97	0.266	115.70	23.14	3.38	26.69	13.35	1.62	74.53	24.04	30.26	15.65
100	40	5.0	12.36	9.70	0.263	135.60	27.12	3.31	30.76	15.38	1.58	87.92	27.90	36.09	18.52
100	50	3.0	8.41	6.60	0.290	106.46	21.29	3.56	36.06	14.42	2.07	88.56	25.01	26.66	16.44
100	50	3.5	9.69	7.61	0.288	120.76	24.15	3.53	40.68	16.27	2.05	101.10	28.30	30.47	18.74
100	50	4.0	10.95	8.59	0.286	134.14	26.83	3.50	44.95	17.98	2.03	112.99	31.35	34.10	20.93
100	50	5.0	13.36	10.48	0.283	158.19	31.64	3.44	52.45	20.98	1.98	134.87	36.80	40.84	24.95
100	50	6.0	15.63	12.27	0.279	178.75	35.75	3.38	58.67	23.47	1.94	154.20	41.43	46.90	28.52
100	60	3.0	9.01	7.07	0.310	120.57	24.11	3.66	54.65	18.22	2.46	121.67	30.64	29.57	20.79
100	60	3.5	10.39	8.16	0.308	137.07	27.41	3.63	61.91	20.64	2.44	139.34	34.79	33.84	23.77
100	60	4.0	11.75	9.22	0.306	152.58	30.52	3.60	68.68	22.89	2.42	156.27	38.68	37.94	26.60
100	60	5.0	14.36	11.27	0.303	180.77	36.15	3.55	80.83	26.94	2.37	187.86	45.75	45.59	31.88
100	60	6.0	16.83	13.21	0.299	205.30	41.06	3.49	91.20	30.40	2.33	216.44	51.92	52.54	36.64
100	80	3.0	10.21	8.01	0.350	148.81	29.76	3.82	105.64	26.41	3.22	196.12	41.91	35.39	30.40
100	80	4.0	13.35	10.48	0.346	189.47	37.89	3.77	134.17	33.54	3.17	253.79	53.38	45.62	39.15
100	80	5.0	16.36	12.84	0.343	225.94	45.19	3.72	159.61	39.90	3.12	307.55	63.72	55.09	47.24
100	80	6.0	19.23	15.10	0.339	258.39	51.68	3.67	182.10	45.53	3.08	357.38	72.98	63.82	54.67
100	100	3.0	11.41	8.96	0.390	177.05	35.41	3.94	177.05	35.41	3.94	278.68	53.19	41.21	41.21
100	100	4.0	14.95	11.73	0.386	226.35	45.27	3.89	226.35	45.27	3.89	362.01	68.10	53.50	53.50
100	100	5.0	18.36	14.41	0.383	271.10	54.22	3.84	271.10	54.22	3.84	440.52	81.72	64.59	64.59
100	100	6.0	21.63	16.98	0.379	311.47	62.29	3.79	311.47	62.29	3.79	514.16	94.12	75.10	75.10
100	100	7.0	24.36	19.12	0.370	337.04	67.41	3.72	337.04	67.41	3.72	582.73	104.53	82.72	82.72
100	100	8.0	27.24	21.39	0.366	365.94	73.19	3.67	365.94	73.19	3.67	644.51	114.23	91.05	91.05
100	100	10.0	32.57	25.56	0.357	411.08	82.22	3.55	411.08	82.22	3.55	749.84	130.10	105.25	105.25
110	60	3.0	9.61	7.54	0.330	152.45	27.72	3.98	59.52	19.84	2.49	138.87	33.89	34.22	22.50
110	60	4.0	12.55	9.85	0.326	193.52	35.19	3.93	74.96	24.99	2.44	178.52	42.86	44.01	28.84
110	60	5.0	15.36	12.05	0.323	230.03	41.82	3.87	88.41	29.47	2.40	214.84	50.80	53.02	34.63
110	70	3.0	10.21	8.01	0.350	169.62	30.84	4.08	84.48	24.14	2.88	180.67	40.12	37.43	27.46
110	70	4.0	13.35	10.48	0.346	216.01	39.27	4.02	107.01	30.57	2.83	233.32	51.00	48.25	35.32
110	70	5.0	16.36	12.84	0.343	257.62	46.84	3.97	126.96	36.28	2.79	282.14	60.76	58.27	42.56
110	110	3.0	12.61	9.90	0.430	238.34	43.33	4.35	238.34	43.33	4.35	373.51	65.07	50.27	50.27
110	110	4.0	16.55	12.99	0.426	305.94	55.62	4.30	305.94	55.62	4.30	486.47	83.63	65.21	65.21
110	110	5.0	20.36	15.98	0.423	367.95	66.90	4.25	367.95	66.90	4.25	593.60	100.74	79.27	79.27
110	110	6.0	24.03	18.87	0.419	424.57	77.19	4.20	424.57	77.19	4.20	694.85	116.47	92.46	92.46
110	110	7.0	27.16	21.32	0.410	463.15	84.21	4.13	463.15	84.21	4.13	791.17	130.08	102.46	102.46
110	110	8.0	30.44	23.90	0.406	505.64	91.93	4.08	505.64	91.93	4.08	878.70	142.82	113.23	113.23
110	110	10.0	36.57	28.70	0.397	574.80	104.51	3.96	574.80	104.51	3.96	1032.26	164.33	132.03	132.03
120	40	2.5	7.59	5.96	0.311	126.71	21.12	4.09	22.30	11.15	1.71	63.77	20.27	27.32	12.47
120	40	3.0	9.01	7.07	0.310	148.04	24.67	4.05	25.79	12.89	1.69	74.56	23.51	32.16	14.60
120	40	4.0	11.75	9.22	0.306	186.89	31.15	3.99	31.90	15.95	1.65	94.23	29.24	41.21	18.53

EN 10219 UNPICKLED

Outer radii profile: $T < 6 \text{ mm}$ C oder R = 1.6 T bis 2.4 T
 $6 \text{ mm} < T < 10 \text{ mm}$ C oder R = 2.0 T bis 3.0 T



EN 10219 unpickled: Pickled or galvanised version (sendzimir galvanised or hot dip galvanised) in acc. with EN 10219 possible on request.



endurance
extreme

endurance
smart

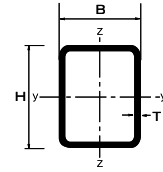
endurance
dynamic

Dimensions		Wall thickness t mm	Cross-section A cm ²	Mass m kg/m	Outer circum-ferential surface As m ² /m	for flexible axis						for the torsion		Flexible axis	
h mm	b mm					y - y			z - z			It cm ⁴	Ct cm ³	Wpl, yy cm ³	Wpl, zz cm ³
						Iyy cm ⁴	Wel, yy cm ³	iy cm	Izz cm ⁴	Wel, zz cm ³	iz cm				
120	40	5.0	14.36	11.27	0.303	220.81	36.80	3.92	36.93	18.46	1.60	111.35	34.05	49.45	22.02
120	50	3.0	9.61	7.54	0.330	168.58	28.10	4.19	42.69	17.08	2.11	112.87	30.32	35.67	19.26
120	50	4.0	12.55	9.85	0.326	213.82	35.64	4.13	53.43	21.37	2.06	114.22	38.13	45.85	24.61
120	50	5.0	15.36	12.05	0.323	253.89	42.32	4.07	62.62	25.05	2.02	172.44	44.92	55.20	29.45
120	50	6.0	18.03	14.16	0.319	288.99	48.16	4.00	70.36	28.14	1.98	197.55	50.76	63.73	33.80
120	60	3.0	10.21	8.01	0.350	189.12	31.52	4.30	64.40	21.47	2.51	156.34	37.14	39.18	24.21
120	60	3.5	11.79	9.26	0.348	215.61	35.94	4.28	73.09	24.36	2.49	179.19	42.24	44.94	27.72
120	60	4.0	13.35	10.48	0.346	240.74	40.12	4.25	81.25	27.08	2.47	201.12	47.05	50.49	31.08
120	60	5.0	16.36	12.84	0.343	286.97	47.83	4.19	95.99	32.00	2.42	242.23	55.85	60.95	37.38
120	60	6.0	19.23	15.10	0.339	328.01	54.67	4.13	108.77	36.26	2.38	279.67	63.60	70.57	43.12
120	60	7.0	21.56	16.92	0.330	348.77	58.13	4.02	115.92	38.64	2.32	311.57	69.54	76.83	47.02
120	80	3.0	11.41	8.96	0.390	230.20	38.37	4.49	123.43	30.86	3.29	255.47	50.80	46.20	35.02
120	80	4.0	14.95	11.73	0.386	294.59	49.10	4.44	157.29	39.32	3.24	331.24	64.93	59.77	45.23
120	80	5.0	18.36	14.41	0.383	353.14	58.86	4.39	187.78	46.94	3.20	402.27	77.77	72.45	54.74
120	80	6.0	21.63	16.98	0.379	406.06	67.68	4.33	215.03	53.76	3.15	468.54	89.40	84.25	63.55
120	80	7.0	24.36	19.12	0.370	438.27	73.04	2.24	232.45	58.11	3.09	529.42	99.06	92.65	69.98
120	80	8.0	27.24	21.39	0.366	475.83	79.31	4.18	251.66	62.92	3.04	584.04	108.01	101.97	76.93
120	80	10.0	32.57	25.56	0.357	534.14	89.02	4.05	281.14	70.29	2.94	675.59	122.44	117.82	88.68
120	100	3.0	12.61	9.90	0.430	271.27	45.21	4.64	205.28	41.06	4.04	367.01	64.47	53.22	47.03
120	100	4.0	16.55	12.99	0.426	348.43	58.07	4.59	263.24	52.65	3.99	477.84	82.83	69.05	60.98
120	100	5.0	20.36	15.98	0.423	419.31	69.88	4.54	316.27	63.25	3.94	582.86	99.75	83.95	74.09
120	100	6.0	24.03	18.87	0.419	484.11	80.68	4.49	364.56	72.91	3.89	682.04	115.29	97.93	86.38
120	100	7.0	27.16	21.32	0.410	527.77	87.96	4.41	397.70	79.54	3.83	776.17	128.70	108.47	95.74
120	100	8.0	30.44	23.90	0.406	576.35	96.06	4.35	433.83	86.77	3.78	861.65	141.25	119.89	105.77
120	100	10.0	36.57	28.70	0.397	655.47	109.25	4.23	492.41	98.48	3.67	1011.24	162.40	139.82	123.25
120	120	3.0	13.81	10.84	0.470	312.35	52.06	4.76	312.35	52.06	4.76	487.72	78.15	60.24	60.24
120	120	4.0	18.15	14.25	0.466	402.28	67.05	4.71	402.28	67.05	4.71	636.57	100.75	78.33	78.33
120	120	5.0	22.36	17.55	0.463	485.47	80.91	4.66	485.47	80.91	4.66	778.50	121.75	95.45	95.45
120	120	6.0	26.43	20.75	0.459	562.16	93.69	4.61	562.16	93.69	4.61	913.46	141.22	111.61	111.61
120	120	7.0	29.96	23.52	0.450	617.26	102.88	4.54	617.26	102.88	4.54	1043.72	158.41	124.29	124.29
120	120	8.0	33.64	26.41	0.446	676.88	112.81	4.49	676.88	112.81	4.49	1162.95	174.58	137.81	137.81
120	120	10.0	40.57	31.84	0.437	776.81	129.47	4.38	776.81	129.47	4.38	1376.41	202.52	161.82	161.82
125	125	4.0	18.95	14.87	0.486	457.23	73.16	4.91	457.23	73.16	4.91	721.99	109.92	85.33	85.33
125	125	5.0	23.36	18.33	0.483	552.63	88.42	4.86	552.62	88.42	4.86	883.82	133.01	104.10	104.10
125	125	6.0	27.63	21.69	0.479	640.89	102.54	4.82	640.89	102.54	4.82	1038.10	154.49	121.87	121.87
125	125	7.0	31.36	24.62	0.470	705.69	112.91	4.74	705.69	112.91	4.74	1187.84	173.62	136.00	136.00
125	125	8.0	35.24	27.67	0.466	775.32	124.05	4.69	775.32	124.05	4.69	1325.35	191.66	151.00	151.00
125	125	10.0	42.57	33.41	0.457	893.42	142.95	4.58	893.42	142.95	4.58	1573.51	223.11	177.83	177.83
127	127	10.0	43.37	34.04	0.465	943.13	148.53	4.66	943.13	148.53	4.66	1657.26	231.63	184.45	184.45
130	130	10.0	44.57	34.98	0.477	1021.10	157.09	4.79	1021.10	157.09	4.79	1788.29	244.70	194.60	194.60
140	40	4.0	13.35	10.48	0.346	281.59	40.23	4.59	37.10	18.55	1.67	114.20	34.44	53.75	21.41
140	50	3.0	10.81	8.48	0.370	249.92	35.70	4.81	49.33	19.73	2.14	137.68	35.62	45.87	22.08

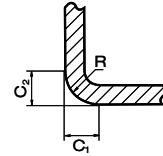
Not all dimensions are produced for stock.

EN 10219 UNPICKLED

Outer radii profile: $T < 6 \text{ mm}$ $C \text{ oder } R = 1.6 T \text{ bis } 2.4 T$
 $6 \text{ mm} < T < 10 \text{ mm}$ $C \text{ oder } R = 2.0 T \text{ bis } 3.0 T$



EN 10219 unpickled: Pickled or galvanised version (sendzimir galvanised or hot dip galvanised) in acc. with EN 10219 possible on request.



endurance
extreme

endurance
smart

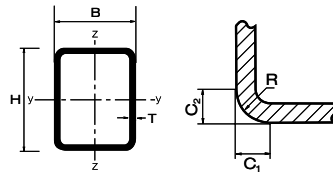
endurance
dynamic

Dimensions		Wall thickness	Cross-section	Mass	Outer circumferential surface	for flexible axis						for the torsion		Flexible axis	
h mm	b mm	t mm	A cm ²	m kg/m	As m ² /m	y - y			z - z			It cm ⁴	Ct cm ³	Wpl. yy cm ²	Wpl. zz cm ²
						Iyy cm ⁴	Wel. yy cm ²	iyy cm	Izz cm ⁴	Wel. zz cm ²	izz cm				
160	90	8.0	35.24	27.67	0.466	1093.73	136.72	5.57	443.46	98.55	3.55	1096.54	172.44	175.02	117.19
160	90	10.0	42.57	33.41	0.457	1259.00	157.38	5.44	506.80	112.62	3.45	1291.04	199.33	205.95	137.47
160	100	4.0	19.75	15.50	0.506	695.08	86.88	5.93	337.01	67.40	4.13	724.91	112.31	105.34	76.34
160	100	5.0	24.36	19.12	0.503	841.86	105.23	5.88	406.60	81.32	4.09	886.43	135.83	128.66	93.09
160	100	6.0	28.83	22.63	0.499	978.38	122.30	5.83	470.74	94.15	4.04	1040.01	157.68	150.80	108.94
160	100	8.0	36.84	28.92	0.486	1186.23	148.28	5.67	569.59	113.92	3.93	1324.28	195.39	187.18	135.21
160	100	10.0	44.57	34.98	0.477	1371.67	171.46	5.55	655.08	131.02	3.83	1568.47	227.17	220.95	159.25
160	120	10.0	48.57	38.12	0.517	1597.00	199.63	5.73	1019.47	169.91	4.58	2166.13	283.03	250.95	205.82
160	160	4.0	24.55	19.27	0.626	987.17	123.40	6.34	987.17	123.40	6.34	1541.45	185.25	142.78	142.78
160	160	5.0	30.36	23.83	0.623	1202.36	150.29	6.29	1202.36	150.29	6.29	1896.32	225.79	175.16	175.16
160	160	6.0	36.03	28.29	0.619	1405.48	175.69	6.25	1405.48	175.69	6.25	2238.90	264.18	206.24	206.24
160	160	7.0	41.16	32.31	0.610	1569.69	196.21	6.18	1569.69	196.21	6.18	2578.94	299.68	232.65	232.65
160	160	8.0	46.44	36.46	0.606	1741.23	217.65	6.12	1741.23	217.65	6.12	2896.58	333.56	260.14	260.14
160	160	10.0	56.57	44.40	0.597	2047.67	255.96	6.02	2047.67	255.96	6.02	3490.29	395.10	310.95	310.95
180	80	4.0	19.75	15.50	0.506	802.12	89.12	6.37	226.67	56.67	3.39	578.22	99.59	111.81	63.47
180	80	5.0	24.36	19.12	0.503	971.03	107.89	6.31	272.28	68.07	3.34	704.11	119.97	136.52	77.24
180	80	6.0	28.83	22.63	0.499	1127.88	125.32	6.25	313.82	78.45	3.30	822.55	138.71	159.95	90.19
180	80	8.0	36.84	28.92	0.486	1361.65	151.29	6.08	376.59	94.15	3.20	1036.02	170.32	198.10	111.49
180	80	10.0	44.57	34.98	0.477	1570.13	174.46	5.94	429.14	107.29	3.10	1213.57	196.17	233.51	130.68
180	100	4.0	21.35	16.76	0.546	926.04	102.89	6.59	373.89	74.78	4.18	853.85	127.06	125.89	84.02
180	100	5.0	26.36	20.69	0.543	1124.20	124.91	6.53	451.77	90.35	4.14	1044.79	153.88	154.02	102.59
180	100	6.0	31.23	24.52	0.539	1309.61	145.51	6.48	523.83	104.77	4.10	1226.68	178.88	180.83	120.22
180	100	7.0	35.56	27.91	0.530	1448.23	160.91	6.38	579.67	115.93	4.04	1402.99	201.33	202.55	134.80
180	100	8.0	40.04	31.43	0.526	1598.49	177.61	6.32	637.47	127.49	3.99	1565.24	222.49	225.62	149.93
180	100	8.8	43.52	34.17	0.522	1709.13	189.90	6.27	679.66	135.93	3.95	1687.64	238.16	243.05	161.33
180	100	10.0	48.57	38.12	0.517	1859.47	206.61	6.19	736.41	147.28	3.89	1858.62	259.61	267.51	177.25
180	120	4.0	22.95	18.01	0.586	1049.97	116.66	6.76	563.81	93.97	4.96	1160.17	154.55	139.97	106.17
180	120	5.0	28.36	22.26	0.583	1277.37	141.93	6.71	683.97	114.00	4.91	1423.83	187.84	171.52	129.95
180	120	6.0	33.63	26.40	0.579	1491.34	165.70	6.66	796.30	132.72	4.87	1676.88	219.13	201.71	152.65
180	120	8.0	43.24	33.95	0.566	1835.33	203.93	6.51	978.44	163.07	4.76	2156.35	274.82	253.14	191.57
180	120	10.0	52.57	41.26	0.557	2148.80	238.76	6.39	1140.81	190.13	4.66	2581.64	323.34	301.51	227.82
180	180	5.0	34.36	26.97	0.703	1736.87	192.99	7.11	1736.87	192.99	7.11	2724.16	289.81	224.02	224.02
180	180	6.0	40.83	32.05	0.699	2036.52	226.28	7.06	2036.52	226.28	7.06	3222.65	340.05	264.35	264.35
180	180	7.0	46.76	36.70	0.690	2286.70	254.08	6.99	2286.70	254.08	6.99	3720.36	387.10	299.43	299.43
180	180	8.0	52.84	41.48	0.686	2545.86	282.87	6.94	2545.86	282.87	6.94	4188.56	432.21	335.70	335.70
180	180	8.8	57.60	45.22	0.682	2741.73	304.64	6.90	2741.73	304.64	6.90	4550.90	466.57	363.58	363.58
180	180	10.0	64.57	50.68	0.677	3016.80	335.20	6.84	3016.80	335.20	6.84	5073.57	515.31	403.51	403.51
200	80	4.0	21.35	16.76	0.546	1046.02	104.60	7.00	249.80	62.45	3.42	663.60	111.14	132.36	69.55
200	80	5.0	26.36	20.68	0.543	1269.09	126.91	6.94	300.44	75.11	3.38	808.38	134.05	161.87	84.74
200	80	6.0	31.23	24.52	0.539	1477.42	147.74	6.88	346.74	86.69	3.33	944.77	155.16	189.99	99.07
200	80	8.0	40.04	31.43	0.526	1795.76	179.58	6.70	418.23	104.56	3.23	1191.77	191.11	236.54	123.01
200	80	10.0	48.57	38.12	0.517	2083.06	208.31	6.55	478.48	119.62	3.14	1398.83	220.79	280.08	144.68

Not all dimensions are produced for stock.

Dimensions		Wall thickness	Cross-section	Mass	Outer circumferential surface	for flexible axis						for the torsion		Flexible axis	
						y - y			z - z			It	Ct	Wpl, yy	Wpl, zz
h mm	b mm	t mm	A cm ²	m kg/m	As m ² /m	Iyy cm ⁴	Wel, yy cm ³	Iyy cm	Izz cm ⁴	Wel, zz cm ³	Izz cm	It cm ⁴	Ct cm ³	Wpl, yy cm ³	Wpl, zz cm ³
200	100	4.0	22.95	18.01	0.586	1199.71	119.97	7.23	410.78	82.16	4.23	958.38	141.81	148.04	97.70
200	100	5.0	28.36	22.26	0.583	1459.25	145.93	7.17	496.94	99.39	4.19	1206.29	171.94	181.37	112.09
200	100	6.0	33.63	26.40	0.579	1703.31	170.33	7.12	576.91	115.38	4.14	1417.03	200.10	213.27	131.50
200	100	7.0	38.36	30.11	0.570	1889.81	188.98	7.02	640.33	128.07	4.09	1621.76	225.57	239.50	147.82
200	100	8.0	43.24	33.95	0.566	2090.84	209.08	6.95	705.36	141.07	4.04	1810.72	249.60	267.26	164.65
200	100	10.0	52.57	41.26	0.557	2444.40	244.44	6.82	817.74	163.55	3.94	2154.13	292.07	318.08	195.25
200	120	4.0	24.55	19.27	0.626	1353.39	135.34	7.43	617.66	102.94	5.02	1345.35	172.49	163.72	115.45
200	120	5.0	30.36	23.83	0.623	1649.42	164.94	7.37	750.14	125.02	4.97	1652.00	209.87	200.87	141.45
200	120	6.0	36.03	28.29	0.619	1929.20	192.92	7.32	874.35	145.72	4.93	1946.73	245.12	236.55	166.33
200	120	7.0	41.16	32.31	0.610	2150.67	215.07	7.23	975.25	162.54	4.87	2236.96	277.50	266.52	187.57
200	120	8.0	46.44	36.46	0.606	2385.92	238.59	7.17	1078.97	179.83	4.82	2507.04	308.27	297.98	209.49
200	120	10.0	56.57	44.40	0.597	2805.73	280.57	7.04	1262.14	210.36	4.72	3007.03	363.69	356.08	249.82
200	150	4.0	26.95	21.15	0.686	1583.92	158.39	7.67	1021.03	136.14	6.16	1942.03	218.55	187.24	154.07
200	150	5.0	33.36	26.18	0.683	1934.67	193.47	7.62	1245.04	166.00	6.11	2391.38	266.83	230.12	189.23
200	150	6.0	39.63	31.11	0.679	2268.03	226.80	7.56	1457.13	194.28	6.06	2826.19	312.72	271.47	223.08
200	150	7.0	45.36	35.61	0.670	2541.96	254.20	7.49	1633.73	217.83	6.00	3258.90	355.51	307.05	252.46
200	150	8.0	51.24	40.23	0.666	2828.55	282.85	7.43	1815.54	242.07	5.95	3664.86	396.44	344.06	282.76
200	150	10.0	62.57	49.11	0.657	3347.73	334.77	7.31	2143.36	285.78	5.85	4428.41	471.45	413.08	339.17
200	200	5.0	38.36	30.11	0.783	2410.09	241.01	7.93	2410.09	241.01	7.93	3763.30	361.82	278.87	278.87
200	200	6.0	45.63	35.82	0.779	2832.75	283.27	7.88	2832.75	283.27	7.88	4458.81	425.51	329.67	329.67
200	200	7.0	52.36	41.10	0.770	3194.10	319.41	7.81	3194.10	319.41	7.81	5155.79	485.70	374.60	374.60
200	200	8.0	59.24	46.51	0.766	3566.25	356.63	7.76	3566.25	356.63	7.76	5815.18	543.64	420.86	420.86
200	200	10.0	72.57	56.96	0.757	4251.06	425.11	7.65	4251.06	425.11	7.65	7071.73	651.48	508.08	508.08
220	120	4.0	26.15	20.53	0.666	1705.91	155.08	8.08	671.50	111.92	5.07	1534.22	190.43	189.07	124.73
220	120	5.0	32.36	25.40	0.663	2082.19	189.29	8.02	816.31	136.05	5.02	1884.69	231.92	232.23	152.95
220	120	6.0	38.43	30.17	0.659	2439.12	221.74	7.97	952.40	158.73	4.98	2221.88	271.11	273.78	180.01
220	120	7.0	43.96	34.51	0.650	2725.81	247.80	7.87	1064.75	177.46	4.92	2554.28	307.30	309.08	203.39
220	120	8.0	49.64	38.97	0.646	3029.40	275.40	7.81	1179.49	196.58	4.87	2864.35	341.73	346.02	227.41
220	120	10.0	60.57	47.54	0.637	3575.79	325.07	7.68	1383.47	230.58	4.78	3440.33	404.05	414.65	271.82
220	140	5.0	34.36	26.97	0.703	2313.36	210.31	8.21	1155.23	165.03	5.80	2446.82	273.83	253.73	186.30
220	140	6.0	40.83	32.05	0.699	2713.97	246.72	8.15	1351.66	193.09	5.75	2890.80	320.95	299.46	219.65
220	140	7.0	46.76	36.70	0.690	3043.51	276.68	8.07	1516.43	216.63	5.69	3331.88	364.87	338.90	248.75
220	140	8.0	52.84	41.48	0.686	3389.12	308.10	8.01	1685.02	240.72	5.65	3745.74	406.85	379.94	278.66
220	140	10.0	64.57	50.68	0.677	4017.12	365.18	7.89	1989.01	284.14	5.55	4523.31	483.77	456.65	334.38
220	220	6.0	50.43	39.59	0.859	3813.36	346.67	8.70	3813.36	346.67	8.70	5976.18	520.57	402.18	402.18
220	220	7.0	57.96	45.50	0.850	4314.30	392.21	8.63	4314.30	382.21	8.63	6918.82	595.50	458.18	458.18
220	220	8.0	65.64	51.53	0.846	4828.01	438.91	8.58	4828.01	438.91	8.58	7914.84	667.86	515.62	515.62
220	220	10.0	80.57	63.24	0.837	5782.46	525.68	8.47	5782.46	525.68	8.47	9532.77	803.62	624.65	624.65
250	100	4.0	26.95	21.15	0.686	2091.66	167.33	8.81	502.99	100.60	4.32	1322.52	178.68	210.41	110.90
250	100	5.0	33.36	26.18	0.683	2553.76	204.30	8.75	609.85	121.97	4.28	1620.11	217.08	258.51	135.84
250	100	6.0	39.63	31.11	0.679	2992.34	239.39	8.69	709.63	141.93	4.23	1904.54	253.15	304.85	159.70
250	100	8.0	51.24	40.23	0.666	3714.08	297.13	8.51	875.06	175.01	4.13	2438.66	317.41	385.37	201.45
250	100	10.0	62.57	49.11	0.657	4384.17	350.73	8.37	1021.08	204.22	4.04	2909.59	373.27	462.00	240.25
250	150	5.0	38.36	30.11	0.783	3304.18	264.33	9.28	1507.95	201.06	6.27	3284.54	336.90	319.76	225.48
250	150	6.0	45.63	35.82	0.779	3885.56	310.84	9.23	1768.35	235.78	6.23	3885.80	395.65	378.05	266.28
250	150	7.0	52.36	41.10	0.770	4375.30	350.02	9.14	1991.87	265.58	6.17	4485.13	450.92	429.20	302.51
250	150	8.0	59.24	46.51	0.766	4885.79	390.86	9.08	2219.25	295.90	6.12	5050.45	503.96	482.17	339.56
250	150	10.0	72.57	56.96	0.757	5825.01	466.00	8.96	2634.20	351.23	6.02	6120.70	602.08	582.00	409.17
260	140	5.0	38.36	30.11	0.783	3471.03	267.00	9.51	1337.56	191.08	5.91	3084.21	325.94	326.44	213.30
260	140	6.0	45.63	35.82	0.779	4081.53	313.96	9.46	1567.27	223.90	5.86	3646.18	382.52	385.92	251.81
260	140	8.0	59.24	46.51	0.766	5128.80	394.52	9.30	1964.15	280.59	5.76	4731.08	486.51	492.03	320.90
260	140	10.0	72.57	56.96	0.757	6112.65	470.20	9.18	2327.67	332.52	5.66	5724.07	580.38	593.78	386.38
260	180	10.0	80.57	63.24	0.837	7363.31	566.41	9.56	4174.13	463.79	7.20	8850.30	771.94	639.78	539.51

EN 10305-5 PICKLED



Edge execution (radii of section):

The curved areas (C1 and C2) on the edges may not exceed a value of $1.5 \times T$ for wall thicknesses up to 2.5 mm and $2.2 \times T$ for wall thicknesses above 2.5 mm up to 4 mm.

Straightness tolerance:

Max. deviation of $0.0025 \times \text{length}$ for side lengths up to 30 mm and $0.0015 \times \text{length}$ for side lengths above 30 mm. (The shorter side is applicable in the case of rectangular cross-sections!)

Length tolerance:

Standard lengths of 6000 mm:
length tolerance $+100/-0$
voestalpine Krems Standard $+50 \text{ mm}/-0$
Exact lengths: length tolerance dependent on overall length

Concavity and convexity of the lateral surfaces:

Concavity (inward curvature) and convexity (outward curvature) are included in the maximum dimensions for width and height.

Outer radii profile: $T < 2.5 \text{ mm}$ $C = \text{max. } 1.5 T$
 $2.5 \text{ mm} < T < 4 \text{ mm}$ $C = \text{max. } 2.2 T$

EN 10305-5 pickled: Static values are not regulated in EN 10305-5. Pickled T 3 and 4 mm, unpickled or galvanised version (sendzimir galvanised or hot dip galvanised) possible on request.

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Dimensions		Wall thickness	cross-section	Mass
h mm	b mm	t mm	A cm ²	m kg/m
15	15	1.0	0.56	0.438
15	15	1.5	0.81	0.632
15	15	2.0	1.03	0.810
16	16	1.5	0.87	0.670
16	16	2.0	1.11	0.820
18	18	1.5	0.99	0.810
18	18	2.0	1.27	1.000
19	19	1.5	1.05	0.830
19	19	2.0	1.35	1.060
20	10	1.5	0.81	0.632
20	10	2.0	1.03	0.810
20	15	1.5	0.96	0.750
20	15	2.0	1.23	0.967
20	20	1.5	1.11	0.868
20	20	2.0	1.43	1.120
22	22	1.5	1.23	0.962
22	22	2.0	1.59	1.248
25	15	1.5	1.11	0.868
25	15	2.0	1.43	1.120
25	20	1.5	1.26	0.985
25	20	2.0	1.63	1.280
25	25	1.5	1.41	1.100
25	25	2.0	1.83	1.440
25	25	2.5	2.24	1.780
25	25	3.0	2.45	2.000
28	20	1.5	1.35	1.054
28	20	2.0	1.75	1.376
30	10	1.5	1.11	0.868
30	10	2.0	1.43	1.120
30	15	1.5	1.26	0.985
30	15	2.0	1.63	1.280
30	20	1.5	1.41	1.100
30	20	2.0	1.83	1.440
30	20	2.5	2.24	1.780
30	20	3.0	2.45	2.000

Dimensions		Wall thickness	cross-section	Mass
h mm	b mm	t mm	A cm ²	m kg/m
30	25	2.0	2.03	1.515
30	30	1.5	1.71	1.340
30	30	2.0	2.23	1.750
30	30	2.5	2.74	2.150
30	30	3.0	3.05	2.390
30	30	4.0	3.82	3.220
32	32	1.5	1.83	1.436
32	32	2.0	2.39	1.878
32	32	2.5	2.94	2.302
34	34	1.5	1.95	1.526
34	34	2.0	2.55	2.006
35	20	1.5	1.56	1.220
35	20	2.0	2.03	1.590
35	25	1.5	1.71	1.340
35	25	2.0	2.23	1.750
35	35	1.5	2.01	1.570
35	35	2.0	2.63	2.070
35	35	2.5	3.24	2.540
35	35	3.0	3.65	2.860
35	35	4.0	4.62	3.780
40	20	1.5	1.71	1.340
40	20	2.0	2.23	1.750
40	20	2.5	2.74	2.150
40	20	3.0	3.05	2.390
40	25	1.5	1.86	1.460
40	25	2.0	2.43	1.910
40	25	2.5	2.99	2.340
40	28	1.5	1.95	1.526
40	28	2.0	2.55	2.006
40	28	2.5	3.14	2.460
40	30	1.5	2.01	1.570
40	30	2.0	2.63	2.070
40	30	2.5	3.24	2.540
40	30	3.0	3.65	2.860
40	40	1.5	2.31	1.810

Dimensions		Wall thickness	cross-section	Mass
h mm	b mm	t mm	A cm ²	m kg/m
40	40	1.5	2.31	1.810
40	40	2.0	3.03	2.380
40	40	2.5	3.74	2.930
40	40	3.0	4.25	3.330
40	40	4.0	5.42	4.250
45	25	1.5	2.01	1.570
45	25	2.0	2.63	2.070
45	25	2.5	3.24	2.540
45	45	1.5	2.61	2.050
45	45	2.0	3.43	2.690
45	45	2.5	4.24	3.330
45	45	3.0	4.85	3.800
45	45	4.0	6.22	4.880
50	20	1.5	2.01	1.570
50	20	2.0	2.63	2.070
50	20	2.5	3.24	2.540
50	20	3.0	3.65	2.860
50	25	1.5	2.16	1.690
50	25	2.0	2.83	2.220
50	25	2.5	3.49	2.740
50	25	3.0	3.95	3.100
50	30	1.5	2.31	1.810
50	30	2.0	3.03	2.380
50	30	2.5	3.74	2.930
50	30	3.0	4.25	3.330
50	30	4.0	5.42	4.250
50	34	2.0	3.19	1.934
50	35	2.0	3.23	1.965
50	40	1.5	2.61	2.050
50	40	2.0	3.43	2.690
50	40	2.5	4.24	3.330
50	40	3.0	4.85	3.800
50	40	4.0	6.22	4.880
50	50	1.5	2.91	2.280
50	50	2.0	3.83	3.010

Not all dimensions are produced for stock.

Description of steel grades:

z.B.: **E220+CR2-S2**

E.....Steel for machine construction and general use

220..... Minimum yield stress N/mm²

CR2..... As-delivered condition welded and rolled to size, no heat treatment provided

S2..... Surface condition pickled

As-delivered condition:

+CR2...welded and rolled to size; no subsequent heat treatment provided

+N.....normalised (after welding and forming to size or directly during tube production)

Options:

The customer may request the following additional options at the time of ordering:

- » Suitability for hot dip galvanisation (always guaranteed at voestalpine Krems)
- » Specification of a steel grade which is not specified in the EN10305-5 standard (e.g.: super high strength steels, etc.)
- » Special surface condition for further processing
- » Position of the weld seam
- » Measurement of surface roughness
- » Restricted tolerances
- » among others

Tests:

- » 100% non-destructive testing of the weld with specific test
- » Precise definition of which steel grades are to be subjected to specific testing and thus also which certificates are to be issued.
- » Precise definition regarding the type of tests to be performed per steel grade and the scope of testing.

Surface condition:

Possible qualities of the surface condition:

- S1**.....unpickled
- S2**.....pickled
- S2**..... cold rolled
- S2**..... with coating of agreed condition (e.g. Sendzimir galvanised)
- » The tubes must exhibit the inner and outer surface condition typical of the production process.
- » Surface irregularities, whose depth cannot be clearly identified (i.e. scale, pinchers) are not permissible or may be removed by grinding or machining as long as the minimum wall thickness is maintained.
- » The tubes must exhibit a smooth inner and outer surface with a maximum roughness Ra of 4 µm.

Dimensions		Wall thickness	cross-section	Mass
h mm	b mm	t mm	A cm ²	m kg/m
50	50	2.5	4.74	3.720
50	50	3.0	5.45	4.280
50	50	4.0	7.02	5.510
51	51	2.5	4.84	3.798
51	51	3.0	5.57	4.374
51	51	4.0	7.18	5.636
55	34	2.0	3.39	2.659
55	40	2.0	3.63	2.850
60	20	1.5	2.31	1.810
60	20	2.0	3.03	2.380
60	20	2.5	3.74	2.930
60	25	2.0	3.23	2.535
60	30	1.5	2.61	2.050
60	30	2.0	3.43	2.690
60	30	2.5	4.24	3.330
60	30	3.0	4.85	3.800
60	30	4.0	6.22	4.880
60	40	1.5	2.91	2.280
60	40	2.0	3.83	3.010
60	40	2.5	4.74	3.720
60	40	3.0	5.45	4.280
60	40	4.0	7.02	5.510
60	50	2.0	4.23	3.320
60	50	3.0	6.05	4.750
60	50	4.0	7.82	6.140
60	60	2.0	4.63	3.640
60	60	2.5	5.74	4.500
60	60	3.0	6.65	5.220
60	60	3.5	7.65	5.970
60	60	4.0	8.62	6.760
70	30	2.0	3.83	3.010
70	30	2.5	4.74	3.720
70	40	2.0	4.23	3.320

Dimensions		Wall thickness	cross-section	Mass
h mm	b mm	t mm	A cm ²	m kg/m
70	40	3.0	6.05	4.750
70	40	4.0	7.82	6.140
70	50	3.0	6.65	5.220
70	50	4.0	8.62	6.760
70	70	2.5	6.74	5.290
70	70	3.0	7.85	6.160
70	70	3.5	9.05	7.090
70	70	4.0	10.22	8.020
80	25	3.0	5.75	4.515
80	30	2.0	4.23	3.320
80	30	3.0	6.05	4.750
80	34	2.0	4.39	3.448
80	35	1.5	3.36	2.705
80	35	2.0	4.43	3.480
80	40	1.5	3.51	2.830
80	40	2.0	4.63	3.640
80	40	2.5	5.74	4.500
80	40	3.0	6.65	5.220
80	40	4.0	8.62	6.760
80	50	2.0	5.03	3.950
80	50	3.0	7.25	5.690
80	50	4.0	9.42	7.390
80	60	2.5	6.74	5.290
80	60	3.0	7.85	6.160
80	60	3.5	9.05	7.090
80	60	4.0	10.22	8.020
80	80	2.5	7.74	6.070
80	80	3.0	9.05	7.100
80	80	4.0	11.82	9.280
90	50	3.0	7.85	6.160
90	50	4.0	10.22	8.020
90	60	2.0	5.83	4.580
90	60	2.5	7.24	5.680
90	90	2.5	8.74	5.520

Dimensions		Wall thickness	cross-section	Mass
h mm	b mm	t mm	A cm ²	m kg/m
90	90	3.0	10.25	8.040
90	90	4.0	13.42	10.500
100	34	2.0	5.19	4.070
100	40	2.0	5.43	4.260
100	40	3.0	7.85	6.160
100	40	4.0	10.22	8.020
100	50	2.0	5.83	4.580
100	50	2.5	7.24	5.680
100	50	3.0	8.45	6.630
100	50	3.5	9.75	7.640
100	50	4.0	11.02	8.650
100	60	2.5	7.74	6.070
100	60	3.0	9.05	7.100
100	60	4.0	11.82	9.280
100	80	3.0	10.25	8.040
100	80	4.0	13.42	10.500
100	100	3.0	11.45	8.990
100	100	4.0	15.02	11.800
110	40	2.5	7.24	5.680
110	60	4.0	12.62	9.890
110	70	4.0	13.42	10.500
120	40	2.5	7.74	6.070
120	40	3.0	9.05	7.100
120	40	4.0	11.82	9.280
120	50	2.0	6.63	5.205
120	50	3.0	9.65	7.570
120	60	2.5	8.74	6.860
120	60	3.0	10.25	8.040
120	60	4.0	13.42	10.500
120	80	2.5	9.74	7.640
120	80	3.0	11.45	8.990
120	80	4.0	15.02	11.800
140	34	2.5	8.44	6.623
140	40	2.5	8.74	6.860

NOTE

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