

# Hollow Bars



## ■ APPLICATION

Hollow Bars are both hollow bars and seamless tubes. Hollow Bars are manufactured specifically for production of radially machined components. Hollow bars are used in production of valves and actuators (flowmeters, valves, filters, manifolds); pumps and compressor (vacuum equipment, hydraulic cylinders, pump housings); axes and shafts (rolls, guides, bushings, clamps, bearings); mechanical gaskets (seals, spacers, rings); connection components (fittings, flanges, couplings, connectors); measuring instruments (sensors, solenoids, resistors).

All of the abovementioned products can be used in various industries, as general machinery, chemical and petrochemical industry, shipbuilding industry, automotive industry, paper and paperboard industry, textile industry, food industry, etc.

The use of hollow bars minimizes material losses and reduces overall need in processing completely excluding operation of equipment for deep drilling. Chemical composition of steels used for manufacturing of hollow bars provides higher speed of cutting and long lifetime of cutting tools ensuring a defect-free surface after machining.

## ■ BASIC SIZE RANGE AND STANDARDS

CENTRAVIS produces a range of standard sizes listed in the table most demanded by machine-building companies and equipment manufacturers. Requirements to hollow bars are in accordance with EN 10216-5 and ASTM A312.

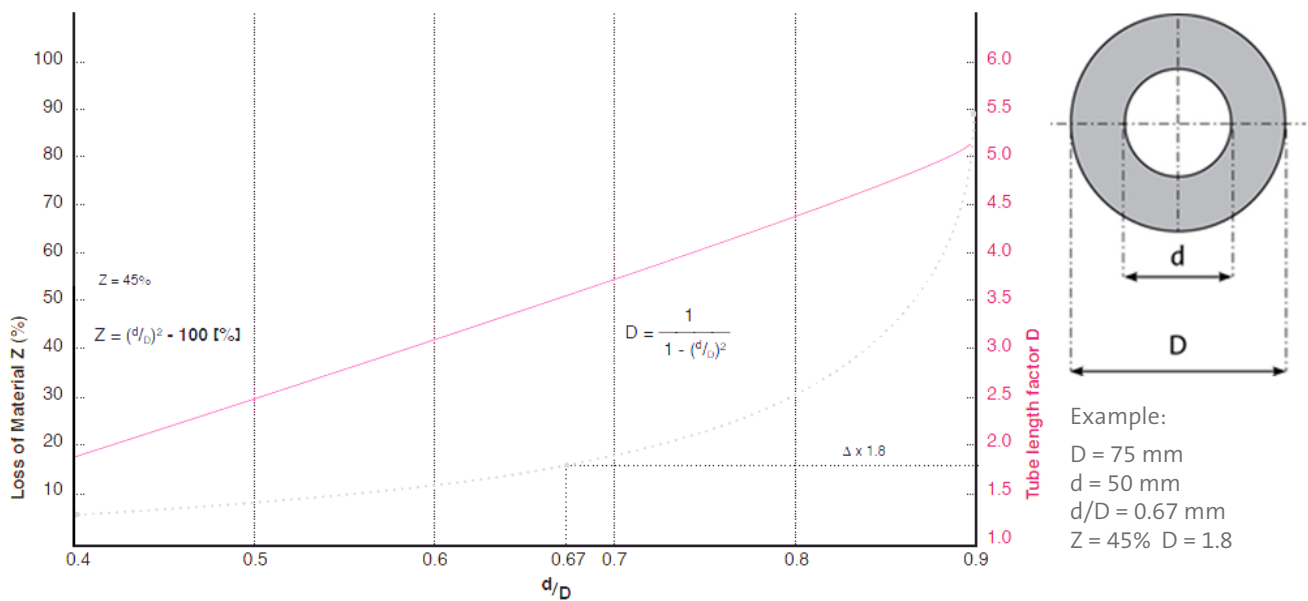
On the Customer's request, the company produces an additional range of sizes and grades not included in the standards as well as production of hollow bars in accordance with the requirements of NF A 49-317 is possible.

### Typical material savings

The red line represents the loss of material 'Z' involved when turning a solid round into a Mechanical Tube. Here 45 % of the solid round must be removed for this purpose.

The dotted line illustrates the tube length factor 'D' which indicates the extra length available for the mechanical parts production as opposed to solid rounds of the same weight.

The example shows a 1.8-fold tube length increase, which means that almost twice as many parts can be made from the tubular weight of material.



Nominal Size		FINISH-TURNED SIZE			
		Chucked OD		Chucked ID	
OD	ID	Max OD	Min ID	Max OD	Min ID
32	20	31	21,9	30,1	21
32	16	31	18	30	17
36	25	35	26,9	34,1	26
36	20	35	22	34	21
36	16	35	18,1	33,9	17
40	28	39	29,9	38,1	29
40	25	39	27	38	26
40	20	39	22,1	37,9	21
45	32	44	33,9	43,1	33
45	28	44	30	43	29
45	20	44	22,2	42,8	21
50	36	49	38	48	37
50	32	49	34,1	47,9	33
50	25	49	27,2	47,8	26
56	45	55	46,9	54,1	46
56	40	55	42	54	41
56	36	55	38,1	53,9	37
56	30	55	32,3	53,7	31
56	28	55	30,3	53,7	29
60	50	59	51,9	58,1	51
60	45	59	47	58	46
60	40	59	42,1	57,9	41
63	50	62	51,9	61,1	51
63	45	62	47,1	60,9	46
63	40	62	42,2	60,8	41
63	36	62	38,3	60,7	37
63	32	62	34,4	60,6	33
65	54	64	55,9	63,1	55
70	50	69	52,1	67,9	51
71	60	70	61,9	69,1	61
71	56	70	58	69	57
71	45	70	47,3	68,7	46
71	40	70	42,4	68,6	41
71	36	70	38,5	68,5	37
75	60	74	62	73	61
75	56	74	58,1	72,9	57

Nominal Size		FINISH-TURNED SIZE			
		Chucked OD		Chucked ID	
OD	ID	Max OD	Min ID	Max OD	Min ID
75	50	74	52,2	72,8	51
75	45	74	47,4	72,6	46
75	40	74	42,5	72,5	41
80	63	79	65	78	64
80	56	79	58,2	77,8	57
80	50	79	52,4	77,6	51
80	45	79	47,5	77,5	46
80	44	79	46,5	77,5	45
80	40	79	42,6	77,4	41
85	67	84	69,1	82,9	68
85	55	84	57,4	82,6	56
85	45	84	47,6	82,4	46
88	70	87	72,1	85,9	71
90	75	89	77	88	76
90	71	89	73,1	87,9	72
90	68	89	70,2	87,8	69
90	63	89	65,3	87,7	64
90	56	89	58,5	87,5	57
90	50	89	52,6	87,4	51
95	75	94	77,1	92,9	76
95	67	94	69,3	92,7	68
95	50	94	52,8	92,2	51
100	80	99	82,1	97,9	81
100	71	99	73,3	97,7	72
100	63	99	65,6	97,4	64
100	56	99	58,7	97,3	57
106	90	105	92	104	91
106	85	105	87,1	103,9	86
106	80	105	82,3	103,7	81
106	71	105	73,5	103,5	72
106	63	105	65,7	103,3	64
106	56	105	58,9	103,1	57
112	95	111	97	110	96
112	90	111	92,2	109,8	91
112	80	111	82,4	109,6	81
112	71	111	73,7	109,3	72

Nominal Size		FINISH-TURNED SIZE			
		Chucked OD		Chucked ID	
OD	ID	Max OD	Min ID	Max OD	Min ID
112	63	111	65,9	109,1	64
118	95	117	97,2	115,8	96
118	90	117	92,3	115,7	91
118	80	117	82,6	115,4	81
118	71	117	73,8	115,2	72
118	63	117	66	115	64
125	100	124	102,2	122,8	101
125	95	124	97,4	122,6	96
125	90	124	92,5	122,5	91
125	80	124	82,8	122,2	81
125	71	124	74	122	72
132	106	131	108,3	129,7	107
132	98	131	100,5	129,5	99
132	90	131	92,7	129,3	91
132	80	131	82,9	129,1	81
132	71	131	74,2	128,8	72
140	112	139	114,3	137,7	113
140	106	139	108,5	137,5	107
140	100	139	102,6	137,4	101
140	90	139	92,9	137,1	91
140	80	139	83,1	136,9	81
150	132	149	135	148	134
150	125	149	127,2	147,8	126
150	118	149	120,4	147,6	119
150	112	149	114,6	147,4	113
150	106	149	108,7	147,3	107
150	95	149	98	147	96
150	90	149	93,1	146,9	91
150	80	149	83,4	146,6	81
160	132	159	135,3	157,7	134
160	122	159	124,6	157,4	123
160	112	159	114,8	157,2	113
160	90	159	93,4	156,6	91
170	140	169	143,3	167,7	142
170	130	169	132,6	167,4	131
170	128	169	130,7	167,3	129

Nominal Size		FINISH-TURNED SIZE			
		Chucked OD		Chucked ID	
OD	ID	Max OD	Min ID	Max OD	Min ID
170	118	169	120,9	167,1	119
170	106	169	109,2	166,8	107
170	100	169	103,4	166,6	101
175	159	174	162	173	161
175	145	174	148,3	172,7	147
180	150	179	153,3	177,7	152
180	140	179	143,6	177,4	142
180	130	179	132,9	177,1	131
180	125	179	128	177	126
180	100	179	103,6	176,4	101
190	160	189	163,3	187,7	162
190	150	189	153,6	187,4	152
190	132	189	136,1	186,9	134
190	123	189	126,3	186,7	124
190	118	189	121,4	186,6	119
190	106	189	109,7	186,3	107
200	170	199	173,3	197,7	172
200	160	199	163,6	197,4	162
200	150	199	153,9	197,1	152
200	140	199	144,1	196,9	142
200	130	199	133,4	196,6	131
212	180	211	183,4	209,6	182
212	170	211	173,7	209,3	172
212	150	211	154,2	208,8	152
212	130	211	133,7	208,3	131
224	180	223	183,7	221,3	182
224	140	223	144,7	220,3	142
236	220	235	223	234	222
236	216	235	219,1	233,9	218
236	206	235	209,3	233,7	208
236	190	235	193,8	233,2	192
236	150	235	154,8	232,2	152
240	224	239	227	238	226
240	220	239	223,1	237,9	222
250	234	249	237	248	236
250	200	249	203,9	247,1	202

### ▣ TOLERANCES

Under Hollow Bars production permissible variations in OD are plus tolerance, in ID are minus tolerance.

Outside diameter range	Machining tolerances			
	For the outside diameter OD	For the inside diameter ID	For eccentricity (centre offset) E	For out-of-straightness h
mm				
50 < D < 250	-0/+2% (min +1/-0 mm)	+0/-2% (min +0/-1 mm)	10%	1 mm/m

CENTRAVIS also produces Mechanical Tubing according to ASTM A511.  
Mechanical tubing according to ASTM A511 - Standard sizes

Outside diameter inches	Wall thickness inches	Outside diameter mm	Wall thickness mm	Outside diameter inches	Wall thickness inches	Outside diameter mm	Wall thickness mm
2.00	0.188 to 0.500	50.80	4.78 to 12.70	5.50	0.250 to 1.000	139.70	6.35 to 25.40
2.25	0.188 to 0.750	57.15	4.78 to 19.05	5.75	0.250 to 1.000	146.05	6.35 to 25.40
2.50	0.188 to 0.750	63.50	4.78 to 19.05	6.00	0.250 to 1.000	152.40	6.35 to 25.40
2.75	0.188 to 0.875	69.85	4.78 to 22.23	6.25	0.250 to 1.500	158.75	6.35 to 38.10
3.00	0.188 to 0.875	76.20	4.78 to 22.23	6.50	0.250 to 1.500	165.10	6.35 to 38.10
3.12	0.188 to 0.875	79.38	4.78 to 22.23	6.75	0.375 to 1.500	171.45	9.53 to 38.10
3.25	0.188 to 0.875	82.55	4.78 to 22.23	7.00	0.375 to 1.500	177.80	9.53 to 38.10
3.50	0.188 to 0.875	88.90	4.78 to 22.23	7.25	0.375 to 1.500	184.15	9.53 to 38.10
3.75	0.250 to 0.875	95.25	6.35 to 22.23	7.50	0.375 to 1.500	190.50	9.53 to 38.10
4.00	0.250 to 0.875	101.60	6.35 to 22.23	7.75	0.375 to 1.500	196.85	9.53 to 38.10
4.25	0.250 to 1.000	107.95	6.35 to 25.40	8.00	0.375 to 1.500	203.20	9.53 to 38.10
4.50	0.250 to 1.000	114.30	6.35 to 25.40	8.25	0.375 to 1.500	209.55	9.53 to 38.10
4.75	0.250 to 1.000	120.65	6.35 to 25.40	8.50	0.375 to 1.500	215.90	9.53 to 38.10
5.00	0.250 to 1.000	127.00	6.35 to 25.40	8.75	0.500 to 1.500	222.25	12.70 to 38.10
5.25	0.250 to 1.000	133.35	6.35 to 25.40				

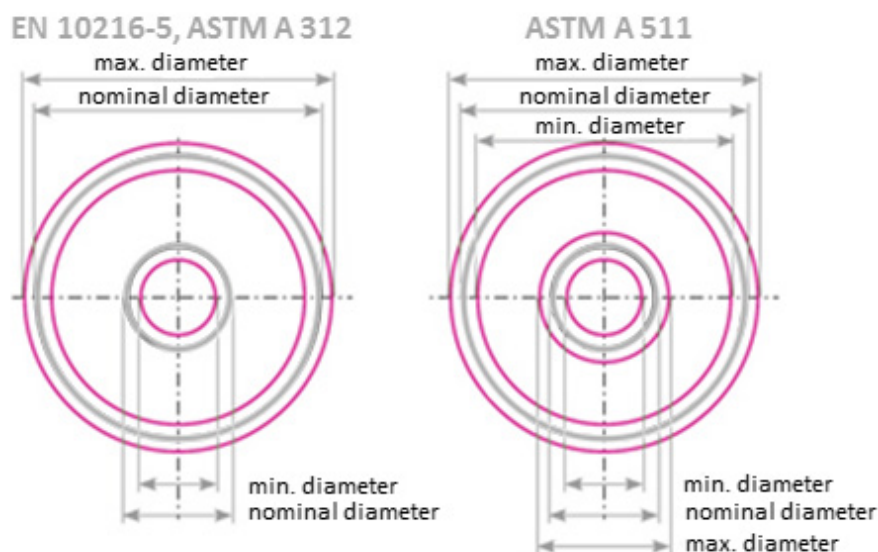
### Permissible Variations in Outside Diameter, Wall Thickness (Hot-Finished Round Tubing)

Specified Nominal Inch Size, Outside Diameter, in. [mm]	Prevailing Range of Commercially Available Metric Sizes, mm	Ratio of Wall Thickness to Outside Diameter	Outside Diameter and Wall Thickness Tolerances					
			Outside Diameter, in. [mm]		Wall Thickness, %			
					Over 0.172 [4.37] to 0.203 in. [5.16 mm], ind		Over 0.203 in. [5.16 mm]	
			Over	Under	Over	Under	Over	Under
Under 3 [75]	Under 76.1	all wall thickness	0.023(0.6)	0.023 [0.6]	14	14	12.5	12.5
3 [75] to 5Vi [140], excl	76.1 to 139.7, excl	all wall thickness	0.031 [0.8]	0.031 [0.8]	14	14	12.5	12.5
5% [140] to [200],excl	139.7 to 203.2, excl	all wall thickness	0.047 [1.2]	0.047 [1.2]	14	14	12.5	12.5
8 [200] to 10% [275],excl	203.2 to 273.1 excl	5 % and over	0.047(1.2)	0.047(1.2)	-	-	12.5	12.5
10% [275] to 12% [325],ind	273.1 to 323.9, ind	under 5 %	0.063(1.6)	0.063 [1.6]	-	-	12.5	12.5

Tolerance for production is a critical parameter when ordering products. For Hollow Bar, OD tolerance is within the plus range and ID tolerance - within the minus range. Allowable wall thickness deviation is defined by the degree of cross-sectional center displacement; this is due to the effect of allowable tolerance for outside and inside diameter, wall thickness and center displacement.

In case of tubes for machining (acc. to ASTM A511), tolerances for outside and inside diameters and wall thickness usually are within plus and minus range of nominal size.

Thus, differences in tolerances between Hollow Bar and ASTM A 511 should be taken into account when ordering products for further machining.

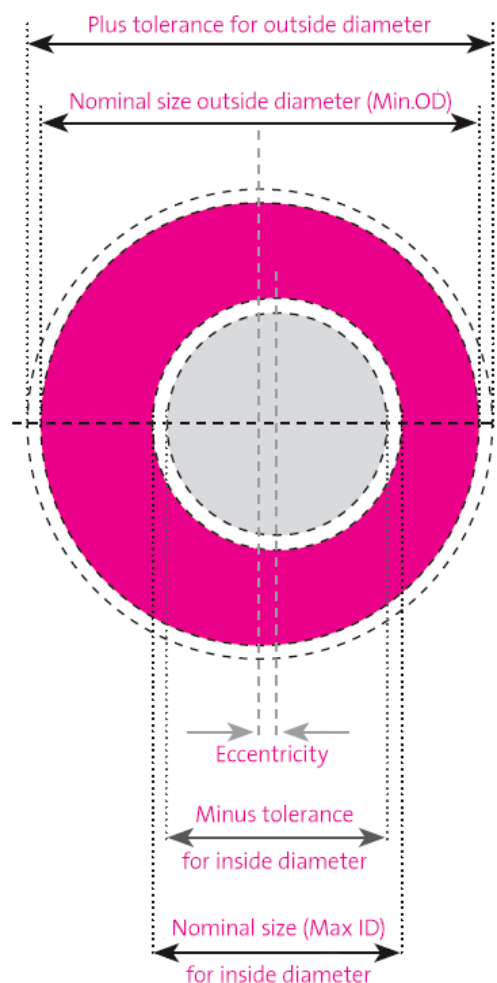


## ■ CENTRAVIS PRODUCTION TECHNOLOGY

Preliminary billet drilling with further expanding is assumed by CENTRAVIS production technology to achieve minimum values of eccentricity in manufacturing of hollow bars. Hollow bars production technology assumes a number of technological changes: vertical heating of shells prior to extrusion, use of a specially developed technology tools calibration procedure.

Due to application of the mentioned technology of hollow bars production, CENTRAVIS has a huge advantage against the other manufacturers of hollow bars.

One of the main quality indicators in production of hollow bars is the eccentricity. The above improvements in hollow bars production technology minimize their variation in wall thickness, thus, enable achievement of maximum uniform wall thickness of tubes cross section directly affecting the eccentricity.





## STANDARD STEEL GRADES

Hollow bars and Mechanical tubing are supplied in a range of specially selected stainless and acid-resistant standard grades chosen to cover the majority of corrosion and processing problems that occur in daily practice.

USA			France		Germany		
UNS	Designation (Grade)	Standard ASTM	Designation	Standard NF	Material		
S30400	MT 304 (TP 304)	A511 (A312)	Z6CN 18-09	A49-117 A49-317	1.4301	X5CrNi 18 10	EN 10216-5
S30403	MT 304L (TP 304L)	A511 (A312)	Z2CN 18-10	A49-117 A49-317	1.4306	X2CrNi 19 11	EN 10216-5
S31600	MT 316 (TP 316)	A511 (A312)	Z6CND 17-11	A49-117	1.4401	X5CrNiMo 17 12 2	EN 10216-5
S31603	MT 316L (TP 316L)	A511 (A312)	Z2CND 17-12	A49-117 A49-317	1.4404	X2CrNiMo 17 12 2	EN 10216-5
S32100	MT 321 (TP 321)	A511 (A312)	Z6CNT 18-10	A49-117 A49-317	1.4541	X6CrNiTi 18 11	EN 10216-5
S31803 S32205	–	A511	Z2CND 22-05-03	A49-127	1.4462	X2CrNiMoN 22-5-3	EN 10216-5

