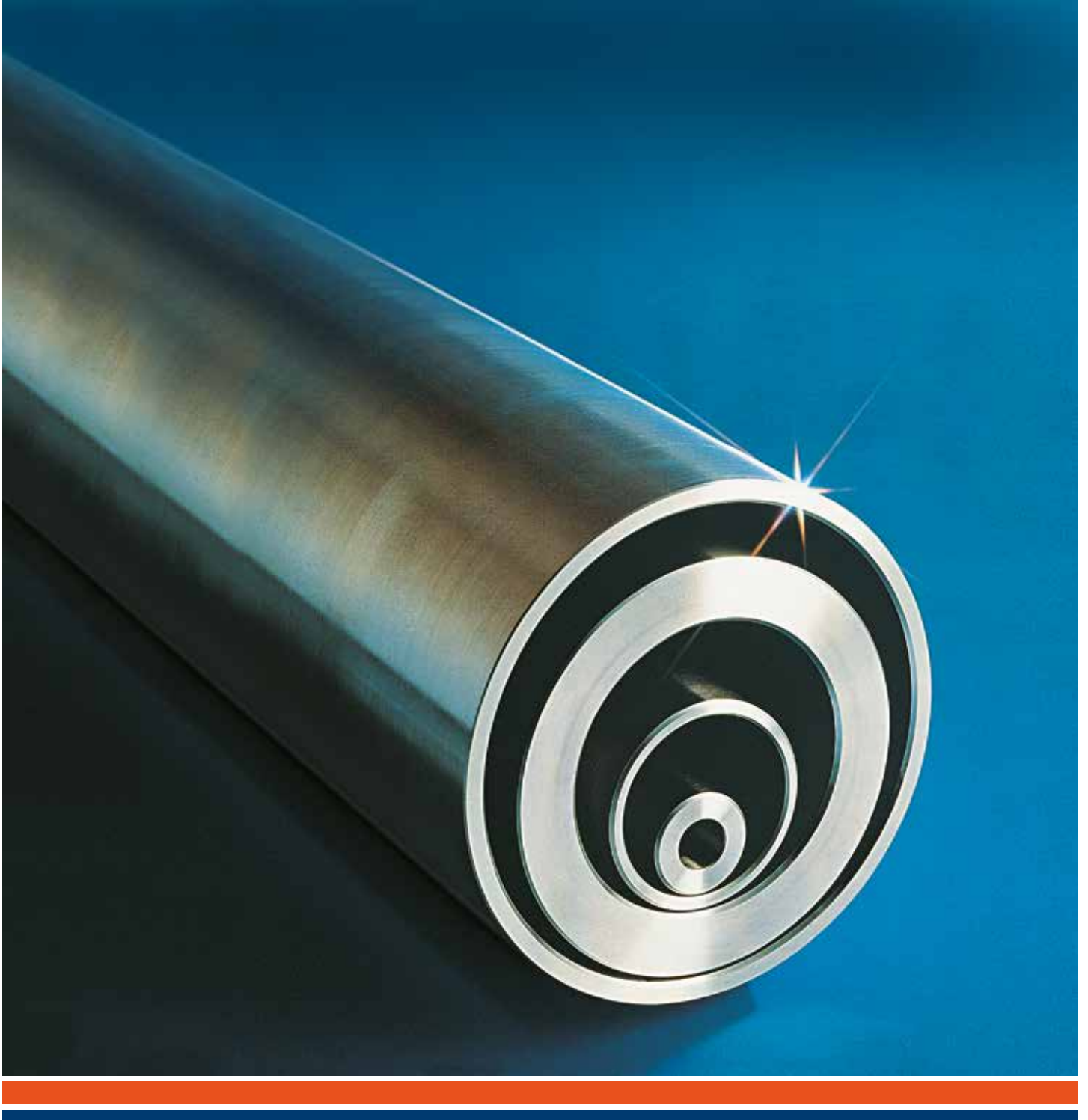


# sicam®



**CD** OLD RAWN TUBES

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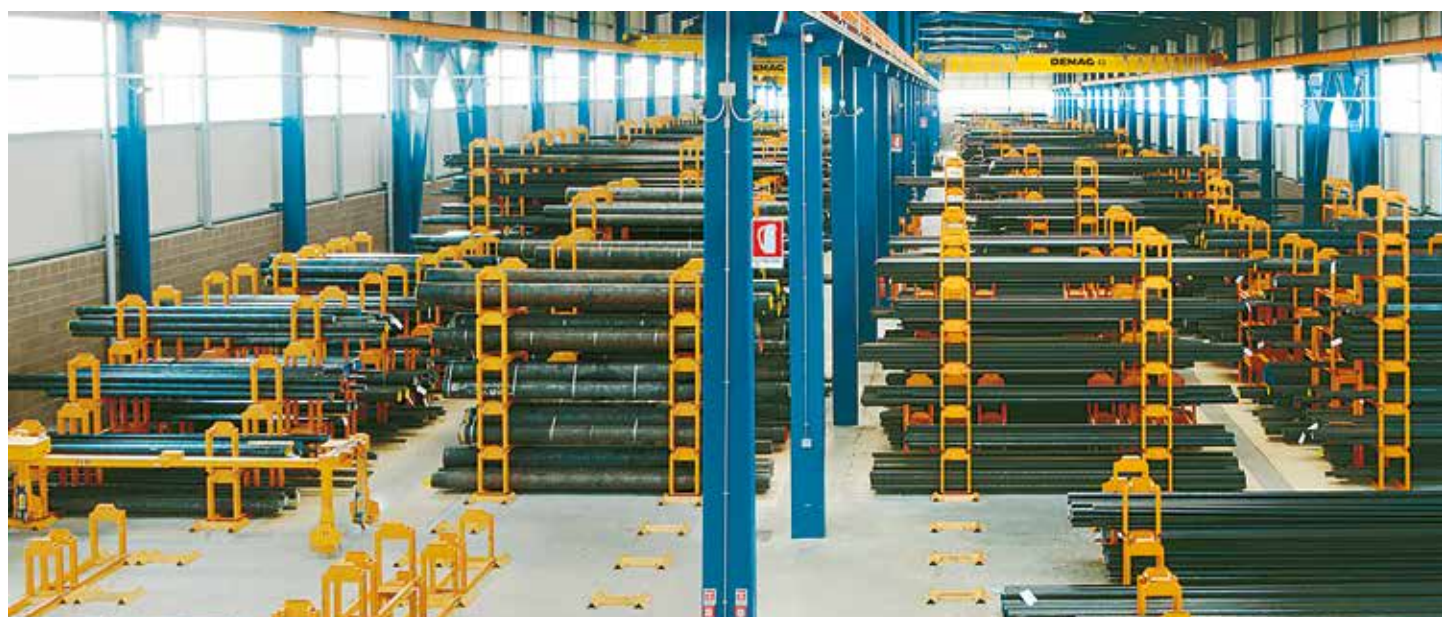
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## **COLD DRAWN TUBES**

### **GENERAL FEATURES**

These products are manufactured by cold drawing of seamless and welded fully killed steel tubes. This particular process assures a high dimensional precision, while different kinds of following heat treatments are used to reach different levels in mechanical properties.

### **TYPES**

The different kinds of cold drawn tubes ready on stock cover a wide range of applications:

- SEAMLESS AND WELDED CYLINDER TUBES.
- SEAMLESS AND WELDED CYLINDER TUBES INSIDE H8.
- SEAMLESS TUBES SUITABLE FOR SHAFTS.
- WELDED SMOOTH BORE READY-TO-USE CYLINDER TUBES INSIDE H9 OR H10.
- SEAMLESS TUBES FOR HYDRAULIC AND PNEUMATIC POWER SYSTEMS.



## STEELGRADES AND DELIVERY CONDITIONS

### COLD DRAWN / HARD

(+C acc. EN 10305 / BK acc. DIN 2391)

No heat treatment after final cold drawing.

### COLD DRAWN / SOFT

(+LC acc. EN 10305 / BKW acc. DIN 2391)

The final heat treatment is followed by a suitable drawing pass (limited reduction of area).

### STRESS RELIEVED

(+SR acc. EN 10305 / BK+S acc. DIN 2391)

After the final cold drawing process, tubes are stress relieved in controlled atmosphere in order to reduce work hardening due to the cold forming process.

### ANNEALED

(+A acc. EN 10305 / GBK acc. DIN 2391)

After final cold drawing process, tubes are annealed in controlled atmosphere.

### NORMALIZED

(+N acc. EN 10305 / NBK acc. DIN 2391)

After final cold drawing process, tubes are normalized in controlled atmosphere at a temperature exceeding the austenitizing temperature.

Norm	Steel grade	Chemical composition (% on mass)									
		C		Si		Mn		P	S	Al	
		Min.	Max.	Min.	Max.	Min.	Max.	Max.	Max.	Min.	Max.
EN 10305-1 (Seamless tubes)	E215	-	0.10	-	0.05	-	0.70	0.025	0.025	0.025 <sup>1</sup>	-
	E235	-	0.17	-	0.35	-	1.20	0.025	0.025	0.015 <sup>1</sup>	-
	E355*	-	0.22	-	0.55	-	1.60	0.025	0.025	0.020 <sup>1</sup>	-
	E410 <sup>2</sup>	0.16	0.22	0.10	0.50	1.30	1.70	0.030	0.035	0.010	0.060
	MW-Grade 660 <sup>3</sup>	-	0.20	-	0.60	1.00	1.70	0.025	0.030	0.020	-
EN 10305-2 (Welded tubes)	E155	-	0.11	-	0.35	-	0.70	0.025	0.025	0.015 <sup>1</sup>	-
	E195	-	0.15	-	0.35	-	0.70	0.025	0.025	0.015 <sup>1</sup>	-
	E235	-	0.17	-	0.35	-	1.20	0.025	0.025	0.015 <sup>1</sup>	-
	E275	-	0.21	-	0.35	-	1.40	0.025	0.025	0.015 <sup>1</sup>	-
	E355*	-	0.22	-	0.55	-	1.60	0.025	0.025	0.020 <sup>1</sup>	-
EN 10305-4 (Seamless tubes)	E215	-	0.10	-	0.05	-	0.70	0.025	0.015	0.025	-
	E235*	-	0.17	-	0.35	-	1.20	0.025	0.015	-	-
	E355	-	0.22	-	0.55	-	1.60	0.025	0.015	-	-

\* Standard stock.

<sup>1</sup> The aluminium content is no longer ruled when the steel contains an adequate percentage of Nitrogen binding elements, like Niobium, Vanadium or Titanium.

<sup>2</sup>  $0.080 \leq V \leq 0.15$ ;  $Nb \leq 0.070$ ;  $Ti \leq 0.050$ ;  $Nb+V \leq 0.20$  (% on mass).

<sup>3</sup> Steel according to manufacturer's specification, not foreseen by any norm.  $Cu \leq 0.70$ ;  $Cr \leq 0.30$ ;  $Ni \leq 0.80$ ;  $Mo \leq 0.10$ ;  $V \leq 0.20$ ;  $Ti \leq 0.040$ ;  $N \leq 0.020$ ;  $Nb \leq 0.050$ ;  $Nb+Ti+V \leq 0.22$  (% on mass).

## MECHANICAL PROPERTIES

Norm	Steel grade	Delivery condition +C			Delivery condition +LC			Delivery condition +SR			Delivery condition +A			Delivery condition +N		
		ReH Mpa	Rm Mpa	All. %	ReH Mpa	Rm Mpa	All. %	ReH Mpa	Rm Mpa	All. %	ReH Mpa	Rm Mpa	All. %	ReH Mpa	Rm Mpa	All. %
<b>EN 10305-1</b> (Seamless tubes)	<b>E215</b>	0.8Rm	430	8	0.7Rm	380	12	280	380	16	0.5Rm	280	30	215	290-430	30
	<b>E235</b>	0.8Rm	480	6	0.7Rm	420	10	350	420	16	0.5Rm	315	25	235	340-480	25
	<b>E355*</b>	0.8Rm	640	4	0.7Rm	580	7	450 <sup>A</sup>	580	10	0.5Rm	450	22	355	490-630	22
	<b>E410</b>	0.8Rm	750	4	0.7Rm	620	8	590	690	12	0.5Rm	520	22	410	550-700	22
	<b>MW-Grade 660</b>	-	-	-	-	-	-	660	700	15	-	-	-	-	-	-
<b>EN 10305-2</b> (Welded tubes)	<b>E155</b>	0.8Rm	400	6	0.7Rm	350	10	245	350	18	0.5Rm	260	28	155	270-410	28
	<b>E195</b>	0.8Rm	420	6	0.7Rm	370	10	260	370	18	0.5Rm	290	28	195	300-440	28
	<b>E235</b>	0.8Rm	490	6	0.7Rm	440	10	325	440	14	0.5Rm	315	25	235	340-480	25
	<b>E275</b>	0.8Rm	560	5	0.7Rm	510	8	375	510	12	0.5Rm	390	22	275	410-550	22
	<b>E355*</b>	0.8Rm	640	4	0.7Rm	590	6	435	590	10	0.5Rm	450	22	355	490-630	22
<b>EN 10305-4</b> (Seamless tubes)	<b>E215</b>	-	-	-	-	-	-	-	-	-	-	-	-	215	290-430	30
	<b>E235*</b>	-	-	-	-	-	-	-	-	-	-	-	-	235	340-480	25
	<b>E355</b>	-	-	-	-	-	-	-	-	-	-	-	-	355	490-630	22

**Note: the values stated in the table are the minimum requirements foreseen by the norm (manufacture specification for the steelgrade MW-Grade 660). When two values are stated, they have to be considered as the minimum and maximum values.**

<sup>A</sup> For tubes with OD > 160 mm ReH≥420 Mpa.

\* Standard stock.

The minimum elongation values refer to longitudinal samples.

For tubes according to EN 10305-4, for dia ≤ 30 mm and w.t. ≤ 3 mm, the yield strength min. values are 10 Mpa lower than the values given in the table.

## STEELGRADES AND COMPARISON TABLE

EN Norms			UNI Norms	DIN Norms	AFNOR Norms	Steels according to manufacturers' specifications
EN 10305-1	EN 10305-2	EN 10305-4				
<b>E215</b>			Fe280 UNI 7945	St 30Si DIN 2391	Tu37b NF A 49-310	
<b>E235</b>			Fe360 UNI 7945	St 35 DIN 2391	-	
<b>E355</b>			Fe490 UNI 7945	St 52 DIN 2391	Tu52b NF A 49-310	
<b>E410</b>			-	-	-	P460 (StE460)
	<b>E155</b>		Fe280 UNI 7946	-	-	
	<b>E195</b>		Fe320 UNI 7946	RSt 34.2 DIN 2393	-	
	<b>E235</b>		Fe360 UNI 7946	RSt 37.2 DIN 2393	-	
	<b>E275</b>		-	-	-	
	<b>E355</b>		Fe490 UNI 7946	St 52.3 DIN 2393	-	
		<b>E215</b>	Fe360 UNI 7946	RSt 34.2 NBK DIN 2391	-	
		<b>E235</b>	-	RSt 37.2 NBK DIN 2391	-	
		<b>E355</b>	Fe490 UNI 7946	St 52.3 NBK DIN 2391	-	







## SEAMLESS AND WELDED CYLINDERS TUBES

The manufacturing process and strict tests foreseen for the cold drawn **SEAMLESS** and **WELDED** tubes give as result a fine grain steel with high pureness degree together with a high dimensional precision.  
These are tubes with dimensional features and tolerances on the ID suitable for skiving and roller burnishing.

### APPLICATIONS

These tubes are intended to resist to internal pressure and are therefore used for the manufacture of cylinders. They are produced in all the sizes used for hydraulic and pneumatic applications, in different steelgrades and delivery conditions.

### NORMS

COLD DRAWN SEAMLESS TUBES  
COLD DRAWN WELDED TUBES

EN 10305-1  
EN 10305-2

## DIMENSIONAL TOLERANCES ACCORDING TO EN 10305-1/2

O.D.: see dimensional table on the next page.

W.T.: welded tubes:  $\pm 7.5\%$  with a minimum  $\pm 0.1$  mm  
seamless tubes :  $\pm 10\%$  with a minimum  $\pm 0.1$  mm

ECCENTRICITY: welded tubes:  $\leq 7.5\%$   
seamless tubes:  $\leq 10\%$   
to be calculated with the following formula:

$$\frac{\text{Max. W.T.} - \text{min. W.T.}}{\text{Max. W.T.} + \text{min. W.T.}} \times 100$$

STRAIGHTNESS:

for OD  $\leq 260$  mm  
if ReH  $\leq 500$  Mpa 0.0015 L;  
if ReH  $> 500$  Mpa 0.002 L;  
for ID  $> 260$  mm  
if ReH  $\leq 500$  Mpa 0.0025 L;  
if ReH  $> 500$  Mpa 0.003 L;

L = total length of the tube, max. values to be checked on the total tube length.



## DIMENSIONAL TABLES

WELDED TUBES O.D. up to 230 mm and W.T. up to 12.5 mm

SEAMLESS TUBES O.D. up to 380 mm and W.T. up to 25 mm

The tolerances on the OD stated in the following tables are referred to the delivery condition +SR.

I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>20</b>	-0,20 / -0,35	30	± 0.08	5	3.08
		40	± 0.15	10	7.40
<b>25</b>	-0,20 / -0,35	35	± 0.15	5	3.70
		40	± 0.15	7.5	6.01
<b>30</b>	-0,20 / -0,35	40	± 0.15	5	4.32
		45	± 0.20	7.5	6.94
		50	± 0.20	10	9.86
<b>35</b>	-0,20 / -0,35	45	± 0.20	5	4.93
		50	± 0.20	7.5	7.86
		55	± 0.25	10	11.10
<b>40</b>	- 0.20 / - 0.35	50	± 0.25	5	5.55
		52	± 0.25	6	6.81
		55	± 0.25	7.5	8.78
		60	± 0.25	10	12.33
<b>45</b>	- 0.20 / - 0.35	55	± 0.25	5	6.30
		57	± 0.25	6	7.60
		60	± 0.25	7.5	9.85
		65	± 0.30	10	13.70
<b>50</b>	- 0.20 / - 0.40	60	± 0.25	5	6.94
		62	± 0.30	6	8.46
		65	± 0.30	7.5	10.80
		70	± 0.30	10	15.00
<b>55</b>	- 0.20 / - 0.40	65	± 0.30	5	7.58
		67	± 0.30	6	9.10
		70	± 0.30	7.5	11.80
		75	± 0.35	10	16.20

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the tolerances are only approximate.

## DIMENSIONAL TABLES

I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>60</b>	- 0.20 / - 0.45	70	± 0.30	5	8.22
		72	± 0.35	6	9.97
		75	± 0.35	7.5	12.70
		80	± 0.35	10	17.50
<b>63</b>	- 0.20 / - 0.45	73	± 0.35	5	8.40
		75	± 0.35	6	10.30
		78	± 0.35	7.5	13.10
		83	± 0.40	10	18.10
<b>65</b>	- 0.20 / - 0.45	75	± 0.35	5	8.85
		77	± 0.35	6	10.60
		80	± 0.35	7.5	13.60
		85	± 0.40	10	18.80
		90	± 0.40	12.5	23.90
<b>70</b>	- 0.20 / - 0.45	80	± 0.35	5	9.48
		82	± 0.40	6	11.50
		85	± 0.40	7.5	14.60
		90	± 0.40	10	20.00
		95	± 0.45	12.5	25.70
<b>75</b>	- 0.25 / - 0.55	85	± 0.40	5	10.10
		87	± 0.40	6	12.00
		90	± 0.40	7.5	15.60
		95	± 0.45	10	21.30
		100	± 0.45	12.5	27.30
<b>80</b>	- 0.25 / - 0.55	90	± 0.40	5	10.80
		92	± 0.45	6	13.00
		95	± 0.45	7.5	16.50
		100	± 0.45	10	22.50
		105	± 0.50	12.5	28.90
		110	± 0.50	15	35.20

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.



I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>85</b>	- 0.25 / - 0.55	95	± 0.45	5	11.40
		97	± 0.45	6	13.50
		100	± 0.45	7.5	17.50
		105	± 0.50	10	23.80
		110	± 0.50	12.5	30.50
		115	± 0.50	15	37.00
<b>90</b>	- 0.25 / - 0.55	100	± 0.45	5	8.40
		102	± 0.50	6	10.30
		105	± 0.50	7.5	13.10
		110	± 0.50	10	18.10
		115	± 0.50	12.5	32.10
		120	± 0.50	15	38.90
<b>95</b>	- 0.25 / - 0.55	105	± 0.75	5	12.70
		107	± 0.50	6	15.00
		110	± 0.50	7.5	19.40
		115	± 0.50	10	26.30
		120	± 0.50	12.5	33.60
		125	± 0.50	15	40.70
<b>100</b>	- 0.25 / - 0.55	110	± 0.75	5	13.40
		112	± 0.50	6	15.68
		115	± 0.50	7.5	20.30
		120	± 0.50	10	27.60
		125	± 0.70	12.5	35.20
		130	± 0.70	15	42.54
		135	± 0.70	17.50	50.80
		140	± 0.70	20	59.20
		150	± 0.80	25	77.10
<b>105</b>	- 0.25 / - 0.65	115	± 0.75	5	13.50
		117	± 0.50	6	16.42
		120	± 0.50	7.5	20.80
		125	± 0.70	10	28.30
		130	± 0.70	12.5	36.20
		135	± 0.70	15	44.30
		140	± 0.70	17.5	52.86
		145	± 0.80	20	61.65
		155	± 0.80	25	80.14

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.

## DIMENSIONAL TABLES

I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>110</b>	- 0.25 / - 0.65	120	± 0.75	5	14.70
		122	± 0.75	6	17.70
		125	± 0.70	7.5	22.30
		130	± 0.70	10	30.20
		135	± 0.70	12.5	38.40
		140	± 0.70	15	46.30
		145	± 0.80	17.5	55.10
		150	± 0.80	20	64.20
		160	± 0.80	25	83.30
<b>115</b>	- 0.25 / - 0.65	125	± 1.05	5	14.70
		127	± 1.05	6	17.90
		130	± 0.70	7.5	22.60
		135	± 0.70	10	30.80
		140	± 0.70	12.5	39.30
		145	± 0.80	15	48.08
		150	± 0.80	17.5	57.18
		155	± 0.80	5	12.70
		165	± 0.90	25	86.31
<b>120</b>	- 0.25 / - 0.65	130	± 1.05	5	16.00
		132	± 1.05	6	19.50
		135	± 0.70	7.5	24.20
		140	± 0.70	10	32.70
		145	± 0.80	12.5	40.84
		150	± 0.80	15	50.00
		155	± 0.80	17.5	59.40
		160	± 0.80	20	69.10
		170	± 0.90	25	89.50
<b>125</b>	- 0.25 / - 0.65	135	± 1.05	5	16.70
		140	± 0.70	7.5	25.20
		145	± 0.80	10	34.00
		150	± 0.80	12.5	43.10
		155	± 0.80	15	51.80
		160	± 0.80	17.5	61.50
		165	± 0.90	20	71.20
		175	± 0.90	25	92.50

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.



I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>130</b>	- 0.25 / - 0.65	140	± 1.05	5	17.30
		142	± 1.20	6	20.20
		145	± 0.80	7.5	26.20
		150	± 0.80	10	35.30
		155	± 0.80	12.5	44.70
		160	± 0.80	15	53.70
		165	± 0.90	17.5	63.70
		170	± 0.90	20	74.00
		180	± 0.90	25	95.60
<b>135</b>	- 0.25 / - 0.65	145	± 1.20	5	17.20
		147	± 1.20	6	20.86
		150	± 0.80	7.5	26.30
		155	± 0.80	10	35.70
		160	± 0.80	12.5	45.40
		165	± 0.90	15	55.48
		170	± 0.90	17.5	65.81
<b>140</b>	- 0.25 / - 0.65	150	± 1.20	5	18.80
		152	± 1.20	6	21.70
		155	± 1.20	7.5	28.10
		160	± 0.80	10	37.50
		165	± 0.90	12.5	48.00
		170	± 0.90	15	57.40
		175	± 0.90	17.5	68.00
		180	± 0.90	20	79.00
		190	± 1.00	25	59.40
<b>145</b>	- 0.25 / - 0.65	155	± 1.20	5	18.40
		157	± 1.20	6	22.34
		160	± 1.20	7.5	28.20
		165	± 0.90	10	38.20
		170	± 0.90	12.5	48.50
		175	± 0.90	15	59.18
		180	± 0.90	17.5	70.12
		185	± 1.00	20	81.38
		195	± 1.00	25	104.80

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.

## DIMENSIONAL TABLES

I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>150</b>	- 0.25 / - 0.65	160	± 1.20	5	20.20
		162	± 1.20	6	23.10
		165	± 1.35	7.5	30.10
		170	± 0.90	10	40.50
		175	± 0.90	12.5	51.20
		180	± 0.90	15	61.10
		185	± 1.00	17.5	72.30
		190	± 1.00	20	83.90
		200	± 1.00	25	107.90
<b>155</b>	- 0.25 / - 0.65	165	± 1.35	5	19.72
		167	± 1.35	6	23.82
		170	± 1.35	7.5	30.00
		175	± 0.80	10	40.69
		180	± 0.90	12.5	51.60
		185	± 1.00	15	62.88
		190	± 1.00	17.5	74.44
		195	± 1.00	20	86.31
		205	± 1.20	25	110.97
<b>160</b>	- 0.25 / - 0.65	175	± 1.35	7.5	32.10
		180	± 0.90	10	43.10
		185	± 1.00	12.5	54.30
		190	± 1.00	15	64.80
		195	± 1.00	17.5	76.70
		200	± 1.00	20	88.80
		210	± 1.20	25	114.10
<b>165</b>	- 0.25 / - 0.65	180	± 1.35	7.5	31.91
		185	± 1.0	10	43.16
		190	± 1.00	12.5	54.72
		195	± 1.00	15	66.58
		200	± 1.00	17.5	78.76
		205	± 1.10	20	91.25
		215	± 1.10	25	231.20

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.





I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	Tolerance (mm)	(Kg/m)
<b>170</b>	- 0.70 / - 1.20	185	± 1.50	7.5	34.00
		190	± 1.00	10	45.80
		195	± 1.00	12.5	57.60
		200	± 1.00	15	68.50
		205	± 1.20	17.5	81.00
		210	± 1.20	20	93.80
		220	± 1.20	25	120.30
<b>175</b>	- 0.70 / - 1.20	190	± 1.50	7.5	33.75
		195	± 1.00	10	45.62
		200	± 1.00	12.5	57.80
		205	± 1.10	15	70.28
		210	± 1.10	17.5	83.08
		215	± 1.10	20	96.18
		225	± 1.20	25	123.30
<b>180</b>	- 0.70 / - 1.20	195	± 1.50	7.5	36.10
		200	± 1.00	10	48.30
		205	± 1.10	12.5	59.40
		210	± 1.10	15	72.20
		215	± 1.10	17.5	85.30
		220	± 1.10	20	98.70
		230	± 1.20	25	126.40
<b>185</b>	- 0.70 / - 1.20	200	± 1.50	7.5	35.60
		205	± 1.65	10	48.09
		210	± 1.10	12.5	60.88
		215	± 1.10	15	73.98
		220	± 1.10	17.5	87.39
		225	± 1.20	20	101.11
		235	± 1.20	25	129.47
<b>190</b>	-0.70 / - 1.20	210	± 1.65	10	49.40
		215	± 1.10	12.5	62.50
		220	± 1.10	15	75.90
		225	± 1.20	17.5	89.60
		230	± 1.20	20	103.60
		240	± 1.20	25	132.60

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.

## DIMENSIONAL TABLES

I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>195</b>	- 0.70 / - 1.20	215	± 1.65	10	50.55
		220	± 1.10	12.5	63.96
		225	± 1.20	15	77.68
		230	± 1.20	17.5	91.71
		235	± 1.20	20	106.04
		245	± 1.30	25	135.64
<b>200</b>	- 0.70 / - 1.20	220	± 1.65	10	51.80
		225	± 1.20	12.5	65.60
		230	± 1.20	15	79.60
		235	± 1.20	17.5	93.90
		240	± 1.20	20	108.60
		250	± 1.30	25	138.80
<b>210</b>	- 0.70 / - 1.20	230	± 1.80	10	54.25
		235	± 1.20	12.5	68.59
		240	± 1.20	15	83.23
		245	± 1.30	17.5	98.18
		250	± 1.30	20	113.44
		260	± 1.30	25	144.88
<b>220</b>	- 0.70 / - 1.20	240	± 1.80	10	56.80
		245	± 1.30	12.5	71.70
		250	± 1.30	15	87.00
		255	± 1.30	17.5	102.50
		260	± 1.30	20	118.40
		270	± 1.40	25	151.10
<b>250</b>	- 0.80 / - 1.30	270	± 2.10	10	64.20
		275	± 2.10	12.5	81.00
		280	± 1.40	15	98.10
		285	± 1.50	17.5	115.50
		290	± 1.50	20	133.20
		300	± 1.50	25	169.60

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.



I.D.		O.D.		W.T.	Mass
Nominal	Tolerance (mm)	Nominal	Tolerance (mm)	(mm)	(Kg/m)
<b>280</b>	- 0.90 / - 1.40	305	± 2.40	12.5	90.20
		310	± 2.40	15	109.20
		315	± 1.60	17.5	128.40
		320	± 1.60	20	148.00
		330	± 1.70	25	188.00
		225	± 1.20	17.5	89.60
<b>300</b>	- 0.90 / - 1.50	325	± 2.55	12.5	96.40
		330	± 2.55	15	116.60
		335	± 1.70	17.5	137.10
		340	± 1.70	20	157.90
		350	± 1.80	25	200.40
<b>320</b>	- 0.90 / - 1.50	345	± 2.70	12.5	102.50
		350	± 2.70	15	124.00
		355	± 2.70	17.5	145.70
		360	± 1.80	20	167.70
<b>330</b>	- 0.90 / - 1.70	360	± 2.70	15	127.70
		365	± 2.85	17.5	150.00
		370	± 1.90	20	172.70
		380	± 1.90	25	218.90
<b>340</b>	- 0.90 / - 1.70	370	± 2.85	15	131.40
		375	± 2.85	17.5	154.30
		380	± 1.90	20	177.60

Note: the tolerances on the ID, thanks to whom the tube is suitable for inside machining , are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.

## SEAMLESS AND WELDED CYLINDER TUBES INSIDE H8

Our standard stock includes cold drawn tubes, both **SEAMLESS** and **WELDED**, with machined ID according to tolerance H8-EN ISO 286-2 and roughness (Ra) below 0.4 micron ( $\mu\text{m}$ ).

### GENERAL FEATURES

Chemical and mechanical features are the same of the raw tube (see steels- table for cold drawn tubes), which is machined on the ID. The dimensional tolerances are the same of the raw tube, except for the ID, which is according to H8.

### NORMS

COLD DRAWN SEAMLESS TUBES  
COLD DRAWN WELDED TUBES  
DIMENSIONAL FEATURES OF THE ID

EN 10305-1  
EN 10305-2  
EN ISO 286-2





## DIMENSIONAL TABLES

WELDED TUBES  
SEAMLESS TUBES

OD up to 230 mm and w.t. up to 12.5 mm

OD up to 380 mm and w.t. up to 25 mm.

ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>20</b>	- 0 / + 0.033	25	2.5	1.39
		30	5	3.08
		32	6	3.85
		35	7.5	6.33
		40	10	7.30
<b>25</b>	- 0 / + 0.033	35	5	3.70
		40	7.5	6.01
		45	10	8.60
<b>30</b>	- 0 / + 0.033	38	4	3.35
		40	5	4.32
		45	7.5	6.93
		50	10	9.86
<b>32</b>	- 0 / + 0.039	45	6.5	6.17
		42	5	4.56
<b>35</b>	- 0 / + 0.039	45	5	4.93
		50	7.5	7.86
		55	10	11.10
<b>40</b>	- 0 / + 0.039	50	5	5.67
		52	6	6.93
		55	7.5	8.79
		60	10	12.33
<b>45</b>	- 0 / + 0.039	55	5	6.30
		57	6	7.55
		60	7.5	9.85
		65	10	13.70

\* Tolerance H9

\*\* Tolerance H10.

## DIMENSIONAL TABLES

ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>50</b>	- 0 / + 0.046	60	5	6.94
		62	6	8.46
		65	7.5	10.80
		70	10	15.00
		75	12.5	19.26
<b>55</b>	- 0 / + 0.046	55	5	7.58
		70	7.5	11.80
		75	10	16.20
<b>60</b>	- 0 / + 0.046	70	5	8.22
		72	6	9.97
		75	7.5	12.70
		80	10	17.50
		90	15	27.74
<b>63</b>	- 0 / + 0.046	73	5	8.38
		75	6	10.30
		77	7	12.08
		78	7.5	13.10
		83	10	18.00
<b>65</b>	- 0 / + 0.046	75	5	8.85
		80	7.5	13.60
		85	10	18.50
<b>70</b>	- 0 / + 0.046	80	5	9.48
		82	6	11.50
		85	7.5	14.60
		90	10	20.00
		100	15	31.44
<b>75</b>	- 0 / + 0.046	85	5	10.10
		90	7.5	15.60
		95	10	21.30

\* Tolerance H9

\*\* Tolerance H10.



ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>80</b>	- 0 / + 0.054	90	5	10.80
		92	6	13.00
		95	7.5	16.50
		100	10	22.50
		105	12.5	28.90
		110	15	35.20
<b>85</b>	- 0 / + 0.054	95	5	11.40
		100	7.5	17.50
		105	10	23.80
		110	12.5	30.50
		115	15	37.00
<b>90</b>	- 0 / + 0.054	100	5	12.10
		102	6	14.60
		105	7.5	18.40
		110	10	25.00
		115	12.5	31.60
		120	15	38.84
<b>95</b>	- 0 / + 0.054	105	5	12.33
		110	7.5	18.96
		115	10	25.89
		120	12.5	33.14
<b>100</b>	- 0 / + 0.054	110	5	13.40
		112	6	15.68
		115	7.5	20.30
		120	10	27.60
		125	12.5	35.20
<b>105</b>	- 0 / + 0.054	115	5	13.56
		120	7.5	20.81
		125	10	28.36
		130	12.5	36.22

\* Tolerance H9

\*\* Tolerance H10.

## DIMENSIONAL TABLES

ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>110</b>	- 0 / + 0.054	120*	5	14.70
		125	7.5	22.30
		130	10	30.20
		135	12.5	37.76
		140	15	46.30
<b>115</b>	- 0 / + 0.054	125*	5	14.80
		130	7.5	22.66
		135	10	30.83
		140	12.5	39.30
<b>120</b>	- 0 / + 0.063	130*	5	16.00
		135	7.5	24.20
		140	10	32.70
		145	12.5	40.84
		150	15	50.00
<b>125</b>	- 0 / + 0.063	135*	5	19.40
		140	7.5	25.20
		145	10	34.00
		150	12.5	43.10
		155	15	51.80
<b>130</b>	- 0 / + 0.063	140*	5	17.30
		145	7.5	26.20
		150	10	35.30
		155	12.5	43.93
		160	15	53.70
<b>135</b>	- 0 / + 0.063	150	7.5	26.36
		155	10	35.76
		160	12.5	45.47

\* Tolerance H9

\*\* Tolerance H10.





ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>140</b>	- 0 / + 0.063	150*	5	18.80
		155	7.5	28.10
		160	10	37.50
		165	12.5	48.00
		170	15	57.40
<b>145</b>	- 0 / + 0.063	160**	7.5	28.21
		165	10	38.22
<b>150</b>	- 0 / + 0.063	160**	5	20.20
		165	7.5	30.10
		170	10	40.50
		175	12.5	50.09
		180	15	61.10
<b>155</b>	- 0 / + 0.063	165**	5	19.73
		170	7.5	30.06
		175	10	40.69
		180	12.5	51.63
<b>160</b>	- 0 / + 0.063	170**	5	20.35
		175	7.5	30.98
		180	10	43.10
		185	12.5	54.30
		190	15	64.80
		195	17.5	76.60
		200	20	88.78
<b>165</b>	- 0 / + 0.063	175**	5	20.96
		180	7.5	31.91
		185	10	43.16
		195	15	66.58
		200	17.5	78.76

\* Tolerance H9

\*\* Tolerance H10.

## DIMENSIONAL TABLES

ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>170</b>	- 0 / + 0.063	180**	5	21.58
		185	7.5	32.83
		190	10	44.39
		195	12.5	52.26
		200	15	68.43
<b>175</b>	- 0 / + 0.063	190	7.5	33.75
		195	10	45.62
		200	12.5	57.80
		205	15	70.28
<b>180</b>	- 0 / + 0.072	200	10	48.30
		205	12.5	59.40
		210	15	72.20
		215	17.5	85.23
		220	20	98.64
<b>185</b>	- 0 / + 0.072	200	7.5	35.60
		205	10	59.39
		215	15	73.98
		220	17.5	87.39
<b>190</b>	- 0 / + 0.072	210	10	49.32
		215	12.5	62.42
		220	15	75.83
<b>195</b>	- 0 / + 0.072	210	12.5	60.88
		220	12.5	63.96
		225	15	77.68
		230	17.5	91.71

\* Tolerance H9

\*\* Tolerance H10.



ID		OD	WT	Mass
Nominal	H8 Tolerance (mm)	(mm)	(mm)	(Kg/m)
<b>200</b>	- 0 / + 0.072	210**	5	25.28
		215	7.5	30.92
		220	10	51.81
		225	12.5	65.60
		235	17.5	93.90
<b>210</b>	- 0 / + 0.072	230	10	54.25
		240	15	83.23
		245	17.5	98.18
<b>220</b>	- 0 / + 0.072	245	12.5	71.67
		250	15	86.93
<b>225</b>	- 0 / + 0.072	245	10	57.95
<b>250</b>	- 0 / + 0.081	280	15	98.03

\* Tolerance H9

\*\* Tolerance H10.

Note: the present table reports only the most common sizes; on request it is possible to supply other sizes and tolerances as well.

## SEAMLESS TUBES SUITABLE FOR SHAFTS

These are **SEAMLESS** tubes with tolerances on the OD thanks to whom they are suitable to be used, after a proper machining, as shafts or hollow pistons. This solution gives the possibility to reduce the weight of the total equipment, in comparison to the use of a solid bar.

### APPLICATIONS

These tubes are mainly used for cylinders on self-propelled cranes, hydraulic systems for lifts, tipping pistons and telescopic cylinders for automotive and hydraulic platforms. They can replace solid piston rods for pneumatic cylinders in order to reduce mass forces in high speed pistons. Besides this application, these tubes can be used also for: high speed rotating cylinders and shafts, hollow drilling rods, guiding rods for linear actuators, drive shafts etc.

### NORMS

EN 10305-1





## WEIGHT SAVING

The tube section optimizes the ratio between mass and stability. The following figures highlight that the ratio section modulus-stability "W : G" (stability feature) is better for a hollow section rather than for a solid bar.

Figure 1  
Stability feature W : G of the solid bar and of the hollow bar.

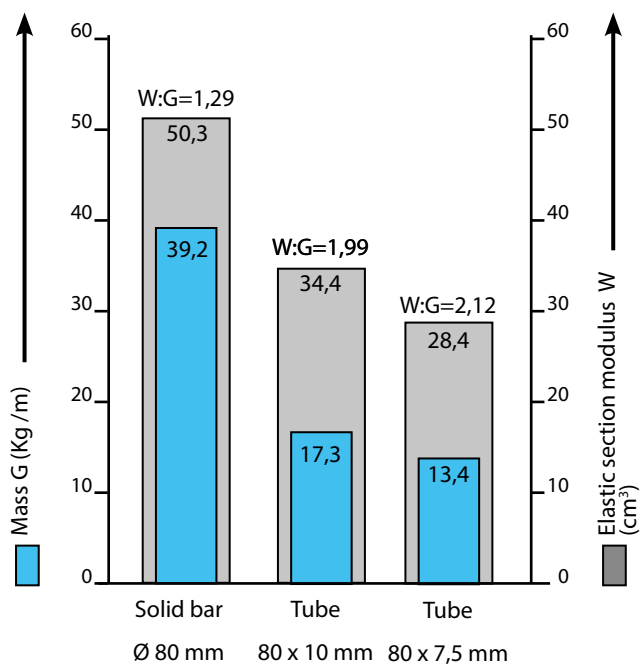
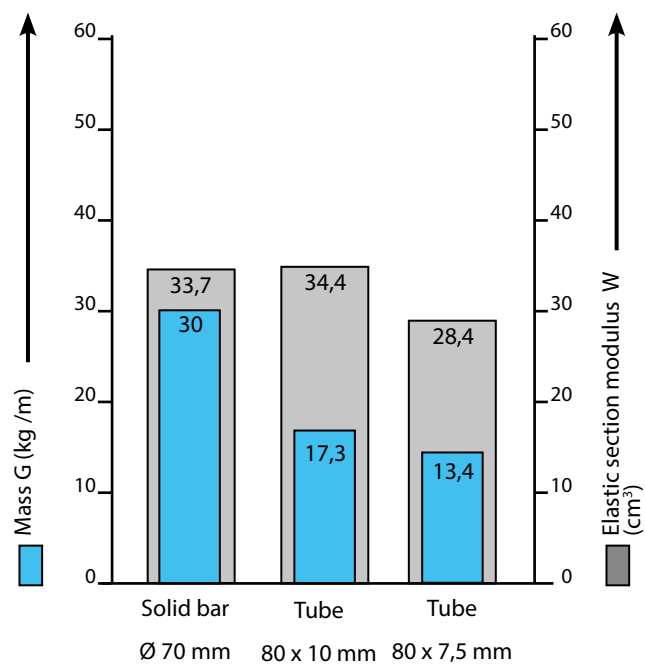


Figure 2  
Replacement of a 70 mm dia solid bar with a 80 mm OD hollow bar.



## TOLERANCES AND SIZES

OD: see dimensional table for tubes suitable for shafts.

ID: standard stock material is according to EN 10305-1. In case of tubes suitable for telescopic cylinders, that can be supplied on request, the tolerance allowing the machining also on the ID has to be agreed at the time of the order.

W.T.:  $\pm 10\%$  with a minimum of  $\pm 0.1\text{ mm}$

ECCENTRICITY:  $\frac{\text{Max w.t.} - \text{min w.t.}}{\text{Max w.t.} + \text{min. w.t.}} \times 100 \leq 10\%$

### STRAIGHTNESS:

for OD  $\leq 260\text{ mm}$   
 if  $\text{ReH} \leq 500\text{ Mpa}$   $0.0015\text{ L}$ ;  
 if  $\text{ReH} > 500\text{ Mpa}$   $0.002\text{ L}$ ;  
 for OD  $> 260\text{ mm}$   
 se  $\text{ReH} \leq 500\text{ Mpa}$   $0.0025\text{ L}$ ;  
 se  $\text{ReH} > 500\text{ Mpa}$   $0.003\text{ L}$ ;

L = total length of the tubes, the max. values are to be checked on the total tube length.





## DIMENSIONAL TABLES

### SIZES SUITABLE FOR SHAFTS

O.D.		W.T. mm $\pm 10\%$								
Nominal value (mm)	Tolerance (mm)	3	4	5	6	7.50	8	10	12.50	15
		Mass (Kg/m)*								
<b>30</b>	+0.20 +0.40	2.11	2.68	3.19	3.66					
<b>32</b>		2.26	2.88	3.45	3.97					
<b>35</b>		2.50	3.19	3.83	4.42					
<b>40</b>				3.70	4.46	5.18	6.16			
<b>45</b>				4.21	5.10	5.94	7.10			
<b>50</b>	+0.25 +0.45			5.77	6.73	8.08	8.50	10.08		
<b>55</b>				6.40	7.49	9.02	9.51	11.34		
<b>56</b>				6.53	7.64	9.21	9.71	11.59		
<b>60</b>				7.04	8.25	9.97	10.52	12.59		
<b>63</b>				7.42	8.71	10.54	11.12	13.34		
<b>65</b>	+0.25 +0.50			7.70	9.03	10.94	11.55	13.86		
<b>70</b>				8.34	9.79	11.88	12.56	15.12		
<b>75</b>				8.98	10.56	12.83	13.57	16.38		
<b>80</b>	+0.30 +0.60			9.69	11.39	13.85	14.65	17.71		
<b>82</b>				9.95	11.70	14.24	15.05	18.21		
<b>85</b>				10.34	12.16	14.81	15.66	18.97		
<b>90</b>				10.98	12.93	15.76	16.68	20.23	24.39	
<b>92</b>				11.24	13.24	16.14	17.08	20.73	25.02	
<b>95</b>				11.63	13.70	16.71	17.69	21.49	25.96	
<b>100</b>	+0.35 +0.70			12.36	14.56	17.76	18.80	22.84	27.62	32.09
<b>105</b>				13.01	15.33	18.71	19.82	24.11	29.19	33.97
<b>110</b>				13.66	16.10	19.67	20.84	25.37	30.77	35.85
<b>115</b>				14.31	16.87	20.63	21.86	26.64	32.34	37.74
<b>120</b>	+0.40 +0.80			15.07	17.76	21.70	22.99	28.02	34.03	39.73
<b>125</b>				15.72	18.53	22.66	24.01	29.29	35.61	41.62
<b>130</b>				16.38	19.31	23.62	25.03	30.56	37.18	43.50
<b>135</b>	+0.45 +0.90			17.16	20.21	24.71	26.18	31.95	38.89	45.51
<b>140</b>				17.81	20.99	25.67	27.21	33.23	40.47	47.41
<b>145</b>					21.78	26.64	28.24	34.50	42.05	49.30
<b>150</b>					22.56	27.61	29.26	35.78	43.64	51.19
<b>155</b>					23.34	28.57	30.29	37.05	45.22	53.08
<b>160</b>	+0.50 +1.00				24.27	29.69	31.47	38.47	46.95	55.12
<b>165</b>					25.05	30.66	32.50	39.75	48.54	57.01
<b>170</b>					25.84	31.63	33.53	41.03	50.12	58.91
<b>175</b>						32.60	34.57	42.31	51.71	60.81
<b>180</b>						33.57	35.60	43.59	53.30	62.70
<b>185</b>						34.54	36.63	44.87	54.89	64.60
<b>190</b>	+0.60 +1.20					35.87	38.02	46.50	56.83	66.85
<b>195</b>							39.06	47.79	58.42	68.75
<b>200</b>							40.10	49.08	60.02	70.66
<b>205</b>								50.37	61.62	72.56
<b>210</b>								51.66	63.21	74.47
<b>215</b>									64.80	76.37
<b>220</b>								54.23	66.41	78.28

\* By mass calculation, the average values of the OD with the necessary tolerances have been taken into consideration.

Note: the tolerances on the OD, thanks to whom the tube is suitable for shafts, are not ruled by any norm but are subject to special agreements with each manufacturer, therefore the deviations are only approximate.



## WELDED SMOOTH BORE READY-TO-USE CYLINDER TUBES INSIDE H9 OR H10

These are cold drawn **WELDED** tubes that get, during the cold drawing process, a good roundness and a high ID precision, that satisfies tolerances H9 or H10 according to EN ISO 286-2.

### APPLICATIONS

These tubes are construction elements, ready for the assembly of hydraulic and pneumatic cylinders.

### NORMS

COLD DRAWN WELDED TUBES  
DIMENSIONAL FEATURES OF THE ID

EN 10305-2  
EN ISO 286-2







## DIMENSIONAL TOLERANCES

OD: see dimensional tables of smooth bore cylinder tubes inside H9 or H10.

ID:  
For steelgrade E235, tolerance H10 with roughness(Ra) below 1 micron ( $\mu\text{m}$ )  
For steelgrade E355, tolerance H9 with roughness (Ra) below 0.8 micron ( $\mu\text{m}$ ).  
(see dimensional table for welded smooth bore cylinder tubes inside H9 or H10).

WT:  $\pm 7.5\%$  with a minimum of  $\pm 0.1\text{ mm}$

ECCENTRICITY:  $\frac{\text{Max. W.T.} - \text{Min. W.T.}}{\text{Max. W.T.} + \text{min. W.T.}} \times 100 \leq 7.5\%$

STRAIGHTNESS:

For OD  $\leq 260\text{ mm}$   
se ReH  $\leq 500\text{ Mpa } 0.0015\text{ L}$ ;  
se ReH  $> 500\text{ Mpa } 0.002\text{ L}$ ;  
For OD  $> 260\text{ mm}$   
se ReH  $\leq 500\text{ Mpa } 0.0025\text{ L}$ ;  
se ReH  $> 500\text{ Mpa } 0.003\text{ L}$ ;

L = total length of the tube, the max values are to be checked on the total tube length.



## DIMENSIONAL TABLES

Tubes have ID tolerance H10 when w.t. is up to 4 mm, and ID tolerance H9 for w.t. from 5 mm. The tolerances on the OD stated in the following table refer to the delivery condition +C.

ID (mm)	WT (mm)	Tolerance on the ID (mm)	OD		Mass (Kg/m)
			Nominal (mm)	Tolerance (mm)	
<b>20</b>	1.5	- 0 / + 0.084	23	± 0.08	0.80
	2		24		1.09
	2.5		25		1.39
	3		26		1.71
	3.5		27		2.03
	5	- 0 / + 0.052	30	3.08	
<b>25</b>	1.5	- 0 / + 0.084	28	± 0.08	0.99
	2		29		1.34
	2.5		30		1.60
	3		31		2.08
	3.5	- 0 / + 0.052	32	± 0.15	2.46
	5		35		3.60
<b>30</b>	1.5	- 0 / + 0.084	33	± 0.15	1.17
	2		34		1.58
	2.5		35		2.00
	3		36		2.45
	3.5		37		2.90
	4	38	3.36		
	5	- 0 / + 0.052	40	4.30	
<b>32</b>	1.5	- 0 / + 0.100	35	± 0.15	1.24
	2		36		1.60
	2.5		37		2.13
	3		38		2.59
	3.5		39		3.07
	4	40	3.56		
	5	- 0 / + 0.062	42	± 0.20	4.57
<b>35</b>	1.5	- 0 / + 0.100	38	± 0.15	1.36
	2		39		1.83
	2.5		40		2.60
	3		41		2.82
	3.5	- 0 / + 0.062	42	± 0.20	3.33
	4		43		3.85
	5		45		4.94



ID (mm)	WT (mm)	Tolerance on the ID (mm)	OD		Mass (Kg/m)
			Nominal (mm)	Tolerance (mm)	
<b>40</b>	1.5	- 0 / + 0.100	43	± 0.20	1.54
	2		44		2.08
	2.5		45		2.63
	3		46		3.19
	3.5		47		3.76
	4	48	4.35		
	5	- 0 / + 0.062	50	5.50	
<b>45</b>	1.5	- 0 / + 0.100	48	± 0.20	1.73
	2		49		2.32
	2.5		50		2.90
	3		51	± 0.25	3.56
	3.5		52		4.19
	4	53	4.84		
	5	- 0 / + 0.062	55	6.10	
	<b>50</b>	1.5	- 0 / + 0.100	53	± 0.25
2		54		2.57	
2.5		55		3.20	
3		56		3.93	
3.5		57		4.62	
4		58		5.33	
5		- 0 / + 0.062	60	6.70	
7.5			65	± 0.30	10.64
<b>55</b>	2.5	- 0 / + 0.120	60	± 0.25	3.55
	3		61	± 0.30	4.30
	3.5		62		5.05
	4		63		5.82
	5	65	7.30		
	7.5	- 0 / 0.074	70		11.56
<b>60</b>	2.5	- 0 / + 0.120	65	± 0.30	3.80
	3		66		4.67
	3.5		67		5.49
	4		68		6.32
	5	- 0 / + 0.074	70	8.00	
	6		72	± 0.35	9.77
	7.5		75		12.49

## DIMENSIONAL TABLES

ID (mm)	WT (mm)	Tolerance on the ID (mm)	OD		Mass (Kg/m)	
			Nominal (mm)	Tolerance (mm)		
<b>63</b>	2.5	- 0 / + 0.120	68	± 0.30	4.00	
	3		69		4.89	
	3.5		70		5.74	
	4	- 0 / + 0.074	71	± 0.35	6.61	
	5		73		8.39	
	6		75		10.21	
<b>65</b>	2.5	- 0 / + 0.120	70	± 0.30	4.10	
	3		71		± 0.35	5.04
	3.5		72			5.92
	4	73	- 0 / + 0.074	6.81		
	5	75		8.00		
	7.5	80		14.33		
<b>70</b>	2.5	- 0 / + 0.120	75	± 0.35	4.40	
	3		76		5.41	
	3.5		77		6.35	
	4	- 0 / + 0.074	78	± 0.40	7.30	
	5		80		9.20	
	6		82		11.25	
	7.5		85		14.33	
<b>75</b>	2.5	- 0 / + 0.120	80	± 0.35	4.78	
	3		81		± 0.40	5.78
	3.5		82			6.78
	4	83	- 0 / + 0.074	7.80		
	5	85		9.80		
	7.5	90		15.26		
<b>80</b>	2.5	- 0 / + 0.120	85	± 0.40	5.09	
	3		86		6.10	
	3.5		87		7.21	
	4	- 0 / + 0.074	88	± 0.45	8.29	
	5		90		10.48	
	6		92		12.73	
	7.5		95		16.18	
<b>85</b>	3.5	- 0 / + 0.140	92	± 0.45	7.64	
	4	- 0 / + 0.087	93		8.72	
	5		95		11.10	



ID (mm)	WT (mm)	Tolerance on the ID (mm)	OD		Mass (Kg/m)
			Nominal (mm)	Tolerance (mm)	
<b>90</b>	3	- 0 / + 0.140	96	± 0.45	6.89
	3.5		97		8.08
	4		98		9.28
	5	- 0 / + 0.087	100	± 0.50	11.70
	6		102		14.20
	7.5		105		18.03
<b>95</b>	3	- 0 / + 0.140	101	± 0.50	7.26
	3.5		102		8.51
	4		103		9.77
	5	- 0 / + 0.087	105	± 0.50	12.34
	7.5		110		18.96
<b>100</b>	3	- 0 / + 0.140	106	± 0.50	7.60
	3.5		107		8.94
	4		108		10.26
	5	- 0 / + 0.087	110	± 0.50	12.95
	7.5		115		19.88
<b>110</b>	3.5	- 0 / + 0.140	117	± 0.50	9.80
	4		118		11.25
	5	- 0 / + 0.087	120	± 0.70	14.19
	7.5		125		21.73
<b>120</b>	3.5	- 0 / + 0.140	127	± 0.70	10.66
	4		128		12.24
	5	- 0 / + 0.087	130	± 0.70	15.42
	7.5		135		23.58
<b>125</b>	3.5	- 0 / + 0.160	132	± 0.70	11.00
	4		133		12.73
	5	- 0 / + 0.100	135	± 0.70	16.03
	7.5		140		24.51



## SEAMLESS TUBES FOR HYDRAULIC AND PNEUMATIC POWER SYSTEMS

These small seamless tubes (OD from 6 to 80 mm), are normalized in controlled atmosphere after being cold drawn. This delivery condition gives the tubes a fine grain and a good deformability at room temperature.

### APPLICATIONS

This kind of tubes is mainly used for pressure power systems for the flow of hydraulic fluids or of compressed gases in pneumatic and hydraulic equipments.

### NORM

EN 10305-4

### DIMENSIONAL TOLERANCES ACCORDING TO EN 10305-4

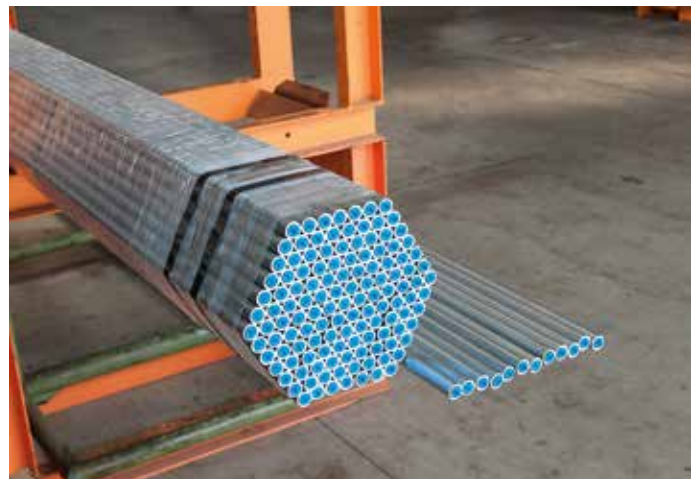
OD: see dimensional table for tubes for hydraulic and pneumatic power systems;

ID: see dimensional table for tubes for hydraulic and pneumatic power systems;

ECCENTRICITY:  $\frac{\text{Max W.T.} - \text{min. W.T.}}{\text{Max. W.T.} + \text{min. W.T.}} \times 100 \leq 10 \%$

STRAIGHTNESS: 0.0015 L;

L = total length of the tube, the max. values are to be checked on the total tube length.





## ELECTRO-PLATING

Superficial electro-platings may extend life and resistance to elements exposure of tubes for hydraulic and pneumatic power systems. These treatments cover the external surface of the tubes with a thin layer, in range of micron ( $\mu\text{m}$ ), of metals like Chromium (Cr) and Zinc (Zn), able to prevent corrosion.

## NORM

EN ISO 2081 (that replaces the previous EN 12329) rules the features of the various kinds of electro-coating.

The following table briefly describes name and features of the main galvanic treatments.

Coating name	Min coating thickness ( $\mu\text{m}$ )	Name	Appearance	Resistance to salt spray (h)
<b>Fe/Zn5/A</b>	5	Clear	Trasparent, clear to bluish	48
<b>Fe/Zn5/B</b>		Bleached	Transparent, with slight iridescence	
<b>Fe/Zn5/F</b>		Black	Black	
<b>Fe/Zn5/C</b>		Iridescent	Yellow Iridescent	72
<b>Fe/Zn5/D</b>		Opaque	Olive green	
<b>Fe/Zn8/A</b>	8	Clear	Trasparent, clear to bluish	72
<b>Fe/Zn8/B</b>		Bleached	Transparent, with slight iridescence	
<b>Fe/Zn8/F</b>		Black	Black	
<b>Fe/Zn8/C</b>		Iridescent	Yellow Iridescent	120
<b>Fe/Zn8/D</b>		Opaque	Olive green	
<b>Fe/Zn12/A</b>	12	Clear	Trasparent, clear to bluish	120
<b>Fe/Zn12/F</b>		Black	Black	
<b>Fe/Zn12/C</b>		Iridescent	Yellow Iridescent	192
<b>Fe/Zn12/D</b>		Opaque	Olive green	
<b>Fe/Zn25/A</b>	25	Clear	Trasparent, clear to bluish	192
<b>Fe/Zn25/F</b>		Black	Black	
<b>Fe/Zn25/C</b>		Iridescent	Yellow Iridescent	360
<b>Fe/Zn25/D</b>		Opaque	Olive green	

## DIMENSIONAL TABLES

O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>4</b>	± 0.1	<b>0.5</b>	± 20	3	± 0.30	0.071	0.043
	± 0.1	<b>1</b>	± 20	2	± 0.30	0.031	0.074

<b>5</b>	± 0.1	<b>0.75</b>	± 20	3.5	± 0.30	0.096	0.079
	± 0.1	<b>1</b>	± 20	3	± 0.30	0.071	0.099

<b>6</b>	± 0.1	<b>1</b>	± 15	4	± 0.25	0.13	0.123
	± 0.1	<b>1.5</b>	± 15	3	± 0.30	0.071	0.166
	± 0.1	<b>2</b>	± 15	2	± 0.40	0.031	0.197

<b>7</b>	± 0.1	<b>1</b>	± 15	5	± 0.25	0.24	0.148
	± 0.1	<b>1.5</b>	± 15	4	± 0.30	0.13	0.204
	± 0.1	<b>2</b>	± 15	3	± 0.40	0.071	0.246

<b>8</b>	± 0.1	<b>1</b>	± 15	6	± 0.20	0.173	0.173
	± 0.1	<b>1.5</b>	± 15	5	± 0.30	0.24	0.240
	± 0.1	<b>2</b>	± 15	4	± 0.35	0.13	0.296
	± 0.1	<b>2.5</b>	± 15	3	± 0.40	0.71	0.339

<b>10</b>	± 0.1	<b>1</b>	± 10	8	± 0.20	0.50	0.222
	± 0.1	<b>1.5</b>	± 10	7	± 0.25	0.38	0.314
	± 0.1	<b>2</b>	± 10	6	± 0.30	0.28	0.395
	± 0.1	<b>2.5</b>	± 10	5	± 0.35	0.20	0.462
	± 0.1	<b>3</b>	± 10	4	± 0.45	0.13	0.519

<b>11</b>	± 0.08	<b>1</b>	± 10	9	± 0.15	0.64	0.247
	± 0.08	<b>1.5</b>	± 10	8	± 0.20	0.50	0.351
	± 0.08	<b>2</b>	± 10	7	± 0.25	0.38	0.444
	± 0.08	<b>2.5</b>	± 10	6	± 0.25	0.28	0.524
	± 0.08	<b>3</b>	± 10	5	± 0.40	0.20	0.592

<b>12</b>	± 0.08	<b>1</b>	± 10	10	± 0.15	0.79	0.271
	± 0.08	<b>1.5</b>	± 10	9	± 0.20	0.64	0.389
	± 0.08	<b>2</b>	± 10	8	± 0.25	0.50	0.493
	± 0.08	<b>2.5</b>	± 10	7	± 0.25	0.38	0.586
	± 0.08	<b>3</b>	± 10	6	± 0.40	0.28	0.666

O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>13</b>	± 0.08	<b>1</b>	± 10	11	± 0.18	0.95	0.296
	± 0.08	<b>1.5</b>	± 10	10	± 0.15	0.79	0.425
	± 0.08	<b>2</b>	± 10	9	± 0.20	0.64	0.543
	± 0.08	<b>2.5</b>	± 10	8	± 0.25	0.50	0.647
	± 0.08	<b>3</b>	± 10	7	± 0.30	0.38	0.740

<b>14</b>	± 0.08	<b>1</b>	± 10	12	± 0.08	1.13	0.321
	± 0.08	<b>1.5</b>	± 10	11	± 0.15	0.95	0.462
	± 0.08	<b>2</b>	± 10	10	± 0.20	0.79	0.592
	± 0.08	<b>2.5</b>	± 10	9	± 0.25	0.64	0.709
	± 0.08	<b>3</b>	± 10	8	± 0.30	0.50	0.814

<b>15</b>	± 0.08	<b>1</b>	± 10	13	± 0.08	1.33	0.345
	± 0.08	<b>1.5</b>	± 10	12	± 0.15	1.13	0.499
	± 0.08	<b>2</b>	± 10	11	± 0.20	0.95	0.641
	± 0.08	<b>2.5</b>	± 10	10	± 0.25	0.79	0.770
	± 0.08	<b>3</b>	± 10	9	± 0.30	0.64	0.888

<b>16</b>	± 0.08	<b>1</b>	± 10	14	± 0.08	1.54	0.370
	± 0.08	<b>1.5</b>	± 10	13	± 0.08	1.33	0.536
	± 0.08	<b>2</b>	± 10	12	± 0.15	1.13	0.691
	± 0.08	<b>2.5</b>	± 10	11	± 0.20	0.95	0.832
	± 0.08	<b>3</b>	± 10	10	± 0.30	0.79	0.962

<b>17</b>	± 0.08	<b>1</b>	± 10	15	± 0.08	1.77	0.395
	± 0.08	<b>1.5</b>	± 10	14	± 0.08	1.54	0.573
	± 0.08	<b>2</b>	± 10	13	± 0.08	1.33	0.740
	± 0.08	<b>2.5</b>	± 10	12	± 0.20	1.13	0.894
	± 0.08	<b>3</b>	± 10	11	± 0.20	0.95	1.036

<b>18</b>	± 0.08	<b>1</b>	± 10	16	± 0.08	2.01	0.419
	± 0.08	<b>1.5</b>	± 10	15	± 0.08	1.77	0.610
	± 0.08	<b>2</b>	± 10	14	± 0.08	1.54	0.789
	± 0.08	<b>2.5</b>	± 10	13	± 0.20	1.33	0.956
	± 0.08	<b>3</b>	± 10	12	± 0.20	1.13	1.11





O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>20</b>	± 0.08	<b>1</b>	± 10	0.469	± 0.08	2.55	0.469
	± 0.08	<b>1.5</b>	± 10	17	± 0.08	2.27	0.684
	± 0.08	<b>2</b>	± 10	16	± 0.08	2.01	0.888
	± 0.08	<b>2.5</b>	± 10	15	± 0.15	1.77	1.079
	± 0.08	<b>3</b>	± 10	14	± 0.20	1.54	1.258
	± 0.08	<b>3.5</b>	± 10	13	± 0.30	1.33	1.424
	± 0.08	<b>4</b>	± 10	12	± 0.35	1.13	1.578

<b>22</b>	± 0.08	<b>1</b>	± 10	20	± 0.12	3.14	0.518
	± 0.08	<b>1.5</b>	± 10	19	± 0.08	2.84	0.758
	± 0.08	<b>2</b>	± 10	18	± 0.08	2.55	0.986
	± 0.08	<b>2.5</b>	± 10	17	± 0.15	2.27	1.202
	± 0.08	<b>3</b>	± 10	16	± 0.15	2.01	1.406
	± 0.08	<b>3.5</b>	± 10	15	± 0.20	1.77	1.597
± 0.08	<b>4</b>	± 10	14	± 0.30	1.54	1.776	

<b>24</b>	± 0.08	<b>1</b>	± 10	22	± 0.12	3.80	0.567
	± 0.08	<b>1.5</b>	± 10	21	± 0.08	3.46	0.832
	± 0.08	<b>2</b>	± 10	20	± 0.08	3.14	1.085
	± 0.08	<b>2.5</b>	± 10	19	± 0.08	2.84	1.326
	± 0.08	<b>3</b>	± 10	18	± 0.15	2.55	1.554
	± 0.08	<b>3.5</b>	± 10	17	± 0.15	2.27	1.769
	± 0.08	<b>4</b>	± 10	16	± 0.20	2.01	1.973

<b>25</b>	± 0.08	<b>1</b>	± 10	23	± 0.12	4.16	0.592
	± 0.08	<b>1.5</b>	± 10	22	± 0.08	3.80	0.869
	± 0.08	<b>2</b>	± 10	21	± 0.08	3.46	1.134
	± 0.08	<b>2.5</b>	± 10	20	± 0.08	3.14	1.387
	± 0.08	<b>3</b>	± 10	19	± 0.15	2.84	1.628
	± 0.08	<b>3.5</b>	± 10	18	± 0.15	2.55	1.856
	± 0.08	<b>4</b>	± 10	17	± 0.20	2.27	2.072
	± 0.08	<b>4.5</b>	± 10	16	± 0.20	2.01	2.275
	± 0.08	<b>5</b>	± 10	15	± 0.30	1.77	2.466

O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>26</b>	± 0.08	<b>1</b>	± 10	24	± 0.12	4.52	0.617
	± 0.08	<b>1.5</b>	± 10	23	± 0.08	4.16	0.906
	± 0.08	<b>2</b>	± 10	22	± 0.08	3.80	1.184
	± 0.08	<b>2.5</b>	± 10	21	± 0.08	3.46	1.449
	± 0.08	<b>3</b>	± 10	20	± 0.15	3.14	1.702
	± 0.08	<b>3.5</b>	± 10	19	± 0.15	2.84	1.942
	± 0.08	<b>4</b>	± 10	18	± 0.15	2.55	2.170
	± 0.08	<b>4.5</b>	± 10	17	± 0.20	2.27	2.386
	± 0.08	<b>5</b>	± 10	16	± 0.30	2.01	2.589

<b>27</b>	± 0.08	<b>1</b>	± 10	25	± 0.12	4.91	0.641
	± 0.08	<b>1.5</b>	± 10	24	± 0.08	4.52	0.943
	± 0.08	<b>2</b>	± 10	23	± 0.08	4.16	1.233
	± 0.08	<b>2.5</b>	± 10	22	± 0.08	3.80	1.511
	± 0.08	<b>3</b>	± 10	21	± 0.15	3.46	1.776
	± 0.08	<b>3.5</b>	± 10	20	± 0.15	3.14	2.028
	± 0.08	<b>4</b>	± 10	19	± 0.15	2.84	2.269
	± 0.08	<b>4.5</b>	± 10	18	± 0.15	2.55	2.497
	± 0.08	<b>5</b>	± 10	17	± 0.20	2.27	2.713

<b>28</b>	± 0.08	<b>1</b>	± 10	26	± 0.12	5.31	0.666
	± 0.08	<b>1.5</b>	± 10	25	± 0.08	4.91	0.980
	± 0.08	<b>2</b>	± 10	24	± 0.08	4.52	1.282
	± 0.08	<b>2.5</b>	± 10	23	± 0.08	4.16	1.572
	± 0.08	<b>3</b>	± 10	22	± 0.15	3.80	1.850
	± 0.08	<b>3.5</b>	± 10	21	± 0.15	3.46	2.115
	± 0.08	<b>4</b>	± 10	20	± 0.15	3.14	2.368
	± 0.08	<b>4.5</b>	± 10	19	± 0.15	2.84	2.608
± 0.08	<b>5</b>	± 10	18	± 0.20	2.55	2.836	

## DIMENSIONAL TABLES

O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>30</b>	± 0.08	<b>1.5</b>	± 10	27	± 0.08	5.73	1.054
	± 0.08	<b>2</b>	± 10	26	± 0.08	5.31	1.381
	± 0.08	<b>2.5</b>	± 10	25	± 0.08	4.91	1.695
	± 0.08	<b>3</b>	± 10	24	± 0.15	4.52	1.998
	± 0.08	<b>3.5</b>	± 10	23	± 0.15	4.16	2.287
	± 0.08	<b>4</b>	± 10	22	± 0.15	3.80	2.565
	± 0.08	<b>4.5</b>	± 10	21	± 0.15	3.46	2.830
	± 0.08	<b>5</b>	± 10	20	± 0.15	3.14	3.083
	± 0.08	<b>6</b>	± 10	18	± 0.30	2.55	3.551

O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>35</b>	± 0.15	<b>1.5</b>	± 10	32	± 0.225	8.04	1.239
	± 0.15	<b>2</b>	± 10	31	± 0.15	7.55	1.628
	± 0.15	<b>2.5</b>	± 10	30	± 0.15	7.07	2.004
	± 0.15	<b>3</b>	± 10	29	± 0.15	6.61	2.367
	± 0.15	<b>3.5</b>	± 10	28	± 0.15	6.16	2.719
	± 0.15	<b>4</b>	± 10	27	± 0.15	5.73	3.058
	± 0.15	<b>4.5</b>	± 10	26	± 0.15	5.31	3.385
	± 0.15	<b>5</b>	± 10	25	± 0.15	4.91	3.699
	± 0.15	<b>6</b>	± 10	23	± 0.20	4.16	4.291

<b>32</b>	± 0.15	<b>1.5</b>	± 10	29	± 0.225	6.61	1.128
	± 0.15	<b>2</b>	± 10	28	± 0.15	6.16	1.480
	± 0.15	<b>2.5</b>	± 10	27	± 0.15	5.73	1.819
	± 0.15	<b>3</b>	± 10	26	± 0.15	5.31	2.146
	± 0.15	<b>3.5</b>	± 10	25	± 0.15	4.91	2.460
	± 0.15	<b>4</b>	± 10	24	± 0.15	4.52	2.762
	± 0.15	<b>4.5</b>	± 10	23	± 0.15	4.16	3.052
	± 0.15	<b>5</b>	± 10	22	± 0.15	3.80	3.329
	± 0.15	<b>6</b>	± 10	20	± 0.30	3.46	3.847

<b>36</b>	± 0.15	<b>1.5</b>	± 10	33	± 0.225	8.55	1.276
	± 0.15	<b>2</b>	± 10	32	± 0.15	8.04	1.677
	± 0.15	<b>2.5</b>	± 10	31	± 0.15	7.55	2.065
	± 0.15	<b>3</b>	± 10	30	± 0.15	7.07	2.441
	± 0.15	<b>3.5</b>	± 10	29	± 0.15	6.61	2.805
	± 0.15	<b>4</b>	± 10	28	± 0.15	6.16	3.157
	± 0.15	<b>4.5</b>	± 10	27	± 0.15	5.73	3.496
	± 0.15	<b>5</b>	± 10	26	± 0.15	5.31	3.822
	± 0.15	<b>6</b>	± 10	24	± 0.15	4.16	4.439

<b>34</b>	± 0.15	<b>1.5</b>	± 10	31	± 0.225	7.55	1.202
	± 0.15	<b>2</b>	± 10	30	± 0.15	7.07	1.578
	± 0.15	<b>2.5</b>	± 10	29	± 0.15	6.61	1.942
	± 0.15	<b>3</b>	± 10	28	± 0.15	6.16	2.294
	± 0.15	<b>3.5</b>	± 10	27	± 0.15	5.73	2.633
	± 0.15	<b>4</b>	± 10	26	± 0.15	5.31	2.959
	± 0.15	<b>4.5</b>	± 10	25	± 0.15	4.91	3.274
	± 0.15	<b>5</b>	± 10	24	± 0.15	4.52	3.576
	± 0.15	<b>6</b>	± 10	22	± 0.20	3.80	4.143

<b>38</b>	± 0.15	<b>1.5</b>	± 10	35	± 0.225	9.62	1.350
	± 0.15	<b>2</b>	± 10	34	± 0.15	9.07	1.776
	± 0.15	<b>2.5</b>	± 10	33	± 0.15	8.55	2.189
	± 0.15	<b>3</b>	± 10	32	± 0.15	8.04	2.589
	± 0.15	<b>3.5</b>	± 10	31	± 0.15	7.55	2.978
	± 0.15	<b>4</b>	± 10	30	± 0.15	7.07	3.354
	± 0.15	<b>4.5</b>	± 10	29	± 0.15	6.61	3.718
	± 0.15	<b>5</b>	± 10	28	± 0.15	6.16	4.069
	± 0.15	<b>6</b>	± 10	26	± 0.15	5.31	4.735



O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>40</b>	± 0.15	<b>2</b>	± 10	36	± 0.15	10.13	1.874
	± 0.15	<b>2.5</b>	± 10	35	± 0.15	9.62	2.312
	± 0.15	<b>3</b>	± 10	34	± 0.15	9.07	2.737
	± 0.15	<b>3.5</b>	± 10	33	± 0.15	8.55	3.150
	± 0.15	<b>4</b>	± 10	32	± 0.15	8.04	3.551
	± 0.15	<b>4.5</b>	± 10	31	± 0.15	7.55	3.940
	± 0.15	<b>5</b>	± 10	30	± 0.15	7.07	4.316
	± 0.15	<b>6</b>	± 10	28	± 0.15	6.16	5.031
	± 0.15	<b>8</b>	± 10	24	± 0.25	4.52	6.313

O.D.		I.D.					
Nom.	Tol.	W.T.	Tol. W.T.	Nom.	Tol.	Flow section	Mass
(mm)	(mm)	(mm)	(%)	(mm)	(mm)	(cm <sup>2</sup> )	(Kg/m)

<b>48</b>	± 0.20	<b>2</b>	± 10	44	± 0.30	15.20	2.269
	± 0.20	<b>2.5</b>	± 10	43	± 0.20	14.51	2.805
	± 0.20	<b>3</b>	± 10	42	± 0.20	13.85	3.330
	± 0.20	<b>3.5</b>	± 10	41	± 0.20	13.19	3.841
	± 0.20	<b>4</b>	± 10	40	± 0.20	12.57	4.340
	± 0.20	<b>4.5</b>	± 10	39	± 0.20	11.94	4.827
	± 0.20	<b>5</b>	± 10	38	± 0.20	11.34	5.307
	± 0.20	<b>6</b>	± 10	36	± 0.20	10.13	6.214
	± 0.20	<b>8</b>	± 10	32	± 0.20	8.04	7.891

<b>42</b>	± 0.20	<b>2</b>	± 10	38	± 0.30	11.34	1.973
	± 0.20	<b>2.5</b>	± 10	37	± 0.20	10.75	2.435
	± 0.20	<b>3</b>	± 10	36	± 0.20	10.13	2.885
	± 0.20	<b>3.5</b>	± 10	35	± 0.20	9.62	3.323
	± 0.20	<b>4</b>	± 10	34	± 0.20	9.08	3.749
	± 0.20	<b>4.5</b>	± 10	33	± 0.20	8.55	4.162
	± 0.20	<b>5</b>	± 10	32	± 0.20	8.04	4.562
	± 0.20	<b>6</b>	± 10	30	± 0.20	7.07	5.327
	± 0.20	<b>8</b>	± 10	26	± 0.20	5.31	6.708

<b>50</b>	± 0.20	<b>2</b>	± 10	46	± 0.30	16.61	2.367
	± 0.20	<b>2.5</b>	± 10	45	± 0.30	15.90	2.928
	± 0.20	<b>3</b>	± 10	44	± 0.20	15.20	3.477
	± 0.20	<b>3.5</b>	± 10	43	± 0.20	14.51	4.014
	± 0.20	<b>4</b>	± 10	42	± 0.20	13.85	4.537
	± 0.20	<b>4.5</b>	± 10	41	± 0.20	13.19	5.049
	± 0.20	<b>5</b>	± 10	40	± 0.20	12.57	5.549
	± 0.20	<b>6</b>	± 10	38	± 0.20	11.34	6.510
	± 0.20	<b>8</b>	± 10	34	± 0.20	9.06	8.286
	± 0.20	<b>10</b>	± 10	30	± 0.20	7.07	9.874

<b>45</b>	± 0.20	<b>2</b>	± 10	41	± 0.30	13.19	2.120
	± 0.20	<b>2.5</b>	± 10	40	± 0.20	12.57	2.615
	± 0.20	<b>3</b>	± 10	39	± 0.20	11.94	3.096
	± 0.20	<b>3.5</b>	± 10	38	± 0.20	11.34	3.581
	± 0.20	<b>4</b>	± 10	37	± 0.20	10.75	4.040
	± 0.20	<b>4.5</b>	± 10	36	± 0.20	10.13	4.494
	± 0.20	<b>5</b>	± 10	35	± 0.20	9.62	4.930
	± 0.20	<b>6</b>	± 10	33	± 0.20	8.55	5.770
	± 0.20	<b>8</b>	± 10	29	± 0.20	6.61	7.230

## STOCK FACILITY

### STEELGRADES

Our standard stock includes the following steelgrades:

- Seamless and welded cold drawn tubes for hydraulic cylinders, ready for honing and H8 **E355+SR,**
- Tubes suitable for shafts **E355+SR**
- Welded smooth bore cylinders tubes inside H9 OR H10 **E355+C**
- Cold drawn seamless tubes for hydraulic and pneumatic power systems **E235+N**

It is possible to supply other steelgrades and other delivery conditions upon request and with a minimum quantity to be agreed.

### LENGTHS

Tubes in random lengths:

- Seamless and welded tubes, H8 or suitable for honing and tubes suitable for shafts from 4 m to 12 m
- Welded cold drawn cylinders tubes H9 or H10 from 4 m to 12 m
- Tubes for hydraulic and pneumatic power systems 6 m

Tubes cut to fixlength upon customer's request

### CUTTING TO FIXLENGTH

All cold drawn tubes, except the tubes for hydraulic and pneumatic power systems, can be cut to fixlength, the quick delivery and the quality of the service are granted by modern automatic cutting machines with band saws. The standard tolerance on fixlength is  $-0 / +5$  mm, more restricted tolerances can be agreed at the moment of the order.

### SIZES

Our standard stockrange includes the sizes stated in the dimensional tables for each product and, generally speaking, the standard sizes according to the different norms. Sizes not in stock can be supplied on request. It is possible to supply MORE RESTRICTED TOLERANCES upon request and for minimum quantities to be agreed.





## PACKING

Tubes are loose or in bundles tightened with iron strips, according to sizes. Tubes for hydraulic and pneumatic power systems are supplied in bundles fastened by adhesive tape or metal bands (and adequate protection), according to the weight.

The material can be also supplied stripped on a wire with polyester bands in order to unload and move the material easily.

Upon request it is possible to arrange special packings: metal or wooden cases, pallets, etc.

## CERTIFICATES AND MARKINGS

Tubes are supplied with 3.1 certification according to EN 10204. Traceability is granted by paint marking or by labels, according to the relevant norms.

## SPECIAL SURFACE TREATMENTS

Tubes for hydraulic and pneumatic power system are available in stock without any coating or with a white chromium VI free Zn12/A ELECTRO-PLATING, according to EN ISO 2081 (it has to resist to salt spray for 192 h). It is possible to supply other kinds of electro-platings or temporary protections upon request, such as phosphatizing.

## PROTECTIONS

**All cold drawn tubes** are protected against rust with mineral oil containing rust inhibitors. **Tubes with finished ID and tubes for hydraulic and pneumatic power systems** are supplied with the ends protected by plastic caps.

## DELIVERIES

Inland, through carriers.





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**CD** <sup>OLD</sup> RAWN TUBES



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SICAM VIDEO

Chromed bars and tubes

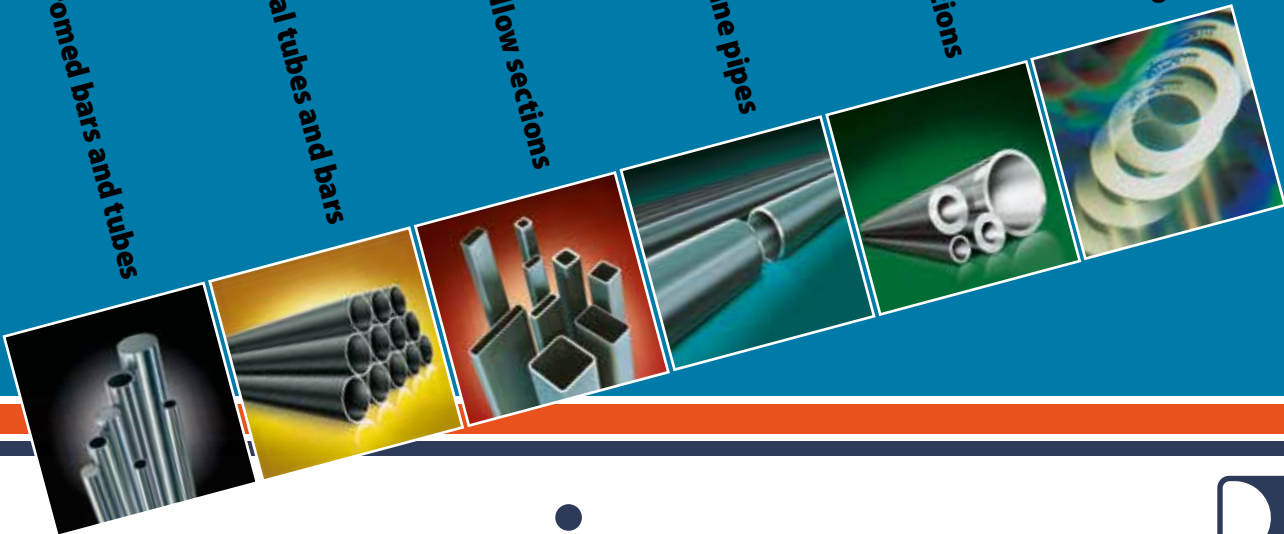
Structural tubes and bars

Square and rectangular hollow sections

Line pipes

Tubes for mechanical applications

Sicam and Bianco Group



**sicam**®



Bianco Group