Tenaris

Industrial & Automotive Services

Tubular hot finished structural hollow sections

Seamless tubular structural hollow sections with an application in construction and steel structural work.
Produced in accordance with the standard EN 10210, which has substituted the various national standards.
Tenaris produce various steel grades in an extensive dimensional range, aimed at both traditional and specific applications.

Tubular hot finished structural hollow sections

Description and field of application

This catalogue is for tubular hot finished hollow sections produced according to the standard EN 10210 parts 1 and 2.
When used in civil and industrial construction the sections come under directive 89/106/CEE of the CPD board, of 21st December 1988, which concerns products for construction and the relative CE mark.
In anticipation of the Community directive coming into effect, it is envisaged that each country should enforce its own provisions of law.

In Italy the law 5th November 1971 n°1086 and the ministerial Decree 9th January 1996 are in force, with the relevant qualification by the Ministry of Public Works and the Environment, Central Technical Services.

Certain steel grades referred to in this catalogue are homologated in accord with legislation in effect in the following countries:
Italy (DM of 09/01/1996)
Germany (U Mark)

1. Order definiton

- Standard referred to: EN 10210 1-2
- Steel grade
- Dimensions Ø external Wall thickness (mm)
- Length
- Quantity and respective tolerances

Options

Lengths different to those shown in the present catalogue
Special checks
Certification and marking different to that which is shown in the present catalogue

2. Standards used

The reference standard is EN 10210-2
The standard EN 10210 has replaced the previous national standards of European countries.
Detailed below is an indicative correspondence to the previous national standards.

PREVIOUS NATIONAL DESIGNATION

EUROPEAN NORM EN 10210-1	ITALY UNI 7806	GERMANY DIN 17121 DIN 17124	FRANCE NF A 35-501 NF A 49-501	GREAT BRITAIN BS 4360
S235JRH	Fe 360 B	St 37.2	E 24-2	
S275J0H	Fe 430 C	St 44-3 U	E 28-3	43 C
S275J2H	Fe 430 D	St 44-3 N	E 28-4	43 D
S355J0H	Fe 510 C	St 52-3 U	E 36-3	50 C
S355J2H	Fe 510 D	St 52-3 N	E 36-4	50 D
S275NH		St E 285 N		
S355NH		St E 355 N		
S460NH		St E 460 N		

Carbon Steel

1. Chemical composition and mechanical properties

Shown below, for each grade of carbon steel provided for by EN 10210-1, are the chemical analyses and mechanical properties.

Option

If agreed upon at the time of ordering, a declaration of conformity to law N°1086/1971 and Ministerial Decree 9.1.96 relevant for grade S355J2H (ex Fe 510 D Uni 7806) for wall thicknesses of from 3 to 35mm inclusive can be issued.

If agreed upon at time of ordering, a declaration of Ü Mark (TÜV) relevant to grades S235JRH, S355J0H, S355J2H, for wall thicknesses of from 2.3 to 100mm inclusive can be issued.

CHEMICAL ANALYSIS %

GRADE	C		Si	Mn	P	S	N
	Norm. W.T. mm						
	≤ 40	> 40 ≤ 65					
S235JRH	≤ 0,17	≤ 0,20	-	≤1,40	≤ 0,045	≤ 0,045	≤ 0,009
S275J0H	≤ 0,20	≤ 0,22	-	≤1,50	≤ 0,040	≤ 0,040	≤ 0,009
S275J2H	≤ 0,20	≤ 0,22	-	≤1,50	≤ 0,035	≤ 0,035	-
S355J0H	≤ 0,22	≤ 0,22	≤ 0,55	≤1,60	≤ 0,040	≤ 0,040	≤ 0,009
S355J2H	≤ 0,22	≤ 0,22	≤ 0,55	≤1,60	≤ 0,035	≤ 0,035	-

CARBON EQUIVALENT (CEV)%*

GRADE	Nominal W.T.		
	≤ 16	>16 ≤ 40	>40 ≤ 65
S235JRH	≤ 0,37	≤ 0,39	≤ 0,41
S275J0H	≤ 0,41	≤ 0,43	≤ 0,45
S275J2H	≤ 0,41	≤ 0,43	≤ 0,45
S355J0H	≤ 0,45	≤ 0,47	≤ 0,50
S355J2H	≤ 0,45	≤ 0,47	≤ 0,50

* Indicated in test mill report if agreed upon at the time of ordering

MECHANICAL PROPERTIES

GRADE	Min. Yield Strength (R_{eH}) N/mm²			Tensile Strength (R_m) N/mm²		Elongation % Minimum				Impact Strengh*	
	Nominal W.T. mm			Nominal W.T. mm		Nominal W.T. mm					
						Long.		Transv.		T°C	J
	0 ≤16	>16 ≤ 40	> 40 ≤ 65	≤ 3	> 3 ≤ 65	≤ 40	> 40 ≤ 65	≤ 40	> 40 ≤ 65		
S235JRH	235	225	215	360 ÷ 510	340 ÷ 470	26	25	24	23	20	≥ 27
S275J0H	275	265	255	430 ÷ 580	410 ÷ 560	22	21	20	19	0	≥ 27
S275J2H	275	265	255	430 ÷ 580	410 ÷ 560	22	21	20	19	- 20	≥ 27
S355J0H	355	345	335	510 ÷ 680	490 ÷ 630	22	21	20	19	0	≥ 27
S355J2H	355	345	335	510 ÷ 680	490 ÷ 630	22	21	20	19	- 20	≥ 27

If agreed upon at the time of ordering, a declaration of conformity to law N°1086/1971 and Ministerial Decree 9.1.96 relevant for grade S355J2H (ex Fe 510 D Uni 7806) for wall thicknesses of from 3 to 35mm inclusive can be issued.

If agreed upon at time of ordering, a declaration of Ü Mark (TÜV) relevant to grades S235JRH, S355J0H, S355J2H, for wall thicknesses of from 2.3 to 100mm inclusive can be issued.

*The impact test values indicated are meant to be calculated as the average of the three samples of width W = 10 mm. One individual value may be below the minimum, but not less than 70% of that value.
The certificate reports the dimension of the sample and the values measured in the test in J. If the sample width W is less than 10 mm, the minimum requested KV_{10} values are reduced in the new KV_W value according to the formula: $KV_W=KV_{10}$ x (W/10)

Fine grain steel

1. Fine grain steel – chemical composition and mechanical properties

Shown below, for each grade of fine grain steel provided for by EN 10210-1, are the chemical analyses and mechanical properties.

Option

If agreed upon at time of ordering, a declaration of Ü Mark (TÜV) relevant to grade S355NH, for wall thicknesses of from 2.3 to 100 mm inclusive can be issued.

CHEMICAL ANALYSIS %

GRADE	C	Si	Mn	P	S	Nb	V	Al tot.	Ti	Cr	Ni	Mo	Cu	N
S275NH	≤ 0,20	≤ 0,40	0,50 1,40	≤ 0,035	≤ 0,030	≤ 0,050	≤ 0,05	≥ 0,020	≤ 0,03	≤ 0,30	≤ 0,30	≤ 0,10	≤ 0,35	≤ 0,015
S355NH	≤ 0,20	≤ 0,50	0,90 1,65	≤ 0,035	≤ 0,030	≤ 0,050	≤ 0,12	≥ 0,020	≤ 0,03	≤ 0,30	≤ 0,50	≤ 0,10	≤ 0,35	≤ 0,015
S460NH	≤ 0,20	≤ 0,60	1,00 1,70	≤ 0,035	≤ 0,030	≤ 0,050	≤ 0,20	≥ 0,020	≤ 0,03	≤ 0,30	≤ 0,80	≤ 0,10	≤ 0,70	≤ 0,015

CARBON EQUIVALENT (CEV)% (long formula)

GRADE	Maximum Carbon Equivalent (CEV) value by nominal W.T. mm	
	≤16	>16 ≤ 65
S275NH	0,40	0,40
S355NH	0,43	0,45
S460NH	-	-

MECHANICAL PROPERTIES

GRADE	Min. Yield Strength (R_{eH}) N/mm²			Tensile Strength (R_m) N/mm²	Elongation % Minimum		Impact Strengh*	
	Nominal W.T. mm			Nominal W.T. mm	Nominal W.T. mm		T °C	J
	≤16	>16 ≤ 40	> 40 ≤ 65		Long.	Transv.		
S275NH	275	265	255	370 ÷ 540	24	22	- 20	≥ 40
S355NH	355	345	335	470 ÷ 630	22	20	- 20	≥ 40
S460NH	460	440	430	550 ÷ 720	17	15	- 20	≥ 40

If agreed upon at the time of ordering, a declaration of conformity to law N°1086/1971 and Ministerial Decree 9.1.96 relevant for grade S355J2H (ex Fe 510 D Uni 7806) for wall thicknesses of from 3 to 35mm inclusive can be issued.

If agreed upon at time of ordering, a declaration of Ü Mark (TÜV) relevant to grades S235JRH, S355J0H, S355J2H, for wall thicknesses of from 2.3 to 100mm inclusive can be issued.

*The impact test values indicated are meant to be calculated as the average of the three samples of width W = 10 mm. One individual value may be below the minimum, but not less than 70% of that value.
The certificate reports the dimension of the sample and the values measured in the test in J. If the sample width W is less than 10 mm, the minimum requested KV_{10} values are reduced in the new KV_W value according to the formula: $KV_W=KV_{10}$ x (W/10)

1. Dimensions and Tolerances

The dimensions and tolerances comply with EN 10210 part 2 and are shown in the table on p. 7.

2. Length

The standard lengths supplied are from 5 to 12 m inclusive.
The lengths supplied vary with the dimension; for each dimension the range is 2m.

Service Center

The Service Center can supply tubes cut in fixed lengths with tolerances of -0 + 5 mm.

3. Checks and tests

The product is subjected to the following checks:
- Cast analysis
- Tensile test
- Impact strength test
- Electromagnetic test (not required by EN 10210)
- Visual and dimensional check

Options

Fixed or multiple lengths can be agreed upon at time of ordering

4. Surfaces

The product is supplied in hot rolled condition.

5. Certification

The product comes with a 3.1.B inspection certificate, in conformity with EN 10204.

Tenaris employs complete product traceability, with the cast number indicated on each tube.

Options

If established when placing the order, a declaration of conformity in accordance with law no.1086/1971 and Ministerial Decree 9.1.96 can be issued for grade S355J2H (ex Fe 510 D Uni 7806) for W.T. from 3 to 35 mm inclusive.
If agreed on at time of ordering, a declaration of conformity to U Mark (TÜV) for grades S235JRH, S355J0H, S355J2H and S355NH can be issued, for W.T. from 2.3 to 100 mm inclusive. 3.1.C or 3.2 certification can be agreed upon when placing the order.

In case 3.2 certification is requested, the customer has to notify the organisation or individual responsible for conducting the inspection at the time of ordering.

6. Identification and marking

The structural tubes are identified as follows:

Dye stamping

- Manufacturer's trademark
- Steel grade
- S (production process)
- Plant inspector

Painted (in continuous)

- Manufacture's trademark
- Dimensions (OD x WT)
- Steel grade
- Production standards
- Cast no.

7. Minimum order

The minimum quantity supplied varies based upon the dimensions and additional requirements (option) and have to be agreed upon when ordering.

The tolerance on quantity is ± 10% for each lot

8. Packaging

Diameters greater than 200 mm: loose.
Diameters less than or equal to 200 mm: in bundles.

9. Technical assistance

Tenaris offers technical advice for the use of its products, including grades superior to those considered in this catalogue.

DIMENSIONS AND WEIGHT (IN ACCORDANCE WITH EN 10210 PART 2)

OUTSIDE DIAMETER mm	WALL THICKNESS 2,3	2,6	3,2	4	5	6	6,3	8	10	12	12,5	16	20	25	30	40	50
21,3	1,08	1,2	1,43														
26,9	1,4	1,56	1,87														
33,7		1,99	2,41	2,93													
42,4		2,55	3,09	3,79													
48,3		2,93	3,56	4,37	5,34												
60,3		3,7	4,51	5,55	6,82												
76,1			5,75	7,11	8,77												
88,9			6,76	8,37	10,3	12,3	12,8										
101,6				9,63	11,9	14,1	14,8	18,5	22,6								
114,3				10,9	13,5	16	16,8	21	25,7								
139,7					16,6	19,8	20,7	26	32	37,8	39,2						
168,3					20,1	24	25,2	31,6	39	46,3	48						
177,8					21,3	25,4	26,6	33,5	41,4	49,1	51						
193,7						27,8	29,1	36,6	45,3	53,8	55,9	70,1					
219,1						31,5	33,1	41,6	51,6	61,3	63,7	80,1	98,2				
244,5							37	46,7	57,8	68,8	71,5	90,2	111	135			
273							41,1	52,3	64,9	77,2	80,3	101	125	153			
323,9								8,37	77,4	92,3	96	121	150	184			
355,6								8,37	97,8	102	106	134	166	204			
406,4								78,6	97,8	117	121	154	191	235	278	361	
457								88,6	110	132	137	174	216	266	316	411	
508									123	147	153	194	241	298	354	46	565
610									148	177	184	234	291	361	429	562	690
711										207	215	274	341	423	504	662	815

Other dimensions not shown can be produced on request.

10. Tolerances

Outside Diameter
± 1 % with a minimum of ± 0.5 mm

Wall Thickness

- 12.5 % + Not defined
(limited by the tolerance on the weight)

To be agreed

Weight
With respect to the nominal values
For each single tube + 8% / -6 %

Straightness
0,2 % along the total length

STATIC VALUES

DIMENSIONS THICKNESS		WEIGHT METRE	SECTION AREA	MOMENT OF INERTIA	RADIUS OF INERTIA	SECTION MODULUS ELASTIC	SECTION MODULUS PLASTIC	MOMENT OF GYRATION	TORSIONAL COSTANT INERTIA	EXTERNAL SURFACE METRE	LENGTH PER APPROXIMATE METRIC TON
D mm	T mm	M kg/m	A cm^2	I cm^4	i cm	W_{el} cm^3	W_{pl} cm^3	I_t cm^4	C_t cm^3	m^2/m	m
	2,3	1,08	1,37	0,629	0,677	0,590	0,834	1,26	1,18	0,0669	928
21,3	2,6	1,20	1,53	0,681	0,668	0,639	0,915	1,36	1,28	0,0669	834
	3,2	1,43	1,82	0,768	0,650	0,722	1,06	1,54	1,44	0,0669	700
	2,3	1,40	1,78	1,36	0,874	1,01	1,40	2,71	2,02	0,0845	717
26,9	2,6	1,56	1,98	1,48	0,864	1,10	1,54	2,96	2,20	0,0845	642
	3,2	1,87	2,38	1,70	0,846	1,27	1,81	3,41	2,53	0,0845	535
	2,6	1,99	2,54	3,09	1,10	1,84	2,52	6,19	3,67	0,106	501
33,7	3,2	2,41	3,07	3,60	1,08	2,14	2,99	7,21	4,28	0,106	415
	4,0	2,93	3,73	4,19	1,06	2,49	3,55	8,38	4,97	0,106	341
	2,6	2,55	3,25	6,46	1,41	3,05	4,12	12,9	6,10	0,133	392
42,4	3,2	3,09	3,94	7,62	1,39	3,59	4,93	15,2	7,19	0,133	323
	4,0	3,79	4,83	8,99	1,36	4,24	5,92	18,0	8,48	0,133	264
	2,6	2,93	3,73	9,7	1,62	4,05	5,44	19,6	8,10	0,152	341
48,3	3,2	3,56	4,53	11,6	1,60	4,80	6,52	23,2	9,59	0,152	281
	4,0	4,37	5,57	13,8	1,57	5,40	7,87	27,5	11,4	0,152	229
	5,0	5,34	6,80	16,2	1,54	6,69	9,42	32,3	13,4	0,152	187
	2,6	3,70	4,71	19,7	2,04	6,52	8,66	39,3	13,0	0,189	270
60,3	3,2	4,51	5,74	23,5	2,02	7,78	10,4	46,9	15,6	0,189	222
	4,0	5,55	7,07	28,2	2,00	9,34	12,7	56,3	18,7	0,189	180
	5,0	6,82	8,69	33,5	1,96	11,1	15,3	67,0	22,2	0,189	147
	2,6	4,71	6,00	40,6	2,60	10,7	14,1	81,2	21,3	0,239	212
76,1	3,2	5,75	7,33	48,8	2,58	12,8	17,0	97,6	25,6	0,239	174
	4,0	7,11	9,06	59,1	2,55	15,5	20,8	118	31,0	0,239	141
	5,0	8,77	11,2	70,9	2,52	18,6	25,3	142	37,3	0,239	114
	3,2	6,76	8,62	79,2	3,03	17,8	23,5	158	35,6	0,279	148
	4,0	8,38	18,7	96,3	3,00	21,7	28,9	193	43,3	0,279	119
88,9	5,0	10,3	13,2	116	2,97	26,2	35,2	283	52,4	0,279	96,7
	6,0	12,3	15,6	135	2,94	30,4	41,3	270	60,7	0,279	81,5
	6,3	12,8	16,3	140	2,93	31,5	43,1	280	63,1	0,279	77,9
	3,2	7,77	9,89	120	3,48	23,6	31,0	240	47,2	0,319	129
	4,0	9,63	12,3	146	3,45	28,8	38,1	293	57,6	0,319	104
	5,0	11,9	15,2	177	3,42	34,9	46,7	355	69,9	0,319	84,0
101,6	6,0	14,1	18,8	207	3,39	40,7	54,9	413	81,4	0,319	70,7
	6,3	14,8	18,9	215	3,38	42,3	57,3	430	84,7	0,319	67,5
	8,0	18,5	23,5	260	3,32	51,1	70,3	519	102	0,319	54,2
	10,0	22,6	28,8	305	3,26	60,1	84,2	611	120	0,319	44,3
	3,2	8,77	11,2	172	3,93	30,2	39,5	345	60,4	0,359	114
	4,0	10,9	13,9	211	3,90	36,9	48,7	422	73,9	0,359	91,9
	5,0	13,5	17,2	257	3,87	45,0	59,8	514	89,9	0,359	74,2
114,3	6,0	16,0	20,4	300	3,83	52,5	70,4	600	105	0,359	62,4
	6,3	16,8	21,4	313	3,82	54,7	73,6	625	109	0,359	59,6
	8,0	21,0	26,7	379	3,77	66,4	90,6	759	133	0,359	47,7
	10,0	25,7	32,8	450	3,70	78,7	109	899	157	0,359	38,9
	4,0	13,4	17,1	393	4,80	56,2	79,7	786	112	0,439	74,7
	5,0	16,6	21,2	481	4,77	68,8	90,8	691	138	0,439	60,2
	6,0	19,8	25,2	564	4,73	80,8	107	1.129	162	0,439	50,5
	6,3	20,7	26,4	589	4,72	84,3	112	1.177	169	0,439	48,2
139,7	8,0	26,0	33,1	720	4,66	103	139	1.441	206	0,439	38,5
	10,0	32,0	40,7	862	4,60	123	169	1.724	247	0,439	31,3
	12,0	37,8	48,1	990	4,53	142	196	1.980	283	0,439	26,5
	12,5	39,2	50,0	1.020	4,52	146	203	2.040	292	0,439	25,5

STATIC VALUES

DIMENSIONS	THICKNESS	WEIGHT METRE	SECTION AREA	MOMENT OF INERTIA	RADIUS OF INERTIA	SECTION MODULUS ELASTIC	SECTION MODULUS PLASTIC	MOMENT OF GYRATION	TORSIONAL COSTANT INERTIA	EXTERNAL SURFACE METRE	LENGTH PER APPROXIMATE METRIC TON
D mm	T mm	M kg/m	A cm^2	I cm^4	i cm	W_{el} cm^3	W_{pl} cm^3	I_t cm^4	C_t cm^3	m^2/m	m
168,3	4,0	16,2	20,6	697	5,81	82,8	108	1.394	166	0,529	61,7
	5,0	20,1	25,7	856	5,78	102	133	1.712	203	0,529	49,7
	6,0	24,0	30,6	1.009	5,74	120	158	2.017	240	0,529	41,6
	6,3	25,2	32,1	1.053	5,73	125	165	2.107	250	0,529	39,7
	8,0	31,6	40,3	1.297	5,67	154	206	2.595	308	0,529	31,6
	10,0	39,0	49,7	1.564	5,61	186	251	3.128	372	0,529	25,6
	12,0	46,3	58,9	1.810	5,54	215	294	3.620	430	0,529	21,6
	12,5	48,0	61,2	1.868	5,53	222	304	3.737	444	0,529	20,0
177,8	3,0	21,3	27,1	1.014	6,11	114	149	2.028	228	0,559	46,9
	6,0	25,4	32,4	1.196	6,08	135	177	2.392	269	0,559	39,3
	6,3	26,6	43,9	1.250	6,07	141	185	2.499	281	0,559	37,5
	8,0	33,5	42,7	1.541	6,01	173	231	3.083	347	0,559	29.9
	10,0	41,4	52,7	1.862	5,94	209	282	3.724	419	0,559	24,2
	12,0	49,1	62,5	2.159	5,88	243	330	4.318	486	0,559	20,4
	12,5	51,0	64,9	2.230	5,86	251	342	4.460	502	0,559	19,6
193,7	5,0	23,3	29,6	1.320	6,67	136	178	2.640	273	0,609	43,0
	6,0	27,8	35,4	1.560	6,64	161	211	3.119	322	0,609	36,0
	6,3	29,1	37,1	1.630	6,63	168	221	3.260	337	0,609	34,3
	8,0	36,6	46,7	2.016	6,57	208	376	4.031	416	0,609	27,3
	10,0	45,3	57,7	2.442	6,50	252	338	4.883	504	0,609	22,1
	12,0	53,8	68,5	2.839	6,44	293	397	5.678	586	0,609	18,6
	12,5	55,9	71,2	2.934	6,42	303	411	5.869	606	0,609	17,9
	16,0	70,1	89,3	3.554	6,31	367	507	7.109	734	0,609	14,3
219,1	5,0	26,4	33,6	1.928	7,57	176	229	3.856	352	0,688	37,9
	6,0	31,5	40,2	2.282	7,54	208	273	4.564	417	0,688	31,7
	6,3	33,1	42,1	2.386	7,53	218	285	4.772	436	0,688	30,2
	8,0	41,6	53,1	2.960	7,47	270	357	5.919	540	0,688	24,0
	10,0	51,6	65,7	3.598	7,40	328	438	7.197	657	0,688	19,4
	12,0	61,3	78,1	4.200	7,33	383	515	8.400	767	0,688	16,3
	12,5	63,7	81,1	4.345	7,32	397	534	8.689	793	0,688	15,7
	16,0	80,1	102	5.297	7,20	483	661	10.590	967	0,688	12,5
	20,0	98,2	125	6.261	7,07	572	795	12.520	1.143	0,688	10,2
244,5	5,0	29,5	37,6	2.699	8,47	221	287	5.397	441	0,768	33,9
	6,0	35,3	45,0	3.199	9,43	262	341	6.397	523	0,768	28,3
	6,3	37,0	47,1	3.346	8,42	274	358	6.692	547	0,768	27,0
	8,0	46,7	59,4	4.160	8,37	340	448	8.321	681	0,768	21,4
	10,0	57,8	73,7	5.073	8,30	415	550	10.146	830	0,768	17,3
	12,0	68,8	87,7	5.938	8,23	486	649	11.887	972	0,768	14,5
	12,5	71,5	91,1	6.147	8,21	503	673	12.295	1.006	0,768	14,0
	16,0	90,2	115	7.533	8,10	616	837	15.066	1.232	0,768	11,1
	20,0	111	141	8.957	7,97	733	1.011	17.914	1.465	0,768	9,03
	25,0	135	172	10.517	7,81	860	1.210	21.034	1.721	0,768	7,39
273,0	5,0	33,0	42,1	3.781	9,48	277	359	7.562	554	0,858	30,3
	6,0	39,5	50,3	4.487	9,44	329	428	8.874	659	0,858	25,3
	6,3	41,4	52,8	4.696	9,43	344	448	9.392	688	0,858	24,1
	8,0	52,3	66,6	5.852	9,37	429	562	11.703	857	0,858	19,1
	10,0	64,9	82,6	7.154	9,31	524	692	14.308	1.048	0,858	15,4
	12,0	77,2	98,4	8.396	9,24	615	818	16.792	1.230	0,858	12,9
	12,5	80,3	102	8.697	9,22	637	849	17.395	1.274	0,858	12,5
	16,0	101	129	10.707	9,10	784	1.058	21.414	1.569	0,858	9,86
	20,0	125	159	12.798	8,97	938	1.283	25.597	1.875	0,858	8,01
	25,0	153	195	15.127	8,81	1.108	1.543	30.254	2.216	0,858	6,54

STATIC VALUES

DIMENSIONS THICKNESS		WEIGHT METRE	SECTION AREA	MOMENT OF INERTIA	RADIUS OF INERTIA	SECTION MODULUS ELASTIC	SECTION MODULUS PLASTIC	MOMENT OF GYRATION	TORSIONAL COSTANT INERTIA	EXTERNAL SURFACE METRE	LENGTH PER APPROXIMATE METRIC TON
D mm	T mm	M kg/m	A cm^2	I cm^4	i cm	W_{el} cm^3	W_{pl} cm^3	I_t cm^4	C_t cm^3	m^2/m	m
323,9	5,0	39,3	50,1	6.369	11,3	393	509	12.739	787	1,02	25,4
	6,0	47,0	59,9	7.572	11,2	468	606	15.145	935	1,02	21,3
	6,3	49,3	62,9	7.929	11,2	490	636	15.858	979	1,02	20,0
	8,0	62,3	79,4	9.910	11,2	612	799	19.820	1.224	1,02	16,0
	10,0	77,4	98,6	12.158	11,1	751	986	24.317	1.501	1,02	12,9
	12,0	92,3	118	14.320	11,0	884	1.168	28.639	1.768	1,02	10,8
	12,5	96,0	122	14.847	11,0	917	1.213	29.693	1.833	1,02	10,4
	16,0	121	155	18.390	10,9	1.136	1.518	36.780	2.271	1,02	8,23
	20,0	150	191	22.139	10,8	1.367	1.850	44.278	2.734	1,02	6,67
	25,0	184	235	26.400	10,6	1.630	2.239	52.800	3.260	1,02	5,43
355,6	6,0	51,7	65,9	10.071	12,4	566	733	20.141	1.133	1,12	19,3
	6,3	54,3	69,1	10.547	12,4	593	769	21.094	1.186	1,12	18,4
	8,0	68,6	87,4	13.201	12,3	742	967	26.403	1.485	1,12	14,6
	10,0	85,2	109	16.223	12,2	912	1.195	32.447	1.825	1,12	11,7
	12,0	102	130	19.139	12,2	1.076	1.417	38.279	2.153	1,12	9,83
	12,5	106	135	19.522	12,1	1.117	1.472	39.704	2.233	1,12	9,45
	16,6	134	171	24.663	12,0	1.387	1.847	49.326	2.774	1,12	7,46
	20,0	166	211	29.792	11,9	1.676	2.255	59.583	3.351	1,12	6,04
	25,0	204	260	35.677	11,7	2.007	2.738	71.353	4.013	1,12	4,91
406,4	6,0	59,2	75,5	15.128	14,2	745	962	30.257	1.489	1,28	16,9
	6,3	62,2	79,2	15.849	14,1	780	1.009	31.699	1.560	1,28	16,1
	8,0	78,6	100	19.874	14,1	978	1.270	39.748	1.956	1,28	12,7
	10,0	97,8	125	24.476	14,0	1.205	1.572	48.952	2.409	1,28	10,2
	12,0	117	149	28.937	14,0	1.424	1.867	57.874	2.848	1,28	8,57
	12,5	121	155	30.031	13,9	1.478	1.940	60.061	2.956	1,28	8,24
	16,0	154	196	37.449	13,8	1.843	2.440	74.898	3.686	1,28	6,49
	20,0	191	243	45.432	13,7	2.236	2.989	90.864	4.472	1,28	5,25
	25,0	235	300	54.702	13,5	2.692	3.642	109.404	5.384	1,28	4,25
	30,0	278	355	63.224	13,3	3.111	4.259	126.447	6.223	1,28	3,59
	40,0	361	460	78.186	13,0	3.848	5.391	156.373	7.796	1,28	2,77
457,0	6,0	66,7	85,0	21.618	15,9	946	1.220	43.236	1.892	1,44	15,0
	6,3	70,0	89,2	22.654	15,9	991	1.280	45.308	1.983	1,44	14,3
	8,0	88,3	113	28.446	15,9	1.245	1.613	56.893	2.490	1,44	11,3
	10,0	110	140	35.091	15,8	1.536	1.998	70.183	3.071	1,44	9,07
	12,0	132	168	41.556	15,7	1.819	2.377	83.113	3.637	1,44	7,59
	12,5	137	175	43.145	15,7	1.888	2.470	86.290	3.776	1,44	7,30
	16,0	174	222	53.959	15,6	2.361	3.113	107.919	4.723	1,44	5,75
	20,0	216	275	65.681	15,5	2.874	3.822	131.363	5.749	1,44	4,64
	25,0	266	339	79.415	15,3	3.475	4.671	158.830	6.951	1,44	3,75
	30,0	316	402	92.173	15,1	4.034	5.479	184.346	8.068	1,44	3,17
	40,0	411	524	114.949	14,8	5.031	6.967	229.898	10.061	1,44	2,43
508,0	6,0	74,3	94,6	29.812	17,7	1.174	1.512	59.623	2.347	1,60	13,5
	6,3	77,9	99,3	31.246	17,7	1.230	1.586	62.493	2.460	1,60	12,8
	8,0	98,6	126	39.280	17,7	1.546	2.000	78.560	3.093	1,60	10,01
	10,0	123	156	48,520	17,6	1.910	2.480	97.040	3.820	1,60	8,14
	12,0	147	187	57.536	17,5	2.265	2.953	115.072	4.530	1,60	6,81
	12,5	153	195	59.755	17,5	2.359	3.070	119.511	4.705	1,60	6,55
	16,0	194	247	74.909	17,4	2.949	3.874	149.818	5.898	1,60	5,15
	20,0	241	307	91.428	17,3	3.600	4.766	182.856	7.199	1,60	4,15
	25,0	298	379	110.918	17,1	4.367	5.837	221.837	8.734	1,60	3,36
	30,0	354	451	129.173	16,9	5.086	6.864	258.346	10.171	1,60	2,83
	40,0	462	588	162.188	16,6	6.385	8.782	324.376	12.771	1,60	2,17
	50,0	565	719	190.885	16,3	7.515	10.530	381.770	15.030	1,60	1,77

STATIC VALUES

DIMENSIONS THICKNESS		WEIGHT METRE	SECTION AREA	MOMENT OF INERTIA	RADIUS OF INERTIA	SECTION MODULUS ELASTIC	SECTION MODULUS PLASTIC	MOMENT OF GYRATION	TORSIONAL COSTANT INERTIA	EXTERNAL SURFACE METRE	LENGTH PER APPROXIMATE METRIC TON
D mm	T mm	M kg/m	A cm^2	I cm^4	i cm	W_{el} cm^3	W_{pl} cm^3	I_t cm^4	C_t cm^3	m^2/m	m
610,0	6,0	89,4	114	51.924	21,4	1.702	2.189	103.847	3.405	1,92	11,2
	6,3	93.8	119	54.439	21,3	1.785	2.296	108.878	3.570	1,92	10,7
	8,0	119	151	68.551	21,3	2.248	2.899	137.101	4.495	1,92	8,42
	10,0	148	188	84.847	21,2	2.782	3.600	169.693	5.564	1,92	6,76
	12,0	167	225	100.814	21,1	3.305	4.294	201.627	6.611	1,92	5,65
	12,5	184	235	104.755	21,1	3.435	4.463	209.509	6.869	1,92	5,43
	16,0	234	299	131.781	21,0	4.321	5.647	263.563	8.641	1,92	4,27
	20,0	291	371	161.490	20,9	5.295	6.965	322.979	10.589	1,92	3,44
	25,0	361	459	196.906	20,7	6.456	8.561	393.813	12.912	1,92	2,77
	30,0	429	547	230.476	20,5	7.557	10.101	460.952	15.113	1,92	2.33
	40,0	562	716	292.333	20,2	9.585	13.017	584.666	19.169	1,92	1,78
	50,0	691	888	347.570	19,9	11.396	15.722	695.140	22.791	1,92	1,45
711,0	6,0	104	133	82.568	24,9	2.323	2.982	165.135	4.645	2,23	9,59
	6,3	109	139	86.586	24,9	2.436	3.129	173.172	4.871	2,23	9,13
	8,0	139	177	109.162	24,9	3.071	3.954	218.324	6.141	2,23	7,21
	10,0	173	220	135.301	24,8	3.806	4.914	270.603	7.612	2,23	5,78
	12,0	207	264	160.991	24,7	4.529	5.864	321.981	9.057	2,23	4,83
	12,5	215	274	167.343	24,7	4.707	6.099	334.686	9.415	2,23	4,64
	16,0	274	349	211.040	24,6	5.936	7.730	422.080	11.873	2,23	3,65
	20,0	341	434	259.351	24,4	7.295	9.552	518.702	14.591	2,23	2,93
	25,0	423	539	317.357	24,3	8.827	11.770	634.715	17.854	2,23	2,36
	30,0	504	642	372.790	24,1	10.486	13.922	745.580	20.973	2,23	1,98
	40,0	662	843	476.242	23,8	13.396	18.031	952.485	26.793	2,23	1,51
	50,0	815	1.038	570.312	23,4	16.043	21.888	1.140.623	32.085	2,23	1,23
	60,0	963	1.227	655.583	23,1	18.441	25.500	1.311.166	36.882	2,23	1,04

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