

Seamless Tubes and Pipes for Power Plants



Tenaris

Tenaris is the leading global manufacturer and supplier of tubular products and services used in the drilling, completion and production of oil and gas and a leading supplier of tubular products and services used in process and power plants and in specialized industrial and automotive applications.

Through our integrated global network of manufacturing, R&D and service facilities, we are working with our customers to meet their needs for the timely supply of high performance products in increasingly complex operating environments.

Tenaris has annual revenues of US\$10.8 billion and 26,500 employees worldwide.



Seamless tubes and pipes for Power Plants

Features

Definition of the order

Ordering Information

- Norms and specifications
- Steel grade and heat treatment
- Sizes, minimum or average wall thickness
- Lengths
- Quantity
- Surface finishing
- Inspection

Options:

- Fixed or multiple lengths
- Special tolerances
- Special tests
- Surface protection
- Special marking
- Colour coding
- Special packing

Reference standards

EN - ASTM/ASME - DIN -NF
A - BS -UNI - ISO -
GB 5310 - GOST - JIS

Steel grades

Carbon steel; alloy steel (i.e. T/P11, 13CrMo4-5, T/P22, 10CrMo9-10, 15NiCuMoNb5-6-4, T/P23); high alloy steel (i.e. T/P91, T/P92); stainless steel (TEMPALOY AA-1, TEMPALOY A-3)

Certification

The products are supplied with 3.1 test certificates, according to EN 10204. Certification according to 3.2 can be agreed at the time of order.

Identification and marking

All products are identified in accordance with the material Specification and/ or in accordance with P O requirements (to be agreed). Special specific marking to be agreed.

Packing

Pipes may be furnished bare or coated and with capped ends.

Tubes and pipes up to 3" OD will be supplied in bundles. In order to prevent rust during sea shipment, bundles of tubes may be wrapped with polypropylene sheets, and secured with flat steel bands.

Over 3" OD will be supplied loose.

Tests and inspections

Main tests performed:

- Heat analysis
- Product analysis (when applicable)
- Tensile test at room temperature
- Tensile test at elevated temperatures (when applicable)
- Impact test (when applicable)
- Hydraulic test or equivalent NDE
- NDE
- Visual and dimensional inspection
- PMI
- Technological tests (when applicable)

Multi Lead Rifled seamless cold drawn tubes for boiler are available upon request.

Specific qualification

Tenaris has been approved by various inspection bodies, TÜV - L.R. - etc.

Homologations:

- TÜV: AD W 0 - TRD 100
- PED 97/23/EC
- IBR

Tenaris applies a Total Quality Assurance programme in compliance with ISO 9001



Seamless hot finished tubes and pipes for utility boilers, industrial boilers and heat recovery steam generators

Dimensional tolerances according to EN 10216-2

OUTSIDE DIAMETER	
O.D. TOLERANCES	
± 1% or ± 0.5 mm whichever is the greater	

WALL THICKNESS				
O.D. mm	TOLERANCES - W.T./O.D. ratio			
	≤ 0,025	>0,025 ≤ 0,050	> 0,050 ≤ 0,10	> 0,10
≤ 219,1	± 12,5% or ± 0.4 mm whichever is the greater			
> 219,1	± 20%	± 15%	± 12,5%	± 10%*

* For outside diameters ≥ 355,6 mm it is permitted to exceed the upper wall thickness locally by a further 5% of the wall thickness
 - Tighter manufacturing tolerances available upon request

Lengths

The tubes and pipes are supplied in random lengths or in fixed lengths to be analysed and agreed at time of order, in the range between 4,000 mm and 26,000 mm depending on the size.

Other type of surface finishing may be agreed at the time of order

Size range

See table (page 6).

Surfaces

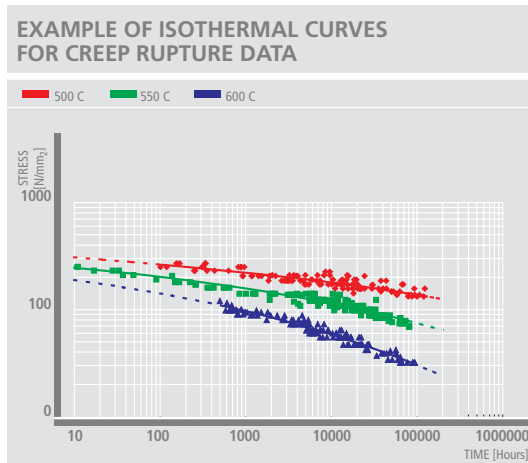
Tubes and pipes will be supplied in accordance with the standard workmanship as per hot finished products. Special surface protection may be agreed at the time of order.



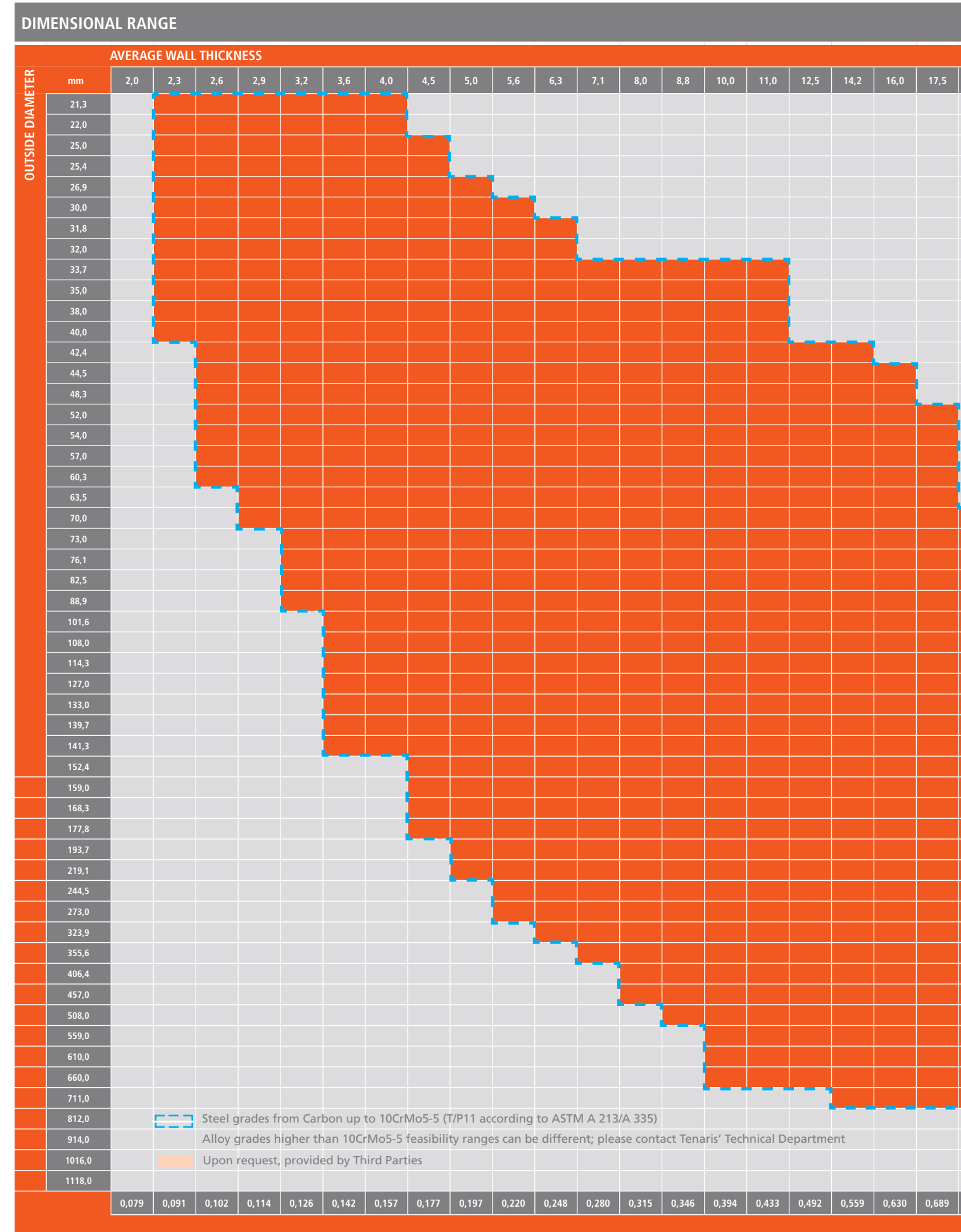
Notes on the behaviour of steel at high temperatures

Boiler tubes and pipes operate at very high pressures and temperatures for long periods of time. The pressure load combined with the high service temperatures produces a slow but continuous microstructural variation of the steel, causing a progressive reduction of the properties of the material itself: this phenomenon is called "Creep". Since 1957 TenarisDalmine has been conducting studies on this topic in cooperation with recognized international R&D laboratories. It is member of the European Creep Collaborative Committee and participates in European R&D programs on boiler materials.

Its creep laboratory conducts extensive studies and characterizations on all the boiler materials, with single tests reaching durations of more than 100000 hours. Tenaris performs deep analyses on the microstructural evolution, in order to verify the long term stability of the materials in service conditions.



DIMENSIONAL RANGE FOR CARBON AND LOW ALLOY STEELS ACCORDING TO EN 10216-2



HOT ROLLED TUBES FOR HIGH TEMPERATURE AND PRESSURE APPLICATIONS

STANDARD CORRELATION BETWEEN EN - ASTM/ASME - DIN - NF A - BS - UNI - ISO

EN	ASTM/ASME							DIN				NF			
EN10216Part1 - TR2 Unalloy	53	106 Carbon Steel						1629 Unalloyed	1630 Unalloyed	49-111 (p)	49-112				
General use Ambient Temperature Pressure purposes	Black Hot-deep zinc-coat.	High Temp.						Special Quality Requirem.	Pressure purposes 300 °C max	Commercial quality Medium Pressure	Ambient Temp.				
P195TR1	A + Carbon equival	A + Carbon equival													
P195TR2															
P235TR1	B + Carbon equival	B + Carbon equival						St 37.0		TU 37-a	TU E 220 A				
P235TR2									St 37.4						
P265TR1								St 44.0			TU E 235 A				
		C + Carbon equival													
P265TR2								St 52.0	St 44.4 St 52.4						
EN	ASTM/ASME							DIN				NF			
EN 10216 Part 2 Unalloy Alloy	106 Carbon Steel	179 Low-Carbon Steel	192 Carbon Steel	209 C-Mo	210 Medium-carbon	213 Alloy (Ferr.& Aust.)	335 Alloy (Ferr.)	17175	17176	49-210	49-211 Alloy	49-213 Unalloy Alloy (Mo & Cr-Mo)	49-215 (p) Unalloy Alloy (Ferritic)	49-219 Unalloy Alloy (Mo & Cr-Mo)	
Elevated Temperature Pressure purposes	High Temp.	Cold-Drawn Heat-Exchanger	Boiler High-pressure	Superheater	Boiler Superheater	Heat-Exchanger Boiler Superheater	High Temp.	Elevated Temp.	Elevated Temp. For Hydrogen Service		Elevated Temp.	Elevated Temp.	Heat-Exchanger	Elevated Temp. Furnaces	
P195GH	A + High temp serv	Low C	Low C												
P235GH								St 35.8			TU E 220	TU 37 C - TU 42 C - TU 42	TU 37 C - TU 42 C	TU 37 F - TU 42 F	
P265GH	B + High temp serv				A1			St 45.8			TU E 250 TU E 275	CR	TU 48 C		
					C			17 Mn 4 19 Mn 5				TU 48 C - TU 48 CR TU 48 C - TU 48 CR TU 52 C			
20MnNb6	C + High temp serv														
16Mo3		T1 T1a T1b				T2	P1 P2	15Mo3					TU 15 D 3	TU 15 D 3	
														TU 15 CD 2-05	
14MoV6-3						T17		14MoV63							
10CrMo5-5						T11	P11						TU 10 CD 5-05	TU 10 CD 5-05	
13CrMo4-5						T12	P12 P15	13CrMo44	13CrMo44				TU 10 CD 5-05 TU 13 CD 4-04	TU 13 CD 4-04	
10CrMo9-10						T21	P21								
11CrMo9-10						T22	P22	10CrMo910	10CrMo910 12CrMo910				TU 10 CD 9-10	TU 10 CD 9-10	
25CrMo4									12CrMo1210 25CrMo4						
15NiCuMoNb5-6-4						T36	P36	ASNiCuMoNbS(**)							
X11CrMo5+I						T5	P5		12CrMo195(G) 12CrMo195(V1) 12CrMo195(V2)				TU Z 12 CD 05-05 a	TU Z 12 CD 05-05	
X11CrMo5+NT1													TU Z 12 CD 05-05 b	TU Z 10 CD 5-05	
X11CrMo5+NT2														TU Z 10 CD 9	
X11CrMo9-1+I						T9	P9		X12CrMo91(G) X12CrMo91(V)				TU Z 10 CD 09 a	TU Z 10 CD 09 a	
X11CrMo9-1+NT													TU Z 10 CD 09 b	TU Z 10 CD 09 b	
X10CrMoVNb9-1						T91	P91	X10CrMoVNb91(*)					TU Z 10 CD 09 b	TU Z 10 CDVNb 09	
7CrWVMoNb9-6						T23	P23								
X11CrMoWVNb9-1-1						T911	P911								
X10CrWVMoVNb9-2						T92	P92						TU Z 10 CDNbV 09-02		
								UNS S-30434 ¹							
								UNS S-30942 ²							

* Vd TÜV 511/2 - **Vd TÜV 377/2 | ¹TEMPALLOY AA-1 | ²TEMPALLOY A-3

BS		UNI		ISO		EN	BS	DIN	Requested Values	
3059-1 Carbon	3601 Carbon Steel	663 Unalloyed steel	7088 Unalloyed steel	9329-1 Unalloyed steel		EN 10216 Part 3 Unalloy Alloy Fine Grain Pressure purposes	3603:91 (p)	17179:86 Fine Grain	KV Trasvers	Elongation
Boiler Superheater No elevated Temp.	Special Delivery Cond. Ambient Temp. Pressure purposes	General Purposes		Ambient Temp. Pressure purposes				Special requirements	Average J Min	Temperature °C
320	0									A % Min
	360	Fe 35-1	Fe 35-2	Fe 35-1	TS 360			St E 255 WSt E 255 TSt E 255 E St E 255		
	430	Fe 45-1	Fe 45-2	Fe 45-1	TS 410 TS 430		430 LT	St E 285 WSt E 285 T St E 285 E St E 285		
		Fe 52-1	Fe 52-2		TS 500					
BS		UNI		ISO						
3059-2 Carbon Alloy Boiler Superheater Elevated Temp.	3602-1 Carbon and C-Mn	3604-1 Alloy (Ferritic)	3606	5462	9329-2 Unalloy Alloy Pressure purposes Specific Temp.					
	Pressure purposes Elevated Temp.	Pressure purposes Elevated Temp.	Heat Exchangers	High-pressure Elevated Temp.						
			320							
360	360		400	C 14	PH 23					
440	430		440	C 18	PH 26					
					PH 29					
	500 Nb				PH 35					
243			243	16 Mo5	16Mo3					
			261							
					8CrMo4-5					
		660			12MoCr6-2					
		621	621		8CrMo5-5					
620-460		620 - 440	620	14CrMo3	13CrMo4-5					
622-490		622	622	12CrMo910	11CrMo9-10(TA)(TN-TT)					
		591								
a		625	625		X11CrMo5TA					
b					X11CrMo5TN-TT					
	629-470	629-470								
	629-590	629-590			X11CrMo9-1TA					
9-01	91				X11CrMo9-1TN-TT					
					X10CrMoVNB9-1					

According to Table 7
EN 10216-3
Requested values are
depending from steel grades
and wall thickness

Cold drawn seamless tubes for heat exchangers and boilers

Dimensional tolerances according to EN 10216-2

OUTSIDE DIAMETER	
O.D. TOLERANCES	
± 1% or ± 0.5 mm whichever is the greater	

WALL THICKNESS				
O.D. mm	TOLERANCES - W.T./O.D. ratio			
	≤ 0,025	>0,025 ≤ 0,050	> 0,050 ≤ 0,10	> 0,10
≤ 219,1	± 12,5% or ± 0.4 mm whichever is the greater			

- Tighter manufacturing tolerances available upon request

Tenaris produces cold drawn seamless tubes/pipes in various steels - carbon, low or high alloyed - for heat exchangers and boilers.

Surface protection

Tubes for heat exchangers are supplied unprotected or with a temporary external oil protection to prevent rust.

Lengths

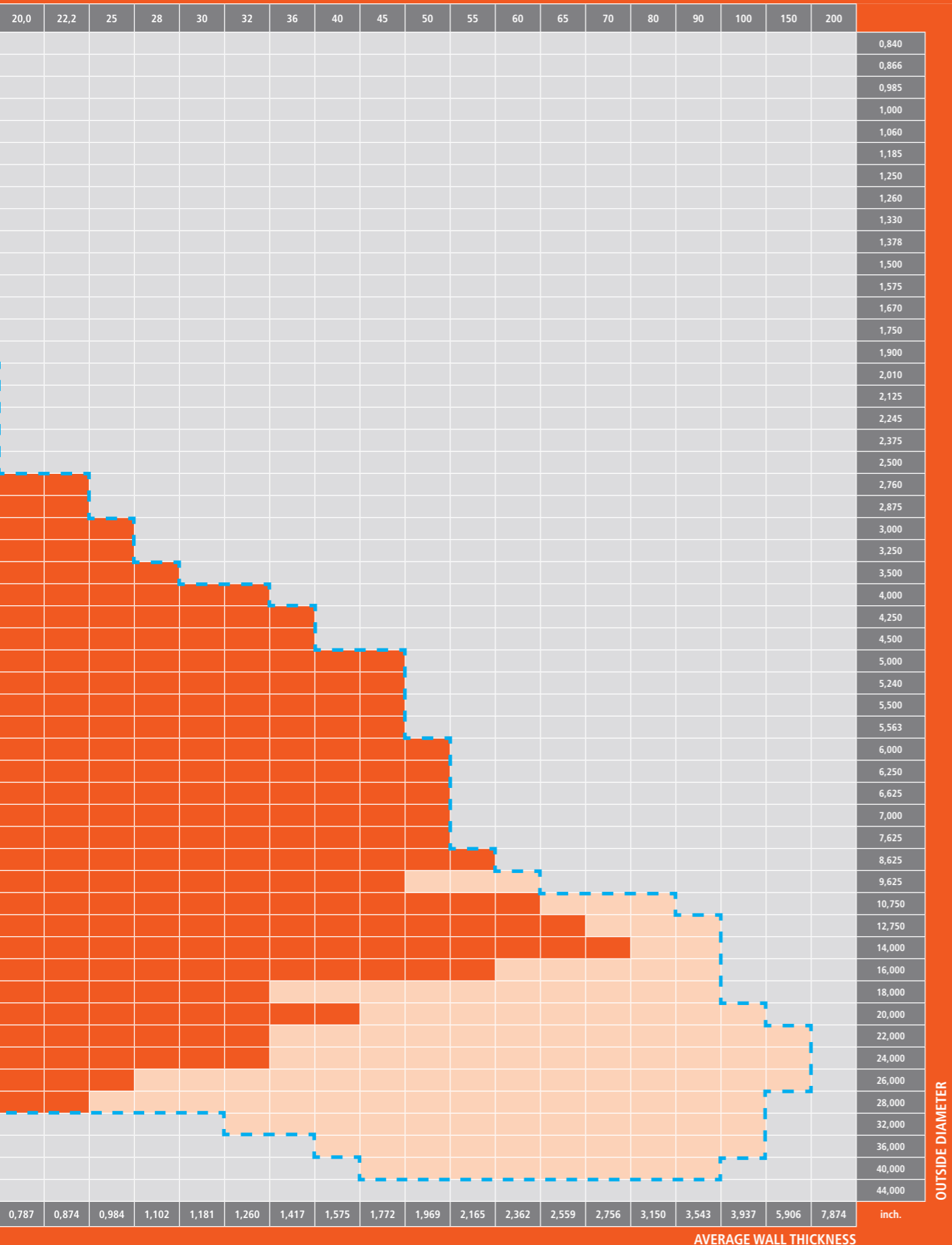
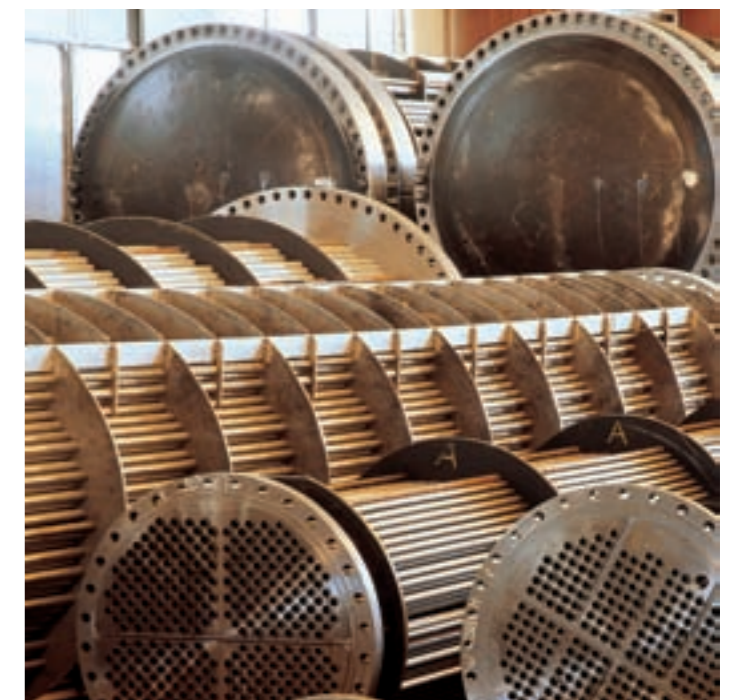
Tubes/pipes can be supplied in lengths of the intervals indicated in the table below:

MIN. LENGTH	MAX. LENGTH
2.750 mm	25.000 mm

Below 4.000 mm and above 18.600 mm, lengths shall be checked on a case by case basis.

Size range

See table (page 14).



REFERENCE STANDARDS AND STEEL GRADES

STANDARD	STEEL GRADE
ASTM A 179 - ASME SA 179 Sez.II	LOW CARBON
ASTM A106 - ASME SA 106 Sez.II	Gr. A - B - C
ASTM A 192 - ASME SA 192 Sez.II	LOW CARBON
ASTM A 209 - ASME SA 209 Sez.II	Gr. T1- T1a
ASTM A210 - ASME SA210 Sez.II	Gr. A1 - C
ASTM A 213 - ASME SA 213 Sez.II	Gr. T2 - T5 - T11 - T12- T22
ASTM A 333 - ASME SA 333 Sez.II	Gr. 1 - 6
ASTM A 334 - ASME SA 334 Sez.II	Gr. 1 - 6
ASTM A 335 - ASME SA 335 Sez.II	Gr. P1 - P2 - P5 - P11 - P12- P22
EN 10216-2	P235GH
EN 10216-2	P265GH
EN 10216-2	16Mo3
EN 10216-2	10CrMo55
EN 10216-2	13CrMo45
EN 10216-2	10CrMo910
EN 10216-2	25CrMo4
EN 10216-3	P355N
EN 10216-3	P355NH
EN 10216-3	P355NL1
EN 10216-3	P460N
EN 10216-3	P460NH
EN 10216-3	P460NL1



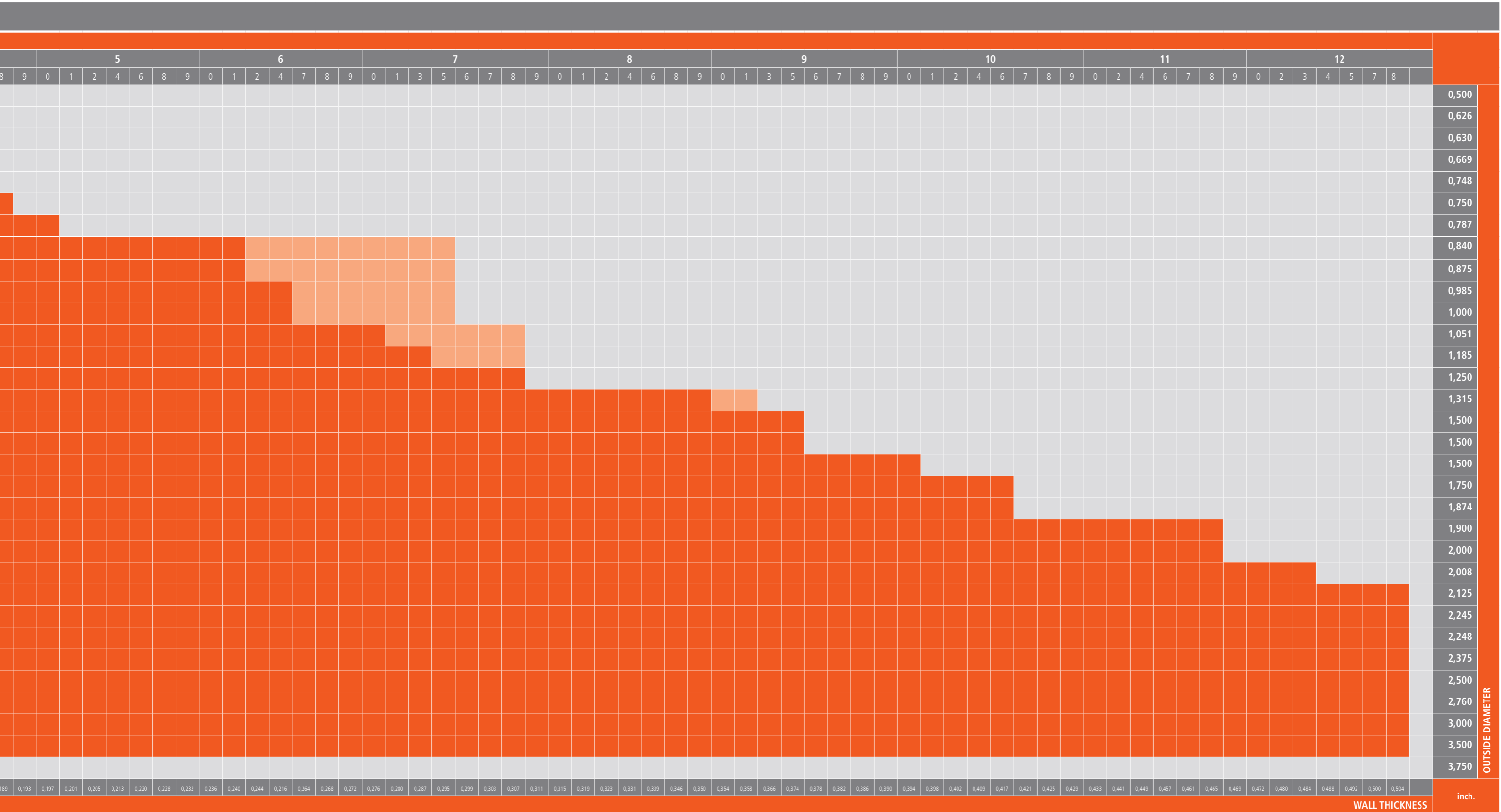
EN STANDARDS CORRESPONDENCE WITH THE ABROGATED NATIONAL STANDARDS

STANDARD	STEEL GRADE	STANDARD	STEEL GRADE	STANDARD	STEEL GRADE	STANDARD	STEEL GRADE	STANDARD	STEEL GRADE
EN 10216-2	P235GH	DIN 17175	St 35.8			UNI 5462	C14	NFA 49215	TU 37 C
EN 10216-2	P265GH	DIN 17175	St 45.8			UNI 5462	C18	NFA 49215	TU 48 C
EN 10216-2	16Mo3	DIN 17175	15Mo3			UNI 5462	16Mo5	NFA 49215	TU 15 D3
EN 10216-2	10CrMo55			BS 3606	621			NFA 49215	TU 10CD5.05
EN 10216-2	13CrMo45	DIN 17175	13CrMo44	BS 3606	620	UNI 5462	14CrMo3		
EN 10216-2	10CrMo910	DIN 17175	10CrMo910	BS 3606	622	UNI 5462	12CrMo910	NFA 49215	TU 10CD9.10
EN 10216-2	25CrMo4								
EN 10216-3	P355N	DIN 17179	StE 355						
EN 10216-3	P355NH	DIN 17179	WStE 355						
EN 10216-3	P355NL1	DIN 17179	TStE 355						
EN 10216-3	P460N	DIN 17179	StE 460						
EN 10216-3	P460NH	DIN 17179	WStE 460						
EN 10216-3	P460NL1	DIN 17179	TStE 460						

DIMENSIONAL RANGE FOR CARBON AND ALLOY STEEL GRADES

DIMENSIONAL RANGE		AVERAGE WALL THICKNESS																											
		1				2					3					4													
OUTSIDE DIAMETER	mm	6	7	8	9	0	1	2	3	4	5	6	8	9	0	2	4	5	6	7	8	9	0	1	2	4	5	6	8
	12,70																												
15,90																													
16,00																													
17,00																													
19,00																													
19,05																													
20,00																													
21,30																													
22,22																													
25,00																													
25,40																													
26,70																													
30,00																													
31,80																													
33,40																													
38,00																													
38,10																													
41,30																													
44,50																													
47,60																													
48,30																													
50,80																													
51,00																													
54,00																													
57,00																													
57,10																													
60,30																													
63,50																													
70,00																													
76,10																													
88,90																													
95,25																													
		0,063	0,067	0,071	0,075	0,079	0,083	0,087	0,091	0,094	0,098	0,102	0,110	0,114	0,118	0,126	0,134	0,138	0,142	0,146	0,150	0,154	0,157	0,161	0,165	0,173	0,177	0,181	0,

■ Carbon and alloy steel grades up to X11CrMo5 (EN 10216-2), T/P5 (ASTM A 213/A 335)
 ■ Sizes available upon agreement
 ■ Tolerances to be agreed with Tenaris' Technical Department
 ■ 10CrMo9-10 (EN 10216-2), T/P22 (ASTM A 213/A 335) and X11CrMo5 (EN 10216-2), T/P5 (ASTM A 213/A 335) steel grades excluded



OUTSIDE DIAMETER

WALL THICKNESS

inch.



For additional information, please visit
www.tenaris.com

For technical assistance, please contact
powergen@tenaris.com



Seamless tubes and pipes for power plants / Version 01 / March 2012

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