



Seamless tubes and pipes  
for Utility Boilers, Industrial Boilers  
and Heat Recovery Steam Generators



The boiler tubes and pipes are manufactured with materials able to withstand high temperatures and high pressures. These materials must meet the most stringent technical requirements for production process and inspection tests in order to guarantee their durability and reliability over the whole service life.

## Seamless tubes and pipes for utility boilers, industrial boilers and heat recovery steam generators.

### Features

#### Definition of the order

##### Ordering Information

- Norms and specifications
- Steel grade and heat treatment
- Sizes, minimum or average wall thickness
- Lengths
- Quantity
- Surface finish
- 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, 15NiCuMoNb5-6-4T/P23); high alloy steel (i.e. T/P91, T/p92); stainless steel (Tempaloy AA-1)

#### Size range

See table.

#### 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 24,000 mm depending on the size.

#### Tests and inspections

##### Main tests performed:

- Heat analysis
- Product analysis (if required)
- Tensile test (at room and elevated temperatures)
- Impact test (if required)
- Hydraulic test or equivalent NDE
- NDI
- Visual and dimensional inspection
- PMI
- Rifled tubes

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



Quality System Certified  
n. 110950



## 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 - T/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
- Tenaris applies a Total Quality Assurance programme in compliance with ISO 9001

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

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

### Minimum quantity

Carbon steels, low alloy and high alloy steels:  
*up to 3" OD - 3 ton*  
*up to 14" OD - 50 m*  
*up to 28" OD - 50 m*

### Technical assistance

Tenaris offers technical consultancy for the use of its products, including fabricability, weldability, and long term performance.

### Specific qualification

Tenaris is qualified by international accredited inspection bodies of TÜV - IBR – UDT.



### TÜV QUALIFICATION

MATERIAL	SPECIFICATION	CONDITION
CARBON STEEL	DIN1629	AR,N
HIGH TEMPERATURE	DIN 17175	AR, N, V
15 NiCuMoNb 5-6-4 (WB36)	VdTÜV 377/2	V
X 10 CrMoVNb 91	VdTÜV 511/2	V

- AR = AS ROLLED
- N = NORMALIZED
- V = QUENCHED AND TEMPERED

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

OUTSIDE DIAMETER mm	AVERAGE WALL THICKNESS																		
	2.3	2.6	2.9	3.2	3.6	4	4.5	5.2	5.6	6.3	7.1	8	8.8	10	11	12.5	14.2	16	17.5
21.3																			
25																			
26.9																			
30																			
31.8																			
33.7																			
38																			
42.4																			
44.5																			
48.3																			
51																			
54																			
57																			
60.3																			
63.5																			
70																			
73																			
76.1																			
82.5																			
88.9																			
101.6																			
108																			
114.3																			
121																			
127																			
133																			
139.7																			
152.4																			
159																			
168.3																			
177.8																			
193.7																			
219.1																			
244.5																			
273																			
323.9																			
355.6																			
406.4																			
457																			
508																			
559																			
610																			
660																			
711																			
	0.091	0.102	0.114	0.126	0.142	0.157	0.177	0.197	0.220	0.248	0.280	0.346	0.394	0.394	0.433	0.492	0.559	0.630	0.689

Steel grades from carbon steel up to T/P11 - Remark: additional sizes (ODxWT) are available upon request

T/P23 - T/P22 - T/P5: additional sizes (ODxWT) are available upon request

For steel grades T/P9, T/P91, T/P92, T/P911, please contact technical department, to be verified for each inquiry

20	22.2	25	28	30	32	36	40	45	50	55	60	65	70	75	80	85	90	100	
																			0.840
																			0.985
																			1.060
																			1.185
																			1.250
																			1.330
																			1.500
																			1.670
																			1.750
																			1.900
																			2.010
																			2.125
																			2.245
																			2.375
																			2.500
																			2.760
																			2.875
																			3.000
																			3.250
																			3.500
																			4.000
																			4.250
																			4.500
																			4.625
																			5.000
																			5.240
																			5.500
																			6.000
																			6.250
																			6.625
																			7.000
																			7.625
																			8.625
																			9.625
																			10.750
																			12.750
																			14.000
																			16.000
																			18.000
																			20.000
																			22.000
																			24.000
																			26.000
																			28.000
0.787	0.874	0.984	1.102	1.181	1.260	1.417	1.575	1.772	1.969	2.165	2.362	2.559	2.756	2.953	3.150	3.346	3.543	3.937	in

OUTSIDE DIAMETER

AVERAGE WALL THICKNESS

■ Sizes in the field outlined to be verified at the time of the inquiry

# Tubes for pressure purposes

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

EN		ASTM/ASME				
EN 10216 Part 1 - TR2 Unalloy	53	106	Carbon Steel			
General use	Black	High Temp.				
Ambient Temperature	Hot-deep zinc-coat.					
Pressure purposes						
P195TR1 *	A + Carbon equivalent	A + Carbon equivalent				
P195TR2						
P235TR1 *	B + Carbon equivalent	B + Carbon equivalent				
P235TR2						
P265TR1 *		C + Carbon equivalent				
P265TR2						

EN		ASTM/ASME				
EN 10216 Part 2 Unalloy	106	179	192	209	210	213
Alloy	Carbon Steel	Low-Carbon Steel	Carbon Steel	C-Mo	Medium-carbon	Alloy (Ferr.& Aust.)
Elevated Temperature	High Temp.	Cold-Drawn	Boiler	Superheater	Boiler	Heat-Exchanger
Pressure purposes		Heat-Exchanger	High-pressure		Superheater	Boiler Superheater
P195GH	A + High temp serv	Low C	Low C			
P235GH						
P265GH	B + High temp serv				A1	
					C	
	C + High temp serv					
20MnNb6						
16Mo3				T1 T1a T1b		T2
8MoB5-4						
						T17
14MoV6-3						
10CrMo5-5						T11
13CrMo4-5						T12
						T21
10CrMo9-10						T22
11CrMo9-10						
25CrMo4						
20CrMoV13-5-5						
15NiCuMoNb5-6-4						T36
X11CrMo5+I						T5
X11CrMo5+NT1						
X11CrMo5+NT2						
X11CrMo9-1+I						T9
X11CrMo9-1+NT						
X10CrMoVNb9-1						T91
X20CrMoV11-1 n						
7CrWVMoNb9-6						T23
7CrMoVTiB10-10 n						T24
X11CrMoWVNb9-1-1						T 911
X10CrWMoVNb9-2						T92
						T122
						18Cr-2Mo
						UNS S-30434 <sup>1</sup>

\* Tubes made of these material grades (TR1) are unlikely to support the essential requirements of the PED - Directive 97/23/EC

\*\* Vd TÜV 511/2 - \*\*\*Vd TÜV 377/2

	DIN		NF				
		1629 Unalloyed	1630 Unalloyed	49-111 (p)	49-112		
	Special Quality Requirem.	Pressure purposes 300 °C max	Commercial quality Medium Pressure	Ambient Temp.			
	St 37.0		TU 37-a	TU E 220 A			
	St 44.0	St 37.4		TU E 235 A			
		St 44.4					
	St 52.0	St 52.4					
	DIN		NF				
335 Alloy (Ferr.)	17175	17176	49-210	49-211 Alloy	49-213 Unalloy Alloy (Mo & Cr-Mo) Elevated Temp.	49-215 (p) Unalloy Alloy (Ferritic) Heat-Exchanger	49-219 Unalloy Alloy (Mo & Cr-Mo) Elevated Temp. Furnaces
High Temp.	Elevated Temp.	Elevated Temp. For Hydrogen Service		Elevated Temp.			
	St 35.8			TU E 220	TU 37 C - TU 42 C - TU 42 CR	TU 37 C - TU 42 C	TU 37 F - TU 42 F
	St 45.8			TU E 250			
				TU E 275		TU 48 C	
	17 Mn 4 19 Mn 5				TU 48 C - TU 48 CR TU 48 C - TU 48 CR TU 52 C		
P1 P2	15Mo3					TU 15 D 3	TU 15 D 3
						TU 15 CD 2-05	
	14MoV63						
P11						TU 10 CD 5-05	TU 10 CD 5-05
P12	13CrMo44	13CrMo44			TU 10 CD 5-05		TU 13 CD 4-04
P15					TU 13 CD 4-04		
P21							
P22	10CrMo910	10CrMo910 12CrMo910			TU 10 CD 9-10	TU 10 CD 9-10	TU 10 CD 9-10
		12 Cr Mo 12 10 25CrMo4 20CrMoV135					
P36	ASNiCuMoNbS(***)						
P5		12CrMo195(G) 12CrMo195(V1) 12CrMo195(V2)			TU Z 12 CD 05-05 a		TU Z 12 CD 05-05 TU Z 12 CD 05-05
P9		X12CrMo91(G) X12CrMo91(V)			TU Z 12 CD 05-05 b	TU Z 10 CD 5-05	
P91	X10CrMoVNb91(**) X20CrMoV121	X12CrMo91(G) X12CrMo91(V) X20CrMoV121			TU Z 10 CD 09 a TU Z 10 CD 09 b TU Z 10 CDVNb 09-01	TU Z 10 CD 9	TU Z 10 CD 09 a TU Z 10 CD 09 b TU Z 10 CDVNb 09-01
P23 P24 P911							
P92 P122						TU Z 10 CDNbV 09-02	

<sup>1</sup>Tempaloy AA-1

● Not available

		BS		UNI		ISO	
	3059-1 Carbon	3601 Carbon Steel		663 Unalloyed steel	7088	9329-1 Unalloyed steel	
	Boiler Superheater No elevated Temp.	Special Delivery Cond. Ambient Temp. Pressure purposes		General Purposes		Ambient Temp. Pressure purposes	
	320	0					
		360		Fe 35-1 Fe 35-2	Fe 35-1	TS 360	
		430		Fe 45-1 Fe 45-2	Fe 45-1	TS 410 TS 430	
				Fe 52-1 Fe 52-2		TS 500	
		BS		UNI		ISO	
(Mo)	3059-2 Carbon Alloy Boiler Superheater Elevated Temp.	3602-1 Carbon and C-Mn	3604-1 Alloy (Ferritic)	3606 Heat Exchangers	5462 High-pressure Elevated Temp.	9329-2 Unalloy Alloy Pressure purposes Specific Temp.	
				320			
42 F	360	360	400	C 14		PH 23	
	440	430	440	C 18		PH 26	
						PH 29	
		500 Nb				PH 35	
	243		243	16 Mo 5		16Mo3	
			261			8CrMo4-5	
			660			12MoCr6-2	
05			621	621		8CrMo5-5	
04	620-460		620 - 440	620	14 Cr Mo 3	13CrMo4-5	
10	622-490		622	622	12 Cr Mo 910	11CrMo9-10(TA) (TN-TT)	
			591				
05-05 a			625	625		X11CrMo5TA	
05-05 b						X11CrMo5TN-TT	
09 a	629-470		629-470			X11CrMo9-1TA	
09 b	629-590		629-590			X11CrMo9-1TN-TT	
Nb 09-01	9 1					X10CrMoVNb9-1	
	762		762			X20CrMoNiV11-1-1	
						9NiMnMoNb5-4-4	



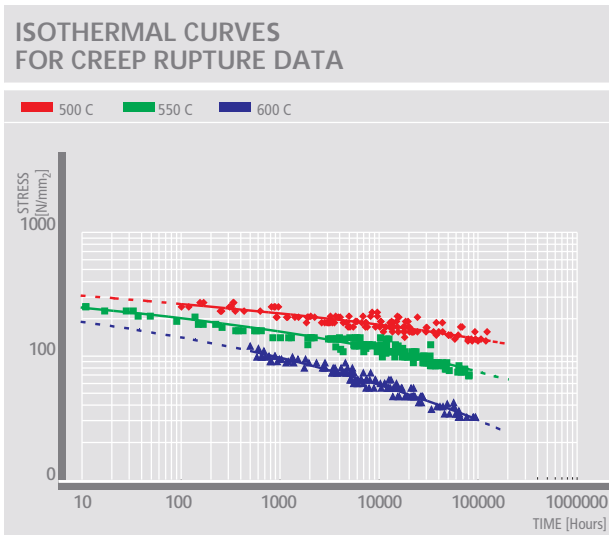


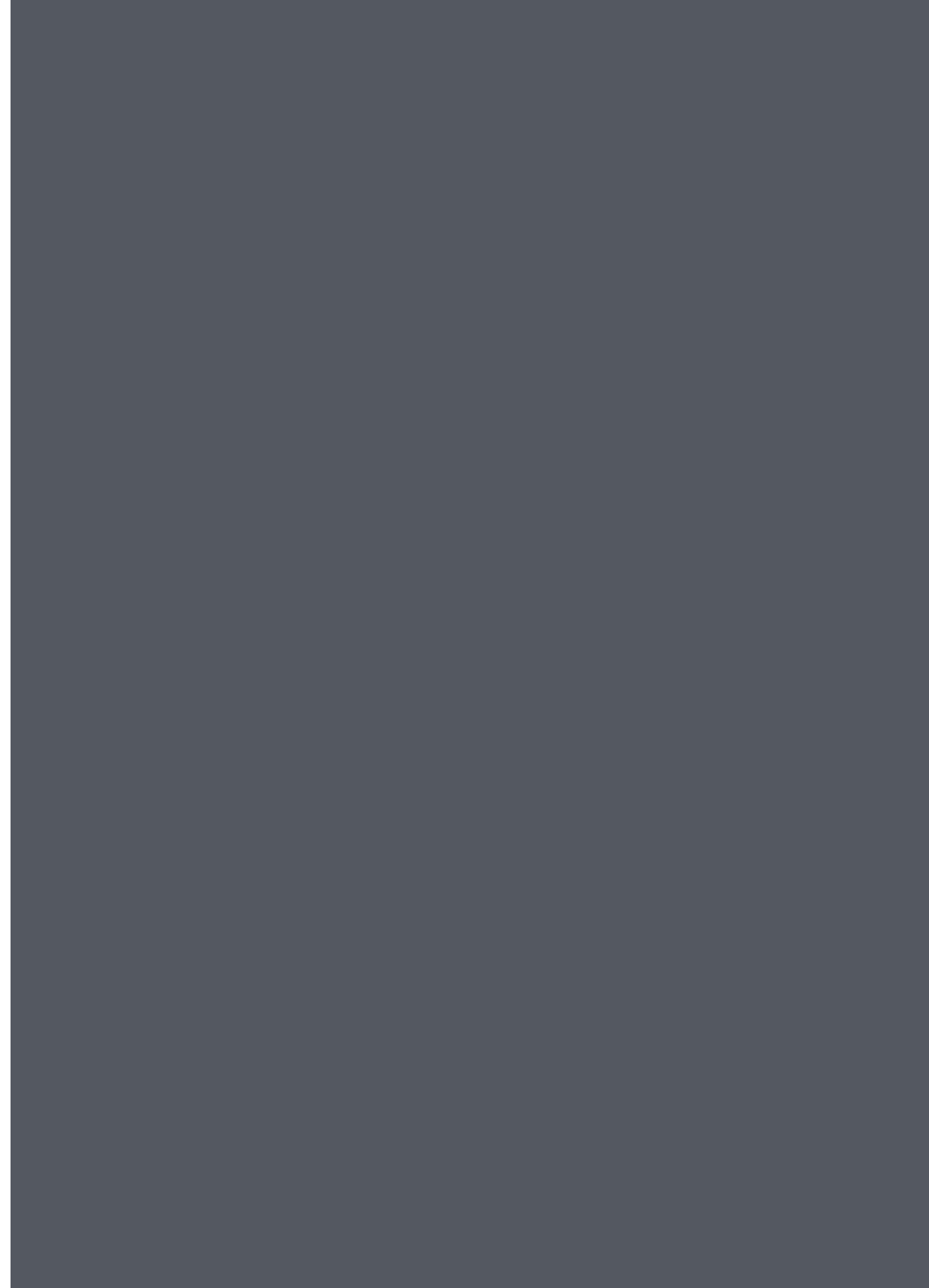
# Notes on the behaviour of steel at high temperatures

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.





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