



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)	VdTUV 377/2	V
X 10 CrMoVNb 91	VdTUV 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		

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	53	106				
Unalloy		Carbon Steel				
General use	Black	High Temp.				
Ambient Temperature	Hot-deep zinc-coat.					
Pressure purposes						
<b>P195TR1 *</b>	A + Carbon equivalent	A + Carbon equivalent				
<b>P195TR2</b>						
<b>P235TR1 *</b>	B + Carbon equivalent	B + Carbon equivalent				
<b>P235TR2</b>						
<b>P265TR1 *</b>		C + Carbon equivalent				
<b>P265TR2</b>						
EN		ASTM/ASME				
EN 10216 Part 2	106	179	192	209	210	213
Unalloy	Carbon Steel	Low-Carbon Steel	Carbon Steel	C-Mo	Medium-carbon	Alloy (Ferr.& Aust.)
Alloy						
Elevated Temperature	High Temp.	Cold-Drawn	Boiler	Superheater	Boiler	Heat-Exchanger
Pressure purposes		Heat-Exchanger	High-pressure		Superheater	Boiler Superheater
<b>P195GH</b>	A + High temp serv	Low C	Low C			
<b>P235GH</b>						
<b>P265GH</b>	B + High temp serv				A1	
					C	
	C + High temp serv					
<b>20MnNb6</b>						
<b>16Mo3</b>				T1 T1a T1b		T2
<b>8MoB5-4</b>						
						T17
<b>14MoV6-3</b>						T11
<b>10CrMo5-5</b>						T12
<b>13CrMo4-5</b>						
						T21
<b>10CrMo9-10</b>						T22
<b>11CrMo9-10</b>						
<b>25CrMo4</b>						
<b>20CrMoV13-5-5</b>						
<b>15NiCuMoNb5-6-4</b>						T36
<b>X11CrMo5+I</b>						T5
<b>X11CrMo5+NT1</b>						
<b>X11CrMo5+NT2</b>						
<b>X11CrMo9-1+I</b>						T9
<b>X11CrMo9-1+NT</b>						
<b>X10CrMoVNb9-1</b>						T91
<b>X20CrMoV11-1 n</b>						
<b>7CrWVMoNb9-6</b>						T23
<b>7CrMoVTiB10-10 n</b>						T24
<b>X11CrMoWVNb9-1-1</b>						T 911
<b>X10CrWMoVNb9-2</b>						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				
	17175	17176	49-210	49-211 Alloy	49-213 Unalloy Alloy (Mo & Cr-Mo)	49-215 (p) Unalloy Alloy (Ferritic) Heat-Exchanger	49-219 Unalloy Alloy (Mo & Cr-Mo)
335 Alloy (Ferr.)							
High Temp.	Elevated Temp.	Elevated Temp. For Hydrogen Service		Elevated Temp.	Elevated Temp.		Elevated Temp. Furnaces
	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				TU 48 C - TU 48 CR		
	19 Mn 5				TU 48 C - TU 48 CR		
					TU 52 C		
P1	15Mo3					TU 15 D 3	TU 15 D 3
P2						TU 15 D 3	
							TU 15 CD 2-05
	14MoV63						
P11							TU 10 CD 5-05
P12	13CrMo44	13CrMo44				TU 10 CD 5-05	TU 10 CD 5-05
P15						TU 13 CD 4-04	TU 13 CD 4-04
P21							
P22	10CrMo910	10CrMo910					TU 10 CD 9-10
		12CrMo910					TU 10 CD 9-10
		12 Cr Mo 12 10					
		25CrMo4					
		20CrMoV135					
P36	ASNiCuMoNbS(***)						
P5		12CrMo195(G)					TU Z 12 CD 05-05
		12CrMo195(V1)				TU Z 12 CD 05-05 a	TU Z 12 CD 05-05
		12CrMo195(V2)				TU Z 12 CD 05-05 b	
P9		X12CrMo91(G)					TU Z 10 CD 5-05
		X12CrMo91(V)					TU Z 10 CD 9
							TU Z 10 CD 09 a
P91	X10CrMoVNb91(**)					TU Z 10 CD 09 a	TU Z 10 CD 09 b
	X20CrMoV121 <sup>■</sup>	X20CrMoV121 <sup>■</sup>				TU Z 10 CD 09 b	TU Z 10 CDVNb 09-01
							TU Z 10 CDVNb 09-01 <sup>■</sup>
P23							
P24 <sup>■</sup>							
P911							
P92							TU Z 10 CDNbV 09-02
P122 <sup>■</sup>							

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

<sup>■</sup> 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	
	3059-2 Carbon Alloy	3602-1 Carbon and C-Mn	3604-1 Alloy (Ferritic)	3606	5462	9329-2 Unalloy Alloy	
	Boiler Superheater Elevated Temp.	Pressure purposes Elevated Temp.	Pressure purposes Elevated Temp.	Heat Exchangers	High-pressure Elevated Temp.	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	13CrMo4-5	
					14 Cr Mo 3		
10	622-490			622	622	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	

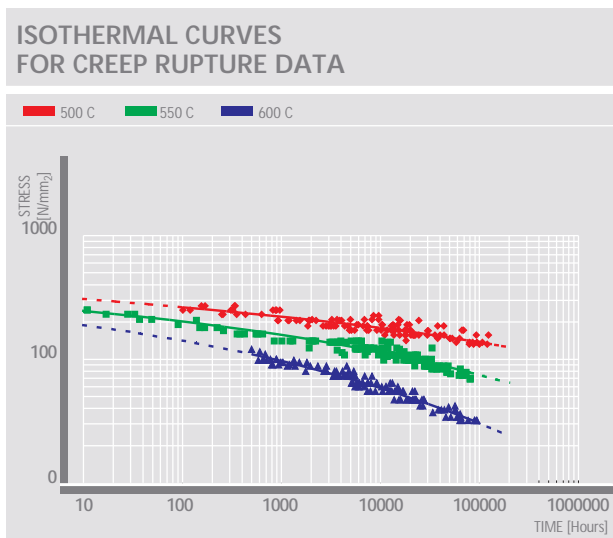


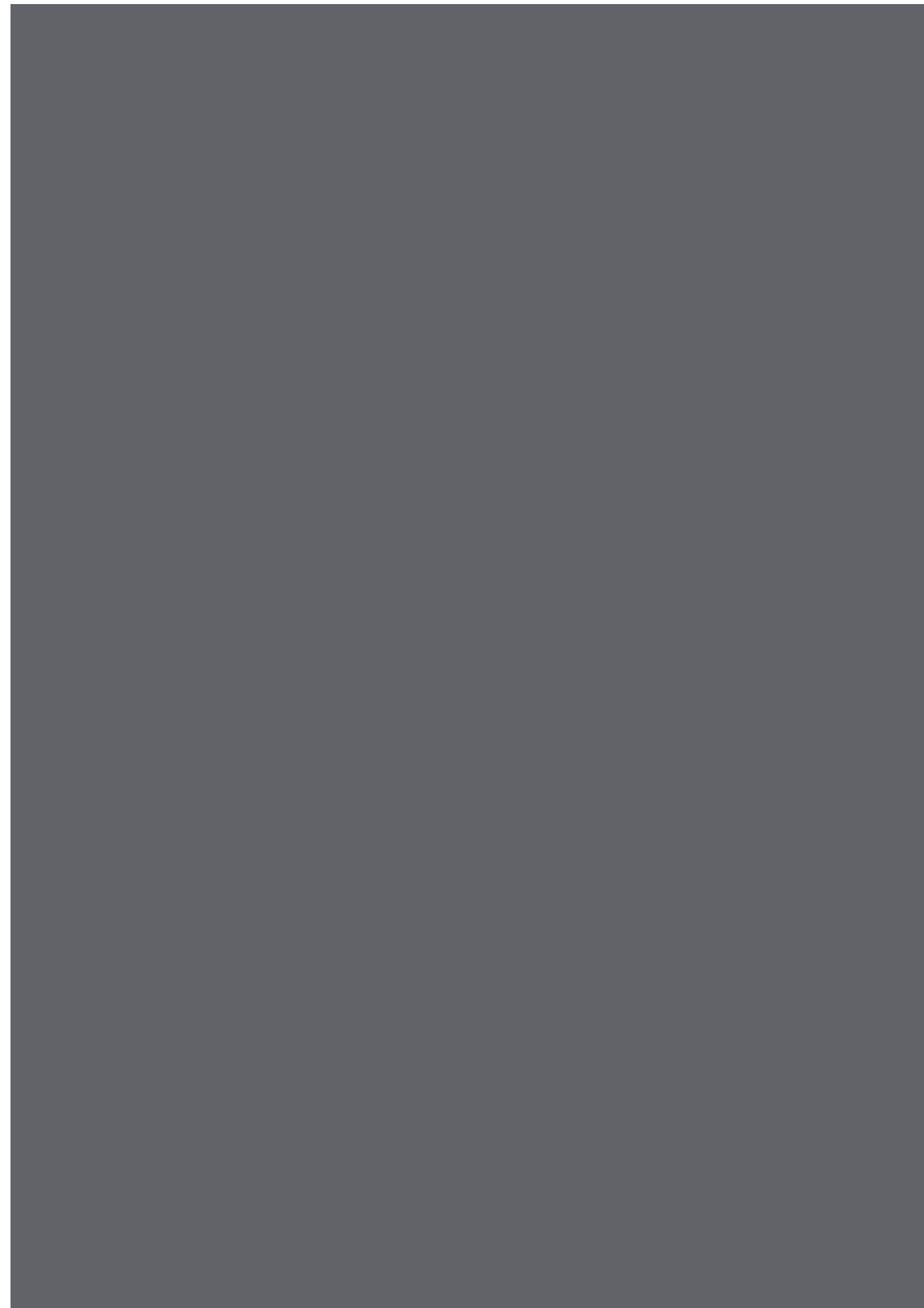
# Notes on the behaviour of steel at high temperatures

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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