



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 (T/P11, 13CrMo4-5, T/P22, 10CrMo9-10, WB36, T23); high alloy steel (T/P91, T92, X20); 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

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 | 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 | AVERAGE WALL THICKNESS | | | | | | | | | | | | | | | | | | | |
|------------------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | mm | 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 | |
| | | | | | | | | | | | | | | | | | | | | AVERAGE WALL THICKNESS |

OUTSIDE DIAMETER

■ 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 |
| | | | | | | |
| 10CrMo9-10 | | | | | | T21 |
| 11CrMo9-10 | | | | | | T22 |
| | | | | | | |
| 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 | | | | | | T911 |
| | | | | | | |
| X10CrWVMoVNb9-2 | | | | | | T92 |
| | | | | | | T122 [■] |
| | | | | | | 18Cr-2Mo [■] |
| | | | | | | |
| | | | | | | UNS S-30434 ¹ |

* 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 | | | | TU 48 C - TU 48 CR | | |
| | 19 Mn 5 | | | | TU 48 C - TU 48 CR | | |
| P1 | 15Mo3 | | | | TU 52 C | | |
| P2 | | | | | | 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 | | | | TU 10 CD 9-10 | 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 | TU Z 10 CD 5-05 | |
| P9 | | X12CrMo91(G) | | | | TU Z 10 CD 9 | TU Z 10 CD 09 a |
| | | X12CrMo91(V) | | | TU Z 10 CD 09 a | | TU Z 10 CD 09 b |
| P91 | X10CrMoVNb91(**) | | | | TU Z 10 CD 09 b | | TU Z 10 CDVN b |
| | X20CrMoV121 [■] | X20CrMoV121 [■] | | | TU Z 10 CDVN b 09-01 [■] | | |
| | | | | | | | |
| P23 [■] | | | | | | | |
| P24 [■] | | | | | | | |
| P911 | | | | | | | |
| | | | | | | | |
| P92 | | | | | | TU Z 10 CDNbV 09-02 | |
| P122 [■] | | | | | | | |

¹Tempaloy AA-1

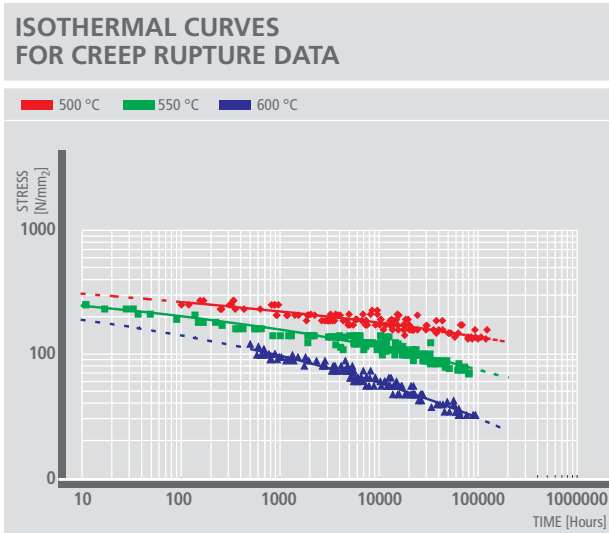
[■] Not available

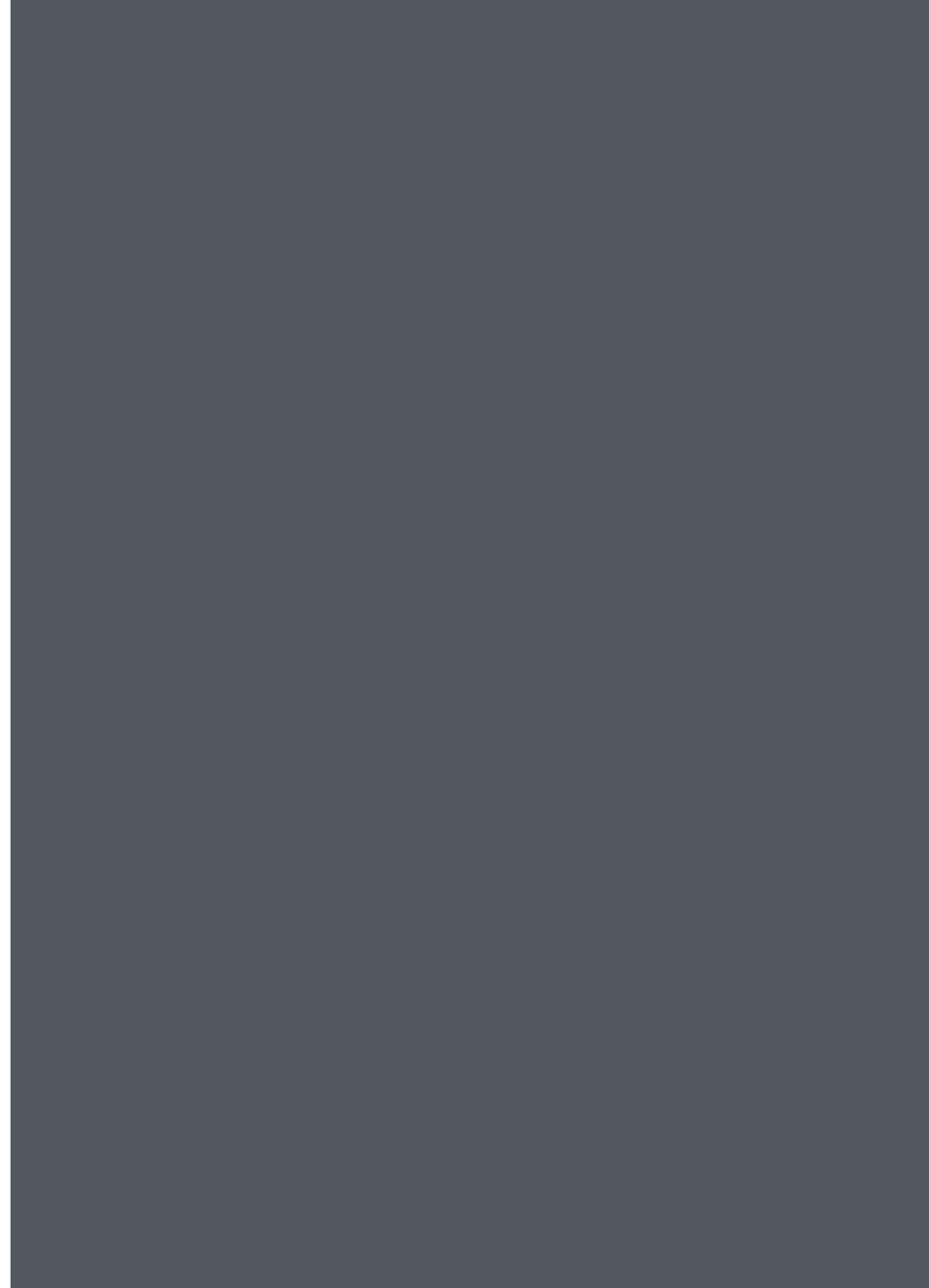
Notes on the behaviour of steel at high temperatures

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. In cooperation with CSM (Centre for Materials Development - Centro Sviluppo Materiali, Rome) 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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