



## High-pressure Boiler Seamless Steel Pipe

High-pressure boiler seamless steel tubes are often under high temperature and pressure when used. The tubes will be oxidized and corroded under the action of high temperature flue gas and water vapor. It is required that the steel pipe has high durability, high resistance to oxidation and corrosion, and good structural stability. High-pressure boiler seamless tubes are mainly used to manufacture superheater tubes, reheater tubes, air ducts, and main steam tubes for high-pressure and ultra-high-pressure boilers.

Application:

- ① General boiler seamless pipes are mainly used to make water wall pipes, boiling water pipes, superheated steam pipes, superheated steam pipes for locomotive boilers, large and small smoke pipes and arched brick pipes.
- ② High-pressure boiler tubes are mainly used to manufacture superheater tubes, reheater tubes, air guide tubes, main steam tubes, etc. of high-pressure and ultra-high-pressure boilers.

Boiler seamless steel tube adopts steel grade:

- (1) High-quality carbon structural steel grades are 20G, 20MnG, and 25MnG.
- (2) Alloy structural steel grades 15MoG, 20MoG, 12CrMoG, 15CrMoG, 12Cr2MoG, 12CrMoVG, 12Cr3MoVSiTb, etc.
- (3) The commonly used 1Cr18Ni9 and 1Cr18Ni11Nb boiler tubes with rust and heat-resistant steels should be subjected to hydrostatic tests, flaring and flattening tests one by one in addition to ensuring chemical composition and mechanical properties. Steel pipes are delivered in heat-treated condition.

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EN 10216-1 P265 Seamless steel tubes will be manufactured by a seamless process. The forming operations and delivery conditions are shown in Table 1.

Table 1 — Forming operations and delivery conditions

| Forming operation          | Quality     | Delivery condition                            |
|----------------------------|-------------|---|
| Hot formed                 | TR1         | As formed or normalized or normalizing-formed |
|                            | TR2         | Normalized or normalizing-formed              |
| Hot formed + cold finished | TR1 and TR2 | Normalized                                    |

Chemical composition of EN 10216-1 P265

Chemical composition (cast analysis) a in % by mass for quality TR2

| Steel grade | Steel number | C max. | Si max. | Mn max. | P max. | S max. | Cr max. | Mo max. | Ni max. |
|-------------|--------------|--------|---------|---------|--------|--------|---------|---------|---------|
| P265TR2     | 1.0259       | 0,20   | 0,40    | 1,40    | 0,025  | 0,015  | 0,30    | 0,08    | 0,30    |

| Al tot min. | Cu max. | Nb max. | Ti max. | V max. | Cr+Cu+Mo+Ni max. |
|-------------|---------|---------|---------|--------|------------------|
| 0,02        | 0,30    | 0,010   | 0,04    | 0,02   | 0,70             |

Chemical composition (cast analysis) a in % by mass for quality TR1

| Steel grade | Steel number | C max. | Si max. | Mn max. | P max. | S max. | Cr max. | Mo max. | Ni max. | Al tot min. |
|-------------|--------------|--------|---------|---------|--------|--------|---------|---------|---------|-------------|
| P265TR1     | 1.0258       | 0,20   | 0,40    | 1,40    | 0,025  | 0,020  | 0,30    | 0,08    | 0,30    | -           |

| Al tot min. | Cu max. | Nb max. | Ti max. | V max. | Cr+Cu+Mo+Ni max. |
|-------------|---------|---------|---------|--------|------------------|
| -           | 0,30    | 0,010   | 0,04    | 0,02   | 0,70             |

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## Mechanical properties of EN 10216-1 P265

## Mechanical properties for quality TR2

| Steel grade |              | Tensile properties  |                   |                   |                                       |                        |    | Impact properties   |         |    |
|-------------|--------------|---|-------------------|-------------------|---------------------------------------|------------------------|----|---|---------|----|
| Steel name  | Steel number | Upper yield strength<br>R <sub>eH</sub><br>b min. for Wall<br>Thickness<br>T mm |                   |                   | Tensile<br>Strength<br>R <sub>m</sub> | Elongation<br>A min. % |    | Minimum average<br>absorbed energy<br>KV 2 J<br>at a temperature<br>of °C |         |    |
|             |              | T ≤<br>16   | 16 <<br>T ≤<br>40 | 40 <<br>T ≤<br>60 |                                       |                        |    | l   |         | t  |
|             |              | MPa<br>*  | MPa<br>*          | MPa<br>*          |                                       |                        |    | MPa *   | l       | t  |
| P265TR2     | 1.0259       | 265   | 255               | 245               | 410 to<br>570                         | 21                     | 19 | 40  | 28<br>d | 27 |

Note: l = longitudinal t = transverse

## Mechanical properties for quality TR1

| Steel grade |              | Tensile properties  |                   |                   |                                       |                                  |    | Impact properties  |   |   |
|-------------|--------------|---|-------------------|-------------------|---------------------------------------|----------------------------------|----|--|---|---|
| Steel name  | Steel number | Upper yield strength<br>R <sub>eH</sub><br>b min. for Wall<br>Thickness<br>T mm |                   |                   | Tensile<br>Strength<br>R <sub>m</sub> | Elongation<br>A min. %<br>b<br>c |    | Minimum average<br>absorbed energy<br>KV 2 J<br>at a temperature<br>of °C<br>c |   |   |
|             |              | T ≤<br>16   | 16 <<br>T ≤<br>40 | 40 <<br>T ≤<br>60 |                                       |                                  |    | l  |   | t |
|             |              | MPa<br>*  | MPa<br>*          | MPa<br>*          |                                       |                                  |    | MPa *  | l | t |
| P265TR1     | 1.0258       | 265   | 255               | 245               | 410 to<br>570                         | 21                               | 19 | -  | - | - |

Note: l = longitudinal t = transverse

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Tolerances of EN 10216-1 Seamless steel tubes

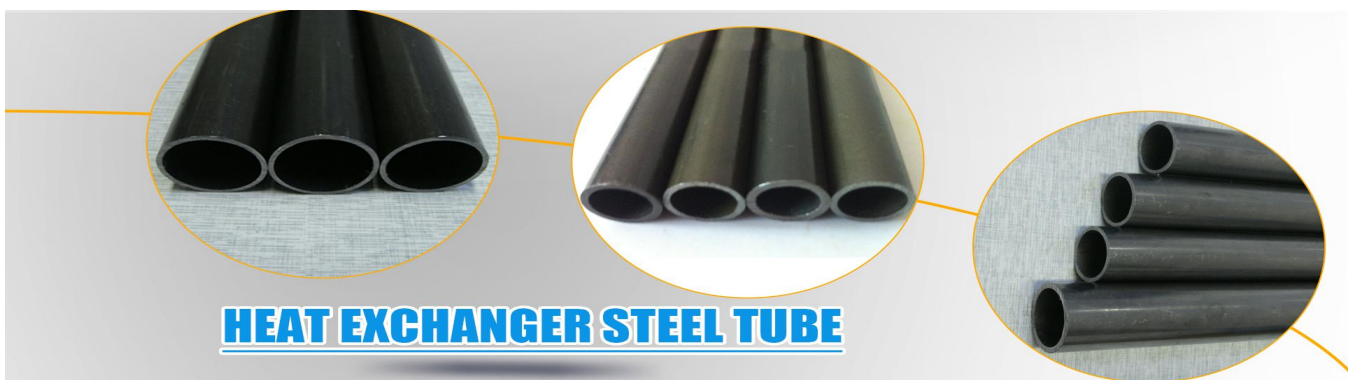
Tolerances on outside diameter and on wall thickness

| Outside diameter D<br>mm | Tolerances<br>on D           | Tolerances on T for a T/D ratio                          |                           |                          |              |
|--------------------------|------------------------------|--|---------------------------|--------------------------|--------------|
|                          |                              | $\leq 0,025$   | $> 0,025$<br>$\leq 0,050$ | $> 0,050$<br>$\leq 0,10$ | $> 0,10$     |
| $D \leq 219,1$           | $\pm 1\%$ or $\pm 0,5$<br>mm | $\pm 12,5\%$ or $\pm 0,4$ mm<br>whichever is the greater |                           |                          |              |
| $D > 219,1$              | whichever is<br>the greater  | $\pm 20\%$   | $\pm 15\%$                | $\pm 12,5\%$             | $\pm 10\%$ a |

a For outside diameters  $D \geq 355,6$  mm it is permitted to exceed the upper wall thickness locally by a further 5 % of the wall thickness T

Tolerances on exact lengths

| Length L                  | Tolerance on exact length |
|---------------------------|---------------------------|
| $L \leq 6\ 000$           | + 10<br>0                 |
| $6\ 000 < L \leq 12\ 000$ | +15<br>0                  |
| $L > 12\ 000$             | +by agreement<br>0        |



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