

Hot-rolled seamless tubes  
for mechanical applications



Hot rolled seamless steel tubes with an application in the mechanical and general engineering fields. Produced according to EN 10297-1. Tenaris produce steel types and grades in a wide dimensional range, suitable for both traditional and specific applications.



Quality System Certified  
n. 110950/004

# Hot-rolled seamless tubes for mechanical applications

## Product description and field of application

Tenaris produce tubes for mechanical applications that satisfy the European norm EN 10297-1 in the grades shown in the following table.

The products described have an application in the field defined by 'Machinery Directive 98/37/EC', that is for mechanical and general engineering purposes. They are excluded from use in specialised work, such as in pressure vessels and structural applications. These being subject to other EN norms, Community directives or national laws in force in the countries where they are being used.

### 1. Order definition

Details (essential data)

- Product " Mechanical Tube": MT "
- Manufacturing norms
- Steel grade and heat treatment
- Nominal dimensions,
- OD and Wall Thickness in mm
- Length
- Quantity and tolerances

Options

- a) Request for steel with controlled sulphur content
- b) Special tolerances
- c) Lengths different to those shown as standard.
- d) Special checks
- e) Certification and marking different to that shown in the present specifications.
- f) Colour coding of one end

## EN 10297-1 CLASSIFICATION OF STEEL GRADES AND DELIVERY CONDITION

	EN 10297-1	STANDARD DELIVERY CONDITION
Engineering application	E 235	AS ROLLED
	E 275	AS ROLLED
	E 315	AS ROLLED
	E 355	AS ROLLED
	E 470	AS ROLLED
	E 275 K2	NORMALISED
	E 355 K2	NORMALISED
	E 420 J2	NORMALISED
	E 460 K2	NORMALISED
	E 590K2	QUENCHED & TEMPERED
E 730 K2	QUENCHED & TEMPERED	
Quench & temper	C22 E	NORMALISED OR QUENCHED & TEMPERED
	C35 E	NORMALISED OR QUENCHED & TEMPERED
	C45 E	NORMALISED OR QUENCHED & TEMPERED
	C60 E	NORMALISED OR QUENCHED & TEMPERED
	38 Mn6	NORMALISED OR QUENCHED & TEMPERED
	25 CrMo 4	QUENCHED & TEMPERED
	41 Cr 4	QUENCHED & TEMPERED
	30 CrMo 4	QUENCHED & TEMPERED
	34 CrMo 4	QUENCHED & TEMPERED
	42 CrMo 4	QUENCHED & TEMPERED
Case hardening	C10E	ANNEALED OR NORMALISED
	C15E	ANNEALED OR NORMALISED
	C15R	ANNEALED OR NORMALISED
	16 MnCr 5	ANNEALED OR NORMALISED
	16 MnCrS 5	ANNEALED OR NORMALISED
	20 NiCrMo 2-2	ANNEALED OR NORMALISED
20 NiCrMoS 2	ANNEALED OR NORMALISED	

Stocked steel

### Option a

Certain steel grades can be requested with a controlled  $0\pm 0.020 - 0.035\%$  sulfur content to improve mechinability.

In this case the steel code well have a HL at the end.

## 2. Steel grade

Highlighted below, for each of the steel grades: the application, chemical analyses and mechanical properties according to EN 10297-1.

TYPE OF APPLICATION	
GRADES	APPLICATION
E235	steel for mechanical applications
E355	steel for mechanical applications
E355K2	steel for mechanical applications, with guaranteed toughness
E470, E420J2, E590K2	steel for high yield strength mechanical applications
E730 K2	quenched and tempered steel with excellent tensile properties, associated with a C < 0.20%
30CrMo4	quenched and tempered steel
42CrMo4	quenched and tempered steel
16MnCrS5	re-sulphured casehardening steel

CHEMICAL ANALYSIS* %												
GRADE	C	Mn	Si	P	S	Ni	V	Cr	Mo	Al tot	Nb	Ti
E235	≤ 0,17	≤ 1,20	≤ 0,35	≤ 0,030	≤ 0,035							
E355**	≤ 0,22	≤ 1,60	≤ 0,55	≤ 0,030	≤ 0,035							
E355K2	≤ 0,20	0,90 ÷ 1,65	≤ 0,50	≤ 0,030	≤ 0,030	≤ 0,50	≤ 0,12	≤ 0,30	≤ 0,10	≥ 0,020	≤ 0,050	≤ 0,050
E470	0,16 ÷ 0,22	1,30 ÷ 1,70	0,10 ÷ 0,50	≤ 0,030	≤ 0,035		0,08 ÷ 0,15			≥ 0,010	≤ 0,070	≤ 0,020
E420J2	0,16 ÷ 0,22	1,30 ÷ 1,70	0,10 ÷ 0,50	≤ 0,030	≤ 0,035	≤ 0,40	0,08 ÷ 0,15	≤ 0,30	≤ 0,08	≥ 0,010	≤ 0,070	≤ 0,050
E590K2	0,16 ÷ 0,22	1,30 ÷ 1,70	0,10 ÷ 0,50	≤ 0,030	≤ 0,035	≤ 0,40	0,08 ÷ 0,15	≤ 0,30	≤ 0,08	≥ 0,010	≤ 0,070	≤ 0,050
E730K2	≤ 0,20	1,40 ÷ 1,70	≤ 0,50	≤ 0,025	≤ 0,030	0,30 ÷ 0,70	≤ 0,12	≤ 0,30	0,30 ÷ 0,45	≥ 0,020	≤ 0,050	≤ 0,050
30CrMo4	0,27 ÷ 0,34	0,35 ÷ 0,60	≤ 0,35	≤ 0,035	≤ 0,035			0,80 ÷ 1,15	0,15 ÷ 0,30			
42CrMo4	0,38 ÷ 0,45	0,60 ÷ 0,90	≤ 0,40	≤ 0,035	≤ 0,035			0,90 ÷ 1,20	0,15 ÷ 0,30			
16MnCrS5	0,14 ÷ 0,19	1,0 ÷ 1,30	≤ 0,40	≤ 0,035	0,020 ÷ 0,040			0,80 ÷ 1,10				

\* All the steel grades are completely killed

\*\* Elements such as Al, Ti, Nb or V can be added to fix the nitrogen or to obtain the desired mechanical characteristics

MECHANICAL PROPERTIES: engineering steels														
GRADE	DELIVERY CONDITION*	TENSILE PROPERTIES										IMPACT TEST**		
		Rp02 (MPa) min					Rm (MPa) min					A % long.	Charpy KV long	
		Wall thickness mm											T °C	J min
		≤ 16	> 16 ≤ 40	> 40 ≤ 65	> 65 ≤ 80	> 80 ≤ 100	≤ 16	> 16 ≤ 40	> 40 ≤ 65	> 65 ≤ 100	min			
E235	G	235	225	215	205	195	360	360	360	340	25	-	-	
E355	G	355	345	335	315	295	490	490	490	470	22	-	-	
E355K2	N	355	345	335	315	295	490	490	470	470	20	-20	40	
E470	G	470	430	-	-	-	650	600	-	-	17	-	-	
E420J2	N	420	400	390	370	360	600	560	530	500	19	-20	27	
E590K2	B	590	540	480	455	420	700	650	570	520	16	-20	40	
E730K2	B	730	670	620	580	540	790	750	700	680	15	-20	40	

\* G = as rolled (not treated) - N = normalised - B = quenched and tempered

\*\*The impact test values indicated are meant to be calculated as the average of the three samples of width W = 10 mm. One individual value may be below the minimum, but not less than 70% of that value.

The certificate reports the dimension of the sample and the values measured in the test in J. If the sample width W is less than 10 mm, the minimum requested KV<sub>10</sub> values are reduced in the new KV<sub>W</sub> value according to the formula: KV<sub>W</sub>=KV<sub>10</sub> x (W/10)

## MECHANICAL PROPERTIES: quenched and tempered alloy steel

GRADE	DELIVERY CONDITION*	TENSILE PROPERTIES									IMPACT TEST**		
		Rp02 (MPa) min			Rm (MPa) min			A %			Charpy KV long		
					Wall thickness mm			min			T °C		
		≤ 8	> 8 ≤ 20	> 20 ≤ 50	≤ 8	> 8 ≤ 20	> 20 ≤ 50	≤ 8	> 8 ≤ 20	> 20 ≤ 50	≤ 8	> 8	≤ 8
30CrMo4	B	750	630	520	950	850	750	12	13	14	20	40	45
42CrMo4	B	900	750	650	1100	1000	900	10	11	12	20	30	35

\* G = as rolled (not treated) - N = normalised - B = quenched and tempered

\*\*The impact test values indicated are meant to be calculated as the average of the three samples of width W = 10 mm. One individual value may be below the minimum, but not less than 70% of that value.

The certificate reports the dimension of the sample and the values measured in the test in J. If the sample width W is less than 10 mm, the minimum requested KV<sub>10</sub> values are reduced in the new KV<sub>W</sub> value according to the formula: KV<sub>W</sub>=KV<sub>10</sub> x (W/10)

### 3. Dimensional tolerances

According to EN10297-1

Dimensions in exception to the standards are highlighted in the table for the dimensional range.

#### Option b

*Tolerances different to those indicated can be agreed upon.*

A straightness better or equal to 1,5‰ is guaranteed.

### 4. Lengths

The products are supplied in commercial lengths.

#### Option c

*Lengths different to standard can be agreed upon at time of ordering*

#### Service Center

The Service Center can supply tubes cut in fixed lengths with tolerances of -0 + 5 mm.

### 5. Checks

The product is subjected to the following tests:

- Mechanical tests in accordance with reference standards
- Electromagnetic test
- Visual and dimensional check on each tube

#### Option d

*Specific additional tests can be agreed at the time of ordering*

### 6. Surfaces

The product is supplied with hot finished surfaces, as rolled.

#### Option e

*Special surface protection can be agreed at the time of ordering*

### 7. Certification

The product is supplied with 3.1. inspection certificate, in conformity with EN 10204.

Tenaris employs complete product traceability.

## 8. Identification and marking

The mechanical tubes are identified as follows , with the details being repeated along the entire length of the tube;

Painted:

- Manufacturer's trademark
- MT
- steel grade
- manufacturing norms
- O.D. x WT
- S (production process)
- mill order n°
- internal confirmation n°

Dye stamping:

- Manufacturer's trademark
- MT
- steel grade
- S (production process)
- plant inspector

Option f

*Color coding at one end can be requested*

## 9. Packaging

Diameters greater than 200 mm: loose.

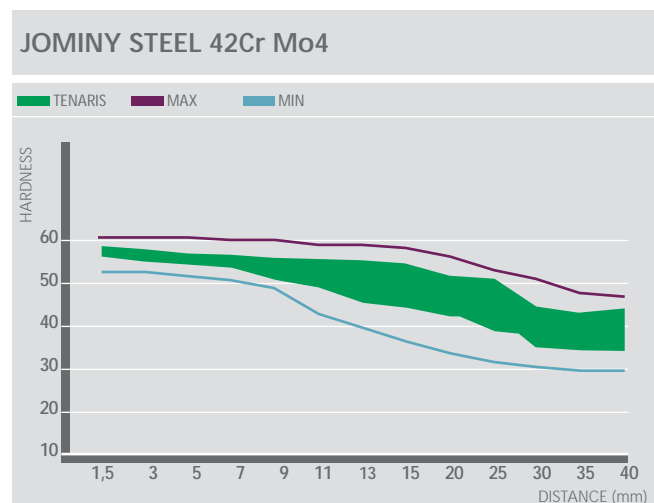
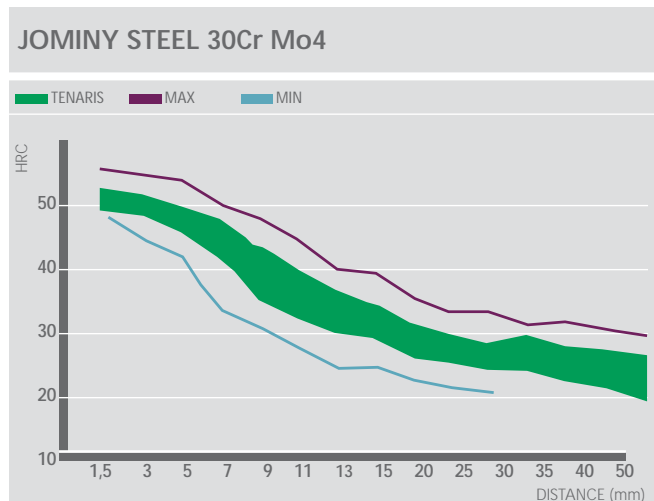
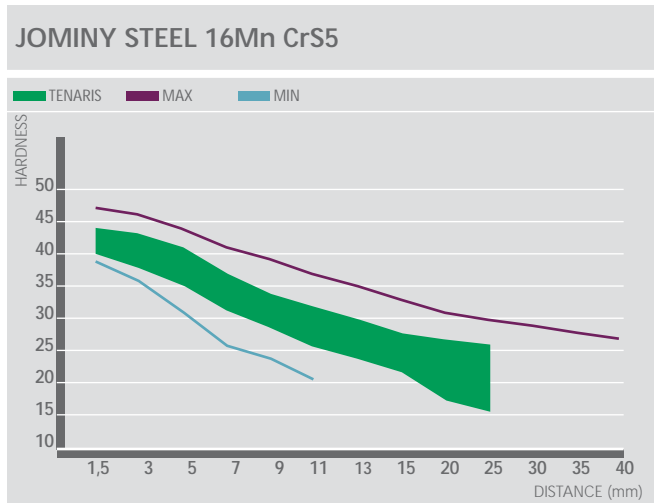
Diameters less than or equal to 200 mm: in bundles.

Tenaris offer technical assistance for tailor made applications of our product.

## Hardenability - Jominy test

The hardenability of casehardening and quenched and tempered steel is evaluated by means of a Jominy test. In this test, a steel sample is hardened in the normal manner; the HRC hardness is then measured at various distances from the hardened surface.

Tenaris is able to produce steel with a much more limited variability in hardness in respect to that stipulated by the standard.





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