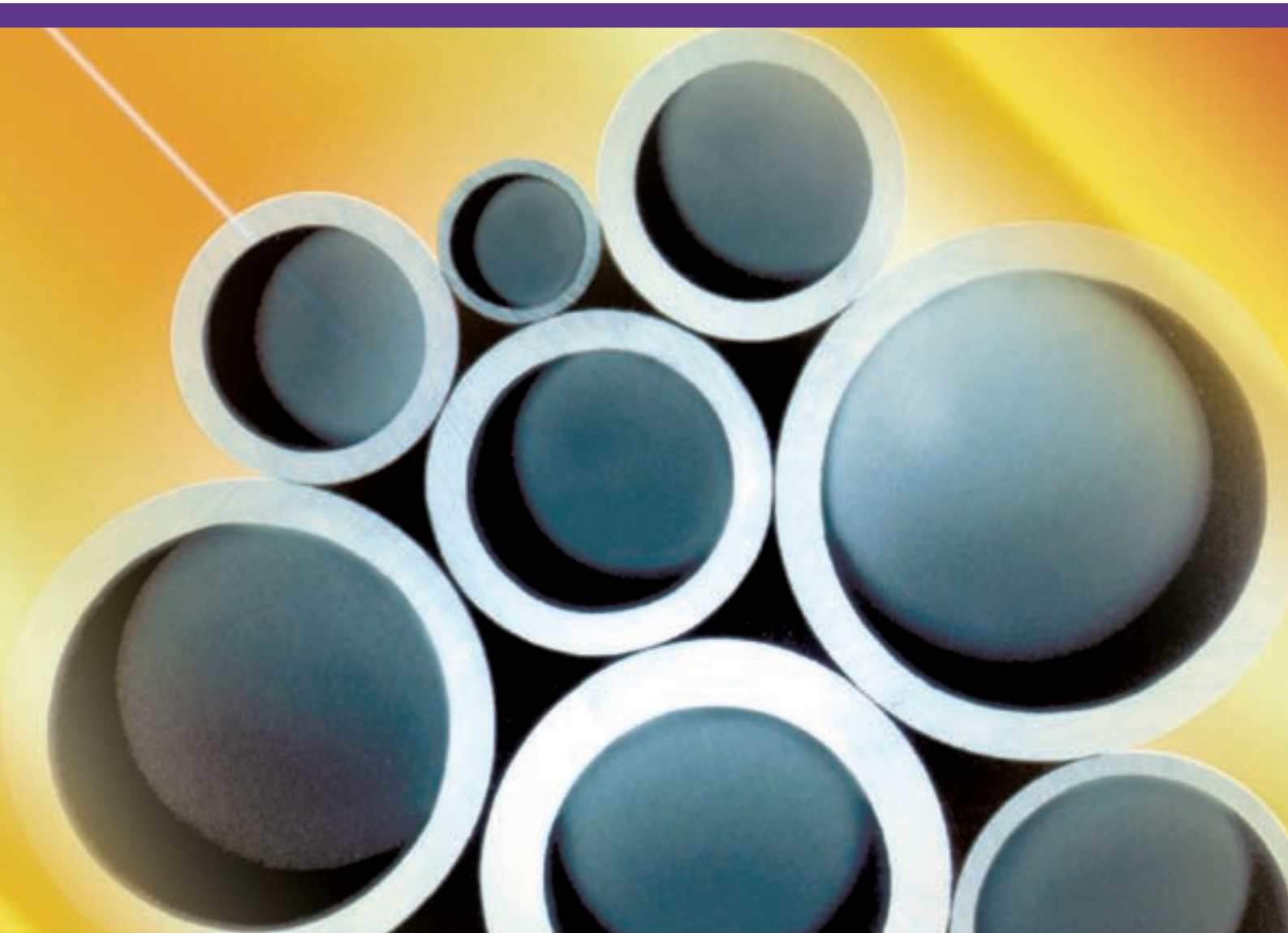


# Hot-rolled seamless tubes for mechanical applications





# 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 specialized 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 AND MARKING

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

#### Options

- Request for steel with controlled sulphur content
- Special tolerances
- Lengths different from those shown as standard
- Special checks
- Certification and marking different from that shown in the present specifications
- Colour coding of one end

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

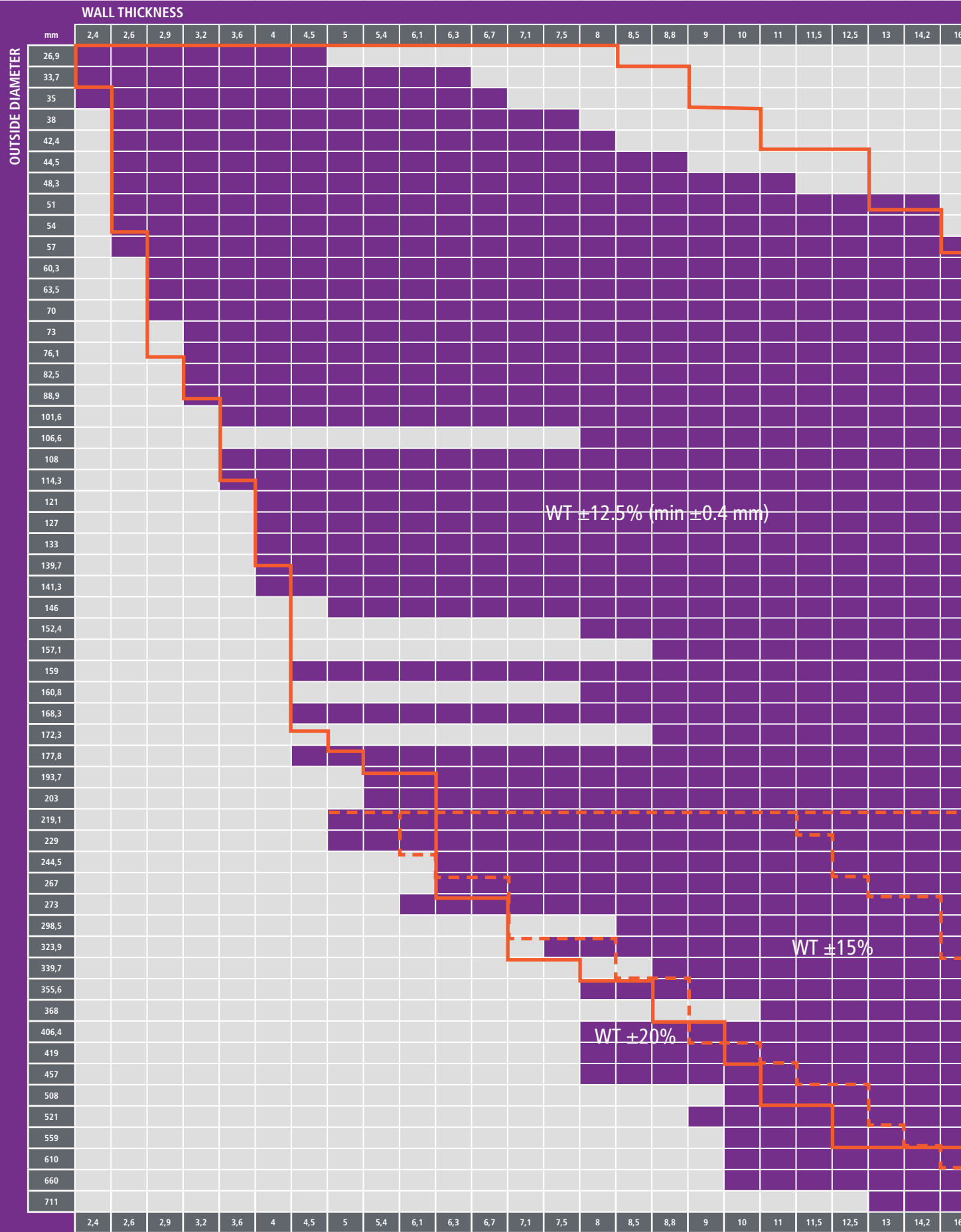
	EN 10297-1	STANDARD DELIVERY CONDITION
Engineering application	E 235	AS ROLLED
	E 275	AS ROLLED
	E 315	AS ROLLED
	E 355	AS ROLLED
	E 470	AS ROLLED
	E 275 K2	NORMALISED
	E 355 K2	NORMALISED
	E 420 J2	NORMALISED
	E 460 K2	NORMALISED
	E 590K2	QUENCHED & TEMPERED
E 730 K2	QUENCHED & TEMPERED	
Quench & temper	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

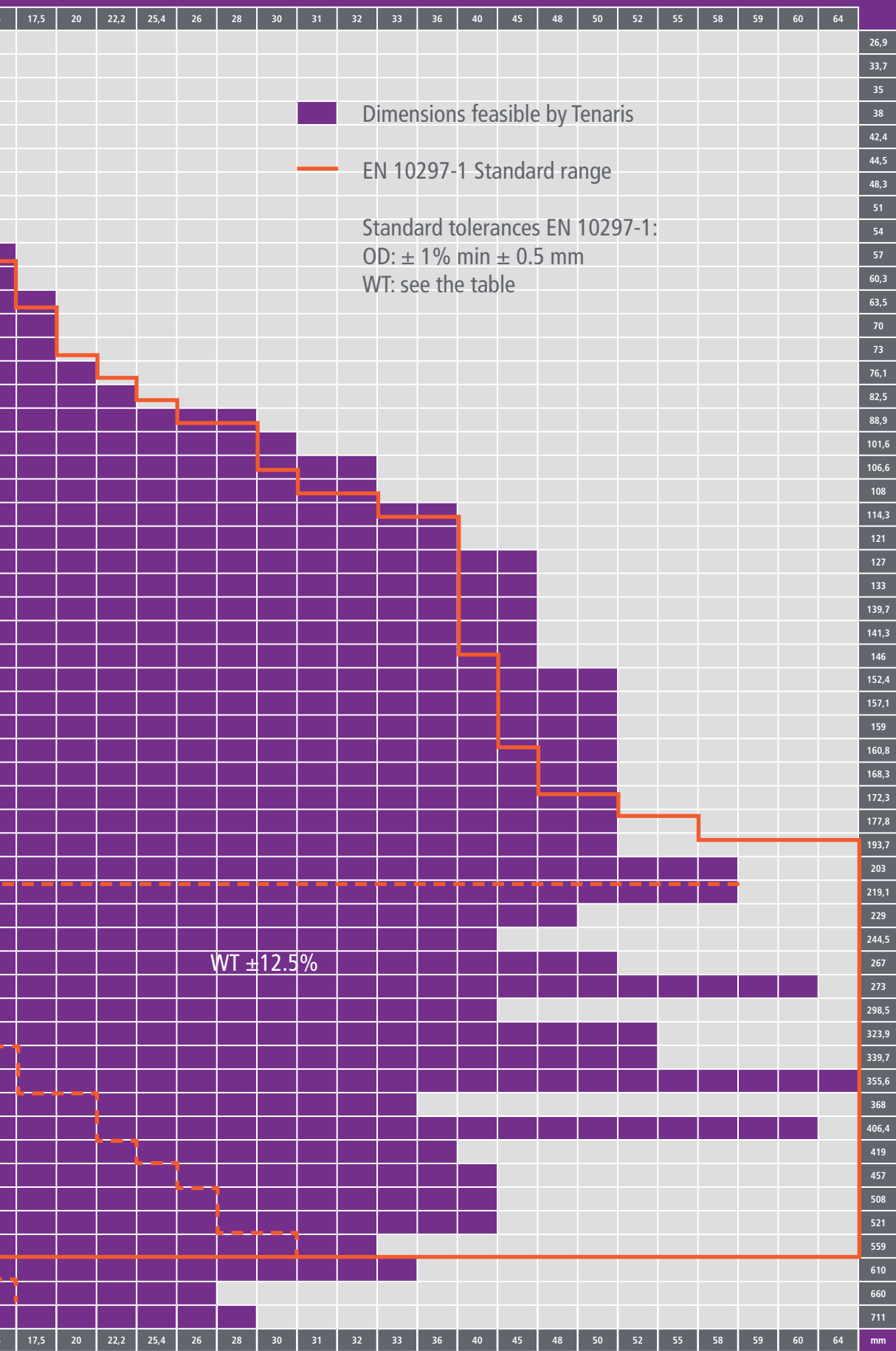
 Stocked steel

#### Option a

Certain steel grades can be requested with a controlled  $0 \div 0.020 - 0.035\%$  sulphur content to improve machinability. In this case the steel code will have a HL at the end.

# DIMENSIONAL RANGE





In addition to the above mentioned dimensions, the following diameters can be produced upon request:

21,3	190,5
25	192,3
28	196,9
30	197,9
31,8	214,1
52,5	215,9
61,2	217,0
66,8	227,0
71,4	246,9
74,5	253,0
79,4	278,5
80,4	280,0
81,4	287,0
85,4	291,0
86,4	300,5
87	304,5
91,2	308,0
92,3	316,0
95,4	334,0
96,2	344,7
98,4	347,6
100,5	377,0
103,5	381,0
111,6	385,0
112,6	394,0
116,6	409,5
118,6	411,9
121,6	416,1
125,3	426,0
132,0	428,7
134,5	431,8
142,0	436,0
150,8	444,0
153,6	448,0
154,9	453,0
162,1	459,2
165,0	470,0
171,5	473,5
175,9	512,0
180,9	533,4
182,2	538,0
184,2	572,0
187,2	622,0

WALL THICKNESS

OUTSIDE DIAMETER

## 2. STEEL GRADE

Highlighted below, for each steel grade: application, chemical analysis 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	≤	≤ 0,035							
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 steel grades are completely killed

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

MECHANICAL PROPERTIES: engineering steels										
GRADE	DELIVERY CONDITION*	TENSILE PROPERTIES							IMPACT TEST**	
		Rp0.2 (MPa) min			Rm (MPa) min			A long. min	Charpy KV long	
		wt ≤16	16 <wt ≤40	40 <wt ≤65	wt ≤16	16 <wt ≤40	40 <wt ≤65		T °C	J min
E235	G	235	225	215	360	360	360	25	-	-
E355	G	355	345	335	490	490	490	22	-	-
E355K2	N	355	345	335	490	490	470	20	-20	40
E470	G	470	430	-	650	600	-	17	-	-
E420J2	N	420	400	390	600	560	530	19	-20	27
E590K2	B	590	540	480	700	650	570	16	-20	40
E730K2	B	730	670	620	790	750	700	15	-20	40

MECHANICAL PROPERTIES: quenched and tempered alloy steel													
GRADE	DELIVERY CONDITION*	TENSILE PROPERTIES									IMPACT TEST**		
		Rp0.2 (MPa) min			Rm (MPa) min			A% min			Charpy KV long		
		wt ≤8	8 <wt ≤20	20 <wt ≤50	wt ≤8	8 <wt ≤20	20 <wt ≤50	wt ≤8	8 <wt ≤20	20 <wt ≤50	T °C	J min	
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 KV10 values are reduced in the new KVW value according to the formula: KVW=KV10 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 from 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 from 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 according to  
EN ISO 10893-3 LEV. F3 longitudinal
- Visual and dimensional check on each  
tube

#### **Option d**

*Specific additional tests can be agreed  
upon order placement.*

### 6. SURFACES

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

#### **Option e**

*Special surface protection can be agreed  
upon order placement.*

### 7. CERTIFICATION

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

Tenaris guarantee complete product  
traceability.

### 8. IDENTIFICATION AND MARKING

Tenaris mechanical tubes are identified by  
the following characteristics, painted and/  
or dye stamped all along the entire length  
of the tube:

#### **Painted:**

- Manufacturer's trademark
- TAM
- steel grade
- manufacturing norms
- OD x WT
- S (production process)
- heat number
- internal confirmation n°

#### **Dye stamping:**

- Manufacturer's trademark
- TAM
- steel grade
- S (production process)

#### **Option f**

*Color coding at one end can be requested*

### 9. PACKAGING

Diameters greater than 219.1 mm: loose.  
Diameters less than or equal to 219.1 mm:  
in bundles.

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



[www.tenaris.com](http://www.tenaris.com)

For technical assistance, please contact:  
[standardmechanical@tenaris.com](mailto:standardmechanical@tenaris.com)



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