
Varjene jeklene cevi za tlačne posode - Tehnični dobavni pogoji - 6. del: Obločno pod praškom varjene nelegirane jeklene cevi s specificiranimi lastnostmi za delo pri nizkih temperaturah

Welded steel tubes for pressure purposes - Technical delivery conditions - Part 6: Submerged arc welded non-alloy steel tubes with specified low temperature properties

Geschweißte Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 6: Unterpulvergeschweißte Rohre aus unlegierten Stählen mit festgelegten Eigenschaften bei tiefen Temperaturen

Tubes soudés en acier pour service sous pression - Conditions techniques de livraison - Partie 6: Tubes soudés à l'arc immergé sous flux en poudre en acier non allié avec caractéristiques spécifiées à basse température

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Tubes soudés en acier pour service sous pression -
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festgelegten Eigenschaften bei tiefen Temperaturen

This European Standard was approved by CEN on 25 April 2002.

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Foreword

This document (EN 10217-6:2002) has been prepared by Technical Committee ECISS/TC 29, "Steel tubes and fittings for steel tubes", the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Other parts of EN 10217 are:

- Part 1: Non-alloy steel tubes with specified room temperature properties.
- Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties.
- Part 3: Alloy fine grain steel tubes.
- Part 4: Electric welded non-alloy steel tubes with specified low temperature properties.
- Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties.
- Part 7: Stainless steel tubes.

Another European Standard series covering tubes for pressure purposes is:

- EN 10216: Seamless steel tubes for pressure purposes.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

EN 10217-6:2002 (E)**1 Scope**

This Part of EN 10217 specifies the technical delivery conditions in two test categories of submerged arc welded tubes of circular cross section, with specified low temperature properties, made of non-alloy steel.

2 Normative references

This European Standard incorporates by date or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For date references, subsequent amendments to or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

The requirements of this European Standard rule when they differ from those in the standards and documents referred to below:

EN 760, *Welding consumables - Fluxes for submerged arc welding – Classification.*

EN 895, *Destructive tests on welds in metallic materials - Transverse tensile test.*

EN 910, *Destructive tests on weld in metallic materials -Bend test.*

EN 1321, *Destructive tests on welds in metallic materials - Macroscopic and microscopic examination of welds.*

EN 10002-1, *Metallic materials - Tensile testing - Part 1 : Method of test (at ambient temperature).*

EN 10020, *Definitions and classification of grades of steel.*

EN 10021, *General technical delivery requirements for steel and iron products.*

EN 10027-1, *Designation systems for steels - Part 1 : Steel names, principle symbols.*

EN 10027-2, *Designation systems for steels - Part 2 : Numerical systems.*

EN 10045-1, *Metallic materials - Charpy impact test - Part 1 : Test method.*

EN 10052, *Vocabulary of heat treatment terms for ferrous products.*

EN 10204, *Metallic products - Types of inspection documents.*

ENV 10220, *Seamless and welded steel tubes - Dimensions and masses per unit length.*

EN 10246-9, *Non-Destructive Testing of steel tubes – Part 9: Automatic ultrasonic testing of the weld seam of submerged arc-welded steel tubes for the detection of longitudinal and/or transverse imperfections.*

EN 10246-10, *Non-Destructive Testing of steel tubes – Part.10: Radiographic testing of the weld seam of automatic fusion arc-welded steel tubes for the detection of imperfections.*

EN 10246-15, *Non-Destructive Testing of steel tubes - Part 15: Automatic ultrasonic testing of strip/ plate used in the manufacture of welded steel tubes for the detection of laminar imperfections.*

EN 10246-16, *Non-Destructive Testing of steel tubes - Part 16: Automatic ultrasonic testing of the area adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections.*

EN 10246-17, *Non-Destructive Testing of steel tubes - Part 17: Ultrasonic testing of tube ends of seamless and welded steel tubes for the detection of laminar imperfections.*

EN 10256, *Non-Destructive Testing of steel tubes - Qualification and competence of level 1 and level 2 NDT personnel.*

prEN 10168 ¹⁾, *Iron and steel products - Inspection documents - List of information and description.*

prEN 10266 ¹⁾, *Steel tubes, fittings and structural hollow sections - Symbols and definition of terms for use in product standards*

EN ISO 377, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997).*

EN ISO 2566-1, *Steel - Conversion of elongation values – Part 1: Carbon and low-alloy steels (ISO 2566-1:1984)*

ISO 14284, *Iron and steel products - Sampling and preparation of samples for the determination of the chemical composition.*

CR 10260, *Designation systems for steel - Additional symbols.*

CR 10261, *ECISS Information Circular IC 11 - Iron and steel - Review of available methods of chemical analysis.*

3 Terms and definitions

For the purpose of this Part of EN 10217 the definitions given in EN 10020, EN 10021, EN 10052, prEN 10266 and the followings apply:

3.1

Test Category

Classification that indicates the extent and level of inspection and testing.

3.2

employer

Organisation for which a person works on a regular basis.

NOTE The employer may be either the tube manufacturer or supplier or a third party organisation providing Non-Destructive Testing (NDT) services.

3.3

qualification of welding procedure

Testing and inspection of the welding procedure in accordance with annex A by the manufacturer.

3.4

approval of welding procedure

Testing and inspection of the welding procedure witnessed and approved in accordance with annex A by an authorised body.

4 Symbols

For the purposes of this part of EN 10217. The symbols given in prEN 10266 and the following apply:

- C1, C2 is the category conformity indicators (see 7.3.1 and 7.3.3.)
- TC test category.

¹⁾ In preparation; until this document is published as a European standard, a corresponding national standard should be agreed at the time of enquiry and order.

EN 10217-6:2002 (E)**5 Classification and designation****5.1 Classification**

In accordance with the classification system in EN 10020, the steel grade given in Tables 2 and 4 the are classified as non-alloy quality steels.

5.2 Designation

5.2.1 For the tubes covered by this Part of EN 10217 the steel designation consists of:

— the number of this Part of EN 10217;

plus either:

— the steel name in accordance with EN 10027-1 and CR 10260;

or:

— the steel number allocated in accordance with EN 10027-2.

5.2.2 The steel name is designated by

— the capital letter P for pressure purposes;

— the indication of the specified minimum yield strength expressed in MPa, (see Table 4);

— the symbol of the delivery condition for the steel grade concerned (see Table 1);

— the symbol L for low temperature.

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6 Information to be supplied by the purchaser**6.1 Mandatory information**

The following information shall be supplied by the purchaser at the time of enquiry and order :

- a) the quantity (mass or total length or number);
- b) the term "tube";
- c) the dimensions [outside diameter D, wall thickness T (see Table 6).
- d) the designation of the steel grade in accordance with this Part of EN 10217 (see 5.2);
- e) the test category (see 9.3).

6.2 Options

A number of options are specified in this Part of this EN 10217 and these are listed below. In the event that the purchaser does not indicate his wish to implement any of these options at the time of enquiry and order, the tubes shall be supplied in accordance with the basic specification (see 6.1).

- 1) Tube manufacturing route (see 7.3.2).
- 2) Restriction on copper and tin content (see Table 2).
- 3) Product analysis (see 8.2.2).
- 4) Special end preparation (see 8.6).

- 5) Exact lengths (see 8.7.3).
- 6) Type of inspection document other than the standard document (see 9.2.1).
- 7) Transverse weld tensile test (see Table 11).
- 8) Test pressure for hydrostatic leak-tightness test (see 11.6).
- 9) Wall thickness measurement away from the ends (see 11.7).
- 10) Non Destructive Testing method for the inspection of weld seam (see 11.9.1).
- 11) Image quality class R1 of EN 10246-10 for the non-destructive radiographic inspection of the weld seam (see 11.9.1).
- 12) Additional marking (see 12.2).
- 13) Protection (see 13).

6.3 Example of an order

500 m of submerged arc welded tube with an outside diameter of 508 mm, a wall thickness of 4,5 mm in accordance with EN 10217-6, made of steel grade P265NL, test category 1, with a 3.1.C inspection certificate in accordance with EN 10204:

500 m - Tube - 508 x 4,5 - EN 10217-6 - P265NL - TC 1 - Option 6: 3.1.C

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7 Manufacturing process

7.1 Steelmaking process

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The steelmaking process is at the discretion of the manufacturer.

7.2 Deoxidation process

Steels shall be fully killed.

7.3 Tube manufacture and delivery conditions

7.3.1 All NDT activities shall be carried out by qualified and competent level 1,2 and/or 3 personnel authorised to operate by the employer.

The qualification shall be in accordance with EN 10256 or, at least, an equivalent to it.

It is recommended that the level 3 personnel be certified in accordance with EN 473 or, at least, an equivalent to it.

The operating authorisation issued by the employer shall be in accordance with a written procedure.

NDT operations shall be authorised by a level 3 NDT individual approved by the employer.

NOTE The definition of level 1,2 and 3 can be found in appropriate Standards, e.g. EN 473 and EN 10256.

For pressure equipment in categories III and IV (of Directive 97/23-EC) the personnel shall be approved by a recognised third-party organisation. Tubes not conforming to this requirement shall be marked "C 2", unless a requirement to mark "C1" (see 7.3.3) applies

7.3.2 The tubes shall be manufactured by a submerged arc welding (SAW) process and in accordance with one of the routes as specified in Table 1.

Unless Option 1 is specified the manufacturing route is at the discretion of the manufacturer.

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Option 1: The manufacturing route is specified by the purchaser.

Tubes shall be submerged arc welded using at least one weld run on the inside and one weld run on the outside of the tube.

The strip used for the manufacture of the helically submerged arc welded (SAWH) tubes shall have a width of not less than 0.8 times or more than 3.0 times the outside diameter of the tube.

The finished tubes shall not include welds used for joining together lengths of the hot or cold rolled strip or plate prior to forming except that for helically welded.

For helically welded submerged arc welded (SAWH) tubes, when the weld joining lengths of strip are part of the delivered tube, they shall have the welding procedure qualified in accordance with annex A and the weld shall be subjected to the same inspection and testing as the helical weld.

7.3.3 Welding shall be carried out by suitably qualified personnel in accordance with suitable operating procedures.

For pressure equipment in categories II, III, and IV, (of Directive 97/23-EC) the operating procedures and the personnel shall be approved by a competent third-party. Tubes not conforming to this requirement shall be marked "C 1".

7.3.4 The welding procedure for SAW tubes shall be qualified in accordance with Annex A.

7.3.5 The delivery condition of tubes covered by this Part of EN 10217 are shown in Table 1

Table 1 — Tube manufacturing process, route and delivery condition

Route N°	Manufacturing process		Manufacturing route		Delivery condition
	Process	Symbols	Starting material	Forming operation	
1			As (hot) rolled plate or strip	Cold formed	Normalized (entire tube)
2a	Submerged arc welded	(SAW)	Normalising rolled plate or strip	Cold formed	Without subsequent heat treatment ^a
2b	-longitudinal seam	- (SAWL)	Normalised plate or strip		
3	-helical seam	- (SAWH)	As (hot) rolled or Normalising or normalising rolled plate or strip	Normalising formed ^b	Without subsequent heat treatment ^a

^a Stress relieving treatment on the weld is permissible

^b Only applicable to SAWL tubes

8 Requirements

8.1 General

The tubes, when supplied in a delivery condition indicated in clause 7.3 and inspected in accordance with clauses 9, 10 and 11, shall conform to with the requirements of this Part EN 10217.

Tubes shall be suitable for hot and cold bending provided the bending is carried out in an appropriate manner.

In addition, the general technical delivery requirements specified in EN 10021 shall apply.

8.2 Chemical composition

8.2.1 Cast analysis

The cast analysis reported by the steel producer shall apply and conform to the requirements of Table 2.

NOTE When welding tubes produced in accordance with this part of EN 10217, account should be taken of the fact that the behaviour of the steel during and after welding is dependent not only on the steel, but also on the applied heat treatment and the conditions of preparing for and carrying out the welding.

8.2.2 Product analysis

Option 3: A product analysis for the tube shall be supplied.

Table 3 specifies the permissible deviations of the product analysis from the specified limits on cast analysis given in Table 2.

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Table 2 — Chemical composition (cast analysis) ^a, in % by mass

Steel grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al _{total} ^b	Cu ^c	Nb	Ti	V
Steel name	Steel number	max	max		max	max	max	max	max	min	max	max	max	max
P215NL	1.0451	0,15	0,35	0,40 to 1,20	0,025	0,020	0,30	0,08	0,30	0,020	0,30	0,010	0,03	0,02
P265NL	1.0453	0,20	0,40	0,60 to 1,40	0,025	0,020	0,30	0,08	0,30	0,020	0,30	0,010	0,03	0,02

^a Elements not included in this Table shall not be intentionally added to the steel without the agreement of the purchaser, except for elements which may be added for finishing the cast. All appropriate measures shall be taken to prevent the addition of undesirable elements from scrap or other materials used in the steel making process.

^b This requirement is not applicable provided the steel contains a sufficient amount of other nitrogen binding elements which shall be reported. When using titanium, the producer shall verify that $(Al+Ti)/2 \geq 0,020\%$.

^c **Option 2:** In order to facilitate subsequent forming operation, an agreed maximum copper content lower than indicated and an agreed specified maximum tin content shall apply.

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Table 3 — Permissible deviations in the product analysis from specified limits on cast analysis given in Table 2
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Element	Limiting value for the cast analysis in accordance with Table 2 % by mass	Permissible deviation of the product analysis % by mass
C	≤ 0,20	+ 0,02
Si	≤ 0,40	+ 0,05
Mn	≤ 1,40	+ 0,10 - 0,05
P	≤ 0,025	+ 0,005
S	≤ 0,020	+ 0,005
Al	≥ 0,020	- 0,005
Cr	≤ 0,30	+ 0,05
Cu	≤ 0,30	+ 0,05
Mo	≤ 0,08	+ 0,02
Nb	≤ 0,010	+ 0,005
Ni	≤ 0,30	+ 0,05
Ti	≤ 0,03	+ 0,01
V	≤ 0,02	+ 0,01