

English version

Loose steel tubes for tube and coupler scaffolds — Technical delivery conditions

Tubes libres en acier pour échafaudages à tubes et
raccords — Conditions techniques de livraison

Systemunabhängige Stahlrohre für die Verwendung in
Trag- und Arbeitsgerüsten — Technische
Lieferbedingungen

This European Standard was approved by CEN on 18 January 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Classification and designation	6
4.1 Classification	6
4.2 Designation	6
5 Information to be supplied by the purchaser	6
5.1 Mandatory information	6
5.2 Options	7
5.3 Examples of ordering	7
6 Manufacturing process	7
6.1 Steelmaking process	7
6.2 Tube manufacture	7
7 Requirements	8
7.1 General	8
7.2 Chemical composition and mechanical properties	8
7.3 Appearance	8
7.4 Straightness	8
7.5 External weld bead and preparation of ends	9
7.6 Dimensions, mass and tolerances	9
8 Inspection	10
8.1 Type of inspection	10
8.2 Inspection documents	10
8.3 Summary of inspection and testing	11
9 Sampling	12
9.1 Frequency of tests	12
9.2 Preparation of samples and test pieces	12
10 Test methods	13
10.1 Tensile test	13
10.2 Flattening test	13
10.3 Visual examination	13
10.4 Dimensional inspection	13
11 Retests, sorting and reprocessing	13
12 Marking	14
13 Coating	14
Annex A (informative) Values for design of structures	15
Bibliography	16

Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 29, Steel tubes and fittings for steel tubes, the Secretariat of which is held by UNI, in conjunction with CEN/TC 53, Temporary works equipment.

This European Standard replaces HD 1039:1990.

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 October 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard is derived with modifications from Harmonization Document HD 1039, *Steel tubes for falsework and working scaffolds — Requirements, tests*.

This European Standard cancels and replaces HD 1039:1990, *Steel tubes for falsework and working scaffolds — Requirements, tests*.

The significant technical changes are:

- tubes will now be supplied galvanized unless an option for them to be supplied without a coating (bare) or painted is specified;
- all tubes are now required to be suitable for galvanizing;
- requirements for the coating previously contained in annexes A and B are now covered (in accordance with CEN rules) by reference to European or International Standards and are not included in the text of this standard;
- tubes may only be manufactured using killed steel;
- the maximum tensile strength of the tubes has been increased to 520 MPa ¹⁾;
- a maximum manganese content has been introduced and the sulfur and phosphorus contents reduced;
- the mass tolerance for single tubes has been changed from –8 % to –7,5 %. The maximum single tube mass tolerance and the mass tolerance for batches of tubes have been deleted from the standard (outside diameter tolerances have not been changed);
- length types, standard or approximate or exact, and tolerances on those length types, are now specified;
- a flattening test requirement has been introduced for welded tubes;
- requirements for the type and content of inspection documents have been introduced for use when inspection documentation is specified;
- specific inspection is now permitted as an option with testing frequencies specified;

¹⁾ 1 MPa = 1 N/mm².

- the depth of marking of at least 0,2 mm is now a recommendation with an option to specify it as a requirement. The order of marking has changed slightly in order to preserve the separation of standard number and thickness type.

Annex A is informative.

1 Scope

This European Standard specifies the requirements for non-alloy steel tubes for use with EN 74 couplers in the construction of falsework and working scaffolds. It includes detailed requirements for marking to aid long-term identification, for protective coating by reference to European and International Standards, and for inspection and testing.

NOTE 1: Tubes to this European Standard, which have a specified outside diameter of 48,3 mm and specified thickness of 3,2 mm or 4,0 mm, may also be used in conjunction with other sizes and grades of steel tubes for applications such as prefabricated scaffolds.

NOTE 2: The use of these tubes should be in accordance with appropriate International and national requirements, for example prEN 12811 and prEN 12812.

2 Normative references

This European Standard incorporates by dated 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 dated 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).

EN 10002-1	<i>Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature).</i>
EN 10020	<i>Definition and classification of grades of steel.</i>
EN 10021	<i>General technical delivery requirements for steel and iron products.</i>
EN 10027-1	<i>Designation systems for steel — Part 1: Steel names principal symbols.</i>
EN 10027-2	<i>Designation systems for steel — Part 2: Steel numbers.</i>
EN 10204	<i>Metallic products — Types of inspection documents (including amendment A1:1995).</i>
EN 10233	<i>Metallic materials — Tube — Flattening test.</i>
EN 10240	<i>Internal and/or external protective coatings for steel tubes — Specification for hot dip galvanized coatings applied in automatic plants.</i>
EN ISO 377	<i>Steel and steel products — Location and preparation of samples and test pieces for mechanical testing.</i>
EN ISO 1461	<i>Hot dip galvanized coatings on fabricated iron and steel articles — Specification and test methods.</i>
EN ISO 2409	<i>Paints and varnishes — Cross-cut test.</i>
EN ISO 2566-1	<i>Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels.</i>
prEN 10168 ²⁾	<i>Iron and steel products — inspection documents contents — List of information and description.</i>
prEN 10266 ²⁾	<i>Steel tubes, fittings and structural hollow sections — Definitions and symbols for use in product standards.</i>
ISO 4628-3	<i>Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 3: Designation of degrees of rusting.</i>
ISO 7253:1996	<i>Paints and varnishes — Determination of resistance to neutral salt spray.</i>
CR 10260	<i>Designation system for steel — Additional symbols.</i>

²⁾ In preparation, until this document is published as a European Standard the corresponding national standard(s) should be agreed at the time of enquiry and order.

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 10020 (definition and classification of steel), EN 10021 (inspection and testing), EN 10204 (inspection documents), prEN 10266 (seamless and welded tube) and the following, in addition to or instead of the definitions and symbols given in the above text, apply.

3.1

type 3 tube

tube of 3,2 mm specified wall thickness

3.2

type 4 tube

tube of 4,0 mm specified wall thickness

3.3

bare tube

tube whose surface is as manufactured without subsequent coating

4 Classification and designation

4.1 Classification

In accordance with the classification system in EN 10020, the steel in Table 1 is classified as non-alloy quality steel.

4.2 Designation

For the tubes covered by this European Standard the steel designation consists of:

- the number of this European Standard (EN 39);

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 Information to be supplied by the purchaser

5.1 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 number of this European Standard (EN 39);
- c) the type (3 or 4) or specified wall thickness (mm);
- d) the standard length required (see 7.6.5);
- e) the options required (see 5.2).

5.2 Options

A number of options are specified in this European Standard and are listed below. In the event that the purchaser does not indicate a wish to implement any of these options, at the time of enquiry and order, the tube shall be supplied in accordance with the basic specification (see 5.1).

- 1) The type of tube, seamless or welded, shall be as specified (see 6.2).
- 2) The silicon content of range 1 shall be limited (see 7.2).
- 3) Approximate or exact length is specified (see 7.6.5).
- 4) A tighter tolerance on length is specified (see Table 2).
- 5) Specific inspection and testing is specified (see 8. 1).
- 6) An inspection document shall be supplied (see 8.2.1).
- 7) Depth of impression of marking to be at least 0,2 mm (see clause 12).
- 8) Tubes shall be supplied bare (see clause 13).
- 9) Temporary corrosion protection is specified (see clause 13).
- 10) Tubes shall be supplied painted, colour to be agreed (see clause 13).

5.3 Examples of ordering

EXAMPLE 1 One thousand tubes in accordance with EN 39 with a specified wall thickness of 3,2 mm (type 3) in 6,0 metre standard lengths, supplied bare (option 8) and with temporary corrosion protection (option 9).

1 000 tubes –EN 39 - 3,2 - 6,0 - Options 8 and 9.

EXAMPLE 2 48 tonnes of tube in accordance with EN 39 type 4 (4,0 mm specified wall thickness), supplied in 6,4 metre standard lengths and with an inspection document 2.2 according to EN 10204 provided (option 6).

48 tonnes tube – EN 39 - 4 - 6,4 - Option 6 - 2.2.

6 Manufacturing process

6.1 Steelmaking process

The steelmaking process is at the discretion of the manufacturer.

The steel shall be killed.

6.2 Tube manufacture

The tubes shall be made seamless or welded, at the discretion of the manufacturer unless option 1 is specified.

Option 1 tubes shall be supplied seamless or welded the type to be specified by the purchaser.

Finished welded tubes shall not include welds used for joining together lengths of the hot or cold rolled strip prior to forming.

7 Requirements

7.1 General

When manufactured in accordance with clause 6 and inspected in accordance with clause 8, the tube shall conform to the requirements of this European Standard.

In addition to the requirements of this European Standard, the general technical delivery requirements specified in EN 10021 shall apply.

7.2 Chemical composition and mechanical properties

The tube shall meet the requirements for chemical composition and mechanical properties given in Table 1.

The cast analysis reported by the steel producer shall apply.

The silicon content shall be within either range 1 or range 2 (see Table 1) unless option 2 is specified.

Option 2 the silicon content in range 1 shall be limited to 0,04 % maximum.

Table 1 — Chemical composition and Mechanical Properties

Steel grade		Chemical composition (cast analysis), in %, by mass						Mechanical properties		
		C	Si	Mn	P	S	Al	Yield strength R_{eH} min	Tensile strength R_m	Elongation A min
Steel name	Steel number	max.		max.	max.	max.	min.	MPa ¹	MPa ¹	%
S235GT	1.010 6	0,20	a, b	1,40	0,040	0,045	0,020	235	340/520	24
^a $\leq 0,05$ % (range 1) ($\leq 0,04$ % if option 2 is specified) or $\geq 0,15$ % $\leq 0,25$ % (range 2). ^b When bare tubes are specified (see option 8) the range shall be reported at the time of enquiry and order.										

A flattening test shall be carried out on welded tube in accordance with 10.2.

7.3 Appearance

The tubes shall have a smooth external surface corresponding to the manufacturing process. Surface imperfections are permitted providing the dimensions remain within the tolerance limits given in 7.6.

7.4 Straightness

The deviation from straightness of any tube length (L) shall not exceed $0,002 L$. Deviations from straightness over any one metre length shall not exceed 3 mm (see Figure 1).

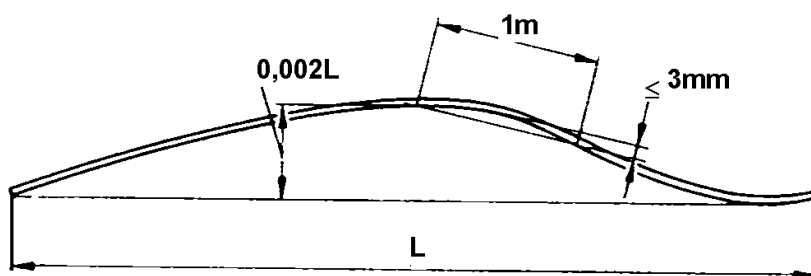


Figure 1 — Maximum deviation of a tube from straight

7.5 External weld bead and preparation of ends

The external weld bead of welded tubes shall be trimmed flush. Tube ends shall be cut nominally square with the axis of the tube and shall be free from harmful burrs.

7.6 Dimensions, mass and tolerances

7.6.1 Dimensions

The specified outside diameter is 48,3 mm and the specified wall thickness is 3,2 mm for type 3 and 4,0 mm for type 4.

7.6.2 Tolerances on dimensions

The tolerance on specified outside diameter is $\pm 0,5$ mm.

The tolerance on out of roundness is included in the diameter tolerance.

The tolerance on wall thickness is -10% . However, for seamless tubes, a deviation from specified wall thickness of more than 10% but not more than 15% of the specified thickness may occur in smooth transition areas over no more than 25% of the circumference.

The inside diameter of tubes shall allow insertion of a gauge of diameter 37,7 mm for a minimum length of 200 mm.

7.6.3 Mass

The nominal mass per unit length of type 3 tube is 3,56 kg/m and for type 4 tube 4,37 kg/m.

7.6.4 Tolerance on mass

The mass deviation on a single tube shall not exceed $-7,5\%$ of the specified mass.

NOTE The plus tolerance is controlled by 7.6.2.

7.6.5 Length

Tubes shall be delivered in standard lengths of 6 m or 6,4 m, purchaser to specify the length required (see 5.1), unless option 3 is specified.

Option 3 approximate or exact lengths shall be supplied, purchaser to specify the length required.

The types of length and tolerances are given in Table 2.

Table 2 — Types of length and tolerances on length

Type of length	Length L m	Tolerance ^a mm
Standard	6 or 6,4	–50/+150 for welded ±500 for seamless
Approximate	$4 \leq L \leq 12$	
Exact	≤ 6	0 / +10
	$6 < L \leq 12$	0 / +15
^a Option 4 a tighter tolerance on length as specified by the purchaser shall apply.		

7.6.6 Values for design of structures

Values for the sectional properties, modulus of elasticity and the mass per metre of tubes supplied in accordance with this European Standard are given for information in annex A.

8 Inspection

8.1 Type of inspection

The tubes shall be supplied with non-specific inspection and testing in accordance with EN 10021 unless option 5 is specified.

Option 5 the tubes shall be supplied with specific inspection and testing.

8.2 Inspection documents

8.2.1 Types of inspection document

The following documents, in accordance with EN 10204, shall be issued.

Tubes with non-specific inspection shall be supplied without an inspection document unless option 6 is specified.

Option 6 an inspection document type 2.1 or 2.2 in accordance with EN 10204, as specified by the purchaser, shall be supplied.

Tubes with specific inspection and testing (see option 5) shall be supplied with an inspection certificate type 3.1.B in accordance with EN 10204.

8.2.2 Content of inspection documents

The content of the inspection documents shall be in accordance with prEN 10168 as shown in 8.2.2.1 and 8.2.2.2.

8.2.2.1 A certificate of compliance with the order (2.1) shall contain the following codes and information.

- A - Commercial transactions and parties involved.
- B - Description of products to which the certificate of compliance with the order applies.
- Z - Authentication

8.2.2.2 A test report (2.2) or an inspection certificate type 3.1.B shall contain the following codes and information.

- A - Commercial transactions and parties involved.
- B - Description of products to which the inspection document applies.
- C10-C13 - Tensile test.
- C60-C69 - Flattening test (if applicable).
- C71-C92 - Chemical composition.
- D 01 - Marking and identification, surface appearance, shape and dimensional properties.
- Z - Authentication.

8.3 Summary of inspection and testing

Inspection and testing shall be carried out in accordance with Table 3.

Table 3 — Inspection and tests

Type of inspection or test	Frequency of testing		Refer to clause
Mandatory	Non-specific inspection	Specific inspection	
Cast analysis	Manufacturers Procedure	Manufacturers Procedure	7.2
Tensile	Manufacturers procedure	1/test unit	7.2 ; 10.1
Flattening ^a	Manufacturers procedure	1/test unit	7.2 ; 10.2
Visual examination	See 7.3 ; 10.3		
Dimensional inspection	See 7.4 ;7.6;10.4		
^a Welded tube only.			

9 Sampling

9.1 Frequency of tests

9.1.1 Test unit

For product supplied with specific inspection and testing, testing for mechanical properties shall be carried out on test units.

A test unit is defined as a quantity of tubes of the same grade and dimensions manufactured by the same process and submitted for acceptance at the same time.

A test unit shall be less than or equal to 40 tonnes of tubes.

9.1.2 Number of samples per test unit

From each test unit one sample shall be taken sufficient for the preparation of the following test pieces.

- 1 tensile test piece.
- 1 flattening test piece, in the case of welded tube.

9.2 Preparation of samples and test pieces

9.2.1 Location, orientation and preparation of samples for mechanical tests

9.2.1.1 General

Samples and test pieces shall be taken at the tube ends and in accordance with the requirements of EN ISO 377.

9.2.1.2 Test piece for the tensile test

The test piece for the tensile test is either a full tube section or a test piece taken in a direction parallel to the longitudinal to the axis of the tube in accordance with the requirements of EN 10002-1.

9.2.1.3 Test piece for the flattening test

The test piece for the flattening test shall consist of a full tube section in accordance with EN 10233.

10 Test methods

10.1 Tensile test

The test shall be carried out on bare tube in accordance with EN 10002-1, at room temperature, and the following determined:

- the tensile strength (R_m);
- the upper yield strength (R_{eH});

If a yield phenomena is not present, the 0,2 % proof strength ($R_{p0,2}$) or the 0,5 % proof strength for total extension ($R_{t0,5}$). In case of dispute the 0,2 % proof strength ($R_{p0,2}$) shall be determined.

- the percentage elongation after fracture (A) with reference to a gauge length (L_0) of $5,65\sqrt{S_0}$. If a non-proportional test piece is used, the percentage elongation value shall be converted to the value for gauge length $L_0 = 5,65\sqrt{S_0}$, where S_0 is the original cross-sectional area, using the tables given in EN ISO 2566-1.

10.2 Flattening test

The test shall be carried out in accordance with EN 10233. The tube section shall be flattened with the weld, for successive tests, or, for tubes supplied with specific inspection, successive test units, placed alternately, at 0° or 90° to the direction of flattening.

When only one test unit is to be tested, the position of the weld is at the discretion of the manufacturer unless otherwise agreed.

The distance between the platens, measured under load, shall not be greater than 75 % of the original outside diameter of the tube and no cracks or flaws observed. The test shall be continued until the distance between the platens, measured under load, is not more than 60 % of the original outside diameter and no cracks or flaws observed in the metal elsewhere than in the weld.

NOTE Slight premature cracking at the edges would not be deemed to affect compliance with this standard.

10.3 Visual examination

Bare tubes shall be visually examined to ensure conformity to the requirements of 7.3.

10.4 Dimensional inspection

Specified dimensions of bare tubes, including straightness, shall be verified.

The outside diameter shall be measured with a gauge.

The inside diameter of tubes shall be checked by the insertion of a gauge of 37,7 mm diameter for a minimum length of 200 mm.

11 Retests, sorting and reprocessing

The requirements of EN 10021 shall apply.

12 Marking

Tubes shall be marked by impression at linear intervals not exceeding 1,5 m. The height of the characters shall be at least 4,0 mm and the impression shall be such as to ensure legibility and durability for the anticipated lifetime of the product.

NOTE The legibility and durability should normally be achieved with a depth of impression of at least 0,2 mm.

Option 7 the depth of impression shall be at least 0,2 mm with inspection requirements in accordance with the manufacturers procedure.

The marking shall be legible after a coating in accordance with clause 13 has been applied.

The marking shall show:

- 1) the number of this European Standard (EN 39);
- 2) the name or trade mark of the manufacturer;
- 3) the thickness type, 3 or 4.

Example of die marking - EN 39 xxx 4.

xxx = name or trademark of manufacturer.

When the coating applier is not the tube manufacturer, an additional durable mark shall be applied to the tube at intervals not exceeding 1,5 m showing the name or trade mark of the coating applier; this mark shall not obscure the tube manufacturers mark.

13 Coating

The tubes shall be hot dip galvanized unless options 8, 9 or 10 are specified. The galvanizing shall be either in accordance with EN 10240 to coating quality B2 or in accordance with EN ISO 1461 (Table 2), except that the marking requirements shall be in accordance with clause 12.

Option 8 tubes shall be supplied bare.

Option 9 tubes shall be supplied with a temporary corrosion protection.

Option 10 tubes shall be supplied painted. The coating shall meet the requirements of EN ISO 2409, classification 0102 from Table 1, and when tested in accordance with ISO 7253, meet the inspection requirement Ri 3 in accordance with ISO 4628-3.

Annex A (informative)

Values for design of structures

Table A.1 — Sectional properties, modulus of elasticity and mass per metre

Properties	Symbol	Type 3 tube	Type 4 tube
Cross-sectional area (cm ²)	A	4,53	5,57
Second moment of area (cm ⁴)	I	11,6	13,8
Elastic section modulus (cm ³)	W_{el}	4,80	5,70
Plastic section modulus (cm ³)	W_{pl}	6,52	7,87
Radius of gyration (cm)	i	1,60	1,57
Mass per metre (kg/m)	M	3,56	4,37
Modulus of elasticity (MPa)	E	210 000	210 000

Bibliography

The standards listed below are used in this European Standard for information to indicate when and how the tubes may be used.

EN 74	<i>Specification for steel couplers, loose spigots and base plates for use in working scaffolds and falsework made of steel tubes.</i>
prEN 12811	<i>Scaffolds — Performance requirements and general design.</i>
prEN 12812	<i>Falsework — Performance requirements and general design.</i>