



SLOVENSKI STANDARD
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Pressure equipment - Part 4: Establishment of technical delivery conditions for metallic materials

Druckgeräte - Teil 4: Erstellung von technischen Lieferbedingungen für metallische Werkstoffe

Equipements sous pression - Partie 4: Etablissement des conditions techniques de livraison des matériaux métalliques

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Pressure equipment - Part 4: Establishment of technical delivery conditions for metallic materials

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This European Standard was approved by CEN on 19 August 2002.

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.

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

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Foreword

This document EN 764-4:2002 has been prepared by Technical Committee CEN/TC 54 "Unfired pressure Vessels", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

This European Standard "Pressure equipment" consists of seven Parts which are:

- Part 1: *Pressure, temperature, volume, nominal size.*
- Part 2: *Quantities, symbols and units.*
- Part 3: *Definition of parties involved.*
- Part 4: *Establishment of technical delivery conditions for materials.*
- Part 5: *Compliance and Inspection Documentation of Materials.*
- Part 6: *Operating instructions.*
- Part 7: *Safety systems and unfired pressure equipment.*

Annexes A to F are normative.

The terminology for safety systems is dealt with in prEN 13340 *Pressure equipment — Safety devices for the prevention of excessive pressure — Terminology*.

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 764-4:2002 (E)**1 Scope**

This Part of the European Standard specifies the requirements for the establishment of the technical delivery conditions in form of:

- harmonized European Standard for material;
- European approval for material (EAM);
- particular material appraisal

for metallic materials for pressure equipment in all product forms, and is restricted to steel at present. Welding consumables are not covered by this standard.

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).

prEN 764-1:2001, *Pressure equipment — Terminology -Part 1: Pressure, temperature, volume, nominal size.*

EN 764-2:2002, *Pressure equipment — Terminology - Part 2: Quantities, symbols and units.*

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

EN 1011-2, *Welding — Recommendations for welding of metallic materials — Part 2: Arc welding of ferritic steels.*

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

EN 10002-5, *Metallic materials — Tensile testing — Part 5: Method of testing at elevated temperature.*

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

EN 10045-2, *Metallic materials —Charpy impact test — Part 2: Verification of the testing machine (pendulum impact).*

EN 10204:1991, *Metallic products — Types of inspection documents.*

EN 10213-1, *Technical delivery conditions for steel castings for pressure purposes — Part 1: General.*

EN 10291, *Metallic materials — Uniaxial creep testing in tension — Method of test.*

EN 13445-2:2002, *Unfired pressure vessels — Part 2: Materials.*

prEN ISO 17642-1, *Destructive tests on welds in metallic materials — Cold cracking tests for weldments — Part 1: General.*

prEN ISO 17642-2, *Destructive tests on welds in metallic materials — Cold cracking tests for weldments — Part 2: Self-restraint tests.*

prEN ISO 17642-3, *Destructive tests on welds in metallic materials — Cold cracking tests for weldments — Part 3: Externally loaded tests.*

EURONORM 103-71, *Microscopic determination of the ferrite or austenitic grain size of steels.*

CR ISO 15608:2000, *Welding — Guidelines for a metallic material grouping system (ISO/TR 15608:2000)*.

EURONORM 114-72, *Determination of the resistance of stainless austenitic steels to intergranular corrosion; corrosion test in sulfuric acid copper sulfate solution (Monypenny-Strauss test)*.

3 Terms and definitions, symbols and abbreviations

For the purposes of this European Standard the following terms and definitions apply.

3.1 Terms and definitions

3.1.1

European Approval for materials (EAM)

technical approval for materials for pressure equipment with no harmonized standard, see also [1], Article 11

3.1.2

European Material Data Sheet (EMDS)

document defining the requirements for a material approved for use in the manufacture of pressure equipment by a European approval for materials according to the provisions of annex A

3.1.3

established material

metallic materials specified in a product standard for pressure equipment; or in an EAM

3.1.4

new material

metallic material not included in a product standard or in an EAM

3.2 Symbols and abbreviations

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For the purposes of this standard the symbols and abbreviations of prEN 764-1:2001, EN 764-2:2002 and the following in Table 1 and Table 2 will apply.

Table 1 — Symbols and units

Symbols	Characteristic	Units
b	width	mm
e	thickness	mm
h	max. permissible reinforcement of weld	mm
T	temperature	°C
T_D	design temperature	°C
A	elongation after fracture	%
C	constant	—
D	diameter	mm
E	modulus of elasticity	N/mm ² ^a
G	shear modulus	N/mm ² ^a
HB	Brinell hardness	—
HV	Vickers hardness	—
KV	Charpy V-notch impact energy	J
L_o	length (gauge length)	mm
P	pressure	bar
P_{LM}	parameter according to Larson-Miller	—
R_e	yield strength	N/mm ² ^a
R_{eH}	upper yield strength	N/mm ² ^a
R_{eL}	lower yield strength	N/mm ² ^a
R_m	tensile strength	N/mm ² ^a
$R_{m/tT}$	creep rupture strength for t hours at T °C	N/mm ² ^a
$R_{m/T}$	tensile strength at temperature T	N/mm ² ^a
$R_{p0,2/T}$	0,2 % proof strength at temperature T	N/mm ² ^a
$R_{p0,2}$	0,2 % proof strength	N/mm ² ^a
$R_{p1,0}$	1,0 % proof strength	N/mm ² ^a
$R_{p1,0/T}$	1,0 % proof strength at temperature T	N/mm ² ^a
S_0	original cross section area	mm ²
t	time	h
α	linear expansion coefficient	K ⁻¹
ε	strain	%
ν	Poisson's ratio	—

^a 1 N/mm² = 1 MPa

Table 2 — Abbreviations

Abbreviation	Description
EAM	European approval of material
EC	European Commission
EMDS	European material data sheet
NDE	non destructive examination
PED	Pressure equipment directive
OJEC	Official Journal of European Communities
RA	Responsible authority

4 Types of technical delivery conditions

4.1 European Standards for material for pressure equipment

European material Standards define the technical requirements for materials frequently used in pressure equipment in Europe. It is within the remit of the responsible technical committee for materials to check at each occasion of the revision work whether related materials covered by a European Material Data Sheet (EMDS) are used to an extent that justifies the incorporation of the material in the European material Standard.

4.2 European approvals for materials for pressure equipment

European approvals for materials are intended for repeated use. They are established on the basis of Article 11 of the PED and apply to materials or treatment conditions and product forms or dimensions not covered in a harmonized European material Standard for pressure equipment.

The European approval for materials for pressure equipment result in European Material Data Sheets.

NOTE Reference of available European Material Data Sheets is published in the Official Journal of the European Community (OJEC).

4.3 Particular material appraisals for pressure equipment

Particular material appraisals apply for individual cases as for example:

- a) a material or a product form or a thickness not covered by a harmonized European material Standard or EMDS intended for use in a particular pressure equipment;
- b) a product specified in a European material Standard or EMDS for materials for pressure equipment is intended in an exceptional case for service conditions outside its specified range of application.

NOTE Under the scope of the PED for pressure equipment in category III and IV the particular material appraisal shall be performed by the Notified Body in charge of the conformity assessment for the pressure equipment.

Where relevant to the pressure equipment under consideration the requirements given in annexes B to F may be used as guidance.

EN 764-4:2002 (E)**5 Content of technical delivery conditions for materials for pressure equipment****5.1 General**

Technical delivery conditions for materials for pressure equipment shall describe the material with its specific properties and shall at least contain clauses for scope, normative references, requirements, testing and inspection and marking and restriction on application where necessary. EMDS and particular material appraisals shall take account of material processing. If appropriate, information on the allocation of the material to the relevant material group in CR ISO 15608 shall be provided with the technical material specification. Particular material appraisals shall always specify in detail the range of application.

For EMDS a list of material manufacturers shall be provided where appropriate.

5.2 Requirements**5.2.1 Manufacture**

The method of manufacture of the material shall be specified. Details need only be specified to an extent as is necessary to ensure the specified quality.

5.2.2 Treatment condition

The following conditions shall be specified:

- type of heat treatment condition,
- surface condition of the material at the time of delivery, where necessary.

5.2.3 Chemical composition

The chemical composition limits shall be specified. Where the composition of the product may be different from the composition of the cast, limit deviations from the cast analysis shall be specified.

The specification of the chemical composition shall include the following:

"Elements, which can influence the essential material characteristics, not specified for the specific material shall not intentionally be added. All reasonable precautions shall be taken to prevent the addition of elements from scrap or other materials used in the manufacture, but residual elements may be present, provided the specified mechanical properties are met and the applicability is not impaired."

5.2.4 Mechanical and technological properties

The following properties shall be specified for the individual steel grades.

a) Tensile properties at room temperature

The technical material specification shall specify the tensile properties in the direction and location of test pieces which shall be representative of the material characteristics.

Where the form and thickness of the products permit the verification testing of transverse test pieces, the property characteristics shall be given for the transverse direction.

In those cases, where the properties in the longitudinal direction are lower, this shall be taken into account;

1) Yield or proof strength

For austenitic steels minimum proof strength values for 1 % non proportional extension ($R_{p1,0/min}$ and, where appropriate, $R_{p0,2/min}$ values additionally) shall be specified.

For all other materials the minimum value for the upper yield strength or, for cases where no yield phenomenon occurs, the minimum proof strength for 0,2 % non proportional extension shall be specified;

2) Tensile strength

For the tensile strength a minimum value shall be specified. A maximum value shall be specified additionally where no maximum yield or proof strength value is specified;

3) Elongation after fracture (standards.iteh.ai)

The minimum percentage elongation after fracture for the gauge length specified in accordance with EN 10002-1 shall be specified;

b) Impact properties

The impact requirements of the material (temperature, energy) shall be specified with regard to the pressure equipment requirements to avoid brittle fracture;

c) Elevated temperature tensile properties

1) The following tensile properties shall be specified for temperatures in accordance with Table 3:

- for austenitic steels intended for an application at a temperature ≥ 50 °C and in accordance with Table 3 the minimum 1,0 % proof strength at elevated temperatures. It is also proposed to specify the minimum elevated temperature tensile strength;
- for all other steels intended for an application at a temperature in accordance with Table 3, but not higher than the maximum design temperature rounded up to 50 K, the minimum 0,2 % proof strength at elevated temperatures.

Table 3 — Elevated temperatures for steels

Steel group in accordance with CR ISO 15608:2000	Temperature		
	from °C	to a maximum of °C	preferably in steps of K
2, 7.1, 7.2, 3 1.1 to 1.3	100	400	50
1.4, 4, 5.1, 5.2	100	500	50
5.3, 5.4, 6	100	600	50
8	50	600	50
10	50	250 ^a	50
^a 250 °C if welded, 280 °C unwelded			

- 2) The specified minimum proof strength values at elevated temperatures should be derived in accordance with prEN 10134 on the basis of data determined in accordance with EN 10002-1 and EN 10002-5;

d) Technological properties

Where necessary, requirements for formability e.g. specified on the basis of flattening or ring expanding tests or on the basis of tests for the deformation properties perpendicular to the surface of the product (see EN 10164) or requirements for other technological properties, important for the processing or use of the material, shall be specified.

5.2.5 Other material properties

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Where necessary, the requirements for properties other than those covered under 5.2.2 to 5.2.4, as for example requirements referring to the corrosion resistance of the material shall also be specified together with their methods of verification.

5.2.6 Freedom of surface and internal defects

The requirements for non destructive testing and visual inspection shall be specified where necessary to meet the relevant requirements in EN 13445-2:2002, 4.1.3.

5.2.7 Dimensions, shape, mass and related tolerances

Dimensions, shape and mass and related tolerances shall be specified where necessary, preferably by reference to an appropriate dimensional standard.

5.3 Testing and inspection

The following requirements on inspection and testing shall be specified:

- a) the types of applicable inspection documents (see EN 10204);
- b) the requirements to be verified (e.g. chemical composition, tensile properties);
- c) the conditions applicable for specific inspection and testing namely:
 - the composition and maximum size of the test unit (e.g. the maximum weight or number of products of the same cast, heat treatment batch); and

- the number of sample products per test unit;
 - the number of samples per sample product; and
 - the number of test pieces per sample to be taken and tested;
 - the location and direction of the test pieces in the product;
 - where necessary, additional conditions for sampling and conditions for the preparation of the samples and test pieces;
 - the European Standards in which the test methods are described;
 - the provisions for retesting;
- d) any other necessary specification for testing and inspection.

5.4 Marking

The marking of the delivery units or products shall ensure traceability between these and the inspection documents.

For European standardized materials the marking shall fulfil the requirements of the relevant product standard.

For other materials the marking shall at least contain:

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- a) the material specification (reference, material designation);
 - b) the material manufacturers name or mark; [SIST EN 764-4:2003](https://standards.iteh.ai/catalog/standards/sist/9ab2db74-3c05-4268-a269-5ebbdcd857cc/sist-en-764-4-2003)
 - c) the stamp of the inspection representative, if applicable; <https://standards.iteh.ai/catalog/standards/sist/9ab2db74-3c05-4268-a269-5ebbdcd857cc/sist-en-764-4-2003>
 - d) an identification which permits the correlation between the product or delivery unit and the relevant inspection document.