SLOVENSKI STANDARD
SIST EN 1975:1999/A1:2004

01-junij-2004

Premiļ ne plinske jeklenke - Specifikacije za zasnovo in izdelavo ponovno polnljivih plinskih jeklenk iz celega iz aluminija in aluminijeve zlitine s prostornino od 0,5 do vkljuļ no 150 litrov

Transportable gas cylinders - Specification for the design and construction of refillable transportable seamless aluminium and aluminium alloy gas cylinders of capacity from 0,5 litre up to 150 litres

Orstbewegliche Gasflaschen - Gestaltung und Konstruktion von wiederbefüllbaren, orstbeweglichen nahtlosen Gasflaschen aus Aluminium und Aluminiumlegierung mit einem Fassungsraum von 0,5 l bis einschließlich 150 l

Bouteilles a gaz transportables - Spécifications pour la conception et la fabrication de bouteilles a gaz rechargeables et transportables en aluminium et alliage d'aluminium sans soudure de capacité comprise entre 0,5 l et 150 l inclus

Ta slovenski standard je istoveten z: EN 1975:1999/A1:2003

ICS:

23.020.30	Tlaļ ne posode, plinske jeklenke	Pressure vessels, gas cylinders

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EUROPEAN STANDARD

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English version

Transportable gas cylinders - Specification for the design and construction of refillable transportable seamless aluminium and aluminium alloy gas cylinders of capacity from 0,5 litre up to 150 litres

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This amendment A1 modifies the European Standard EN 1975:1999; it was approved by CEN on 3 November 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant 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 amendment 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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

Ref. No. EN 1975:1999/A1:2003 E

Contents

Foreword

This document (EN 1975:1999/A1:2003) has been prepared by Technical Committee CEN/TC 23 "Transportable gas cylinders", the secretariat of which is held by BSI.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the objectives of the framework Directives on Transport of Dangerous Goods.

This European Standard has been submitted for reference into the RID and/or in the technical annexes of the ADR. Therefore in this context the standards listed in the normative references and covering basic requirements of the RID/ADR not addressed within the present standard are normative only when the standards themselves are referred to in the RID and/or in the technical annexes of the ADR.

This Amendment to the European Standard EN 1975:1999 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

This amendment has been prepared to replace the existing informative annex G by a normative annex covering specific requirements for aluminium alloy 2001.

Amendment instructions:

1. Remove the existing annex G and replace it by the new annex G presented hereafter.

2. Change the title of annex G in the contents page to read "annex G (normative) Specific requirements for cylinders made of aluminium alloy 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Annex G
(normative)

Specific requirements for cylinders made of aluminium alloy 2001

G.1 Foreword

This annex applies to aluminium alloy 2001 where, due to its higher strength (compared to 5xxx or 6xxx series alloys), lower elongation after fracture values may be accepted provided that an adequate fracture toughness and an adequate resistance to crack propagation under a cycling stress are demonstrated.

This requires two types of tests, both using an artificial flaw produced by machining.

The first test aims at establishing that, when the cylinder is cycled or burst at a pressure of at least 2/3 p_h, the critical defect size for which rupture would occur by leaking and not bursting is above a specified value (leak before burst or LBB test).

The second test aims at establishing that the residual cycling life at p_h of a cylinder bearing a specified defect remains above a specified value (flawed cylinder cycle test or FCCT test).

NOTE A similar approach has been used for cylinders made of high strength steels.

G.2 and **G.3** specify the test procedures. **G.4** specifies the frequency of testing. **G.5** specifies additional manufacturing requirements for alloy 2001. The applicable elongation after fracture requirements are also specified.

G.2 Leak before burst test (LBB test)

G.2.1 Cylinder flaw manufacturing procedure

One flaw shall be machined on each cylinder to be tested. The flaw shall be machined longitudinally. It shall be located approximately at mid-length of the cylindrical part of the cylinder, and at the point where the minimum wall thickness of this midsection is recorded (based on four measurements equally spaced around the circumference).

The flaw length l_o shall be the overall length of the cut and shall be at least equal to 4 a, where a is the calculated minimum thickness of the cylindrical shell as defined in **5.2**.

The cutter used to machine the flaw shall be approximately 12,5 mm thick with an angle of 45° and a tip radius r_c of (0,25 ± 0,05) mm. The cutter diameter (= 2 R_c) shall be 20 mm for cylinders with a nominal outside diameter, D, not greater than 140 mm and 30 mm for cylinders with D greater than 140 mm (a standard CNV cutter is recommended).

NOTE 1 Larger cutter diameters or other means of machining, which do not affect the properties of the material, may be used when so required to achieve an appropriate flaw depth in thick walled cylinders.

NOTE 2 The cutter should be sharpened regularly to ensure the tip radius meets the requirements.

The flaw depth shall be at least 60 % of the actual wall thickness, t, of the cylinder at the flaw location.

Figure G.1 gives an overall view of the flaw and cutter geometries.

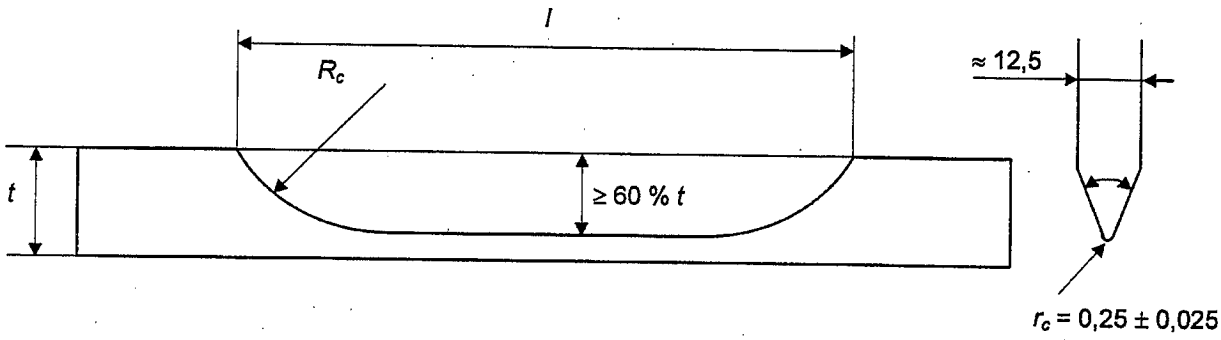

Figure G.1 — Overall view of the flaw and cutter geometries

G.2.2 Test procedure

G.2.2.1 General

The flawed cylinder shall be submitted to either one of the two tests described in **G.2.2.2** and **G.2.2.3**.

G.2.2.2 Pressure cycling test procedure

The flawed cylinder shall be hydraulically pressure cycled until failure, using the procedure described in **7.3**, except that :

- the upper cycling pressure, p_f, shall be at least equal to 2/3 p_h x (t / a);
- the cycling frequency shall not exceed 5 cycles per minute.

G.2.2.3 Monotonic burst test procedure

The flawed cylinder shall be hydraulically pressurised to failure using the test procedure described in **7.2.1** except for the duration of the test, which shall not be less than 1 min.

G.2.3 Acceptance criteria

G.2.3.1 Pressure cycling test

a) The cylinder is deemed to have passed the test when the following conditions are simultaneously fulfilled:

- the failure shall occur by leakage, i.e. the overall length of the flaw after failure, as measured on the outer surface of the cylinder, shall not exceed 1,1 x l_o;
- the upper cycle pressure or failure pressure, p_f, shall be at least equal to 2/3 p_h x (t / a).

b) If the criteria as per a) of this clause are not met, then the corresponding batch shall be deemed to have failed the test.

c) When the number of cycles to failure falls well outside the range usually observed, typically when the crack propagation deviates from the radial direction, the test may be carried out again, but in this case two new cylinders shall be tested. If any of these new cylinders fails the test then the corresponding batch shall be deemed to have failed the test.

G.2.3.2 Hydraulic burst test

a) The cylinder is deemed to have passed the test when the following conditions are simultaneously fulfilled:

- the failure shall occur by leakage, i.e. the overall length of the flaw after failure, as measured on the outer surface of the cylinder, shall not exceed 1,1 x l_o;

- the failure pressure, p_f, shall be at least equal to 2/3 p_h x (t / a).

b) If the failure pressure is less than 2/3 p_h x (t / a) and the failure occurs by leakage, a new test may be carried with a less deep flaw, the acceptance criteria remaining unchanged.

c) If the pressure failure exceeds 2/3 p_h x (t / a) and the failure occurs by burst then a new test may be carried out with a deeper flaw, the acceptance criteria remaining unchanged.

d) If the criteria as per a) of this clause are not met, then the corresponding batch shall be deemed to have failed the test.

G.2.4 Parameters to monitor

G.2.4.1 Pressure cycling test

- actual flaw length;
- actual wall thickness;
- actual flaw depth;
- upper and lower cycling pressure;
- cycling rate;
- pressurising medium used;
- temperature of the cylinder at the beginning and end of the test;
- number of cycles to failure;
- failure mode.

G.2.4.2 Monotonic burst test

- actual flaw length;
- actual wall thickness;
- actual flaw depth;
- failure pressure;
- pressurising medium used;
- failure mode.

G.3 Flawed cylinder cycle test (FCCT test)

G.3.1 Cylinder flaw manufacturing procedure

The test shall be carried out on two cylinders. One flaw shall be machined on each cylinder to be tested.

The flaw shall be machined longitudinally. It shall be located approximately at mid-length of the cylindrical part of the cylinder, and at the point where the minimum wall thickness of this midsection is recorded (based on four measurements equally spaced around the circumference).

The flaw length l_o shall be the overall length of the cut and shall be at least equal to 4a, where a is the calculated minimum thickness of the cylindrical shell as defined in **5.2**.

The cutter used to machine the flaw shall be approximately 12,5 mm thick with an angle of 45° and a tip radius r_c of (0,25 ± 0,05) mm. The cutter diameter (= 2 R_c) shall be 20 mm for cylinders with a nominal outside diameter, D, not greater than 140 mm and 30 mm for cylinders with D greater than 140 mm (a standard CNV cutter is recommended).

The depth of the flaw shall be equal to 10 % of the actual wall thickness, t, of the cylinder at the flaw location.

NOTE 1 The cutter should be sharpened regularly to ensure the tip radius meets the requirements.

NOTE 2 When measuring the actual depth of the flaw, after machining, a deviation not exceeding 0,10 mm from the depth specified is acceptable.

G.3.2 Pressure cycling procedure

The flawed cylinder shall be hydraulically pressure cycled until failure, using the procedure described in **7.3**. However, the upper cycling pressure shall be at least equal to ph, and the cycling frequency shall not exceed 5 cycles per minute.

G.3.3 Acceptance criteria

The test is deemed to have been passed when the number of cycles achieved without failure exceeds 2 000 as a mean value of the two cylinders tested with an absolute minimum of 1 500 for each cylinder.

G.3.4 Parameters to monitor

- actual flaw length;
- actual wall thickness;
- actual flaw depth;
- upper and lower cycling pressure;
- pressurising medium used;
- temperature of the cylinder at the beginning and end of the test;
- number of cycles without failure;
- description of the failure.

G.4 Frequency of testing

G.4.1 Prototype testing

G.4.1.1 LBB test

This test shall be carried out for each new design (see **C.1.1** for the definition of a new design). Two cylinders selected from the batch of cylinders submitted to prototype testing shall be submitted to the LBB test. As applicable, all requirements in **C.1** and **C.3** shall be followed.

G.4.1.2 FCCT test

This test shall be carried out for each new design (see **C.1.1** for the definition of a new design). Two cylinders selected from the batch of cylinders submitted to prototype testing shall be submitted to the FCCT test. As applicable, all requirements in **C.1** and **C.3** shall be followed.