INTERNATIONAL STANDARD

ISO 11117

Second edition
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Gas cylinders — Valve protection caps and valve guards — Design, construction and tests

Bouteilles à gaz — Chapeaux fermés et chapeaux ouverts de protection des robinets — Conception, construction et essais

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11117 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

This second edition cancels and replaces the first edition (ISO 11117:1998) which has been technically revised.

Introduction

This International Standard covers devices intended for the protection of gas cylinder valves, where such protection is required, for example, where the valve is unable to meet the impact test requirements of the relevant valve standard to allow safe transport, handling and storage without such protection.

This International Standard specifies the principal dimensions, requirements for fitment and drop test procedure, to confirm the provision of adequate valve protection, in the event of the occurrence of a cylinder toppling from its base.

Gas cylinders — Valve protection caps and valve guards — Design, construction and tests

1 Scope

This International Standard specifies the requirements for valve protection caps and guards for gas cylinders.

This International Standard defines tests for checking the mechanical strength and physical properties of the valve protection cap or valve guard.

This International Standard applies to protection devices for valves used on cylinders for liquefied, dissolved or compressed gases. This International Standard excludes protection devices for cylinders with a water capacity of 5 l or less and cylinders whereby the protection device is fixed by means of lugs welded or brazed to the cylinder, or is welded or brazed directly to the cylinder. This International Standard does not cover valve protection for breathing apparatus cylinders.

This International Standard does not specify all the requirements that may be necessary to enable the valve protection device to be used for lifting the cylinder.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10297, *Transportable gas cylinders — Cylinder valves — Specification and type testing*

ISO 14245, *Gas cylinders — Specifications and testing of LPG cylinder valves — Self-closing*

ISO 15995, *Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
valve protection cap
cap
device securely fixed over the valve during handling, transportation and storage and which is removed for access to the valve

3.2
valve guard
guard
device protecting the valve during handling, transportation, storage

NOTE The guard need not be removed to provide access to the valve.

3.3
permitted mass
mass of the cylinder, together with its permanent attachments and test substance contents, as used during the drop test

See 6.7.

3.4
test valve
gas filling and/or dispensing device used to verify the guard or protection cap approval in accordance with this International Standard and which represents the valve of equal or lesser dimensions for which approved guards or protection caps provide suitable protection

4 General requirements

4.1 Cap

The cap shall be of adequate strength to protect the valve during handling and transportation.

It shall be capable of being securely fixed to the cylinder, either by screwed thread or other suitable means.

Provision should be made for assisted fitting or removal of the cap, for example, a hexagonal section.

Unless otherwise specified, the cap shall be provided with vent hole(s), e.g. by diametrically opposed vent holes of 10 mm diameter. Two diametrically opposite vent holes shall be provided, each of them having a minimum diameter of 10 mm. (When the cap has no vent hole, the valve outlet passage of the cylinder shall be plugged to prevent leakage and subsequent pressure build up in the cap.)

Caps designed for use with valve dimensions in accordance with ISO 10297, as applicable, shall conform to dimensions given in Figure 1 and preferably Figure 4 where a threaded fixing connection is used. Caps designed for use with valves with dimensions other than those given in ISO 10297 shall be tested with the intended largest valve. The cap shall be of such dimensions as not to contact any part of the valve.

See Tables 1 and 2.

4.2 Guard

The guard shall be of adequate strength to protect the valve during handling and transportation.

It shall be fixed so as to prevent easy removal by the end user or dismantling under normal service conditions.

The design shall permit ready access for valve operation and assembly of operational equipment. When the guard is of a rotating type, it shall be capable of manual orientation.

The clearance dimensions of the guard given in Figure 2 are typical for valves designed in accordance with ISO 10297. The centre of the opening in the guard shall be within $\pm$ 10 mm of the valve outlet axis. The opening shall not extend below the reference plane.

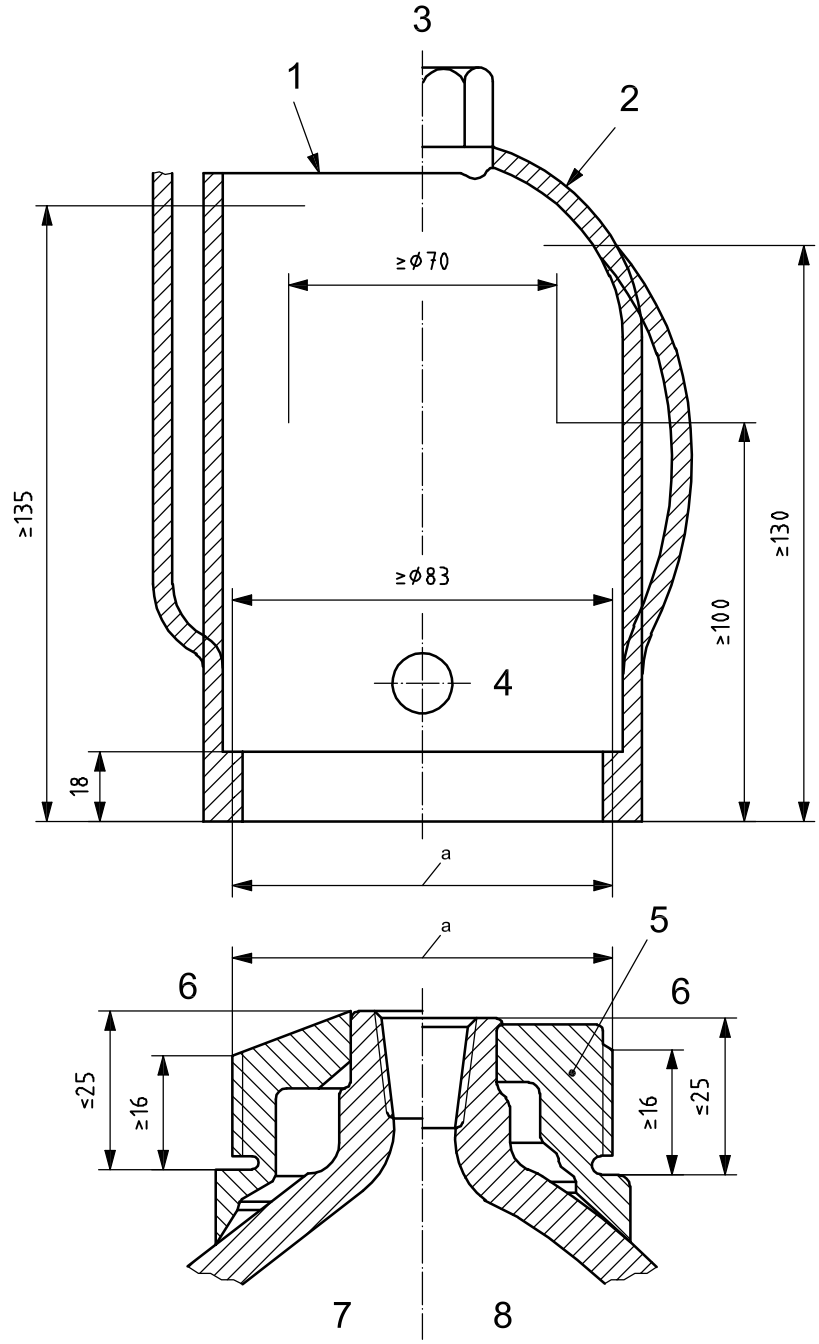
Where a threaded fixing connection is used, the preferred thread dimensions are given in Figure 4.

Figure 3 gives examples of guards.

4.3 Testing

Type testing of the protection devices shall be performed in accordance with the procedure described in Clause 6.

Dimensions in millimetres



Key

1	cap with open top	5	cylinder neck ring
2	closed cap	6	reference plane
3	cylinder axis	7	example A
4	vent Ø $\geqslant$ 10 mm	8	example B

[a] Ø 80 × 2,309 Whitworth.

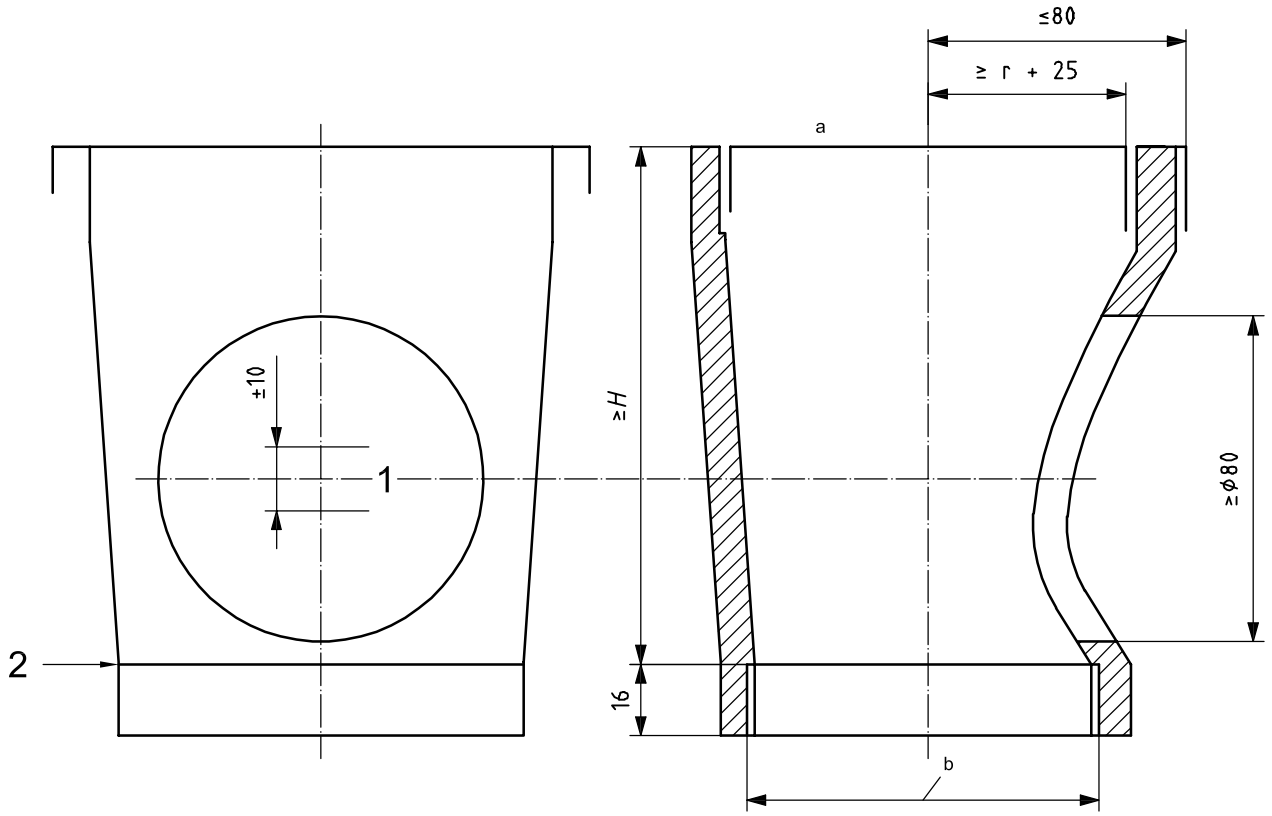
NOTE 1 The outlines and dimensions given are typical for caps in common use. Any other shape or dimension can be used, provided they give appropriate clearance around the valve.

NOTE 2 The preferred 80 mm fixing connection is shown. Alternative sizes, e.g. 78 mm, can be used. Caps for such cylinders should have the appropriate dimensions.

NOTE 3 For open tops, water drainage should be considered.

Figure 1 — Basic dimensions of valve protection caps and neck rings

Dimensions in millimetres



Key

H height of the guard (at least 1 mm greater than the projection of the fully open valve above the reference plane)

r maximum radius of handwheel

1 axis of the valve outlet

2 reference plane

a Measured at the lowest position of the handwheel.

b Ø 80 × 2,309 Whitworth.

NOTE 1 The outlines and dimensions given are typical for guards in common use. Any other shape or dimensions can be used, providing they give appropriate clearance around the valve.

NOTE 2 The preferred 80 mm fixing connection is shown. Alternative sizes, e.g. 78 mm can be used. Guards for such cylinders should have the appropriate dimensions.

NOTE 3 For valve details see ISO 10297, ISO 14245 and ISO 15995.

NOTE 4 Provisions for water drainage should be considered.

Figure 2 — Basic dimensions of valve guard

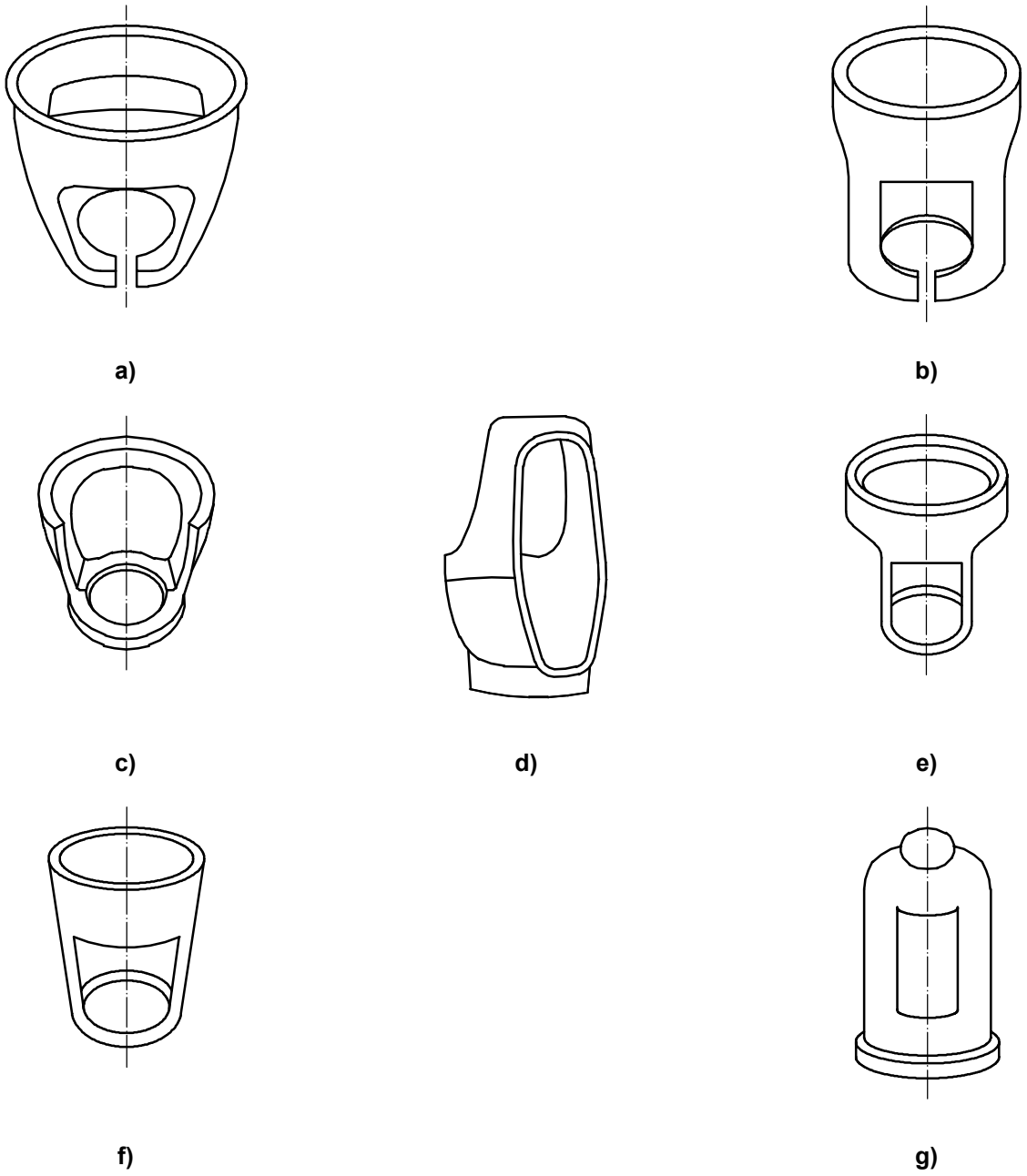
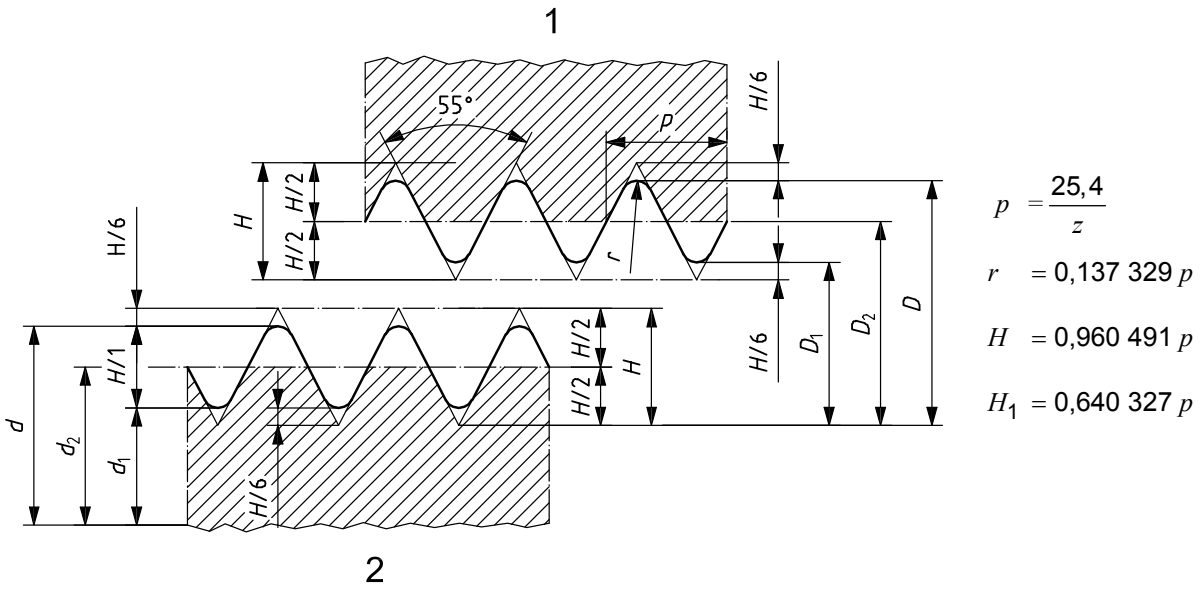


Figure 3 — Examples of valve guards



$$p = \frac{25,4}{z}$$

$$r = 0,137\,329\,p$$

$$H = 0,960\,491\,p$$

$$H_1 = 0,640\,327\,p$$

Key

1 cap or guard thread profile

2 cylinder neck ring thread profile

NOTE Other recognized thread forms are permitted, provided that all test requirements of this International Standard are met.

Figure 4 — Thread

Table 1 — Dimensions of the thread

Dimensions in millimetres

Nominal diameter	Major diameter $d = D$	Pitch diameter $D_2 = D_2$	Minor diameter $D_1 = D_1$	Pitch p	Number of threads per inch z	Thread height H_1	Radius r
W 80	80	78,521	77,042	2,309	11	1,479	0,317

Table 2 — Tolerances of the thread

Dimensions in millimetres

Nominal diameter	Cylinder neck ring			Cap or guard		
	Major diameter d	Pitch diameter d_2	Minor diameter d_1	Major diameter D	Pitch diameter D_2	Minor diameter D_1
W 80	−0,055	0	0	[a]	+0,280	+0,630
	−0,530	−0,280	−0,450	0	0	+0,155

[a] No maximum tolerance is specified but satisfactory operation shall be ensured.

5 Materials

The cap or guard shall withstand impacts and falls throughout the whole range of operating temperatures from −20 °C to +20 °C. The relationship between material properties and operating temperature shall be taken into account. The cap or guard shall be designed to withstand local temperature conditions outside this range if specified.

The cap or guard material shall be adequately resistant to atmospheric conditions and the transported product, including solvents [e.g. acetone, dimethylformamide (D.M.F)].

6 Type testing

6.1 General

These tests qualify the protection device for use, only with valves of maximum dimensions equal to, or less than, that of the test valve, and with cylinders plus contents (gross mass) equal to or less than the permitted weight (see 3.3).

6.2 Documentation

The following documents shall be available:

— a description of the protection device and the method by which it is fixed to the cylinder;

— a complete set of drawings, identifying all dimensions and material specifications of the protection device;

— details of the intended service conditions, the intended valves and the intended cylinders;

— limitations on use, due to material incompatibility with the cylinder contents.

6.3 Number of test samples

Thirteen samples shall be submitted for type testing:

— sample 1 for the torque test (if applicable);

— sample 2 for the axial test;

— samples 3 to 8 for the room temperature drop test;

— samples 9 and 10 for additional drop tests (see 6.7.5);

— samples 11 and 12 for extreme temperature tests;

— sample 13 for any additional test which may be required.

6.4 Preliminary check

The design of the protection device shall be checked for conformity with the documentation submitted and with the requirements of Clauses 4 and 5.

6.5 Torque test (one test)

Non rotational metallic valve guards, fixed to the cylinder by means of a screw thread, shall be tested to ensure that an applied torque of 70 N·m does not cause the guard to rotate. Non-rotational polymeric valve guards, fixed to the cylinder by means of a screw thread, shall be tested to ensure that an applied torque of 30 N·m does not cause the guard to rotate.

The cylinder neck ring test piece for this test shall have the minimum thread dimensions allowed in order to ensure the loosest fit permitted by the tolerances.

6.6 Axial test (one test)

The fixing of the protection device shall be tested axially.

The fixing shall not disengage or loosen and the protection device shall not be significantly damaged under an axial tensile load, equivalent to four times the weight of the filled cylinder to which it will be fitted.

NOTE The axial pull test should not be interpreted to imply that lifting of cylinders by the valve protection is an acceptable or safe practice.

6.7 Drop test

6.7.1 The protection device shall be tested to prove that under rough handling conditions, the test valve maintains its operability.

This test shall be carried out with the cap or guard at room temperature $20\left(\begin{smallmatrix}+10\\-5\end{smallmatrix}\right)$ °C and at $-20\left(\begin{smallmatrix}0\\-5\end{smallmatrix}\right)$ °C or a lower temperature if specified (see Clause 5).

6.7.2 The protection device together with the test valve for which it is intended shall be fitted to a test cylinder.

This assembly shall be dropped vertically from a height of 1,20 m on to an impact surface, as specified in 6.7.3.

6.7.3 The impact surface shall be a concrete block of at least 1 m × 1 m by 0,1 m thick. The block shall be protected by a sheet of steel of at least 10 mm thick. The flatness of the protective sheet shall be such that the difference in level of any two points on its surface shall not exceed 2 mm. It shall be changed when it is significantly damaged.

6.7.4 The cylinder for this test shall be the heaviest cylinder with which the device is to be used, filled with a quantity of water or other substance appropriate to the test temperature so as to equal the desired permitted mass.

6.7.5 Prior to drop testing, the assembly shall be suspended with the cylinder longitudinal axis at an angle of 30° to the vertical, the cap or guard directed downwards. There shall be a distance of 1,20 m between the lowest point of the guard or cap and the impact surface.

6.7.6 Six to eight caps or guards of the same type shall be tested. The drop test shall be carried out at six points, an equal 60° apart, on the top circumference of the protection device.

Each of the six caps or guards shall be subjected to the drop test at one single impact point. Two additional tests with the reserved samples may be carried out at the impact area where the protection device appears to be weakest.

The extreme temperature test shall be carried out on the samples at the same weakest impact area.

6.7.7 After the completion of the drop test, minor deformation of the test valve is acceptable. Such deformation shall not affect the operability of the valve.

6.7.8 A cylinder test valve is defined as operable if no external leakage of gas occurs, either from the valve itself or from the joint of valve and cylinder and if it remains capable of being opened and closed by hand or by using a simple tool or actuating connector (e.g. a valve key). The leak tightness (internal, external, valve to cylinder connection) of the valve shall be verified after the drop test by pressurizing the cylinder to a minimum of 1 bar.

The cylinder may be pressurized before or after the drop test.

6.7.9 If, during the test, no visible damage occurs to the test valve, the protection device shall be accepted for use with all valves of maximum dimensions not exceeding those of the test valve, and for use only with cylinders not exceeding the permitted mass, when full, of the test cylinder.

6.7.10 If, during the test, visible damage occurs to the test valve, but the damage does not affect the operability of the valve, the protection device shall be accepted for use only with the specific valve and cylinders, not exceeding the permitted mass, when full, of the test cylinder.

7 Marking

Protection devices, which fulfil the requirements of this International Standard, shall have the following permanent markings:

— “ISO P”;

— the manufacturer's identity;

— permitted mass (e.g. “100 kg”);

— marking of date (year and month) of manufacture for non-metallic caps and guards;

— tests made at temperatures outside the range.

Additional markings may be required.

Caps shall also comply with Annex A.

8 Test report

The report of the test body shall include:

— the documentation as described in 6.2;

— the dimensions of the test valve;

— the test conditions;

— results from the tests in accordance with 6.4 to 6.7.

A copy of this report shall be kept by the test body.

Annex A
(normative)

Marking of caps

Caps which comply with this International Standard shall have a suffix identification mark according to Table A.1.

Table A.1 — Cap letter designations

Valves associated with ISO standard	Cap letter designation
ISO 10297	A
ISO 14245	B
ISO 15995	B
Other	C

EXAMPLE A cap marking for a cap meeting the requirements of this International Standard for an ISO 10297 valve would be:

ISO P A

ICS 11.040.10; 23.020.30

Price based on 10 pages