भारतीय मानक **IS 8776 : 2024**

Indian Standard

13 लीटर पानी की क्षमता तक के द्रवित पेट्रोलियम गैस (एलपीजी) सिलिंडरो के साथ उपयोग के लिए वाल्व फिटिंग — विशिष्टि

(दूसरा पुनरीक्षण)

Valve Fittings for Use with Liquefied Petroleum Gas (LPG) Cylinders up to and Including 13 Litre Water Capacity — Specification

(Second Revision)

ICS 23.060.40; 23.020.30

भारतीय मानक ब्यूरो
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Gas Cylinders Sectional Committee, MED 16

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Gas Cylinders Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

This standard was published in 1988 covering valve fittings for use with liquefied petroleum gas (LPG) cylinders for up to and including 5 litre water capacity which may be used with newly manufactured LPG cylinders.

This standard was first published in 1978 and subsequently revised in 1988. This standard is being revised again to keep pace with the latest technological developments and international practices. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act*, 2016.

The following major modifications have been incorporated in this revision of the standard:

a) Scope revised to include cylinders up to 13 litre water capacity;
b) Terminology incorporated;
c) Additional tests for non-metallic materials have been included;
d) Inlet threads Type 1 is included; and
e) Type test included.

The purpose of this standard is to provide a specification for the design, manufacture, inspection and testing of valve fittings for use with Liquefied Petroleum Gas (LPG) of up to 13 litre water capacity.

In the preparation of this standard assistance has been derived from IS 8737 : 2017 ‘Valve fittings for use with liquefied petroleum gas (LPG) cylinders for more than 5 litre water capacity — Specification (*second revision*)’ and ISO 14245 : 2006 ‘Gas cylinders — Specifications and testing of LPG cylinder valve self-closing’.

While implementing this standard, the manufacturer and the inspection agency shall ensure compliance with statutory regulations. It is the responsibility of the owners and the users to ensure that the cylinders are periodically tested as per norms laid down in *Gas Cylinder Rules*, 2016 as amended from time-to-time and as enforced by statutory authorities under the rules.

The relevant SI units and corresponding conversion factors are given below for guidance:

1 kgf/cm^2 = 98.066 5 kPa (kilopascal) = 10 m of Water column (WC)
= 0.08066 5 MPa (megapascal)
= 0.980 665 bar
1 Pa = 1 N/m^2

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

VALVE FITTINGS FOR USE WITH LIQUEFIED PETROLEUM GAS (LPG) CYLINDERS UP TO AND INCLUDING 13 LITRE WATER CAPACITY — SPECIFICATION

(Third Revision)

1 SCOPE

This standard specifies the basic requirements of material, dimensions and testing of valve fittings for liquefied petroleum gas (LPG) gas cylinders up to and including 13 litre water capacity. The standard covers the following types of valves:

a) Valves with parallel inlet threads, Type A; and

b) Valves with their bodies directly welded to the cylinder, Type B;

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Valve Body — The major valve component which includes an inlet and an outlet.

3.2 Spindle — The element of the valve which when operated directly or indirectly actuates the sealing member (seal) to ‘open’ or ‘closed’ position.

3.3 Sealing Face — The fixed contact face in the valve body for completing the seal of the gas flow.

3.4 Valve Stem — The inlet connection of the valve which fits on to the cylinder.

3.5 Valve Outlet — The service connection of the valve which is connected to the application device.

3.6 Cylinder Neck — The part of the cylinder that has the threaded connection for the valve stem.

3.7 Quick Coupling Connection — System which enables an appliance or equipment to be connected to a cylinder valve without the use of tools.

3.8 Liquefied Petroleum Gas (LPG) — A hydrocarbon product composed predominantly is a mixture of butane (n and iso) and/or butylene with propane and/or propylene of maximum vapour pressure of 1.66 MPa (17 kgf/cm^2) at 65 °C temperature.

3.9 Leak — An unintended flow of gas in excess of 4 Nmm^3/s at NTP (*see* **3.13**). N indicates conversion to NTP.

3.10 Type Test — Test or series of tests conducted to prove that the design meets the requirements of this standard.

3.11 Production Test/Routine Test — Test or series of tests conducted to accept a production batch.

3.12 Cylinder Valve — Mechanical device attached to a compressed gas cylinder that permits flow into or out of the cylinder when the device is in the open position and prevents flow when in the closed position.

3.13 NTP — Normal temperature and pressure [20 °C (293.15 K), 1.013 bar absolute (0.101 3 MPa absolute)].

3.14 Working Pressure — The maximum developed pressure in cylinder at temperature of 65 °C.

3.15 Sealing Cap — Device fitted to or integral with the outlet of the cylinder valve to provide secondary closure.

4 MATERIALS

4.1 All components used in valve construction shall be made of material compatible with LPG and with the material of the cylinder [*see* IS/ISO 11114 (Part 1) and IS/ISO 11114 (Part 2)]. The material of the valve body shall comply with the properties given in **4.2**, **4.3** and **4.4**.

4.2 Type A — The valve body shall be forged from wrought or extruded sections.

Type B — The valve body shall be made of free cutting steel and machined from cold drawn bars.

4.2.1 *Chemical Composition*

The chemical composition of brass alloy shall have the following elements and composition:

Sl No	*Element*	*Composition* (*in percent*)
(1)	(2)	(3)
i)	Copper (Cu)	56.5 to 60
ii)	Lead (Pb)	1.0 to 2.0
iii)	Iron (Fe)	0.3, *Max*
iv)	Manganese (Mn)	0.5, *Min*
v)	Others	0.75, *Max* (inclusive of Iron)
vi)	Zinc	Remainder

4.2.2 The physical properties and chemical composition of the Type B valve body shall be free cutting cold drawn steel bar of grade 11C10S25 suitably added with lead as per IS 4431.

4.3 Tensile Strength and Elongation

4.3.1 The tensile strength and elongation of the material of valve body when determined according to IS 1608 (Part 1) shall be at least 392 MPa (40 kgf/mm^2) and 18 percent measured on a gauge length 5.65 $\sqrt{S_o}$, S_o is the original area of cross-section.

4.3.2 During tensile test if the specimen breaks outside the gauge length and has not elongated as specified in **4.3.1** then either for acceptance IS 1608 may be referred or else the specimen may be ignored not treated as having failed. In that case a new sample test shall be taken and retested.

4.4 Impact strength the Izod impact strength of the material of valve body when determined according to IS 1598 or other applicable specification shall not be less than 21.5 N.m (2.2 kg.m) for brass.

4.5 Test Samples

Test samples for tensile and Izod impacts tests shall, where practicable, be taken from a valve body blank; where this is not practicable, the test sample shall be forged from the same raw material (wrought or extruded section) giving the same outside shape as the valve body blanks it represents. The scale of sampling and criteria for conformity shall be accordance with the requirement of Annex B, unless otherwise agreed between the manufacturer and the purchaser.

4.6 Non-metallic Materials

In contact with LPG shall be compatible with LPG and shall not distort, harden or adhere to the body or seat face to such an extent as to impair the function of the valve and shall also comply with the relevant requirement as stipulated in IS 9798 and for ozone test IS 3400 (Part 20).

5 SCREW THREADS ON THE VALVE STEM AND IN CYLINDER NECK (VALVE INLET THREADS)

5.1 Parallel Threads

In case of parallel threads for the Type A valves.

5.1.1 The valve inlet of Type A (*see* **1**) shall be provided with parallel inlet threads conforming to IS 4218 (Part 3) or any other size as approved by the statutory authority. They shall be not less than 20 mm nominal size and shall be of fine pitch. The length of the thread stem shall not be less than half the diameter.

5.1.2 The body of valve having parallel threads shall be so designed that, it shall not be possible to unscrew the valve from cylinder neck by normal standard tools.

5.2 Welded Type

In case of valves of Type B, the valve body made out of steel may be welded to cylinder body and parts assembled.

6 VALVE OUTLET CONNECTIONS

Valve outlet connection will be as agreed between manufacturer and the purchaser.

7 DESIGN REQUIREMENTS

The construction of valve shall be such that same would satisfy all the basic functional and safety requirements.

7.1 Valve shall be self-sealing type as agreed between the manufacturer and the purchaser.

7.2 All valves with threaded outlet connections shall be provided with suitable security nuts to prevent damage to threads and leakage of gas. All valve without threaded outlet connections shall be provided with suitable security caps.

7.3 The minimum finished wall thickness at any portion of the valve shall not be less than 1.9 mm. However, this requirement may be relaxed in the case of sections not susceptible to tamper, damage or rupture during use, or where any damage or rupture to the section will not effect the sealing off of the valve.

7.4 Maximum working pressure shall be 1.67 MPa (17 kgf/cm^2) at 65 °C (vapour pressure of LPG at 65 °C).

7.5 All rubber and other moulded parts coming in contact with LPG in the construction of the valve shall be compatible with LPG, when tested according to Annex D of IS 9798. All rubber and other moulded parts shall be suitable for extreme climatic conditions in which the valve is likely to be used, the range of temperature being -20 °C to + 65 °C. The method of test shall be according to Annex H of IS 9798.

7.6 Valves shall not be provided with safety relief device.

7.7 The general matching tolerances unless otherwise stated shall be of medium class specified in IS 2102 (Part 1).

8 TESTS

8.1 Stress Corrosion Test for Copper Alloy

Brass components of the valve shall be subjected to mercurous nitrate test in accordance with IS 2305 the sample shall show no sign of cracking after the test.

8.2 Hydrostatic Tests

Representative samples of machined valve bodies, before assembly, shall be subjected to a hydrostatic test at l.5 times the maximum working pressure at which it is envisaged that valve will be used. The scale of sampling and the criteria of conformity shall be the same as that adopted for the tensile strength and elongation test or the Izod impact test as given in **4.4** or more stringent, if agreed to between the manufacturer and the purchaser.

8.3 Pneumatic Test

Each assembled valve shall be subjected to pneumatic proof tests at pressures specified in **8.3.1** and **8.3.2** and checked for shut off and leak tightness/soundness for a test period of 15 s. The valve shall be considered to be leak tight if the leakage rate does not exceed 4 × N mm^3/s (The symbol 'N' indicates conversion to normal temperature pressure condition, NTP that is 760 mm of Hg and 20 °C temperatures). For conducting the pneumatic proof tests under **8.3.1** and **8.3.2** on assembled valves, test set-ups with pressure differentio-meters, bubble leak detectors or such appropriate devices shall be used to detect and/or measure leakages. Use of water or any other liquid medium likely to enter the assembled valve shall be strictly avoided.

8.3.1 *Tightness of Valve Spindle and Valve Housing*

This test shall be carried out with valve spindle in closed position. The test shall be carried out both at 0.25 kgf/cm^2 and at maximum working pressure applied to the inlet of the valve housing (body).

8.3.2 *Tightness of Housing for Threaded Outlet*

A threaded connector shall be used to make a leak-proof joint with outlet which also depresses valve spindle to open position. A test pressure not less than the maximum working pressure shall be applied to the inlet of the valve housing (body).

8.3.3 The leak rate for internal and external tightness shall not exceed 4 N.mm^3/s of air at standard temperature and pressure at specified pressure range.

9 TYPE APPROVAL TESTS

Following are the prototype test to be carried out once or at the time of type approval change of type.

9.1 Design and Fabrication

Before the design of the valve is approved it shall be checked for conformity to all requirements of this standard. Whenever there is a change in material of any component or change in any design, type approval tests shall be repeated and shall meet all the requirement of the standard.

9.2 Cycle Test

The valve shall perform satisfactorily for 5 000 cycles of opening and closing operations with valve

inlet connected to an air/nitrogen supply and the opening travel of the spindle shall not be less than three quarter of its maximum designed travel during the test. After the cycle test, the valve shall be subjected to the pneumatic test given in **8.3** and shall perform satisfactorily.

NOTE — Procedure defined in Annex C.

9.3 Operation Test

9.3.1 *Procedure*

a) The number of cycles is one (one valve);
b) The relevant matching connector or application as advised by the manufacturer/purchaser shall be attached to the valve;
c) The sealing element should be subjected to maximum working pressure; and
d) The valve shall be opened and closed using the mechanism on the matching connector.

9.3.2 Requirement

The opening and closing operation shall be carried out without causing damage or deformation to either the valve or the matching connector.

9.4 Valve Fitting Testing Torque

9.4.1 *Procedure*

9.4.1.1 A rigidly anchored steel test rig/bung of the same inlet thread is to be used for the test. The inlet thread of the steel test rig/bung and the inlet threading of the valve test sample should be gauged for acceptance before carrying out the test.

9.4.1.2 The threaded valve stem shall be tightened to the torque of 80 Nm.

The torque value given is intended for the sole purpose of giving an indication of strength of valve stem and shall not be used for operational applications.

9.4.1.3 *Requirement*

There shall be no sign of shearing/cracking. Deformation in the valve thread is acceptable.

10 MARKING

10.1 Each valve shall be permanently marked with the following information:

a) Quarter and year of manufacture;
b) Manufacturer’s identification mark;
c) Number of this standard; and
d) Maximum working pressure, in MPa.

10.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No	*Title*	*IS No*	*Title*
IS 1598 : 1977	Method for Izod impact test of metals (*first revision*)	IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 1608 (Part 1) : 2022/ISO 6892-1 : 2019	Metallic materials — Tensile testing: Part 1 Method of test at room temperature (*fifth revision*)	IS 9798 : 2013	Low pressure regulators for use with liquefied petroleum gas (LPG) — Specification (*second revision*)
IS 2102 (Part 1) : 1993/ISO 2768-1 : 1989	General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indication (*third revision*)	IS/ISO 11114-1 : 2020	Gas cylinders — Compatibility of cylinders and valve materials with gas contents: Part 1 Metallic Materials (*first revision*)
IS 2305 : 1988	Method for mercurous nitrate test for copper and copper alloys (*first revision*)	IS/ISO 11114-2 : 2013	Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents: Part 2 Non-metallic materials
IS 3400 (Part 20) : 2018/ISO 1431-1: 2012	Methods of test for vulcanized rubbers: Part 20 Resistance to ozone cracking — Static strain test (*second revision*)		
IS 4431 : 1978	Specification for carbon and carbon-manganese free-cutting steels (*first revision*)		

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ANNEX B

(*Clause* 4.5)

SAMPLING PLAN FOR EVALUATION OF MECHANICAL PROPERTIES OF THE VALVE MATERIAL

B-1 SCALE OF SAMPLING

B-1.1 Lot

All the valve blanks of the same material, size and produced under similar conditions of manufacture shall grouped together to constitute a lot.

B-1.1.1 Valve blanks shall be selected from each lot separately and then tested for ascertaining their conformity to the requirements of mechanical properties.

B-1.1.2 The number of valve blanks to be selected from a lot shall depend upon the size of the lot and shall be in accordance with col (2) and col (3) of Table 1. All the samples shall be taken randomly from the lot and for this purpose reference may be made to IS 4905.

B-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 All the valve blanks selected according to col (3) of Table 1 shall be tested for tensile and elongation.

B-2.2 The lot shall be declared as conforming to the requirements of mechanical properties if it has been found satisfactory when sampled according to **B-2.1** and conforms to requirements of **4.3** and **4.4**. If any test sample fails to meet the requirements of **4.3** or **4.4**, additional specimens equaling twice the number of sample size for the failed test in the same lot shall be taken and tested for the failed test only. If any of these specimens again fail to meet the requirements, the entire lot represented shall be rejected.

Table 1 Scale of Sampling

(*Clauses* B-1.1.2 *and* B-2.1)

Sl No.	Numbers of Valve Blanks in the Lot	Sample Size for Tensile Strength and Elongation
(1)	(2)	(3)
i)	Up to 500	5
ii)	501 to 3 200	7
iii)	3 201 to 10 000	10
iv)	10 001 to 35 000	16
v)	35 001 and above	25

ANNEX C

(*Clause* 9.2)

PROCEDURE FOR CARRYING OUT CYCLE TEST

C-1 PROCEDURE

C-1.1 The valve inlet shall remain pressurized throughout the entire test. The valve outlet is connected to a venting device that remains closed during closing and opening position of the cycle. After each closure, by opening the venting device, the pressure downstream of the valve seat shall be released to atmosphere to reach atmospheric pressure.

C-1.2 For self-sealing spring-loaded valves 5 000 cycles of opening and closing shall be performed.

C-2 PROCEDURE FOR SELF-SEALING VALVES

Sample subjected to leak tightness shall be used for cycle test. The test shall be carried out using air or nitrogen. The temperature shall be room temperature. The valve inlet is pressurized with 7 bar. From the closed position, the valve operating mechanism shall be moved three quarter of its maximum travel to the open position and closed again. After each closure, the pressure downstream of the seat shall be release to atmosphere. The cycle time shall be minimum of 5 s. Care shall be taken to ensure that there shall be no excessive temperature raise due to friction in the valve.

C-2.1 Requirement

After completion of 5 000 cycles, test sample will be tested for leak tightness test as per **8.3** and also checked for deformation, wear and cracks. Any failure, deformation, excessive wear or cracks that affect the normal operation of the valve shall be a cause for rejection.

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Gas Cylinder Sectional Committee, MED 16

Organization	*Representative*(*s*)
Petroleum and Explosive Safety Organization, Nagpur	SHRI P. KUMAR **(*Chairperson*)** SHRI P. SEENIRAJ SHRI K. S. RAO (*Alternate*)
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