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Draft Indian Standard

**ROAD VEHICLES — COMPRESSED NATURAL GAS (CNG) FUEL SYSTEM COMPONENTS
— AUTOMATIC VALVE (SOLENOID VALVE)**

ICS : 43.060.40

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Automotive Vehicles Running on Non-conventional Energy Sources Sectional Committee, TED
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(Formal Clause to be added later)

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Vehicles Running on Non-conventional Energy Sources Sectional Committee had been approved by the Transport Engineering Division Council.

In the formulation of this standard considerable assistance has been derived from the following standards issued by the Automotive Research Association of India and the International Organization for Standardization respectively:

AIS 024 (And 4 to version 3) — Safety and procedural requirements for type approval of CNG operated vehicles

AIS-028 (Version 3) — Code of practice for use of CNG fuel in internal combustion engine vehicles

ISO 15500-1:2001 — Road vehicles — Compressed natural gas (CNG) fuel system components — Part 1: General requirements and definitions

The composition of the Committee responsible for the formulation of this standard is given in Annex-##

(To be added later)

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 : 1960 'Rules for rounding off numerical values (*revised*)'. 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***ROAD VEHICLES — COMPRESSED NATURAL GAS (CNG) FUEL SYSTEM COMPONENTS — AUTOMATIC VALVE (SOLENOID VALVE)****1 SCOPE**

1.1 This standard specifies tests and requirements of automatic valve (Solenoid valve) of Bio CNG and CNG onboard fuel system components, intended to use on motor vehicles defined in IS 14272 (Part 1), two wheelers, construction equipment vehicles (CEV).

1.1.1 This standard is applicable to Bio CNG and CNG fuel system components intended to use on vehicles using compressed natural gas in accordance with IS 15320 (mono-fuel or bi-fuel or dual fuel applications). It is not applicable to the following:

- a) Liquefied natural gas (LNG) fuel system components located upstream of, and including, the vapourizer;
- b) Fuel containers;
- c) Stationary gas engines;
- d) CNG fuel systems components for the propulsion of marine craft;
- e) Container Mounting hardware;
- f) Electronic fuel management;
- g) Re-fuelling receptacles.

1.1.2 This standard is based upon a service pressure for compressed natural gas as a fuel at 20 MPa (200 bar) settled at 15°C. Other service pressures could be accommodated by adjusting the pressure by the appropriate factor (ratio). For example, a 25 MPa (250 bar) service pressure system will require pressures to be multiplied by 1.25. All references to pressure are to be considered gauge pressures unless otherwise specified.

2 REFERENCES

The following standards 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 editions of the standards indicated below.

<i>IS No.</i>	<i>Title</i>
14272(Part 1): 1995	Automotive vehicles — Types - Terminology: Part 1 Three and four wheelers
15320: 2003/ ISO 15403	Natural gas — Designation of the: quality of natural gas for use as 2000 compressed fuel for vehicles
15710	Road vehicles Compressed natural gas (CNG) fuel system components General requirements and definitions
15711	Road vehicles -Compressed natural gas (CNG) fuel system component - 1 Performance and general test methods

3 TERMS AND DEFINITIONS

For the purpose of this standard, the terms and definitions given in IS 15710 and the following shall apply:

3.1 Automatic (Solenoid) Valve — On/Off valve for controlling flow of gas that is not manually operated.

4 CONSTRUCTION AND ASSEMBLY

4.1 The automatic valve shall comply with the applicable provisions of IS 15710 and IS 15711 and with the tests specified in 5. All automatic valves, including solenoid valves, cylinder valves and valves with manual by-pass, shall comply with the tests specified in 5.

4.2 An automatic valve shall be closed when de energized.

4.3 An automatic valve with manual by-pass shall meet the minimum requirements of this standard.

Test	Applicable	Test procedure as required by IS 15711	Specific test requirements of this part of this standard
Hydrostatic strength	X	X	X (see 5.2)
Leakage	X	X	X (see 5.3)
Excess torque resistance	X	X	
Bending moment	X	X	
Continued operation	X	X	X (see 5.4)
Corrosion resistance	X	X	
Oxygen ageing	X	X	
Ozone ageing	X	X	
Heat Ageing	X	X	
Automotive Fluids	X	X	
Electrical overvoltages	X	X	
Non-metallic material immersion	X	X	
Vibration resistance	X	X	
Brass material compatibility	X	X	
Insulation resistance	X		X (see 5.5)
Minimum opening voltage	X		X (see 5.6)
Pressure impulse	X		X (see 5.7)

5 TESTS

5.1 Applicability

The tests required to be carried out are indicated in Table 1.

5.2 Hydrostatic Strength

Test the automatic valve according to the procedure for testing hydrostatic strength specified in IS 15711. The test pressure shall be 2.5 times the working pressure.

5.3 Leakage

Test the automatic valve according to the procedure for leakage testing as per clause 6 of IS 15711

5.4 Continued Operation

Test the automatic valve in accordance with the procedure for testing continued operation given in IS 15711, for 50 000 cycles, but lower the downstream pressure of the test fixture to less than 2 % of working pressure, and perform the leakage test in accordance with 5.3. The valve shall continue to operate according to the manufacturer's specifications.

5.5 Insulation Resistance

This test is designed to check for a potential failure of the insulation between the two-pin coil assembly and the automatic valve casing.

If the automatic valve is electrically operated and is to be used inside a gas-tight housing, it shall be intrinsically safe as defined in IEC 60079-10-1.

Apply 1 000 V dc between one of the connector pins and the housing of the automatic valve for at least 2 s. The minimum allowable resistance shall be 240 ka

5.6 Minimum Opening Voltage

The minimum opening voltage at room temperature shall be < 8V for a 12V system and < 16 V for a 24 V system. The component shall be pressurized at 0,75 times working pressure during the test.

5.7 Pressure Impulse

The automatic valve that is exposed in service to cylinder pressure, shall withstand 100 pressure pulses, as follows.

- a) If the automatic valve is external, connect both inlet and outlet to a pipe or tube of the type specified by the manufacturer and of at least 1 m in length each.
- b) If the automatic valve is mounted to or inside the cylinder valve, the cylinder valve containing the automatic valve shall be connected securely by a suitable fitting to a pressurized source of dry air, nitrogen or natural gas. Connect the outlet to a pipe or tube of the type specified by the manufacturer and of at least 1 m in length each.
- c) The outlet of the automatic valve shall be vented until the inlet is at atmospheric pressure, and then the outlet of the valve shall be closed.
- d) Working pressure shall be instantaneously applied to the inlet.
- e) Test the component in the same way with reverse flow direction.

Following the pressure impulse test, the automatic valve should operate according to the manufacturer's specification.

This test was included in order to evaluate the performance of the components that may suffer from the effects of an instantaneous increase in pressure. In normal service, this may happen, for example, when filling gas in an empty system or when a solenoid valve opens the flow of gas to an empty fuel line. Previous tests have revealed that certain designs cannot cope with these instantaneous pulses and the components tend to bend or jam.

6 MARKING

6.1 Each automatic valve shall be legibly and indelibly marked with the following:

- a) Manufactures name, trade-mark or symbol,
- b) Part No. or unique identification mark,
- c) Working pressure and temperature range or service Pressure, and
- d) Date of manufacture or batch number, and

Note- Not applicable if is the integral part of pressure regulator and on which appropriate marking exists.

6.2 BIS Certification Marking

Each automatic valve may also be marked with the BIS Standard Mark.

6.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 TECHNICAL INFORMATION TO BE SUBMITTED BY THE COMPONENT MANUFACTURER

Technical information to be submitted by the component manufacturer for component type test (Type approval) shall contain at least following information:

- a) Name of the manufacturer,
- b) Manufacturing plant address,
- c) Part number,
- d) Type No./Model No.,
- e) Working pressure,
- f) Rated voltage of the solenoid coil,
- g) Operating temperatures, and
- h) Drawings with relevant dimensions and materials.

8 NUMBER OF SAMPLES FOR TESTING

Minimum 9 numbers of the automatic valve (Solenoid valve) assemblies shall be submitted to the test agency for complete type testing along with minimum 10 numbers each of the non-metallic

parts used in the automatic valve (Solenoid valve) assembly. Each nonmetallic part shall be submitted separately in the packets mentioning details like part name, part No. and quantity.

9 TYPE TEST (TYPE APPROVAL)

For type approval automatic valve (Solenoid valve) shall meet the requirements as specified in this standard.

10 ACCEPTANCE TEST (CONFORMITY OF PRODUCTION)

For the purpose of acceptance test, automatic valve

(Solenoid valve) manufactured shall conform to following test requirements as specified in relevant clauses of this standard (*see* Table 1):

- a) Hydrostatic strength test,
- b) Leakage test,
- c) Corrosion resistance test,
- d) Non-metallic synthetic immersion test,
- e) Oxygen ageing,
- f) Brass material compatibility, and
- g) Over voltage test.

NOTE — Frequency of tests will depend upon the duration of tests.

11 CHANGE IN TECHNICAL SPECIFICATIONS OF A TYPE APPROVED COMPONENT AND EXTENSION OF APPROVAL

Any modification in technical specification of already type approved component shall require re-type test/ extension of approval at the discretion of test agency, based on the justification provided by the component manufacturer and reviewed by the test agency, which has granted type approval.

12 BIS Certification Marking

The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.