

BUREAU OF INDIAN STANDARDS

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भारतीय मानक प्रारूप

**सड़क वाहन – संपीडित प्राकृतिक गैस (सीएनजी) ईंधन प्रणाली के घटक – स्वचल
वाल्व (सोलीनोयड वाल्व)
(प्रथम संशोधन)**

Draft Indian Standard

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

ICS : 43.060.40

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Automotive Vehicles Running on Non-Conventional Energy Sources Sectional Committee,
TED 26

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 (TEDC).

This standard was first published in 2006 to specify tests and requirements of automatic valve (Solenoid valve) of CNG on board fuel system components, intended to use on motor vehicles defined in IS 14272. In this Revision, Bio- CNG is added to the scope of this standard keeping in view the technological advancements that have taken place since its last Publication. The revised version also incorporates the Amendment issued to the standard in 2012. Clause 5 has been suitably renumbered to incorporate requirement of the amendment. (Leakage test to be done in accordance with clause 6 of IS 15711).

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(Rev.1) (Part A):- Safety and Procedural Requirements for Type Approval of Gaseous Fuelled Vehicles - Part A (Automotive Application).

AIS 024(Rev.1) (Part B):- Safety and Procedural Requirements for Type Approval of Gaseous Fuel Agricultural Tractors - Part B (Agricultural Tractors Application).

AIS 024(Rev.1) (Part C):- Safety and Procedural Requirements for Type Approval of Gaseous Fuel Vehicles - Part C (CEV's Application).

AIS 028(Rev.1) (Part A):-Code of Practice for Use of Gaseous Fuels in Internal Combustion Engine Vehicles - Part A (Automotive Application)

AIS 028(Rev.1) (Part B):-Code of Practice for Use of Gaseous Fuels in Internal Combustion Engine Agricultural Tractors - Part B (Agricultural Tractors Application)

AIS 028(Rev.1) (Part C):-Code of Practice for Use of Gaseous Fuels in Internal Combustion Engine Construction Equipment Vehicles (CEV's) - Part C (CEV's Application).

ISO 15500-6:2001 — Road vehicles — Compressed natural gas (CNG) fuel system components — Part 6: Automatic valve

This standard deviates from ISO 15500-6:2001 with respect to following:

- a) The hydrostatic strength test pressure is changed from 100 MPa to four times the working pressure,
- b) Considering Indian climate conditions the low temperature test of gas/air mixer is changed to -20°C Instead of -40°C as specified in ISO Standard.
- c) Testing at room temperature shall be done at 27±5°C instead of 20°C as specified in ISO Standard.

This standard is one of the series of Indian Standards published on CNG/Bio-CNG onboard fuel system components. Other standards in the series are:

<i>IS No.</i>	<i>Title</i>
15710: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – General requirements & definition.
15711: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Performance and general test methods
15713: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Pressure regulator
15714: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Gas Air mixer
15715: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) / Liquefied Petroleum Gas (LPG) Fuel system components – CNG/Bio-CNG/LPG Conduit (Ventilation Hose/Pipe)
15716: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – CNG / Bio-CNG high pressure fuel line (rigid) with end connections (having pressure exceeding 2.15 MPa)
15717: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) / Liquefied Petroleum Gas (LPG) Fuel system components – Petrol valve (Automatic/Manual)
15718: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – CNG/Bio-CNG high Pressure fuel line (flexible hose) with end connections (having pressure exceeding 2.15 MPa)
15719: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG)/ Liquefied Petroleum Gas (LPG) fuel system components – Electrical Wiring kit
15720: XXXX ¹⁾	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) /Liquefied Petroleum Gas (LPG) fuel system component – Compartments sub- Compartments

- 15721: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) / Bio-Compressed natural gas (Bio-CNG)/ Liquefied Petroleum Gas (LPG) fuel system components – Fire retardant material for seat, upholstery, roof and side lining
- 15722: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) / Bio-Compressed natural gas (Bio-CNG) fuel system components - CNG /Bio-CNG flexible fuel line with or without end connections (having pressure not exceeding 2.15 MPa)
- 15723: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) /Liquefied Petroleum Gas (LPG) fuel system components – Current Limiting devices

Note — Standards Marked with superscript '1)' are under the process of Revision. The year of publication of these standards will be updated at the time of printing of this draft standard.

The composition of the Committee responsible for the formulation of this standard is given at Annex A.

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 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.

Draft 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 CNG/Bio-CNG on board fuel system components, intended to use on motor vehicles defined in IS 14272.

1.1.1 This standard is applicable to CNG /Bio-CNG fuel system components intended to use on vehicles using compressed natural gas / Bio- compressed natural gas in accordance with IS 15320 Part 1 (mono-fuel or bi-fuel applications or dual fuel applications). This standard is not applicable to the following:

- a) Liquefied natural gas (LNG) fuel system components located upstream of, and including, the vaporizer;
- b) Fuel containers;
- c) Stationary gas engines;
- d) Container Mounting hardware;
- e) Electronic fuel management;
- f) Refuelling receptacles;
- g) CNG / Bio- CNG fuel systems components for the propulsion of marine craft, and
- h) Hydrogen Natural Gas Blend (HCNG) Fuel system components.

1.1.2 This standard is based upon a service pressure for compressed natural gas / Bio-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>
14272:2011	Automotive Vehicles – Types – Terminology
15320 (Part 1) :2012/ ISO 15403-1 : 2006	Natural gas - Natural gas for use as a compressed fuel for vehicles: Part 1 designation of the quality (First Revision)
15710: XXXX ²⁾	Road vehicles - Compressed Natural Gas (CNG) / Bio-Compressed Natural Gas (Bio-CNG) fuel system components – General requirements and definitions
15711: XXXX ²⁾	Road vehicles - Compressed natural gas (CNG) / Bio-Compressed Natural Gas (Bio-CNG) fuel system components – Performance and general test methods

Note — Standards Marked with superscript ‘2)’ are under the process of Revision. The year of publication of these standards will be updated at the time of printing of this draft standard.

3 TERMS AND DEFINITIONS

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

3.1 Automatic (Solenoid) Valve — Device that electrically or pneumatically stops the flow of high pressure gas from the cylinder.

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.

5 TESTS

5.1 Applicability

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

Table 1 Tests Applicable
(Clause 5.1)

SI No. (1)	Test (2)	Applicable Tests on Automatic valves (Solenoid valves) (3)	Tests for which Procedure is given in IS 15711 (4)	Specific Tests/Test Conditions required for This Standard (5)
i)	Hydrostatic strength	X	X	X (see 5.2)
ii)	Leakage	X	X	----
iii)	Excess torque resistance	X	X	----
iv)	Bending moment	X	X	----
v)	Continued operation	X	X	X (see 5.3)
vi)	Corrosion resistance	X	X	----
vii)	Oxygen ageing	X	X	----
viii)	Electrical over-voltages	X	X	----
ix)	Non-metallic synthetic immersion	X	X	----
x)	Vibration resistance	X	X	----
xi)	Brass material compatibility	X	X	----
xii)	Insulation resistance	X	----	X (see 5.4)
xiii)	Minimum opening voltage	X	----	X (see 5.5)

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 four times the working pressure.

5.3 Continued Operation

Test the automatic valve in accordance with the procedure for testing continued operation given in IS 15711, for 50000 cycles, but lower the downstream pressure of the test fixture to less than 0.5 MPa (5 bar), and perform the leakage test in accordance with clause 6 of IS 15711.

5.4 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. Apply 1000 V DC between one of the connector pins and the housing of the automatic valve for at least 2s. The minimum allowable resistance shall be 240 kΩ.

5.5 Minimum Opening Voltage

The minimum opening voltage for automatic valve (solenoid valve) at room temperature shall be $\leq 6V$ for a 12V system and $\leq 16 V$ for a 24 V system.

7 MARKING

7.1 Each Automatic valve shall be legibly and indelibly marked with the following:

- a) Manufacturer's 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.

NOTE — Not applicable if it is the integral part of pressure regulator and on which appropriate marking exists.

7.2 BIS Certification Marking

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

7.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 2016* 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.

8 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

9 NUMBER OF SAMPLES FOR TESTING

Minimum 7 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 non-metallic part shall be submitted separately in the packets mentioning details like part name, part No. and quantity.

10 TYPE TEST (TYPE APPROVAL)

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

11 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.

12 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 certifying authority, based on the justification provided by the component manufacturer and reviewed by the certification authority, which has granted type approval.

ANNEX A
(Foreword)

COMMITTEE COMPOSITION

Automotive Vehicles Running on Non-conventional Energy Sources Sectional Committee, TED 26

Will be Added Later.