**TED 26 (18373) F**

***भारतीय मानक***

***Indian Standard***

**IS 15714: 2024**

**सड़क वाहन ─ संपीड़ित प्राकृतिक गैस (सीएनजी)/जैव-संपीड़ित प्राकृतिक गैस (जैव-सीएनजी) — ईंधन प्रणाली के घटक — गैस/वायु मिश्रक**

*( पहला पुनरीक्षण )*

**Road Vehicles — Compressed Natural Gas (CNG)/Bio- Compressed Natural Gas (Bio- CNG) — Fuel System Components — Gas/ Air Mixer**

*( First Revision )*

ICS 43.060.40

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भारतीय मानक ब्यूरो

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

FOREWORD

This Indian Standard (First Revision) 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.

This standard was first published in 2006 to specify definitions, test methods and requirements of gas/air mixer of CNG onboard fuel system components, intended for 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.

In the formulation of this standard considerable assistance has been derived from the following AIS standards issued by the Automotive Research Association of India:

ISO 15500-11 : 2015 — Road vehicles — Compressed natural gas (CNG) fuel system components — Part 11: Gas/air mixer

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)

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:

| *IS No.* | *Title* |
| --- | --- |
| IS 15710 : 2024  | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG) fuel system components — General requirements and definitions (*first revision*) |
| IS 15711 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG) fuel system components — Performance and general test methods (*first revision*) |
| IS 15712 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG), fuel system components — Automatic valve (solenoid valve) (*first revision*) |
| IS 15713 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG) fuel system components — Pressure regulator (*first revision*) |
| IS 15715 : 2024 | 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) (*first revision*) |
| IS 15716 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-Compressed natural gas (Bio-CNG) fuel system components — high pressure fuel line (rigid) with end connections (having pressure exceeding 2.15 MPa (21.5 Bar)] (*first revision*) |
| IS 15717 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG)/liquefied petroleum gas (LPG) fuel system components — Petrol valve (automatic/manual) (*first revision*) |
| IS 15718 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — High pressure fuel line (flexible hose) with end connections [(having pressure exceeding 2.15 MPa (21.5 bar)] (*first revision*) |
| IS 15719 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG)/liquefied petroleum gas (LPG) fuel system components — Electrical wiring kit (*first revision*) |
| IS 15720 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG)/liquefied petroleum gas (LPG) — Fuel system components — CNG/ bio-CNG/LPG compartment/sub-compartments (*first revision*) |
| IS 15721 : 2024 | 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 (*first revision*) |
| IS 15722 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components flexible fuel line with end connections [CNG fuel line having pressure not exceeding 2.15MPa (21.5 bar)] (*first revision*) |
| IS 15723 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) and liquefied petroleum gas (LPG) — Fuel system components — Current limiting devices (*first revision*) |

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.

*Indian Standard*

ROAD VEHICLES — COMPRESSED NATURAL GAS (CNG)/ BIO-COMPRESSED NATURAL GAS (BIO- CNG) FUEL SYSTEM COMPONENTS — GAS/ AIR MIXER

(*First Revision*)

**1 SCOPE**

**1.1** This Indian Standard specifies definitions, test methods and requirements of gas/air mixer of CNG / Bio-CNG onboard fuel system components, intended for 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).

**1.1.2** 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.

**1.1.3** 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 standards given below 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:

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| IS 14272 : 2011 | Automotive vehicles — Types — Terminology |
| IS 15710 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG) fuel system components — General requirements and definitions (*first revision*) |
| IS 15711 : 2024 | Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (Bio-CNG) fuel system components — Performance and general test methods (*first revision*) |
| IS 15958 : 2012 | Compressed natural gas (CNG) for automotive purpose — Specification |

**3 DEFINITIONS**

For the purpose of this standard definitions given in IS 15710 shall apply.

**4 CONSTRUCTION AND ASSEMBLY**

The gas/air mixer shall comply with the applicable provisions of IS 15710 and IS 15711, and with the tests specified in **5**.

**5 TESTS**

**5.1 Applicability**

There are many types of gas/air mixers available. This standard gives requirement for three different existing designs: positive and negative pressure venturi, which have no moving parts, and variable orifice. As gas/air mixer designs vary, so will the tests required.

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

**5.2 Hydrostatic Strength**

Test the gas/air mixer according to the procedure for testing hydrostatic strength specified in IS 15711 at four times the working pressure, recommended by its manufacturer or 600 kPA, whichever is greater.

**5.3 Leakage**

Test the gas/air mixer at the temperatures of -20 °C (+ 0 °C -5 °C), 27 °C ± 5 °C and 120 °C (-0 °C + 5 °C) the minimum test pressure shall be either 1.25 times the working pressure or 150 kPa, whichever is greater.

**5.4 Continued Operation**

If the gas/air mixer’s components move repeatedly during engine operation, then it shall undergo 100 000 cycles from minimum to maximum flow. At the completion of this test, the gas/air mixer shall comply with **5.3** at room temperature.

The duration of each cycle shall be no less than 10s.

**5.5 Corrosion Resistance**

If material or designs susceptible to corrosion are used in the component, then the corrosion resistance test as given in IS 15711 shall be performed.

**Table 1 Tests Applicable**

(*Clause* 5.1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl No.** | **Test** | **Applicable Tests on the Component** | **Tests for which Procedure is Given in IS 1571** | **Specific Tests/Test Conditions Required for this Standard** |
| (1) | (2) | (3) | (4) | (5) |
| i) | Hydrostatic Strength | X1) | X | X (*see* **5.2**) |
| ii) | Leakage | X | X | X (*see* **5.3**) |
| iii) | Excess torque Resistance | ─ | ─ | ─ |
| iv) | Bending moment | ─ | ─ | ─ |
| v) | Continued operation | X2) | X | X (*see* **5.4**) |
| vi) | Corrosion resistance | X | X | X (*see* **5.5**) |
| vii) | Oxygen ageing | X | X | ─ |
| viii) | Ozone ageing | X | X | ─ |
| ix) | Heat Ageing | X | X | ─ |
| x) | Automotive Fluids | X | X | ─ |
| xi) | Electrical over–voltages | ─ | ─ | ─ |
| xii) | Non-metallic material immersion | X | X | ─ |
| xiii) | Vibration resistance | X | X1) | ─ |
| xiv) | Brass material compatibility | X | X | ─ |

1) indicates that gas/air mixers that have a working pressure of < 0.1 MPa (1 bar) are not required to be strength tested.

2) indicates that gas/air mixer with no moving parts, or with parts that are only moved at the time of installation or servicing, are not required to be tested for continued operation.

**6 MARKING**

**6.1** Each gas/air mixer shall be legibly and indelibly marked with the following:

a) Manufacturer’s name, trade-mark or symbol;

b) Part No. or unique identification mark; and

c) Date of manufacture or batch number.

**6.2 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 products may be marked with the Standard Mark.

**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:

a) Name of the manufacturer;

b) Manufacturing plant address;

c) Part No.;

d) Type No./Model No.;

e) Inlet pressure;

f) Operating temperatures; and

g) Drawings with relevant dimensions and material.

**8 NUMBER OF SAMPLES FOR TESTING**

Minimum 7 numbers of the gas air mixer 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 gas/air mixer assembly. Each non-metallic part shall be submitted separately in the packets mentioning details like part name, part number and quantity.

**9 TYPE TEST (TYPE APPROVAL)**

For type approval, gas/air mixer shall meet the requirements as specified in this standard.

**10 ACCEPTANCE TEST (CONFORMITY OF PRODUCTION**)

For the purpose of acceptance test, gas/air mixer manufactured shall conform to the following test requirements as specified in relevant clauses of this standard:

a) Leakage test;

b) Corrosion resistance test;

c) Non-metallic synthetic immersion test;

d) Oxygen ageing; and

e) Brass material compatibility.

**11 CHANGES 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 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

| *Organization* | *Representative*(*s*) |
| --- | --- |
| Automotive Research Association of India (ARAI), Pune | Dr S. S. Thipse (***Chairperson***)  Shri A. D. Dekate (*Alternate*) |
| A B Process Technologies, Pune | Shri Kunal Chopde |
| Ashok Leyland Ltd, Chennai | Shrimati Suchismita C.  Shri Muthukumar N (*Alternate*) |
| Automotive Component Manufactures Association of India, New Delhi | Shri Sanjay Tank  Shrimati Seema Babal (*Alternate*) |
| Bajaj Auto Ltd, Pune | Shri Milind J. Pagare  Shri Arvind V. Kumbhar (*Alternate* |
| Bosch Limited, Bengaluru | Shri Bharadwaj M. Krishnamurthy  Shri Vikram K. (*Alternate*) |
| Central Institute of Road Transport, Pune | Shri Samir Sattigeri  Shri V. V. Joshi (*Alternate*) |
| Central Pollution Control Board, New Delhi | Shri A. Sudhakar  Shri Suneel Dave (*Alternate* I) Shri Kedarnath Dash (*Alternate* II) |
| CLH Gaseous Fuel Applications Ltd, Gurugram | Shri Shishir Agrawal  Shri Gagan Agrawal (*Alternate*) |
| Delhi Transport Corporation, New Delhi |  Shri Vikas Batra  |
| GAIL (India) Limited, New Delhi | Shri Ashish Kumar Mittal  Shri Lokesh Mehta (*Alternate*) |
| Indian Auto LPG Coalition, Faridabad | Shri Shishir Agrawal  Shri Suyash Gupta (*Alternate*) |
| Indian Institute of Petroleum, Dehradun | Shri Wittison Kamei  Shri Robindro Lairenlakpam (*Alternate*) |
| Indian Institute of Science, Bengaluru | Prof R.V. Ravikrishna  |
| Indian Institute of Technology Ropar, Punjab | Shri Dhiraj Kumar Mahajan  Dr Debaprasad Mandal (*Alternate*)  |
| Indian Oil Corporation Ltd, (R & D Centre), Faridabad | Dr M. Sithananthan (*Alternate*) |
| Indian Rubber Mfrs. Research Association, Thane, Mumbai | Dr K. Raj Kumar  Dr Bharat Kapgate (*Alternate*) |
| International Centre for Automotive Technology (ICAT), Manesar | Shri Vaibhav Prashant Yadav  Shri Vijayanta Ahuja (*Alternate*) |
| Mahindra & Mahindra Ltd, Mumbai | Shri Rajamani Parthiban  Shri Shailesh Kulkarni (*Alternate*) |
| Mahindra & Mahindra Ltd (Truck and Bus Division), Pune | Shri V. G. Kulkarni (*Alternate*) |
| Maruti Suzuki India Limited, Gurugram | Shri Gururaj Ravi Shri Arun Kumar (*Alternate*) |
| Minda Emer Technologies Limited, Gurugram | Shri Vivek Jain  Shri Bibhuti Kumar (*Alternate*)  |
| Ministry of New and Renewable Energy, New Delhi | Shri Dipesh Pherwani  |
| Petroleum and Explosive Safety Organization, Nagpur | Shri D. K. Gupta  Shri Vivek Kumar (*Alternate*) |
| Petronet LNG Ltd, New Delhi | Shri Pankaj Wadhwa (*Alternate*) |
| Prodair Air Products India Private Ltd, Pune | Shri Ravi Subramanian  Shri Arun Kuruvangattil (*Alternate*) |
| Renault India Private Limited, Mumbai | Shri Rajendra Khile  Shri Vijay Dinakaran (*Alternate*)  |
| Rohan BRC Gas Equipment Pvt Ltd, Ahmedabad | Shri Stefano De Carolis  Shri Parthiv Shukla (*Alternate*)  |
| Society of Indian Automobile Manufacturers, New Delhi | Shri P. K. Banerjee  Dr Sandeep Garg (*Alternate*) |
| Swagelok – Bombay Fluid System components Pv Ltd, Mumbai | Shri Sachin Koulgi  Shri Harish Takke (*Alternate*) |
| Tata Motors Ltd, Pune | Shri P. S. Gowrishankar  Shri Shailendra Dewangan (*Alternate*) |
| TVS Motor Company Ltd, Hosur | Shri V. Pattabiraman  Shri K M Srikanth (*Alternate*) |
| Vanaz Engineers Ltd, Pune | Shri S. J. Vispute  Shri J. S. Dhumal (*Alternate*)  |
| Volkswagen India Pvt Ltd, Mumbai | Shri Joreg Bouzek  Shri Pankaj Gupta (*Alternate*) |
| BIS Directorate General | Shri Deepak Agarwal, Scientist ‘F’/ senior director and head (transport engineering) [representing director general (*ex-officio*)] |

*Member Secretary*

Shri Gaurav Jayaswal

Scientist ‘C’ /Deputy Director

(transport engineering), BIS