

BUREAU OF INDIAN STANDARDS

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भारतीय मानक मसौदा

**सड़क वाहन - संपीडित प्राकृतिक गैस (सीएनजी) / जैव-संपीडित प्राकृतिक गैस (जैव-सीएनजी)
/ तरल पेट्रोलियम गैस (एलपीजी) ईंधन प्रणाली घटक - सीएनजी / जैव-सीएनजी / एलपीजी
कम्पार्टमेंट / सब-कम्पार्टमेंट
(पहला पुनरीक्षण)**

Draft Indian Standard

**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-
COMPARTMENT
(First Revision)**

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

FOREWORD

(Formal Clause to be added later)

This draft standard was first published in 2008 to specify definitions, test methods and requirements of compartments/sub-compartments of CNG on-board fuel system components, intended for use on motor vehicles defined in IS 14272. Later on through an amendment published in 2012, The scope of this draft standard was extended to LPG on board fuel system components along with some other changes. This version of the standard incorporates the content of the amendment issued to the standard in 2012. In this Revision, Bio- CNG is also added to the scope of this draft standard keeping in view the technological advancements that have taken place since its last Publication.

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

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).

AIS-025 (Version 3): Safety and Procedural requirements for Type Approval of LPG Operated Vehicles

AIS 026 (Version 3): Code of Practice for use of LPG Fuel in Internal Combustion Engine to Power 4 Wheeled Vehicles

AIS 027 (Version 3): Code of Practice for use of LPG Fuel in Internal Combustion Engine to Power 2 & 3 Wheeled Vehicles.

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

<i>IS No.</i>	<i>Title</i>
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- 15710: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – General requirements & definition.
- 15711: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components –Performance and general test methods
- 15712: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Automatic valve
- 15713: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components–Pressure regulator
- 15714: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Gas Air mixer
- 15715: XXXX¹⁾ 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: XXXX¹⁾ 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: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) / Liquefied Petroleum Gas (LPG) Fuel system components – Petrol valve (Automatic/Manual)
- 15718: XXXX¹⁾ 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: XXXX¹⁾ Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG)/ Liquefied Petroleum Gas (LPG) fuel system components – Electrical Wiring kit
- 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 draft standard is given at Annex B (will be added later).

For the purpose of deciding whether a particular requirement of this draft 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)/ BIO- COMPRESSED
NATURAL GAS (Bio- CNG) / LIQUEFIED PETROLEUM GAS (LPG) FUEL
SYSTEM COMPONENTS — CNG / BIO- CNG / LPG COMPARTMENT / SUB-
COMPARTMENT**

1 SCOPE

1.1 This draft standard specifies definitions, test methods and requirements of compartments / sub-compartments of CNG / Bio- CNG/ LPG on-board fuel system components, intended for use on motor vehicles defined in IS 14272.

1.1.1 This draft standard is applicable to CNG /Bio-CNG/LPG fuel system components intended to be used on vehicles using compressed natural gas / Bio- compressed natural gas / Liquefied petroleum gas in accordance with IS 15320 Part 1 (mono-fuel or bi-fuel applications or dual fuel applications).

1.1.2 This draft 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) CNG / Bio- CNG/LPG fuel systems components for the propulsion of marine craft; and
- e) Hydrogen Natural Gas Blend (HCNG) Fuel system components

1.1.3 This draft standard is based upon a service pressure for compressed natural gas / Bio-compressed natural gas as a fuel at 20 MPa (200 bar) and liquefied petroleum gas as a fuel at 2 MPa (20 bar) settled at 15°C.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this draft standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this draft 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>
IS 14272: 2011	Automotive Vehicles — Types — Terminology
15061: 2002	Automotive Vehicles – Flammability requirements

15710: XXXX²⁾ Road vehicles - Compressed Natural Gas (CNG) / Bio-Compressed Natural Gas (Bio-CNG) fuel system components – General requirements and definitions

NOTE — Standard 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 DEFINITIONS

For the purpose of this draft standard following definition in addition to those given in IS 15710 shall apply.

3.1 Self-Extinguishing / No Bum Rate (SE/NBR)

The material stops burning before it has burnt for 60s from the start of timing and has not burnt more than 50.8 mm (2 in) from the point where the timing was started.

4 TYPE TESTS (TYPE APPROVAL)

4.1 Construction

4.1.1 Hatches, covers or construction joints, which may need to be opened or dismantled during maintenance or inspection, shall be capable of being opened at least 10 times without adverse effects on durability.

4.1.2 Hinges and locking devices of hatches and covers shall be designed to prevent the dislodgment of the hatch or cover when in the closed and locked position.

4.1.3 The construction of compartments/sub-compartments shall be such that when subjected to a pushing force of 60 kgf applied at any point on any external face of the sub-compartment, any resultant damage shall not be of a nature to permit gas leakage in the event of pressure testing as per 4.3. The pushing force shall be applied by a measuring instrument having a flat circular face of 20 mm diameter.

4.2 Material

The pliable material (non-metallic material) of compartments/sub-compartments shall be sufficiently strong to resist mechanical damage, preserve venting integrity, shall not support combustion and shall meet the following minimum criteria.

4.2.1 *Resistance to Cold Cracking*

The material shall withstand a bend of 180° applied within 0.5 s around a 6 mm diameter former at temperature -35°C without cracking.

4.2.2 *Flammability Test*

When tested for Horizontal Burning Rate as per Annex A of IS 15061, the material shall be Self-Extinguishing/No Burn Rate (SE/NBR).

NOTE — If the size of component is insufficient for drawal of sample as per standard, then the sample size shall be selected as per mutual agreement between the test agency and the manufacturer.

4.2.3 Resistance 10 Ultraviolet Degradation

When tested as per Annex A of this draft standard, presence of stabilizer for ultraviolet degradation shall be confirmed.

4.3 Hydrostatic Test

When a compartment/sub-compartment has been subjected to hydrostatic internal pressure of 30 kPa (0.3 bar) applied for 5 min, sealing materials or gaskets shall not be displaced or otherwise lose integrity during the test.

5 MARKING

5.1 Each compartment / sub-compartment shall be legibly and indelibly marked with the following:

- a) Manufacturer 's name or trade-mark or symbol;
- b) Part No. or unique identification mark; and
- c) Date of manufacture or Batch No.

NOTE — Marking for compartment/sub-compartment shall be applicable if it is a separate component.

5.2 BIS Certification Marking

Each Compartment / sub-compartment may also be marked with the Standard Mark.

5.2.1 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 Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6 TECHNICAL INFORMATION TO BE SUBMITTED BY THE COMPONENT MANUFACTURER

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

- a) Manufacturer's name, trade-mark or symbol;
- b) Part No. or unique identification mark;
- c) Model/Type no.; and
- d) Drawings with relevant dimensions and materials.

7 NUMBER OF SAMPLES FOR TESTING

Minimum two numbers of compartments/sub-compartments shall be provided with suitable adaptors/plugs for its opening to the test agency for testing.

8 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 agency, based on the justification provided by the component manufacturer and reviewed by the certifying agency, which has granted type approval.

ANNEXURE A*(Clause 4.2.3)***TEST METHOD TO DETERMINE THE PRESENCE OF ULTRAVIOLET
DEGRADATION AGENT
(UV STABILIZER)****A-1 SCOPE**

This test method is intended to provide a general technique to determine the presence of ultraviolet degradation agent (UV stabilizer) present in the samples. This method is useful in performing a qualitative analysis.

A-2 SUMMARY OF THE TEST PROCEDURE

This test method consists of a method in which the acetone extract of the sample under test is prepared in the form of thin film or capillary film and its spectrum is collected over IR range of 4000 to 400 cm^{-1} . The spectrum is then compared with any internationally available library, such as Atlas of Hummel Polymer Library spectra or with the Enhanced Polymer

Additives Library such as Sadtler, FDM, Nicolet, RAPRA or any other library spectra.

A-3 APPARATUS

Fourier transform infrared spectrometer with wave number range of 7800 to 350 cm^{-1} .

A-4 REAGENTS

Acetone.

A-5 PROCEDURE

The representative test quantity of sample is extracted with acetone solvent for 16 h. The extract is dried and then subjected to FTIR spectrometer test.

The sample prepared from the above techniques is mounted to a suitable sample holder and kept inside sample compartment of optical bench of IR spectrometer and its infrared spectrum is collected keeping the following instrumental parameters according to the nature of the sample:

- a) The environmental conditions for equipment are maintained. They are as follows:
 - 1) Room temperature: 0°C to 35°C; and
 - 2) Relative humidity: 20 percent to 80 percent
- b) The optical bench is switched on and is allowed to initialize.
- c) The resolution is set to 4.0 cm^{-1} , No. of scans to 40, Apodization to Happ-Ganzel and wave number range from 4000 to 400 cm^{-1} .
- d) Background spectrum is collected without the sample in the compartment.

- e) The sample spectrum is collected with the prepared sample in the compartment after collecting background spectrum.
- f) The sample spectrum collected is baseline corrected and normalized to compare with the standard spectrum from the library using search commands.

A-6 REPORT

The obtained FTIR spectrum is searched in any internationally available library, such as Atlas of Hummel Polymer Library spectra or with the Enhanced Polymer Additives Library such as Saddtler, FDM, Nicolet, RAPRA or any other library spectra for best matching spectrum of ultraviolet stabilizer.

ANNEX B
(Foreword)

COMMITTEE COMPOSITION

AUTOMOTIVE VEHICLES RUNNING ON NON-CONVENTIONAL ENERGY
SOURCES SECTIONAL COMMITTEE, TED 26

Will be Added Later.