

सड़क वाहन-संपीड़ित प्राकृतिक गैस
(सीएनजी)/जैव-संपीड़ित प्राकृतिक गैस
(बायो-सीएनजी) ईंधन प्रणाली के घटक —
सामान्य अपेक्षाएँ एवं परिभाषाएँ
(पहला पुनरीक्षण)

Road Vehicles — Compressed
Natural Gas (CNG)/Bio-compressed
Natural Gas (Bio-CNG) Fuel System
Components — General
Requirements and Definitions
(First Revision)

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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 general requirements and definitions of CNG on board fuel system components, intended to be used 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 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 fuel 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 15500-1 : 2015 — Road vehicles — Compressed natural gas (CNG) fuel system components — Part 1: General requirements and definitions

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>
IS 15711 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Performance and general test methods
IS 15712 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Automatic valve
IS 15713 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Pressure regulator
IS 15714 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Gas air mixer
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)

(Continued on third cover)

Indian Standard

ROAD VEHICLES — COMPRESSED NATURAL GAS (CNG)/BIO-COMPRESSED NATURAL GAS (BIO-CNG) FUEL SYSTEM COMPONENTS — GENERAL REQUIREMENTS AND DEFINITIONS

(First Revision)

1 SCOPE

1.1 This standard specifies general requirements and definitions of CNG/bio-CNG onboard fuel system components, intended to be used 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 edition indicated was valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards:

IS No.	Title
IS 3224 : 2002	Valve fittings for compressed gas cylinders excluding liquefied petroleum gas (LPG) cylinders — Specification (third revision)
IS 14272 : 2011	Automotive Vehicles — Types — Terminology
IS 15320-1 : 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)
IS 15711 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Performance and general test methods
IS 15719 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Electrical wiring kit

3 TERMS AND DEFINITIONS

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

3.1 **Approved or Approval** — Approved by or approval of the statutory authority.

3.2 **Bi-fuel System** — A bi-fuel system is defined as a system equipped to operate with either on

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CNG/bio-CNG or some other fuel, for example, petrol.

3.3 Burst Pressure — Pressure which causes failure and consequential fluid loss through the component envelope.

3.4 Compressed Natural Gas (CNG)/ Bio-Compressed Natural Gas (Bio-CNG) — Natural gas which has been compressed and stored for use as a vehicle fuel.

3.5 Compressed Natural Gas (CNG)/ Bio-Compressed Natural Gas (Bio-CNG) on Board Fuel System — Complete system assembly from CNG/bio-CNG cylinder to gas-air mixer or injector for converting vehicle to run on CNG/bio-CNG.

3.6 Construction Equipment Vehicles (CEV) — Rubber tyres (including pneumatic tyres), rubber padded or steel drum wheel mounted, self-propelled, excavator, loader, backhoe, compactor roller, dumper, motor grader, mobile crane, dozer, fork lift truck, self-loading concrete mixer or any other construction equipment vehicle or combination thereof designed for off-highway operations in mining, industrial undertaking, irrigation and general construction but modified and manufactured with 'on or off' or 'on and off' high-way capabilities.

3.7 Container (or Cylinder) — Any vessel used for the storage of compressed natural gas. A container can be of metal, metal liner reinforced with resin impregnated continuous filament (hoop wrapped), metal liner reinforced with resin impregnated continuous filament (filly wrapped), resin impregnated continuous filament with a non-metallic liner (all composite).

3.8 Dedicated/Mono Fuel System — The system operating on gaseous fuel (for example, CNG/bio-CNG) only.


3.9 Downstream — The direction in which the stream flows.

3.10 Electronic Control Unit (CNG/Bio-CNG Fuelling) — A device which controls the gas demand of the engine and other engine parameters and cuts off automatically the automatic valve, required by safety reason.

3.11 Filling Unit or Receptacle — A device fitted in the vehicle external or internal (engine compartment) used to fill the container in the filling station.

3.12 Filter — Protective screen which removes

foreign debris from the gas stream.

3.13 Fitting — Connector used **enjoining** piping, tubing, or hose system. 

3.14 Flexible Fuel Line — Flexible tubing or hose through which natural gas flows.

3.15 Gas Flow Adjuster — Gas flow restricting device, installed downstream of a pressure regulator, controlling gas flow to the engine.

3.16 Gas Injector — Device for introducing gaseous fuel into the engine or associated intake system.

3.17 Gas Tight Housing — Device which vents gas leakage to outside the vehicle including the gas ventilation hose/Pipe, the clear opening of which is at least 250 mm² for two and three wheelers and 450 mm² for other vehicles.

3.18 Gas/Air Mixer — Device for mixing the gaseous fuel and intake air for the engine.

3.19 Natural Gas Vehicle (NGV) — Road vehicle powered by natural gas.

3.20 Pressure — Pressure refers to gauge pressure.

3.20.1 Downstream Pressure — Pressure recorded in the direction of flow after the component under test

3.20.2 Upstream Pressure — Pressure recorded in the direction of flow before the component under test.

3.21 Pressure Indicator — Device which indicates the gas pressure.

3.22 Pressure Regulator — Device used to control the delivery pressure of gaseous fuel to the engine.

3.23 Pressure Relief Device (PRD) — One time use device triggered by excessive temperature or temperature and pressure which vents gas to protect the cylinder from rupture.

3.24 Rigid Fuel Line — Tubing which has been designed not to flex in normal operation and through which natural gas flows.

3.25 Service Pressure — Settled pressure of 20 MPa (200 bar) at a uniform gas temperature of 15 °C.

3.26 Statutory Authority — The Government department or notified agency by Government of India (GOI), responsible for the particular aspect.

3.27 Test Pressure — Pressure to which a component is taken during testing.

3.28 Type of Components — Components which do not differ in such essential respect as materials and working pressure.

3.29 Type of Electronic Control Unit — Components which do not differ in such essential respect as the basic software principles excluding minor changes.

3.30 Upstream — The direction against the flow of the stream.

3.31 Valve — Device by which the flow of a fluid may be controlled.

3.31.1 Automatic Cylinder Valve — Automatic valve rigidly fixed to the cylinder which controls the flow of gas to the fuel system.

3.31.2 Automatic Valve — Valve which is not operated manually such as solenoid valve.

3.31.3 Check Valve including Non-return Valve — Automatic valve which allows gas to flow in only one direction.

3.31.4 Excess Flow Valve — Valve which automatically shuts-off, or limits, the gas flow when the flow exceeds a set design value.

3.31.5 Manual Cylinder Valve — A manually controlled shut-off valve fitted on the cylinder which can open or shut-off the CNG/bio-CNG supply and which incorporates a burst disc backed with a fusible material.

3.31.6 Manual Valve — Valve which is operated manually.

3.31.7 Pressure Relief Valve (PRV) — Device which prevents a pre-determined upstream pressure being exceeded.

3.31.8 Service Valve — Manual valve which is closed only when servicing the vehicle.

3.32 Working Pressure — Maximum pressure to which a component is designed to be subjected to and which is the basis for determining the strength of the component under consideration.

4 CONSTRUCTION AND ASSEMBLY

4.1 Components shall be made of materials compatible with CNG/bio-CNG.

4.2 Joining components shall provide gas-tight

sealing performance. Where joints are required to be disassembled, it is recommended that any tapered thread fittings to be replaced are not reused.

4.3 Components to be attached to the cylinder shall have one of the type of threads conforming to IS 3224.

4.4 Components in the engine compartment shall be suitable for service within a temperature range of - 20 °C to 120 °C. All other component shall be suitable for service within a range of - 20 °C to 85 °C

4.5 All synthetic materials used in seals and diaphragms shall comply with the oxygen ageing test specified in IS 15711.

4.6 All synthetic materials in contact with natural gas shall comply with the non-metallic synthetic immersion test specified in IS 15711.

4.7 All components subject to weather exposure and other corrosive conditions shall be made of corrosion resistant material or otherwise protected.

4.8 It is recognized that multifunctional components may be made up of several components. Such components shall be examined for conformance to this standard and tested according to the appropriate functional tests.

4.9 Fuel flow shut-off shall be failure-safe.

5 ELECTRICAL EQUIPMENT AND WIRING

5.1 Any openings in electrical wiring components shall be equipped with means to prevent chafing and abrasion of the wire insulation.

5.2 Electrical equipment and circuit wiring in a component shall be of automotive quality with respect to mechanical strength, insulation and current carrying capacity, in accordance with IS 15719.

5.3 Materials used for electrical construction shall be suitable for their particular application. When determining the acceptability of an electrical insulating material, consideration shall be given to its mechanical strength, dielectric strength, heat-resistant properties, the degree to which it is enclosed or protected, and any other features influencing fire and accident hazards.

5.4 Fire resistance sleeving (for example, glass fibre) shall be provided on harness used in engine compartment and near exhaust manifold.

6 INSTRUCTIONS

6.1 Clear, concise printed instructions and diagrams, stated in terms clearly understandable and adequate for proper assembly, installation, maintenance and safe operation, shall be made available by the manufacturer of the component and component package.

6.2 Instructions for periodic maintenance of components, as required, shall be provided. Parts which require replacement shall be identified.

6.3 Printed instructions shall state that the installation shall be in accordance with the regulations of the authority concerned, or in the absence of local regulations, in accordance with this standard.

6.4 This information shall be in a form easily understood in the country of destination.

7 MARKING



The components shall be marked with the details as given in their relevant standard.


ANNEX A

(Foreword)

COMMITTEE COMPOSITION

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

<i>Organization</i>	<i>Representative(s)</i>
Automotive Research Association of India (ARAI), Pune	DR S. S. THIPSE (Chairperson) SHRI A. D. DEKATE
A B Process Technologies, Pune	SHRI KUNAL CHOPDE
Ashok Leyland Ltd, Chennai	SHRIMATI SUCHISMITA C. SHRI MUTHUKUMAR N. (<i>Alternate</i>)
Automotive Component Manufactures Association of India, New Delhi	SHRI SANJAY TANK SHRIMATI SEEMA BABAL (<i>Alternate</i>)
Bajaj Auto Ltd, Pune	SHRI MILIND J. PAGARE SHRI ARVIND V. KUMBHAR (<i>Alternate</i>)
Bosch Limited, Bengaluru	SHRI BHARADWAJ M. KRISHNAMURTHY SHRI VIKRAM K. (<i>Alternate</i>)
Central Institute of Road Transport, Pune	SHRI SAMIR SATTIGERI SHRI V. V. JOSHI (<i>Alternate</i>)
Central Pollution Control Board, New Delhi	SHRI A. SUDHAKAR SHRI SUNEEL DAVE (<i>Alternate I</i>) SHRI KEDARNATH DASH (<i>Alternate II</i>)
CLH Gaseous Fuel Applications Ltd, Gurugram	SHRI SHISHIR AGRAWAL SHRI GAGAN AGRAWAL (<i>Alternate</i>)
Delhi Transport Corporation, New Delhi	SHRI VIKAS BATRA
GAIL (India) Limited, New Delhi	SHRI ASHISH KUMAR MITTAL SHRI LOKESH MEHTA (<i>Alternate</i>)
Indian Auto LPG Coalition, Faridabad	SHRI SHISHIR AGRAWAL SHRI SUYASH GUPTA (<i>Alternate</i>)
Indian Institute of Petroleum, Dehradun	SHRI WITTISON KAMEI SHRI ROBINDRO LAIRENLAKPAM (<i>Alternate</i>)
Indian Institute of Science, Bengaluru	PROF R. V. RAVIKRISHNA
Indian Institute of Technology Ropar, Punjab 	SHRI DHIRAJ KUMAR MAHAJAN DR DEBAPRASAD MANDAL (<i>Alternate</i>)
Indian Oil Corporation Ltd, (R & D Centre), Faridabad	DR M. SITHANANTHAN (<i>Alternate</i>)
Indian Rubber Mfrs  Research Association, Thane, Mumbai	DR K. RAJ KUMAR DR BHARAT KAPGATE (<i>Alternate</i>)
International Centre for Automotive Technology, (ICAT), Manesar	SHRI VAIBHAV PRASHANT YADAV SHRI VIJAYANTA AHUJA (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
Mahindra & Mahindra Ltd (Truck and Bus Division), Pune	SHRI V. G. KULKARNI (Alternate) 
Mahindra & Mahindra Ltd, Mumbai	SHRI RAJAMANI PARTHIBAN SHRI SHAILESH 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 Pvt 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 (<i>Ex-officio</i>)]

Member Secretary
SHRI GAURAV JAYASWAL
SCIENTIST 'C'/DEPUTY DIRECTOR
(TRANSPORT ENGINEERING), BIS

(Continued from second cover)

<i>IS No.</i>	<i>Title</i>
IS 15716 : 2024	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)
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)
IS 15718 : 2024	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)
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
IS 15720 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) /liquefied petroleum gas (LPG) fuel system component — Compartments sub-compartments
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
IS 15722 : 2024	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)
IS 15723 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG)/liquefied petroleum gas (LPG) fuel system components — Current limiting devices

The composition of the Committee responsible for the formulation of this standard is given in [Annex A](#).

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.