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(आई एस 15710: 2006 का संशोधन)

Draft Indian Standard

**ROAD VEHICLES — COMPRESSED NATURAL GAS (CNG) / BIO-
COMPRESSED NATURAL GAS (BIO- CNG) FUEL SYSTEM
COMPONENTS — GENERAL REQUIREMENTS AND DEFINITIONS
(REVISION OF IS 15710: 2006)**

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

FOREWORD

(Formal Clause to be added later)

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(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 15500-1:2001 — 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>
TED 26 (15007)	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Performance and general test methods
TED 26 (15008)	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Automatic valve
TED 26 (18368)	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Pressure regulator

- TED 26 (18373) Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Gas Air mixer
- TED 26 (15013) 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)
- TED 26 (15014) 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)
- TED 26 (18374) Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) / Liquefied Petroleum Gas (LPG) Fuel system components – Petrol valve (Automatic/Manual)
- TED 26 (18375) 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)
- TED 26 (18377) Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG)/ Liquefied Petroleum Gas (LPG) fuel system components – Electrical Wiring kit
- TED 26 (18378) Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) /Liquefied Petroleum Gas (LPG) fuel system components – Compartments sub- Compartments
- TED 26 (18379) 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
- TED 26 (18380) 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)
- TED 26 (15015) 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 at Annex A (Will be added later).

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

1 SCOPE

1.1 This standard specifies general requirements and definitions of CNG/Bio-CNG onboard 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).

1.1.2 It 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 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>
IS 3224:2002/ DIN 477, ANSI/CSA/CGA STANDARD V- 1	Valve fittings for compressed gas cylinders excluding liquefied petroleum gas (LPG) cylinders - Specification (Third Revision)
IS 14272:2011	Automotive Vehicles – Types – Terminology
IS 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)
TED 26 (15007)	Road vehicles - Compressed natural gas (CNG) /Bio-Compressed natural gas (Bio-CNG) fuel system components – Performance and general test methods
TED 26 (18377)	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 apply.

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

3.1.1 Manual Valve — Valve which is operated manually.

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

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

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

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

3.1.6 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.

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

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

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

- 3.3 Filter** — Protective screen which removes foreign debris from the gas stream.
- 3.4 Fitting**— Connector used enjoining a piping, tubing, or hose system.
- 3.5 Flexible Fuel Line**— Flexible tubing or hose through which natural gas flows.
- 3.6 Gas/Air Mixer** — Device for mixing the gaseous fuel and intake air for the engine.
- 3.7 Gas Flow Adjuster** — Gas flow restricting device, installed downstream of a pressure regulator, controlling gas flow to the engine.
- 3.8 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.
- 3.9 Natural Gas Vehicle (NGV)** — Road vehicle powered by natural gas.
- 3.10 Pressure Indicator** — Device which indicates the gas pressure.
- 3.11 Pressure Regulator** — Device used to control the delivery pressure of gaseous fuel to the engine.
- 3.12 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.
- 3.13 Rigid Fuel Line** — Tubing which has been designed not to flex in normal operation and through which natural gas flows.
- 3.14 Service Pressure** — Settled pressure of 20 MPa (200 bar) at a uniform gas temperature of 15°C.
- 3.15 Test Pressure** — Pressure to which a component is taken during testing.
- 3.16 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.
- 3.17 Burst Pressure** — Pressure which causes failure and consequential fluid loss through the component envelope.
- 3.18 Gas Injector** — Device for introducing gaseous fuel into the engine or associated intake system.
- 3.19 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.
- 3.20 Pressure** — Pressure refers to gauge pressure.
- 3.20.1 Upstream Pressure** — Pressure recorded in the direction of flow before the component under test.

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

3.21 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).

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

3.23 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.

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

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

3.26 Downstream — The direction in which the stream flows.

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

3.28 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.

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

3.30 Bi-fuel System — A bi-fuel system is defined as a system equipped to operate with either on CNG /Bio-CNG or some other fuel, for example, petrol.

3.31 Approved or Approval — Approved by or approval of the Statutory Authority.

3.32 Statutory Authority — The Government Department or Notified agency by Government of India (GoI), responsible for the particular aspect.

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 be replaced and should not be 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.