Indian Standard

ROAD VEHICLES – COMPRESSED NATURAL GAS (CNG) FUEL SYSTEM COMPONENTS – GENERAL REQUIREMENTS AND DEFINITIONS

0. Foreword:

To be added by BIS

1. SCOPE:

1.1 This standard specifies general requirements and definitions of CNG onboard fuel system components, intended to use on motor vehicles defined in IS 14272 (Part 1), two wheelers and construction equipment vehicles (CEV).

1.1.1 This standard is applicable to CNG fuel system components intended to use on vehicles using compressed natural gas in accordance with IS 15320 (mono-fuel or bi-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; and
d) CNG fuel systems components for the propulsion of marine craft.

1.1.3 This standard is based upon a service pressure for 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.

2.0 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.

IS No.	Title
3224:2002	Valve fittings for compressed gas cylinders excluding liquefied petroleum gas (LPG) cylinders (third revision)
14272 (Part 1):1995	Automotive Vehicles – Types – Terminology : Part I Three and four wheelers
15320 :2003 / ISO 15403 : 2000	Natural Gas - Designation of the quality of natural for use as a compressed fuel for vehicles
15711 :2006	Road vehicles - compressed natural gas (CNG) fuel system components – Performance and general test methods.
15719 :2006	Road vehicles - compressed natural gas (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 supply and which incorporates a burst disc backed with a fusible material.

3.1.7 Pressure relief valve (discharge valve) PRV:- Self- closing device which opens to prevent a pre-determined pressure being exceeded.

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

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

3.3 Filter
Component containing a screen or media that is intended to remove foreign debris from the gas stream.

3.4 Fitting
Connector used in joining 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, the clear opening of which is at least 250 mm^2 for two and three wheelers and 450 mm^2 for other vehicles.

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

3.9.1 Mono-fuel NGV:

Road vehicle which operates on natural gas only.

Note 1 to entry: It is also known as "Dedicated Natural Gas Vehicle".

Note 2 to entry: In Europe and in India, the term mono-fuel also applies to light duty NGV with maximum 15 liter gasoline tank

3.9.2 Bi-fuel NGV:
Vehicle that has two independent fuel systems (one of them for natural gas) and can run alternatively on either fuel, but only on one at a time.

3.9.3: Duel- Fuel NGV:

Vehicle that has two independent fuel systems (one of them for natural gas) and can run on both fuels simultaneously; it also may run on one fuel alone.

3.10 Pressure Indicator — Pressurized device which indicates the gas pressure; It can be a gauge or a sensor.

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 acting in series or in parallel 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,

Note:- 1 to entry: Other service pressure can be accommodated by adjusting the pressure by the appropriate factor (ratio). For example, a 25 MPa (250 Bar) settled at 15°C service pressure system will require pressures to be multiplied by 1.25.

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) on Board Fuel System — Complete system assembly from CNG cylinder to gas-air mixer or injector for converting vehicle to run on 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-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 tyred, (including pneumatic tyred) rubber padded or steel drum wheel mounted, self-propelled, excavator, loader, back 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’ highway capabilities.

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

3.30 Bi-fuel System — A hi-fuel system is defined as a system equipped to operate with either on 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.

3.33 Fuel Rail:- Pipe or duct that connects the gas injectors

3.34 Multifunctional components:- Device consisting of two or more different components specified by this part of standard, combined or fitted together.

4 CONSTRUCTIONS AND ASSEMBLY:-

4.1 Components shall be made of materials suitable for use with CNG. Resistance to galvanic corrosion shall be taken under consideration when joining components containing dissimilar materials.

4.2 Jointing 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 cylinders shall have one of the type of threads conforming to IS 3224.

4.4 Components shall be suitable for service over one of the following temperature ranges:

	Engine compartment	On-board (except engine compartment)
Moderate	-20°C to 120°C	-20°C to 85°C
Cold	-40°C to 120°C	-40°C to 85°C

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

4.6 All non-metallic 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. Comply with the corrosion resistance tests as specified in IS 15711.

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 Automatic Fuel Flow shut-off valves shall be closed when de –energized

NOTE:- Replace the “CNG” with “CNG / Bio- CNG” wherever it specified. Also, Bio- CNG shall Confirm all requirements which are specified for CNG.

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 tibre) 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 BIS Certification Marking

The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 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.