

AUTOMOTIVE INDUSTRY STANDARD

**Automotive CNG/LPG Vehicles –
Test Method to Evaluate the Range**

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ON BEHALF OF :

AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER

CENTRAL MOTOR VEHICLE RULES - TECHNICAL STANDING COMMITTEE

SET-UP BY

MINISTRY OF ROAD TRANSPORT & HIGHWAYS

GOVERNMENT OF INDIA

April 2004

Status chart of the Standard to be used by the purchaser for updating
the record

Sr. No.	Corr-igenda.	Amend-ment	Revision	Date	Remark	Misc.

General Remarks:

Introduction

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the Ministry of Surface Transport (MoST) has constituted a permanent Automotive Industry Standard Committee (AISC) vide order No.RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the Secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their Web site.

This Automotive Industry Standard is formulated to assess the maximum distance travelled or the range of automotive vehicles fuelled with alternate fuels such as CNG & LPG, based on GVW, nature of fuel and quantity of fuel used, which are the major parameters responsible for maximum possible distance travelled whereas other attributes are considered as average. (As of todate, range of minimum 250 km is mandated for buses, as notified by MoRTH)

Considerable assistance has been taken from IS:11921-1993 – Automotive Vehicles-Method of Evaluation of Fuel Consumption in making this AIS.

The Automotive Industry Standards Committee (AISC) responsible for preparation of this standard is given in Annexure : B.

Automotive CNG/LPG Vehicles – Test Method to Evaluate the Range

1. SCOPE:

This standard specifies the methodology, for the measurement of range of automotive vehicles fuelled with alternate fuels such as LPG, CNG.

2. TERMINOLOGY:

Range:

For the vehicles specified under cl.1, range is a measurement of max. distance covered by a vehicle, with a full charge of its gas cylinder(s) installed.

3. REFERENCE:

IS: 9211- 1979 : Denomination and definition of weight of road vehicle.

IS : 11422-1986 : Terms & definitions of weights of two-wheeled motor vehicles.

IS: 11825-1986 : Method of weightment of automotive vehicles.

4. FEATURES OF TEST TRACK:

The surface shall be dry, levelled surface / suitable highway which simulate / represent the typical driving conditions on road.

5. ATMOSPHERIC CONDITIONS:

The atmospheric conditions at test site such as pressure, temperature & relative humidity shall be recorded.

6. PREPARATION OF VEHICLE:

6.1. The vehicle shall conform to its parts, components and systems to the technical specifications declared by the manufacturer.

6.2. In the case of commercial vehicles, either fully built vehicle or vehicle with cab and load body shall be tested.

6.3. The tyre pressure shall be adjusted to the value specified by the manufacturer.

6.4. All the fuel enriching devices other than those required for the normal functioning of the vehicle shall be made inoperative.

6.5 The vehicle shall be loaded to the gross vehicle weight (GVW) specified by the vehicle manufacturer and the weight distribution between the axles shall be as recommended by the manufacturer.

- 6.6 The instruments, the testing personnel and other equipments necessary to be carried on the test vehicle at the time of test shall form part of the payload and shall be recorded in the report.
- 6.7 The fuel tank/s, cylinder/s shall be filled to its maximum capacity as specified by the manufacturer.
- 6.8 In case of multi –tanks/cylinders, forming part of total fuel capacity shall be manifolded together by fully opening the individual valves.

(Important : The adjustment of fuel system, ignition system, idling speed etc. shall confirm to the manufacturer’s recommendations made for mass emission test & should not be tampered with before or during the test.)

7. INSTRUMENTATION :

- 7.1. The calibration status of the instruments shall be verified before use.
- 7.2. All instruments used shall be mounted in such a way that they do not affect the performance or stability of the vehicle & do not hamper driver from normal driving of vehicle.
- 7.3 The instruments used for measurement of distance and speed shall have accuracy of $\pm 1 \%$. Alternately, vehicle odometer can be calibrated and calibration factor can be applied to the distance covered during test to obtain corrected range.

8. EVALUATION OF RANGE:

- 8.1 FOR CNG FUELLED VEHICLES: Before starting the test, initial readings of cylinder pressure, cylinder temperature, ambient temperature, relative humidity, wind velocity, shall be recorded.
- 8.2 FOR LPG FUELLED VEHICLES: Before starting the test, initial readings of cylinder weight (individual cylinder weights in case of multi-cylinders), ambient temperature, relative humidity, wind velocity, shall be recorded.
- 8.3 The vehicle shall be driven at a normal driving speed considering the traffic conditions. The max. speed shall not exceed the speed limit prescribed on the highways
- 8.4 The vehicle shall be driven till the maximum possible consumption of fuel takes place. (Although 100 % consumption of fuel never takes place, maximum consumption of fuel shall be considered until fuel tank becomes empty, which can be verified by dial gauge / pressure gauge installed in the LPG / CNG system.)
- 8.5 The total distance traveled, time required & average speed for traveling the distance shall be recorded.
- 8.6 FOR CNG FUELLED VEHICLES : After completion of test final readings of cylinder pressure, cylinder temperature, ambient temperature, relative humidity, wind velocity shall be recorded.

- 8.7 FOR LPG FUELLED VEHICLES : After completion of test final readings of cylinder weight (individual cylinder weights in case of multi-cylinders), ambient temperature, relative humidity and wind velocity shall be recorded.
- 8.8 The average speed shall be calculated from following formula-

$$V_{avg} = (\text{Total Distance travelled}) / (\text{Total time})$$
- 8.9 The total distance covered by the vehicle is reported as range of a vehicle for complete depletion of cylinder(s) / tank(s).

9. TECHNICAL SPECIFICATIONS OF VEHICLE:

The technical specifications submitted by the vehicle manufacturer or kit installer to the test agency shall contain at least the details given in Annexure-A.

Note: In case, the specifications submitted for whole type approval of vehicle contains the above information, it is not necessary to submit again.

In case of following changes, tests are necessary for establishing compliance:

- i. Changes in excess of 10% vehicle test weight
- ii. Changes in engine type, capacity (cubic capacity) in excess of 10%, number and arrangement of cylinders
- iii. In case of spark ignition engines, which are retrofitted with CNG / LPG, changes in the fuel system such as carburettor to fuel injection or vice versa.
- iv. Changes in engine power or torque in excess of 5%
- v. Changes in type of transmission
- vi. Changes in the overall transmission ratio by 8 %.
- vii. No. of axles
- viii Air intake system (Naturally aspirated to super/turbo charged or vice versa)
- ix. Changes in the Engine Control Unit (ECU), including calibration.
 - x. Changes in body shape which increases the frontal area by +25 %.
 - xi. Change in tyre size.

ANNEXURE:A

TECHNICAL SPECIFICATIONS OF THE VEHICLE

A.0 GENERAL

- A.0.1 Kit Manufacturer's Name & Address
- A.0.2 Kit Installers Name and Address
- A.0.2 Telephone No. / Fax No.
- A.0.2 Contact Person

A.1 VEHICLE

- A.1.2 Model
- A.1.3 Variant
- A.1.4 Type & Category
- A.1.5 Type of Fuel

A.2 CONFIGURATION

- A.2.1 No. of Cylinders/Tanks
- A.2.2 Tank Capacity (Water Equivalent)
- A.2.3 Working pressure(In case of CNG)
- A.2.4 Make of Cylinder/s
- A.2.5 Identification No/s.
- A.2.6 CCOE Approval Certificate Ref.

A.3 WEIGHTS

- A.3.1 Max. permissible FAW
- A.3.2 Max. permissible RAW
- A.3.3 GVW
- A.3.4 Unladen Vehicle Weight

A.4 TYRE SIZE & PLY RATING

- A.4.1 Front
- A.4.2 Rear

A.5 TYRE INFLATION PRESSURE (Laden)

- A.5.1 Front
- A.5.2 Rear

A.6 ENGINE

- A.6.1 Make
- A.6.2 Max. Power
- A.6.3 Max. Torque
- A.6.4 Fuel system
- A.6.5 Air Intake System
- A.6.6 CPU Make & Id. No.

A.7 TRANSMISSION

A.7.1 Type

A.7.2 Gear Box

A.7.3 Gear ratios

A.7.4 Rear axle ratio

Test Agency	Manufacturer	Document No.(indicating also revision status)
Signature	Signature	
Name	Name	
Designation	Designation	
Date	Date	Sheet No.----- of ----

Annexure : B
(See Introduction)
COMMITTEE COMPOSITION
Automotive Industry Standards Committee

Chairman	
Shri B. Bhanot	Director The Automotive Research Association of India, Pune
Members	Representing
Shri Alok Rawat	Ministry of Road Transport & Highways, New Delhi
Shri Sushil Kumar	Department of Heavy Industry, Ministry of Heavy Industries & Public Enterprises, New Delhi
Director	Office of the Development Commissioner Small Scale Industries, Ministry of Small Scale Industries, New Delhi
Shri L. R. Singh	Bureau of Indian Standards, New Delhi
Shri A. S. Lakra Shri D. G. Shirke (Alternate)	Central Institute of Road Transport, Pune
Director	Indian Institute of Petroleum, Dehra Dun
Shri R.C. Sethi Shri N. Karuppaiah (Alternate)	Vehicles Research & Development Establishment, Ahmednagar
Shri Rajat Nandi	Society of Indian Automobile Manufacturers
Shri T.C. Gopalan Shri Ramakant Garg (Alternate)	Tractor Manufacturers Association, New Delhi
Shri K.N.D. Nambudiripad	Automotive Components Manufacturers Association New Delhi
Shri G. P. Banerji	Automotive Components Manufacturers Association New Delhi

Member Secretary
Mrs. Rashmi Urdhwareshe
Sr. Assistant Director
The Automotive Research Association of India, Pune