भारतीय मानक **IS 15718 : 2024**

Indian Standard

सड़क वाहन — संपीड़ित प्राकृतिक गैस (सीएनजी)/जैव-संपीड़ित प्राकृतिक गैस (जैव-सीएनजी) — ईंधन प्रणाली के घटक — सीएनजी उच्च दाब ईंधन लाईन (नम्य होज) सिरे कनेक्शन सहित [2.15 मैगापास्कल (21.5 बार) से अधिक दाब की]

(पहला पुनरीक्षण)

Road Vehicles — Compressed Natural Gas (CNG)/Bio-Compressed Natural Gas (Bio-CNG) — Fuel System Components — High Pressure Fuel Line (Flexible Hose) with End Connections [Having Service Pressure Exceeding 2.15 MPA (21.5 Bar)]

(First Revision)

ICS 43.060.40

भारतीय मानक ब्यूरो
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November 2024 **Price Group 6**

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

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 definitions, test methods and requirements of high-pressure fuel line (flexible hose) with end connections having service pressure exceeding 2.15 MPa (21.5 bar) of CNG on-board fuel system component intended for use 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 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 gaseousfuel agricultural tractors — Part B (Agricultural tractors application)

AIS 024 (Rev. 1) (Part C) — Safety and procedural requirements for type approval of gaseousfuel 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)

SAE J 517 : 1998 — Hydraulic hose

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:

IS No.	*Title*
IS 15710 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — General requirements and definitions
IS 15711 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Performance and general test methods (*first revision*)
IS 15712 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Automatic valve (solenoid valve) (*first revision*)
IS 15713 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Pressure regulator (*first revision*)
IS 15714 : 2024	Road vehicles — Compressed natural gas (CNG)/bio-compressed natural gas (bio-CNG) fuel system components — Gas air mixer (*first revision*)

(*Continued on third cover*)

Indian Standard

ROAD VEHICLES — COMPRESSED NATURAL GAS (CNG)/BIO-COMPRESSED NATURAL GAS (BIO-CNG) FUEL SYSTEM COMPONENTS — HIGH PRESSURE FUEL LINE (FLEXIBLE HOSE) WITH END CONNECTIONS [HAVING SERVICE PRESSURE EXCEEDING 2.15MPa (21.5 BAR)]

(First Revision)

1 SCOPE

1.1 This standard specifies definitions, test methods and requirements of CNG/bio-CNG high pressure fuel line (flexible hose) with end connections having service pressure exceeding 2.15 MPa (21.5 bar) of CNG/bio-CNG on-board fuel system component intended for use on motor vehicles defined in IS 14272.

1.1.1 This standard is applicable to CNG/bio-CNG fuel system components intended to be used 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) CNG/bio-CNG fuel systems components for the propulsion of marine craft; and
e) 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 listed in Annex A 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 edition of these standards.

3 DEFINITIONS

For the purpose of this standard definitions given in IS 15710 shall apply.

4 TYPES

CNG/bio-CNG high pressure fuel line (flexible hose) shall be of following types:

a) Type A — This hose shall consist of an inner tube of oil-resistant synthetic rubber, single wire braid reinforcement and an oil-and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire; and

b) Type AT — This hose shall be of the same construction as Type A, except having a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

5 TYPE TESTS

5.1 Dimensions

Dimensions and tolerances applicable to this hose are given in Table 1.

The inside diameter of hose shall be concentric with outside diameter of hose and the outer surface of the reinforcement within the limits given in Table 2.

5.2 Proof Pressure Test

When tested as per **5** of IS 15711 flexible hose shall not leak at the proof pressure test specified in Table 3.

5.3 Change In Length Test

Shall not exceed + 2 percent to - 4 percent change when pressurized to operating pressure specified in Table 3.

5.4 Burst Test

One 460 mm free hose length assembly shall not leak or fail below the minimum burst pressure specified in Table 3 when tested as per **5** of IS 15711.

5.5 Leakage Test

Two 300 mm free hose length assemblies shall not leak or fail when tested as per **5** of IS 15711 at 1.5 times of operating pressure as specified in Table 3.

5.6 Cold Bend Test

One hose assembly shall exhibit no cover cracks or leakage when bent at a minimum bend radius specified in Table 3 and exposed at - 20 °C.

Table 1 Dimensions of Flexible Hose

(*Clause* 5.1)

Sl No.	**Nominal Size,** in mm (inch)	**Hose[3] Dash Size**	**Hose ID,** in mm	**Tolerance on ID,** in mm		**Reinforcement Diameter,** in mm		**Hose OD Type A,** in mm		**Hose OD Type AT,** in mm	**Cover[4] Thickness Type AT,** in mm	
(1)	(2)	(3)	(4)	(5)		(6)		(7)		(8)	(9)	
				+	-	*Max*	*Min*	*Max*	*Min*	*Max*	*Max*	*Min*
i)	4(3/16)	- 3	4.8	0.6	0.2	10.1	8.9	13.5	11.9	12.5	1.52	0.76
ii)	6(1/4)	- 4	6.4			11.7	10.6	16.7	15.1	14.1		
iii)	8(5/16)	- 5	7.9			13.3	12.1	18.3	16.7	15.7		
iv)	9(3/8)	- 6	9.5			15.7	14.5	20.6	19.0	18.1		
v)	10(13/32)	- 6.5	10.3	0.8	0.4	16.4	15.3	21.4	19.8	18.9		
vi)	12(1/2)	- 8	12.7			19.0	17.5	23.8	22.2	21.5		
vii)	16(5/8)	- 10	15.9			22.2	20.6	27.0	25.4	24.7		
viii)	18(3/4)	- 12	19.0			26.2	24.6	31.0	29.4	28.6		
ix)	22(7/8)	- 14	22.2			29.4	27.8	34.1	32.5	31.8		
x)	25(1)	- 16	25.4	1.0		34.1	32.5	39.3	36.9	36.6		
xi)	32(1-1/4)	- 20	31.8	1.2		41.7	39.3	47.6	44.4	44.8	2.03	1.02
xii)	38(1-1/2)	- 24	38.1			48.0	45.6	54.0	50.8	52.0	2.54	1.27
xiii)	50(2)	- 32	50.8			61.9	58.7	68.3	65.1	65.9		

NOTES
1 Superscript '**3)**' indicates 'For information only'.
2 Hose dash size = Nominal size, in inch x 16.
3 Superscript '**4)**' indicates cover thickness shall be measured by means of a dial indicator depth gauge having a round foot placed parallel to the hose bridging a groove obtained by stripping a 12.5 to 25.4 width of cover from the hose. A mandrel should be placed in the hose bore to insure freedom from misalignment.

Table 2 Hose Concentricity

(*Clause* 5.1)

Sl No.	**Nominal Hose ID,** in mm (inch)	**Concentricity, FIR ID to OD,** in mm	**Concentricity, FIR ID to Reinforcement,** in mm
(1)	(2)	(3)	(4)
1)	Up to and including 6 (1/4)	0.8	0.4
2)	Over 6 (1/4) to 22 (7/8) inclusive	1.0	0.6
3)	Over 22 (78)	1.3	0.8

5.7 Oil Resistance Test

When tested as per IS 3400 (Part 6) the specimens prepared from the inner tube and the cover shall show a volume increase of not more than 100 percent when measured after removal from oil No. 3 in which it has been immersed for 70 h at 100 °C ± 2 °C.

5.8 Ozone Resistance Test

When tested as per IS 3400 (Part 20) for ozone resistance test to an atmosphere comprised of air and ozone with an ozone partial pressure of 50 MPa (50 parts ozone per 100 million parts of air at standard atmospheric conditions) at an ambient temperature of 40 °C for 70 h exposure, specimens shall not show evidence of cracking or deterioration when viewed with seven-power magnification while still in a stressed condition.

5.9 Ageing Test

When hose is aged for 72 h at 125 °C ± 2 °C in accordance with IS 3400 (Part 4) the change in tensile strength and elongation at break of the lining and cover when tested in accordance with IS 3400 (Part 1) shall not vary from the corresponding pre-determined un-aged values by more than 40 percent.

6 ACCEPTANCE TEST

For the purpose of acceptance test, CNG/bio-CNG high pressure fuel line (flexible hose) having pressure exceeding 2.15 MPa (21.5 bar) approved under this standard shall be so manufactured as to conform following test requirements as specified in relevant clauses of this standard:

a) Proof pressure test;
b) Burst test;
c) Leakage test;
d) Cold bend test;
e) Ozone resistance test; and
f) Ageing test.

7 MARKING

7.1 CNG/bio-CNG high pressure fuel line (flexible hose) with end connections shall be permanently marked with:

a) Manufacturers name, trade-mark or symbol;
b) Part No. or unique identification mark;
c) Type;
d) Nominal size;
e) Working pressure;
f) Date of manufacture or batch number, and
g) CNG/bio-CNG;

Table 3 Specifications of Flexible Hose

(*Clauses* 5.2, 5.3, 5.4, 5.5 *and* 5.6)

Sl No.	**Nominal Size,** in mm (inch)	**Burst Pressure MPa,** *Min*	**Proof Pressure,** MPa	**Operating Pressure,** MPa	**Min Bend Radius[5],** in mm
(1)	(2)	(3)	(4)	(5)	(6)
i)	4(3/16)	82.7	41.4	20.7	89
ii)	6(1/4)	75.8	37.9	19.0	102
iii)	8(5/16)	68.9	34.5	17.2	114
iv)	9(3/8)	62.0	31.0	15.5	127
v)	10(13/32)	62.0	31.0	15.5	140
vi)	12(1/2)	55.2	27.6	13.8	178
vii)	16(5/8)	41.2	20.7	10.3	203
viii)	18(3/4)	34.5	17.2	8.6	241
ix)	22(7/8)	31.0	15.5	7.8	279
x)	25(1)	27.6	13.8	6.9	305
xi)	32(1-1/4)	17.2	8.6	4.3	419
xii)	38(1-1/2)	13.8	6.9	3.4	508
xiii)	50 (2)	10.3	5.2	2.6	635

[5] indicates ‘bend radius measured at inside of bend’.

7.2 BIS Certification Marking

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

8 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) Name of the hose manufacturer;
b) Manufacturing plant address;
c) Part No.;
d) Type No. (Type A or Type AT);
e) Nominal inner diameter (ID);
f) Nominal outer diameter (OD);
g) Maximum operating pressure; and
h) Drawings with relevant dimensions and materials.

9 NUMBER OF SAMPLES FOR TESTING

Samples of free hose length of CNG/bio-CNG high pressure hose assembly with or without end connections having preferably BSP threading shall be submitted as per Table 4 for complete testing as per this standard.

10 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 certification authority, based on the justification provided by the component manufacturer and reviewed by the certification authority, which has granted type approval.

Table 4 Number of Samples for Testing

(*Clause* 9)

Sl No.	Free Hose Length Sample	Minimum Quantity
(1)	(2)	(3)
i)	460 mm length with end connections	3
ii)	460 mm length without end connections	1
iii)	300 mm length with end connections	2
iv)	300 mm length without end connections	2
v)	150 mm × 150 mm slabs of cover and lining material	4

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDRADS

IS No.	*Title*	*IS No.*	*Title*
IS 3400 (Part 1) : 2021/ISO 37 : 2017	Methods of test for vulcanized rubber: Part 1 Tensile stress-strain properties (*fourth revision*)	IS 14272 : 2011	Automotive vehicles — Types — Terminology
IS 3400 (Part 4) : 2012/ ISO 188 : 2011	Methods of test for vulcanized rubber: Part 4 Accelerated ageing and heat resistance (*third revision*)	IS 15710 : 2024	Road vehicles — Compressed Natural Gas (CNG)/ bio-compressed natural gas (bio-CNG) fuel system components — General requirements and definitions
IS 3400 (Part 6) : 2018/ISO 1817 : 2015	Methods of test for vulcanized rubbers: Part 6 Determination of the effect of liquids (*fourth 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 3400 (Part 20) : 2018/ISO 1431-1 : 2012	Methods of test for vulcanized rubbers: Part 20 Resistance to ozone cracking — Static strain test (*second revision*)		

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

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

Organization	*Representative(s)*
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. (*Alternate*)
Automotive Component Manufactures Association of India, New Delhi	SHRI SANJAY TANK MISS SEEMA BABAL (*Alternate*)
Bajaj Auto Ltd, Pune	SHRI MILIND J. PAGARE SHRI ARVIND V. KUMBHAR (*Alternate*)
Bosch Limited, Bengaluru	SHRI BHARADWAJ M. KRISHNAMURTHY SHRI VIKRAM K. (*Alternate*)
Central Institute of Road Transport, Pune	SHRI SAMIR SATTIGERI SHRI V. V. JOSHI (*Alternate*)
Central Pollution Control Board, New Delhi	SHRI A. SUDHAKAR SHRI SUNEEL DAVE (*Alternate* I) SHRI KEDARNATH DAS (*Alternate* II)
CLH Gaseous Fuel Applications Ltd, Gurugram	SHRI SHISHIR AGRAWAL SHRI GAGAN AGRAWAL (*Alternate*)
Delhi Transport Corporation, New Delhi	SHRI VIKAS BATRA
GAIL (India) Limited, New Delhi	SHRI ASHISH KUMAR MITTAL SHRI LOKESH MEHTA (*Alternate*)
Indian Auto LPG Coalition, Faridabad	SHRI SHISHIR AGRAWAL SHRI SUYASH GUPTA (*Alternate*)
Indian Institute of Petroleum, Dehradun	SHRI WITTISON KAMEI SHRI ROBINDRO LAIRENLAKPAM (*Alternate*)
Indian Institute of Science, Bengaluru	PROF R.V. RAVIKRISHNA
Indian Institute of Technology Ropar, Rupnagar	SHRI DHIRAJ KUMAR MAHAJAN DR DEBAPRASAD MANDAL (*Alternate*)
Indian Oil Corporation Ltd, (R & D Centre), Faridabad	DR M. SITHANANTHAN
Indian Rubber Manufacturers Research Association, Thane, Mumbai	DR K. RAJ KUMAR DR BHARAT KAPGATE (*Alternate*)
International Centre for Automotive Technology (ICAT), Manesar	SHRI VAIBHAV PRASHANT YADAV SHRI VIJAYANTA AHUJA (*Alternate*)
Mahindra & Mahindra Ltd, Mumbai	SHRI RAJAMANI PARTHIBAN SHRI SHAILESH KULKARNI (*Alternate*)

Organization	*Representative(s)*
Mahindra & Mahindra Ltd (Truck and Bus Division), Pune	SHRI V. G. KULKARNI
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*)
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Rohan BRC Gas Equipment Pvt Ltd, Ahmedabad	SHRI STEFANO DE CAROLIS SHRI PARTHIV SHUKLA (*Alternate*)
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Member Secretary
SHRI GAURAV JAYASWAL
SCIENTIST 'C'/DEPUTY DIRECTOR
(TRANSPORT ENGINEERING), BIS

(*Continued from second cover*)

IS No.	*Title*
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) (*first revision*)
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 (21.5 bar)]
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 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 (*first revision*)

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this 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.

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