COMPENDIUM
of
INDIAN STANDARDS
on

INTERNAL COMBUSTION ENGINES
COMPRESSION IGNITION (DIESEL) ENGINES

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Introduction

Prime movers serve as the main source of power, converting energy into mechanical motion to drive vehicles. Automotive prime movers, transmission systems, and internal combustion engines are crucial elements of vehicle propulsion, ensuring efficient power generation, transfer, and utilization.

Internal combustion engines remain a dominant propulsion technology, converting fuel into mechanical energy through controlled combustion broadly categorized as under: -

a) **Spark-ignition (SI) engines, which typically run on petrol, and**
b) **Compression-ignition (CI) engines, mainly fuelled by diesel**

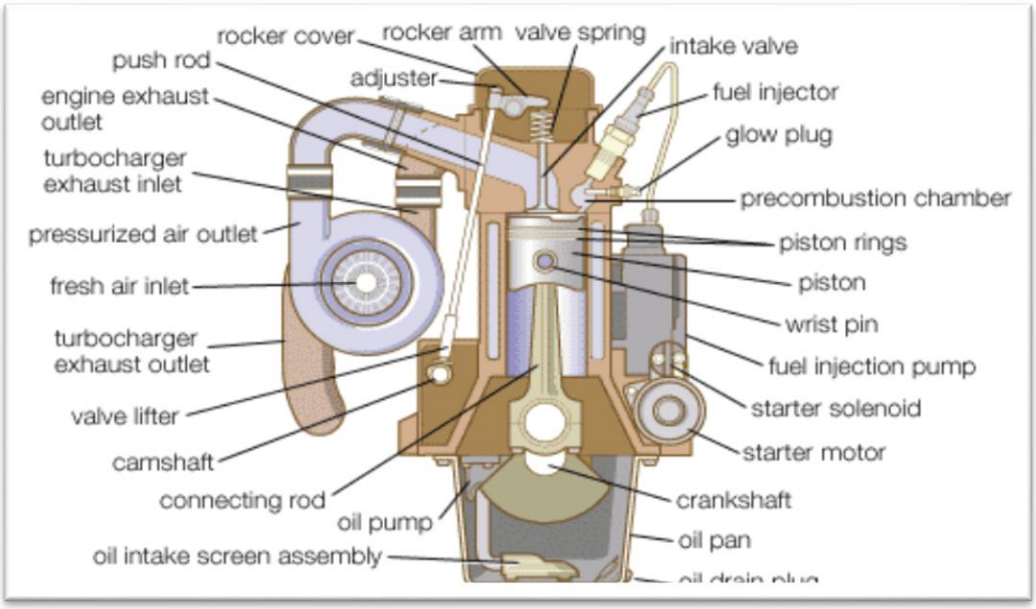
Both SI and CI engines offer distinct advantages in terms of power, efficiency, and emissions control. Continued advancements aim to enhance fuel economy, minimize environmental impact, and integrate with hybrid-electric systems to promote sustainability.

Standards ensure a precise control over dimensions and performance parameters of the components of the IC engines, a key factor for an efficient and durable engine.

Transmission systems manage the distribution of power from the prime mover to the wheels, optimizing torque and speed for improved efficiency and driving dynamics. Various types, such as manual, automatic, and continuously variable transmissions, provide different levels of control, responsiveness, and fuel economy.

This compendium is a collation of Standards pertaining to the Compression Ignition (CI) based Internal Combustion Engines and their components for the following: -

i) **Constant Speed Compression Ignition (CI) Diesel Engines for General Purpose.**
ii) **Constant Speed Compression Ignition (CI) Diesel Engines for Agriculture Purpose.**
iii) **Parts and components of the Internal Combustion (CI) diesel engines.**



Illustrative diagram indicating construction and components of CI (Diesel) Engines

Constant Speed Compression Ignition Diesel Engines for General Purpose.

IS 10001: 1981/ISO 3046 Performance Requirements for Constant Speed Compression ignition (diesel) engines for general purposes (up to 20 kW)

Scope
The standard specifies key performance attributes, such as power output, constant speed operation, and fuel consumption.

Applications
These engines are widely used in various general-purpose applications, including agricultural machinery, irrigation pumps, and small generators

IS 10002: 1981/ISO 3046 Specification for performance requirements for constant speed compression ignition (Diesel) engines for general purposes (Above 20 KW)

Scope
The standard specifies key performance attributes, such as power output, constant speed operation, and fuel consumption for engines above 20 kW.

Applications
This standard applies to engines meant for heavy duty work such as to propel road construction and earth-moving machines, industrial trucks, and for other applications where no other suitable standard for these engines exists.

It also applies to Reciprocating Internal Combustion (RIC) engines for land, rail-traction and marine use.

Constant Speed Compression Ignition Diesel Engines for Agriculture Purpose.

IS 11170: 1985/ISO 3046 Performance requirements for Constant speed compression ignition (diesel) engines for agricultural purposes of rating up to 20 kW

Scope

This standard lays down the performance requirements for Constant speed compression ignition (diesel) engines for agricultural purposes of rating up to 20 kW

Applications
This standard is applicable to engines for Agriculture purpose except those for tractors.

Key Components

The key components of CI (diesel) internal combustion engines and the relevant standards for conformance are as under: -

S No	**Component of Compression Ignition IC Engine**	**Indian Standard**
1	Fuel injection pump mounting bolts	IS 12352 : 1988Reviewed In : 2019
2	Couplings for driving fuel injection pumps	IS 12404 : 1988Reviewed In : 2019
3	Two stage, 0.5 litre diesel fuel filters	IS 12499 : 1988Reviewed In : 2019
4	0.2 litre diesel fuel filters	IS 12500 : 1988Reviewed In : 2019
5	Single cylinder fuel injection pumps	IS 1543 : 1964Reviewed In : 2023
6	Two stage, one litre, diesel fuel filters	IS 3169 : 1991Reviewed In : 2020
7	Fuel injection equipment - Single and double ended pipe unions (Single And Double Ended Banjo)	IS 3172 : 1997Reviewed In : 2021
8	High pressure connections for fuel injection equipment for diesel engines	IS 3173 : 1965Reviewed In : 2022
9	Pipe union bolt	IS 3174 : 1974Reviewed In : 2023
10	Feed pumps for diesel fuel injection equipment	IS 9420 (Part 2) : 1988Reviewed In : 2019

The Indian standards related to dimensions of the IC engine components are given below:-

S No	**Indian Standard**	**IC Engine component**
1	IS 10478 : 2018/ISO 6519 : 2015	Diesel engines - Fuel injection pumps - Tapers for shaft ends and hubs (Second Revision)
2	IS 9418 : 1980	Dimensions for mounting flanges for in - Line fuel injection pumps for multi - Cylinder compression ignition engines
3	IS 9420 (Part 1) : 1988	Specification for feed pumps for diesel fuel injection equipment: Part 1 external dimensions(First Revision)
4	IS 9465 : 1980	Mounting dimensions for in - Line injection pump assemblies for fuel injection equipment for multi - Cylinder compression ignition engines
5	IS 12904 : 1990ISO 7648Reviewed In : 2024Decision taken to Reaffirm and Archive	Flywheel housings for reciprocating internal combustion engines - Nominal dimensions and tolerances

6	IS 13090 : 2018ISO 7649	Automotive vehicles - Commercial vehicles - Clutch housings - Dimensions (First Revision)
7	IS/ISO 8178-8 : 2015ISO 8178-8 : 2015 Reviewed In : 2020	Reciprocating internal combustion engines - Exhaust emission measurement: Part 8 engine group determination
8	IS 12904 : 1990ISO 7648Reviewed In : 2024Decision taken to Reaffirm and Archive	Flywheel housings for reciprocating internal combustion engines - Nominal dimensions and tolerances

Test Methods

Important Tests and the Test Methods

IS 11170 also prescribes Type Tests and the corresponding Test method as given below: -

I. Preliminary run according to IS : 10000 (Part 5)-1980;
II. Initial performance test according to Section I of IS : 10000 (Part 8)-1980 'Methods of tests for internal combustion engines: Part 8 Performance tests;
III. Endurance test according to Section 1 of IS : 10000 (Part 9)-1980 'Methods of tests for internal combustion engines: Part 9 Endurance tests':
IV. Final performance test according to Section 1 or IS : 10000 (Part 8)-1980;
V. Final inspection test according to IS : 10000 (Part 6)-1980 'Methods of tests for internal combustion engines: Part 6 Recording of test results; and
VI. Lubricating oil consumption according to IS : 10000 (Part 4)-1981

The additional standards relating to method of tests are listed below :-

S No	Indian Standard	Test Method
1	IS 13018 : 1990	Internal combustion of test for pressure engines - Method charged engines
2	IS 14273 : 1999	Automotive vehicles - Exhaust emissions - Gaseous pollutants from vehicles fitted with compression ignition engines - Method of measurement
3	IS 14511 (Part 1) : 2007/ISO 8984-1	Diesel engines - Testing of fuel injectors: Part 1 hand - Lever - Operated testing and setting apparatus (First Revision)
4	IS 14511 (Part 2) : 2007/ISO 8984-2	Diesel engines - Testing of fuel injectors: Part 2 test methods (First Revision)
5	IS 14553 : 2008	Automotive vehicles - Apparatus for the measurement of opacity (Smoke) of exhaust gas from vehicles equipped with compression ignition engines - Specification (First Revision)
6	IS 14599 : 1999	Automotive vehicles - Performance requirements (Measurement Of Power, SFC, Opacity) of positive and compression ignition engines - Method of test
7	IS 3351 : 2006	Road vehicles - Fuel filters for diesel engines - Test methods (Second Revision)

8	IS 8118 : 2008	Automotive vehicles - Opacity (Smoke) of exhaust gas from vehicles equipped with compression ignition engines operating under free acceleration - Method of measurement (Third Revision)
9	IS/ISO 8178-4 : 2020/ISO 8178-4:2020	Reciprocating internal combustion engines Exhaust emission measurement Part 4: Steady-state and transient test cycles for different engine applications
10	IS/ISO 8178-3 : 2019/ISO 8178-3:2019	Reciprocating internal combustion engines - Exhaust emission measurement - Part 3: Test procedures for measurement of exhaust gas smoke emissions from compression ignition engines using a filter type smoke meter
11	IS 17042 (Part 4) : 2018/ISO 22241-4 : 2009	Diesel Engines NOX Reduction Agent AUS 32 Part 4 Refilling Interface
12	IS 17042 (Part 5) : 2018/ISO 22241-5 : 2012	Diesel engines - Nox reduction agent aus 32: Part 5 refilling interface for passenger cars
13	IS/ISO 8528-10 : 2022ISO 8528-10:2022	Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets Part 10 Measurement of Airborne Noise (First Revision)
14	IS/ISO 8528-6 : 2005Reviewed In : 2019	Reciprocating internal combustion engine driven alternating current generating sets: Part 6 test methods
15	IS/ISO 8528-9 : 2017ISO 8528-9 : 2017	Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets Part 9 Measurement and Evaluation of Mechanical Vibrations (First Revision)
16	IS 10000 (Part 1) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 1 glossary of terms relating to test methods
17	IS 10000 (Part 11) : 1980Reviewed In : 2020	Methqds of tests for internal combustion engines: Part 11 information to be supplied by the purchaser to the manufacturer and information to be supplied by the manufacturer along with the engine
18	IS 10000 (Part 13) : 2002Reviewed In : 2018	Methods of tests for internal combustion engines: Part 13 recommendations on nature of tests required for functional changes in critical components
19	IS 10000 (Part 2) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines Part 2 standard reference conditions
20	IS 10000 (Part 3) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 3 measurements for testing - Units and limits of accuracy
21	IS 10000 (Part 5) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 5 preparation for tests and measurements for wear
22	IS 10000 (Part 6) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 6 recording of test results
23	IS 10000 (Part 7) : 1980Reviewed In : 2020	Methods of tests for internal combustion, engines: Part 7 governing tests for constant speed engines and selection of engines for use with electrical generators
24	IS 10000 (Part 8) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines Part 8 performance tests
25	IS 10000 (Part 9) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 9 endurance tests

26	IS 11509 (Part 1) : 2012ISO 4548-1 : 1997Reviewed In : 2017	Methods of test for full - Flow lubricating oil filters for internal combustion engines: Part 1 differential pressure/flow characteristics (First Revision)
27	IS 11509 (Part 2) : 2012ISO 4548-2 : 1997Reviewed In : 2017	Methods of test for full - Flow lubricating oil filters for internal combustion engines: Part 2 element by - Pass valve characteristics (First Revision)
28	IS 11509 (Part 3) : 2012ISO 4548-3 : 1997Reviewed In : 2017	Methods of test for full - Flow lubricating oil filters for internal combustion engines: Part 3 resistance to high differential pressure and to elevated temperature (First Revision)
29	IS 11838 : 1986Reviewed In : 2021	Recommendations for measurement of quality characteristics of gudgeon pins
30	IS 12025 : 1987Reviewed In : 2017	Recommendations for measurement of quality characteristics for pistons
31	IS 13686 : 1993Reviewed In : 2019	Internal combustion engines radiators - Methods of test
32	IS 13687 : 1993Reviewed In : 2019	Internal combustion engines - Radiators - Heat dissipation performance - Method of test
33	IS 14600 : 1999Reviewed In : 2019	Automotive vehicles - Exhaust emissions - Gaseous pollutants from vehicles equipped with internal combustion engines - Method of measurement
34	IS 10000 (Part 12) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 12 specimen test certificates
35	IS 10000 (Part 4) : 1980Reviewed In : 2020	Methods of tests for internal combustion engines: Part 4 declaration of power, efficiency, fuel consumption and lubricating oil consumption
36	IS/ISO 8178-7 : 2015ISO 8178 : Part 7 : 2015 Reviewed In : 2020	Reciprocating internal combustion engine - Exhaust emission measurement: Part 7 engine family determination (First Revision)
37	IS/ISO 8178-9 : 2019ISO 8178-9:2019	Reciprocating internal combustion engines - Exhaust emission measurement - Part 9: Test cycles and test procedures for measurement of exhaust gas smoke emissions from compression ignition engines using an opacimeter
38	IS 11509 (Part 5) : 2023ISO 4548-5:2020	Method of test for full-flow lubricating oil filters for internal combustion engines - Part 5: Test for hydraulic pulse durability
39	IS/ISO 8178-1 : 2023ISO 8178-1:2020	Reciprocating internal combustion engines Exhaust emission measurement Part 1: Test bed measurement systems of gaseous and particulate emissions

Code of Practice

The standards relating to code of practice for CI internal combustion engines are as under:-

S No	Indian Standard	Code of Practice
1	IS 12587 : 1989	Automotive vehicles - Transmission system - Gear arrangement - Recommendations

2	IS 13029 : 1991	Internal combustion engines - setting ignition timing in spark ignition engines - Code of practice
3	IS 8503 : 1986	Technical supply conditions for aluminium alloy pistons for internal combustion engines (First Revision)
4	IS 9262 : 1979	Recommendations for gear positions for road vehicles
5	IS/ISO 6621-2 : 2020/ISO 6621-2:2020	Internal combustion engines - Piston rings - Part 2: Inspection measuring principles
6	IS/ISO 8528-3 : 2020/ISO 8528-3:2020	Reciprocating internal combustion engine driven alternating current generating sets Part 3: Alternating current generators for generating sets
7	IS 17458 : 2024/ISO 6826: 2022	Reciprocating Internal Combustion Engines â€" Fire Protection (First Revision)

Terminology

The terms and Definitions for the Compression Ignition IC Engines are given in the Indian Standards listed below: -

S No	Indian Standard	Title of the Standard
1	IS 12535 (Part 1) : 1988Reviewed In : 2019	Automotive vehicles - Transmission systems - Glossary: Part 1 general definitions
3	IS 15653 : 2021ISO 2710-2:2019	Reciprocating internal combustion engine - Vocabulary - Terms for engine maintenance
4	IS 7449 (Part 1) : 1974Reviewed In : 2019	Glossary of terms for IC engines: Part 1 fuel injection equipment
5	IS 7451 (Part 1) : 2020ISO 2710-1 : 2017	Reciprocating Internal Combustion Engines — Vocabulary Part 1 Terms for Engine Design and Operation (Second Revision)
6	IS 7451 (Part 2) : 2006ISO 1204Reviewed In : 2021	Reciprocating internal combustion engines: Part 2 designation of the direction of rotation and of cylinders and valves in cylinder heads, and definition of right - Hand and left - Hand in - Line engines and locations on an engine (First Revision)
7	IS/ISO 6621-1 : 2018ISO 6621 : Part 1	Internal Combustion Engines — Piston Rings Part 1 Vocabulary (First Revision)

To access complete details of any standard, please download the standard from "Know your Standard" link available on BIS website www.bis.gov.in