

BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

(Not to be reproduced without permission of BIS or used as an Indian Standard)

भारतीय मानक मसौदा

आंतरिक दहन इंजनों के लिए स्टार्टर रिंग गियर्स —
भाग 2: अक्षीय और समाक्षीय स्टार्टर्स के लिए गियर्स — विशिष्टि
(पहला पुनरीक्षण)

Draft Indian Standard

**STARTER RING GEARS FOR INTERNAL COMBUSTION ENGINES —
PART 2: GEARS FOR AXIAL AND COAXIAL STARTERS — SPECIFICATION**
(First Revision)

ICS: 43.060.10

Not to be reproduced without permission
of BIS or used as standard

Last date for receipt of comments
is 11/02/2024

© BIS 2023
BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Automotive Primemovers, Transmission Systems and Internal Combustion Engine Sectional Committee, TED 2

FOREWORD

(Formal Clause to be added later)

This Standard was first published in 1975.

This standard covers ring gears for heavy duty commercial vehicle applications and for marine engines and heavy duty stationary engines used with axial and coaxial starters. It does not cover ring gears for inertia or pre-engaged starters which are covered in Part 1 of this standard.

Requirements of this standard are so chosen that they meet the requirements of starter endurance test specified in IS 3141: 2007 ‘Starter motors for internal combustion engines used for automotive and other applications - Specification (*second revision*)’

In this first revision of this standard the referencing standards have been updated. A separate clause for references has also been introduced for ease of interpretation.

This standard is one of the series of Indian Standards published on starter ring gears for internal combustion engines. Other standard in the series is:

7657 (Part 1)	Specification for starter ring gears for internal combustion engines: Part 1 gears for inertia and solenoid starters
---------------	--

The composition of the Committee responsible for the formulation of this standard is given in ANNEX A (Will be added later).

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 a 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.

Draft Indian Standard

STARTER RING GEARS FOR INTERNAL COMBUSTION ENGINES
PART 2 GEARS FOR AXIAL AND COAXIAL STARTERS — SPECIFICATION
(First Revision)

1 SCOPE

This standard specifies gear profile, dimensions, material and other requirements for involute spurs for axial and coaxial starters having aluminium bronze or hardened steel pinions for use on heavy duty commercial vehicles, marine engines and heavy duty stationary engines.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitutes 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 5517: 1993	Specification for steels for hardening and tempering <i>(Second Revision)</i>
IS 1570 (Part 1): 1978	Schedules for wrought steels: Part 1 steels specified by tensile and/or yield properties <i>(First Revision)</i>
IS 7657 (Part 1): XXXX ^{a)}	Specification for starter ring gears internal combustion engines: Part 1 Gears for inertia and solenoid pre-engaged starters'

NOTE — Standard Marked with superscript 'a)' is under the process of revision. The year of publication of this standards will be updated at the time of printing of this draft standard.

3 TERMINOLOGY

Definitions given in IS 7657 (Part 1) and the following definition shall apply.

3.1 Axial Pre-engagement — Engagement of the pinion effected by axial movement of the motorshaft or by the operation of a mechanism coaxial with it which is within the motor.

4 DIMENSIONS

These gears are generally used with 3 and 4 module involute spur gears. The tolerances shall be specified according to any one of the methods given in Table 1.

Table 1 Recommended Methods of Measurements for Starter Ring Gears
(Clause 4)

All dimensions in millimetres.

		METHOD I Span Over Given Number of Teeth¹⁾ Base Tangent Length	METHOD II Dimensions Over Roller Using Φ Roller	METHOD III Chordal Measurement	
				Chordal Height	Chordal Thickness
Before shrink fit	<i>Max</i>				
	<i>Min</i>				
After shrink fit ²⁾ (For a nominal shrinkage of 0.5 mm) ³⁾	<i>Max</i>				
	<i>Min</i>				

NOTES —

- 1) Given number of teeth depends on total number of teeth on ring gear-and pressure angle.
- 2) Not applicable for bolted type of ring gears.
- 3) Recommended practice is to have 0.028 mm shrinkage allowance per 25 mm of inside diameter (to maintain a hoop stress of not more than 227.5 N/mm²).

4.1 Face Width of Teeth

This shall be as follows:

Axial starters - 22 mm (*Max*)
 Coaxial starters - 16 mm (*Max*)

4.2 Tooth Chamfer

Teeth should not be rounded or chamfered, but shall have all sharp edges removed.

4.3 Working Clearance

Shall be 0.6 to 0.8 mm backlash under adverse working conditions, for shrunk-on type ring gears an additional diametral allowance of 0.5 mm shall be provided.

5 MATERIALS

Steel C40 or C45 according to IS 5517 for use with hardened steel pinions.

5.1 For use with aluminium bronze pinions, 31Ni3CrFMoZ steel according to IS 1570 (Part 1) shall be used.

5.2 Any other material which would give hardness conditions specified in 7 could be used subject to agreement between the purchaser and the manufacturer.

6 DESIGNATION

Shall include:

- a) Name;
- b) Symbol A or CA for axial or coaxial type;
- c) Module;
- d) Whether used with soft or hard pinion - Symbol S or H respectively; and
- e) No. of this standard.

Example:

A ring gear for axial type starters of module 3 and to be used with hard pinion shall be designated as:

Ring Gear A 3 H IS 7657 (Part 2)

7 HARDNESS

The hardening of the tooth engaging face on the pitch line shall be as follows:

<i>Type of Ring Gear</i>	<i>Hardness, (HV)</i>
Ring gears used with hardened pinions	470 to 550
Ring gears used with soft pinions	200 to 262

7.1 The minimum depth of hardness shall be 2.5 mm over the whole profile.

8 ASSEMBLY ON FLYWHEEL

8.1 Manual Gear Box Vehicles

The gear ring can be bolted on to the flywheel or can be shrunk-on. With shrunk-on gear rings this operation is sometimes combined with tempering, If tempering has been done separately, the rings should not be heated to more than 200°C to avoid softening of gear teeth. This is of special importance when replacement rings are fitted by service stations. A shoulder or step on the flywheel is recommended to ensure that the ring is located equally with the correct out of mesh clearance when fitted to the engine.

8.2 Automatic Gear Box Vehicles

The ring gear can be bolted or shrunk-on, but it is also common practice for the ring gear to be welded to a flexible plate. In the latter case, the ring gear is made to the finished size since

there is no expansion of the ring during fitting, it should be noted that the inherently more flexible location unusually results in a higher noise level, although wear rates can be similar to that of the other methods. Particular attention should be paid to accuracy of location.

9 MARKING

9.1 BIS Certification Marking

Each gear may also be marked with the Standard Mark.

9.1.1 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.

ANNEX A
(Foreword)

COMMITTEE COMPOSITION

AUTOMOTIVE PRIMEMOVERS, TRANSMISSION SYSTEMS AND INTERNAL
COMBUSTION ENGINE SECTIONAL COMMITTEE, TED 02

Will Be Added Later