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प्रारम्भिक भारतीय मानक मसौदा
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Preliminary Draft Indian Standard
BIODEGRADABLE LUBRICATING GREASES — SPECIFICATION

ICS 75.100

Lubricants and their Related Products Sectional Committee,
PCD 25

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FOREWORD

(Formal clauses will be added later)

Various components and ingredients of lubricating greases, if improperly disposed, have the potential to pollute and damage the environment and ecosystem. Non-biodegradable substances can get introduced into the food chain and lead to accumulation of toxic and hazardous substances in different animals, also known as “Biological Accumulation”, which poses a serious health hazard and can lead to disturbed environment. Therefore, to ensure sustainable development and minimize damage to ecosystem, it is very important that lubricating greases are biodegradable.

Biodegradable greases are recommended to be used in environmentally sensitive areas and industries like agriculture and forestry, mining and underground works, construction & earth moving industry, marine, railways, etc.

This standard contains clause **5.1**, which calls for agreement between the purchaser and the supplier.

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 placed retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for biodegradable lubricating greases for multipurpose application. This standard also covers complex soap greases containing extreme pressure (EP) additives.

2 REFERENCE

The following Indian Standards contain provisions, which through reference in this text, constitute the provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement 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 1447 (Part 3) : 2021	Methods of sampling of petroleum and its products Part 3 Semi-Solid and solid petroleum products (<i>second revision</i>)
IS 1448	Methods of tests for petroleum and its products
(Part 25 / Sec 1) : 2018 / ISO 3104 : 1994	Transparent and opaque liquid Section 1 — Determination of kinematic viscosity and calculation dynamic viscosity (<i>first revision</i>)

(Part 52) : 2017 / ISO 2176 :1995	Drop point (<i>second revision</i>)
(Part 53) : 1979	Determination of acidity and alkalinity of greases (<i>first revision</i>)
(Part 56) : 2013 / ISO 2909 : 2002	Calculation of viscosity index from kinematic viscosity (<i>third revision</i>)
(Part 60) : 2023 / ISO 2137 : 2020	Consistency of lubricating greases by cone penetrometer (<i>second revision</i>)
(Part 69) : 2019 / ISO 2592 : 2017	Determination of flash and fire points — Cleveland open cup method (<i>second revision</i>)
(Part 89) : 2023	Test for thermal stability of lubricating greases (<i>first revision</i>)
(Part 90) : 2008 / ISO 11009 : 2000	Petroleum products and lubricants — Determination of water washout characteristics of lubricating greases (<i>first revision</i>)
(Part 94) : 2019	Test for oxidation stability of lubricating greases by oxygen pressure vessel method (<i>first revision</i>)
(Part 125) : 1987	Estimation of deleterious particles in lubricating grease
(Part 165) : 2018	Test method for roll stability of lubricating grease
PCD 01 (18454)	Methods of test for petroleum and its products Part XX Determination of the leakage tendencies of automotive wheel bearing greases
PCD 01 (18991)	Methods of test for petroleum and its products Part 51 Copper strip corrosion test for lubricating greases
ASTM D1743-22	Standard test method for determining corrosion preventive properties of lubricating greases
ASTM D 2266-23	Standard test method for wear preventive characteristics of lubricating grease (four-ball method)
ASTM D2509-20	Standard test method for measurement of load-carrying capacity of lubricating grease (timken method)
ASTM D4289-21	Standard test method for elastomer compatibility of lubricating grease and fluids
CEC L-33-A-94	Biodegradability of two-stroke cycle outboard engine oils in water: approved test method
IP 186/1993	Determination of low temperature torque of lubricating grease
IP 220/2017	Determination of rust prevention characteristics of lubricating greases

3 GRADES

The material shall be classified into four types, namely:

- a) Regular Type Grade 1;
- b) Regular Type Grade 2;
- c) EP Type Grade 1; and
- d) EP Type Grade 2.

4 REQUIREMENTS

4.1 General

The material shall be smooth and of homogeneous preparation, free from objectionable odour and visible impurities. It shall be free from rosin, rosinate, rosin oils, tar oil, grit and fillers such as asbestos, clay, talc, etc. and shall not be gelled with bentonite and silica gel.

NOTE — A declaration shall be provided by supplier that the grease is free from rosin, rosinate, rosin oils, tar oil, grit and fillers such as asbestos, clay, talc, etc., and product is not gelled with bentonite and silica gel.

4.2 Composition

The material shall consist of following ingredients:

- a) Lithium-calcium based thickener; and
- b) Synthetic ester with the following requirements:

Characteristic	Regular Type	EP Type	Methods of Test, Ref to Parts of IS 1448
Kinematic Viscosity, cSt, at 40 °C, <i>Min</i>	18	18	Part 25
Viscosity Index (VI), <i>Min</i>	130	130	Part 56
Flash point, °C (COC), <i>Min</i>	250	250	Part 69

NOTE — Base oil may be used as agreed between the purchaser and the supplier.

4.3 The material shall also comply with the requirements given in Table 1 for regular type and Table 2 for extreme pressure (EP) type when tested according to the methods given in col 5 and 6 of the Table 1 and 2.

4.4 Keeping Quality

The keeping quality of the material shall be such that when stored in original sealed containers under normal conditions, it shall retain the properties given in the specification for not less than one year from the date of manufacture.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed in metal or any other suitable containers of appropriate size as agreed to between the purchaser and the supplier.

5.2 Marking

The container shall be securely closed and marked with the following information:

- a) Name and type of material;
- b) Manufacturer's name, initials or trade-mark, if any;
- c) Net mass of material;
- d) Identification in code or otherwise to enable traceability of manufactured product; and
- e) Any other statutory requirements.

5.2.1 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

6 SAMPLING

Representative samples of the material shall be drawn as prescribed in IS 1447 (Part 3).

6.1 Criteria for Conformity

6.2.1 Individual containers selected according to IS 1447 (Part 3) shall be opened and examined for the general requirements given in **4.1**. Tests for consistency, free organic acidity and free alkalinity shall be done on individual samples. Tests for copper strip corrosion shall be conducted on two of the individual samples.

6.2.2 Tests for all the remaining characteristics shall be done on the composite sample prepared by mixing small portions from individual containers selected during sampling.

Table 1 Requirements of Multipurpose Grease, Regular Type
(Clause 4.3)

SI No.	Characteristics	Requirements of		Methods of Test, Ref to	
		Grade 1	Grade 2	Parts of IS 1448	Other Standards
(1)	(2)	(3)	(4)	(5)	(6)
i)	Consistency of worked grease at 25 °C ± 0.5 °C			Part 60	-
	a) 60 double strokes	265 - 295	220 - 250		
	a) 100 000 strokes	Shall not differ by more than 30 units from the 60 double strokes.			
ii)	Free organic acidity (as oleic), percent by mass, <i>Max</i>	0.1	0.1	Part 53	-
iii)	Free alkalinity, percent by mass, <i>Max</i>	0.1	0.1	Part 53	-
iv)	Drop point, °C, <i>Min</i>	180	180	Part 52	-
v)	Biodegradability, <i>Min</i>	> 80	> 80		CEC L-33-A-94
vi)	Copper strip corrosion at 100 °C, for 24 h, <i>Max</i>	1a	1a		PCD 01 (18991)
vii)	Leakage and deposits forming tendencies (wheel bearing test)				PCD 01 (18454)
	a) Leakage by mass, g, <i>Max</i>	5	5		
	b) Deposit in the wheel bearing races of the rollers	Shall be free from deposits			
	c) Evidence of abnormal changes in consistency or structure of the material	Observations are to be reported			
	d) Indication of dry running of races	No dry running of races			
viii)	Resistance to water wash at 80 °C, percent loss by mass, <i>Max</i>	10	10	Part 90	-
ix)	Heat stability, percent loss by mass, <i>Max</i>	6.0	5.0	Part 89	-
x)	Oxidation stability (100 h) drop in Pressure, kg/cm ² , <i>Max</i>	0.5	0.5	Part 94	-
xi)	Freedom from deleterious particles, Permitted, no. of scratches, <i>Max</i>	10	10	Part 125	-
xii)	Roll stability test penetration change, percent after 16 h, <i>Max</i>	25	25	Part 165	
xiii)	Corrosion preventive test rating	Shall pass the test	Shall pass the test	-	ASTM D1743
xiv)	Dynamic antirust test, rating, <i>Max</i>	0.0	0.0	-	IP 220
xv)	Low temperature torque test, -20 °C			-	IP 186
	a) Starting torque, g/cm, <i>Min</i>	5000	5000		
	b) Running torque, g/cm, <i>Min</i>	1000	1000		
xvi)	Elastomer Compatibility				ASTM D4289
	a) Volume change, percent	-5 to +30	-5 to +30		
	b) Hardness change, Shore A	-15 to +2	-15 to +2		

NOTE — Serial no.(x), (xiii), (xiv), (xv) and (xvi) are type tests for which manufacturers/suppliers shall provide the proof of conformity.

Table 2 Requirements of Multipurpose Grease, EP Type
(Clause 4.3)

Sl No.	Characteristics	Requirements of		Methods of Test, Ref to	
		Grade 1	Grade 2	Parts of IS1448	Other Standards
(1)	(2)	(3)	(4)	(5)	(6)
i)	Consistency of worked grease at 25 °C ± 0.5 °C			Part 60	-
	b) 60 double strokes	265 - 295	220 - 250		
	b) 100 000 strokes	Shall not differ by more than 30 units from the 60 double strokes.			
ii)	Free organic acidity (as oleic), percent by mass, <i>Max</i>	0.1	0.1	Part 53	-
iii)	Free alkalinity, percent by mass, <i>Max</i>	0.1	0.1	Part 53	-
iv)	Drop point, °C, <i>Min</i>	180	180	Part 52	-
v)	Biodegradability, <i>Min</i>	>80	>80		CEC L-33-A-94
vi)	Copper strip corrosion at 100 °C, for 24 h, <i>Max</i>	1b	1b		PCD 01 (18991)
vii)	Leakage & deposits forming tendencies (wheel bearing test)				PCD 01 (18454)
	a) Leakage by mass, g, <i>Max</i>	5	5		
	b) Deposit in the wheel bearing races of the rollers	Shall be free from deposits			
	c) Evidence of abnormal changes in consistency or structure of the material	Observations are to be reported			
	d) Indication of dry running of races	No dry running of races			
viii)	Resistance to water wash at 80 °C, percent loss by mass, <i>Max</i>	10	10	Part 90	-
ix)	Heat stability, percent loss by mass, <i>Max</i>	6.0	5.0	Part 89	-
x)	Oxidation stability (100 h) drop in Pressure, kg/cm ² , <i>Max</i>	0.5	0.5	Part 94	-
xi)	Freedom from deleterious particles, permitted, no. of scratches, <i>Max</i>	10	10	Part 125	-
xii)	Roll stability test penetration change, percent after 16 h, <i>Max</i>	25	25	Part 165	
xii)	Corrosion preventive test rating	Shall pass the test	Shall pass the test	-	ASTM D1743
xiv)	Dynamic antirust test, rating, <i>Max</i>	0.0	0.0	-	IP 220
xv)	Low temperature torque test, -20 °C			-	IP 186
	a) Starting torque, g/cm, <i>Min</i>	5000	5000		
	b) Running torque, g/cm, <i>Min</i>	1000	1000		

xvi)	Elastomer Compatibility				ASTM D4289
	a) Volume change, percent	-5 to +30	-5 to +30		
	b) Hardness change, Shore A	-15 to +2	-15 to +2		
xvii)	Four ball weld load, kg, <i>Min</i>	250	250	(Part 170)	
xviii)	Four ball wear scar diameter, mm, <i>Max</i>	0.6	0.6		ASTM D2266
xvi)	Timken O.K. load, kg, <i>Min</i>	22	22		ASTM D2509

NOTE— Serial No.(x), (xiii), (xiv), (xv), (xvi), (xvii), and (xviii) are type tests for which manufacturers/suppliers shall give the proof of conformity.