
**Petroleum products and lubricants —
Determination of cone penetration of
lubricating greases and petrolatum**



This document is a preview generated by ERS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	2
5 Classifications, procedures and limitation	2
6 Apparatus	3
7 Sampling	14
8 Procedures for lubricating grease using full-scale methods	14
8.1 Procedure for unworked penetration	14
8.1.1 Preparation of test portion	14
8.1.2 Cleaning the cone and movable attachments	14
8.1.3 Penetration measurement	14
8.2 Procedure for worked penetration	15
8.2.1 Preparation of test sample	15
8.2.2 Preparation of test portion	15
8.2.3 Penetration measurement	16
8.3 Procedure for prolonged worked penetration	16
8.3.1 Preparation of apparatus and test portion	16
8.3.2 Penetration measurement	16
8.4 Procedure for block penetration	17
8.4.1 Preparation of test portion	17
8.4.2 Penetration measurement	17
8.4.3 Additional determinations	17
9 Procedures for lubricating grease using one-half-scale and one-quarter-scale cone method	17
9.1 General	17
9.2 Procedure for unworked penetration	18
9.2.1 Preparation of test portion	18
9.2.2 Cleaning cone and movable attachments	18
9.2.3 Penetration measurement	18
9.3 Procedure for worked penetration	18
9.3.1 Preparation of test sample	18
9.3.2 Preparation of test portion	18
9.3.3 Penetration measurement	19
10 Procedure for determining the cone penetration of petrolatum	19
10.1 Preparation of the test portion	19
10.2 Penetration measurement	19
11 Calculation	20
11.1 Calculation of full-scale penetration	20
11.2 Conversion to full-scale penetration for the one-half-scale and one-quarter-scale cones	20
11.2.1 General	20
11.2.2 One-quarter-scale cone	20
11.2.3 One-half-scale cone	20
12 Expression of results	20
13 Precision	20
13.1 General	20
13.2 Repeatability, r	20

13.3	Reproducibility, R	20
14	Test report	21
	Bibliography	22

This document is a preview generated by EVS

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*.

This fourth edition cancels and replaces the third edition (ISO 2137:2007), which has been technically revised. The main changes compared to the previous edition are as follows:

- cleaning of cone and shaft assembly with solvent has been introduced to eliminate any drag forces;
- the precision table for repeatability and reproducibility for one-half-scale and one-quarter-scale has been revised to keep only an unconverted value.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 2137 was first published in 1972. A second edition was issued in 1985. The third revision was mainly on the dimensional tolerances of the various cones, to better fit with what is available from laboratory equipment suppliers. This revision was necessary because of all the quality plans and data integrity programmes established by numerous laboratories to conform with the various ISO quality standards. In the third edition of ISO 2137, the dimensional tolerances were enlarged to allow most of the cones to fulfil the requirements.

Before adopting changes in the third revision, an interlaboratory study was performed with cones conforming to new requirements and demonstrated that the precision of the method was not altered by changing the tolerances. Tolerances were retained only on the characteristics where it was established that they have a direct impact on the penetration determination, i.e. tip angle, tip height, tip top thickness, tip base diameter, cone angle, total mass of cone plus movable attachments.

Petroleum products and lubricants — Determination of cone penetration of lubricating greases and petrolatum

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to the application of the standard, and to determine the applicability of any other restrictions for this purpose.

1 Scope

This document specifies several methods for the empirical estimation of the consistency of lubricating greases and petrolatum by measuring the penetration of a standardized cone.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 23572, *Petroleum products — Lubricating greases — Sampling of greases*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

penetration

depth that a standard object, cone or needle penetrates into a test portion under standardized conditions of time, temperature, load, etc

[SOURCE: ISO 1998-2:1998, 2.80.001 — modified: the Note has been deleted.]

3.2

cone penetration

distance that a standardized cone penetrates into a test portion under standardized conditions of load, time and temperature

Note 1 to entry: The cone penetration is expressed in units of 0,1 mm.

3.3

working

shearing action of a grease worker

3.4

unworked penetration

cone penetration (3.2) of a test portion that has received only minimum disturbance in transfer from the sample container to the cup of the grease worker