

Australian Standard™

**Methods for the determination of the
flash point of flammable liquids
(closed cup)**

**Part 2: Determination of flash point—
Pensky-Martens closed cup method**



This Australian Standard was prepared by Committee CH-009, Safe Handling of Chemicals. It was approved on behalf of the Council of Standards Australia on 5 April 2005. This Standard was published on 26 April 2005.

The following are represented on Committee CH-009:

Air Conditioning and Refrigeration Wholesalers Association
Australasian Fire Authorities Council
Australasian Railway Association
Australian Consumer & Specialty Products Association
Australian Institute of Petroleum
Avcare
Consumers' Federation of Australia
Department of Emergency Services, Qld
Department of Environment and Conservation, N.S.W.
Department of Industry & Resources, W.A.
Engineers Australia
New Zealand Chemical Industry Association
New Zealand Fire Service
Plastics and Chemicals Industry Association
TRANZ Rail
Victorian WorkCover Authority

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Web Shop at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Global Standard*, has a full listing of revisions and amendments published each month.

Australian Standards™ and other products and services developed by Standards Australia are published and distributed under contract by SAI Global, which operates the Standards Web Shop.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to the Chief Executive, Standards Australia, GPO Box 5420, Sydney, NSW 2001.

This Standard was issued in draft form for comment as DR 05030.

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 2106.2—2005

Methods for the determination of the flash point of flammable liquids (closed cup)

Part 2: Determination of flash point—Pensky-Martens closed cup method

RECONFIRMATION NOTICE

Technical Committee CH-009 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 29 June 2016.

The following are represented on Technical Committee CH-009:

Accord Australasia

Agsafe

Australasian Fire and Emergency Service Authorities Council

Australasian Institute of Dangerous Goods Consultants

Australian Institute of Petroleum

Australian Logistics Council

Australian Paint Manufacturers' Federation

National Measurement Institute

Plastics and Chemicals Industries Association

SafeWork NSW

SafeWork SA

Worksafe New Zealand

NOTES

Australian Standard™

**Methods for the determination of the
flash point of flammable liquids
(closed cup)**

**Part 2: Determination of flash point—
Pensky-Martens closed cup method**

Originated as part of AS 2106—1977.
Previous edition AS/NZS 2106.2:1999.
Revised and designated as AS 2106.2—2005.

COPYRIGHT

© Standards Australia

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 6632 3

PREFACE

This Standard was prepared by Joint Australian/New Zealand Standards Committee CH-009, Safe Handling of Chemicals, to supersede AS/NZS 2106.2:1999, *Methods for the determination of the flash point of flammable liquids (closed cup)*, Part 2: *Pensky-Martens closed cup method*. It is identical with, and has been reproduced from ISO 2719:2002, *Determination of flash point—Pensky-Martens closed cup Method*.

The objective of this Standard is to provide a test method for the determination of closed cup flash point using the Pensky-Martens apparatus, aligned with international practices given in ISO 2719.

The main changes between this edition and that published in 1999 include the provision of further information on sampling and procedures for calibration of apparatus.

As this publication has been reproduced from an International Standard, the following modifications apply:

- (a) Its number does not appear on each page of text and its identity is shown on the cover and title page.
- (b) In the source text ‘this International Standard’ should read ‘this Australian Standard.’
- (c) Substitute a full point for a comma when referring to a decimal marker.

References to the following International Standard should be replaced by the Australian//New Zealand Standard.

<i>Reference to International Standard</i>	<i>Australian/New Zealand Standard</i>	
ISO	AS/NZS	
1513 Paints and varnishes—Examination and preparation of samples for testing	1580	Paints and related materials—Methods of test
	1580.103.1	Method 103.1 Examination and preparation of samples for testing
	AS	
1523 Determination of flash point—Closed cup equilibrium method	2106	Methods for the determination of the flash point of flammable liquids (closed cup)
	2106.6	Part 6: Determination of flash point—Closed cup equilibrium method
3679 Determination of flash point—Rapid equilibrium closed cup method	2106.4	Part 4: Determination of flash point—Rapid equilibrium closed cup method
13736 Petroleum products and other liquids—Determination of flash point—Abel closed cup method	2106.1	Part 1: Determination of flash point—Abel closed cup method

Other International Standards referenced in the source document have not been adopted as Australian Standards.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

CONTENTS

1	Scope	1
2	Normative references	1
3	Term and definition	2
4	Principle	2
5	Chemicals and materials	2
6	Apparatus	2
7	Apparatus preparation	3
7.1	Location of the apparatus	3
7.2	Cleaning the test cup	3
7.3	Apparatus assembly	3
7.4	Apparatus verification	3
8	Sampling	3
9	Sample handling	4
9.1	Petroleum products	4
9.1.1	Subsampling	4
9.1.2	Samples containing undissolved water	4
9.1.3	Samples that are liquid at ambient temperature	4
9.1.4	Samples that are semi-solid or solid at ambient temperature	4
9.2	Paints and varnishes	4
10	Procedure	4
10.1	General	4
10.2	Procedure A	4
10.3	Procedure B	5
11	Calculation	5
11.1	Conversion of barometric pressure reading	5
11.2	Correction of observed flash point to standard atmospheric pressure	6
12	Expression of results	6
13	Precision	6
13.1	General	6
13.2	Repeatability, r	6
13.3	Reproducibility, R	7
14	Test report	7

Annexes

A	Apparatus verification	8
B	Pensky-Martens closed cup test apparatus	11
C	Thermometer specifications	17
D	Adaptor for low-range thermometer	18
	Bibliography	21

INTRODUCTION

Flash point values may be used in shipping, storage, handling and safety regulations, as a classification property to define “flammable” and “combustible” materials. Precise definition of the classes is given in each particular regulation.

A flash point value may indicate the presence of highly volatile material(s) in a relatively non-volatile or non-flammable material and flash point testing may be a preliminary step to other investigations into the composition of unknown materials.

Flash point determinations should not be carried out on potentially unstable, decomposable, or explosive materials, unless it has been previously established that heating the specified quantity of such materials in contact with the metallic components of the flash point apparatus within the temperature range required for the method will not induce decomposition, explosion or other adverse effects.

The interpretation of flash point results obtained on material containing halogenated hydrocarbons should be considered with caution, as these mixtures can give anomalous results.

AUSTRALIAN STANDARD

Methods for the determination of the flash point of flammable liquids (closed cup)

Part 2:

Determination of flash point—Pensky-Martens closed cup method

WARNING — The use of this International Standard may involve hazardous materials, operations and equipment. This International Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard describes two procedures, A and B, using the Pensky-Martens closed cup tester, for determining the flash point of combustible liquids, liquids with suspended solids, liquids that tend to form a surface film under the test conditions and other liquids. It is applicable for liquids with a flash point above 40 °C.

NOTE 1 Although technically kerosines with a flash point above 40 °C may be tested using this International Standard, it is standard practice to test kerosines according to ISO 13736^[8]. Similarly, unused lubricating oils are normally tested according to ISO 2592^[5].

Procedure A is used for the determination of the flash point of paints and varnishes that do not form a surface film, unused lubricating oils and other petroleum products not covered by Procedure B.

Procedure B is used for the determination of the flash point of residual fuel oils, cutback bitumens, used lubricating oils, liquids that tend to form a surface film, liquids with suspensions of solids and highly viscous materials such as polymeric solutions and adhesives.

NOTE 2 For the comparison of the flash points of used and unused lubricating oils, such as in a lubricant monitoring scheme, used lubricating oils may be tested using Procedure A. However, the precision data for these materials is only valid for Procedure B.

This International Standard is not applicable to water-borne paints or liquids contaminated by traces of highly volatile materials.

NOTE 3 Water-borne paints may be tested using ISO 3679^[6]. Liquids contaminated by traces of highly volatile materials may be tested using ISO 1523^[4] or ISO 3679.

NOTE 4 Precision data is only valid for the flash point ranges given in clause 13.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1513:1992, *Paints and varnishes — Examination and preparation of samples for testing*

ISO 3170:—¹⁾, *Petroleum liquids — Manual sampling*

1) To be published. (Revision of ISO 3170:1988)

ISO 3171:1988, *Petroleum liquids — Automatic pipeline sampling*

ISO 15528:2000, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Term and definition

For the purposes of this International Standard, the following term and definition applies.

3.1

flash point

lowest temperature of the test portion, corrected to a barometric pressure of 101,3 kPa, at which the application of an ignition source causes the vapour of the test portion to ignite and the flame to propagate across the surface of the liquid under the specified conditions of test

4 Principle

The test portion is placed in the test cup of a Pensky-Martens apparatus and heated to give a constant temperature increase with continuous stirring. An ignition source is directed through an opening in the test cup lid at regular temperature intervals with simultaneous interruption of stirring. The lowest temperature at which the application of the ignition source causes the vapour of the test portion to ignite and propagate over the surface of the liquid is recorded as the flash point at the ambient barometric pressure. This temperature is corrected to standard atmospheric pressure using an equation.

5 Chemicals and materials

5.1 Cleaning solvent, for the removal of traces of sample from the test cup and cover.

NOTE The choice of solvent will depend upon the previous material tested, and the tenacity of the residue. Low volatility aromatic (benzene-free) solvents may be used to remove traces of oil, and mixed solvents, such as toluene/acetone/methanol, may be efficacious for the removal of gum-type deposits.

5.2 Verification liquids, as described in annex A.

6 Apparatus

6.1 Flash point apparatus, Pensky-Martens closed cup test apparatus as specified in annex B.

If automated equipment is used, ensure that it has been established that the results obtained are within the precision of this International Standard and that the test cup and cover assembly conform to the dimensional and mechanical requirements as specified in annex B. If automated testers are used, the user shall ensure that all of the manufacturer's instructions for adjusting and operating the instrument are followed.

NOTE Under certain circumstances, the use of electric ignition sources may give different results to those obtained when using a flame ignition source. In addition, electric ignition sources may give variable results.

In cases of dispute, unless explicitly agreed otherwise, the manual determination of the flash point using a flame ignition source shall be considered as the referee test.

6.2 Thermometers, low, medium and high range, conforming to annex C. The initial choice of thermometer shall be based on the expected flash point.

NOTE Other types of temperature-measuring devices may be used, provided that they meet the requirements for accuracy and have the same response as the thermometers specified in annex C.

6.3 Barometer, accurate to 0,1 kPa. Barometers precorrected to give sea-level readings, such as those used at weather stations and airports, shall not be used.