AS ISO 13317.5:2026
ISO 13317-5:2025

Australian STANDARD®

STANDARDS Australia

Determination of particle size distribution by gravitational liquid sedimentation methods

Part 5: Photosedimentation techniques



AS ISO 13317.5:2026

This Australian Standard® was prepared by NT-001, Nanotechnologies. It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on 11 June 2026.

This Standard was published on 26 June 2026.

The following are represented on Committee NT-001:

Adelaide University
Australian Industrial Chemicals Introduction Scheme
Australian Institute of Health & Safety
Australian Nuclear Science and Technology Organisation
Consumers' Federation of Australia
Engineers Australia
National Association of Testing Authorities Australia
National Measurement Institute
Smart Energy Council

This Standard was issued for comment as DR AS ISO 13317.5:2026

Status of this document

Standards Australia publications are periodically reviewed to ensure their ongoing relevance and accuracy. This document may be withdrawn, revised, or superseded at any time. To verify this document's current status, visit:

www.standards.org.au

ISBN: 978 1 76175 840 9

AS ISO 13317.5:2026
ISO 13317-5:2025

Australian Standard®

Determination of particle size distribution by gravitational liquid sedimentation methods

Part 5: Photosedimentation techniques

Originated as AS ISO 13317.5:2026.

© ISO 2026 — All rights reserved
© Standards Australia Limited 2026

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, unless otherwise permitted under the Copyright Act 1968 (Cth).

Users must not use the content in this publication in combination with artificial intelligence (AI) tools for any purpose, unless they have the express prior written consent from Standards Australia.

How to read this Standard

This page explains the meaning of the language and structure of this Standard.

Refer to Standards Australia's Standardisation Guide 006 for more details about drafting rules.

Australian and Australian/New Zealand Standards are voluntary unless they are referenced in legislation or called up in contracts.

Requirements

To conform to a Standard, all requirements in the Standard need to be met.

A requirement is any statement in the Standard which uses the word "shall".

Recommendations, permissions and possibilities

The following words are commonly used in Standards, but statements using them do not have to be followed to conform to the Standard:

(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

Structure of Standards

A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply.

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

This Standard was prepared by the Standards Australia Committee NT-001, Nanotechnologies.

The objective of this document is to specify principles and methods for the use of gravitational photosedimentation techniques for the characterization of dispersed phases of suspensions and emulsions. These techniques monitor the gravity-induced phase separation of particulate materials dispersed in liquids by recording photometric signals (i.e. intensity of transmitted or scattered light) as a function of either vertical position or measurement time, or both.

This document does not cover particle migration by centrifugal, electric or magnetic forces, or sedimentation at high particle concentrations (e.g. zone sedimentation). Moreover, it does not cover the determination of properties other than sedimentation velocity and particle size (i.e. it does not cover particle concentration, particle shape, particle density, zeta-potential or apparent viscosity).

Additionally, this document does not cover alternative techniques for gravitational sedimentation including balance based and X-ray based techniques.

This document is identical to, and has been reproduced from, ISO 13317-5:2025, *Determination of particle size distribution by gravitational liquid sedimentation methods — Part 5: Photosedimentation techniques*.

© Standards Australia Limited 2026

Contents

Page

Preface ..... **v**
Foreword ..... **vii**
Introduction ..... **viii**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols and abbreviated terms **6**
5 Measurement principle and instrumentation **8**
5.1 General measurement principle 8
5.2 Primary and derived measurement results 10
5.3 Instrumentation 11
6 Measurement data and calculation of distribution function **14**
6.1 Primary and derived measurands 14
6.2 Intrinsically measured distribution functions 15
6.3 Conversion to volume-weighted distribution functions 17
6.4 Determination of the start position 18
6.5 Assumptions behind data analysis in photosedimentation 20
6.5.1 Assumptions related to Stokes law 20
6.5.2 Assumptions related to photometric particle quantification 21
6.6 Working range with respect to particle size and concentration 21
6.6.1 Limits defined by the applicability of Stokes law 21
6.6.2 Limits defined by the applicability of photometric detection 22
7 Performing size analyses **24**
7.1 General 24
7.2 Sampling 24
7.3 Dispersion process and primary sample preparation 24
7.4 Secondary sample preparation (sample conditioning) 25
7.5 Instrument preparation 25
7.6 Measurement 26
7.7 Data analysis 26
7.8 Reporting 27
8 System qualification and quality control **29**
8.1 General remarks 29
8.2 Reference materials 29
8.3 Performance qualification 30
8.4 Measurement uncertainty 30
Annex A (informative) **Measurement position** **33**
Annex B (informative) **Calculation of number-weighted particle size distribution** **37**
Annex C (informative) **Detailed multi-wavelength approach** **40**
Annex D (informative) **Guide to uncertainty determination** **42**
Annex E (informative) **Beyond velocity and size determination** **47**
Bibliography **50**

© Standards Australia Limited 2026

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 24, *Particle characterization including sieving*, Subcommittee SC 4, *Particle characterization*.

A list of all parts in the ISO 13317 series can be found on the ISO website.

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.

© Standards Australia Limited 2026

Introduction

The principles of gravitational photosedimentation and its potential use for the granulometric characterization of particle systems have been known for several decades. Recent developments in optoelectronics and data processing have boosted the commercial success and popularity of this measurement technique, which is currently employed in manifold academic and industrial applications.

This document is a part of the ISO 13317 series that provides a general overview on the principles, techniques, methods and underlying physics of particle size analysis by gravitational sedimentation. Photosedimentation employs photometric signals (i.e. transmitted, reflected or scattered light) in order to monitor the changes in the local particle concentration, which arise by the downward or upward particle migration under gravity (called hereafter sedimentation). The temporal or spatial functions of these signals can be directly transformed to distributions of the sedimentation velocity, without referring to model assumptions or being restricted by essential preconditions. Provided the applicability of Stokes' law on particle mobility, one can derive equivalent diameters from the sedimentation velocities (the *Stokes diameter*) and the corresponding particle size distributions. Size fractions are then intrinsically weighted by photometric quantities (e.g. light extinction or scattered light intensity), which is in contrast to the sedimentation techniques described in ISO 13317-2, ISO 13317-3 and ISO 13317-4. However, conversion into volume-weighted distributions is often an integrated part of signal processing, which employs established models for light-particle interactions. A noteworthy feature of gravitational photosedimentation is its ability to finely resolve details in the particle distribution functions. This is related to the physical fractionating of particle systems under gravity and constitutes an advantage compared to spectroscopic ensemble techniques.

Gravitational photosedimentation facilitates the granulometric characterization of dispersed materials of non-zero density contrast to the continuous phase, including solid particles and emulsion droplets. The available measurement range depends on dispersed and continuous phase properties and typically amounts to 200 nm to 100 µm for aqueous samples, whereas the sedimentation velocity can be quantified for the range 0,6 µm/s to 10 mm/s. Also, the working range with regard to particle concentration is strongly affected by material properties and by particle size, yet it is typically well below 1 vol%. The data analysis relies on the assumption that all particles have the same density and comparable shape and do not undergo chemical or physical change in the continuous phase.

In addition, photosedimentation techniques that monitor gravity-induced concentration changes along the complete sample height, e.g. by position-scanning or time-resolved projection, facilitate the characterization of dense dispersion beyond particle size, e.g. with respect to clarification, segregation, agglomeration, consolidation and physico-chemical stability (see ISO/TR 13097). Gravitational photosedimentation is equally applicable in determining particle density (see ISO 18747 series) as well as the formation of sediments and cream layers.

© Standards Australia Limited 2026

Australian Standard®

Determination of particle size distribution by gravitational liquid sedimentation methods

Part 5: Photosedimentation techniques

1 Scope

This document specifies principles and methods for the use of gravitational photosedimentation techniques for the characterization of dispersed phases of suspensions and emulsions. These techniques monitor the gravity-induced phase separation of particulate materials dispersed in liquids by recording photometric signals (i.e. intensity of transmitted or scattered light) as a function of either vertical position or measurement time, or both.

This document does not cover particle migration by centrifugal, electric or magnetic forces, or sedimentation at high particle concentrations (e.g. zone sedimentation). Moreover, it does not cover the determination of properties other than sedimentation velocity and particle size (i.e. it does not cover particle concentration, particle shape, particle density, zeta-potential or apparent viscosity).

Additionally, this document does not cover alternative techniques for gravitational sedimentation including balance based and X-ray based techniques.

NOTE This document does not purport to address all the safety problems associated with its use.

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 9276-1, *Representation of results of particle size analysis — Part 1: Graphical representation*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
sedimentation
directional motion of *particles* (3.7) in a viscous liquid under the action of gravity or centrifugal fields

Note 1 to entry: For a positive *density contrast* (3.17), sedimentation occurs in the direction of gravitational acceleration; it is counter directed to this acceleration for a negative density contrast.

Note 2 to entry: A downward motion under gravity is also called “settling” or “falling”.

Note 3 to entry: An upward motion under gravity is also called “creaming” (e.g. droplets) or more generally, “rising” or “floating”.

[SOURCE: ISO 13317-1:2024, 3.1]

© Standards Australia Limited 2026