



SLOVENSKI STANDARD

SIST ISO 9276-2:2002

01-junij-2002

Predstavitev podatkov, dobljenih z granulometrijsko analizo - 2. del: Izračun povprečij njih velikosti/premerov in momentov iz granulacij

Representation of results of particle size analysis -- Part 2: Calculation of average particle sizes/diameters and moments from particle size distributions

iTeh STANDARD PREVIEW

Représentation de données obtenues par analyse granulométrique -- Partie 2: Calcul des tailles/diamètres moyens des particules et des moments à partir de distributions granulométriques

[SIST ISO 9276-2:2002](https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abad-5eae3721475/sist-iso-9276-2-2002)

[https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abad-](https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abad-5eae3721475/sist-iso-9276-2-2002)

[5eae3721475/sist-iso-9276-2-2002](https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abad-5eae3721475/sist-iso-9276-2-2002)

Ta slovenski standard je istoveten z: ISO 9276-2:2001

ICS:

19.120

Analiza velikosti delcev.
Sejanje

Particle size analysis. Sieving

SIST ISO 9276-2:2002

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 9276-2:2002

<https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abed-5eacb3721475/sist-iso-9276-2-2002>

INTERNATIONAL
STANDARDISO
9276-2First edition
2001-04-01

**Representation of results of particle size
analysis —**

Part 2:

**Calculation of average particle
sizes/diameters and moments from particle
size distributions**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

*Représentation de données obtenues par analyse granulométrique —**Partie 2: Calcul des tailles/diamètres moyens des particules et des
moments à partir de distributions granulométriques*

<https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abed-5eacb3721475/sist-iso-9276-2-2002>

Reference number
ISO 9276-2:2001(E)

© ISO 2001

ISO 9276-2:2001(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST ISO 9276-2:2002

<https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abed-5eacb3721475/sist-iso-9276-2-2002>

© ISO 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Symbols and abbreviated terms	1
4 Basic definition of a moment.....	3
5 Average particle diameters.....	4
5.1 Arithmetic average particle diameters	4
5.2 Weighted average particle diameters	5
5.3 The calculation of $M_{k,r}$ and average particle diameters from a number or a volume density distribution, $q_0(x)$ or $q_3(x)$	5
5.4 Calculation of $M_{k,r}$ from a number or a volume density distribution, $q_0(x)$ or $q_3(x)$, given as a histogram.....	6
5.5 Calculation of volume specific surface area.....	7
5.6 The variance of a particle size distribution.....	7
Annex A (informative) Calculation of different average particle diameters from the histogram of a given volume density distribution, numerical example.....	9
Annex B (informative) Further average particle diameters	11
Bibliography.....	12

ISO 9276-2:2001(E)

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 9276 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9276-2 was prepared by Technical Committee ISO/TC 24, *Sieves, sieving and other sizing methods*, Subcommittee SC 4, *Sizing by methods other than sieving*.

ISO 9276 consists of the following parts, under the general title *Representation of results of particle size analysis*:

- *Part 1: Graphical representation*
- *Part 2: Calculation of average particle sizes/diameters and moments from particle size distributions*
- *Part 3: Calculation of means and moments of particle size distributions*
- *Part 4: Characterization of a classification process.*
- *Part 5: Validation of calculations relating to particle size analyses using the logarithmic normal probability distribution*

Introduction

In particle size analysis, particulate matter is often characterized based on representative samples of the population with the final aim of linking the size information with some other important physical property such as strength, flowability, solubility, etc. In general, a correlation between the physical property and the size of the particles, the so-called property function, can be obtained if an average particle size has been derived or calculated from the measured distribution of sizes.

A unique definition of the average size, $\bar{x}_{k,r}$, is given in this part of ISO 9276, using the so-called moments, $M_{k,r}$, of a size distribution. Apart from average sizes, moments are also used in the calculation of volume related surface area, the spread and other statistical measures of a particle size distribution.

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST ISO 9276-2:2002

<https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abed-5eacb3721475/sist-iso-9276-2-2002>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 9276-2:2002

<https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abed-5eacb3721475/sist-iso-9276-2-2002>

Representation of results of particle size analysis —

Part 2:

Calculation of average particle sizes/diameters and moments from particle size distributions

1 Scope

The object of this part of ISO 9276 is to provide the relevant equations for the calculation of average particle sizes or average particle diameters and moments from a given particle size distribution. It is assumed that the size distribution is available as a histogram. It is nevertheless also possible to apply the same mathematical treatment if the particle size distribution is represented by an analytical function.

It is furthermore assumed in this part of ISO 9276 that the particle size x of a particle of any other shape may also be represented by the diameter of an equivalent sphere, e.g. a sphere having the same volume as the particle concerned.

STANDARD PREVIEW
(standards.iteh.ai)

2 Normative references

SIST ISO 9276-2:2002

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9276. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 9276 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 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*.

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

3 Symbols and abbreviated terms

For the purposes of this part of ISO 9276, the following symbols and abbreviated terms apply.

i	number of the size class with upper particle size, x_i
k	power of x
n	total number of size classes
r	type of quantity of a distribution (general description)
$r = 0$	type of quantity, number
$r = 1$	type of quantity, length

ISO 9276-2:2001(E)

$r = 2$	type of quantity, surface or projected area
$r = 3$	type of quantity, volume or mass
$M_{k,r}$	complete k -th moment of a $q_r(x)$ -distribution
$m_{k,r}$	complete k -th central moment of a $q_r(x)$ -distribution
$q_r(x)$	density distribution
$\bar{q}_{r,i}$	average height of a density distribution in the i -th particle size interval, Δx_i
$\bar{q}_{r,i}(x_{i-1}, x_i)$	histogram
$Q_r(x)$	cumulative distribution
$\Delta Q_{r,i}$	difference of two values of the cumulative distribution, i.e. relative amount in the i -th particle size interval, Δx_i
s_r	standard deviation of a $Q_r(x)$ distribution
s_g	geometric standard deviation of a normal distribution
S	surface area
S_V	volume specific surface area
V	particle volume
$\bar{V}$	average particle volume
x	particle diameter, diameter of a sphere
x_i	upper particle size of the i -th particle size interval
x_{i-1}	lower particle size of the i -th particle size interval
$x_{\min}$	particle size below which there are no particles in a given size distribution
$x_{\max}$	particle size above which there are no particles in a given size distribution
$\bar{x}_{k,r}$	average particle diameter (general description)
$\bar{x}_{k,0}$	arithmetic average particle diameter (general description)
$\bar{x}_{1,0}$	arithmetic average length diameter
$\bar{x}_{2,0}$	arithmetic average surface diameter
$\bar{x}_{3,0}$	arithmetic average volume diameter
$\bar{x}_{1,r}$	weighted average particle diameter (general description)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 9276-2:2002
<https://standards.iteh.ai/catalog/standards/sist/0281c94e-553d-4419-abad-5eacb3721475/sist-iso-9276-2-2002>

$\bar{x}_{1,1}$	weighted average length diameter
$\bar{x}_{1,2}$	weighted average surface diameter, Sauter-Diameter
$\bar{x}_{1,3}$	weighted average volume diameter
$\bar{x}_{\text{geo},r}$	geometric mean diameter (informative only)
$\bar{x}_{\text{har},r}$	harmonic mean diameter (informative only)
$x_{50,3}$	median particle size of a cumulative volume distribution
$\Delta x_i = x_i - x_{i-1}$	width of the i -th particle size interval
z	dimensionless variable of a logarithmic normal probability distribution

4 Basic definition of a moment

The complete k -th moment of a $q_r(x)$ density distribution (see [1] in the bibliography) is represented by integrals as defined in equation (1):

$$M_{k,r} = \int_{x_{\min}}^{x_{\max}} x^k q_r(x) dx \quad (1)$$

where

M stands for moment;

k indicates the power of x ;

r describes the type of quantity of the density distribution.

If $r = 0$, $q_0(x)$ represents a number density distribution, if $r = 3$, $q_3(x)$ represents a volume or mass density distribution.

Equation (1) describes a "complete moment" if the integral boundaries are represented by the minimum particle size $x_{\min}$ and the maximum particle size $x_{\max}$.

A special complete moment is represented by $M_{0,r}$:

$$M_{0,r} = \int_{x_{\min}}^{x_{\max}} x^0 q_r(x) dx = \int_{x_{\min}}^{x_{\max}} q_r(x) dx = Q_r(x_{\max}) - Q_r(x_{\min}) = 1 \quad (2)$$

A moment is incomplete, if the integration is performed between two arbitrary particle diameters x_{i-1} and x_i within the given size range of a distribution $x_{\min} < x_{i-1} < x < x_i < x_{\max}$.

$$M_{k,r}(x_{i-1}, x_i) = \int_{x_{i-1}}^{x_i} x^k q_r(x) dx \quad (3)$$