

ICS 19.120
CCS A28



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 19077-2024

Particle size analysis - Laser diffraction methods

粒度分析 激光衍射法

Issued on: October 26, 2024

Implemented on: May 1, 2025

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

4 Introduction...	6
1 Scope...	7
2 Normative References...	7
3 Terms, Definitions and Symbols...	8
3.1 Terms and definitions...	8
3.2 Symbols...	14
4 Principle...	16
4.1 General...	16
4.2 Theory...	16
4.3 Typical instrument and optical arrangement...	17
4.4 Measurement zone...	19
4.5 Application and sample presentation...	19
4.6 Off-line measurements...	20
4.7 In-line measurements...	20
4.8 Online measurements...	21
4.9 At-line measurements...	21
4.10 Scattering and detectors...	21
5 Operational Requirements and Procedures...	22
5.1 Instrument location...	22
5.2 Dispersion gases...	22
5.3 Dispersion liquids...	22
5.4 Sample inspection, preparation, dispersion and concentration...	22
5.5 Measurement...	24
5.6 Resolution and sensitivity...	26
6 Accuracy Repeatability and Instrument Qualification...	28
6.1 General...	28
6.2 Accuracy...	29
6.3 Instrument repeatability...	30
6.4 Method repeatability...	30
6.5 Accuracy under intermediate precision conditions...	31
7 Reporting of Results...	32

Foreword

This Document was drafted as per the rules specified in GB/T 1.1-2020 Directives for Standardization - Part

1. Rules for the Structure and Drafting of Standardizing Documents. This Document replaced GB/T 19077-2016 Particle Size Analysis - Laser Diffraction Methods. Compared with GB/T 19077-2016, the major technical changes of this Document are as follows besides the structural adjustments and the editorial modifications.

--- Add, change and delete some terms and definitions (see

3.1 of this Edition;

3.1 of the 2016 Edition);

--- Add, change and delete some symbols (see

3.2 of this Edition;

3.2 of the 2016 Edition);

--- Add the application descriptions for off-line measurement, on-line measurement, in-line measurement, and at-line measurement (see Clause 4 of this Edition);

--- Add the measurement content and requirements such as robustness, sensitivity, and resolution (see Clause 5 of this Edition);

--- Add a Clause on "Accuracy, Repeatability, and Instrument Validation" (see Clause 6 of this Edition);

--- Delete the references of ISO 9276-4 (see Clause 7 of the 2016 Edition);

--- Delete the normative references of ISO 14488 and ISO 14887 (see 6.2.3.3 of the 2016 Edition);

1 Scope

GB/T 19077-2024 is the Chinese standard for particle size analysis by laser diffraction, the Chinese adoption of ISO 13320 and by a wide margin the most used particle sizing method in industry. Laser diffraction is fast and reproducible but it is not absolute: the result depends on the optical model chosen, on the refractive index assumed for the particle and the medium, on how the sample is dispersed and presented, and on the instrument's alignment and background, and a number quoted without those conditions cannot be compared with anyone else's. The standard therefore spends most of its length on exactly those points. It sets the principle and the underlying theory, the typical instrument and optical arrangement, the measurement zone, the application and sample presentation

including off-line, in-line, on-line and at-line measurement, then the requirements on the instrument, the operating procedure, the dispersion of the sample in liquid and in air, the measurement itself, the data conversion and the reporting, together with the qualification of the instrument and the assessment of precision and accuracy. It takes effect on 1 May 2025.

This Document provides guidance on instrument qualification and size distribution measurement of particles (e.g. powders, sprays, aerosols, suspensions, emulsions and gas bubbles in liquids) in many two-phase systems through the analysis of their light-scattering properties. It does not address the specific requirements of particle size measurement of specific materials. This Document is applicable to particle sizes ranging from approximately 0.1 μm to 3 mm. With special instrumentation and conditions, the applicable size range can be extended above 3 mm and below 0.1 μm . For spherical and non-spherical particles, a size distribution is reported, where the predicted scattering pattern for the volumetric sum of spherical particles matches the measured scattering pattern. This is because the technique assumes a spherical particle shape in its optical model. For non-spherical particles the resulting particle size distribution is different from that obtained by methods based on other physical principles (e.g. sedimentation, sieving).

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document. ISO 9276-