
Hydraulic fluid power — Calibration of automatic particle counters for liquids

*Transmissions hydrauliques — Étalonnage des compteurs
automatiques de particules en suspension dans les liquides*



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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).

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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 131 *Fluid power systems*, SC 6, *Contamination control*.

This fifth edition cancels and replaces the fourth edition (ISO 11171:2020), which has been technically revised.

The main changes are as follows:

- in term 3.8, particle size distribution, Note 1 to entry has been amended;
- in 6.12 c), 0,72 has been changed to 0,56;
- in 6.12 d) 1,32 has been changed to 1,56;
- in B.4, 3rd line, “mass concentrate” has been changed to “mass concentration”;
- B.8 has been amended to read: “.....”calculate the theoretical number concentration of particles for each mass concentration, X_t .”;
- in Table B.1, the units for “ X_t (particles/L)” have been corrected to “ X_t (particles/mL)”;
- in D.3 c), 0,72 has been changed to 0,56;
- in D.3 d), 1,32 has been changed to 1,56;
- in D.7 a), 0,72 has been changed to 0,56;
- in D.7 e), 1,32 has been changed to 1,56;
- in G.6, the subscript in the denominator of Formula G.3 has been corrected from “ V_0 ” to “ V_S ”;
- in Reference [6] in the Bibliography, the RM 8631 batch identifier has been changed from “a” to “b”;
- in Reference [7] in the Bibliography, the RM 8632 batch identifier has been changed from “b” to “a”.

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.

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Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. The fluid is both a lubricant and a power-transmitting medium. Reliable system performance requires control of the contaminants in the fluid. Qualitative and quantitative determination of the particulate contaminants in the fluid medium requires precision in obtaining the sample and in determining the contaminant particle size distribution and concentration. Liquid automatic particle counters (APC) are an accepted means of determining the concentration and size distribution of the contaminant particles. Individual APC accuracy is established through calibration.

This document is a standard calibration procedure for APC that are used for determining particle sizes and counts. The primary particle-sizing calibration is conducted using NIST SRM 2806x suspensions with particle size distribution certified by the United States National Institute of Standards and Technology (NIST) for particle sizes 30 μm (c) and smaller, and using polystyrene latex spheres at larger sizes.

A secondary calibration method uses suspensions of NIST RM 8631x, ISO MTD, or other test dust conforming to ISO 12103-1, which are independently analysed using an APC calibrated by the primary method. Minimum performance specifications are established for the APC coefficient of variation (CV) of sample volume, CV of flow rate, resolution and particle counting accuracy. The operating limits of an APC, including its threshold noise level, coincidence error limit and flow rate limits are determined.

Hydraulic fluid power — Calibration of automatic particle counters for liquids

1 Scope

This document specifies procedures for the following:

- a) primary particle-sizing calibration for particle sizes 1 μm (c) and larger, sensor resolution and counting performance of liquid automatic particle counters that are capable of analysing bottle samples;
- b) secondary particle-sizing calibration using suspensions verified with a primary calibrated APC;
- c) establishing acceptable operation and performance limits;
- d) verifying particle sensor performance using a test dust;
- e) determining coincidence and flow rate limits.

This document is applicable for use with hydraulic fluids, aviation and diesel fuels, engine oil and other petroleum-based fluids. This document is not applicable to particle-sizing calibration using NIST SRM 2806b primary calibration suspensions.

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 3722, *Hydraulic fluid power — Fluid sample containers — Qualifying and controlling cleaning methods*

ISO 4787, *Laboratory glass and plastic ware — Volumetric instruments — Methods for testing of capacity and for use*

ISO 5598, *Fluid power systems and components — Vocabulary*

ISO 12103-1, *Road vehicles — Test contaminants for filter evaluation — Part 1: Arizona test dust*

ISO 16889, *Hydraulic fluid power — Filters — Multi-pass method for evaluating filtration performance of a filter element*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and the following 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

automatic particle counter

APC

instrument that automatically: