
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 on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control*.

This third edition cancels and replaces the second edition (ISO 11171:2010), of which it constitutes a minor revision.

This edition includes the following significant changes with respect to the previous edition:

- 6.8: defining μm equation, Table 3 – revised to show $\mu\text{m}(\text{b})$ and $\mu\text{m}(\text{c})$ to be reported;
- 7.1: revised to show how to report $\mu\text{m}(\text{b})$ and $\mu\text{m}(\text{c})$.

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 (APCs) are an accepted means of determining the concentration and size distribution of the contaminant particles. Individual APC accuracy is established through calibration.

This International Standard establishes a recommended standard calibration procedure for determining particle sizing and counting accuracy. The primary particle-sizing calibration is conducted using NIST SRM 2806 suspensions with particle size distribution certified by the United States' National Institute of Standards and Technology (NIST). A secondary calibration method with traceability to NIST uses suspensions of ISO MTD which are independently analysed using an APC calibrated by the primary method. Concentration limits are determined through the use of serial dilutions of a concentrated suspension. Operation and performance limits are also established using this International Standard.

Hydraulic fluid power — Calibration of automatic particle counters for liquids

1 Scope

This International Standard specifies procedures for the following:

- a) primary particle-sizing calibration, sensor resolution and counting performance of automatic particle counters (APCs) for liquids 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 truncated test dust;
- e) determining coincidence and flow rate limits.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 5598, *Fluid power systems and components — Vocabulary*

ISO 12103-1, *Road vehicles — Test dust 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.

3.1

automatic particle counter

APC

instrument that automatically counts and sizes individual particles suspended in a fluid, typically relying on optical light scattering or light extinction principles of particle sizing

Note 1 to entry: An APC consists of, at a minimum, a particle sensor, a means for delivering a known volume of sample to the sensor at a controlled rate, a signal processor, an analyser that compiles the sensor output for the sizes of individual particles into particle size distribution and a means for outputting particle size distribution results for the sample.

3.2

threshold noise level

minimum voltage setting of an automatic particle counter at which the observed pulse-counting frequency does not exceed 60 counts/min due to electrical noise in the absence of flow in the sensing volume