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## Hydraulic fluid power — Online automatic particle-counting systems for liquids — Methods of calibration and validation

*Transmissions hydrauliques — Systèmes de comptage automatique en ligne de particules en suspension dans les liquides — Méthode d'étalonnage et de validation*



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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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control*.

This second edition cancels and replaces the first edition (ISO 11943:1999) which has been technically revised.

This edition includes the following significant changes:

- the new SRM2806b has been taken into account for expression of  $\mu\text{m}$  sizes;
- there is no more intent to prepare and monitor the particle size distribution of secondary calibration suspension;
- the different validation relationships has been updated to be more severe and to make more confident the calibration of APCs;
- the round robin study is summarized in [Annex C](#).

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## Introduction

In hydraulic fluid power systems, power is transmitted, and controlled, through a fluid under pressure within an enclosed circuit. The fluid is both a lubricant and a power-transmitting medium.

Reliable system performance requires control of the fluid medium. Qualitative and quantitative determination of particulate contaminant, in the fluid medium, requires precision in obtaining the sample and determining the size and distribution of contaminants.

Automatic Particle Counters (APC) are an accepted means for determining the size and size distribution of particulate contamination in fluids. Individual instrument accuracy is established through calibration performed with reference primary calibration suspensions or with secondary calibration suspensions.

APCs are being utilized online to eliminate the need for sample containers, to provide increased accuracy, and to provide for a more rapid access to particle count information. A major application of online particle counting is for evaluating filtration efficiency of hydraulic filter elements during a multipass test as defined in ISO 16889. Depending upon the type of filter tested and the capabilities of the APC used, it might be necessary to dilute the samples before flowing through the sensor.

This document establishes procedures for validation of equipment for preparation of secondary calibration suspensions and for online counting of particles with or without dilution circuits, and the online calibration of APCs. It defines a procedure to match two or more particle counters that will improve the accuracy of particulate filtration efficiency as shown, for example in ISO 16889.