
**Hydraulic fluid power — Determination of
the particulate contamination level of a
liquid sample by automatic particle
counting using the light-extinction
principle**

*Transmissions hydrauliques — Détermination du niveau de pollution
particulaire d'un échantillon liquide par comptage automatique des
particules par absorption de lumière*



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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11500 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 11500:1997), which has been technically revised, specifically with the following major differences:

- a) inclusion of a “quick check” method to determine the presence of water in the sample;
- b) update of the method for calibrating the automatic particle counter (APC) from ISO 4402¹⁾ to ISO 11171;
- c) elimination of requirement to analyse samples in a class 100 000 clean room;
- d) improved dilution methods;
- e) improved guidelines on APC operation, including guidance for detecting and overcoming coincidence error;
- f) revision of how to check the validity of the reported particle count.

It also incorporates the Technical Corrigendum ISO 11500:1997/Cor. 1:1998.

1) ISO 4402, *Hydraulic fluid power — Calibration of automatic-count instruments for particles suspended in liquids — Method using AC Fine Test Dust contaminant*. Withdrawn and revised by ISO 11171.

Introduction

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

The presence of solid contaminant particles in the liquid interferes with the ability of the hydraulic fluid to lubricate and causes wear to the components. The extent of contamination in the fluid has a direct bearing on the performance and reliability of the system and it is necessary to control solid contaminant particles to levels that are considered appropriate for the system concerned.

A quantitative determination of particulate contamination requires precision in obtaining the sample and in determining the extent of contamination. The liquid automatic particle counter (APC), which works on the light-extinction principle, has become an accepted means of determining the extent of contamination. The accuracy of particle count data can be affected by the techniques used to obtain such data.

This International Standard details procedures for the analysis of contaminated liquid samples using an automatic particle counter. Correct use of an automatic particle counter helps to reduce errors and enhances the accuracy of reproducibility in data.

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Hydraulic fluid power — Determination of the particulate contamination level of a liquid sample by automatic particle counting using the light-extinction principle

1 Scope

This International Standard specifies an automatic particle counting procedure for determining the number and sizes of particles present in hydraulic-fluid bottle samples of clear, homogeneous, single-phase liquids using an automatic particle counter (APC) that works on the light-extinction principle.

This International Standard is applicable to the monitoring of

- a) the cleanliness level of fluids circulating in hydraulic systems,
- b) the progress of a flushing operation,
- c) the cleanliness level of support equipment and test rigs,
- d) the cleanliness level of packaged stock.

NOTE 1 Measurements can be made with particles suspended in the original liquid or in a sample of the liquid diluted with a compatible liquid to reduce coincidence error.

NOTE 2 The presence of a fluid interface obstructs the light beam and gives false signals.

2 Normative references

The following referenced documents are indispensable for the application 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 4406, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

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

ISO 11171:1999, *Hydraulic fluid power — Calibration of automatic particle counters for liquids*