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Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the counting method using a microscope

*Transmissions hydrauliques — Pollution des fluides — Détermination de
la pollution particulaire solide — Méthode de comptage au microscope*



Reference number
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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.

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.

International Standard ISO 4407 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

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 power-transmitting medium.

Reliable system performance requires control of the fluid medium. Qualitative and quantitative determination of particulate contamination in the fluid medium requires precision in obtaining the sample and determining the nature and extent of contamination.

The microscope method of determining fluid contamination involves counting illuminated filtered particles under a microscope. The method employs membrane filters, which maintain fluid cleanliness by removing insoluble particles.

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Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the counting method using a microscope

1 Scope

This International Standard defines methods of determining the solid particle contamination of hydraulic fluids used in hydraulic fluid power systems by counting the number of particles on the surface of a membrane filter using a microscope under transmitted light and under incident light.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4021:1977, *Hydraulic fluid power — Particulate contamination analysis — Extraction of fluid samples from lines of an operating system*.

ISO 5598:1985, *Fluid power systems and components — Vocabulary*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 and the following definitions apply.

3.1 blank count: Count resulting from contaminants introduced from other sources, such as reagents or cleaning of glassware, which do not exceed 1 000 particles, the size of which are 5 μm or greater.

NOTE 1 For this determination, a clean, unused membrane is prepared as indicated in clause 9, replacing the

sample fluid by the same volume of filtered solvent. Counts in excess of 1 000 particles indicate unsatisfactory test conditions; the required standard should be achieved before sample analysis is undertaken.

3.2 calculation factor: Ratio of the effective area to the total area counted.

3.3 effective area: Area of the membrane open to flow during filtration of the fluid. (This is generally accepted as 100 grid squares and has an area of 890 mm^2 .)

3.4 fibre: Particle longer than 100 μm with a length-to-width ratio greater than, or equal to, 10:1.

3.5 fixative fluid: Fluid which, as a result of a heat-curing process, causes a contaminated membrane filter to adhere to a glass base slide, resulting in an opaque honeycomb residue.

3.6 grid square: Square that has sides of 3,08 mm and is printed on the membrane filter.

3.7 mountant fluid: Fluid which is applied to the dry honeycomb residue on the glass base slide to render it transparent.

3.8 particle size: Size of particle determined by measurement using a calibrated ocular micrometer.

3.9 sub-unit area: Area approximately one-twentieth of a grid square used where populations of 25 000 and above are estimated at $\times 10$ magnification. (See 10.2.)

3.10 unit area: Area bounded in the horizontal plane by two adjacent vertical membrane grid lines and in the vertical plane by two parallel lines in the circular micrometer eyepiece or drawn on the projection screen. The dimensions of the unit area are measured by a previously calibrated ocular micrometer.