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**Hydraulic fluid power — Fluids
— Method for coding the level of
contamination by solid particles**

*Transmissions hydrauliques — Fluides — Méthode de codification du
niveau de pollution particulaire solide*



Reference number
ISO 4406:2017(E)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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. International Standards are drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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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.

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

This third edition cancels and replaces the second edition (ISO 4406:1999), which has been technically revised.

The main changes compared to the previous edition are as follows:

- All year references for ISO 11171 have been removed to ensure that only the most recent version of ISO 11171 is used. This is needed to ensure consistency in the usage and definition of the $\mu\text{m(c)}$ particle sizes used in this document.
- All year references for ISO 4407 and ISO 11500 have been removed to ensure that only the most recent version of these standards are used.

This corrected version of ISO 4406:2017 incorporates the following corrections.

Following the first (and only) sentence in 3.4.5, the following text has been added: "Graphical presentation of ISO Code results shall be as described in Annex A."

Following the first (and only) sentence in 3.5.4, the following text has been added: "Graphical presentation of ISO Code results shall be as described in Annex A."

Figure A.1 has been replaced by a new Figure A.1 which includes the missing exponent in Y.

Introduction

In hydraulic fluid power systems, power is transmitted, and controlled, through a liquid under pressure within an enclosed circuit. Solid particle contaminant is always present in the hydraulic fluid and the amount needs to be determined because the contaminant may cause serious problems.

Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles

1 Scope

This document specifies the code to be used in defining the quantity of solid particles in the fluid used in a given hydraulic fluid power system.

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 4407, *Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the counting method using an optical microscope*

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

ISO 11500, *Hydraulic fluid power — Determination of the particulate contamination level of a liquid sample by automatic particle counting using the light-extinction principle*

3 Code definition

3.1 General

The purpose of this code is to simplify the reporting of particle count data by converting the numbers of particles into broad classes or codes, where an increase in one code is generally a doubling of the contamination level.

The original code, in accordance with the first edition of this document, stated the reporting at two sizes $\geq 5 \mu\text{m}$ and $\geq 15 \mu\text{m}$. The sizes in this document account for the use of a different calibration standard for optical automatic particle counters (APCs). The reported sizes are $\geq 4 \mu\text{m(c)}$, $\geq 6 \mu\text{m(c)}$ and $\geq 14 \mu\text{m(c)}$, the last two of these being equivalent to the $5 \mu\text{m}$ and $15 \mu\text{m}$ particle sizes obtained using the ISO 4402:1991¹⁾ method of calibrating APCs. Throughout this document the use of $\mu\text{m(c)}$ means that particle size measurements are carried out using an automatic particle counter that has been calibrated in accordance with ISO 11171.

Measurement of particles using an optical microscope as specified in ISO 4407 establishes the size of a particle as being equal to its longest dimension, whereas an automatic particle counter derives the size of an equivalent particle from its cross-sectional area, a value different in most cases from that determined using a microscope. The particle sizes to be reported for measurement by microscope $\geq 5 \mu\text{m}$ and $\geq 15 \mu\text{m}$ are unchanged from those specified in the first edition of this document.

CAUTION — Particle counts are affected by a variety of factors. These factors include procurement of sample, particle counting accuracy and the sample container (where used), and its cleanliness. Proper care should be taken during sample procurement to ensure that the sample obtained is representative of the fluid circulation in the system.

1) ISO 4402:1991 has been replaced by ISO 11171.