
**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*



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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 3.

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 4406 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control and hydraulic fluids*.

This second edition cancels and replaces the first edition (ISO 4406:1987), which has been technically revised. The new edition introduces a three-part code for contamination levels measured with automatic particle counters calibrated in accordance with ISO 11171. It also introduces equivalent particle sizes for such counters, based on calibration with NIST standard reference material SRM 2806.

The particle sizes to be reported for measurement by using a microscope, $\geq 5 \mu\text{m}$ and $\geq 15 \mu\text{m}$, are unchanged from those specified in ISO 4406:1987.

Defining the automatic particle counter code sizes in this way validates direct comparison of measurements made in accordance with this standard using either measurement method, or between such measurements and data records based on ISO 4406:1987.

Annex A forms a normative part of this International Standard.

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.

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

1 Scope

This International Standard 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 normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 4407:1991, *Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the counting method using a microscope*.

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

ISO 11500:1997, *Hydraulic fluid power — Determination of particulate contamination by automatic 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 ISO 4406:1987 stated the reporting at two sizes, $\geq 5 \mu\text{m}$ and $\geq 15 \mu\text{m}$, but the sizes in this revision have been changed to account for the use of a different calibration standard for optical automatic particle counters. 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 4402:1991 method of calibrating automatic particle counters. ISO 4402:1991 has been replaced by ISO 11171:1999. Throughout this International Standard, the use of $\mu\text{m(c)}$ means that particle size measurements are carried out using an automatic particle counter which has been calibrated in accordance with ISO 11171.

Measurement of particles using an optical microscope as specified in ISO 4407:1991 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 ISO 4406:1987.