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Hydraulic fluid power — Impact and use of ISO 11171:2016 µm(b) and µm(c) particle size designations on particle count and filter test data

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National foreword

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Foreword

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

A minor revision to ISO 11171:2010 was approved during 2016. The revision was necessitated by a particle size shift resulting from the replacement of the particle counter calibration material, National Institute of Standards and Technology (NIST) SRM 2806a, with SRM 2806b. Prior to this revision, particle count data based upon ISO 11171 was reported in units of µm(c). Following the introduction of SRM 2806b, users of particle count data in the absence of this revision could not discern whether particle sizes being reported were based upon SRM 2806a or SRM 2806b. Hypothetically, a particle size reported as 20 µm(c) could actually be as large as 20 µm or as small as 18 µm depending upon whether SRM 2806a or SRM 2806b were used. This approximately 10 % shift in particle size can become significant in terms of the actual numbers of particles counted.

To minimize confusion and provide for clear communication, ISO 11171:2010, 6.8 and 7.1 were revised to provide a means for reporting particle size that clearly identifies the basis for reported particle size and provides the industry with tools to relate past SRM 2806a and new SRM 2806b data without extensive revisions to existing standards, specifications, and other literature. It provides a historically consistent, traceable definition of µm(c), while allowing an option to report sizes in terms of a defined µm(b) as needed. This document summarizes the underlying reasons for the minor revision and its practical impact on the industry.

TECHNICAL REPORT **ISO/TR 22681:2019(E)**

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1 Scope

This document explains the use of the two acceptable methods of reporting particle size, µm(c) and µm(b), that are defined in ISO 11171:2016. It also explains the reasons for the existence of two alternative size reporting methods and its implications with respect to particle count and filter Beta Ratio data.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Origins of the particle size shift

ISO 11171 provides direct traceability to the standard international (SI) definition of a metre through NIST SRM 2806. ISO 11171 has been widely used to calibrate automatic particle counters (APCs) for hydraulic, lube oil, diesel fuel, and other non-aqueous liquid applications since 1999. NIST SRM 2806 is the primary calibration material used in this document.

During 2010, the original supply of SRM 2806, also sold as SRM 2806a, was exhausted. For ease of communication, the term "SRM 2806a" is used henceforth in this document to refer to both designations, SRM 2806 and SRM 2806a, of the original calibration material.

During 2014, its replacement, SRM 2806b, was released. The SRM 2806b production and certification process was overseen by an international group of experts from ISO/TC 131/SC 6. The specifications for SRM 2806b were better defined than those for SRM 2806a and it was produced by a different supplier. Advances in sample preparation and metrology were used to produce and certify SRM 2806b. A critical difference between SRM 2806a and SRM 2806b is that particle sizing was done manually from SEM micrographs with SRM 2806a, while automated image analysis was used with SRM 2806b.

This allowed an order of magnitude of more particles to be analysed and in a manner not subject to human bias. The end result was a certified calibration material, SRM 2806b, with better precision in the size distribution and a reduction in uncertainty compared to its predecessor, SRM 2806a.