TECHNICAL REPORT

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Hydraulic fluid power – Interpolation method for particle count and filter test data

Transmissions hydrauliques – Méthode d'interpolation pour les données issues du comptage des particules et des essais du filtre

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Contents

Page

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

The 2016 version of ISO 11171 provides options for reporting particle size in either units of µm(c) or µm(b). While mathematical conversion of µm(b) sizes to µm(c) sizes is straightforward, there is no such universal means for converting particle concentrations or filter Beta Ratios. This is problematic when attempting to comply with contamination control and filter performance specifications given in integral units of µm(c) when data are in integral units of µm(b) corresponding to decimal point µm(c) sizes, or vice versa. For example, particle sizes of 4 µm(b), 6 µm(b), 14 µm(b) and 21 µm(b), correspond to sizes of 3,6 µm(c), 5,4 µm(c), 12,6 µm(c) and 18,9 µm(c), respectively. In the absence of a common interpolation method, otherwise acceptable fluid and filter products can be deemed unacceptable for use because of a discrepancy in the particle sizes reported. This document describes a recommended method for converting µm(b) data to µm(c) data and for interpolating particle concentration, Beta Ratio, and removal efficiency data. The resultant interpolated values can be used to convert cleanliness level or filter performance specifications and data from µm(b) to µm(c).

Hydraulic fluid power – Interpolation method for particle count and filter test data

1 Scope

This document describes a recommended method for the interpolation of particle concentration and filter Beta Ratio data when results are not otherwise available at the desired particle sizes. It is applicable for assessing conformance with existing fluid cleanliness and filter Beta Ratio specifications whereby the specification and actual test results are provided in different units of particle size, for example, the specification is in µm(c), but the particle counts or Beta Ratio data are in units of µm(b).

This document is also applicable when particle sizes in specifications and available data use the same units of particle size, but do not correspond to exactly the same sizes, for example, when particle counts at 20 µm(c) are specified, but data was collected at 21 µm(c). This method allows interpolation to intermediate particle sizes within the range of existing data and does not permit extrapolation to particle sizes outside the range of available data.

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 4406, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

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

ISO 16889, *Hydraulic fluid power — Filters — Multi-pass method for evaluating filtration performance of a filter element*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4406, ISO 11171 and ISO 16889 apply.

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 Background

In contamination control programmes, filter purchase decisions and quality control programmes, particle count and filter Beta Ratio data are compared to established benchmarks, such as fluid cleanliness specifications, filter performance specifications and historical data. Meaningful assessments can only be made if identical sizes are being compared. This became an issue with ISO 11171:2016. Historical data and specifications prior to 2016 were reported in size units of µm(c). Beginning in 2016, however, some chose to report size in units of µm(b) while others report in µm(c). The two units of particle size, µm(c) and µm(b), are mathematically related, but the corresponding values for particle concentration and Beta Ratio are not. The 10 % difference in particle size between the two units of particle size yields differences in the corresponding particle concentrations and Beta Ratios. These, in turn, can significantly impact critical contamination control decisions.