

TECHNICAL ISO/TSR
This is a preview of "ISO/TR 16144:2002". [Click here to purchase the full version from the ANSI store.](#)

First edition
2002-09-15

Hydraulic fluid power — Calibration of liquid automatic particle counters — Procedures used to certify the standard reference material SRM 2806

Transmissions hydrauliques — Étalonnage des compteurs automatiques de particules en suspension dans les liquides — Procédures utilisées pour certifier le matériau de référence normalisé SRM 2806



Reference number
ISO/TR 16144:2002(E)

© ISO 2002

This is a preview of "ISO/TR 16144:2002". [Click here to purchase the full version from the ANSI store.](#)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 2002

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

This is a preview of "ISO/TR 16144:2002". [Click here to purchase the full version from the ANSI store.](#)

Contents

	Page
Foreword	iv
Introduction.....	v
1 Scope.....	1
2 Equipment and material.....	1
2.1 Test powder	1
2.2 Test fluid.....	1
2.3 Sample preparation loop	2
2.4 Membrane preparation equipment	2
2.5 Scanning electron microscope and image analyser	2
3 Equipment validation	3
3.1 Sample preparation validation	3
3.2 Microscope calibration validation	4
3.3 Membrane preparation validation.....	4
3.4 Membrane and SRM 2806 stability testing	6
4 Test procedure	6
4.1 Calibration suspension preparation SRM 2806	6
4.2 Membrane preparation.....	7
4.3 Membrane examination and particle counting.....	7
5 Data processing	11
Bibliography.....	16

This is a preview of "ISO/TR 16144:2002". [Click here to purchase the full version from the ANSI store.](#)

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.

The main task of technical committees is to prepare International Standards. 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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this Technical Report may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 16144 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control*.

This is a preview of "ISO/TR 16144:2002". [Click here to purchase the full version from the ANSI store.](#)

Introduction

Solid particulates are a major contributor to wear in hydraulic systems. The fluid power industry, the aerospace industry and the military sector utilize optical automatic particle counter (APC) technologies to assess the level of hydraulic oil contamination by suspended particulate. The amount of contamination is often related to the integrity of the system and the usage of the fluid. APCs are also employed in various oil filter testing operations by the manufacturers and the users. The standard method ISO 4402^{[1]1)} has been used for nearly 30 years to calibrate optical particle counters in terms of particle size as a function of particle concentration.

The calibration material used in ISO 4402:1991 is Air Cleaner Fine Test Dust (ACFTD) produced in the past by a division of General Motors Corporation. This material consists of a polydisperse dust having the largest number of particles, as indicated in ISO 4402:1991, with the size range of 1 μm to 80 μm diameter (particle concentration increases with decreasing diameter). There is a low concentration of particles reported to extend out to approximately 100 μm . Some problems have arisen with the use of ACFTD in such calibration procedures. Firstly, there has been ongoing concern that the particle size distribution is not accurate in the small particle size regime (< 10 μm) of the distribution^{[2], [3], [4], [5]}. Many researchers have noted that there are more sub-10 μm particles in ACFTD than reported by ISO 4402:1991. Secondly, but not less importantly, the production of ACFTD has been discontinued by the supplier.

Thus there is a need to investigate, design and devise a new standard method (*Hydraulic fluid power — Calibration method for liquid automatic particle counters*) using a new Standard Reference Material (SRM)^[6]. The National Institute of Standards and Technology (NIST) was requested to develop an SRM for use by the fluid power industry. Users will benefit from improved precision since there is a central source of only one material and increased accuracy resulting from the size characterization^[7]. The new SRM, designated as SRM 2806, is composed of ISO Medium Test Dust (ISO MTD) suspended in MIL-H-5606 hydraulic fluid. The number of particles per millilitre greater than specified sizes has been determined for this material.

1) Cancelled in 1999 and replaced by ISO 11171:1999.