
**Hydraulic fluid power — Filters —
Evaluation of differential pressure versus
flow characteristics**

*Transmissions hydrauliques — Filtres — Évaluation de la perte de charge
en fonction du débit*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 3968:2001](https://standards.iteh.ai/catalog/standards/sist/609ecc54-7fda-4b88-94fd-aa651b249997/iso-3968-2001)

[https://standards.iteh.ai/catalog/standards/sist/609ecc54-7fda-4b88-94fd-
aa651b249997/iso-3968-2001](https://standards.iteh.ai/catalog/standards/sist/609ecc54-7fda-4b88-94fd-aa651b249997/iso-3968-2001)



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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 3968:2001](#)

<https://standards.iteh.ai/catalog/standards/sist/609ece54-7fda-4b88-94fd-aa651b249997/iso-3968-2001>

© ISO 2001

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

Contents

Page

Foreword.....	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	2
4.1 Literal symbols	2
4.2 Graphical symbols.....	2
5 Test equipment	2
5.1 General indications	2
5.2 Pump.....	2
5.3 Reservoir	3
5.4 Temperature control.....	4
5.5 Clean-up filter.....	4
5.6 Sampling valve.....	4
5.7 Mounting of filter	4
5.8 Test fluid.....	4
6 Measurements.....	4
6.1 Pressure measurement.....	4
6.2 Temperature measurement	5
6.3 Kinematic viscosity measurement.....	5
6.4 Flow rate measurement.....	5
6.5 Fluid cleanliness measurement	6
6.6 Accuracy of measuring instruments and test conditions	6
7 Procedure	6
7.1 Pipework correction	6
7.2 Cleanliness of test circuit	6
7.3 Characteristics of the filter housing	6
7.4 Characteristics of the filter assembly.....	7
7.5 Characteristics of the filter element only	7
7.6 Characteristics of the bypass valve	7
8 Presentation of results.....	8
9 Identification statement (Reference to this International Standard).....	10
Bibliography.....	11

ITeH STANDARD PREVIEW
(standards.iteh.ai)

ISO 3968:2001

<http://standards.iteh.ai/catalog/standards/sist/609ece54-7fda-4b88-94fd-aa651b249997/iso-3968-2001>

aa651b249997/iso-3968-2001

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.

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

ISO 3968 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control*.

This second edition cancels and replaces the first edition (ISO 3968:1981), which has been technically revised. Its primary objective is to bring procedures and equipment as close as possible to those of ISO 16889. It also integrates some recommendations of ISO 9110-1^[1] and ISO 9110-2^[2], which deal with pressure measurements, and of other standards pertaining to the subject matter.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/609ecc54-7fda-4b88-94fd-aa651b249997/iso-3968-2001>

Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a fluid under pressure circulating within a closed circuit. Filters maintain the cleanliness of the fluid by retaining the insoluble contaminants.

Hydraulic filters normally include a housing that serves as the pressure-containing vessel to direct the flow of fluid through a filter element that separates contaminants from the test fluid.

In operation, fluid flowing through a filter meets resistance due to kinetic and viscous effects. The pressure required to overcome this resistance and to maintain flow is known as the differential pressure. The differential pressure is the total pressure difference observed between the filter inlet port and outlet port and represents the sum of the losses recorded in the housing and filter element.

Factors which affect clean filter differential pressure are fluid viscosity, fluid specific gravity, flow rate, filter element media type and construction, as well as housing design.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 3968:2001](https://standards.iteh.ai/catalog/standards/sist/609ece54-7fda-4b88-94fd-aa651b249997/iso-3968-2001)

<https://standards.iteh.ai/catalog/standards/sist/609ece54-7fda-4b88-94fd-aa651b249997/iso-3968-2001>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 3968:2001

<https://standards.iteh.ai/catalog/standards/sist/609ece54-7fda-4b88-94fd-aa651b249997/iso-3968-2001>

Hydraulic fluid power — Filters — Evaluation of differential pressure versus flow characteristics

1 Scope

This International Standard specifies a procedure for evaluating differential pressure versus flow characteristics of hydraulic filters and constitutes a basis for agreement between the filter manufacturer and user.

It also specifies a method for measurement of the differential pressure generated at different flow rates and viscosities by the relevant parts of a filter assembly, that is the housing, the filter element and any valves contained within the housing that are in the flow stream.

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 IEC and ISO maintain registers of currently valid International Standards.

ISO 1219-1, *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 1: Graphic symbols*

ISO 3448, *Industrial liquid lubricants — ISO viscosity classification*

ISO 4021, *Hydraulic fluid power — Particulate contamination analysis — Extraction of fluid samples from lines of an operating system*

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

ISO 5598, *Fluid power systems and components — Vocabulary*

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 International Standard, the definitions given in ISO 5598 and the following apply.

3.1

filter rated flow rate

flow rate recommended by the filter manufacturer for a specified kinematic viscosity

3.2

viscosity index

empirical measure of the viscosity/temperature characteristics of a fluid

NOTE The smaller the change in viscosity within a given temperature range, the higher the viscosity index.

3.3

differential pressure

difference between the tested component inlet and outlet pressures under specified conditions

4 Symbols

4.1 Literal symbols

The following literal symbols are used in this International Standard:

- a) q_V is the test volume flow rate;
- b) q_R is the filter rated volume flow rate;
- c) p is the static pressure;
- d) p_1 is the static pressure measured upstream of the filter;
- e) p_2 is the static pressure measured downstream of the filter;
- f) Δp is the differential pressure ($\Delta p = p_1 - p_2$);
- g) D is the internal pipe diameter.

ITeH STANDARD PREVIEW
(standards.iteh.ai)

4.2 Graphical symbols

The graphical symbols used in this International Standard are in accordance with ISO 1219-1.

<https://standards.iteh.ai/catalog/standards/sist/609ece54-7fda-4b88-94fd-aa651b249997/iso-3968-2001>

5 Test equipment

5.1 General indications

A suitable test rig consists of a pump, a reservoir, a clean-up filter, the filter under test and, if required, a heat exchanger, together with all the necessary equipment for measuring the pressure, the flow rate, the temperature and the fluid cleanliness level (see 6.5). Figure 1 shows a typical test rig in schematic form.

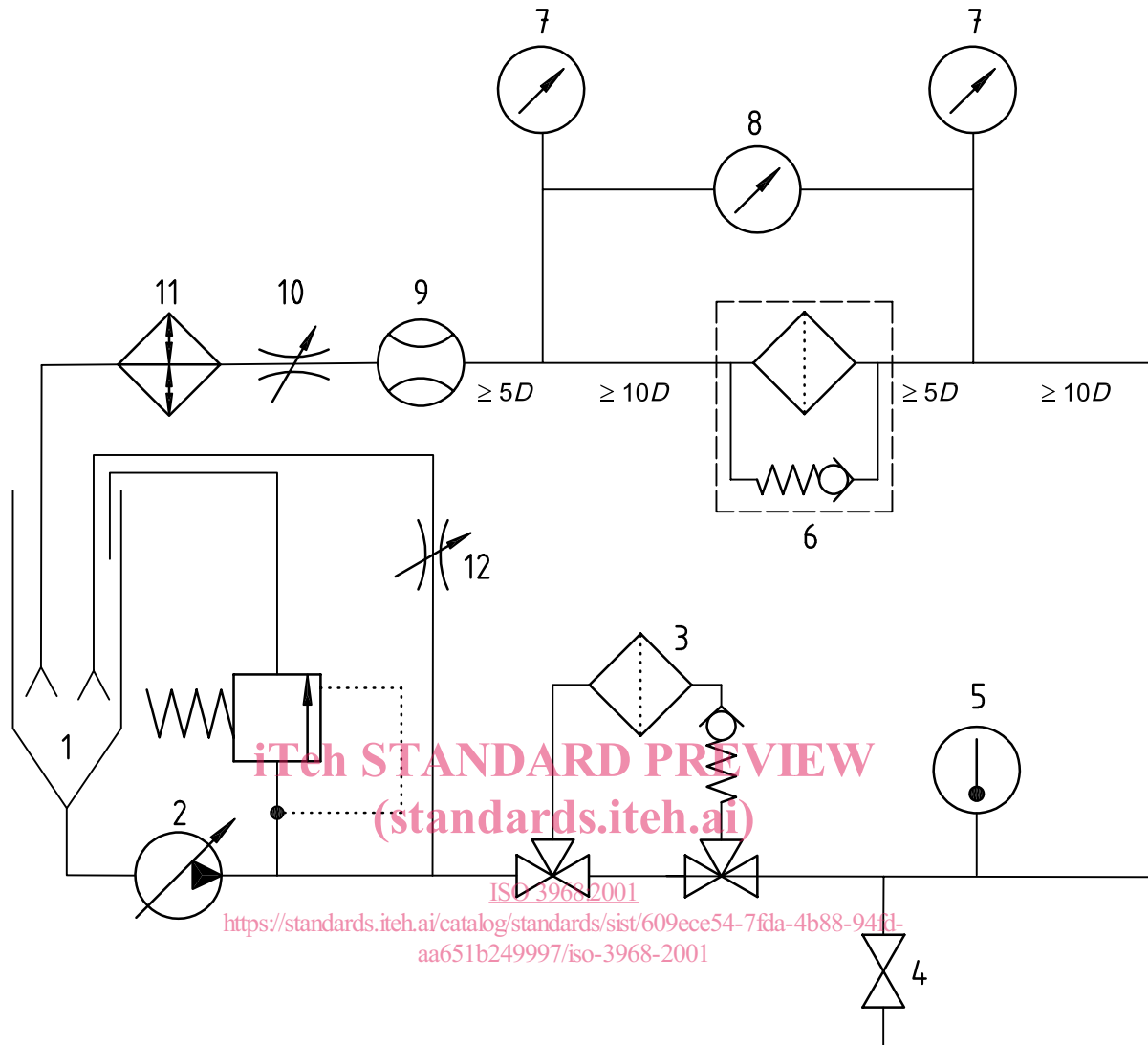
A test rig in accordance with ISO 16889 is suitable for this test.

The test rig shall be constructed so that it does not contain dead legs or zones or quiescent areas where contaminant can settle out and re-entrain later during the test.

When testing return filters to be half-immersed in the reservoir, the test equipment located downstream of the test filter on Figure 1 [flow meter, heat exchanger (counter pressure valve is not necessary)] shall be located upstream of the test filter.

5.2 Pump

Use a pump with a flow rate equal to or greater than the maximum flow rate required for the test. The delivery pressure shall be sufficient for pumping the required flow through the filter under test and for supplying simultaneously the clean-up filter and the remainder of the rig. A device shall make it possible to continuously vary the flow rate from zero to maximum. Pressure ripple shall be suppressed, if required, to guarantee pressure readings with the required accuracy.



Key

- | | |
|----------------------|--------------------------------------|
| 1 Reservoir | 7 Absolute pressure transducer |
| 2 Variable flow pump | 8 Differential pressure transducer |
| 3 Clean-up filter | 9 Flow meter |
| 4 Sampling valve | 10 Counter pressure regulating valve |
| 5 Thermometer | 11 Heat exchanger |
| 6 Filter under test | 12 Bypass flow regulating valve |

Figure 1 — Example of a test circuit suitable for measuring the differential pressure versus flow rate characteristics of filter assemblies

5.3 Reservoir

Use a reservoir with a conical bottom and sized for containing a volume in litres of test fluid of between one and two times the maximum flow rate in litres per minute scheduled for the test. It should be designed to minimize air entrainment (for example by means of a return of the fluid beneath the test fluid surface) and ingress of airborne contamination.