International Standard 7744

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Hydraulic fluid power — Filters — Statement of requirements

Transmissions hydrauliques — Filtres — Spécification des conditions d'emploi

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7744 was prepared by Technical Committee ISO/TC 131, *Fluid power systems.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Hydraulic fluid power — Filters — Statement of requirements

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Filters maintain fluid cleanliness by removing insoluble contaminants.

The filter element is the porous device which performs the actual process of filtration.

1 Scope and field of application

This International Standard defines a statement of requirements for filters in hydraulic systems.

A statement of requirements (SOR) is defined as a document to be provided by a user to specify his requirements to a manufacturer. A model SOR is described below to enable a user to define his requirements fully, without ambiguity and in standard form so that the supplier can meet the requirements as accurately as possible.

Only the main features of a filter are to be defined in the SOR, but it will be understood that many variations and refinements are available which will influence the final choice. The response by manufacturers to the SOR will enable an initial choice to be made from those products which meet the main features defined in the SOR.

It is unlikely that a manufacturer will meet all features defined in the SOR exactly from his standard range of products. He may offer his nearest standard product which might be beyond the limits laid down in the SOR. It is the responsibility of the user to determine the acceptability of features outside the stated requirements.

2 References

ISO 4406, *Hydraulic fluid power — Fluids — Method for coding level of contamination by solid particles.* [1]

ISO 4572, *Hydraulic fluid power — Filters — Multi-pass method for evaluating filtration performance.*

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

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 and the following definitions apply.

3.1 rated pressure: Maximum working pressure, expressed in bar (MPa)[2], in the line to which the filter is fitted.

3.2 clean pressure drop: The difference between inlet and outlet pressure, expressed in bar (MPa)[2], across a filter assembly, fitted with a clean filter element, when passing maximum flow, expressed in litres per minute, under specified conditions.

3.3 maximum pressure drop: The permitted difference between inlet and outlet pressure, expressed in bar (MPa)[2], across a filter assembly, when the filter element has become clogged and passing maximum flow, expressed in litres per minute, under specified conditions.

3.4 fluid type: Fluid described by the suppliers' designation.

3.5 kinematic fluid viscosity: Viscosity, expressed in centistokes, at a temperature of 40 °C.

3.6 temperature range: Range defined by three temperatures — minimum, maximum and normal — expressed in degrees Celsius.

1) At present at the stage of draft.

2) 1 bar = 0,1 MPa = 10^5 Pa; 1 Pa = 1 N/m^2

3.7 degree of filtration: It is recommended that the degree of filtration[1),2)] be derived from the ISO multi-pass test[3)] and quoted as a Beta ratio[4)]. However, until this method is internationally accepted other methods or ratings may be quoted, such as absolute filter rating[5)].

3.8 fluid capacity: The volume of fluid, expressed in litres, in a system.

4 Requirements

The following requirements shall be specified in the SOR:

a) rated pressure;

b) clean pressure drop;

c) maximum flow;

d) maximum pressure drop;

e) fluid type;

f) fluid viscosity;

g) temperature range;

h) degree of filtration;

i) fluid capacity;

j) others, which may include:

1) special materials, e.g. corrosion-resistant types;

2) port sizes and types;

3) mounting arrangements;

4) element type, cleanable or disposable;

5) clogging indicator, local or remote;

6) bypass valve;

7) any dimensional/weight limitation (housings or elements, as relevant);

8) environment;

9) cleanliness standard (see ISO 4406);

10) special functioning conditions;

11) direction of fluid circulation;

12) estimated length of life for the filter element (period between two element changes);

13) description (with diagram) of a circuit in which the filter will be installed.

5 Filter specification

5.1 Specification of what is required of a filter to perform a specific duty shall be defined in the SOR.

NOTE — The filter specification is information presented by the filter manufacturer in his literature and which relates to the performance data obtained from standard test procedures.

5.2 Interpretation of the data in the filter specification and determination of the correlation between the filter specification and the SOR is the joint responsibility of both the user and the manufacturer.

NOTE — The user might require guidance from the manufacturer in interpreting the filter specification; likewise the manufacturer can only supply a filter to meet the requirements if he is supplied with all the relevant information.

6 Standard form

For a recommended standard form of the SOR, see annex A.

NOTE — Use of this form is not mandatory, but is recommended for ease of interpretation by filter manufacturers.

7 Identification statement (Reference to this International Standard)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard:

"Method of drawing up a statement of requirements (SOR) conforms to ISO 7744, *Hydraulic fluid power — Filters — Statement of requirements.*"

8 Bibliography

The following documents served as references in the preparation of this International Standard and will be helpful when using it:

ISO 2941, *Hydraulic fluid power — Filter elements — Verification of collapse/burst resistance.*

1) The particle retention performance of a filter is a complex subject. A filter does not collect all particles above a prescribed (or absolute) rating, but collects a proportion of particles throughout the whole spectrum of sizes. A simple designation of the complete performance of a filter has not yet been defined but the designation systems outlined in footnotes 4 and 5 below should be adequate for most applications.

2 The required degree of filtration is related to, but not equal to, the critical clearances of the hydraulic system components. If these are not known to the user, annex B can be used as a guide to typical clearances. The ratio between degree of filtration and critical clearance depends upon the life and reliability requirements of the system. Advice on this aspect may be obtained from filter manufacturers and/or component suppliers.

3) See ISO 4572.

4) The Beta ratio is the ratio of the number of particles greater than a given size, expressed in micrometres, in the influent fluid in relation to the number of particles greater than the same size in the effluent fluid; β_{10} ratio of 2 indicates that for each passage through the filter only half of all the particles above 10 µm will be retained.

5) Absolute filtration rating is defined by the diameter of the largest hard spherical particle that will pass through a filter under specified test conditions.

ISO 2942, *Hydraulic fluid power — Filter elements — Verification of fabrication integrity.*

ISO 2943, *Hydraulic fluid power — Filter elements — Verification of material compatibility with fluids.*

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

ISO 3722, *Hydraulic fluid power — Fluid sample containers — Qualifying and controlling cleaning methods.*

ISO 3723, *Hydraulic fluid power — Filter elements — Method for end load test.*

ISO 3724, *Hydraulic fluid power — Filter elements — Verification of flow fatigue characteristics.*

ISO 3938, *Hydraulic fluid power — Contamination analysis — Method for reporting analysis data.*

ISO 3968, *Hydraulic fluid power — Filter elements — Evaluation of pressure drop versus flow characteristics.*

ISO 4402, *Hydraulic fluid power — Calibration of liquid automatic particle-count instruments — Method using Air Cleaner Fine Test Dust contaminant.*

ISO 4407, *Hydraulic fluid power — Fluids — Determination of solid particle contamination — Counting method using a microscope under transmitted light.* [1)]

ISO 4408, *Hydraulic fluid power — Fluids — Determination of solid particle contamination — Counting method using a microscope under incident light.* [1)]

1) At present at the stage of draft.

Annex A

Standard form for a statement of requirements (SOR) for hydraulic filters

Company name and address		
Description of system (state main components)		
Property	**Units**	**Remarks** (to include preferred test methods)
Rated pressure	... bar (MPa)	
Clean pressure drop	... bar (MPa)	
Maximum flow	... l/min	
Maximum pressure drop	... bar (MPa)	
Fluid type (manufacturer and designation)		
Kinematic fluid viscosity at 40 °C	... cSt	
Temperature minimum maximum normal	 ... °C ... °C ... °C	
Degree of filtration [1]	Beta ratio ... Absolute rating (µm) ... Others ...	
Fluid capacity	... l	
Other requirements [see clause 4]		

1) Delete as appropriate and state required test method if known.

Annex B

Clearances

The following table gives typical critical clearances of fluid power system components:

Component	Typical clearance µm
Gear pump (pressure-loaded)	
Gear-to-side-plate	0,5 to 5
Gear-tip-to-case	0,5 to 5
Vane pump	
Tip of vane	0,5 to 5
Sides of vane	5 to 13
Piston pump	
Piston-to-bore (R) [1]	5 to 40
Valve-plate-to-cylinder	1,5 to 10
Servo-valve	
Orifice	130 to 450
Flapper wall	18 to 63
Spool sleeve (R) [1]	2,5 to 8
Control valve	
Orifice	130 to 10 000
Spool sleeve (R) [1]	2,5 to 23
Disc type	1,5 to 5
Poppet type	13 to 40
Actuators	50 to 250
Hydrostatic bearings	1 to 25
Anti-friction bearings	1,5 to 10
Side bearings	1,5 to 10
Gear pump	
Fixed side clearances	25 to 50

1) Radial clearance.

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