INTERNATIONAL STANDARD

ISO 4392-1

Third edition
2002-02-15

Hydraulic fluid power — Determination of characteristics of motors —

Part 1: At constant low speed and constant pressure

Transmissions hydrauliques — Détermination des caractéristiques des moteurs —

Partie 1: Essai à pression constante et basse vitesse constante

Reference number
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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. 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 part of ISO 4392 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4392-1 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 8, *Product testing*.

This third edition cancels and replaces the second edition (ISO 4392-1:1989), of which it constitutes a minor revision.

ISO 4392 consists of the following parts, under the general title *Hydraulic fluid power — Determination of characteristics of motors*:

— *Part 1: At constant low speed and constant pressure*

— *Part 2: Startability*

— *Part 3: At constant flow and at constant torque*

Annex A forms a normative part of this part of ISO 4392.

Introduction

In hydraulic fluid power systems power is transmitted and controlled through a fluid under pressure within an enclosed circuit.

Hydraulic motors are units which transform hydraulic energy into mechanical energy, usually with a rotary output.

Hydraulic fluid power — Determination of characteristics of motors —

Part 1:
At constant low speed and constant pressure

1 Scope

This part of ISO 4392 describes a method of determining the low speed characteristics of positive displacement rotary fluid power motors, of either fixed or variable displacement types.

The method involves testing at slow speeds which may generate frequencies having a significant influence upon the steady continuous torque output of the motor and affect the system to which the motor would be connected.

The accuracy of measurement is divided into three classes, A, B and C, which are explained in annex A.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 4392. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 4392 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 ISO and IEC maintain registers of currently valid International Standards.

ISO 3448:1992, *Industrial liquid lubricants — ISO viscosity classification*

ISO 4391:1983, *Hydraulic fluid power — Pumps, motors and integral transmissions — Parameter definitions and letter symbols*

ISO 5598:1985, *Fluid power systems and components — Vocabulary*

ISO 9110-1:1990, *Hydraulic fluid power — Measurement techniques — Part 1: General measurement principles*

ISO 9110-2:1990, *Hydraulic fluid power — Measurement techniques — Part 2: Measurement of average steady-state pressure in a closed conduit*

3 Terms and definitions

For the purposes of this part of ISO 4392, the terms and definitions given in ISO 4391, ISO 5598 and the following apply.

3.1
complete motor cycle
total angular movement of the motor output shaft needed to achieve a repetitive leakage and/or torque recording

NOTE In most motors this will be 360°; however, in some, such as gear motors, it may be several shaft revolutions.

4 Symbols

4.1 The physical quantity letter symbols and their suffixes used in this part of ISO 4392 are in accordance with ISO 4391.

4.2 The graphical symbols used in Figure 1 are in accordance with ISO 1219-1.

5 Test installation

5.1 Hydraulic test circuit

5.1.1 A hydraulic test circuit similar to that shown in Figure 1 shall be used.

This figure does not show all the safety devices necessary to protect against damage in the event of component failure. It is important that those responsible for carrying out these tests give due consideration to safeguarding both staff and equipment.

NOTE 1 Although Figure 1 illustrates a basic circuit to test a bidirectional motor, a similar but suitably modified circuit is acceptable for testing unidirectional motors.

NOTE 2 An additional booster pump circuit may be necessary when testing piston-type motors.

5.1.2 A hydraulic supply (1a and 1b of Figure 1) shall be used and pressure-relief valves (2a and 2b of Figure 1) shall be installed which satisfy the requirements of 8.2.

5.1.3 A fluid conditioning circuit shall be installed which provides the filtration necessary to protect the test motor and the other circuit components and which will maintain the fluid temperatures specified in clause 7.

5.1.4 If the test motor is equipped with an external case drain, the drain shall be connected to the test motor return line so as to measure total flow [see 5.3.1 a)].

Should the safe pressure for the motor casing be exceeded by the above method, the separate case drain flow and return line flow shall be measured simultaneously.

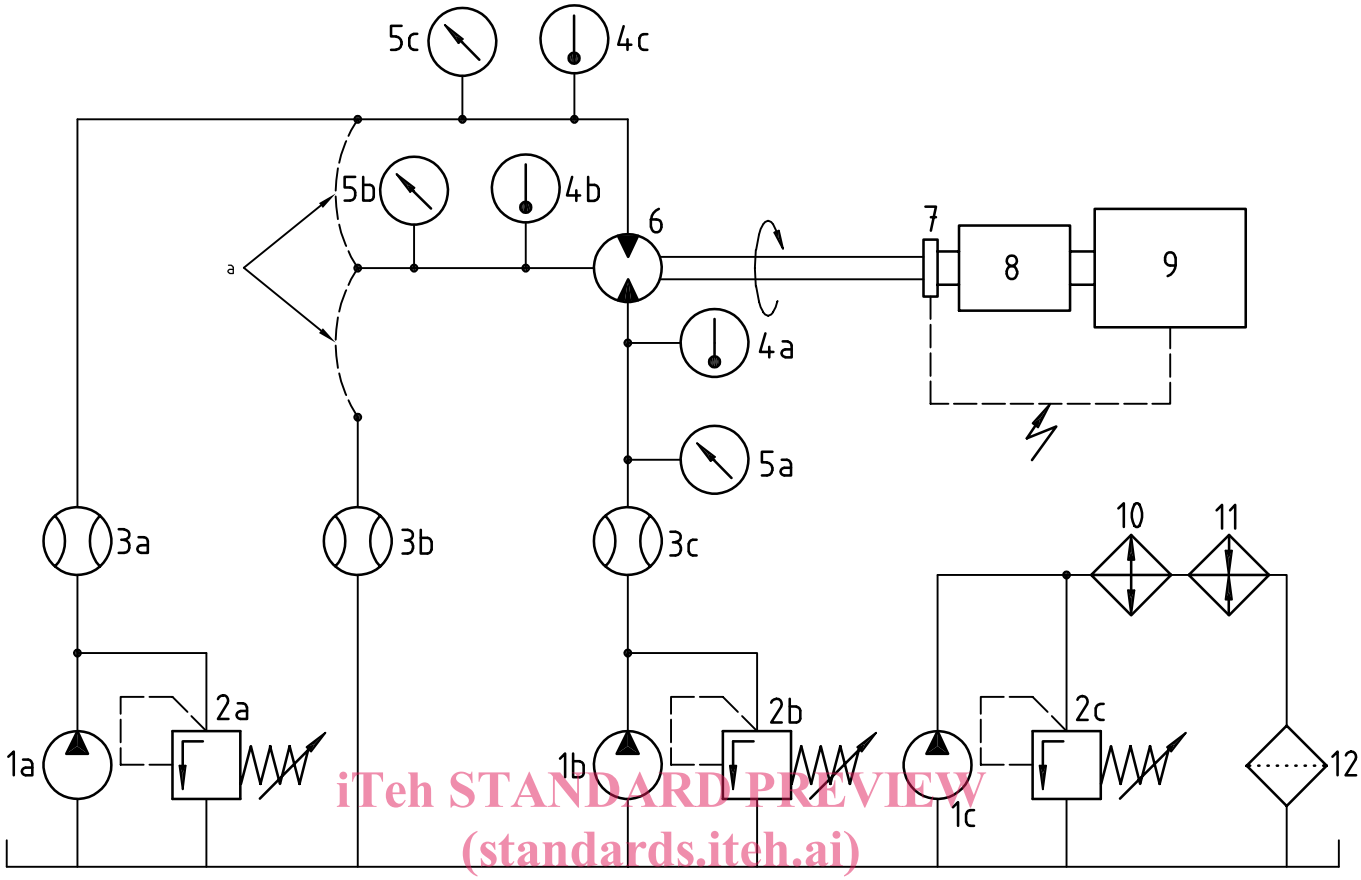
5.1.5 As an alternative to 5.1.4, a high-pressure flowmeter [see 5.3.1 c)] may be installed in the motor inlet line to measure the total flow.

5.1.6 The hydraulic ports of the test motor shall be connected to the hydraulic circuit in such a manner that the motor shaft will rotate in the same direction as the constant speed load.

5.2 Test apparatus

5.2.1 A test rig shall be set up which makes use of the test circuit specified in 5.1 and provides the equipment shown in Figure 1.

5.2.2 A positive locking device shall be provided on continuously variable displacement motors to prevent the displacement inadvertently changing during the pertinent portion of each test.



Main test circuit **Fluid-conditionning circuit**

Key

1a,	1b	1c	Circulating pumps	7	Speed and shaft angle control
2a,	2b,	2c	Pressure-relief valves	8	Torque transducer
3a,	3b,	3c	Flowmeters	9	Adjustable constant speed load [c]
4a,	4b[b],	4c	Temperature indicators	10	Cooler
5a,	5b,	5c	Pressure indicators	11	Heater
	6		Motor being tested	12	Filter

[a] Alternative connections (see 5.1.4).

[b] Optional.

[c] An example of an adjustable constant speed load is a combination of a worm gearbox(es) with a constant speed drive.

Figure 1 — Typical hydraulic test circuit for bidirectional motor

5.3 Instrumentation

5.3.1 Measuring instruments shall be selected and installed to measure the following test motor data:

a) total flow (see 5.1.4);

b) inlet and outlet temperatures;

c) inlet and outlet pressure;

d) inlet flow (see 5.1.5);

e) output torque;

f) output shaft speed and angular displacement.