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Hydraulik – Elektriskt styrda riktningssventiler för hydraulik – Del 1: Provningsmetoder för fyrports riktningssventiler för flödesstyrning (ISO 10770-1:2009, IDT)

Hydraulic fluid power – Electrically modulated hydraulic control valves – Part 1: Test methods for four-port directional flow-control valves (ISO 10770-1:2009, IDT)

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Denna standard ersätter SS-ISO 10770-1, utgåva 1.

The International Standard ISO 10770-1:2009 has the status of a Swedish Standard. This document contains the official English version of ISO 10770-1:2009.

This standard supersedes the Swedish Standard SS-ISO 10770-1, edition 1.

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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 2.

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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10770-1 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 8, *Product testing*.

This second edition cancels and replaces the first edition (ISO 10770-1:1998), which has been technically revised.

ISO 10770 consists of the following parts, under the general title *Hydraulic fluid power — Electrically modulated hydraulic control valves*:

- *Part 1: Test methods for four-port directional flow-control valves*
- *Part 2: Test methods for three-way directional flow control valves*
- *Part 3: Test methods for pressure control valves*

Introduction

This part of ISO 10770 has been prepared with the intention of improving the uniformity of valve testing and hence the consistency of recorded valve performance data so that these data can be used for system design, regardless of the data source.

Hydraulic fluid power — Electrically modulated hydraulic control valves —

Part 1: Test methods for four-port directional flow-control valves

1 Scope

This part of ISO 10770 describes methods for determining the performance characteristics of electrically modulated, hydraulic, four-port directional flow-control valves. This type of electrohydraulic valve controls the direction and flow in a hydraulic system.

2 Normative references

The following referenced documents are indispensable for the application 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 1219-1, *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 1: Graphic symbols for conventional use and data-processing applications*

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

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 6743-4, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*

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

ISO 10771-1, *Hydraulic fluid power — Fatigue pressure testing of metal pressure-containing envelopes — Part 1: Test methods*

IEC 60617-DB-12M, *Graphical symbols and diagrams*

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598, together with the following, apply.

3.1.1

electrically modulated, hydraulic directional flow-control valve

valve that provides a degree of proportional flow control in response to a continuously variable electrical input signal

NOTE The flow direction can be changed by the input signal.

3.1.2

input signal deadband

portion of input signal that does not produce a controlled flow

3.1.3

threshold

change of input signal required to produce a reversal in continuous control valve output

NOTE The threshold is expressed as a percentage of rated signal.

3.1.4

rated input signal

that signal defined by the manufacturer to achieve rated output

3.2 Symbols and units

For the purposes of this document, the symbols given in Table 1 apply.

NOTE The graphic symbols in this part of ISO 10770 conform to ISO 1219-1 and IEC 60617-DB-12M.

Table 1 — Symbols and units

| Parameter | Symbol | Unit |
|-------------------------|---|---------------------------|
| Inductance | L_c | H |
| Insulation resistance | R_i | Ω |
| Insulation test current | I_i | A |
| Insulation test voltage | U_i | V |
| Resistance | R_c | Ω |
| Dither amplitude | — | % (of max. input signal) |
| Dither frequency | — | Hz |
| Input signal | I , or U | A, or V |
| Rated input signal | I_n , or U_n | A, or V |
| Output flow | q | l/min |
| Rated flow | q_n | l/min |
| Flow gain | $K_v = (\Delta q / \Delta I)$, or $K_v = (\Delta q / \Delta U)$ | l/min/A, or l/min/V |
| Hysteresis | — | % (of max. output signal) |
| Internal leakage | q_l | l/min |
| Supply pressure | p_P | MPa (bar) |
| Return pressure | p_T | MPa (bar) |

Table 1 (continued)

| Parameter | Symbol | Unit |
|---------------------------|---|----------------------------|
| Load pressure | p_A or p_B | MPa (bar) |
| Load pressure difference | $p_L = p_A - p_B$, or $p_L = p_B - p_A$ | MPa (bar) |
| Valve pressure drop | $p_V = p_P - p_T - p_L$ | MPa (bar) |
| Rated valve pressure drop | p_n | MPa (bar) |
| Pressure gain | $K_p = (\Delta p_L / \Delta I)$, or $K_p = (\Delta p_L / \Delta U)$ | MPa (bar)/A MPa (bar)/V |
| Threshold | — | % (of max. input signal) |
| Amplitude (ratio) | — | dB |
| Phase lag | — | ° |
| Temperature | — | °C |
| Frequency | f | Hz |
| Time | t | s |
| Time constant | t_c | s |
| Linearity error | q_{err} | l/min |

4 Standard test conditions

Unless otherwise specified, tests shall be carried out using the standard test conditions given in Table 2.

Table 2 — Standard test conditions

| Parameter | Condition |
|---------------------|---|
| Ambient temperature | 20 °C ± 5 °C |
| Fluid cleanliness | Solid contaminant code number shall be stated in accordance with ISO 4406. |
| Fluid type | Commercially available mineral-based hydraulic fluid (i.e. L - HL in accordance with ISO 6743-4 or other fluid with which the valve is able to operate) |
| Fluid viscosity | 32 cSt ± 8 cSt at valve inlet |
| Viscosity grade | Grade VG32 or VG46 in accordance with ISO 3448 |
| Pressure drop | Test requirement ± 2,0 % |
| Return pressure | Shall conform to the manufacturer's recommendations |

5 Test installation

A test installation conforming to the requirements of Figure 1 shall be used for testing all valves.

SAFETY PRECAUTIONS — It is essential that consideration be given to the safety of personnel and equipment during the tests.

Figure 1 shows the minimum items required to carry out the tests without any safety devices to protect against damage in the event of component failure. For tests using the test circuit shown in Figure 1, the following apply.

- a) Guidance on carrying out the tests is given in Annex A.
- b) A separate circuit may be constructed for each type of test. This can improve the accuracy of test results as it eliminates the possibility of leakage through the shut-off valves.
- c) Hydraulic performance tests are carried out on a combination of valve and amplifier. Input signals are applied to the amplifier and not directly to the valve. For electrical tests, the signals are applied directly to the valve.