INTERNATIONAL STANDARD

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Hydraulic fluid power — Gas-loaded accumulators with separator — Ranges of pressures and volumes and characteristic quantities

Transmissions hydrauliques — Accumulateurs hydropneumatiques avec séparateur — Gammes de pressions et de volumes et grandeurs caractéristiques

Reference number
ISO 5596:1999(E)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

International Standard ISO 5596 was developed by Technical Committee ISO/TC 131, *Fluid power systems*.

This second edition cancels and replaces the first edition (ISO 5596:1982), which has been technically revised.

Introduction

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

Gas-loaded accumulators are components that are able to store and return energy in accordance with the principle of compressibility of gases.

Hydraulic fluid power — Gas-loaded accumulators with separator — Ranges of pressures and volumes and characteristic quantities

1 Scope

This International Standard specifies the characteristic performance quantities required for defining, designing, and testing gas-loaded accumulators with separator, which are used in hydraulic fluid power systems.

It also defines ranges of pressures and volumes for these accumulators.

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 ISO and IEC maintain registers of currently valid International Standards.

ISO 3, *Preferred numbers — Series of preferred numbers.*

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

3 Terms and definitions

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

3.1
gas-loaded accumulator
accumulator with separation in which the liquid is pressurized using the compressibility of an inert gas (nitrogen, for example).

NOTE The separation is achieved by means of a bladder, diaphragm, piston, etc.

3.2
gas-loaded accumulator, transfer type
gas-loaded accumulator with a port for additional gas capacity from one or more gas bottle(s)

3.3
compatible fluid
fluid that has no significant effect on the nature or life of the parts of the accumulator, especially those made of elastomeric materials

4 Applications

4.1 Energy storage

The gas-loaded accumulator stores hydraulic fluid under pressure during a period of low energy demand from the circuit in which it is mounted. The stored hydraulic fluid is then returned to the circuit to supplement or replace the pump discharge temporarily or to ensure emergency operation.

4.2 Pulse or surge damping

The gas-loaded accumulator absorbs hydraulic fluid to reduce pressure peaks and returns hydraulic fluid to compensate for pressure drops. The accumulator thus reduces the amplitude of pressure oscillations in the circuit in which it is mounted.

4.3 Thermal compensation

The gas-loaded accumulator absorbs volume changes resulting from changes in the temperature of the hydraulic fluid contained in an isolated part of the circuit.

5 Characteristic quantities

The following quantities shall be used to define and design a gas-loaded accumulator.

5.1 Pressures

p_0 = pre-charging pressure, i.e., the gas pressure in the accumulator when the hydraulic circuit is not under pressure (initial state) at a temperature of 20 °C ± 5 °C.

p_1 = minimum working pressure of the hydraulic circuit.

p_2 = maximum working pressure of the hydraulic circuit.

p_3 = set pressure of the pressure relief valve for the accumulator, if one is fitted.

p_4 = allowable pressure, i.e., the maximum permissible pressure for which the accumulator has been designed and/or qualified by test.

p_5 or p_t = hydraulic test pressure; the ratio between p_5 and p_4 is defined by relevant national regulations or design codes.

$\frac{p_2}{p_0}$ = allowable pressure ratio below which the accumulator type can be used.

Pressures shall be expressed in megapascals, with the equivalent value in bars in parentheses.

5.2 Volumes

V = internal volume of the gas chamber.

V_0 = gas volume at pressure p_0.

V_1, V_2 = volumes occupied by the gas contained in the accumulator and any additional gas bottles at pressures p_1 and p_2, respectively (as defined in 5.1).

V_S = swept volume of piston-type accumulator.

ΔV = volume that can be stored or discharged between the two pressures p_1 and p_2.

Volumes shall be expressed in litres.

5.3 Flow rates

q_{in} = maximum volumetric flow rate into the accumulator.

q_{out} = maximum volumetric flow rate out of the accumulator.

Flow rates shall be expressed in litres per minute.

5.4 Temperatures

t_1 = minimum operating temperature of the hydraulic fluid or of the environment, whichever is lower.

t_2 = maximum operating temperature of the hydraulic fluid or of the environment, whichever is higher.

$t_{c,min}$ = minimum design temperature; $t_{c,min}$ shall be lower than or equal to t_1.

$t_{c,max}$ = maximum design temperature; $t_{c,max}$ shall be higher than or equal to t_2

Temperatures shall be expressed in degrees Celsius.

6 Ranges of pressures and volumes

6.1 Nominal pressure range, p_4

6,3 (63) – 10 (100) – 16 (160) – 20 (200) – 25 (250) – 31,5 (315) – 40 (400) – 50 (500) – 63 (630)

Pressures are expressed in megapascals, with the equivalent value in bars in parentheses.

For special applications that require lower or higher pressures, use pressures corresponding to the R 10 series of preferred numbers (see ISO 3).

6.2 Nominal volume range, V

0,25 – 0,4 – 0,5 – 0,63 – 1,0 – 1,6 – 2,5 – 4,0 – 6,3 – 10 – 16 – 20 – 25 – 32 – 40 – 50 – 63 – 100 – 160 – 200

Volumes are expressed in litres.

For special applications that require smaller or larger volumes, use volumes corresponding to the R 10 series of preferred numbers (see ISO 3).

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:

"Ranges of pressures and volumes, and characteristic quantities for gas-loaded accumulators with separator selected in accordance with ISO 5596:1999, *Hydraulic fluid power — Gas-loaded accumulators with separator — Ranges of pressures and volumes and characteristic quantities."*

Bibliography

[1] ISO 2944:[1)] , *Fluid power systems and components — Nominal pressures*.

[2] ISO 10945:1994, *Hydraulic fluid power — Gas-loaded accumulators — Dimensions of gas ports.*

[3] ISO 10946:1999, *Hydraulic fluid power — Gas-loaded accumulators with separator — Selection of preferred hydraulic ports*.

1) To be published. (Revision of ISO 2944:1974)

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