INTERNATIONAL STANDARD

ISO 6301-2

Second edition
2006-09-01

Pneumatic fluid power — Compressed-air lubricators —

Part 2: Test methods to determine the main characteristics to be included in supplier's literature

Transmissions pneumatiques — Lubrificateurs pour air comprimé —

Partie 2: Méthodes d'essai pour déterminer les principales caractéristiques à inclure dans la documentation du fournisseur

Reference number
ISO 6301-2:2006(E)

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Published in Switzerland

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 6301-2 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 5, *Control products and components*.

This second edition cancels and replaces the first edition (ISO 6301-2:1997), which has been technically revised.

ISO 6301 consists of the following parts, under the general title *Pneumatic fluid power — Compressed-air lubricators*:

— Part 1: *Main characteristics to be included in supplier's literature and product-marking requirements*

— Part 2: *Test methods to determine the main characteristics to be included in supplier's literature*

Introduction

In pneumatic fluid power systems, power is transmitted and controlled through air under pressure within a circuit. Where lubrication of the air media is desired, compressed air lubricators are components designed to introduce the required quantity of lubricant into the air stream.

Pneumatic fluid power — Compressed-air lubricators —

Part 2:
Test methods to determine the main characteristics to be included in supplier's literature

1 Scope

This part of ISO 6301 specifies tests, procedures and a method of presenting the results concerning the parameters that define the main characteristics to be included in the supplier's literature of lubricators conforming to ISO 6301-1.

This part of ISO 6301 can be applied

— to facilitate the comparison of lubricators by standardizing test methods and presentation of test data;

— to assist in the proper application of lubricators in compressed-air systems.

The tests specified are intended to allow comparison between the different types of lubricators; they are not production tests to be carried out on each lubricator manufactured.

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 3, *Preferred numbers — Series of preferred numbers*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*

ISO 1219-1[1)], *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 1: Graphic symbols for conventional use and data-processing applications*

ISO 2944, *Fluid power systems and components — Nominal pressures*

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

ISO 5598[2)], *Fluid power systems and components — Vocabulary*

ISO 6301-1:1997, *Pneumatic fluid power — Compressed-air lubricators — Part 1: Main characteristics to be included in supplier's literature and product-marking requirements*

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1) To be published. (Revision of ISO 1219-1:1991)

2) To be published. (Revision of ISO 5598:1985)

ISO 6358:1989, *Pneumatic fluid power — Components using compressible fluids — Determination of flow-rate characteristics*

ISO 8778, *Pneumatic fluid power — Standard reference atmosphere*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and ISO 6301-1 apply.

4 Units and symbols

Units from ISO 1000 are generally used in pneumatic fluid power systems, in particular:

— gauge pressure, expressed in kilopascal (bar);

— temperature, expressed in degrees Celsius;

— air flow rate, expressed in litres per second or cubic decimetres per second (ANR) (see ISO 8778).

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

5 Test conditions and samples

5.1 Temperature

The temperature of the processed air, the equipment and the ambient air temperature shall be maintained at 23 °C ± 5 °C for all tests.

5.2 Pressures

The specified pressures shall be held to within ± 2 %. The preferred test pressures are those given in 4.2.1 of ISO 6301-1:1997 or from ISO 2944. Where other test pressures are required, the value shall be selected from series R5 of preferred numbers, according to ISO 3.

5.3 Test samples

Test a minimum of three random samples in each of Clauses 6, 7, 8, 9 and use the average of the results.

6 Test procedure to verify rated pressure

6.1 Perform this test with a proposed rated pressure for the product.

6.2 In this test, the product-sealing means may be modified to prevent leakage and allow structural failure to occur, but modifications shall not increase the structural strength of the pressure-containing envelope.

6.3 Fill samples with liquid whose viscosity does not exceed ISO VG 32, in accordance with ISO 3448, and install them in the temperature environment described in 5.1.

6.4 After stabilizing the temperature, pressurise slowly to a level of 1,5 times the proposed rated pressure. Hold at this level for 2 min and observe for leakage or failure (as defined in 6.6).

6.5 If there is no leakage or failure, increase the pressure by approximately half of its proposed rated pressure. Hold at this pressure for 2 min and observe for leakage or failure (as defined in 6.6).

If there is still no leakage or failure, in terms of the following units:

a) for products constructed of light alloys, brass and steel: continue raising the pressure as above until a level of four times the proposed rated pressure has been reached;

b) for products constructed of zinc die cast alloys or plastics:

— used at operating temperatures up to 50 °C, continue raising the pressure as above until a level of four times the proposed rated pressure has been reached,

— used at operating temperatures between 50 °C and 80 °C, continue raising the pressure as above until a level of five times the proposed rated pressure has been reached.

6.6 Criteria for failure are a fracture, a separation of parts or a crack or any phenomenon that can pass liquid across the pressure-containing envelope sufficiently to wet the outer surface. Leakage across port threads shall not constitute a failure unless caused by a fracture or crack.

6.7 The proposed rated pressure is verified if all three samples pass the test.

6.8 Where a unit or sub-assembly in the unit (e.g. reservoir or sight glass) is constructed of different materials, the highest appropriate ratio between the test pressure and rated pressure should be used. The application of pressure may be restricted to the area of the interface between the different materials.

6.9 Where the design of the pressure-containing envelope is covered by a pressure vessel code in the country of sale, the requirements of that code take precedence over the requirements stated in this part of ISO 6301.

7 Air flow rate tests

7.1 The test circuit shall comply with the one described in ISO 6358:1989, Figure 1, Table 3 and 5.3.

7.2 The measuring tubes shall comply with those described in ISO 6358:1989, Figure 3, Table 4 and 5.4 and 5.5

7.3 The oil-feed control shall be set to zero and there shall be no oil in the reservoir.

NOTE The purpose of this operation is to reduce the chance of contamination of the flow rate measuring device.

7.4 Each series of results obtained for a specified test condition shall be recorded as soon as a steady-state condition has been reached. Recording shall be carried out with care and with a sufficiently slow period of change in conditions to avoid a drift in the steady-state characteristic. A periodic check shall be made to verify that no pressure intakes of measuring instruments are blocked by solid or liquid particles.

7.5 Set the inlet pressure to test levels of 250 kPa (2,5 bar); 630 kPa (6,3 bar); 1 000 kPa (10 bar) or at the rated pressure, if different from 1 000 kPa (10 bar). Adjust the pressure regulator as required to maintain the selected inlet pressure at a constant value throughout the test.

7.6 Begin circulating air through the test circuit, recording air flow rate and pressure drop, up to a maximum air flow rate corresponding to a pressure drop equal to the lesser of 80 kPa (0,8 bar) or 20 % of the inlet pressure. Then record air-flow rate and pressure drop with air-flow rate decreasing to zero.

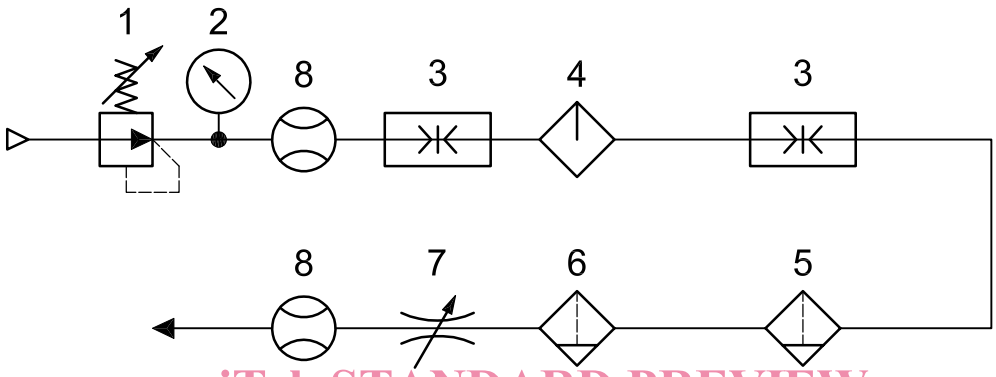
7.7 Results shall be taken from the mean of the increasing or decreasing air flow rate data and presented in accordance with ISO 6301-1:1997, Figure 2, recording the port size and type of lubricator, or in accordance with ISO 6301-1:1997, Table 1, where the air-flow rate at which the pressure drop is 5 % of the inlet pressure is tabulated.

8 Test procedure to establish the minimum operating air flow rate

NOTE Non-recirculating lubricators dispense all the oil drops observed in the sight dome into the downstream air flow and measurement of the drop rate is a direct indication of the quantity of oil being carried in the downstream air. Recirculating lubricators direct the oil drops passing through the sight dome to a venturi in which the oil is sheared to form a mist of oil particles in the lubricator reservoir. A significant quantity of these particles settle in the reservoir and only a fraction of the generated particles are carried into the downstream air flow. The drop rate visible in the sight dome is not a direct measure of the quantity of oil delivered.

8.1 Option 1

8.1.1 Install the lubricator into the test circuit as described in Figure 1.



Key

1 pressure regulator
2 pressure gauge
3 couplings
4 test lubricator
5 general purpose filter
6 coalescing filter
7 flow control valve
8 flowmeter

Figure 1 — Test circuit

8.1.2 The reservoir shall be partially filled with a liquid of viscosity equal to that of ISO VG 32, according to ISO 3448, to a liquid level approximately 25 % of the reservoir capacity as determined in Clause 9.

8.1.3 Set the oil-feed mechanism to its maximum open position and maintain this throughout the test.

8.1.4 With the supply pressure held constant at 630 kPa (6,3 bar) or the rated pressure, if lower, open the flow control valve in the test circuit to generate an oil delivery of at least

— 1 drop/min per 5 dm^3/s (ANR) of flow for non-recirculating lubricators; or

— 10 drops/min per 5 dm^3/s (ANR) of flow for recirculating lubricators.

8.1.5 Remove and weigh the lubricator.

8.1.6 Install the lubricator and, without adjusting the flow control valve or lubricator drip setting, reapply the test pressure. Note the air-flow rate, and run the test for at least 30 min. Record the elapsed time. Stop the air flow and depressurize the test circuit.

NOTE At low air-flow rates, it can be necessary to extend the test period in order to deliver a significant amount of oil output.

8.1.7 Remove the lubricator and reweigh it. The difference between this mass and the mass determined in 8.1.5 is the amount of oil delivered over the test period. Use this mass to establish the oil output density in milligrams per cubic metre (ANR).

8.1.8 Repeat the test described in 8.1.6 with the air flow adjusted as necessary to achieve a nominal oil output density of 60 mg/m^3 (ANR).

8.1.9 The minimum operating air flow rate can be established by interpolation or extrapolation of three results.

NOTE If the oil drop mass in a sight dome of a non-recirculating lubricator is known, the oil output can be established by noting the number of drops delivered over a test period.

8.2 Option 2

8.2.1 Install the lubricator into the test circuit as described in 7.1 and 7.2, with the exceptions that the downstream pressure-measuring tube is removed and the flowmeter is located only in the upstream part of the circuit.

8.2.2 The reservoir shall be partially filled with a liquid of viscosity equal to that of ISO VG 32, according to ISO 3448, to a liquid level approximately 25 % of the reservoir capacity as determined in Clause 9.

8.2.3 Set the oil feed mechanism to its maximum open position and maintain this throughout the test.

8.2.4 With the supply pressure held constant at 630 kPa (6,3 bar) or the rated pressure, if lower, sufficiently open the flow control valve in the test circuit to generate an oil delivery of at least 5 drops per minute, as observed in the sight dome. Record the corresponding air-flow rate as the minimum operating air-flow rate.

9 Measurement of reservoir capacity

9.1 With the lubricator completely assembled, measure the amount of liquid necessary to fill the reservoir from the level 2 mm above the bottom of the pick-up tube to the maximum fill level marked by the manufacturer.

9.2 Determine the average for each group of samples. This value shall be the rated reservoir capacity for a given reservoir size.

10 Identification statement (reference to this part of ISO 6301)

It is strongly recommended to manufacturers who have chosen to conform to part of ISO 6301 that the following statement be used in test reports, catalogues and sales literature:

"Main characteristics of compressed-air lubricators determined in accordance with ISO 6301-2:2006, *Pneumatic fluid power — Compressed-air lubricators — Part 2: Test methods to determine the main characteristics to be included in supplier's literature.*"