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**Methods of test for full-flow lubricating oil filters for internal  
combustion engines - Part 9: Inlet and outlet anti-drain valve  
tests**

内燃机全流式机油滤清器试验方法 第9部分:进、出口止回阀试验

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## Table of Contents

|                                                                                  |   |
|----------------------------------------------------------------------------------|---|
| 1 Scope .....                                                                    | 1 |
| 2 Normative references .....                                                     | 1 |
| 3 Terms and definitions .....                                                    | 1 |
| 4 Principle of the test .....                                                    | 1 |
| 4.1 Inlet anti-drain valve .....                                                 | 1 |
| 4.2 Outlet anti-drain valve .....                                                | 1 |
| 5 Test apparatus .....                                                           | 1 |
| 6 Test liquid .....                                                              | 2 |
| 7 Test procedure .....                                                           | 2 |
| 7.1 General .....                                                                | 2 |
| 7.2 Inlet anti-drain valve - test A: basic performance test .....                | 2 |
| 7.3 Inlet anti-drain valve - test B: basic and auxiliary performance test .....  | 2 |
| 7.4 Outlet anti-drain valve - test A: basic performance test .....               | 3 |
| 7.5 Outlet anti-drain valve - test B: basic and auxiliary performance test ..... | 4 |
| 8 Test report .....                                                              | 8 |
| Bibliography .....                                                               | 9 |

### 1 Scope

This part of GB/T 8243 specifies the test methods for the effectiveness of the inlet and outlet anti-drain valves of "spin-on" or "replaceable element" full-flow lubricating oil filters for internal combustion engines.

### 2 Normative references

The following document is indispensable for the application of this document. For dated references, only the edition cited applies; for undated references, the latest edition (including all amendments) applies.

ISO 4548-1, Methods of test for full-flow lubricating oil filters for internal combustion engines - Part 1: Differential pressure/flow characteristics.

### 3 Terms and definitions

The terms and definitions given in ISO 4548-1 apply to this document.

## 4 Principle of the test

4.1 Inlet anti-drain valve. The test assesses the ability of the inlet anti-drain valve to prevent the oil held in the filter from flowing out through the inlet port when the engine has been stopped.

4.2 Outlet anti-drain valve. The test assesses the ability of the outlet anti-drain valve to prevent the oil held in the filter from flowing out through the outlet port when the engine has been stopped.

## 5 Test apparatus

The recommended test apparatus is shown in Figures 1 to 3. Figures 1 and 2 show the simple rigs used for the basic test. Figure 3 shows a more elaborate rig, in which the header cylinder can be raised and lowered at a fixed speed of 0.5 m/min over an oil level height of 0 mm to 1 500 mm above the test bench; that rig is used only where the opening pressure and the flow/differential pressure data have to be measured.

NOTE: Figures 1 to 3 use the graphical symbols specified in ISO 1219-1.

The test apparatus is made up of the following items together with the necessary piping, fittings and supports: a) oil tank; b) oil pump (a vane pump is recommended); c) strainer; d) oil shut-off switch (see Figures 1 to 3); e) three-way valve (see Figures 1 to 3); f) test filter head; g) header cylinder (for example a separating funnel); h) measuring cylinder; i) stopwatch or clock (not shown).

Where all the tests specified in this part are to be carried out, a single test rig combining all the features of Figures 1 to 3 may be used.

## 6 Test liquid

The test liquid shall be a mineral oil with a kinematic viscosity at 20 °C of 8 square millimetres per second  $\pm$  2 square millimetres per second, corresponding to viscosity grade ISO VG 5. A footnote on the same page records the conversion 1 square millimetre per second = 1 cSt.

## 7 Test procedure

7.1 General. This part specifies two test procedures for the inlet and the outlet anti-drain valve. Test A is the basic performance test to be carried out on the valve according to its function. Test B is the basic test together with the additional procedure recommended when certain auxiliary performance data are to be determined.

7.2 Inlet anti-drain valve - test A. The rig of Figure 1 is used, and the individual items of Figure 1 are called out in bold figures in brackets through 7.2.2 to 7.2.13. If the filter is also

fitted with an outlet anti-drain valve, that valve is locked open by a suitable means before the test so that oil can be admitted from the outlet side of the filter. The ambient temperature during the test is  $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ . The test filter head is mounted upside down on the bench, that is turned through  $180^{\circ}$  from the position shown in Figure 1, and the filter under test is fitted to the head with a suitable gasket to prevent leakage at the thread. Where the purpose of the test is only to assess the performance of the valve and not to check the manufacturing integrity of the filter assembly, any leakage path between the threaded cover plate and the seal retaining plate is sealed off.

7.2 (continued). With the inlet switch and the outlet switch under the header cylinder opened, test liquid is pumped into the system until all the air has been expelled and the oil level below the filter reaches  $600\text{ mm} \pm 10\text{ mm}$ , after which both switches are closed. The note to this step records that the filter is mounted in that position so that the air is driven out completely. The inlet pipe below the filter is then disconnected and the filter is turned through  $180^{\circ}$  to the position shown in Figure 1. The outlet switch under the header cylinder is opened, the bleed screw on the test filter head is removed and the residual test liquid in the head is drained for 5 min. The bleed screw is refitted, a suitable measuring cylinder is placed under the outlet pipe and the stopwatch is started. Over 1 h the total quantity of test liquid leaking from the filter during that time is measured, the liquid level in the header cylinder being held at  $600\text{ mm} \pm 10\text{ mm}$ . The test result is then recorded in accordance with Clause 8.

7.3 Inlet anti-drain valve - test B. The rig of Figure 3 is used, with its items called out in bold figures in brackets through 7.3.2 to 7.3.20. This method is used where the flow, the differential pressure and the opening pressure are to be measured, and where necessary the test is repeated with the filter mounted out of the vertical, the mounting angle being agreed between user and manufacturer, and after the filter has been aged in the vertical and the inclined position in accordance with ISO 4548-3. The ambient temperature is again  $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ . After the filter has been mounted and the pump has been run until no air bubbles remain in the oil, the pump is stopped, the inlet and outlet switches are closed and the three-way valve is set so that the inlet of the head is shut. The header cylinder is then set so that the oil level reaches  $600\text{ mm} \pm 10\text{ mm}$ , or another specified height, and the filter is turned through  $180^{\circ}$  to the position shown in Figure 3.

7.3 (continued). The oil downstream of the inlet anti-drain valve is drained into a suitable vessel and the residual test liquid in the head is drained for 5 min. A measuring cylinder is placed at the lower end of the drain pipe, the stopwatch is started, and over 1 h the total quantity of test liquid leaking past the inlet anti-drain valve is measured; the drain switch is then closed and the result recorded in accordance with Clause 8. For the opening pressure, the header cylinder is lowered until the oil height is close to zero, the three-way valves are set so that the oil in the header cylinder flows towards the filter head inlet, the drain switch is opened and oil is drained into a suitable vessel for 5 min. The header cylinder is then raised gradually until oil is seen to flow from the drain switch, which shows that the inlet

anti-drain valve has opened; the oil height is noted, the cylinder is lowered again to close the valve and a clean measuring cylinder is placed at the drain switch.

7.3 (continued). The header cylinder is then raised at 0.5 m/min until oil flows from the drain switch, which shows that the opening pressure of the valve has been reached, and that oil height is recorded. The cylinder is raised at 0.5 m/min to the next 100 mm step, the oil is allowed to flow steadily for 2 min, a clean measuring cylinder is placed under the drain switch and the oil flow is measured against the stopwatch; the procedure is repeated at every further 100 mm of oil height up to 1 500 mm. A curve of oil flow against oil height is then plotted, and the opening pressure of the anti-drain valve is taken from that curve at a flow of 0.05 L/min.

7.4 Outlet anti-drain valve - test A. The rig of Figure 2 is used, with its items called out in bold figures in brackets through 7.4.2 to 7.4.11. If the filter is also fitted with an inlet anti-drain valve, that valve is locked open by a suitable means before the test so that oil can be admitted from the inlet side of the filter.