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JB/T 12651.2-2016

Internal combustion engines—Filter paper for filters —Part 2: Test method

内燃机 滤清器用滤纸 第2部分：检测方法

(English Translation)

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Foreword

The JB/T 12651 *Internal combustion engines—Filter paper for filters* consists of the following two parts under the general title:

— *Part 1: Specification*

— *Part 2: Test method*

This part is the second part of JB/T 12651.

This part is drafted in accordance with the rules given in the GB/T 1.1-2009 *Directives for standardization—Part 1: Structure and drafting of standards.*

This part was proposed by China Machinery Industry Federation.

This part was prepared by SAC/TC 177 National Technical Committee 177 on IC Engines Standardization Administration of China.

This part was issued as first edition.

Internal combustion engines—Filter paper for filters— Part 2: Test method

1 Scope

This part of JB/T 12651 specifies the terms and definitions, testing items, sampling, preparation and treatment of samples, testing method and testing report of filter papers used in internal combustion engines.

This part is applicable to filter paper used in air filter, oil filter and fuel filter for internal combustion engines, which are abbreviated as air filter paper, oil filter paper and fuel filter paper respectively, and are collectively referred to as filter paper. This part doesn't apply to crinkling paper, pure glass fibre filter paper and pure non-woven. Filter paper for other filters can refer to this part.

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.

GB/T 450-2008, *Paper and board —Sampling for testing and identification of machine and cross direction, wire side and felt side*

GB/T 451.2-2002, *Paper and board--Determination of grammage*

GB/T 454-2002, *Paper--Determination of bursting strength*

GB/T 462-2008, *Paper, board and pulp - Determination of moisture content of analytical sample*

GB/T 2423.3, *Environmental testing —Part 2: Testing method —Test Cab: Damp heat, steady state*

GB/T 4687-2007, *Paper, board, pulps and related terms – Vocabulary*

GB/T 5453-1997, *Textiles--Determination of the permeability of fabrics to air*

GB/T 8243.12, *Methods of test for full-flow lubricating oil filters for internal combustion engines - Part 12: Filtration efficiency using particle counting, and contaminant retention capacity*

GB/T 10739-2002, *Paper, board and pulps--Standard atmosphere for conditioning and testing*

GB/T 11121, *Gasoline engine oils*

GB/T 11122, *Diesel engine oils*

GB/T 22364-2008, *Paper and board - Determination of resistance to bending*

GB/T 24218.2-2009, *Textiles - Test methods for nonwovens - Part 2: Determination of thickness*

JB/T 12210, *Internal combustion engines-Air cleaners-Fractional efficiency testing (using particle counting)*

ISO 12103-1, Road vehicles — Test contaminants for filter evaluation — Part 1: Arizona test dust

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 4687-2007, GB/T 8243.12 and JB/T 12210 and the following apply.

3.1
cured filter paper
filter paper strengthened by thermosetting resin

3.2
non-cured filter paper
filter paper strengthened by thermoplastic resin

3.3
resistance to humidity
stiffness retention rate of air filter papers after treatment under high humidity condition within the specified time

3.4
resistance to oil
burst retention of oil filter papers after treatment in oil bath at high temperature within the specified time

Note 1 to entry: It is expressed in Kilopascal (kPa).

3.5
fractional efficiency before dust loading of air filter paper
filtration efficiency of air filter papers measured before the filtration efficiency is altered by captured particles

3.6
overall efficiency of lubricating oil filter paper
calculated by the mean number of particles before and after filtration

3.7
X% micrometer (μm(c)) rating of lubricating oil filter paper
corresponding particle size when the overall filtration efficiency of oil filter papers is X%

Note 1 to entry: It is expressed in micron(μm(c)).

3.8
initial filtration efficiency of fuel filter paper
filtration efficiency is calculated according to the average particle count of upstream and downstream in the first 6 minutes and the last 3 minutes of fuel filter paper test.

4 Test items

The test items include:

a) Moisture content;
b) Volatiles;
c) Grammage;
d) Thickness
e) Flute depth;
f) Bursting strength;
g) Machine direction stiffness;
h) Air permeance
i) Pore size;
j) resistance to humidity;
k) Flame retardancy;
l) Resistance to oil;
m) Filtration efficiency and contaminant capacity

5 Sampling, preparation and treatment of samples

5.1 The sampling is determined by GB/T 450-2008.

5.2 Samples are treated according to GB/T 10739-2002. The test is carried out under specific conditions.

5.3 Samples of cured filter paper shall be cured before sampling. The curing temperature and time are determined by recommendations of the manufacturer. Samples of cured filter paper are treated according to GB/T 10739-2002. The testing is carried out under specific conditions.

6 Test methods

6.1 Moisture content

The moisture content is determined by GB/T 462-2008.

6.2 Volatiles

The volatiles of cured filter paper are measured in an oven according to GB/T 462-2008. The temperature deviation is ±2 °C of the setting temperature preset by the manufacturer. The oven is able to keep the setting temperature.

6.3 Grammage

The grammage measured according to GB/T 451.2-2002.

6.4 Thickness

6.4.1 The thickness of flat filter papers is measured by method A in GB/T 24218.2-2009.

6.4.2 The thickness of fluted filter papers is tested in accordance with Annex A.

6.5 Flute depth

The depth of fluted filter paper is measured in accordance with Annex A.

6.6 Bursting strength

The burst of filter papers is measured according to GB/T 454-2002. The measurement direction is consistent with the liquid flow direction through filter papers.

6.7 Machine direction stiffness

The machine direction stiffness of filter papers is measured by method A specified in GB/T 22364-2008.

6.8 Air permeance

The air permeability of filter papers is measured according to GB/T 5453-1997.

6.9 Pore size

The pore size of filter papers is measured according to Annex B.

6.10 Resistance to humidity

The resistance to humidity of filter papers is measured according to Annex C.

6.11 Flame retardancy

The flame retardancy of filter papers is measured according to Annex D.

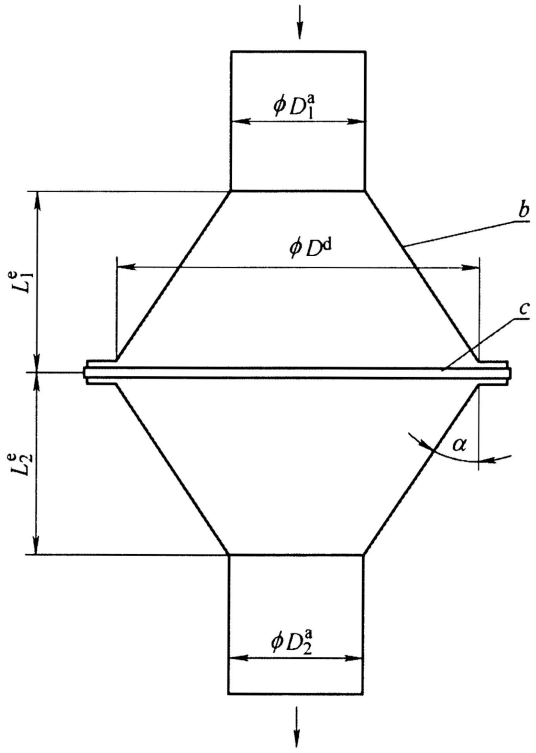
6.12 Resistance to oil

The oil resistance of filter papers is measured according to Annex E.

6.13 Filtration efficiency and contaminant capacity

6.13.1 Test housing

The test housing used to inspect filtration efficiency and contaminant capacity of filter papers are shown in Figure 1.



Key

D_1, D_2	the diameters of the inlet tube and outlet tube	D	the effective diameter of filter papers in the test
L_1, L_2	the heights of the test housing	α	the cone angle should be no greater than 30°

[a] $D_1=D_2$, which are simultaneously determined by the flow rate in the test

[b] smooth connecting

[c] the filter paper should be sealed and installed

[d] the diameter of D should not be altered through the whole testing

[e] L_1 and L_2 are calculated from area H and cone angle α

Figure 1 —Housing for measuring filtration efficiency and contaminant capacity

6.13.2 Test of air filter paper

Besides the following requirements, the test of air filter paper is carried out according to JB/T 12210:

a) The surface velocity of sample is (10±0.1) cm/s during the test;
b) The particle counter is capable of counting the particles with particle size greater than 1 μm~3 μm; it is recommended to count particles with following six particle size levels: >0.3 μm~0.5 μm, >0.5μm~1μm, >1μm~3μm, >3 μm~5 μm, >5μm~10μm and>10 μm;
c) A2 testing dust in ISO 12103-1 is used in the test of contaminant capacity;
d) The terminal condition of the test of contaminant capacity is pressure increased of 2.5 kPa based on initial pressure.
e) The test is carried out in five different spots of the same air filter paper. The mean value is used in the test report.

6.13.3 Test of oil filter paper

Besides the following requirements, the test of oil filter papers is carried out according to GB/T 8243.12:

a) The surface velocity of sample is controlled at (5.00± 0.25) mm/s during the test;
b) The base concentration of upstream is 10 ml/L;
c) The terminal condition for the test of contaminant capacity is pressure increased of 200 kPa based on the initial pressure;
d) The testing is carried out in five different spots of the same air filter paper. The mean value is used in the test report.

6.13.4 Test of fuel filter paper

Besides the following requirements, the test of fuel filter papers is carried out according to GB/T 8243.12:

a) The surface velocity of sample is controlled at (0.80± 0.04) mm/s during the test;
b) The particle counter with16 channels is used to count the particles with the following particle sizes (μm(c)): 4, 6, 7, 8, 9, 10, 11, 14, 15, 17, 20, 25, 30, 40, 50;
c) Upstream reference weight concentration is 25 ml/L;
d) The initial filtration efficiency is calculated from the mean number of particles before and after filtration between 4^{th} -6^{th} minutes from the beginning of filtration;
e) The terminal condition for the testing of dust holding capacity is pressure increase of 100 kPa based on the initial pressure;
f) The testing is carried out in five different spots of the same air filter paper. The mean value is used in the testing report.

7 Test report

The test report shall include the following information:

a) Reference to this part of standard;
b) Date and place of testing;
c) Temperature and humidity of the testing environment;
d) Testing items;
e) All information necessary for identification of the sample;
f) The devices and the types of the devices for the testing;
g) Testing results;
h) Any departure from the procedure specified in this part.

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