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Passenger car air filter technical specification

乘用车空气滤清器技术条件

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Table of Contents

Appendix:

Number, name, and date of implementation of 32 automotive industry standards

No.	Standard number	Standard name	Number of standard replaced	Date of implementation
1	QC/T 231-2014	Specification of kick-starter for motorcycles and mopeds	QC/T 231-1997	October 01, 2014
2	QC/T 233-2014	Performance and measurement method for static intensity of motorcycles and mopeds	QC/T 233-1997	October 01, 2014
3	QC/T 66-2014	Wet clutch for moped and motorcycles	QC/T 66-1993	October 01, 2014
4	QC/T 962-2014	Technical specifications for coating of motorcycles and moped		October 01, 2014
5	QC/T 680-2014	General technical specifications for voltage regulators for motorcycles and moped	QC/T 680-2002	October 01, 2014
6	QC/T 963-2014	Drum brakes of motorcycles and mopeds wheels		October 01, 2014
7	QC/T 234-2014	General technical specifications for steering shaft for motorcycles and moped	QC/T 234-1997	October 01, 2014
8	QC/T 964-2014	The strength of plastic seats and their anchorages for city buses		October 01, 2014
9	QC/T 644-2014	Technical specifications for automotive metallic fuel tank	QC/T 644-2000 QC/T 488-2000	October 01, 2014
10	QC/T 965-2014	Driver of electric rear-view mirrors for motor vehicles		October 01, 2014
11	QC/T 966-2014	Technical specifications for automotive plastic parts coatings		October 01, 2014
12	QC/T 459-2014	Truck with loading crane	QC/T 459-2004	October 01, 2014
13	QC/T 29106-2014	Technical specification of automobile wire harness	QC/T 29106-2004	October 01, 2014
14	QC/T 198-2014	General technical specification for automotive switch	QC/T 198-1995	October 01, 2014
15	QC/T 220-2014	Technical specifications for automotive fusible links	QC/T 220-1996	October 01, 2014
16	QC/T 967-2014	Port fuel injector for gasoline engine		October 01, 2014
17	QC/T 968-2014	Determination methods of platinum, palladium and rhodium contents in metallic catalytic converters		October 01, 2014
18	QC/T 969-2014	Interior truck release for compartment of a passenger car		October 01, 2014
19	QC/T 636-2014	Electric window regulator specification for vehicles	QC/T 636-2000	October 01, 2014

20	QC/T 970 2014	Passenger car air filter technical specification		October 01, 2014
21	QC/T 971-2014	Specification of air filter element for motorcycles and scooters		October 01, 2014
22	QC/T 972-2014	Technical requirements and test method for motor vehicle-electronically controlled hydraulic power steering gear		October 01, 2014
23	QC/T 299.1-2014	Automotive hydraulic steering power pump – Part 1: Technical requirements	QC/T 299-2000	October 01, 2014
24	QC/T 299.2-2014	Automotive hydraulic steering power pump – Part 2: Test methods	QC/T 299-2000	October 01, 2014
25	QC/T 563-2014	Performance and test methods for automobile steering wheel	QC/T 563-1999	October 01, 2014
26	QC/T 29097-2014	The technical specifications of automobile steering gear	QC/T 29097-1992	October 01, 2014
27	QC/T 29096-2014	The bench test methods of automobile steering gear	QC/T 29096-1992	October 01, 2014
28	QC/T 303-2014	Technical requirements and test methods for motor vehicles oil reservoir	QC/T 303-1999	October 01, 2014
29	QC/T 301-2014	Technical requirements and test methods for motor vehicles power cylinder	QC/T 301-1999 QC/T 302-1999	October 01, 2014
30	QC/T 70-2014	Measurement method of acoustic noise for engines of motorcycles and mopeds	QC/T 70-1993	October 01, 2014
31	QC/T 226-2014	Specification of brake shoes assembly and brake lining assembly for motorcycles and moped	QC/T 226-1997	October 01, 2014
32	QC/T 593-2014	Performance requirements and bench test methods of automobile hydraulic proportional valve	QC/T 593-1999	October 01, 2014

Introduction

There is no corresponding international standard, foreign standard, national and industry standard with regard to passenger car air filter technical specification. Both domestic and foreign automobile companies and air filter manufacturers have developed technical specifications for their respective enterprises and models. Therefore, there are differences in main properties, technical parameters and test methods. In order to improve the industry standard system of automobile filters, to drive the technological progress of air filters for passenger cars, and to promote trade and communication, it is necessary to formulate this Standard.

The primary function of the air filters for passenger cars is to clean and filter the air entering the engine for combustion. In view of the distinguishing features such as combustion modes of the gasoline engines, diesel engines and gas engines equipped for passenger cars, calorific value and density of fuel, vehicle maintenance cycle, reliability mileage, etc., while maintaining the contents of conventional filter function index, the disparity index was determined for the two properties of full-life filter efficiency and ash storage capacity, respectively.

One of the main functions of the air filters for passenger cars is to eliminate engine intake noise, which has played an important role in reducing the vehicle pass-by noise and noise inside automobile. In the past, the acoustic attenuation performance of the air filters for passenger cars was normally evaluated on the engine bench or full vehicle under prescribed conditions. Test operation is difficult, and the test results affected by the noise sources are lack of comparability. Therefore, the requirements for such technology are almost vacant in relevant domestic standards and product drawings. In this case, it is particularly looking forward to developing adaptive technical requirements and test methods for intake silencing performance, based on the noise elimination characteristics of the passenger car air filter structure. This Standard describes the performance requirements and test methods for sound-transmission loss and surface radiation noise of the air filters for passenger cars, by using white noise as the noise source and adopting the latest measurement principle of two-load method, in order to fill the vacancy and build the technical framework.

With regard to air filters for passenger cars, the vibration fatigue test is mainly used to avoid failure and damage caused by fatigue; the fixed-frequency sinusoidal vibration test is simple to control and easy for test operation, but it cannot reflect the real state of mechanical vibration environment of the air filter. Consequently, according to the application of air filters in the passenger cars, it is recommended that two test methods of sinusoidal vibration and sinusoidal-random composite vibration, with different requirements for vibration severity,

Passenger car air filter technical specification

1 Scope

This Standard specifies the technical requirements, test methods and inspection rules of the air filters for passenger cars (hereinafter referred to as air filters) and the filter elements. Since filter element is the core element of the air filter, all the technical requirements thereof are applicable to the air filter.

This Standard **is applicable to** the air filters for passenger cars and filter elements with a volume flow of below 900m^3/h. Other air filters and filter elements may use this Standard for reference.

2 Normative references

The following documents are essential to the application of this document. For dated references, only the editions with the dates indicated are applicable to this document. For undated references, only the latest editions (including all the amendments) are applicable to this document.

GB/T 2298-1991 *Mechanical vibration and shock - Terminology*

GB/T 2423.56-2006 / IEC 60068-2-64:1993 *Environmental testing for electric and electronic products - Part 56: Test methods - Test Fh: Vibration, broad-band random (digital control) and guidance*

GB/T 2423.58-2008 / IEC 60068-2-80:2005 *Environmental testing for electric and electronic products - Part 58: Test methods - Test Fi: Vibration - Mixed mode*

GB 3240 *Preferred frequencies for the acoustical measurement*

GB/T 3241-1998 *Octave-band and fractional-octave-band filters*

GB/T 3730.1-2001 *Motor vehicles and trailers - Types - Terms and definitions*

GB/T 3785.1-2010 *Electroacoustics - Sound level meters - Part 1: Specifications*

GB/T 3947-1996 *Acoustical terminology*

GB/T 4760-1995 *Acoustics - Measurement procedure for silencers*

The sealing parts of the air filter shall be sealed in a reliable manner. Overhaul shall be performed immediately upon the completion of the filter efficiency test or ash storage capacity test. The sealing parts of the air filter shall have no trace of ash leakage.

4.2.9 Condition pressurize performance.

Under the effect of 5kPa vacuum, ambient air leakage on the clean air side of the air filter shall not be greater than 100L/h.

4.2.10 Isolation noise performance of the air filter.

Within the center frequency range of (50 ~ 10000) Hz at 1/3 octave, the radiation noise attenuation value on the upper surface of the air filter shall not be less than 35dB.

4.2.11 Sound-transmission loss of the air filter.

Within the center frequency range of (50 ~ 10000) Hz at 1/3 octave, the sound-transmission loss at the center frequency of the air filter shall not be less than 20dB.

4.2.12 Immersion-resistant performance of the air filter / filter element (paper element).

After the air filter / filter element is conducted with water immersion test in purified water at room temperature for 4h according to the prescribed procedures, the pleated paper filter element shall not be damaged.

4.2.13 Shower-resistant performance of the air filter / filter element.

After the air filter / filter element is conducted with shower test at a shower load per unit effective filtration area of 50g/m^2, the filter efficiency shall be in accordance with the requirements of 4.2.3 / 4.2.4; the ash storage capacity shall not be less than 90% specified in 4.2.5.

4.2.14 High-and-low temperature resistant performance.

After high-and-low temperature resistance test, the air filter shall have no structural defects such as brittle fracture, deformation, etc. The condition pressurize performance thereof shall be in accordance with the requirements of 4.2.9.

Note: High-and-low temperature resistant performance is only applicable to the air filters with resin housings.

— The temperature measurement accuracy shall be in accordance with the requirements of 4.1.4 in QC/T 32-2006;

— The measurement accuracy of relative humidity shall be in accordance with the requirements of 4.1.5 in QC/T 32-2006;

— The mass measurement accuracy shall be in accordance with the requirements of 4.1.6 in QC/T 32-2006;

— The measurement accuracy of absolute filter shall be in accordance with the requirements of 4.1.7 in QC/T 32-2006;

— The standard state shall be in accordance with the requirements of 4.2 in QC/T 32-2006;

— The measurement accuracy of sound level meter shall be Grade I as specified in GB/T 3785.1-2010;

— The band filter shall be Grade 1 as specified in GB/T 3241-1998;

— The sound level calibrator shall be Grade 1 as specified in GB/T 15173.

5.2 Test materials and test conditions

In accordance with the requirements of Chapter 5 in QC/T 32-2006.

5.3 Test devices

5.3.1 Air filter test bench.

The air filter test bench shall be in accordance with the requirements of 6.1 in QC/T 32-2006.

5.3.2 Test device for ambient air leakage of air filter.

Test device for ambient air leakage of air filter (SEE Figure A.1).

5.3.3 Shower test device for air filter.

Shower test device for air filter / filter element (SEE Figure A.2).

5.3.4 Acoustic performance test device for air filter.

The acoustic performance test device for air filter is mainly composed of noise source, power amplifier, loudspeaker, microphone, vibration noise analyzer, end muffler and main pipe. The main pipe shall be in accordance with the requirements of 4.2 in GB/T 4760-1995 (SEE Figure A.3).

The test method for sealing performance of the air filter shall be in accordance with the requirements of 7.7 in QC/T 32-2006.

5.4.9 Condition pressurize performance.

5.4.9.1 As shown in Figure A.1, the new air filter to be tested shall be securely connected to the test device. The air inlet of the air filter and all possible intake parts on the non-clean air side shall be strictly sealed.

5.4.9.2 START the vacuum pump. VACUUM at the air outlet. ADJUST and MAINTAIN a steady vacuum value of 5kPa on the clean air side of the air filter.

5.4.9.3 MEASURE the air leakage on the clean air side, such as the sealed edges of the filter element and the upper and lower end covers, etc. RECORD the measurements.

5.4.10 Isolation noise performance.

5.4.10.1 Test conditions.

— White noise is used as the noise source; the center frequency range of (50 ~ 10000) Hz at 1/3 octave shall be in accordance with the requirements of Chapter 3 in GB 3240;

— The sound pressure level of the noise source shall be in accordance with the requirements of 4.3 in GB/T 4760-1995;

— Static measurement: The measuring device shall be in accordance with the requirements of 5.4 in GB/T 4760-1995;

— Measuring point layout: The main pipe at the inlet of the air filter shall be provided with 1 measuring point. 1 measuring point shall be set up 50mm above the designated position on the surface of the air filter.

5.4.10.2 Test method.

In accordance with the requirements of GB/T 6881.1-2002.

5.4.11 Sound-transmission loss.

5.4.11.1 Test conditions.

— White noise is used as the noise source; the center frequency range of (50 ~ 10000) Hz at 1/3 octave shall be in accordance with the requirements of Chapter 3 in GB 3240;

— The sound pressure level of the noise source shall be in accordance with

the requirements of 4.3 in GB/T 4760-1995;

— Static measurement: The measuring device shall be in accordance with the requirements of 5.4 in GB/T 4760-1995;

— Measuring point layout: The main pipe at the inlet and outlet of the air filter shall be provided with 1 measuring point, respectively.

5.4.11.2 Test method.

In accordance with the requirements of GB/T 6881.1-2002.

5.4.12 Immersion-resistant performance of the air filter / filter element.

5.4.12.1 A new air filter / filter element shall be conducted with original intake resistance test according to the requirements of 5.4.1 / 5.4.2 in this Standard. RECORD the measurements.

5.4.12.2 REMOVE the new filter element. PLACE it in purified water at room temperature for 4h. TAKE it out and DRAIN for 15min before the resumption of assembly. PERFORM continuous air drying at a rated air volume flow, until the pressure drop returns to its original value or is stable.

5.4.12.3 RECORD the filter element status and intake resistance measurements.

5.4.13 Shower-resistant performance of the air filter / filter element.

5.4.13.1 As shown in Figure A.2, the new air filter / filter element to be tested shall be securely connected to the test device.

5.4.13.2 The test piece shall be conducted with the original intake resistance test according to the requirements of 5.4.1 / 5.4.2 in this Standard. RECORD the measurements.

5.4.13.3 At a rated air volume flow, START the shower system. DETERMINE the shower amount according to the effective filtration area of the filter element. The shower load is 50g/m^2. At a shower concentration with an intake volume of 5g/m^3, USE dry compressed air with a pressure of 100kPa to keep showering. STOP the test after reaching the specified value.

5.4.13.4 After showering, the test piece shall be conducted with continuous air drying at a rated air volume flow, until the pressure-drop returns to its original value or is stable.

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