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National Standard
of the People's Republic of China

GB/T 12385-2008

Replacing GB/T 12385-1990

Standard test method for sealability of gaskets for pipe flanges

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Standardization Administration of China.

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Foreword

This Standard is revision to GB/T 12385-1990 *Standard Test Method for Sealability of Gaskets for Pipe Flanges.* Compared with GB/T 12385-1990, the main changes are as follows:

— The applicable scope of the Standard is modified. Add the non-asbestos rubber gaskets, rubber gaskets, Teflon gaskets. Expand or modify Teflon gaskets, flexible graphite composite gaskets, and gaskets of serrated metal, corrugated metal and waveform serrated metal with non-metallic coating;

— Rules and regulations are supplemented for the added gasket types, including sample pretreatment method, gasket preload stress, test temperature, test medium pressure and so forth;

— Referring to ASTM F112 and F37, pressure drop method is adopted for the measurement of leakage rate in test method B. And test apparatus, test procedures and the calculation of leakage rate are changed accordingly;

— General provisions for the key measuring instruments are added;

— Provisions for the number of tests and the test report content are added.

This standard replaces GB/T 12385-1990, from the date of implementation.

This Standard was proposed by China Machinery Industry Federation (CMIF).

This standard shall be centralized by National Pipe Accessories Standardization Technical Committee.

Drafting organizations of this Standard: Nanjing Tech University, China Productivity Center for Machinery (CPCFM), Zhejiang Cathay Packing & Sealing Co., Ltd., Ningbo Tiansheng Sealing Packing Co., Ltd., Ningbo IDT Sinyuan Sealing Technology Co., Ltd., National Non-metallic Mineral Products Quality Supervision and Inspection Center, and East China University of Science and Technology.

The main drafters of this Standard: Gu Boqin, Li Junying, Wu Yimin, Cai Renliang, Chen Ye, Li Xinggen, Yuan Yilin, Lei Jianbin, and Feng Mei.

Previous version of the standard replaced by this Standard are as follows:

— GB/T 12385-1990.

4 Gasket;
5 Cylinder;
6 Pressure source;
7 Test medium;
11 Pressure sensor;
12 Temperature sensor;
13 Micro-pressure sensor;
14 Data collection system.

Figure 1 Test apparatus of gasket sealability - Test method A

2.1.2 Gasket loading system shall be able to provide the required gasket preload stress. And it can control the constant loading and unloading speed. Fluctuations of the gasket preload stress during the test shall be within ± 2% of the specified value. When the gasket preload stress is not greater than 35 MPa, the speed of loading and unloading is 0.2 MPa/s. When the gasket preload stress is greater than 35 MPa, the speed of loading and unloading is 0.5 MPa/s.

2.1.3 Test medium supply system shall be able to provide the required test medium pressure. Fluctuations of the medium pressure during the test shall be within ± 2% of the specified value range.

2.1.4 Pressurization method of leak detection chamber shall be adopted for the measuring of the leakage rate. It is calculated based on the ideal gas law. A sealed circular leak detection chamber shall be set BETWEEN the external gasket AND in-between the upper and lower flanges. The capacity V_c of the leak detection chamber shall be strictly calibrated. The resolution ratio of the leak detection system shall not be lower than 10^{-5} cm ^{3}/s.

2.1.5 The test flange uses simulation flange, and the sealing surface is a plane. The ratio of flange thickness to diameter shall not be less than 1/3, the elasticity modulus of the flange material shall be 195 GPa-210 GPa, the rigidity of the sealing surface shall be 40HRC- 50HRC, and the surface roughness *R*a shall be within the range of 3.2 *μ*m to 6.3 *μ*m.

2.1.6 The measuring range of the pressure sensor for measuring test medium pressure shall not be greater than 10 MPa, the error shall not be greater than 0.5% of the full range, and the resolution shall not be less than 1 kPa.

2.1.7 The measuring range of the temperature sensor for the leak detection chamber shall not exceed 32°C, the error shall not be greater than 0.5% of the full range, and the resolution shall not be less than 0.01°C.

2.1.8 The measuring range of the pressure sensor for measuring the micro-pressure of the leak detection chamber shall not be greater than 5 MPa, the error shall not be greater than 0.5% of the full range, and the resolution shall not be less than 0.5 kPa.

2.2 Sample

2.2.1 The sample selected shall be placed at an environment with a temperature

T_2 — The absolute temperature of the leak detection chamber when leak detection ends, the unit is in K;

V_c — The volume of leak detection chamber, the unit is in cm^3;

t — The time of leak detection, the unit is s;

2.6.2 Take the average value of all tests as the final test result, and take 2 effective digits.

3 Test method B

3.1 Test apparatus

3.1.1 The test shall be carried out on dedicated test apparatus for the comprehensive performance of gasket. The test apparatus consists of gasket loading system, medium supply systems, leak detection system and test flanges, etc., as shown in Figure 2.

3.1.2 The gasket preload stress shall be applied according to provisions of 2.1.2.

3.1.3 The test medium shall be applied according to provisions of 2.1.3.

3.1.4 Pressure-drop method shall be adopted for the measuring of the leakage rate, which is calculated based on the ideal gas law. The volume V_c of the leak detection chamber shall be strictly calibrated. The resolution of the leak detection system shall not be lower than 10^{-3} cm^3/s.

3.1.5 The test flange shall comply with the provisions of 2.1.5.

3.1.6 The pressure sensor for measuring the test medium pressure shall comply with the provision of 2.1.6.

3.1.7 The temperature sensor for measuring the temperature of sealed chamber shall comply with the provisions of 2.1.7.

3.4.2 Apply preload stress to the gasket according to provisions of 2.4.2.

3.4.3 Calibrate the volume of the leak detection chamber.

3.4.3.1 Unlock valve 8 and valve 10 to unload the system.

3.4.3.2 Lock valve 8 and unlock valve 11 to let the test medium with a pressure P_s into the leak detection chamber.

3.4.3.3 Lock valve 11 and unlock valve 8. Measure the balance pressure P_c after the connection of the sealed chamber and the standard vessel.

3.4.3.4 The volume of the sealed chamber shall be calculated according to Formula (3):

$$V_s = V_B\left(\frac{p_e - p_B}{p_s - p_c}\right) \qquad \cdots\cdots(3)$$

Where:

V_s — The volume of the sealed chamber, the unit is in cm^3;

V_B — The volume of the standard vessel, the unit is in cm^3;

P_B — The initial absolute pressure of the standard vessel, the unit is in Pa;

P_s — The absolute pressure of the test medium into the sealed chamber, the unit is in Pa;

P_e — The absolute pressure after the connection of the standard vessel and the sealed chamber, the unit is in Pa.

3.4.3.5 The above calibration shall be repeated for 3 times, and the arithmetic average of the 3 measured value V_c shall be regarded as the volume of the leak detection chamber. The deviation of the measured value V_c of each time shall not be greater than 3% to the average value.

3.4.4 Unlock valve 10 and lock valve 8.

3.4.5 Unlock valve 11. The test medium is accessed into it according to the provisions of Table 1. Maintain for 10 minutes after the medium pressure reaches the specified value. and then lock valve 11.

3.4.6 Start to test the leakage. At the beginning, record the initial pressure P_3 and temperature T_3 of the leak detection chamber. And start the timing. At the end of test, record the pressure P_4 and temperature T_4. The measuring time is determined upon the leakage rate. It is usually 2 minutes - 10 minutes.

3.5 Number of tests

Select several samples from the same sample, and randomly select at least 3 samples for testing.

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