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Information about EM fittings in a vacuum

1. Measuring in a vacuum - general information

Pressure is the sum of all impacts between molecules and the wall surrounding them. Collisions are largely eliminated in a vacuum (<1 mbar) due to the limited number of particles and measuring pressure in the conventional sense becomes impossible. Particles in the gas are ionised. The different ions are separated and determined by quantifying partial pressures. At a partial pressure of 10^{-13} ... 10^{-14} approximately 100 ions/sec are measured.

Measuring the pressure with high absolute accuracy is not meaningful in vacuum technology because the measurement depends on many factors. To be able to distinguish between "virtual holes" and real ones, the process of measuring must be known.

The helium leak test method was developed to simplify this process. The test object is evacuated and filled with helium. Since helium has a very small molecular size, it can penetrate even through very small leaks, which means it can be detected very quickly.

2. Tightness in a vacuum

2.1 General information

The leak rate for test objects used with the helium leak test device is indicated in mbar x L/s.

At the basic setting without helium charging, a leak rate for helium of 10^{-9} ... 10^{-8} mbar x L/s He was detected.

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2.2 Measurement results and explanations of various components

in the test:	Leak-proof until:
Ball valve 6L750 DN 4 G ¼" PVDF	10^{-8} mbar L/s He 1)
Ball valve 6A732 DN 4 G ¼" PVDF	10^{-7} mbar L/s He 1)
Valve 5A111 DN 4 G ¼" PVDF	10^{-9} mbar L/s He 2)
Valve 5A113 DN 4 G ¼"	10^{-8} mbar L/s He 2)
Flow meter Ø10 and Ø17 PVDF	10^{-8} mbar L/s He 3)
Connector 1+100/1A100/1C100 DN 4/6 G ¼" PVDF	10^{-8} mbar L/s He 4)
Connector 2N100 D 6 G ¼" PVDF	10^{-7} mbar L/s He 5)
Connector series 2 with flexible tube 150 mm D 6 G ¼" PVDF	10^{-7} mbar L/s He 6)

Explanations:

1) Gas cushioning was enclosed in some areas of the ball valve. It was not completely evacuated until after being activated several times. After that, movements of the valve were leak-proof. All access routes were first closed in the test. In the second test, the valve was switched to allow access to the open end.

2) When the spindle was activated (turning and bending), a strong radical load occurred with a slightly increased leak rate of 10^{-6} to 10^{-7} mbar L/s.

3) Both versions were leak-proof for the point under consideration (seal on the glass and spindle). Some leakage occurred when the spindle was activated. However, tightness to 10^{-5} ... 10^{-7} mbar L/s He was ensured.

4) The connector was leak-proof to 10^{-7} mbar L/s even without a clamping ring and nut, with the closing cap lightly applied.

5) The connector was closed with a dowel pin and tightened finger-tight. The PTFE ring was significantly deformed during the test. It was possible to loosen and retighten the connector without any adverse effect on the results.

6) The overall system exhibited slight leakage of 10^{-6} mbar L/s with bending load on the flexible tube. The series 1 unit was more stable.