



Method for Testing the Life of Vacuum Valves

Purpose

To test the life of the metal corrugated bellow in a high vacuum poppet valve under a vacuum environment.

Test Equipment and Conditions

Required equipment:

Helium mass spectrometer leak detector: 1 unit;

Mechanical vacuum pump: 1 unit;

Manual vacuum valve: 1 unit;

Pirani vacuum gauge: 1 unit;

KF vacuum tee, KF adapter, etc.

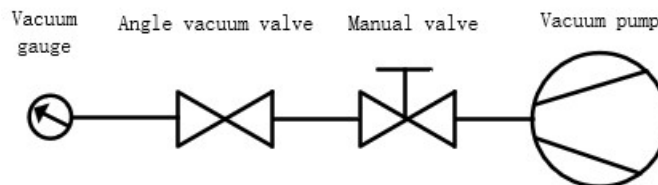
operating conditions:

Clean compressed air: 6 Bar

High vacuum poppet valve voltage: 24V

Operation

1. Use a helium mass spectrometer leak detector to check the entire vacuum pipeline for leaks, ensuring no leaks in the vacuum pipeline (if no leak detector is available, the subsequent pressure holding method can be used instead, but the vacuum seal must be strictly inspected during pipeline installation).



2. Supply gas and power to the high vacuum poppet valve to be tested, and perform an opening and closing action every 0.86 seconds (i.e., supply 24V voltage to the solenoid valve for 0.86 seconds, then disconnect for 0.86 seconds), at this frequency, the number of actions per 24 hours is 100,000 times.

3. After the high vacuum poppet valve starts operating, open the manual valve and mechanical pump, vacuum the entire pipeline for more than 4 hours for the first time, then close the manual valve for pressure holding, and then turn off the mechanical pump.

4. In a low vacuum environment, due to internal gas release, the vacuum gauge pressure will slowly rise and eventually stabilize at several tens to a few hundred pascals (depending on the cleanliness of the pipeline and the pumping time), when any tiny cracks occur in the bellows of the high vacuum poppet valve due to fatigue, the cracks will rapidly expand in a very short time, causing the pressure to surge to thousands of pascals or even atmospheric pressure.

5. By observing whether there is a sudden change in the vacuum gauge pressure, calculate the valve's operating days N:

$$\text{Life} = 100,000 \text{ cycles} * N$$

Remark: The recommended test frequency for KF25, KF16, KF10 is 200,000 times per day, for KF40 it is 100,000 times per day, and for KF50 it is 50,000 times per day.