PURGE PULSE DIAPHRAGM VALVE

The latest innovation in GC diaphragm valve technology

UNIQUE FEATURES

- **STATIC PURGE DESIGN**
  - Minimise purge gas consumption, reduce operation cost especially when helium is used.
  - No extra plumbing hardware required to supply the purge gas. Reduce overall integration cost.
  - Always keep inert atmosphere inside the valve.
- **NEW PLUNGER DESIGN**
  - Free compressible plunger
  - Push over the entire surface area
  - Grooved plunger to allow easy purge flow around them.
- **LONG TERM STORAGE PRESSURE RELEIF**
  - Avoid diaphragm deformation when the valve is at rest.
- **SS300 SERIES TREATED VALVE HEAD**
  - Eliminate surface adhesion problem of diaphragm.

KEY CHARACTERISTICS

- **OPERATING TEMPERATURE: up to 180 ˚C**
- **OPERATING PRESSURE: up to 300 PSIG**
- **ACTUATION PRESSURE: 65 PSIG**
- **PORT SIZE: 0.030''**
- **CONNECTION SIZE: 1/16''**
- **STATIC PURGE DESIGN**
- **DIRECT REPLACEMENT FOR EXISTING**

PULSE PURGE TECHNOLOGY

The Pulsing Purge Diaphragm Valve (PPDV)[patent pending] is the latest innovation in the diaphragm valve technology market. It has been designed for applications that require the characteristics of a diaphragm valve or to improve performance without design changes of existing applications where diaphragm valves are used. Over a decade ago, the first purged diaphragm valve was introduced on the market and offered many advantages. The disadvantage of such technology was that a separate purged flow path was necessary which increased integration cost, carrier flow consumption and complexity of manufacturing. This is a story of the past with this new technology. It uses the static purge principle to purge the valve inner volume using the actuation gas.

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STATIC PURGE DESIGN

In order to reduce substantially the purge gas flow consumption, the system is based on a static purge system, i.e by successive dilution, instead of a dynamic, i.e. continuous flow, purge concept. This typically results in only 5% of the purge flow consumption compare to a standard purge valve. Here how it works.

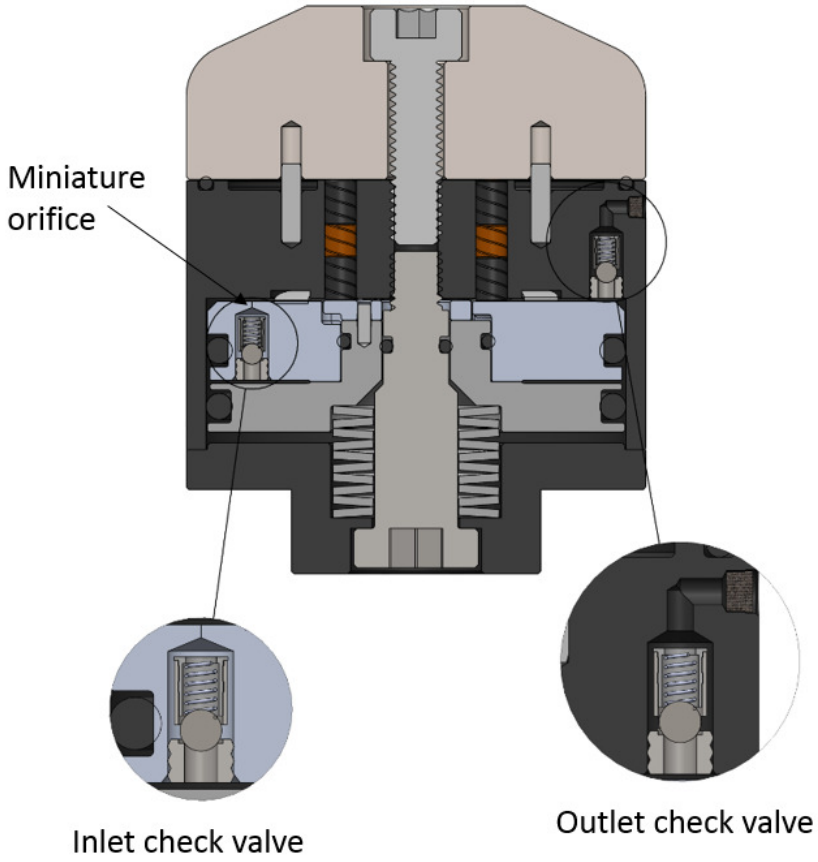
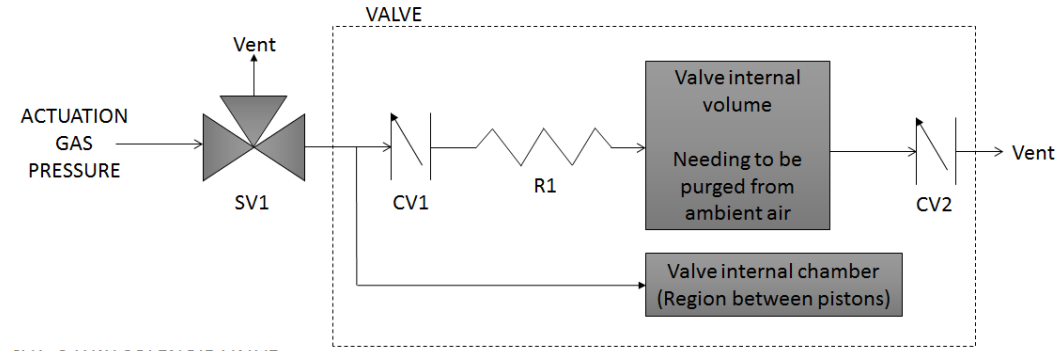


Figure 1

Reference to the functional block diagram, shown in figure 2, when SV1 is turned ON, it allows the actuation gas, typically the carrier gas, to flow and pressurise the volume between the two internal pistons, moving them apart so actuating the valve. At the same time, the gas flows through CV1 and flows into R1. The purge flow through R1 builds-up a pressure into the volume to be purged and eventually depressurises it when CV2 opens. This results in a pulse or oscillating purge pressure into the internal volume. This repetitive cycle is going on until the SV1 is turn off and the internal volume is still slightly pressurised with inert gas, keeping air outside. The first time the valve is used, it takes a few cycles before completely eliminating the air inside the internal volume. See the curve at figure 3. The purge gas flows around the plunger through their grooves and sweep away the volume under the diaphragm. This prevent any permeation through the diaphragm, from ambient.



SV1: 3-WAY SOLENOID VALVE
CV1 & CV2: CHECK VALVE, CV2 HAVING A CRACKING PRESSURE OF AROUND 1 PSIG
R1: MINIATURE FLOW ORIFICE

Figure 2

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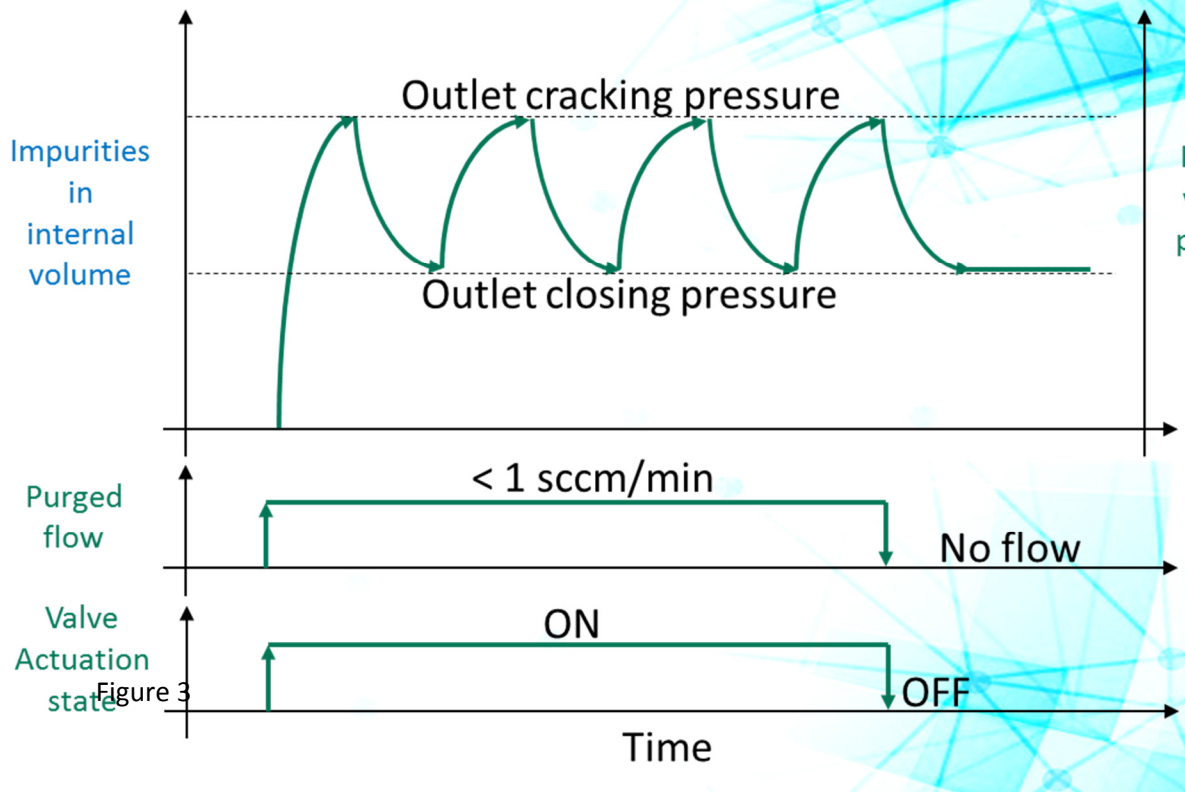

Figure 3

NEW PLUNGER DESIGN

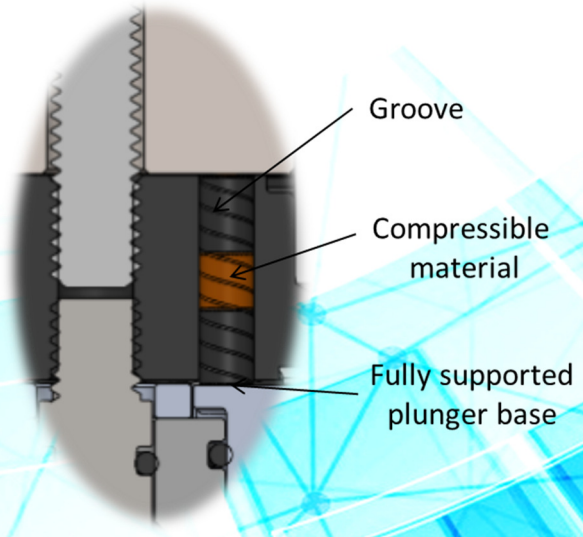

Figure 4

PURGE GROOVE

As the gap between the plunger and its corresponding hole can be very small, it could greatly limit flow or air exchange between actuation and under-the-diaphragm volumes. To limit the impact of such tight tolerance parts, we are adding grooves around the perimeter of the plunger.

FULLY SUPPORTED BASE

The whole base of the plungers is supported. This way, the sealing pressure is evenly applied against the diaphragm, minimizing the leak risk and localised diaphragm deformation.

FLEXIBLE PLUNGER

The plunger is also separated in 3 sections: top, bottom and mid sections. The improvement comes from the replacement of the rigid mid-section by a compressible one. The mid-part compressibility compensates for valve part geometry flaw (planarity, parallelism, etc.), diaphragm local thickness variation, etc.

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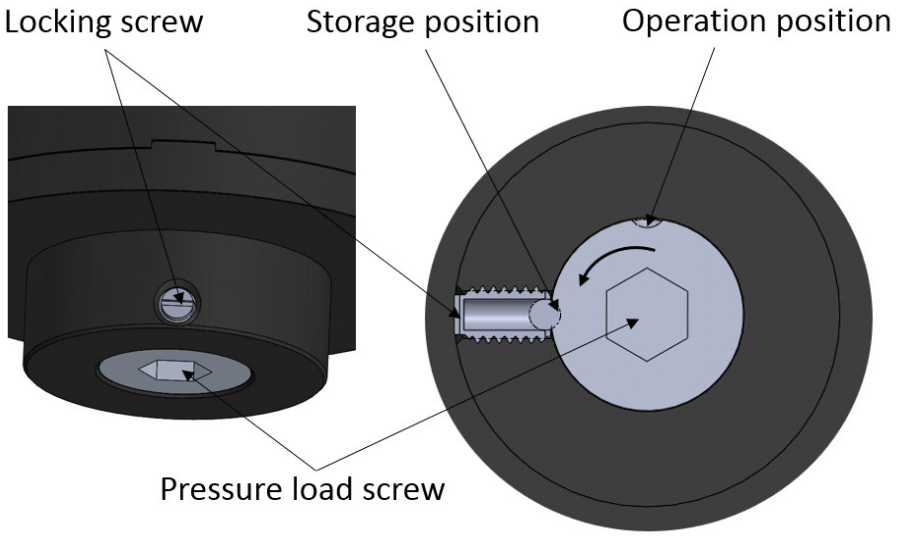
Pressure relief mechanism



The new valve design includes a pressure relief mechanism. This simple mechanism provides a storage and operation mode. In the storage mode, the force applied on the plunger push plate is reduced to prevent deformation of the diaphragm. In the operation mode, the necessary force is applied to the diaphragm to allow proper operation.

Specification	
Port Number	6 / 10
Port size	.030” (0.76mm)
Max Working Pressure	300 psig
Max Working Temperature	180°C
Actuation Pressure	65 psig (450 kPa)
Purge Gas Consumption	~1sccm for valve actuated, none when unactuated
Estimated Working Lifetime	3 years
Valve Head Material	Treated SS316 Series
Fitting connections	1/16”

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