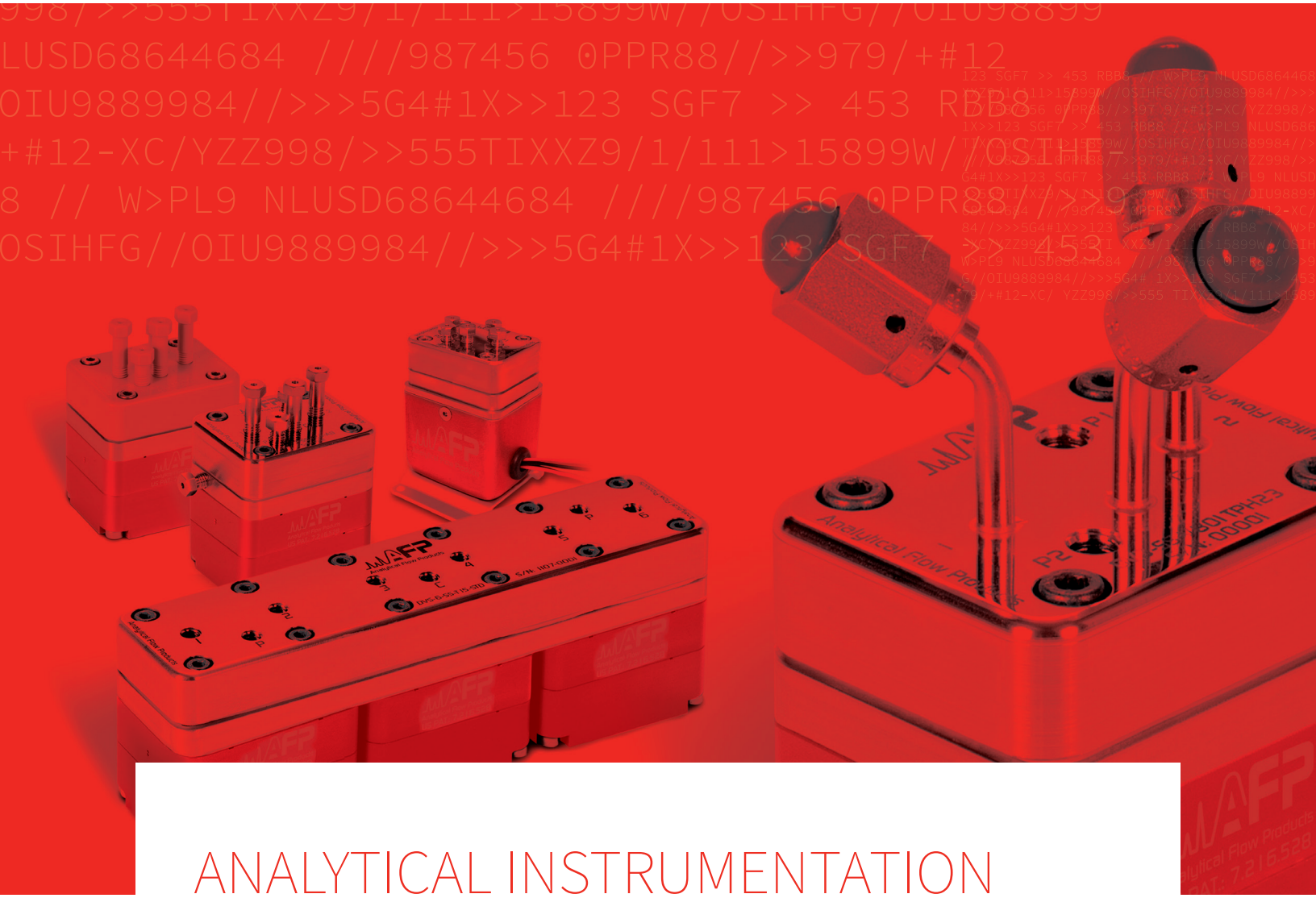
ANALYTICAL FLOW PRODUCTS

Product overview



ANALYTICAL INSTRUMENTATION
TIGHT SHUT-OFF DIAPHRAGM VALVES

The first real analytical tight shut-off diaphragm valve.

Patent pending 7.216.528. Ohter Patent pending

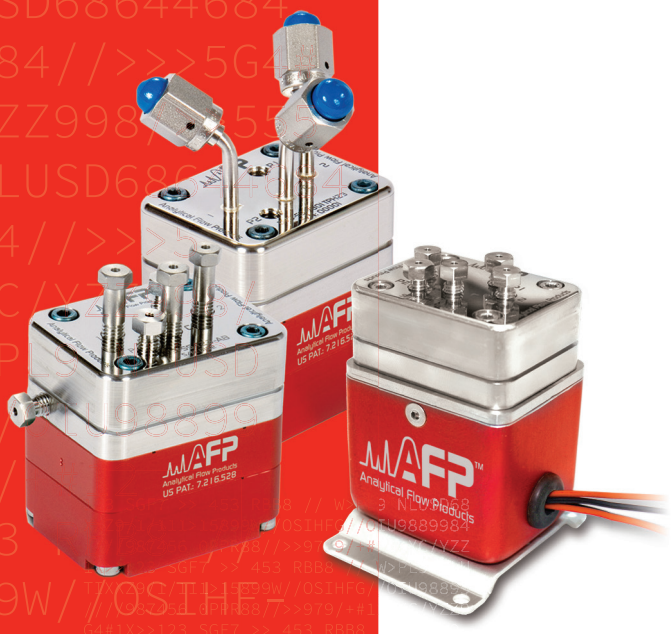
See by yourself how these can make your life much easier.

THIS IS THE FIRST REAL ANALYTICAL TIGHT SHUT-OFF DIAPHRAGM VALVE. THEY CAN BE USED IN MULTIPLE PLACES IN GAS CHROMATOGRAPHIC SYSTEMS, AUTO-SAMPLERS, SAMPLING AND GENERAL INSTRUMENTATION. NO DEAD VOLUME EFFECTS, CONTINUOUS FLOWPATH AND PURGE SYSTEM MAKE THEM IDEAL IN MANY SITUATIONS. FROM SIMPLE 3-WAY TO COMPLEX CONFIGURATION WITH TIMING SEQUENCE, THE JOB IS EASILY DONE.

WIDE CHOICE OF CONFIGURATIONS, FROM SIMPLE PNEUMATIC ACTUATOR TO FULLY LOADED MICROPROCESSOR CONTROLLED ELECTRICAL ACTUATOR.

DV SERIES VALVES COME STANDARD... ??? COMPRESSION FITTINGS. COULD BE ORDERED WITH 1/8 VCR FITTING WITH A MINIMUM QUANTITY.

HAVE A LOOK TO THE APPLICATION NOTE AND SEE BY YOURSELF HOW THESE CAN MAKE YOUR LIFE MUCH EASIER.



PRODUCTS AVAILABLE FOR ANALYTICAL INSTRUMENTATION

_ DV3, 3-WAY DIAPHRAGM VALVE

- Pneumatic actuation, i.e. DV3
- Electronic actuation, i.e. EDV3

_ DVS, SAMPLE STREAM SELECTION

- Three configurations:
  - ON/OFF: Pneumatic or electronic actuation
  - Sample By-Pass: Pneumatic or electronic actuation
  - Double Block & Bleed: Pneumatic or electronic actuation

Common feature description

- PURGE FEATURE TO PREVENT INBOARD/OUTBOARD CONTAMINATION/ FUGITIVE EMISSION AND PERMEATION THROUGH THE DIAPHRAGM (OPTIONNAL)
- 100% HELIUM MASS SPECTROMETER LEAK TESTED
- ELIMINATION OF ANY DEAD VOLUME EFFECTS
- CONTINUOUSLY SWEEPING FLOW PATH
- TIGHT POSITIVE PORT SHUT-OFF DESIGN
- WORKING PRESSURE RANGING FROM VACUUM TO 1000 PSIG
- USABLE WITH LIQUID OR GAS MEDIA
- LOW PRESSURE DROP
- PORTS ARE INDEPENDENTLY CONTROLLED
- PNEUMATIC VERSION INTRINSICALLY SAFE

Fields of application

- GAS CHROMATOGRAPH/LIQUID CHROMATOGRAPH/GCMS/LCMS
- ON-LINE GAS ANALYSER/VARIOUS SAMPLING SYSTEM
- AUTOMATED LABORATORY SAMPLE INJECTION SYSTEM
- SAMPLE PREPARATION SYSTEM/SAMPLE CONCENTRATION SYSTEM
- CONTINUOUS FLOW ANALYSER
- PURGE AND TRAP G.C. SAMPLER/HEAD SPACE SAMPLING
- TOTAL ORGANIC COMPOUND ANALYSER
- AUTOMATED PROCESS ANALYSER PANEL
- REFINING AND HYDROCARBON ANALYSER/NATURAL GAS ANALYSER
- ION CHROMATOGRAPHIC SYSTEM
- AND MORE...

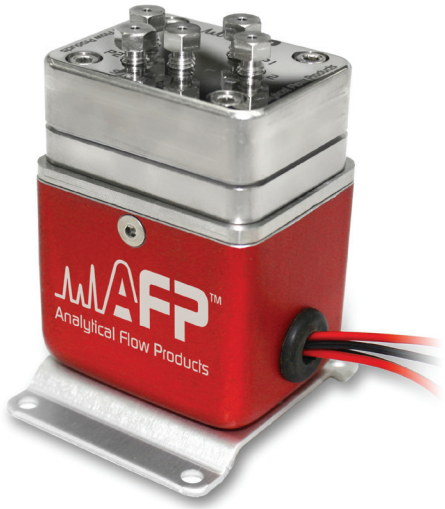
DV3-Series

3-WAY diaphragm valve

Positive port shut-off diaphragm valve

DV3-SERIES
Pneumatic Actuation

EDV3-SERIES
Electronic Actuation



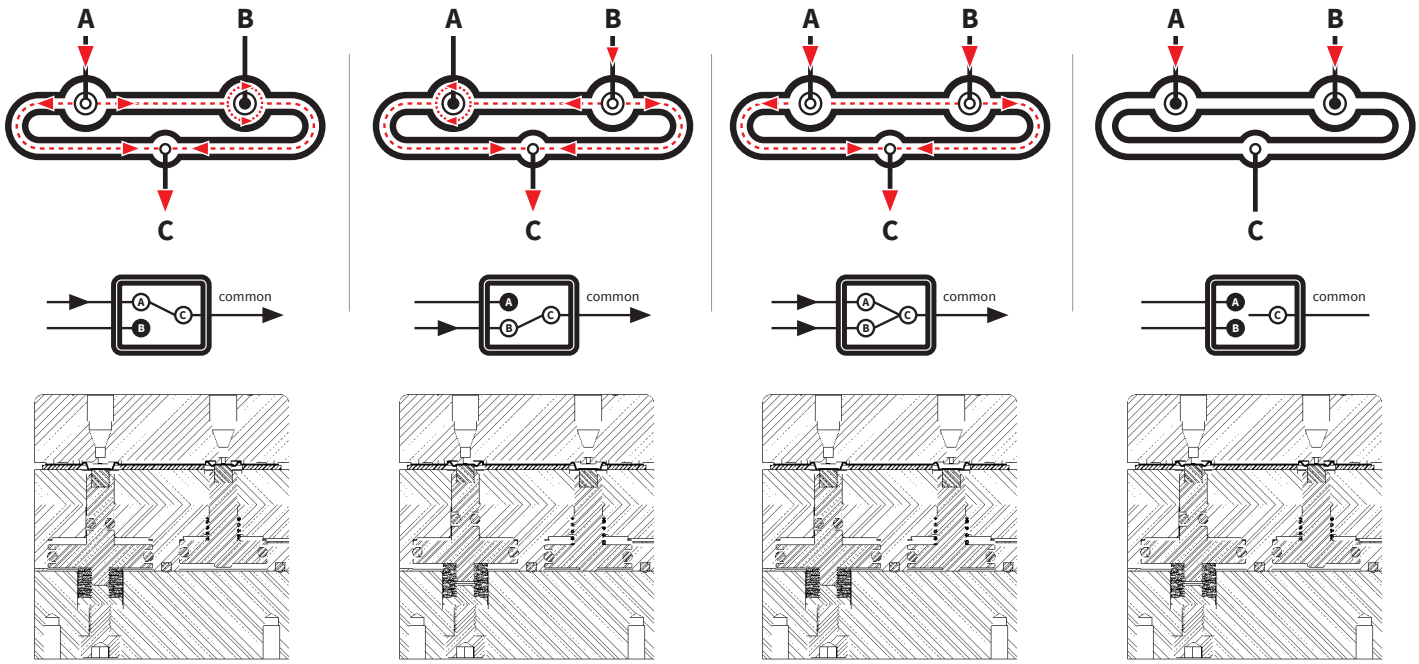


FIGURE 1A :
Port A open and B closed

FIGURE 1B :
Port A closed and B open

FIGURE 1C :
Both ports open

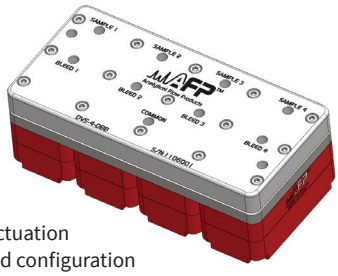
FIGURE 1D :
Both ports closed

DVS-Series

Sample stream selection diaphragm valve

DVS-SERIES

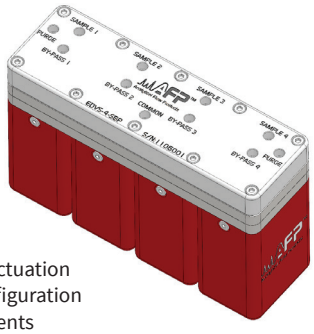
DVS-6 Pneumatic actuation
ON/OFF configuration



DVS-4 Pneumatic actuation
double block & bleed configuration
individual bleed vents

EDVS-SERIES

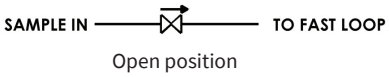
EDVS Electronic
actuation
ON/OFF
configuration



EDVS-4 Electronic actuation
sample by-pass configuration
individual by-pass vents

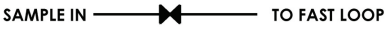
ON/OFF stream configuration

Single stream operational state #1



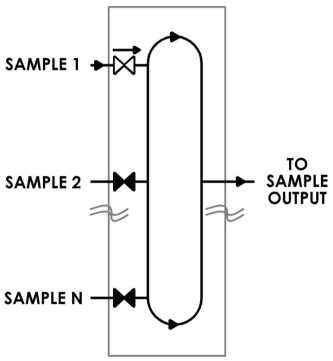
Open position

Single stream operational state #2

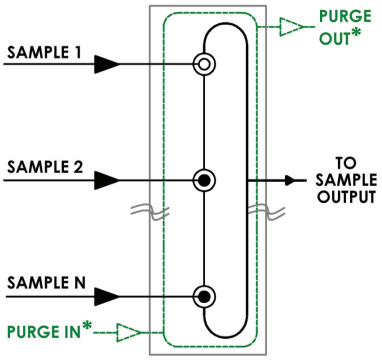


Closed position

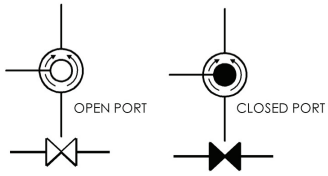
Multiple stream flowpath schematic



Multiple stream physical flowpath



- All channels built on the same substrate
- Internal fast loop included

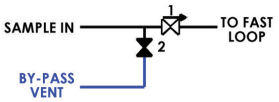


US.PAT.: 7,216,528

* PURGE IS AVAILABLE AS AN OPTION

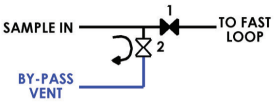
Sample by-pass stream configuration

SINGLE STREAM
Operational state #1



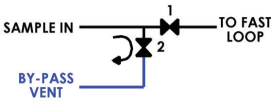
Sampling position

SINGLE STREAM
Operational state #2



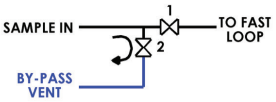
Sampling by-pass position

SINGLE STREAM
Operational state #3

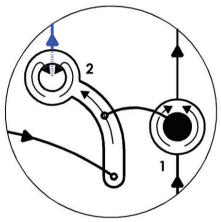


All-closed position

SINGLE STREAM
Operational state #4



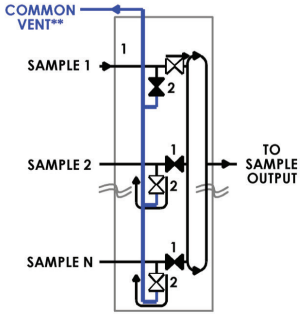
All-open position



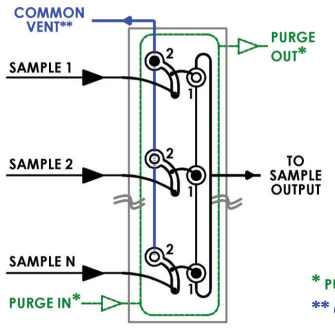
MULTIPLE STREAM
Physical flowpath sample by-pass position

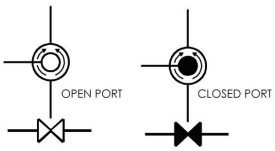
Note : valve ports 1 and 2 can be independently controllable

MULTIPLE STREAM
Flowpath schematic



MULTIPLE STREAM
Physical flowpath





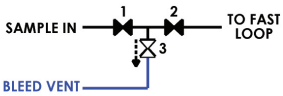
US.PAT.: 7,216,528

* PURGE IS AVAILABLE AS AN OPTION
** COMMON BY-PASS VENT IS AVAILABLE AS AN OPTION

- All channels built on the same substrate
- Internal fast loop included

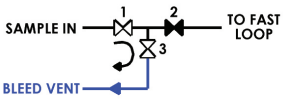
Double block & bleed stream configuration

SINGLE STREAM
Operational state #1



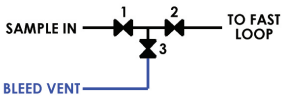
Double block & bleed position : sample inlet closed

SINGLE STREAM
Operational state #2



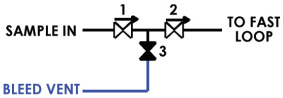
Sample by-pass position : Accelerates sample refresh rate before selection

SINGLE STREAM
Operational state #5



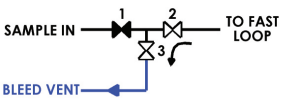
All-closed position

SINGLE STREAM
Operational state #3



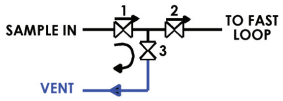
Sample selection position

SINGLE STREAM
Operational state #4

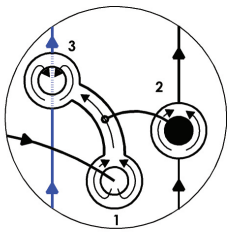


Back purging position : momentary back purges the unselected streams

SINGLE STREAM
Operational state #6



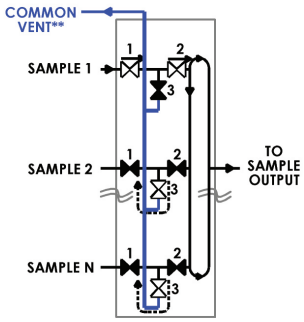
All-open position



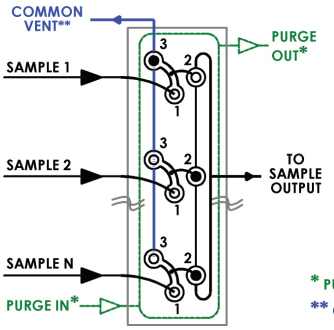
MULTIPLE STREAM
Physical flowpath sample by-pass position

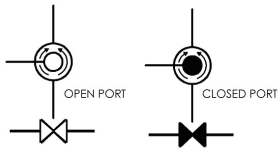
Note : valve ports 1, 2 and 3 can be independently controllable

MULTIPLE STREAM
Flowpath schematic



MULTIPLE STREAM
Physical flowpath





US.PAT.: 7,216,528

* PURGE IS AVAILABLE AS AN OPTION
** COMMON BY-PASS VENT IS AVAILABLE AS AN OPTION

- All channels built on the same substrate
- Internal fast loop included

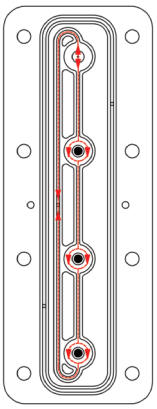
Actuator configuration

If you want a fail-safe assembly to prevent malfunction or unintentional operation of your system, you should choose only one normally open port and all the others normally closed. This way the normally open port will sweep the valve with a inert gas while the other gases are shut off.

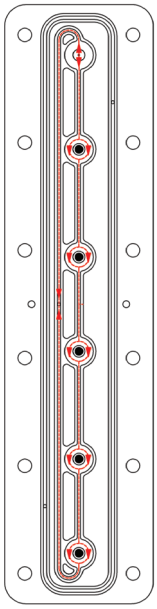
Fail-safe definition :
Pertaining to a system or component that automatically places itself in a safe operating mode in the event of a failure.

- **REPLACES STANDARD ROTARY SAMPLE STREAM SELECTION VALVE IN AN ANALYTICAL PANEL.**
- **DROP-IN VALVE SYSTEM FOR EASY ANALYTICAL SYSTEM AUTOMATION.**
- **EASY TO INSTALL AND CONTROL IN OEM GAS ANALYSERS.**
- **REPLACES A STANDARD SAMPLE STREAM VALVE DESIGN WITH INTERNAL O-RINGS TO PROVIDE A CONTAMINATION FREE SYSTEM.**
- **USED AS A BUILDING BLOCK FOR AN ANALYZER PANEL.**
- **MULTIPLE COLUMNS OR SAMPLE LOOPS SELECTION IN CHROMATOGRAPHIC SYSTEM.**

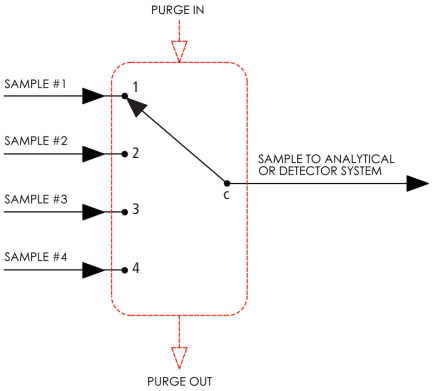
Fluid flow path example



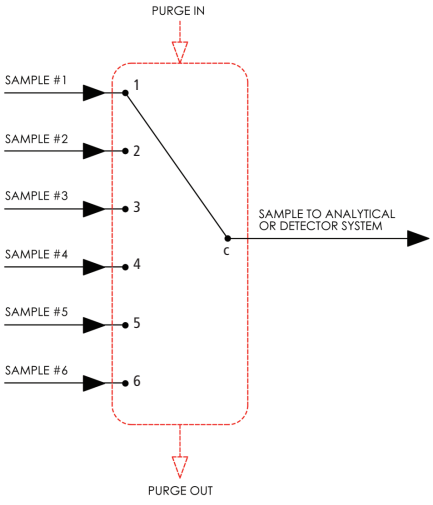
(E)DVS-4 PHYSICAL FLOWPATH



(E)DVS-6 PHYSICAL FLOWPATH



(E)DVS-4 FLOWPATH SCHEMATIC



(E)DVS-6 FLOWPATH SCHEMATIC

In-line option

The IN-LINE option gives you the opportunity to put few valves in series. You may increase to any value the number of sample inlet streams. It allows different sampling configuration schemes. The various DVS blocks are externally connected through an appropriate size tubing. This results in a multiple channel system with no dead volume effects and carry over (memory effect). This option is available on all DVS-Series valves.As shown on Figure 10, you can pick two DVS-8 with the in-line option and make a sixteen-port stream selection valve.

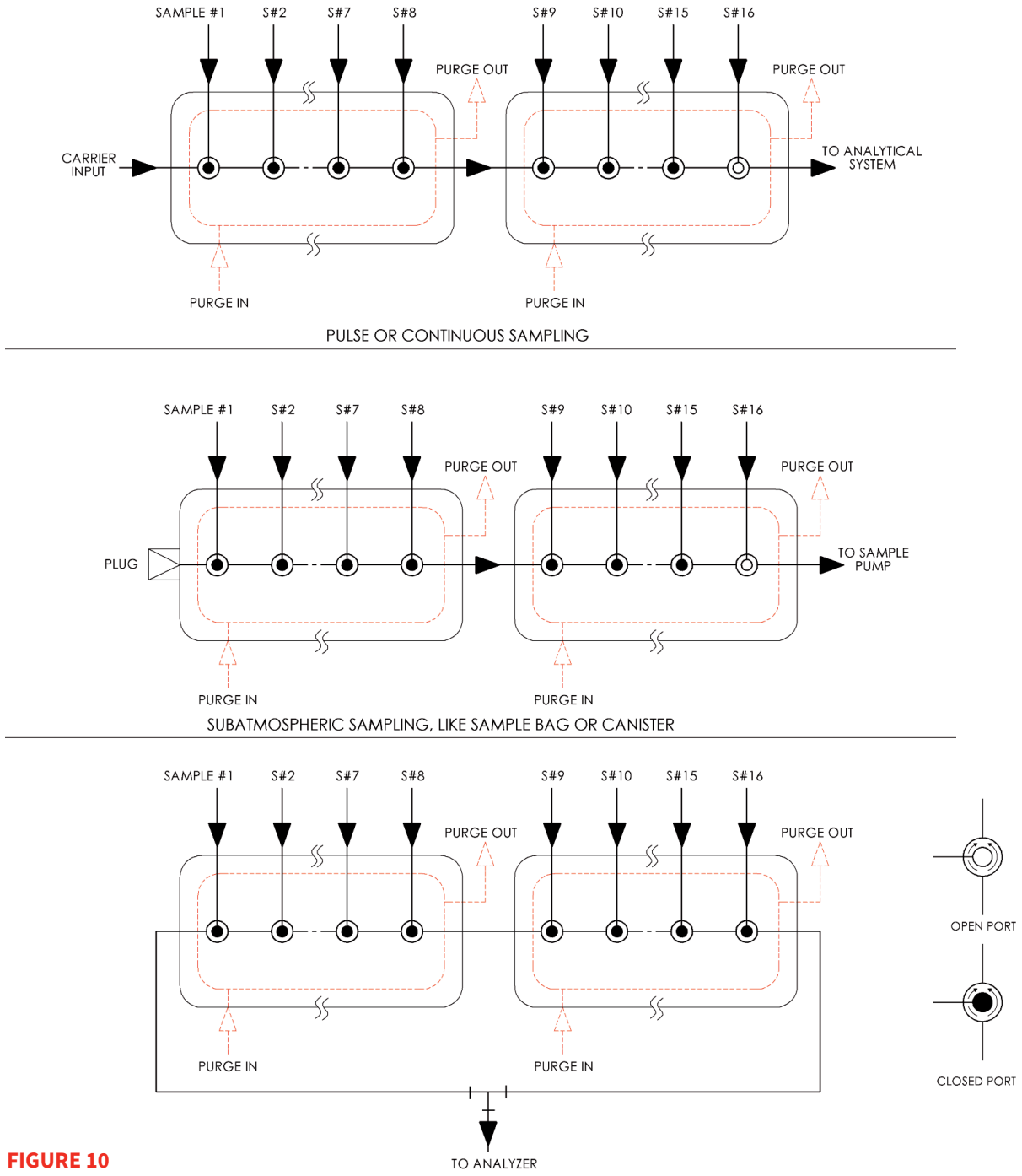


FIGURE 10

16 STREAM SAMPLE SELECTOR SAMPLING VARIOUS PROCESS FLOWS

PL9 NLUSD68644684 ////987456 0PPR88//>>979/+#12-XC/YZZ998/>>555TI
W>PL9 NLUSD68644684
G//0IU9889984//>>>5G4#

Pneumatic description

The DV series valves are especially designed for analytical systems. All ports are independently controlled by supplying the pneumatic actuating pressure to their corresponding piston. A port is closed when its associate piston is forced against the corresponding valve's seat, interrupting the flow by directly closing the port. This is what is called positive port shut-off action. The small displacement needed to close or open the port results in a fast switching time. Figure 11 shows a standard DV3 configuration valve's head, and Figure 12 shows a low temperature independent actuator with a normally closed and a normally open configuration. Figure 13 shows a high temperature independent actuator with a double normally closed configuration.

The DV series valves could be used as a simple stand alone valve or a multiple combinations of them could be used to realize complex applications.

The problems that plague many other valve designs to be efficiently used in analytical systems have been corrected. The elimination of any dead volume effects could be achieved with the continuous flow at all time into the valve internal fluid channel, and this even if a port is closed or open. The fluid will flow through an open port or around a closed one. The inboard/outboard leak rate is extremely low, and lower than the detection limit of many leak test systems. This is achieved by the use of a flexible diaphragm that seals the internal valve volume from the exterior environment.

In critical applications an extra protection could be added by the action of purging/sealing grooves machined in the valve head and the sealing plate that could be swept by the appropriate fluid media.

FIGURE 11
Standard DV3 valve's head

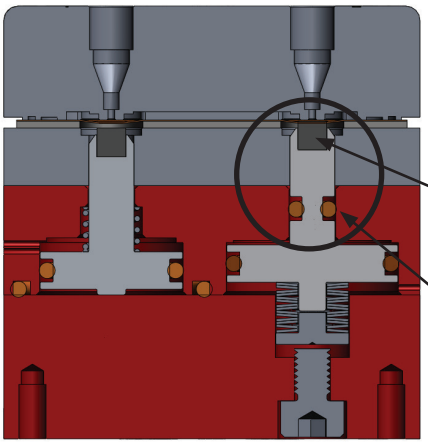


FIGURE 12
Independant actuation
LT model Normally Closed/Normally open configuration

Cushion

One-piece piston rod

Pneumatic Valve Actuation Specification	
	DV-SERIES
Actuation pressure (psig / kPa) **(Process gas pressure of 300 psig)**	60 / 415
Actuation pressure (psig / kPa) **(Process gas pressure of 1000 psig) In Option**	125 / 860
Gas Consumption per Actuation (in^3 / cc^3)	.030 / .50

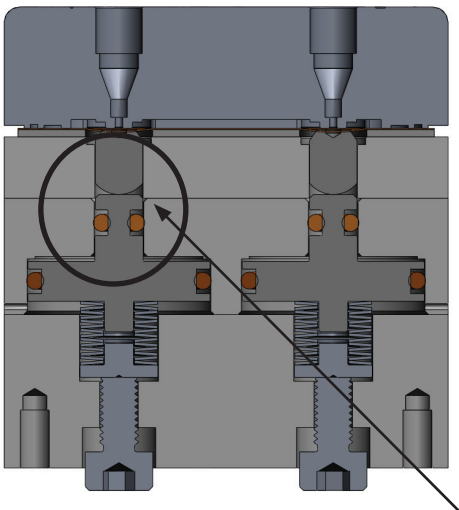


FIGURE 13
Independant actuation
HT model
Normally Closed/ Normally Closed configuration

Two-pieces piston rod

Electronic actuation

Electronic actuation is available for all the DV-Series valves

Common features :

- **MICROPROCESSOR CONTROLLED MOTORS**
- **GREEN POWER : CONSUMES POWER ONLY DURING ACTUATION SLEEP MODE BETWEEN ACTUATION**
- **USER SELECTABLE DEFAULT POSITION; NORMALLY CLOSED (NC), NORMALLY OPEN (NO). POSITION SELECTED ON POWER UP**
- **SERVOLOOP TORQUE CONTROLLED, COMPENSATING FOR LONG TERM WEARING; MAINTAINING SEALING LEVEL OVER TIME**
- **VARIOUS INTERFACE FOR CONTROL :**
  - Motor Direct Drive.
  - Digital input; Interface with PLC, dry contact, digital electronic.
  - Serial interface, allows daisy chain of multiple valve modules through RS-485.
  - Allows system status report and user's programmable timing sequence and control from PC or microcontroller.
- **CE, RoHS**

Applications :

- **ELECTRICALLY CONTROLLED SAMPLE STREAM SELECTION SYSTEMS**
- **ANALYZER AUTO-CALIBRATION SYSTEMS**
- **BUILT-IN ANALYZER SAMPLE AND CALIBRATION GAS SELECTION**
- **COMPLEX GC CONFIGURATIONS**
- **LIQUID AUTOSAMPLERS**
- **SAMPLE PANEL AUTOMATION**
- **PURGE AND TRAP SYSTEMS**
- **GC FRONT END SAMPLE PROCESSING (CONCENTRATION/PURICATION)**
- **SYRINGE PUMP / DISPENSER / DILUTER SYSTEMS**

Actuation mechanism

In general, port closing or opening is done by controlling a miniature DC motor. Depending on applied voltage polarity to the motor, the output shaft rotates in one direction (clockwise) or the other (counter-clockwise). Speed control is important. This allows the valve to be efficient in different pressure systems by controlling opening and closing parameters (speed, time and priority).

Mechanically, the shaft has a flat side, that is inserted into the motor drive adapter. It transfers the torque from the motor assembly to the threaded coupling through its flat end, which is inserted in the slot at the threaded coupling. The threaded coupling and the motor drive adapter are free to move up and down on the shaft when they rotate. The threaded coupling transfers the rotational torque into a vertical displacement. Then it pushes on a self-aligned plunger. The plunger does not rotate, thanks to the anti-rotation dowel pin. The side of the plunger facing the threaded coupling is treated to reduce friction and wearing while other side is fitted with a compressible cushion, which transfers the vertical force onto the sealing diaphragm. The other side of the diaphragm is facing the valve's seat. Pressing the diaphragm against the valve's seat shuts off fluid flow. Lifting it restores the flow. The plunger is self-aligned and free to move. When the threaded coupling is going up, the plunger will be lifted by the return spring, removing any force on the sealing diaphragm. This makes sure that there is no flow restriction when the valve port is fully open. See Figure 1.

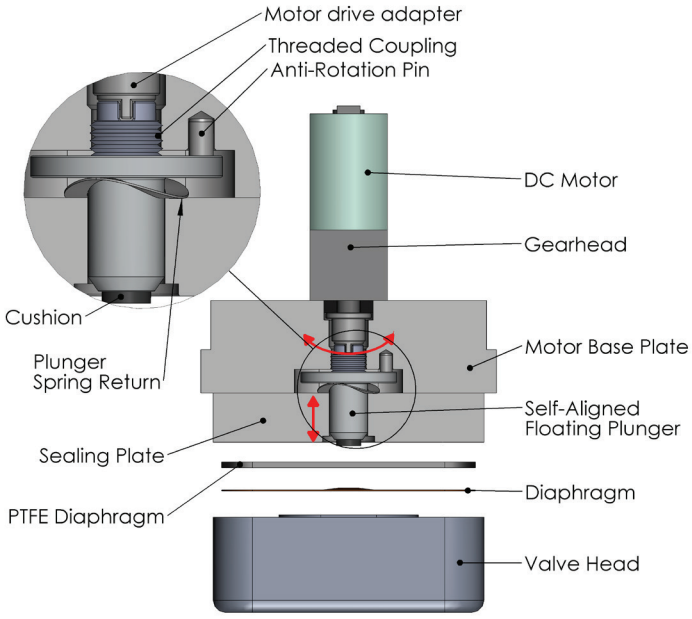


FIGURE 1 :
Mechanical assembly

+ ////987456 0PPR88//>>97 97+#12-XC/YZZ998/>>555TIXXZ9/

Electronic interface

Figure 2 shows the valve electronic actuation aspects. Each motor is controlled through an H bridge driver. The H bridge allows direction, speed and torque control over the motor. A pulse width modulation technique (PWM) and other parameters are used to reliably control valve operations regarding its specifications (pressure, speed, multiple actuation, diaphragm type).

Diaphragm valve LOW POWER consumption is a good AFP innovation. The mechanical design makes sure that there is no plunger movement when the power is shut off (or H bridge in idle mode) resulting in very low standby power compared to solenoid valve. Safety and application issues can be solved with this feature.

The valve operation could be controlled in three different ways. First, by simply using the corresponding digital input lines; this mimics the traditional way to control closing or opening of a valve port. Applying voltage to a digital input line opens the associate valve port, and vice-versa. The digital input lines are electrically isolated from the electronic control circuit. These inputs are low power inputs and can be connected to PLC, microcontroller digital outputs or dry contact relay.

The second method uses a predefined BCD (binary coded decimal) instruction format.

The third method is through the use of serial interface. Simple command could be sent to open or close a port. This is not doing more than using the discrete digital inputs for controlling the valve. The only difference is the serial interface is used, typically RS-485. Multiple valve modules could be daisy chained and controlled through serial interface freeing system digital outputs. The serial interface allows also the use of the valve internal microcontroller to control various valve operation sequences, in a user programmed timing sequence.

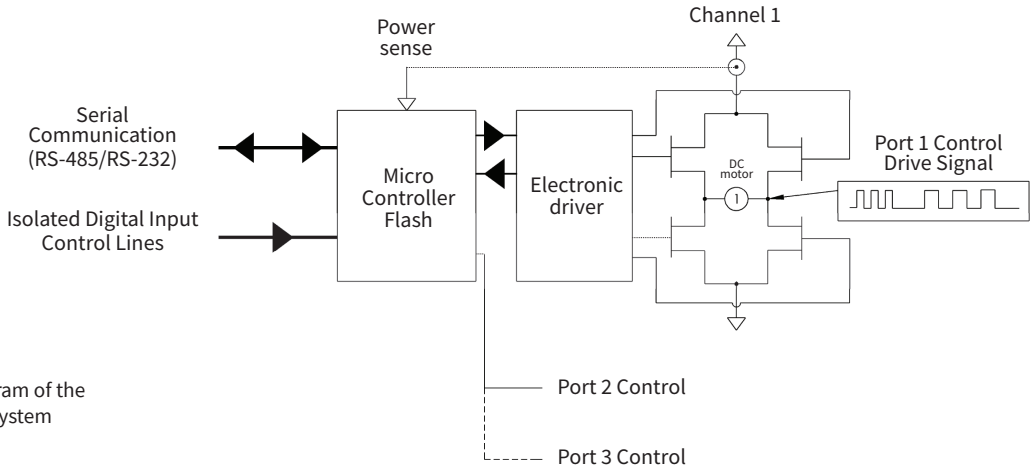


FIGURE 2 :
Simplified block diagram of the electronic actuation system

Electronic specification

Typical for an EDVS4 : 4-inlet sample stream selection valve

Features :

- **FOR ANY VALVE CONFIGURATION, EACH PORT IS INDEPENDENTLY CONTROLLABLE**
- **NO SOLENOID VALVE AND TUBING ARE REQUIRED FOR ACTUATION. THIS SAVES SPACE, COST AND SETUP TIME**
- **GREEN ACTUATION. INDEED, POWER IS CONSUMED ONLY WHEN THE VALVE IS ACTUATED. ONCE THE VALVE REACHES ITS FINAL POSITION (OPEN OR CLOSED), NO MORE POWER IS CONSUMED. THE VALVE SWITCHES TO STANDBY POWER MODE. FOR AN ON/OFF CONFIGURATION, THE EQUIVALENT SOLENOID VALVE CONSUMES BETWEEN 7 AND 10W TO KEEP A PORT OPEN. THE EDV STANDBY IS CONSUMING LESS THAN 140 mW**
- **DIRECT INTERFACE TO PLC DIGITAL I/O, OR ANY DIGITAL CONTROLLER**
- **SERIAL CONTROL INTERFACE: CONTROL MULTIPLE INLETS WITH A PAIR OF WIRES**
- **REAL TIME WEARING COMPENSATION: CONSTANT TORQUE**
- **RS-485 AFP COMMAND INTERPRETER**
- **SOFTWARE TOOLS AVAILABLE**
- **ELECTRIC AND ENVIRONNEMENT SELF-DIAGNOSTIC**
- **CE, RoHS**

GENERAL SPECIFICATION

8 bits microcontroller with (RTC) real time clock, for precise event timing		
Log and configuration memory	Flash	1 Meg byte
RS-232	Speed	9600 Bauds
RS-485 (2 wires)	Speed	9600 Bauds
Supply voltage monitoring	Analog converter	10 Bits
Internal temperature monitoring	Analog converter	10 Bits
Motor current monitoring	Analog converter	10 Bits
Operating temperature (Electronic module)	Fahreheit (°F)	32°F to 140°F [1]
	Celsius (°C)	0°C to 60°C
CE conform , RoHS		

Note 1 : From the temperature specification. It is important to note that the " valve body" maximum temperature could be much higher and does not affect the electronic module.

ELECTRICAL SPECIFICATION

Supply voltage input range (Transient and reversepolarity protector)	MIN	5 Volts DC
	MAX	24 Volts DC
Standby power consumption	Typical	140 mW [2]

Note 2 : Configurable upon application and pressure

DIGITAL AND CONTROL INPUT

Input protection	All input	Digital isolated
Input voltage and current range to open a port	5 Volts DC	1.6 mA
	12 Volts DC	2.5 mA
	24 Volts DC	5.1 mA
Port actuation can be controlled by serial port		
In normal mode, port control is "compatible" to a normaly close pneumatic valve Port open = 5 to 24 Volts Port close = GND or not connected		

ELECTRICAL POWER CONSUMPTION DURING PORT ACTUATION @ 500 PSI

Opening power	Max	2000 mW [2]
	Average	1500 mW [2]
Closing power	Max	2400 mW [2]
	Average	2000 mW [2]
Closing or opening time (actuation time)	Typical	300 msec. [3]

Note 2 : Configurable upon application and pressure
Note 3 : This power is consumed only when port is actuated. Between actuation maximum power consumption is less then 140 mW

Control mode table

ON - OFF CONFIGURATION HAS ONE CONTROLLABLE PORT

OPERATION DESCRIPTION	Serial Mode	Standard Mode	*BCD mode digital inputs	Valve port state
	AFP Commands	Digital Input	Digital Input	
		1	1	1
Port closed	closed	0	0	C
Port open	open	1	1	O

1 = Digital input supplied **0 =** Digital input to ground **O =** Open **C =** Closed

THE SAMPLE BY-PASS CONFIGURATION HAS TWO CONTROLLABLE PORTS

OPERATION DESCRIPTION	Serial Mode	Standard Mode		*BCD mode digital inputs		Valve port State	
	AFP Commands	Digital Input		Digital Input			
		2	1	2	1	2	1
Sample selected	Sample	0	1	0	1	O	C
Sample by-pass	By-pass	1	0	1	0	C	O
All ports closed	All closed	0	0	0	0	C	C
All ports open	All open	1	1	1	1	O	O

1 = Digital input supplied **0 =** Digital input to ground **O =** Open **C =** Closed

THE DOUBLE BLOCK & BLEED HAS THREE CONTROLLABLE PORTS

OPERATION DESCRIPTION	Serial Mode	Standard Mode			*BCD mode digital inputs			Valve port State		
	AFP Commands	Digital Input			Digital Input					
		3	2	1	3	2	1	3	2	1
Sample selected	Sample	0	1	1	0	0	1	C	O	O
Sample by-pass	By-pass	1	0	1	0	1	0	O	C	O
Back purging unselected streams	Back Purge	1	1	0	0	1	1	O	O	C
Sample isolated, bleed port open	DBB	1	0	0	1	0	0	O	C	C
All ports closed	All closed	0	0	0	0	0	0	C	C	C
All ports open	All open	1	1	1	1	1	1	O	O	O

1 = Digital input supplied **0 =** Digital input to ground **O =** Open **C =** Closed

***** BCD control mode is selected with the help of the internal dip switches. Please see user's instructions for detail.
In BCD and serial control modes, the driver makes sure that valve ports are operated in the appropriate sequence, i.e., for example, break before make.

Guidelines for valve configuration

Valve's head configuration

Since there is no one size fit all application valve, the system designer must select the appropriate valve configuration that will fulfill the needs of the application. To achieve this, the following parameters for any particular design must be considered :

- Valve head material, i.e. metal, polymer or coating
- Diaphragm type
- Operating pressure and temperature
- Fitting type
- Purged sealing plate

As rule of thumb, one must take into consideration the effects that may have on a particular application, the adsorption, the absorption, the out gassing, the permeation and the chemical inertness of the various valve materials in contact (i.e. the so called ''wetted parts'') with the fluid to be controlled. The following will help the system designer to understand various DV series possible configurations. It may be used as a general guide line. For example, if the system where the valve would be installed is working with an ECD (i.e. electron capture detector) any material releasing electron absorbing compounds will kill the detector sensitivity. This is the case with some fluoropolymer that may release halogen compounds. In this case a Teflon® type diaphragm would not be a right choice. However in some other applications, Teflon® type diaphragm could be an excellent choice. Another example of this fact is if the valve is to be installed in a system measuring low level of moisture or oxygen, surface adsorption and diaphragm permeation, absorption and out gassing are of prime importance. Not only the valve itself must be considerated, but also its operating environment. In such case, operating the valve at higher temperature will have a major impact on system performance. Working with corrosive gases, for example chlorine or acid (like HCL), will also call for specific valve materials.

In brief, the final configuration of a DV valve is application driven.

Standard configuration

The DV basic standard version has a valve head made of 316L grade stainless steel. The diaphragm is made of a multilayer polymer, i.e. Teflon®/ Polyimide. The maximum operating temperature defined as standard range is 180°C. The standard operating and test pressure is 500 psig (3345 kPa). Minimum operating pressure is vacuum. The diaphragm and other parts of the valve are easily replaceable. All the port connections are 1/16¨ single ferrule type with AFP™ high quality finish.

Extra purge connection

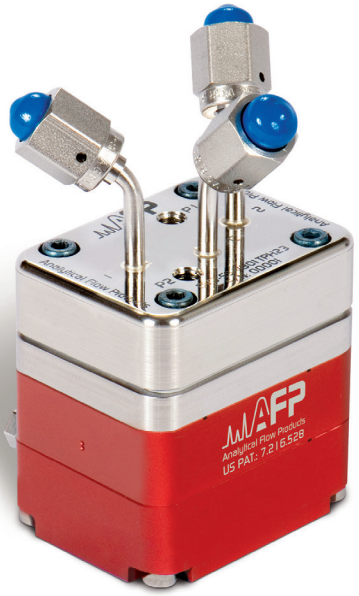
The DV is also available with an extra purge connection. These purge connections allow the select purge fluid to purge the back side of the diaphragm, depending on a particular system requirements.

This allows :

- Working at higher pressure by equilibrating the pressure on both side of a diaphragm
- Eliminating permeation problem through the diaphragm. (Gas application)
- Reducing hazard risk when working with dangerous media.
- Real time diagnostic for critical operation. This is done by monitoring the purge fluid on the purge vent.

DV3 with 1/8” VCR and/or other fitting connections

DV3 could be also fit with 1/8¨ VCR brazed fittings for process port connection. This configuration could be required for semiconductor and vacuum applications. It also works better for extended time columns, traps or sample isolation due to high level of sealing integrity.



Optionnal valve head materials for chemically inert and corrosive application

For application requiring chemically inert material in regard to the process fluid, for example, corrosive or some organic compound, the DV valve head could be made of polymer, such as PEEK™ or other appropriate materials. This is often required in the field of liquid chromatography or mass spectrometry. In such configurations, all wetted parts would be made in materials compatible with your applications.

Diaphragm and seat design

Seat option

Hard seat

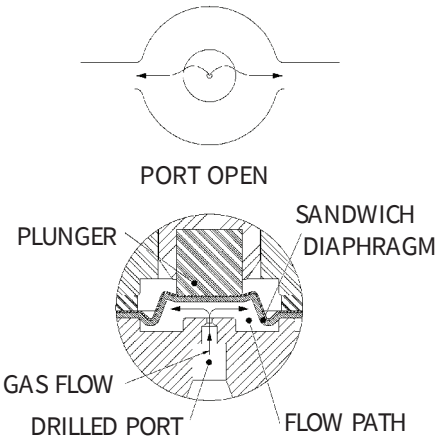


FIGURE 1A : Hard seat

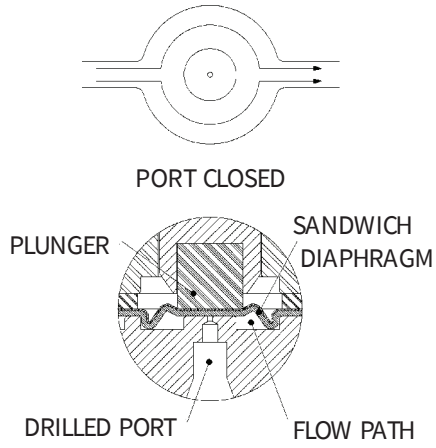
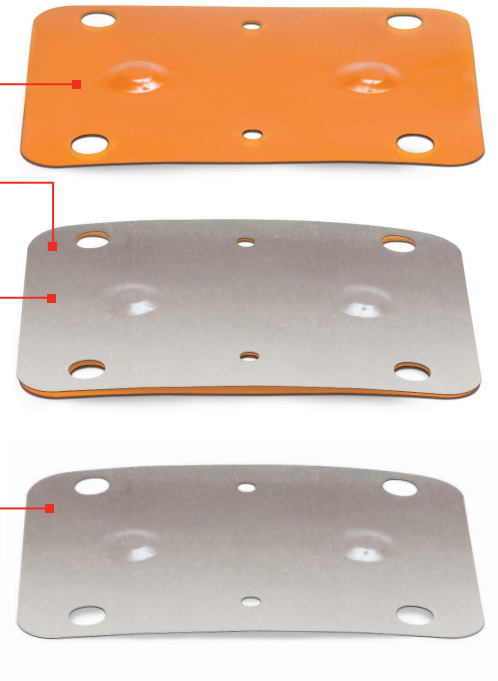


FIGURE 1B : Hard Seat

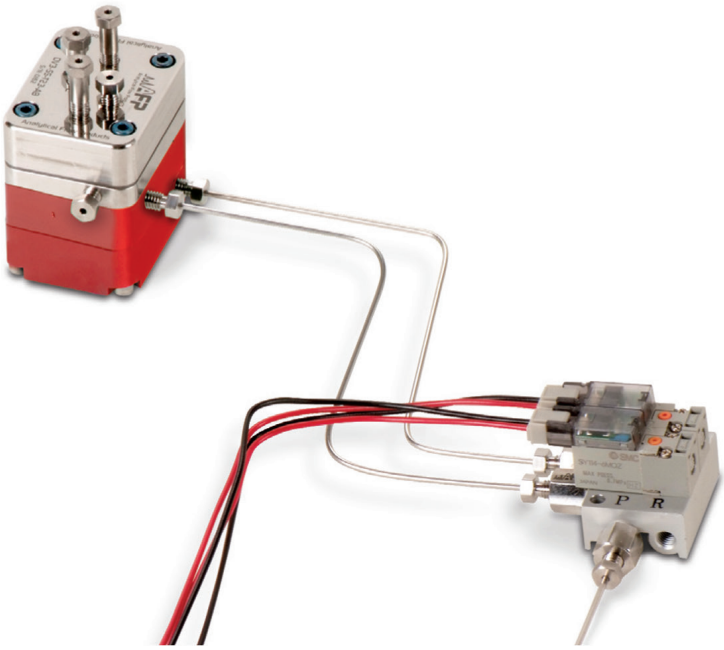
Diaphragm model, typical for DV3 Series

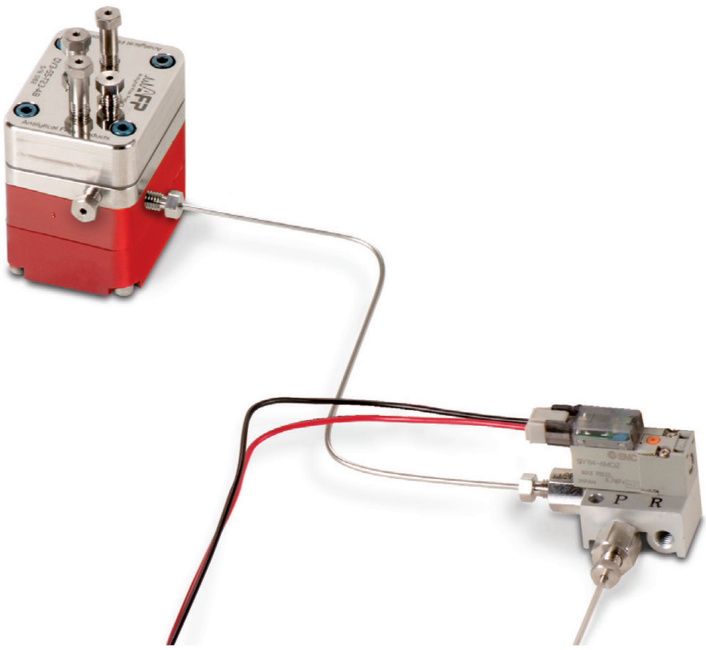
- Single layer of selected polymer (Polyimide/Teflon®/PEEK™)
- Multilayer Teflon®/Polyimide (general purpose, longer lifetime)
- Multilayer, very low absorption and permeation
- Metalized, i.e. selected polymer with metal deposition on it.



Actuator configuration

DV series valve pneumatic actuator could be driven by only one solenoid, i.e. all ports actuated at the same time with a break before make action, or by one solenoid valve for each port, so they would be independently controlled.



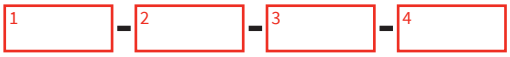


Part numbering

DV3-Series configuration / Pneumatic actuation

1 MODELS	2 CONNECTION	3 TEMPERATURE	4 MANIFOLD	5 ACTUATION PORT #	6 CONFIGURATION	7 OPTION
DV3	**16** = Fitting 1/16'' **LS16** = Lip Seal 1/16''* **08** = Fitting 1/8'' **LS08** = Lip Seal 1/8''* **V8** = VCR 1/8''	**T** = 180°C **HT** = 250°C	**RM** = Remote solenoid manifold **BM** = Bolt-on solenoid manifold	**1** = 1 port **2** = 2 ports	**1** = NO, NO **2** = NC, NC **3** = NC, NO NO = Normally Open NC = Normally Closed	**P** = Backside of the diaphragm purged **M** = Metalized diaphragm **S** = SilcoNert 2000™ **D** = Dursan™ **HC** = Hastelloy® **TI** = Titanium **XX** = Custom **C** = Pre-conditioning

EDV-3 Series configuration / Electronic actuation



1 MODELS	2 CONNECTION	3 CONTROLLER	4 OPTION
EDV-3	**16** = Fitting 1/16'' **LS16** = Lip Seal 1/16''* **08** = Fitting 1/8'' **LS08** = Lip Seal 1/8''* **V8** = VCR 1/8''	**D** = Digital input **B** = BCD **S** = Serial command	**P** = Backside of the diaphragm purged **M** = Metalized diaphragm **S** = SilcoNert 2000™ **D** = Dursan™ **HC** = Hastelloy® **TI** = Titanium **XX** = Custom **C** = Pre-conditioning

DVS-Series configuration / Pneumatic actuation

1 MODELS	2 # OF INLETS	3 CONNECTION	4 CONFIGURATION	5 TEMPERATURE	6 MANIFOLD	7 # OF N.C. PORTS	8 BY PASS PORT ***	9 OPTION
DVS	**3** = 3 inlets **4** = 4 inlets **6** = 6 inlets **8** = 8 inlets	**16** = Fitting 1/16'' **LS16** = Lip Seal 1/16''* **08** = Fitting 1/8'' **LS08** = Lip Seal 1/8''* **V8** = VCR 1/8''	**OO** = ON/OFF **SBP** = Sample By-Pass **DBB** = Double Block and Bleed	**T** = 180°C **HT** = 250°C	**RM** = Remote solenoid manifold **BM** = Bolt-on solenoid manifold	**0 to 8**	**0** = ON/OFF **1** = Common **2** = Individual	**P** = Backside of the diaphragm purged **M** = Metalized diaphragm **S** = SilcoNert 2000™ **D** = Dursan™ **HC** = Hastelloy® **TI** = Titanium **XX** = Custom **C** = Pre-conditioning

***Lip Seal :** Lip Seal fitting is our new patent pending AFP fitting detail. This reduces the dead volume, eliminates the rotation of the ferrule and improves the sealing resulting in an improved connection for valve and fitting. This is very beneficial for any analytical high sensitivity instrumentation. Sealing integrity of a VCR fitting with the flexibility of a compression fitting. Please refer to Design Report 3 (DR-3) in the Analytical Flow Product Cookbook.

*Patent Pending

*** 0= ON/OFF = When used with ON/OFF configuration
1= Common = One common port for all channels
2= Individual = One port for each channel

EDVS-Series configuration / Electronic actuation

1	–	2	–	3	–	4	–	5	–	6	–	7

1 MODELS	2 # OF INLETS	3 CONNECTION	4 CONFIGURATION	5 CONTROLLER	6 BY PASS PORT ***	7 OPTION
EDVS	**3** = 3 inlets **4** = 4 inlets **6** = 6 inlets **8** = 8 inlets	**16** = Fitting 1/16'' **LS16** = Lip Seal 1/16''* **08** = Fitting 1/8'' **LS08** = Lip Seal 1/8''* **V8** = VCR 1/8''	**OO** = ON/OFF **SBP** = Sample By-Pass **DBB** = Double Block and Bleed	**D** = Digital input **B** = BCD **S** = Serial command	**0** = ON/OFF **1** = Common **2** = Individual	**P** = Backside of the diaphragm purged **M** = Metalized diaphragm **I** = Inline **S** = SilcoNert 2000™ **D** = Dursan™ **HC** = Hastelloy® **TI** = Titanium **XX** = Custom **C** = Pre-conditioning

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*Patent Pending

*** 0= ON/OFF = When used with ON/OFF configuration
1= Common = One common port for all channels
2= Individual = One port for each channel

OPTION

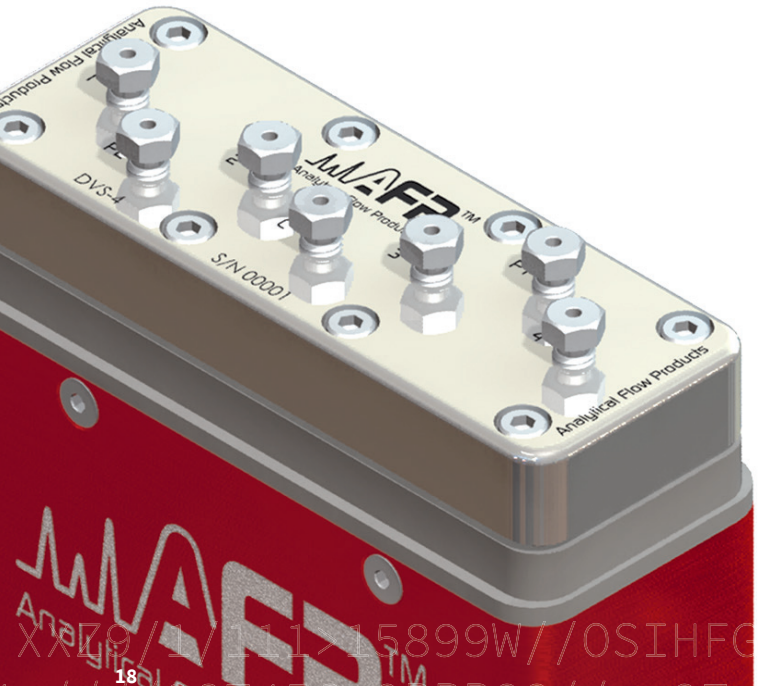
P = Backside of the diaphragm purged with extra purge ports on the sealing plate.

M = Metalized diaphragm.

I = Inline; this allows the possibility to put few valves in series.

S = SilcoNert 2000™ The ultimate passivation of treated surfaces. A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds & mercury. Greatly reduce moisture contamination, improve system performance and eliminates surface adsorption of active compounds on steel.

D = Dursan™ is a coating designed to improve the inertness, hardness, and corrosion resistance of stainless steel. Ideal for sulfur, H2S, mercaptan, ammonia and mercury sampling.



DIMENSION :
Refer to website afproducts.ca

APPLICATION EXAMPLES

Example with three DV3

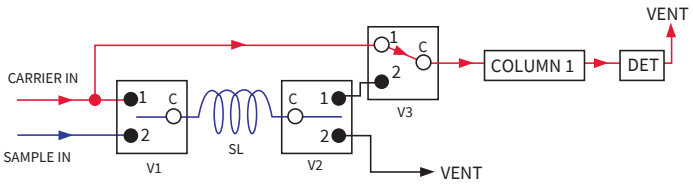


FIGURE 2A :
Step 1 - Sample isolated

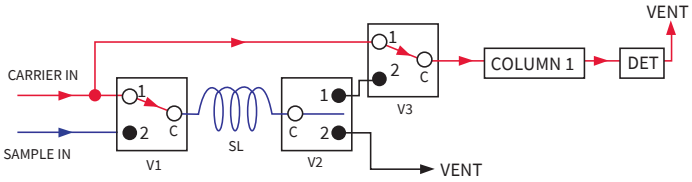


FIGURE 2B :
Step 2 - Sample injection into a simple column configuration with sample loop pressurization to carrier pressure

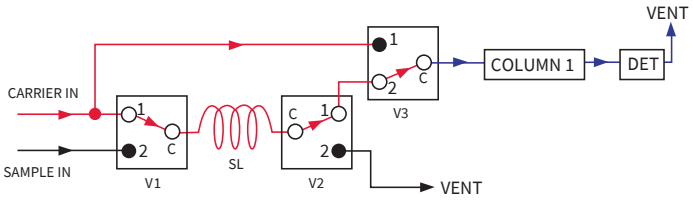


FIGURE 2C :
Step 3 - Sample injection into a simple column configuration with pressurized sampling loop injection

LEGEND:

C: INDICATE THE COMMON PORT
● VALVE PLUNGER DOWN, CLOSING THE PORT
○ VALVE PLUNGER UP, OPENING THE PORT

WARNING :
NOT TO BE USED IN LIFE SUPPORT EQUIPMENT WITHOUT FORMAL AGREEMENT OF AFP™.

Based on a specific valve configuration and working condition, warranty period and valve maintenance procedure (i.e. part replacement) are different. Please refer to Analytical Flow Products™ specific valve documentation for more information.

It is still the responsibility of the user to make sure that the selected valve configuration is safe and reliable for his application.

Analytical Flow Products engineering team will do their best to help customers for any application that may require custom modification. Analytical Flow Products will be please to supply demonstration parts to qualified OEMs.

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