

# DV DIAPHRAGM VALVE SERIES APPLICATION IDEAS



## A potpourri of liquid application using the DV series diaphragm valve

The unique feature of the DV series diaphragm valves makes them an excellent choice for liquid application. Their unique patented dynamic flow path eliminates problems related to dead volume and carry over. No inboard / outboard contamination, no friction allow extended lifetime compare to rotary design. Tight shut off port design give a tremendous level of sealing at high pressure. Sealing level is by far superior to rotary shear valve design. The intelligent electronic integrated drive makes integration work really easier. Each port is control independently allowing complex fluid control path to be done easily. Wide range of material valve head availability, port connection type, number and orientation allow then to retro-fit existing design base on rotary valves improving their performances with little effort and investment.

They found their use in HPLC application, auto-sampler system, syringe base pumps with higher pressure and life performance and many more other liquid control application.

### Application includes :

- CLINICAL DIAGNOSTICS
- GENOMIC
- SAMPLE PREPARATION / PURIFICATION
- PROTEINS SCIENCE SOLUTION
- DRUG DISCOVERY
- CELL BIOLOGY SOLUTIONS
- FORENSICS
- FLUIDIC AND MICROFLUIDIC CONTROL DEVICES

### EDV general description

\*Please see EDV brochures for complete description and option

The EDV series has the same flow configuration as the DV series. The only difference is the actuator. This one is based on miniature gear head motor. The EDV is available in 3 actuation configurations.

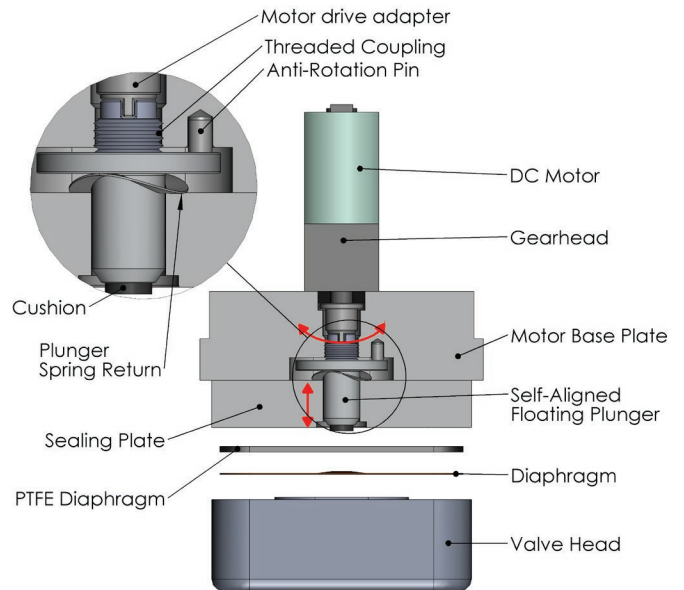
- 1 In its simplest form, the EDV may be supplied without any built in controller. The user has direct access to the valve motors.
- 2 The next level is the standard one. The EDV is supplied with minimal electronic circuit that allows control as a simple solenoid valve by using the digital control line or through serial RS-485 port.
- 3 The third configuration has a complete drive and microcontroller built-in into the valve assembly. It is possible to download switching event table and many other parameters.

The EDV moves away from the traditional electrically control solenoid valve. To get the same amount of performance, a solenoid valve will consume anywhere between 8 to 12 watts of power. It's a lot of power and heat generation when working with multiple channels system. The EDV is a diaphragm valve having a high level of port sealing, available with diaphragm purging option, eliminating diffusion and permeation. Ideal for high purity sampling.

## EDV actuation mechanism

The port closing or opening is done by controlling the power of a miniature DC motor gear head drive, as shown in Figure 1. When the power is applied to the motor, the output shaft of the gear head rotates in one direction or the opposite, depending on applied voltage polarity. This shaft has a flat side, and it's inserted into the threaded coupling. The threaded coupling is free to move up and down on the shaft when it rotates. The threaded coupling transfers the rotational torque into a vertical displacement. Then it pushes on a self-aligned plunger. The plunger do not rotate, thank to the anti-rotation dowel pin.

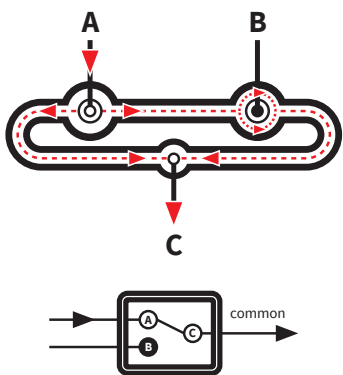
The other side of the diaphragm is facing the valve's seat. Pressing the diaphragm against the valve's seat shuts off fluid flow. Lifting it restores the flow. The plunger is self-aligned and free to move. When the threaded coupling is going up, the plunger will be lifted by the return spring, removing any force on the sealing diaphragm. This makes sure that there is no flow restriction when the valve port is fully open. Controlling the speed of the motor controls the speed of operation of the entire system. This allows valve operation in a controlled speed mode that could be advantageously used to control the rate of rise of pressure or flow of a system.



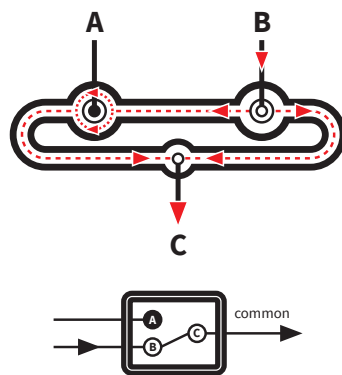
**FIGURE 1 :**  
Mechanical assembly

## Flow path

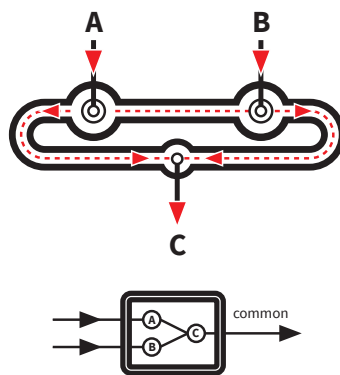
The unique patented flow path make sure that there is no dead volume effect, eliminating the carry over problem. There is always a flow around a closed port. The Fluid could be set to flow from or into a port. Pressure drop is extremely low. The independently controlled port make easy to wash the internal channel.



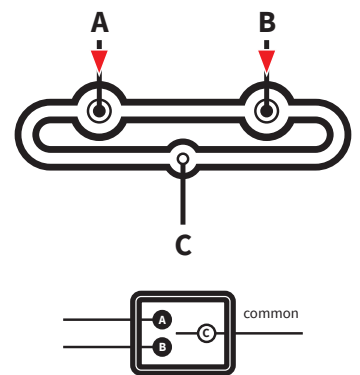
**FIGURE 2A :**  
Port A open and B closed



**FIGURE 2B :**  
Port A closed and B open



**FIGURE 2C :**  
Both ports open

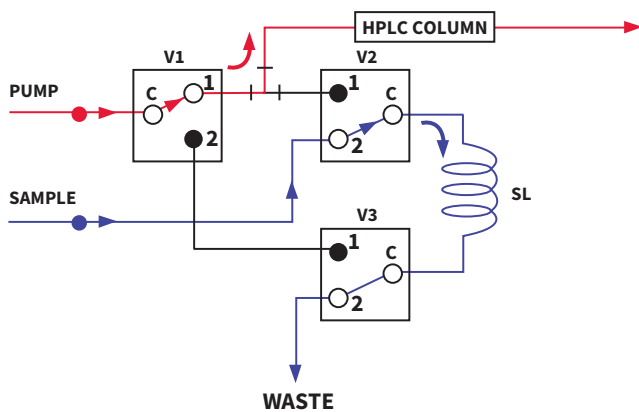


**FIGURE 2D :**  
Both ports closed

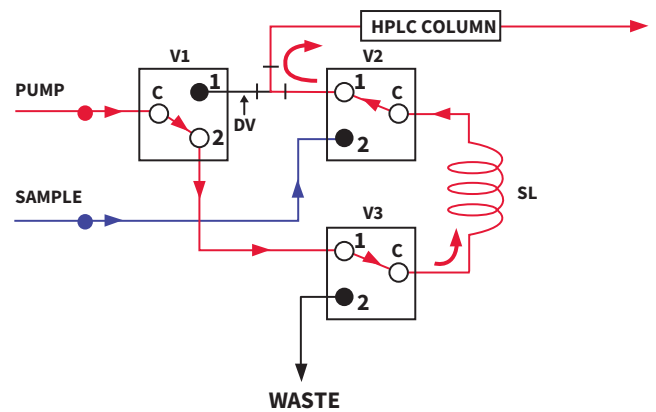
Here some ideas of applications.

# Typical HPLC application

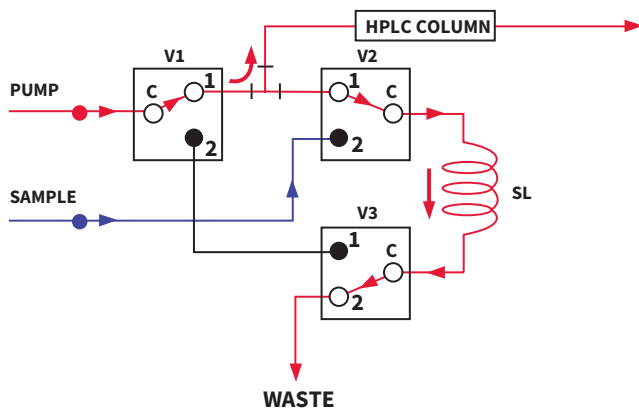
## Sample loop injection / backwash



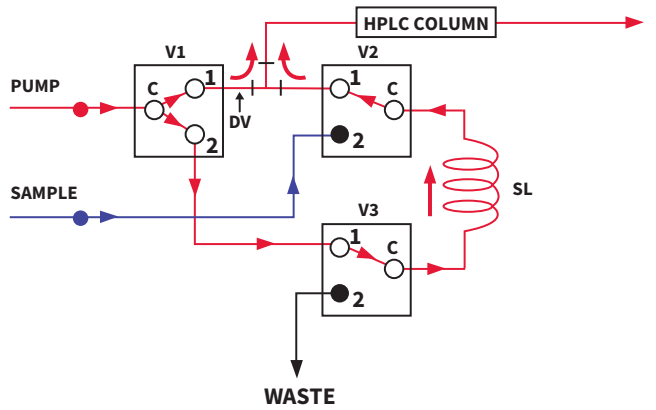
**A** - SAMPLE FLOWING THROUGH SAMPLING LOOP



**B** - SAMPLE LOOP INJECTION



**C** - SAMPLING LOOP CLEANING OR FLUSH

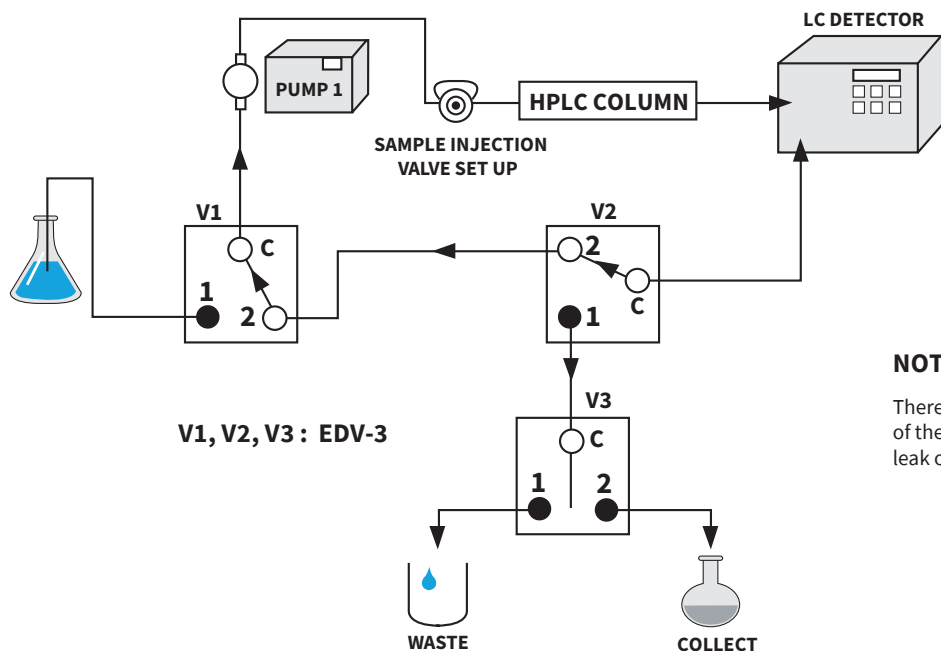


**D** - ALTERNATE FLOWPATH SAMPLE INJECTION FOR DEAD VOLUME CANCELLATION EFFECT. HERE THE SECTION DV IS SWEEPED.

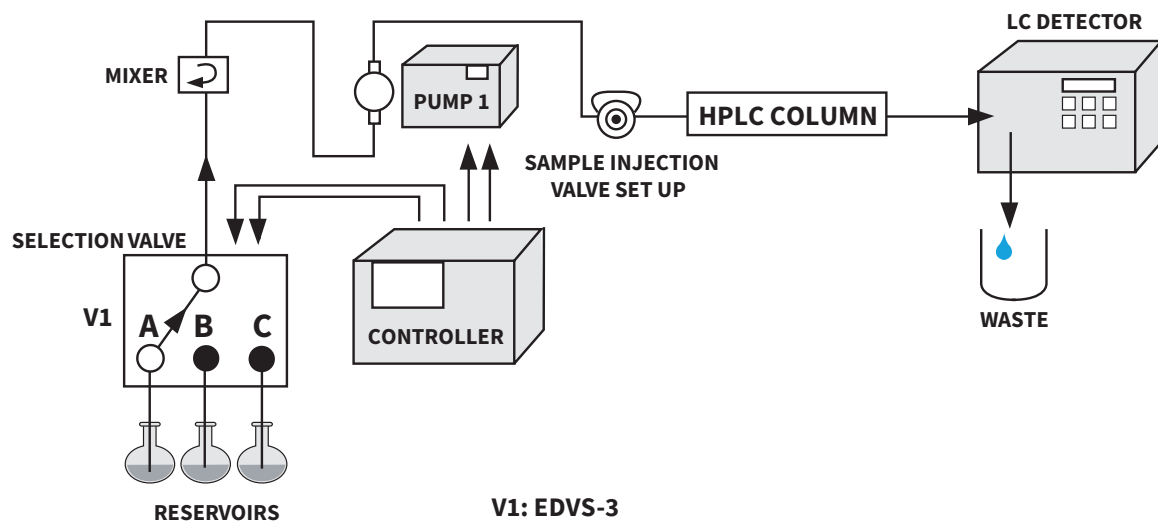
### TIP :

This LC sample injection use only 3 valves. However such configuration create an unswept dead volume upon sample injection. This dead volume is show in fig. B and identified as DV. Such dead volume may cause peak tailing base on HPLC system operating parameters. If your system fall in this categorie, an alternate sample injection as show in fig. D may be considered. By opening both ports of V1 at sample injection, the DV section is also swept.

## Liquid application, shave / recycle system

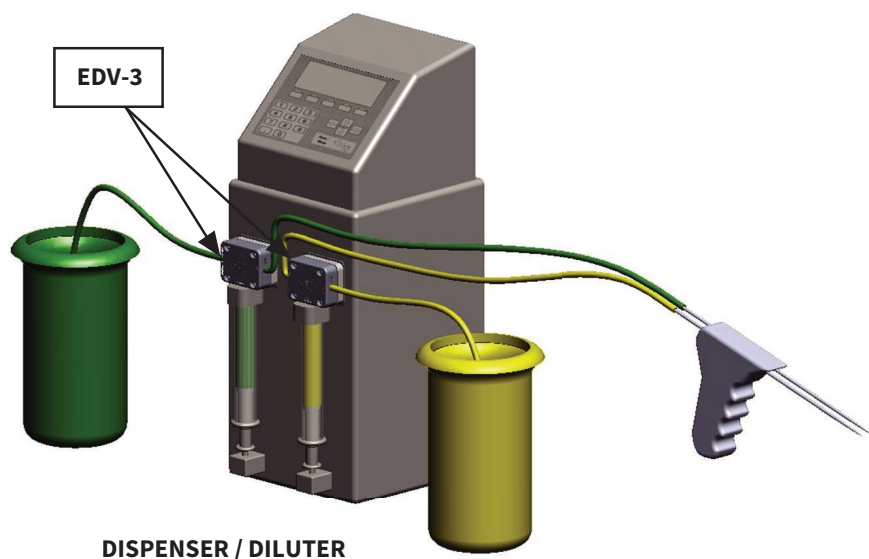


## Liquid application / proportioning valve gradient system

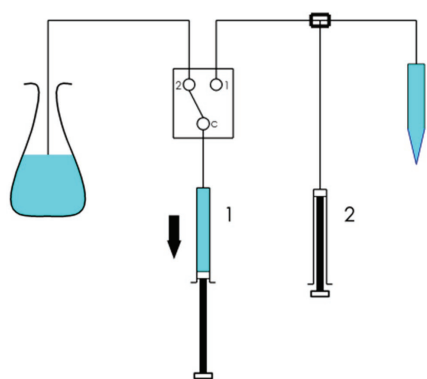


# Automation of syringe application

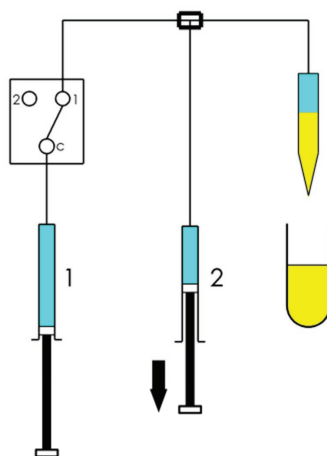
All the application shown below are done with an EDV-3.



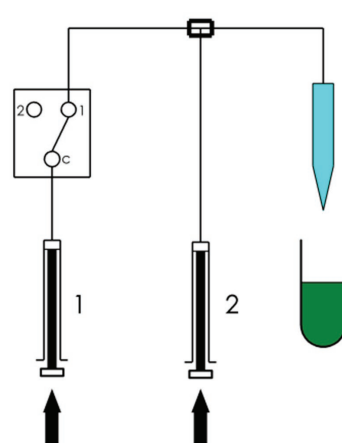
## Sample dilution



**A - FILL THE SYRINGE 1 WITH DILUTING SOLUTION**

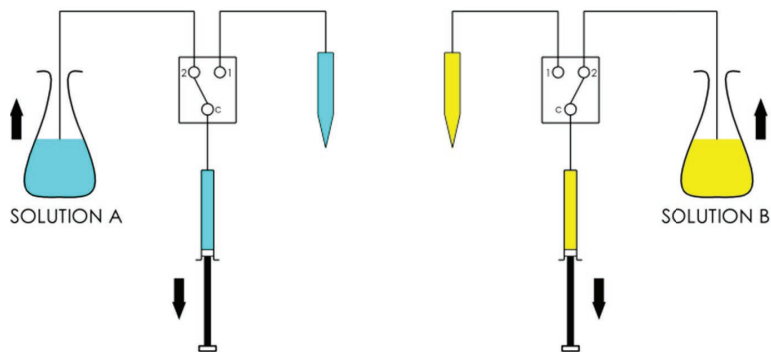


**B - ASPIRATE SOME AMOUNT OF SAMPLE WITH SYRINGE 2**

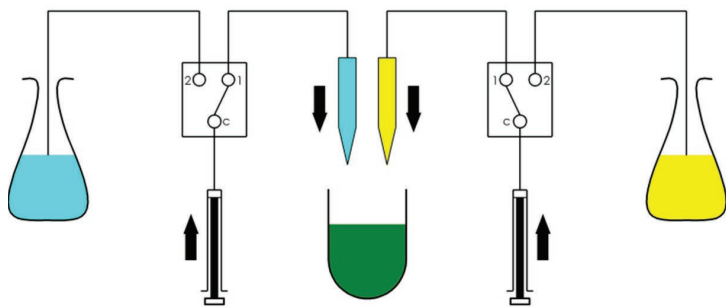


**C - LOAD VIAL WITH SAMPLE AND DILUTING SOLUTION**

## Reagent dilution

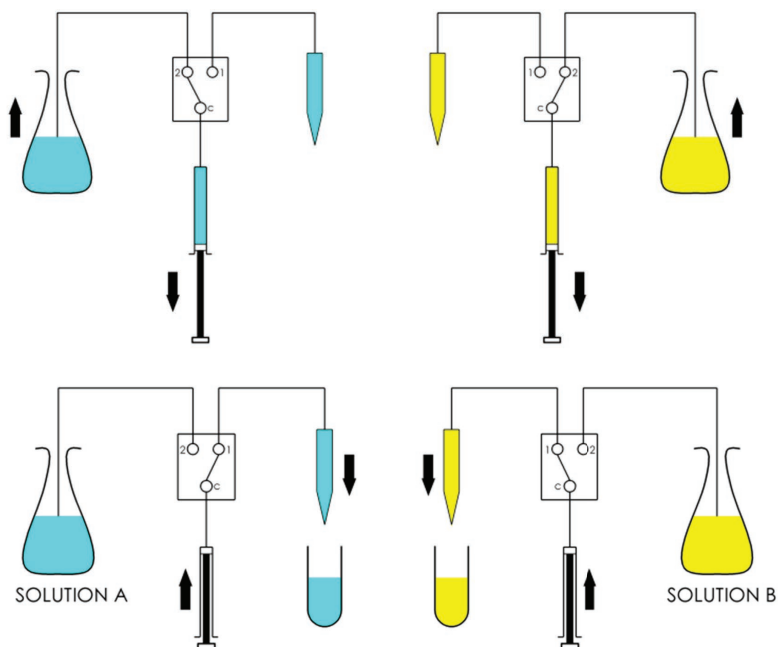


**A** - LOAD SOLUTION A AND B  
IN THEIR RESPECTIVE SYRINGE.

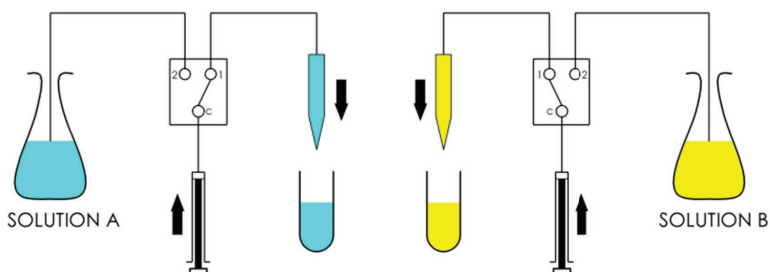


**B** - ADDITION OF SOLUTION A AND B TO A  
COMMERCIAL OR RESERVOIR.

## Simple dispense of solution

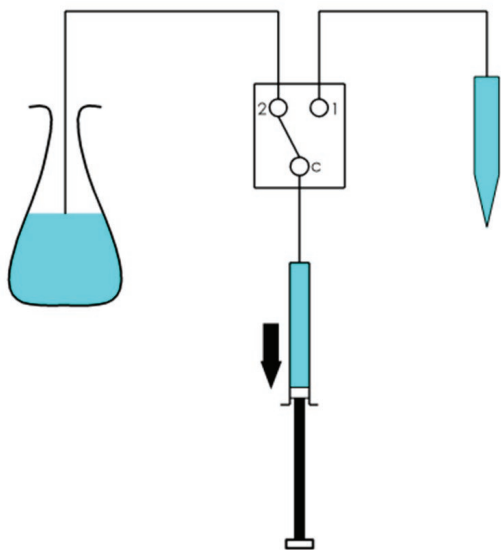


**A** - DISPENSE PRECISE AMOUNT OF  
REAGENT INTO VIALS.

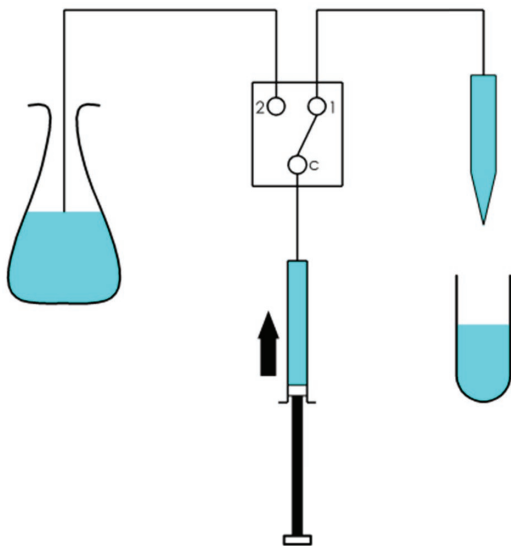


**B** - DISPENSE PRECISE AMOUNT OF  
REAGENT INTO VIALS.

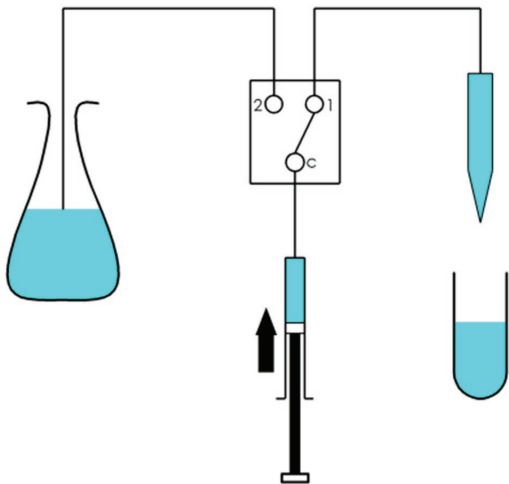
Aliquot dispense



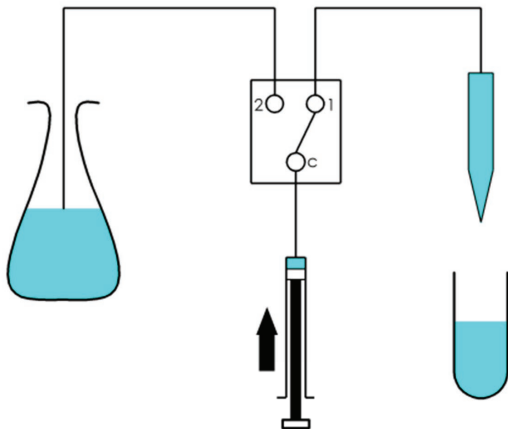
A - FILL IN THE SYRINGE



B - REPETITIVE DISPENSE OF FIXE VOLUME



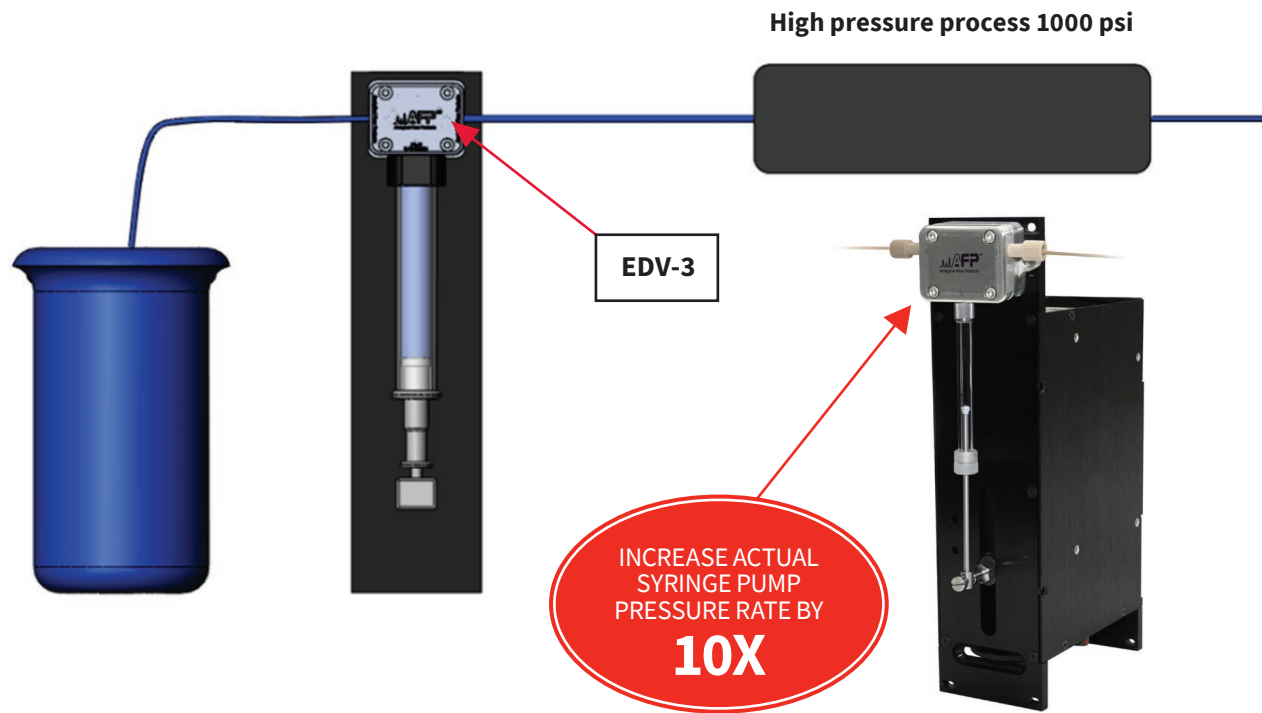
C - REPETITIVE DISPENSE OF FIXE VOLUME



D - REPETITIVE DISPENSE OF FIXE VOLUME



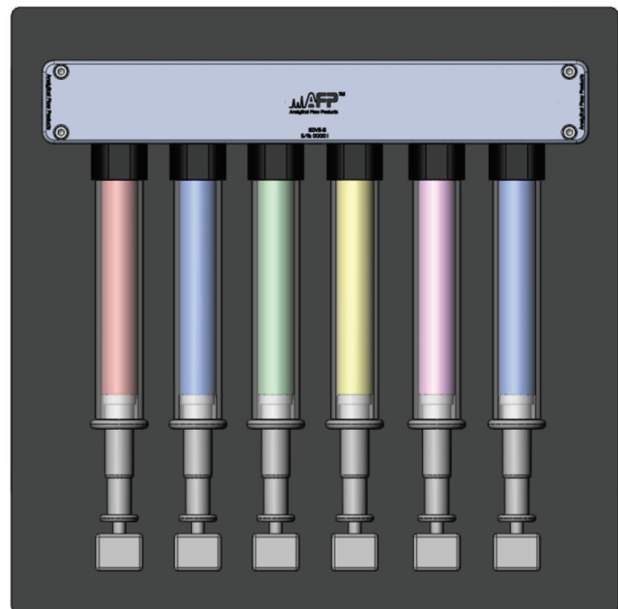
## High pressure syringe pump



## Multiple channel syringe pump

EDV-6  
1 common port  
6 controlable  
Syringe ports

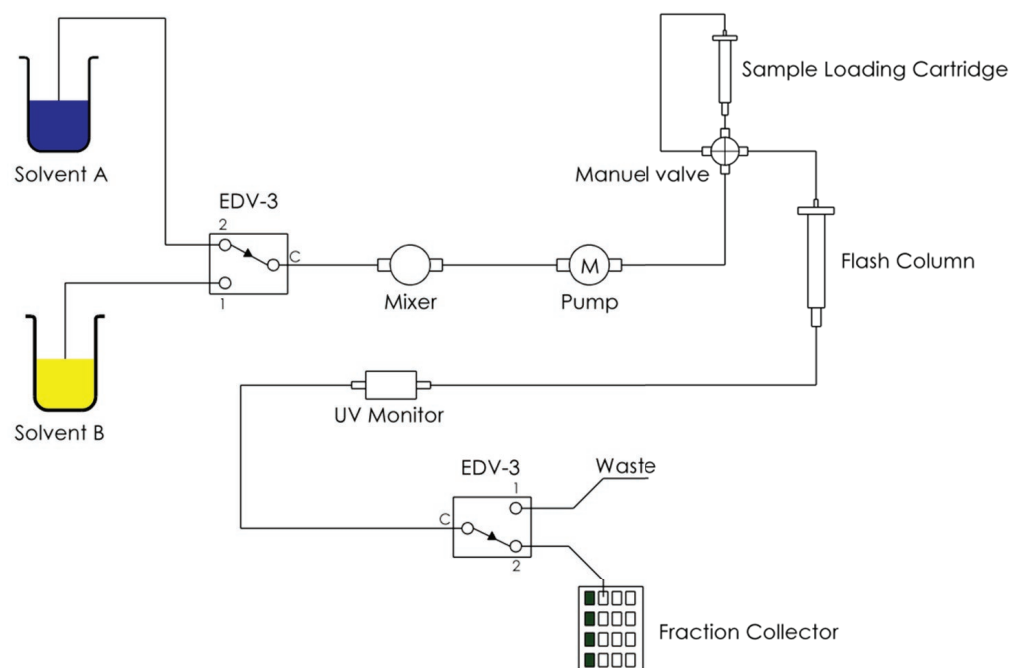
- PRECISE AND PULSATION-FREE DOSING OF FLUIDS.
- EASY WASHING CYCLE, ELIMINATING CARRY OVER.



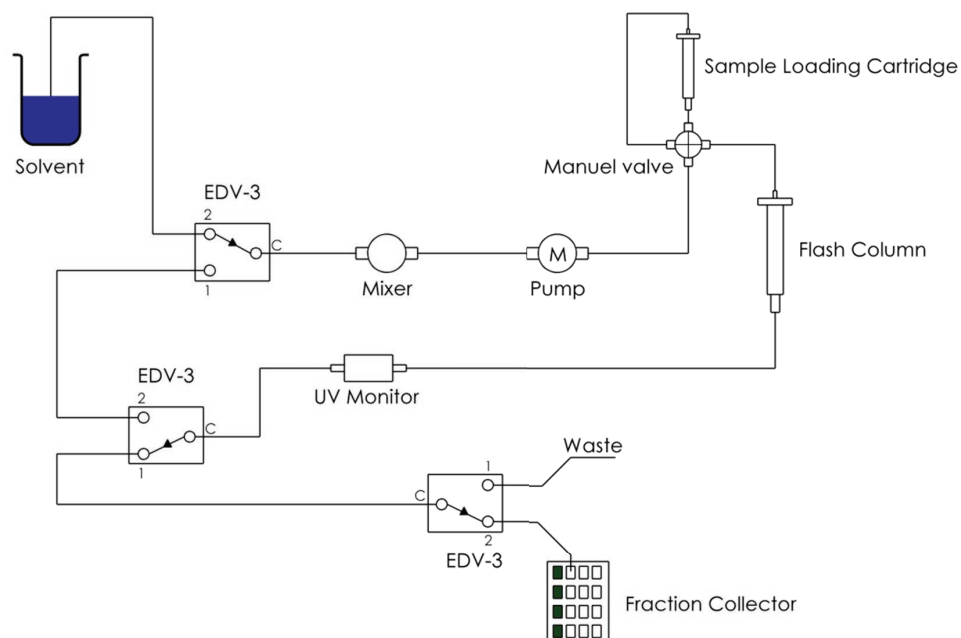


# Fluidic automation

## Purification system



## Purification recycle system



## Purification enhanced system

