PreDyne® specializes in made-to-order fluidic systems and valves. Our area of expertise is to accurately understand an OEM's requirements, develop smart design solutions, and build an application specific system.

The Gems™ PreDyne® Valve Resource Guide is designed to aid your search for the correct valve or fluidic system that meets your exact specifications. It is conveniently organized into three main sections:

- Solenoid Valves
- Manifold Assemblies
- Fluidic Systems

If at any time, you have a question or simply want to give us your requirements and have Gems Sensor and Controls design your valve or system, please contact us at 888-840-1230 or email us at valveinfo@gemssensors.com.

Use the ADS

An application data sheet (ADS), located on the last page of this resource guide, will help you select performance criteria and options.
Fax it directly to a Gems PreDyne Engineer at 860-827-0223 or use the Valve Builder at www.gemssensors.com.

Valve Selection

The three steps described in this section will help you identify the performance criteria needed to meet your application requirements and select the right valve.

Step 1.

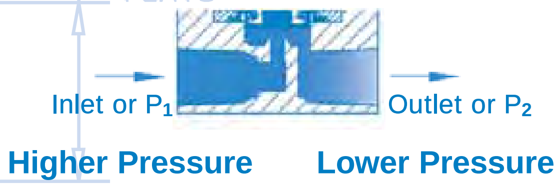
Calculating C_V and Valve Function

Begin by calculating the valve flow coefficient, or C_V, using: operating pressure differential; flow rate for your application; Specific Gravity; and in some circumstances, temperature.

If you already know your C_V and valve function, please go directly to Step 2 and identify a valve series, or contact us at 888-840-1230 or valveinfo@gemssensors.com.

C_V combines the effects of all flow restrictions in the valve into a single number. C_V represents the quantity of water, at 68°F and in gallons per minute (GPM) that will flow through your valve with a 1psi pressure differential. C_V can also be calculated for gases, as shown by the calculations on page two.

Pressure Differential



(Figure 1) Pressure differential is the difference between the inlet and outlet pressures.

Specific Gravity (SG) for liquid is the ratio of the density, or specific weight of the liquid, relative to that of water. Similarly, the SG for gas is the ratio of the density, or specific weight of the gas, relative to that of air. The SG of your media is important in calculating C_V because it directly correlates to the flow rate through your valve.

Temperature is not included in the C_V calculation for non-compressible fluids (liquids) and is only used in determining SG. Conversely, because gases are compressible, temperature (T) has a greater effect on volume and therefore is included as a separate variable in gas C_V calculations.

Valve Selection

Liquid Flow

Because liquids are incompressible, their flow rate depends only on the difference between the inlet and outlet pressures (P1 - P2 or ΔP, pressure differential).

The C_V of any valve flowing liquid media can be determined with the following equation:

$$C_v = \frac{V}{\sqrt{\frac{\Delta P}{SG}}}$$

Where:
C_V = Valve flow coefficient
V = Flow rate in GPM
ΔP = Pressure differential (PSID)
SG = Specific Gravity

An example using water at 68° F:

V = 3.08 GPM
P1 = 100 PSI
P2 = 40 PSI
SG = 1

$$C_v = \frac{3.08}{\sqrt{\frac{100-40}{1}}} = .3$$

For help calculating your C_V, please contact a Gems™ PreDyne® engineer at 888-840-1230 or valveinfo@gemssensors.com.

Gas Flow

Since gases are compressible fluids there are two separate equations for high and low-pressure differential flow.

Low-pressure differential flow is when $P_2 > \frac{P_1}{2}$ and the following equation is used.

$$C_v = \frac{V}{16.05\sqrt{\frac{(P_1^2 - P_2^2)}{(SG)\ T}}}$$

High-pressure differential flow is when $P_2 \leq \frac{P_1}{2}$ and the following equation is used.

$$C_v = \frac{V}{13.61\ P_1\sqrt{\frac{1}{(SG)\ T}}}$$

Where:
C_V = Valve flow coefficient
V = Flow rate in SCFM
P1 = Inlet pressure in PSIA
P2 = Outlet pressure in PSIA
SG = Specific Gravity
T = Temperature of gas in Degree Rankine

16.05 and 13.61 are constants used in gas flow equations

An example using air:

V = 10 SCFM
P1 = 20 PSIG = 34.7 PSIA (20 + 14.7)
P2 = 0 PSIG = 14.7 PSIA (0 + 14.7)
SG = 1
T = 72° F = 532° Rankine (72 + 460)

Since this is high-pressure differential flow (14.7 ≤ 34.7 / 2), we use the following equation.

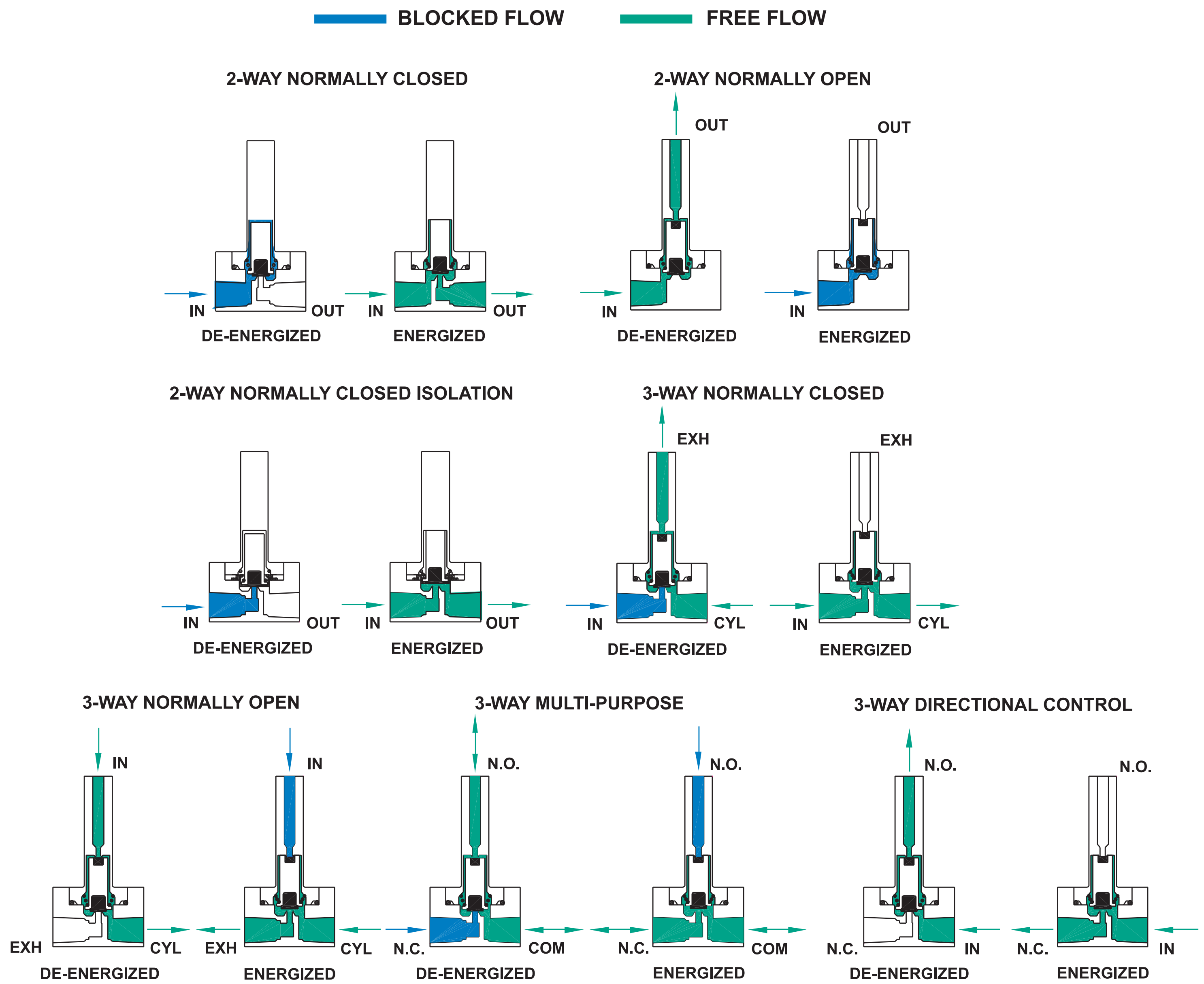
$$C_v = \frac{10}{13.61 \cdot 34.7\sqrt{\frac{1}{(1)\ 532}}} = .49$$

Again, for help calculating your C_V, please contact a Gems PreDyne engineer at 888-840-1230 or valveinfo@gemssensors.com.

Valve Selection

Identify how your valve will function in your application. Pick from the following:

VALVE FLOW SCHEMATIC



If you don't see what you're looking for, or have a question, contact us at 888-840-1230 or valveinfo@gemssensors.com.

An important note regarding C_V and valve function:

The C_V calculated will apply to either the Body Orifice or the Stop Orifice depending on the valve's function.

For example, the Stop Orifice for a 3-way normally closed valve, when de-energized, is the exhaust port. In other words, C_V is calculated using the specific Inlet Pressure (P1) and Outlet Pressure (P2) for the flow paths described in the Figure 2.