SIZING CALCULATOR GUIDE

BEFORE YOU BEGIN...

To use Kimray's Sizing Calculators, you will need to **gather the condition details for your valve**. If you are an OEM or Supply Store, your end user should have this information available.

If you aren't sure about some of your condition details, we have listed several standard Specific Gravity ranges, as well as some other tips in this guide.

A great benefit that our sizing calculator provides is the ability to save your calculations, including labels, conditions, and results. To save your calculation results, you'll **need a Kimray.com account**. Be sure to set up an account if you'd like to save your results for later.

REQUIRED GAS CONDITIONS

- Gas Specific Gravity
- Flowing Temperature
- Critical Flow Factor (Cf)
- Upstream Pressure
- Downstream Pressure
- Flow Rate or Valve Flow Coefficient (Cv)

REQUIRED LIQUID CONDITIONS

- Liquid Specific Gravity
- Critical Flow Factor (Cf)
- Upstream Pressure
- Downstream Pressure
- Flow Rate or Valve Flow Coefficient (Cv)

Extended only:

- Critical Point Pressure
- Vapor Pressure

REQUIRED GLYCOL CONDITIONS

- Glycol/Water Content (gal/lb)
- Allowable Water Content (lb/MMCF)
- Gas Temperature
- Gas Contactor Pressure
- Gas Flow Rate

Does Temperature affect my sizing?

While temperature doesn't significantly affect the sizing of the valve, it is still good information to have when selecting your valve. Depending on what your flowing temperature is, you may want to use certain elastomers.

The flowing temperature is application-specific. Certain processes, valves, or location of valves can affect the flowing temperature. If you don't know the flowing temperature, use close to ambient air temperature.

What is my Specific Gravity?

Specific Gravity is the ratio of a substance's density compared to water. For example, substances with a Specific Gravity lower than 1 (water's Specific Gravity) will float in water.

- Water: 1
- Condensate: .6
- Crude Oil: .79 - .86
- Natural Gas: .6 - .75
- Glycol: 1.038 - 1.125

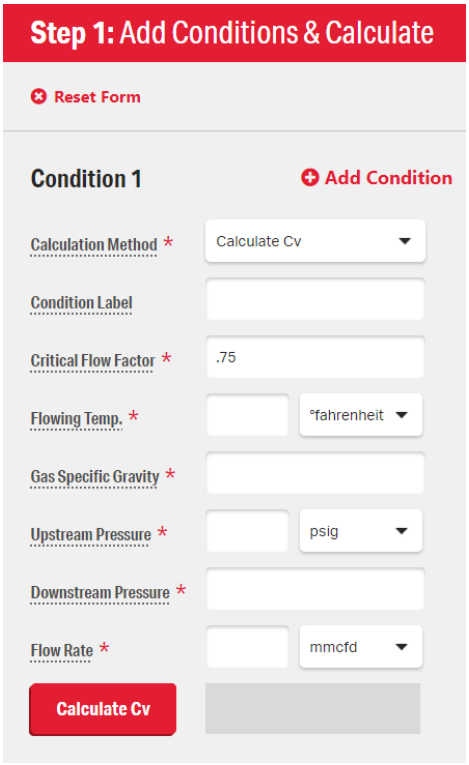
Which Sizing Calculator should I use?

- **Gas** – used to size valves for use in gas production
- **Liquid** – used to size valves for use in oil production
- **Liquid Expanded** – used to size valves with a much higher degree of detail and precision.
- **Glycol** – used to size glycol pumps for use in dehydration applications

STEP-BY-STEP INSTRUCTIONS

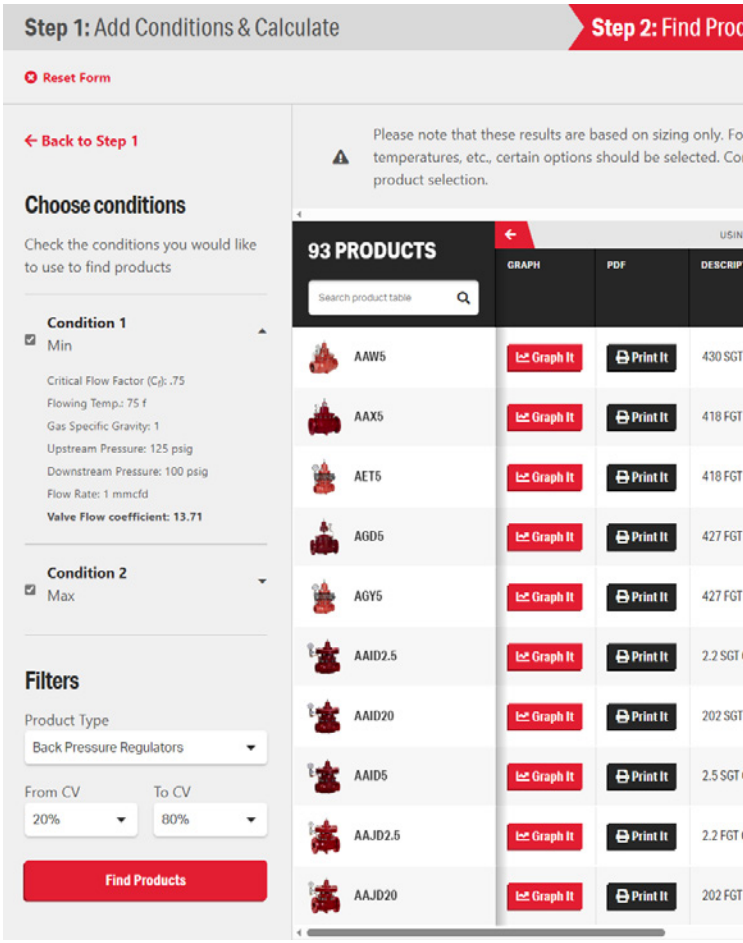
Step 1: Add Conditions & Calculate

1. Gather your condition details.
2. Select your Calculation Method: Cv or Flow Rate. The process for calculating these will differ slightly.
3. Input your condition details.
4. When ready, click Calculate Cv (or Flow Rate) to generate your results.
5. Once you have your calculation results, you can either proceed to Step 2, or you can save your calculations first.
6. To save your calculation results, you will first need to **create a Kimray.com account**. The saved results include all of your labels and condition details, as well as the calculation result. You can use the saved results to quickly load conditions that you've already calculated.



Step 2: Find Products

1. Select the Conditions you want to use in your product search. All conditions are checked by default.
2. Select the Product Type.
3. Adjust the Cv ranges if needed. For general purpose or liquid applications, we recommend the 20% - 80% range at as close to 50% of the valve's stem travel as possible. This will allow wiggle room for any change in flow rate or pressure in a gas application. For throttling gas control or flow control, we recommend the 40% - 60% range.
4. Click Find Products.
5. Use the filters and scroll buttons on the search results to narrow down by connection size, body type, trim type, set point pressure, and more. You can also use the results search bar to find a particular product code or product description.
6. Scroll to the far right of the filters to find a Cv chart for each product. Using your calculation results, look for a valve that fits within your desired Cv range.
7. Once you have chosen a valve, you can save its details using the Print or PDF actions.



If you're not able to find a valve that fits your need, please **reach out to our Product Support team** for assistance.

CHOOSING A PRODUCT

What Trim Type should I use?

- **Equal Percentage** valve trim is used to control pressure or flow of gases and vapors in throttling applications. This trim type can also be used with liquid dump valves - specifically in our larger valves and interface control. We typically recommend a Cv range of 40-60% for this trim.
- **Nominal, or Linear,** valve trim is used for throttling liquids, liquid level control, and in applications where water hammering has been an issue. We typically recommend a Cv range of 20-80% for this trim.
- **Snap, or Quick-Opening**, valve trim opens quickly and is used for on/off service. Primary applications include liquid dump and liquid measurement. We also offer zirconia and carbide seats for erosive applications. We typically recommend a Cv range of 20-60% for this trim.

What Trim Material should I use?

- **316 Stainless Steel** – 316 Stainless Steel is a popular grade of steel that is effective in corrosive conditions.
- **D2 Steel** – D2 Steel is an air hardening, high-carbon, high-chromium tool steel. It offers high wear resistance and mild corrosion resistance. This is the standard trim material used in many Kimray valves.
- **17-4PH** – 17-4PH is a precipitation hardening stainless steel that is used when high strength or corrosion resistance is needed.
- **Tungsten Carbide** – Tungsten Carbide is a hard metal we may recommend using for valve trim during flowback.
- **Zirconia** – Zirconia is designed specifically for highly abrasive oil and gas applications, such as flowback. It offers a combination of abrasion and corrosion resistance not found in steels or alloys.

For more information about trim types and materials, check out our **Valve Trim Type Guide**.

What Elastomers should I use?

- **Nitrile** is a synthetic rubber and is also known as Buna-N or Buna. This material is good for most applications with a typical amount of wear and corrosive elements in the production flow. This is the standard elastomer used in many Kimray valves.
- **Highly Saturated Nitrile (HSN)** is a special class of nitrile with more chemical resistance, thermal stability, and greater tensile strength. It is resistant to a variety of elements, such as petroleum oils, sour gas, low levels of H2S, and more. It also provides excellent resistance to methanol injection. Look for a product code that ends in "HSN" to find a valve outfitted with Highly Saturated Nitrile.
- **Viton** is a type of fluoroelastomer (FKM). Viton is a great option primarily for higher operating temperatures. However, you will want to avoid hot water or steam applications. Look for a product code that ends in "V" to find a valve outfitted with Viton.
- **Aflas** is a type of fluoroelastomer (FKM). Aflas is highly resistant to a wide range of chemicals, acids, strong bases, amines, and steam. It has outstanding heat-resistance and excellent electrical insulation properties. Look for a product code that ends in "AF" to find a valve outfitted with Aflas.

For more information about elastomers, check out our **Elastomer Material Guide**.

NEED HELP?

Our Product Support team is available to assist with product selection and other questions.

- Mon - Fri, 7 AM - 5 PM CST
- (405) 525-4264
- prodtechsupport@kimray.com

EXAMPLE SCENARIOS

Scenario 1: Gas Sizing

A midstream company is looking to size a regulator for their 2-phase vertical separator to regulate the gas back pressure. They're looking for a low-pressure solution to help them regulate gas back pressure. The separator has a max working pressure of 300 with 2" threaded NPT connections.

Below are the normal operating conditions they are looking to match with a valve:

- Flowing Temperature: 110
- Gas Specific Gravity: .62
- Upstream Pressure: 140 PSI
- Downstream Pressure: 80 PSI
- Flow Rate: 1000 MCFD

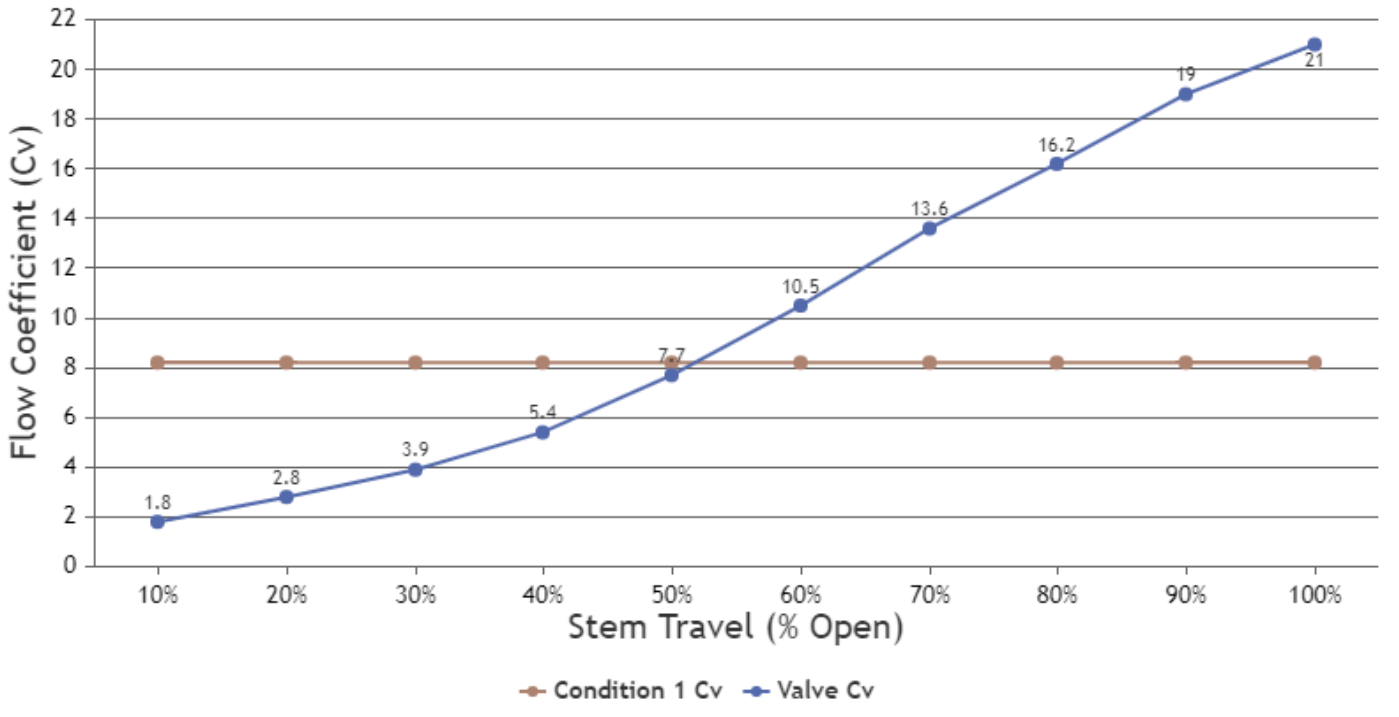
After running these conditions through the Gas Sizing Calculator, we get a calculated Valve Flow Coefficient (Cv) of **8.21**. We will use this calculated Cv to select our valve.

It is recommended that the calculated Cv be within 20%-80% of the valve's Cv, at as close to 50% of the valve's stem travel as possible. This will allow for wiggle room for any increase or decrease in flow rate or pressure in a gas application.

Based on these conditions, body connections, and the calculated Cv of 8.205 we can narrow down the results using filters to get an appropriate valve.

The **AAR5** would be the best fit since the calculated Cv is right at 50% of the valve stem travel.

1.8	2.8	3.9	5.4	7.7	10.5	13.6	16.2	19	21



Scenario 2: Liquid Sizing

An upstream company is looking to size a dump valve for their free water knockout to send oil to be further processed. They're looking for a low-pressure solution to help them dump the large volume of liquid.

This vessel has a max working pressure of 500 with 2" threaded NPT connections and would prefer an angle body valve to help with erosion.

Below are the normal operating conditions they are looking to match with a valve:

- Specific Gravity: 1.05
- Upstream Pressure: 400 PSI
- Downstream Pressure: 300 PSI
- Flow Rate: 150 GPM

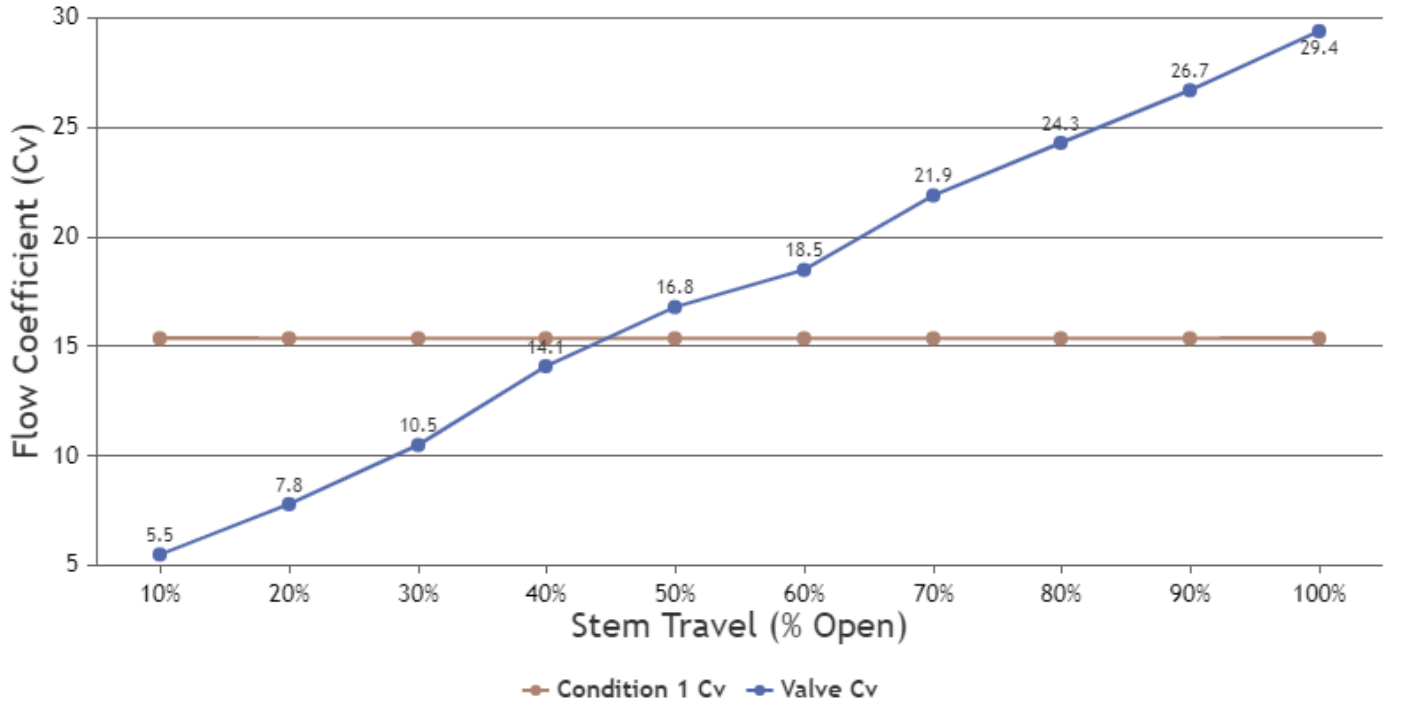
After running these conditions through the Liquid Sizing Calculator, we get a calculated Valve Flow Coefficient(CV) of **15.37**. We will use the calculated CV to pick our valve.

It is recommended that the calculated CV be within 20%-80% of the valve's CV at as close to 50% of the valve's stem travel as possible.

Based on these conditions, body connections, and the calculated CV of 15.37 we can narrow down the results using filters to get an appropriate valve.

The **MYA5** would be the best fit since the calculated CV is right at 50% of the valve stem travel.

5.5	7.8	10.5	14.1	16.8	18.5	21.9	24.3	26.7	29.4



APPENDIX

Allowable Water Content

Measured in pounds (lb) per MMCF (million cubic feet), this is the allowed amount of water in the production fluid.

Critical Flow Factor (Cf)

Defines how pressure will recover after it drops to its lowest point inside the control valve.

Downstream Pressure

The pressure of the fluid or gas after the valve. Also known as outlet pressure or P2.

Flow Rate

The volume of liquid or gas that moves through the valve during a set period of time.

Flowing Temperature

The temperature of the upstream fluid or gas while in the valve you're sizing for.

Glycol/Water Content

Measured in gallons per pound (lb), this is the ratio of glycol to water.

Glycol Circulation Rate

Generally, a glycol circulation rate of 3-5 gallons per pound of water to be removed is sufficient to adequately dehydrate the gas. However, if the glycol flow rate is too high, it can overwhelm the reboiler and you will lose efficiency.

Upstream Pressure

The pressure of the fluid or gas before the valve. Also known as inlet pressure or P1.

Valve Flow Coefficient (Cv)

A valve's capacity for a liquid or gas to flow through it. The larger the opening in a valve, the larger the Cv.

Pressure Measurements

- PSI – Pounds per square inch
- PSIA – Pounds per square inch absolute (includes atmospheric pressure, which is 14.7 psi)
- kPa - Kilopascal – Unit of measurement used in Europe and other areas that use the metric system
- kg/cm2 - Kilogram-force per square centimeter of natural gas. Metric equivalent of pounds per square inch (psi)

Flow Rate Measurements

- TCF – One trillion cubic feet of natural gas
- MMCF – One million cubic feet of natural gas
- BCF – One billion cubic feet of natural gas
- MCFM – One thousand cubic feet per minute of natural gas
- MCFD – One thousand cubic feet per day of natural gas
- MMCFM – One million cubic feet per minute of natural gas
- MMCFD – One million cubic feet per day of natural gas
- Bar – 100 Kilopascals. Slightly less than the average atmospheric pressure on Earth at sea level
- CFM – Cubic feet per minute of natural gas
- M3/h or CMH – Cubic meters per hour of gas or liquid
- M3/d - Cubic meters per day of gas or liquid
- GPM – Gallons per minute of liquid
- BBLD – Barrels per day of liquid
- GPH – Gallons per hour of liquid
- GPM – Gallons per minute of liquid
- L/h - Liter per hour of liquid
- L/m - Liter per minute of liquid