Data Sheet

Brooks® Cartridge Valve

Variable Area

Brooks Cartridge III Valve for Gas and Liquid Applications

Brooks Cartridge Valve

Overview

The Cartridge III Valve is a multipurpose valve, designed for gas and liquid flow applications. It is interchangeable with previous versions of Brooks valves.

These valves come in three different sizes — low, medium and high flow. The stem is conical tapered at the end and it has two orifice sizes that provide a wide choice of flow ranges for all models. A Teflon piece is crimped into the valve body which gives better setability, repeatability and feel of operation.

Product Features

- Eight turns open-to-close
- Large knob
- Excellent setability and repeatability
- Rugged design
- Interchangeability - For use with all Brooks purgemeters

Product Specifications

Specifications	Brooks Cartridge Valve
Capacities	See Capacity Tables
Maximum Operating Pressure*	2000 psi (138 bar)
Maximum Operating Temperature*	400°F (200°C)
Dimensions	See Dimensions Figure
Materials of Construction:	
Valve Body and Stem	316 Stainless Steel
Orifice	PEEK Arlon® 1126 15% glass filled
Valve Ring	Teflon® (PTFE)
O-Rings	Standard: Viton® fluoroelastomers; Optional: Buna, Kalrez®, EPR, Teflon®, Butyl
Knob	Phenolic (Thermoset)

* These ratings are for the cartridge valve only. The valve rating shall supersede any higher equipment rating. A lower equipment rating shall supersede the valve rating.

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Product Specifications (Continued)

Capacity Table (United States Customary Units)

Valve	Max.Capacity		
Size	Air** (slpm)	Water** (lpm)	Cv
Low	5.7	0.176	0.015
Medium	19.7	0.712	0.050
High	75.6	2.04	0.193

** Capacities measured with 10 psig supply and atmospheric pressure exhaust.
Flow capacities will vary for different gases, liquids and pressures.
Standard temperature 70°F, standard pressure 14.7 psia.

Capacity Table (Standard International Units)

Valve	Max.Capacity		
Size	Air $m^3(n)/h$***	Water L/hr***	Kv
Low	0.34	13	0.012
Medium	1.2	51	0.044
High	4.6	147	0.167

*** Standard capacities measured with 1 barg supply and atmospheric pressure exhaust.
Flow capacities will vary for different gases, liquids and pressures.
Standard temperature 0°C, normal pressure 1.013 bar.

Specific Gravity Table for Gases

Gas	Specific Gravity Referred to Air at 70°F (SG)	Density (kg/m^3_n)
Acetylene	0.907	1.173
Air	1.0	1.293
Ammonia	0.587	0.771
Argon	1.38	1.784
Butane	2.07	2.593
Carbon Dioxide	1.529	1.977
Helium	0.138	0.178
Hydrogen	0.0695	0.090
Methane	0.554	0.717
Nitrogen	0.967	1.251
Oxygen	1.105	1.429
Propane	1.562	2.008
Sulfur Dioxide	2.264	2.858

Product Dimensions

OPEN: 1.38 IN. [35.1]
CLOSED 1.24 IN. [31.5]
.97 IN. [24.6]
3/4 [19] HEX
.75 IN. [19.1] DIA.

inch / [mm]
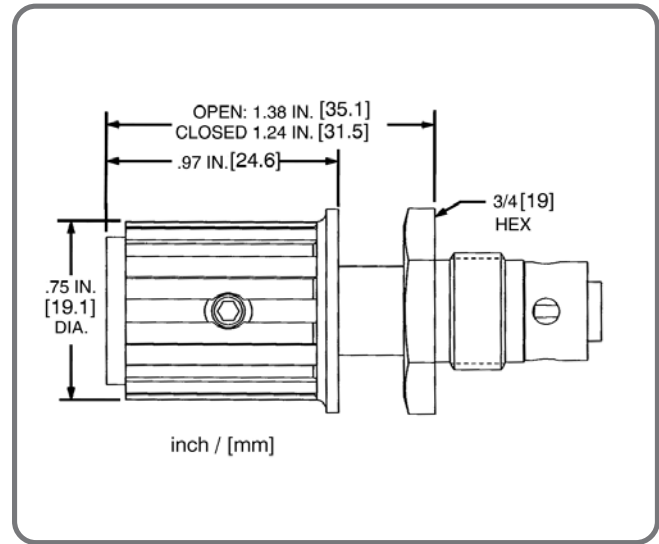
Cartidge Valve Sizing

GAS - United States Customary Units
The correct cartridge valve can be determined for any gas by using one of the formulas below:

1. Subcritical Flow Formula (when downstream pressure, P_2, is greater than the critical pressure P_C, or $P_1 < 2P_2$)

$$C_v = \frac{Q}{454} \sqrt{\frac{(SG) \times (T)}{P_1^2 - P_2^2}}$$

2. Critical Flow Formula (when downstream pressure, P_2, is less than the critical pressure P_C, or $P_1 > 2P_2$)

$$C_v = \frac{Q\sqrt{(SG) \times (T)}}{385 \times P_1}$$

Note: Critical pressure is equal to approximately 1/2 of the upstream absolute pressure. ($Pc = 1/2\ P_1$)

Where:
C_v = Valve flow coefficient
Q = Gas flow in slpm
SG = Gas specific gravity (See Specific Gravity Table)
T = Absolute temp. of flowing gas in °R (°F + 460)
P_1 = Upstream pressure (psia)
P_2 = Downstream pressure (psia)
P_c = Critical pressure (psia)

LIQUID - United States Customary Units
The correct needle valve can be determined for any liquid by using the formula below:

$$C_v = 0.264\ (Q) \sqrt{\frac{(SG)}{\Delta P}}$$

Where:
C_v = Valve flow coefficient
Q = Liquid flow (slpm)
ΔP = Pressure drop (psi)
SG = Liquid specific gravity

GAS - Standard International Units
The correct cartridge valve can be determined for any gas by using one of the formulas below:

1. Subcritical Flow Formula (when downstream pressure, P_2, is greater than the critical pressure P_C, or $P_1 < 2P_2$)

$$K_v = \frac{Q_{max}}{514} \sqrt{\frac{density\ (T)}{DP\ (P_2)}}\ 2.$$

Critical Flow Formula (when downstream pressure, P_2, is less than the critical pressure P_C, or $P_1 > 2P_2$)

$$K_v = \frac{Q_{max}}{257(P_1)} \sqrt{density\ (T)}$$

Where:
K_v = Valve flow coefficient
Q_{max} = Gas flow (m^3_n/h)
Density = Gas density (kg/m^3_n) (See Specific Gravity Table)
T = Absolute actual operating temp. °K (°C + 273)
P_1 = Upstream pressure (bar abs)
P_2 = Downstream pressure (bar abs)
ΔP = Pressure drop (bar)

LIQUID - Standard International Units
The correct cartridge valve can be determined for any liquid by using the formula below:

$$K_v = (Q_{max}) \sqrt{\frac{(density)}{\Delta P(1000)}}$$

Where:
K_v = Valve flow coefficient
Q_{max} = Liquid flow (m^3/h)
D = Fluid density (kg/m^3)
ΔP = Pressure drop (bar)

Brooks Service and Support

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.
Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required. For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users, and maintenance persons.
Please contact your nearest sales representative for more details.

Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

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