# Extending Orifice Flow Data

## EXTRAPOLATION

## 1. Specific Gravity

### Other Gases

To convert air flow from chart to another gas flow.

Flow (gas) = Flow (air) / $\sqrt{\text{S.G.}}$ (gas)

***EXAMPLE:***
To obtain flow rate for helium when air flow is 5 SCFH

Flow (Helium) = Flow (air) / $\sqrt{.138}$

= 5 / .371 = 13.48 SCFH

S.G. = specific gravity of gas relative to air
S.G. = .138 for Helium

| Gas | Specific Gravity[1] | Chart Multiplier[2] |
|---|---|---|
| Air | 1.0 | 1.0 |
| Argon | 1.379 | .852 |
| Carbon Dioxide | 1.53 | .809 |
| Helium | .138 | 2.68 |
| Hydrogen | .0696 | 3.79 |
| Methane | .554 | 1.34 |
| Natural Gas | .61 | 1.28 |
| Nitrogen | .972 | 1.01 |
| Oxygen | 1.1053 | .95 |
| Propane | 1.56 | .80 |

Note 1 Specific gravity relative to air @ 70°F, 14.7 psia

Note 2 To obtain the flow of gases other than air, multiply the air flow values on the charts on pages 20, 21 and 22 by the chart multiplier.

## 2. Pressure – Air Flow

### High Pressure Extrapolation

To calculate flow rates at pressures higher than those on the charts, use the following formula.

$$Q_{HP} = Q_{80} \times \frac{P_{HP} + 14.7}{94.7}$$

$Q_{HP}$ = Flow at elevated pressure (above 80 psig.).
$Q_{80}$ = Chart flow reading at 80 psig.
$P_{HP}$ = Elevated pressure in psig.

***EXAMPLE:***
To calculate the flow for the No. 16 metal orifice at 150 psig supply pressure.

$$Q_{HP} = 17.9 \times \frac{150 + 14.7}{94.7} = 31.13 \text{ SCFH}$$

↑ (from chart)

### Low Pressure Extrapolation

To calculate flow rates at pressures lower than those on the charts, use the following formula.

$$Q_{LP} = Q_5 \sqrt{\frac{P_{LP}^2 + 29.4\, P_{LP}}{13.12}}$$

$Q_{LP}$ = Flow at the low pressure (below 5 psig.)
$Q_5$ = Chart flow reading at 5 psig.
$P_{LP}$ = Low pressure in psig.

***EXAMPLE:***
To calculate the flow at a supply pressure of 0.5 psig. for the No. 16 metal orifice.

$$Q_{LP} = 3.26\sqrt{\frac{0.5^2 + 29.4\,(.5)}{13.12}} = 0.96 \text{ SCFH}$$

↑ (from chart)

## 3. Temperature Effects

### Air Flow

The flow of gases through an orifice varies inversely as the absolute temperature. As the gas temperature rises and the gas density decreases, the mass flow rate also decreases.

To extend the chart data on pages 20-22 for air flow, use the following formula.

$$Q_T = Q_S \sqrt{\frac{T_S}{T_T}}$$

Where:
$T_S$ = standard absolute temperature °R (°R = 460 + °F).
$T_T$ = non standard absolute temperature °R.
$Q_S$ = flow from chart at 70°F = 530°R.
$Q_T$ = flow at a different temperature.

***EXAMPLE:***
At 70°F and an inlet pressure of 25 psig the No. 60 (.060" dia.) orifice has a flow rate of 52.8 SLPM (see page 21). Under similar conditions, the air flow rate at 300°F is

$$Q_T = 52.8 \sqrt{\frac{530}{760}} = 44.09 \text{ SLPM}$$

## 4. Other Orifice Sizes

### Air Flow

To calculate the required diameter of an orifice that is not included in the charts on pages 20-22 use the following formula. The equations are based on data taken for the size no. 60 (.060" dia.) orifice.

$$d_L = .060 \sqrt{\frac{Q_L}{Q_{60}}} \text{ in. dia.}$$

Where:
$d_L$ = diameter of the unknown orifice.
$Q_L$ = flow through the unknown orifice.
$Q_{60}$ = flow from chart on pages 20-22.

***EXAMPLE:*** (data from page 21)
At supply pressure of 50 psig and outlet at standard conditions,

$Q_{60}$ = 87.4 SLPM (from chart)
Let:
$Q_L$ = 600 SLPM @ 50 psig

$$d_L = .060 \sqrt{\frac{600}{87.4}} = .157 \text{ in. dia.}$$

### Water Flow

Using the $C_V$ method for liquid flow, and using measured $C_V$ data we can derive the following formula to calculate required orifice sizes.

$$d_L = \sqrt{\frac{1}{22.5} \frac{Q_L}{\sqrt{\Delta P}}}$$

Where:
$d_L$ = diameter of unknown orifice (in.)
$Q_L$ = required flow (gpm)

***EXAMPLE:***
Flow rate required =
.5 GPM @ ΔP = 1.0 psi

$$d_L = \sqrt{\frac{1}{22.5} \frac{.5}{\sqrt{1}}} = .149\text{" dia.}$$

Also, to obtain the $C_V$

$$C_{VL} = \frac{Q_L}{\sqrt{\Delta P}} = \frac{.5}{1} = .5$$

$C_{VL}$ is the $C_V$ for the orifice with diameter = $d_L$.

## Conversion Factors

**A. Gas Flow**

SCFH - *standard cu. ft. per hour*
SLPM - *standard liters per minute*
SCCM - *standard cu. cm. per minute*

SCFH x .472 = SLPM
SCFH x 472 = SCCM
SLPM x 1000 = SCCM

***EXAMPLE:***

5 SCFH x .472 = 2.36 SLPM

**B. Liquid Flow**

GPM - *gallons per minute*
LPM - *liters per minute*
CCM - *cubic centimeters per minute*
CFH - *cubic feet per hour*
CFM - *cubic feet per minute*

GPM x 3.785 = LPM
GPM x 3785 = CCM
GPM x .1337 = CFM
GPM x 8.021 = CFH
CCM x .001 = LPM

***EXAMPLE:***

25 GPM x 3.785 = 94.625 LPM

**C. Pressure – Gases or Liquids**

PSIG - *pounds per sq. in. gage*
$Kg/CM^2$ - *kilograms per sq. cm*
KPA - *kilo pascals*
Bar - *unit of pressure equal to 1 atmos.*
In-$H_2O$ - *pressure produced by 1" $H_2O$*

PSIG x .0703 = $Kg/CM^2$
PSIG x 6.895 = KPA
PSIG x .0689 = Bars
PSIG x 27.68 = In. $H_2O$

***EXAMPLE:***

25 psig x 6.895 = 172.37 KPA

## Liquid Flow $C_v$ Method

**A. Water**

The $C_V$ method of rating flow capacity of various devices employs empirical data based on water flow. The basic formula for water flow is

$$Q = C_V \sqrt{\Delta P}$$

Q = flow in GPM
$\Delta P$ = pressure differential in psi
$C_V$ = flow factor

For a flow of 1 gpm at $\Delta P = 1$, the $C_V = 1$

To obtain the water flow rate through precision orifices use the above equation and obtain the $C_v$ value from the charts on pages 23, 24.

***EXAMPLE:***

Size Number 100 (.100" dia.) has a $C_V = .23$
For a 25 psig pressure differential:

$$Q = C_V \sqrt{\Delta P} = .23 \sqrt{25} = 1.15 \text{ GPM}$$

Selected flow data is also presented on pages 23, 24. The chart data assumes flooded conditions on both sides of the orifice. This is particularly important for orifices less than .020" diameter because of surface tension influences.

**B. Other Liquids**

For liquids other than water, the equation becomes:

$$Q = C_V \sqrt{\frac{\Delta P}{S.G}}$$

Where:
S.G. = Specific gravity of the liquid
(The specific gravity of water is 1.0)

To obtain the flow rate of an oil with S.G. = .85, use the above equation and obtain the $C_v$ value from the charts on pages 20, 21, 22.

***EXAMPLE:*** Size number 100 (.100" dia.) has a $C_V = .23$
For a 25 psig pressure differential:

$$Q = C_v \sqrt{\frac{\Delta P}{S.G.}} = .23 \sqrt{\frac{25}{.85}} = 1.25 \text{ GPM}$$

**Specific Gravity of Various Liquids Relative to Water @ 60°F**

| | |
|---|---|
| Alcohol, Ethyl | .79 |
| Gasoline | .75 |
| Glycerine | 1.26 |
| Kerosene | .80 |
| Diesel Oil | .85 |
| Lube Oil | .90 |
| Turpentine | .87 |
| Water | 1.00 |

## Test Procedures

**A. Rotameters - Gas Flow**

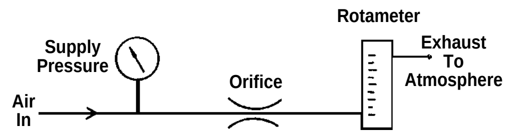
Rotameters for measurement of air or other gas flows must be used for the conditions for which they are calibrated. Typically they are calibrated for the following:

- Air Flow
- Outlet Conditions - 14.7 psig @ 70ºF

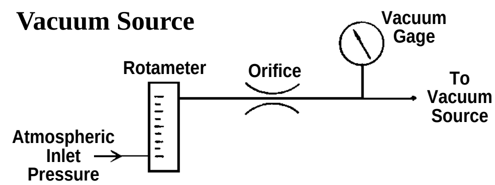
Rotameters can be calibrated for other gas flows or other outlet pressure conditions. Manufacturers also provide graphs or tables for correction of measured data when conditions vary from the calibration conditions.

When using rotameters calibrated for standard outlet conditions use the test procedures shown below.

**Positive Supply Pressure**




**Vacuum Source**




**B. Mass Flowmeters - Gas Flow**

Mass flowmeters are generally insensitive to gas pressure or barometric pressure conditions. Consequently their location in the test circuit is not critical. Consult your instrument manufacturer for recommended test procedures.

**C. Instrument Accuracy - Gas Flow**

The three variables to be measured in gas flow applications are:

- Pressure
- Temperature
- Flow Rate

The accuracy of the flow measurement of a gas through an orifice is limited by the combined accuracy of the instruments used in the measurement. Expected accuracy of a gas flow measurement is generally in the range of 1 to 20%. 1% accuracy can only be achieved with high quality instruments.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# Metal Orifice Air Flow – SCFH

| Orifice Diameter Inches | | 0.004 | 0.005 | 0.006 | 0.007 | 0.008 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.015 | 0.016 | 0.017 | 0.018 | 0.019 | 0.020 | 0.021 | 0.022 | 0.023 | 0.024 | 0.025 | 0.026 | 0.027 | 0.028 | 0.029 | 0.031 | 0.032 | 0.033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Size Number** | | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **31** | **32** | **33** |
| $C_v$ | | 0.00035 | 0.00061 | 0.00086 | 0.0012 | 0.0015 | 0.0019 | 0.0025 | 0.0028 | 0.0034 | 0.0038 | 0.0043 | 0.0050 | 0.0055 | 0.0067 | 0.0073 | 0.0080 | 0.0088 | 0.0096 | 0.011 | 0.012 | 0.013 | 0.014 | 0.016 | 0.017 | 0.018 | 0.019 | 0.022 | 0.024 | 0.025 |
| Supply Pressure – psig | 1 | 0.075 | 0.136 | 0.182 | 0.269 | 0.360 | 0.479 | 0.593 | 0.653 | 0.843 | 0.962 | 1.11 | 1.30 | 1.40 | 1.64 | 1.82 | 2.03 | 2.22 | 2.39 | 2.73 | 2.99 | 3.26 | 3.54 | 4.05 | 4.13 | 4.68 | 5.06 | 5.62 | 6.10 | 6.42 |
| | 5 | 0.18 | 0.33 | 0.45 | 0.64 | 0.85 | 1.10 | 1.37 | 1.51 | 1.94 | 2.25 | 2.56 | 2.99 | 3.26 | 3.73 | 4.20 | 4.70 | 5.23 | 5.62 | 6.29 | 6.87 | 7.48 | 8.12 | 9.20 | 9.41 | 10.5 | 11.3 | 12.4 | 13.6 | 14.4 |
| | 10 | 0.25 | 0.47 | 0.65 | 0.91 | 1.21 | 1.57 | 1.97 | 2.14 | 2.73 | 3.14 | 3.56 | 4.13 | 4.26 | 4.79 | 5.38 | 6.00 | 6.70 | 7.48 | 9.17 | 10.1 | 11.0 | 11.8 | 13.0 | 13.6 | 15.2 | 16.6 | 18.3 | 19.9 | 21.1 |
| | 15 | 0.34 | 0.59 | 0.82 | 1.14 | 1.53 | 1.97 | 2.48 | 2.67 | 3.43 | 3.92 | 4.45 | 5.17 | 5.30 | 6.04 | 6.84 | 7.56 | 8.50 | 9.34 | 11.3 | 12.6 | 13.6 | 14.7 | 16.1 | 16.8 | 18.6 | 20.3 | 22.5 | 24.6 | 26.1 |
| | 20 | 0.40 | 0.70 | 0.97 | 1.38 | 1.80 | 2.33 | 2.92 | 3.16 | 4.07 | 4.64 | 5.28 | 6.08 | 6.29 | 7.20 | 8.18 | 9.03 | 10.3 | 11.1 | 13.5 | 14.7 | 16.1 | 17.3 | 18.9 | 19.7 | 21.8 | 23.7 | 26.3 | 28.6 | 30.3 |
| | 25 | 0.47 | 0.82 | 1.12 | 1.59 | 2.08 | 2.69 | 3.37 | 3.62 | 4.66 | 5.30 | 6.06 | 6.95 | 7.25 | 8.31 | 9.43 | 10.4 | 11.8 | 12.7 | 15.5 | 16.8 | 18.3 | 19.9 | 21.6 | 22.7 | 24.8 | 27.1 | 30.1 | 32.6 | 34.5 |
| | 30 | 0.53 | 0.92 | 1.26 | 1.80 | 2.37 | 3.03 | 3.81 | 4.09 | 5.23 | 5.98 | 6.80 | 7.82 | 8.20 | 9.39 | 10.7 | 11.8 | 13.4 | 14.4 | 17.4 | 19.0 | 20.7 | 22.5 | 24.4 | 25.4 | 28.0 | 30.5 | 33.7 | 36.7 | 39.0 |
| | 40 | 0.64 | 1.15 | 1.56 | 2.22 | 2.92 | 3.75 | 4.68 | 5.02 | 6.44 | 7.31 | 8.33 | 9.56 | 10.1 | 11.6 | 13.2 | 14.5 | 16.5 | 17.8 | 21.4 | 23.3 | 25.4 | 27.5 | 29.9 | 31.1 | 34.1 | 37.1 | 41.1 | 44.7 | 47.7 |
| | 50 | 0.76 | 1.37 | 1.86 | 2.67 | 3.50 | 4.45 | 5.55 | 5.93 | 7.59 | 8.62 | 9.83 | 11.3 | 12.1 | 13.8 | 15.7 | 17.3 | 19.6 | 21.2 | 25.2 | 27.5 | 30.1 | 32.6 | 35.2 | 36.7 | 40.3 | 43.9 | 48.5 | 53.0 | 56.4 |
| | 60 | 0.89 | 1.59 | 2.16 | 3.09 | 4.05 | 5.13 | 6.40 | 6.84 | 8.75 | 10.0 | 11.3 | 13.0 | 14.0 | 16.0 | 18.2 | 20.0 | 22.7 | 24.6 | 29.2 | 31.8 | 34.7 | 37.5 | 40.7 | 42.4 | 46.4 | 50.4 | 55.9 | 61.0 | 65.0 |
| | 70 | 1.02 | 1.82 | 2.46 | 3.54 | 4.60 | 5.83 | 7.27 | 7.76 | 9.92 | 11.3 | 12.8 | 14.7 | 16.0 | 18.2 | 20.7 | 22.9 | 25.9 | 28.0 | 33.1 | 36.0 | 39.2 | 42.6 | 46.0 | 48.1 | 52.5 | 57.2 | 63.6 | 69.3 | 73.9 |
| | 80 | 1.14 | 2.04 | 2.75 | 3.96 | 5.15 | 6.53 | 8.12 | 8.67 | 11.1 | 12.6 | 14.3 | 16.5 | 17.9 | 20.5 | 23.3 | 25.6 | 29.0 | 31.6 | 37.1 | 40.3 | 43.9 | 47.7 | 51.3 | 53.6 | 58.7 | 64.0 | 71.2 | 77.8 | 82.6 |
| | 90 | 1.27 | 2.27 | 3.05 | 4.41 | 5.70 | 7.20 | 8.96 | 9.56 | 12.2 | 13.9 | 15.9 | 18.3 | 19.9 | 22.7 | 25.9 | 28.4 | 32.2 | 35.0 | 40.9 | 44.5 | 48.5 | 52.8 | 56.8 | 59.3 | 65.0 | 71.0 | 78.8 | 86.0 | 91.5 |
| | 100 | 1.40 | 2.48 | 3.35 | 4.83 | 6.25 | 7.88 | 9.81 | 10.5 | 13.4 | 15.3 | 17.4 | 20.0 | 21.8 | 25.0 | 28.4 | 31.1 | 35.2 | 38.1 | 44.7 | 48.7 | 53.2 | 58.1 | 62.3 | 65.3 | 71.4 | 78.0 | 86.7 | 94.5 | 101 |
| Vacuum Level In. Hg. | 5 | 0.113 | 0.203 | 0.273 | 0.405 | 0.536 | 0.703 | 0.860 | 0.953 | 1.23 | 1.40 | 1.64 | 1.90 | 2.07 | 2.41 | 2.70 | 2.99 | 3.28 | 3.60 | 4.03 | 4.45 | 4.87 | 5.25 | 5.81 | 6.00 | 6.70 | 7.23 | 8.01 | 8.73 | 9.15 |
| | 10 | 0.145 | 0.263 | 0.356 | 0.521 | 0.687 | 0.892 | 1.10 | 1.20 | 1.55 | 1.77 | 2.06 | 2.37 | 2.62 | 2.99 | 3.35 | 3.79 | 4.15 | 4.62 | 5.17 | 5.68 | 6.12 | 6.63 | 7.29 | 7.59 | 8.48 | 9.11 | 10.1 | 10.9 | 11.5 |
| Choked Flow | 15 | 0.158 | 0.284 | 0.392 | 0.568 | 0.744 | 0.964 | 1.20 | 1.30 | 1.68 | 1.91 | 2.26 | 2.59 | 2.86 | 3.28 | 3.71 | 4.11 | 4.64 | 4.92 | 5.53 | 6.04 | 6.61 | 7.08 | 7.73 | 8.01 | 8.90 | 9.56 | 10.7 | 11.5 | 12.1 |
| | 20 | 0.158 | 0.284 | 0.392 | 0.568 | 0.744 | 0.964 | 1.20 | 1.30 | 1.68 | 1.91 | 2.26 | 2.59 | 2.86 | 3.28 | 3.71 | 4.11 | 4.64 | 4.92 | 5.53 | 6.04 | 6.61 | 7.08 | 7.73 | 8.01 | 8.90 | 9.56 | 10.7 | 11.5 | 12.1 |
| | 30 | 0.158 | 0.284 | 0.392 | 0.568 | 0.744 | 0.964 | 1.20 | 1.30 | 1.68 | 1.91 | 2.26 | 2.59 | 2.86 | 3.28 | 3.71 | 4.11 | 4.64 | 4.92 | 5.53 | 6.04 | 6.61 | 7.08 | 7.73 | 8.01 | 8.90 | 9.56 | 10.7 | 11.5 | 12.1 |

| **Orifice Diameter Inches** | | 0.035 | 0.037 | 0.038 | 0.039 | 0.040 | 0.041 | 0.042 | 0.043 | 0.047 | 0.052 | 0.055 | 0.060 | 0.063 | 0.067 | 0.070 | 0.073 | 0.076 | 0.079 | 0.081 | 0.086 | 0.089 | 0.094 | 0.096 | 0.100 | 0.104 | 0.109 | 0.113 | 0.120 | 0.125 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Size Number** | | **35** | **37** | **38** | **39** | **40** | **41** | **42** | **43** | **47** | **52** | **55** | **60** | **63** | **67** | **70** | **73** | **76** | **79** | **81** | **86** | **89** | **94** | **96** | **100** | **104** | **109** | **113** | **120** | **125** |
| Cv | | 0.028 | 0.031 | 0.032 | 0.033 | 0.036 | 0.038 | 0.039 | 0.041 | 0.048 | 0.059 | 0.068 | 0.081 | 0.088 | 0.10 | 0.11 | 0.12 | 0.13 | 0.14 | 0.15 | 0.17 | 0.18 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.31 | 0.34 | 0.37 |
| Supply Pressure – psig | 1 | 7.37 | 8.12 | 8.75 | 9.45 | 9.75 | 9.90 | 10.6 | 11.4 | 13.6 | 17.0 | 19.9 | 23.7 | 25.9 | 30.1 | 33.6 | 35.9 | 39.3 | 43.0 | 46.0 | 49.7 | 53.7 | 60.2 | 63.7 | 69.8 | 75.2 | 83.9 | 91.4 | 101 | 106 |
| | 5 | 16.3 | 18.0 | 19.3 | 20.6 | 21.6 | 22.5 | 23.9 | 25.6 | 30.1 | 37.3 | 43.0 | 50.6 | 55.3 | 64.2 | 71.6 | 76.5 | 83.5 | 91.3 | 97.5 | 108 | 116 | 131 | 138 | 150 | 162 | 180 | 195 | 216 | 229 |
| | 10 | 22.5 | 25.0 | 26.5 | 28.8 | 30.5 | 31.4 | 33.1 | 35.6 | 41.0 | 51.9 | 57.4 | 68.2 | 74.6 | 86.2 | 96.6 | 103 | 112 | 121 | 131 | 144 | 153 | 172 | 181 | 196 | 216 | 237 | 250 | 286 | 314 |
| | 15 | 27.8 | 30.7 | 32.6 | 35.4 | 37.5 | 38.6 | 40.5 | 43.2 | 50.0 | 62.9 | 69.7 | 82.6 | 90.3 | 104 | 117 | 125 | 136 | 147 | 158 | 174 | 185 | 207 | 218 | 235 | 261 | 286 | 303 | 345 | 377 |
| | 20 | 32.4 | 36.0 | 38.4 | 41.5 | 44.3 | 45.3 | 47.7 | 50.9 | 58.7 | 74.2 | 82.0 | 97.3 | 106 | 123 | 138 | 146 | 160 | 172 | 185 | 203 | 216 | 242 | 256 | 275 | 305 | 335 | 354 | 403 | 445 |
| | 25 | 37.5 | 41.5 | 44.1 | 47.9 | 50.9 | 52.3 | 54.9 | 58.5 | 67.6 | 85.4 | 94.5 | 112 | 122 | 141 | 158 | 168 | 183 | 198 | 212 | 233 | 248 | 278 | 292 | 316 | 347 | 381 | 405 | 464 | 511 |
| | 30 | 42.4 | 47.0 | 50.0 | 54.2 | 57.6 | 59.3 | 62.3 | 66.3 | 76.3 | 96.6 | 107 | 126 | 138 | 160 | 179 | 190 | 206 | 222 | 239 | 265 | 280 | 314 | 331 | 356 | 392 | 432 | 458 | 525 | 578 |
| | 40 | 52.5 | 58.1 | 67.2 | 67.0 | 71.2 | 73.3 | 76.9 | 82.0 | 94.3 | 119 | 132 | 156 | 170 | 196 | 220 | 233 | 254 | 273 | 295 | 324 | 343 | 384 | 405 | 439 | 483 | 532 | 566 | 648 | 714 |
| | 50 | 62.5 | 69.1 | 73.7 | 79.7 | 85.0 | 87.5 | 91.7 | 97.5 | 112 | 142 | 157 | 185 | 202 | 233 | 261 | 278 | 301 | 324 | 347 | 384 | 407 | 456 | 481 | 523 | 576 | 634 | 672 | 771 | 850 |
| | 60 | 72.7 | 80.5 | 86.0 | 92.8 | 99 | 102 | 107 | 113 | 130 | 165 | 182 | 214 | 233 | 269 | 301 | 320 | 347 | 375 | 400 | 445 | 473 | 530 | 559 | 606 | 667 | 735 | 780 | 894 | 985 |
| | 70 | 83.1 | 91.7 | 98.1 | 106 | 113 | 117 | 122 | 129 | 148 | 187 | 207 | 244 | 267 | 307 | 343 | 362 | 394 | 428 | 458 | 509 | 538 | 604 | 638 | 693 | 763 | 839 | 892 | 1021 | 1125 |
| | 80 | 93 | 103 | 110 | 119 | 127 | 131 | 137 | 145 | 167 | 210 | 231 | 273 | 298 | 343 | 384 | 405 | 443 | 481 | 513 | 570 | 604 | 678 | 716 | 778 | 856 | 943 | 1000 | 1146 | 1263 |
| | 90 | 106 | 115 | 122 | 132 | 141 | 146 | 151 | 161 | 185 | 231 | 256 | 303 | 331 | 379 | 424 | 447 | 489 | 532 | 568 | 631 | 670 | 750 | 792 | 860 | 947 | 1042 | 1106 | 1267 | 1398 |
| | 100 | 114 | 126 | 135 | 146 | 156 | 164 | 167 | 177 | 203 | 254 | 282 | 331 | 362 | 415 | 468 | 496 | 540 | 587 | 627 | 697 | 739 | 831 | 875 | 951 | 1047 | 1153 | 1225 | 1403 | 1545 |
| Vacuum Level In. Hg. | 5 | 10.4 | 11.4 | 12.3 | 13.3 | 14.3 | 14.5 | 15.4 | 16.3 | 19.2 | 23.9 | 26.4 | 31.4 | 36.2 | 42.4 | 47.7 | 50.6 | 55.1 | 60.0 | 64.0 | 70.3 | 76.1 | 84.9 | 88.6 | 96.1 | 104 | 114 | 123 | 138 | 150 |
| | 10 | 13.1 | 14.4 | 15.4 | 16.6 | 17.6 | 18.0 | 19.2 | 20.3 | 23.6 | 29.4 | 32.7 | 38.6 | 44.9 | 51.7 | 57.6 | 63.4 | 68.9 | 74.8 | 79.9 | 87.9 | 94.9 | 106 | 110 | 120 | 130 | 142 | 153 | 173 | 187 |
| Choked Flow | 15 | 13.8 | 15.2 | 16.2 | 17.4 | 18.3 | 18.8 | 20.0 | 21.1 | 24.5 | 30.5 | 33.7 | 39.4 | 46.8 | 54.0 | 60.2 | 66.1 | 71.8 | 78.0 | 83.5 | 91.7 | 99.0 | 110 | 115 | 125 | 135 | 148 | 160 | 180 | 195 |
| | 20 | 13.8 | 15.2 | 16.2 | 17.4 | 18.3 | 18.8 | 20.0 | 21.1 | 24.5 | 30.5 | 33.7 | 39.4 | 46.8 | 54.0 | 60.2 | 66.1 | 71.8 | 78.0 | 83.5 | 91.7 | 99.0 | 110 | 115 | 125 | 135 | 148 | 160 | 180 | 195 |
| | 30 | 13.8 | 15.2 | 16.2 | 17.4 | 18.3 | 18.8 | 20.0 | 21.1 | 24.5 | 30.5 | 33.7 | 39.4 | 46.8 | 54.0 | 60.2 | 66.1 | 71.8 | 78.0 | 83.5 | 91.7 | 99.0 | 110 | 115 | 125 | 135 | 148 | 160 | 180 | 195 |

Standard Conditions 70°F, 14.7 psia

SCFH – Standard Cu. Ft. Per Hour
SLPM – Standard Liters Per Minute

Above data obtained with Type B restrictor. Flow rates for other metal restrictors are essentially the same as for Type B. Above data supercedes previous publications.

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# Metal Orifice Air Flow – SLPM

| | Orifice Diameter Inches | 0.004 | 0.005 | 0.006 | 0.007 | 0.008 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.015 | 0.016 | 0.017 | 0.018 | 0.019 | 0.020 | 0.021 | 0.022 | 0.023 | 0.024 | 0.025 | 0.026 | 0.027 | 0.028 | 0.029 | 0.031 | 0.032 | 0.033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Size Number** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **31** | **32** | **33** |
| | $C_v$ | 0.00035 | 0.00061 | 0.00086 | 0.0012 | 0.0015 | 0.0019 | 0.0025 | 0.0028 | 0.0034 | 0.0038 | 0.0043 | 0.0050 | 0.0055 | 0.0067 | 0.0073 | 0.0080 | 0.0088 | 0.0096 | 0.011 | 0.012 | 0.013 | 0.014 | 0.016 | 0.017 | 0.018 | 0.019 | 0.022 | 0.024 | 0.025 |
| Supply Pressure – psig | 1 | 0.035 | 0.064 | 0.086 | 0.127 | 0.170 | 0.226 | 0.280 | 0.308 | 0.398 | 0.45 | 0.52 | 0.61 | 0.66 | 0.77 | 0.86 | 0.96 | 1.05 | 1.13 | 1.29 | 1.41 | 1.54 | 1.67 | 1.91 | 1.95 | 2.21 | 2.39 | 2.65 | 2.88 | 3.03 |
| | 5 | 0.09 | 0.16 | 0.21 | 0.30 | 0.40 | 0.52 | 0.65 | 0.71 | 0.92 | 1.06 | 1.21 | 1.41 | 1.54 | 1.76 | 1.98 | 2.22 | 2.47 | 2.65 | 2.97 | 3.24 | 3.53 | 3.83 | 4.34 | 4.44 | 4.94 | 5.31 | 5.86 | 6.42 | 6.80 |
| | 10 | 0.12 | 0.22 | 0.31 | 0.43 | 0.57 | 0.74 | 0.93 | 1.01 | 1.29 | 1.48 | 1.68 | 1.95 | 2.01 | 2.26 | 2.54 | 2.83 | 3.16 | 3.53 | 4.33 | 4.75 | 5.18 | 5.55 | 6.15 | 6.43 | 7.18 | 7.83 | 8.63 | 9.40 | 9.98 |
| | 15 | 0.16 | 0.28 | 0.39 | 0.54 | 0.72 | 0.93 | 1.17 | 1.26 | 1.62 | 1.85 | 2.10 | 2.44 | 2.50 | 2.85 | 3.23 | 3.57 | 4.01 | 4.41 | 5.35 | 5.93 | 6.43 | 6.95 | 7.58 | 7.95 | 8.78 | 9.58 | 10.6 | 11.6 | 12.3 |
| | 20 | 0.19 | 0.33 | 0.46 | 0.65 | 0.85 | 1.10 | 1.38 | 1.49 | 1.92 | 2.19 | 2.49 | 2.87 | 2.97 | 3.40 | 3.86 | 4.26 | 4.84 | 5.22 | 6.35 | 6.95 | 7.58 | 8.15 | 8.90 | 9.28 | 10.3 | 11.2 | 12.4 | 13.5 | 14.3 |
| | 25 | 0.22 | 0.39 | 0.53 | 0.75 | 0.98 | 1.27 | 1.59 | 1.71 | 2.20 | 2.50 | 2.86 | 3.28 | 3.42 | 3.92 | 4.45 | 4.91 | 5.59 | 6.01 | 7.30 | 7.95 | 8.65 | 9.38 | 10.2 | 10.7 | 11.7 | 12.8 | 14.2 | 15.4 | 16.3 |
| | 30 | 0.25 | 0.44 | 0.60 | 0.85 | 1.12 | 1.43 | 1.80 | 1.93 | 2.47 | 2.82 | 3.21 | 3.69 | 3.87 | 4.43 | 5.03 | 5.56 | 6.33 | 6.81 | 8.23 | 8.98 | 9.75 | 10.6 | 11.5 | 12.0 | 13.2 | 14.4 | 15.9 | 17.3 | 18.4 |
| | 40 | 0.30 | 0.54 | 0.74 | 1.05 | 1.38 | 1.77 | 2.21 | 2.37 | 3.04 | 3.45 | 3.93 | 4.51 | 4.78 | 5.47 | 6.21 | 6.85 | 7.81 | 8.42 | 10.1 | 11.0 | 12.0 | 13.0 | 14.1 | 14.7 | 16.1 | 17.5 | 19.4 | 21.1 | 22.5 |
| | 50 | 0.36 | 0.65 | 0.88 | 1.26 | 1.65 | 2.10 | 2.62 | 2.80 | 3.58 | 4.07 | 4.64 | 5.31 | 5.70 | 6.51 | 7.40 | 8.15 | 9.26 | 10.0 | 11.9 | 13.0 | 14.2 | 15.4 | 16.6 | 17.3 | 19.0 | 20.7 | 22.9 | 25.0 | 26.6 |
| | 60 | 0.42 | 0.75 | 1.02 | 1.46 | 1.91 | 2.42 | 3.02 | 3.23 | 4.13 | 4.70 | 5.34 | 6.13 | 6.61 | 7.56 | 8.58 | 9.46 | 10.7 | 11.6 | 13.8 | 15.0 | 16.4 | 17.7 | 19.2 | 20.0 | 21.9 | 23.8 | 26.4 | 28.8 | 30.7 |
| | 70 | 0.48 | 0.86 | 1.16 | 1.67 | 2.17 | 2.75 | 3.43 | 3.66 | 4.68 | 5.32 | 6.05 | 6.96 | 7.53 | 8.61 | 9.77 | 10.8 | 12.2 | 13.2 | 15.6 | 17.0 | 18.5 | 20.1 | 21.7 | 22.7 | 24.8 | 27.0 | 30.0 | 32.7 | 34.9 |
| | 80 | 0.54 | 0.96 | 1.30 | 1.87 | 2.43 | 3.08 | 3.83 | 4.09 | 5.23 | 5.95 | 6.77 | 7.79 | 8.46 | 9.67 | 11.0 | 12.1 | 13.7 | 14.9 | 17.5 | 19.0 | 20.7 | 22.5 | 24.2 | 25.3 | 27.7 | 30.2 | 33.6 | 36.7 | 39.0 |
| | 90 | 0.60 | 1.07 | 1.44 | 2.08 | 2.69 | 3.40 | 4.23 | 4.51 | 5.78 | 6.58 | 7.49 | 8.62 | 9.38 | 10.7 | 12.2 | 13.4 | 15.2 | 16.5 | 19.3 | 21.0 | 22.9 | 24.9 | 26.8 | 28.0 | 30.7 | 33.5 | 37.2 | 40.6 | 43.2 |
| | 100 | 0.66 | 1.17 | 1.58 | 2.28 | 2.95 | 3.72 | 4.63 | 4.94 | 6.33 | 7.22 | 8.21 | 9.46 | 10.3 | 11.8 | 13.4 | 14.7 | 16.6 | 18.0 | 21.1 | 23.0 | 25.1 | 27.4 | 29.4 | 30.8 | 33.7 | 36.8 | 40.9 | 44.6 | 47.5 |
| Vacuum Level In. Hg. | 5 | 0.053 | 0.096 | 0.129 | 0.191 | 0.253 | 0.332 | 0.406 | 0.450 | 0.582 | 0.661 | 0.773 | 0.899 | 0.977 | 1.14 | 1.28 | 1.41 | 1.55 | 1.70 | 1.90 | 2.10 | 2.30 | 2.48 | 2.74 | 2.83 | 3.16 | 3.41 | 3.78 | 4.12 | 4.32 |
| | 10 | 0.069 | 0.124 | 0.168 | 0.246 | 0.324 | 0.421 | 0.519 | 0.564 | 0.730 | 0.834 | 0.972 | 1.12 | 1.24 | 1.41 | 1.58 | 1.79 | 1.96 | 2.18 | 2.44 | 2.68 | 2.89 | 3.13 | 3.44 | 3.58 | 4.00 | 4.30 | 4.77 | 5.16 | 5.43 |
| Choked Flow | 15 | 0.075 | 0.134 | 0.185 | 0.268 | 0.351 | 0.455 | 0.566 | 0.614 | 0.792 | 0.902 | 1.07 | 1.22 | 1.35 | 1.55 | 1.75 | 1.94 | 2.19 | 2.32 | 2.61 | 2.85 | 3.12 | 3.34 | 3.65 | 3.78 | 4.20 | 4.51 | 5.05 | 5.45 | 5.72 |
| | 20 | 0.075 | 0.134 | 0.185 | 0.268 | 0.351 | 0.455 | 0.566 | 0.614 | 0.792 | 0.902 | 1.07 | 1.22 | 1.35 | 1.55 | 1.75 | 1.94 | 2.19 | 2.32 | 2.61 | 2.85 | 3.12 | 3.34 | 3.65 | 3.78 | 4.20 | 4.51 | 5.05 | 5.45 | 5.72 |
| | 30 | 0.075 | 0.134 | 0.185 | 0.268 | 0.351 | 0.455 | 0.566 | 0.614 | 0.792 | 0.902 | 1.07 | 1.22 | 1.35 | 1.55 | 1.75 | 1.94 | 2.19 | 2.32 | 2.61 | 2.85 | 3.12 | 3.34 | 3.65 | 3.78 | 4.20 | 4.51 | 5.05 | 5.45 | 5.72 |

| | Orifice Diameter Inches | 0.035 | 0.037 | 0.038 | 0.039 | 0.040 | 0.041 | 0.042 | 0.043 | 0.047 | 0.052 | 0.055 | 0.060 | 0.063 | 0.067 | 0.070 | 0.073 | 0.076 | 0.079 | 0.081 | 0.086 | 0.089 | 0.094 | 0.096 | 0.100 | 0.104 | 0.109 | 0.113 | 0.120 | 0.125 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Size Number** | **35** | **37** | **38** | **39** | **40** | **41** | **42** | **43** | **47** | **52** | **55** | **60** | **63** | **67** | **70** | **73** | **76** | **79** | **81** | **86** | **89** | **94** | **96** | **100** | **104** | **109** | **113** | **120** | **125** |
| | Cv | 0.028 | 0.031 | 0.032 | 0.033 | 0.036 | 0.038 | 0.039 | 0.041 | 0.048 | 0.059 | 0.068 | 0.081 | 0.088 | 0.10 | 0.11 | 0.12 | 0.13 | 0.14 | 0.15 | 0.17 | 0.18 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.31 | 0.34 | 0.37 |
| Supply Pressure – psig | 1 | 3.48 | 3.83 | 4.13 | 4.46 | 4.60 | 4.67 | 4.99 | 5.36 | 6.43 | 8.04 | 9.40 | 11.2 | 12.2 | 14.2 | 15.9 | 16.9 | 18.5 | 20.3 | 21.7 | 23.5 | 25.4 | 28.4 | 30.1 | 32.9 | 35.5 | 39.6 | 43.1 | 47.8 | 50.1 |
| | 5 | 7.67 | 8.48 | 9.09 | 9.70 | 10.2 | 10.6 | 11.3 | 12.1 | 14.2 | 17.6 | 20.3 | 23.9 | 26.1 | 30.3 | 33.8 | 36.1 | 39.4 | 43.1 | 46.0 | 51.1 | 54.9 | 61.9 | 65.0 | 70.8 | 76.6 | 84.8 | 92.1 | 102 | 108 |
| | 10 | 10.6 | 11.8 | 12.5 | 13.6 | 14.4 | 14.8 | 15.6 | 16.8 | 19.4 | 24.5 | 27.1 | 32.2 | 35.2 | 40.7 | 45.6 | 48.5 | 52.9 | 57.3 | 61.6 | 67.9 | 72.3 | 81.0 | 85.5 | 92.3 | 102 | 112 | 118 | 135 | 148 |
| | 15 | 13.1 | 14.5 | 15.4 | 16.7 | 17.7 | 18.2 | 19.1 | 20.4 | 23.6 | 29.7 | 32.9 | 39.0 | 42.6 | 49.3 | 55.3 | 58.8 | 64.0 | 69.4 | 74.5 | 82.1 | 87.3 | 97.8 | 103 | 111 | 123 | 135 | 143 | 163 | 178 |
| | 20 | 15.3 | 17.0 | 18.1 | 19.6 | 20.9 | 21.4 | 22.5 | 24.0 | 27.7 | 35.0 | 38.7 | 45.9 | 50.1 | 58.0 | 65.0 | 69.0 | 75.3 | 81.4 | 87.3 | 95.6 | 102 | 114 | 121 | 130 | 144 | 158 | 167 | 190 | 210 |
| | 25 | 17.7 | 19.6 | 20.8 | 22.6 | 24.0 | 24.7 | 25.9 | 27.6 | 31.9 | 40.3 | 44.6 | 52.8 | 57.7 | 66.7 | 74.7 | 79.3 | 86.4 | 93.5 | 100 | 110 | 117 | 131 | 138 | 149 | 164 | 180 | 191 | 219 | 241 |
| | 30 | 20.0 | 22.2 | 23.6 | 25.6 | 27.2 | 28.0 | 29.4 | 31.3 | 36.0 | 45.6 | 50.4 | 59.7 | 65.2 | 75.4 | 84.3 | 89.5 | 97.4 | 105 | 113 | 125 | 132 | 148 | 156 | 168 | 185 | 204 | 216 | 248 | 273 |
| | 40 | 24.8 | 27.4 | 31.7 | 31.6 | 33.6 | 34.6 | 36.3 | 38.7 | 44.5 | 56.3 | 62.2 | 73.6 | 80.3 | 92.7 | 104 | 110 | 120 | 129 | 139 | 153 | 162 | 181 | 191 | 207 | 228 | 251 | 267 | 306 | 337 |
| | 50 | 29.5 | 32.6 | 34.8 | 37.6 | 40.1 | 41.3 | 43.3 | 46.0 | 52.9 | 66.9 | 74.0 | 87.4 | 95.4 | 110 | 123 | 131 | 142 | 153 | 164 | 181 | 192 | 215 | 227 | 247 | 272 | 299 | 317 | 364 | 401 |
| | 60 | 34.3 | 38.0 | 40.6 | 43.8 | 46.7 | 48.1 | 50.3 | 53.5 | 61.5 | 77.7 | 85.8 | 101 | 110 | 127 | 142 | 151 | 164 | 177 | 189 | 210 | 223 | 250 | 264 | 286 | 315 | 347 | 368 | 422 | 465 |
| | 70 | 39.2 | 43.3 | 46.3 | 50.0 | 53.3 | 55.0 | 57.4 | 61.0 | 70.0 | 88.4 | 97.6 | 115 | 126 | 145 | 162 | 171 | 186 | 202 | 216 | 240 | 254 | 285 | 301 | 327 | 360 | 396 | 421 | 482 | 531 |
| | 80 | 44.0 | 48.7 | 52.1 | 56.2 | 60.0 | 61.9 | 64.5 | 68.5 | 78.6 | 99.1 | 109 | 129 | 141 | 162 | 181 | 191 | 209 | 227 | 242 | 269 | 285 | 320 | 338 | 367 | 404 | 445 | 472 | 541 | 596 |
| | 90 | 50.0 | 54.2 | 57.8 | 62.4 | 66.7 | 68.9 | 71.5 | 76.0 | 87.2 | 109 | 121 | 143 | 156 | 179 | 200 | 211 | 231 | 251 | 268 | 298 | 316 | 354 | 374 | 406 | 447 | 492 | 522 | 598 | 660 |
| | 100 | 53.9 | 59.6 | 63.7 | 68.7 | 73.5 | 77.3 | 78.6 | 83.5 | 95.8 | 120 | 133 | 156 | 171 | 196 | 221 | 234 | 255 | 277 | 296 | 329 | 349 | 392 | 413 | 449 | 494 | 544 | 578 | 662 | 729 |
| Vacuum Level In. Hg. | 5 | 4.92 | 5.40 | 5.81 | 6.29 | 6.76 | 6.82 | 7.29 | 7.67 | 9.08 | 11.3 | 12.4 | 14.8 | 17.1 | 20.0 | 22.5 | 23.9 | 26.0 | 28.3 | 30.2 | 33.2 | 35.9 | 40.1 | 41.8 | 45.3 | 49.0 | 53.9 | 57.9 | 65.3 | 70.9 |
| | 10 | 6.18 | 6.78 | 7.29 | 7.85 | 8.31 | 8.50 | 9.08 | 9.58 | 11.1 | 13.9 | 15.4 | 18.2 | 21.2 | 24.4 | 27.2 | 29.9 | 32.5 | 35.3 | 37.7 | 41.5 | 44.8 | 50.0 | 52.1 | 56.6 | 61.2 | 67.2 | 72.2 | 81.4 | 88.4 |
| Choked Flow | 15 | 6.50 | 7.17 | 7.63 | 8.22 | 8.66 | 8.87 | 9.46 | 10.0 | 11.6 | 14.4 | 15.9 | 18.6 | 22.1 | 25.5 | 28.4 | 31.2 | 33.9 | 36.8 | 39.4 | 43.3 | 46.7 | 52.1 | 54.4 | 59.0 | 63.8 | 70.1 | 75.3 | 84.9 | 92.2 |
| | 20 | 6.50 | 7.17 | 7.63 | 8.22 | 8.66 | 8.87 | 9.46 | 10.0 | 11.6 | 14.4 | 15.9 | 18.6 | 22.1 | 25.5 | 28.4 | 31.2 | 33.9 | 36.8 | 39.4 | 43.3 | 46.7 | 52.1 | 54.4 | 59.0 | 63.8 | 70.1 | 75.3 | 84.9 | 92.2 |
| | 30 | 6.50 | 7.17 | 7.63 | 8.22 | 8.66 | 8.87 | 9.46 | 10.0 | 11.6 | 14.4 | 15.9 | 18.6 | 22.1 | 25.5 | 28.4 | 31.2 | 33.9 | 36.8 | 39.4 | 43.3 | 46.7 | 52.1 | 54.4 | 59.0 | 63.8 | 70.1 | 75.3 | 84.9 | 92.2 |

Standard Conditions 70°F, 14.7 psia

SCFH – Standard Cu. Ft. Per Hour
SLPM – Standard Liters Per Minute

Above data obtained with Type B restrictor. Flow rates for other metal restrictors are essentially the same as for Type B. Above data supercedes previous publications.



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# Sapphire Orifice Air Flow – SLPM

| | Orifice Diameter Inches | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 | 0.0035 | 0.0039 | 0.0043 | 0.0047 | 0.0051 | 0.0055 | 0.0059 | 0.0063 | 0.0067 | 0.0071 | 0.0079 | 0.0087 | 0.0094 | 0.0102 | 0.0110 | 0.0118 | 0.0126 | 0.0134 | 0.0142 | 0.0157 | 0.0173 | 0.0189 | 0.0205 | 0.0213 | 0.0228 | 0.0252 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size Number | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 40 | 44 | 48 | 52 | 54 | 58 | 64 |
| | $C_v$ | 0.000030 | 0.000053 | 0.000090 | 0.00012 | 0.00017 | 0.00022 | 0.00028 | 0.00035 | 0.00042 | 0.00050 | 0.00061 | 0.00071 | 0.00084 | 0.00094 | 0.0011 | 0.0012 | 0.0015 | 0.0018 | 0.0021 | 0.0024 | 0.0028 | 0.0032 | 0.0036 | 0.0040 | 0.0046 | 0.0057 | 0.0067 | 0.0080 | 0.0091 | 0.010 | 0.011 | 0.013 |
| Supply Pressure – psig | 1 | 0.003 | 0.005 | 0.010 | 0.014 | 0.020 | 0.025 | 0.034 | 0.040 | 0.050 | 0.058 | 0.068 | 0.080 | 0.095 | 0.106 | 0.120 | 0.139 | 0.161 | 0.194 | 0.259 | 0.275 | 0.300 | 0.340 | 0.393 | 0.446 | 0.499 | 0.677 | 0.822 | 0.965 | 1.10 | 1.12 | 1.38 | 1.69 |
| | 5 | 0.009 | 0.013 | 0.027 | 0.036 | 0.047 | 0.059 | 0.076 | 0.093 | 0.108 | 0.136 | 0.159 | 0.192 | 0.223 | 0.256 | 0.273 | 0.313 | 0.350 | 0.430 | 0.584 | 0.623 | 0.695 | 0.800 | 0.933 | 1.06 | 1.20 | 1.51 | 1.81 | 2.16 | 2.50 | 2.57 | 3.26 | 4.06 |
| | 10 | 0.010 | 0.016 | 0.036 | 0.049 | 0.065 | 0.082 | 0.107 | 0.132 | 0.164 | 0.193 | 0.228 | 0.264 | 0.308 | 0.357 | 0.382 | 0.430 | 0.480 | 0.590 | 0.830 | 0.868 | 0.968 | 1.09 | 1.27 | 1.45 | 1.63 | 2.01 | 2.43 | 2.90 | 3.32 | 3.45 | 4.43 | 5.58 |
| | 15 | 0.014 | 0.021 | 0.046 | 0.062 | 0.082 | 0.104 | 0.134 | 0.166 | 0.205 | 0.240 | 0.285 | 0.329 | 0.386 | 0.443 | 0.482 | 0.535 | 0.613 | 0.755 | 1.05 | 1.11 | 1.24 | 1.42 | 1.63 | 1.85 | 2.09 | 2.56 | 3.08 | 3.69 | 4.26 | 4.43 | 5.55 | 7.08 |
| | 20 | 0.016 | 0.025 | 0.055 | 0.074 | 0.099 | 0.125 | 0.159 | 0.197 | 0.243 | 0.284 | 0.337 | 0.390 | 0.457 | 0.525 | 0.569 | 0.635 | 0.730 | 0.910 | 1.25 | 1.32 | 1.48 | 1.70 | 1.95 | 2.20 | 2.48 | 3.04 | 3.64 | 4.36 | 5.06 | 5.31 | 6.55 | 8.33 |
| | 25 | 0.019 | 0.030 | 0.063 | 0.087 | 0.115 | 0.144 | 0.184 | 0.229 | 0.280 | 0.327 | 0.389 | 0.450 | 0.526 | 0.605 | 0.654 | 0.733 | 0.843 | 1.05 | 1.44 | 1.52 | 1.70 | 1.95 | 2.24 | 2.52 | 2.84 | 3.50 | 4.19 | 5.03 | 5.81 | 6.11 | 7.53 | 9.55 |
| | 30 | 0.022 | 0.034 | 0.072 | 0.098 | 0.132 | 0.164 | 0.208 | 0.260 | 0.317 | 0.370 | 0.440 | 0.511 | 0.595 | 0.685 | 0.710 | 0.838 | 0.958 | 1.19 | 1.63 | 1.69 | 1.91 | 2.19 | 2.52 | 2.84 | 3.19 | 3.96 | 4.75 | 5.69 | 6.57 | 6.90 | 8.48 | 10.7 |
| | 40 | 0.027 | 0.043 | 0.089 | 0.122 | 0.163 | 0.203 | 0.257 | 0.321 | 0.390 | 0.456 | 0.543 | 0.632 | 0.734 | 0.845 | 0.880 | 1.04 | 1.18 | 1.47 | 2.02 | 2.11 | 2.35 | 2.67 | 3.07 | 3.46 | 3.90 | 4.89 | 5.86 | 7.02 | 8.10 | 8.50 | 10.4 | 13.1 |
| | 50 | 0.032 | 0.052 | 0.106 | 0.147 | 0.195 | 0.241 | 0.306 | 0.383 | 0.463 | 0.542 | 0.652 | 0.753 | 0.872 | 1.00 | 1.05 | 1.24 | 1.41 | 1.75 | 2.39 | 2.50 | 2.78 | 3.16 | 3.63 | 4.08 | 4.59 | 5.83 | 6.96 | 8.35 | 9.63 | 10.1 | 12.3 | 15.5 |
| | 60 | 0.037 | 0.061 | 0.123 | 0.171 | 0.227 | 0.280 | 0.356 | 0.445 | 0.536 | 0.630 | 0.751 | 0.875 | 1.01 | 1.16 | 1.23 | 1.45 | 1.64 | 2.03 | 2.77 | 2.89 | 3.20 | 3.63 | 4.17 | 4.69 | 5.29 | 6.77 | 8.10 | 9.69 | 11.1 | 11.7 | 14.2 | 17.9 |
| | 70 | 0.042 | 0.070 | 0.141 | 0.195 | 0.259 | 0.318 | 0.403 | 0.507 | 0.609 | 0.717 | 0.855 | 0.996 | 1.15 | 1.32 | 1.40 | 1.66 | 1.87 | 2.31 | 3.14 | 3.28 | 3.62 | 4.12 | 4.72 | 5.31 | 5.99 | 7.71 | 9.23 | 11.0 | 12.7 | 13.3 | 16.0 | 20.2 |
| | 80 | 0.047 | 0.080 | 0.158 | 0.200 | 0.292 | 0.357 | 0.453 | 0.569 | 0.683 | 0.804 | 0.959 | 1.12 | 1.28 | 1.48 | 1.57 | 1.86 | 2.09 | 2.59 | 3.51 | 3.66 | 4.04 | 4.68 | 5.28 | 5.93 | 6.69 | 8.65 | 10.4 | 12.3 | 14.3 | 14.8 | 17.9 | 22.6 |
| | 90 | 0.053 | 0.089 | 0.175 | 0.244 | 0.324 | 0.396 | 0.502 | 0.632 | 0.757 | 0.891 | 1.06 | 1.24 | 1.42 | 1.64 | 1.75 | 2.06 | 2.32 | 2.87 | 3.89 | 4.05 | 4.47 | 5.07 | 5.83 | 6.56 | 7.41 | 9.60 | 11.5 | 13.7 | 15.7 | 16.4 | 19.7 | 24.9 |
| | 100 | 0.058 | 0.098 | 0.193 | 0.269 | 0.356 | 0.435 | 0.551 | 0.692 | 0.830 | 0.978 | 1.17 | 1.36 | 1.56 | 1.80 | 1.92 | 2.27 | 2.55 | 3.15 | 4.26 | 4.44 | 4.89 | 5.57 | 6.38 | 7.18 | 8.12 | 10.6 | 12.6 | 15.0 | 17.2 | 18.0 | 21.6 | 27.3 |
| Vacuum Level In. Hg. | 5 | 0.003 | 0.006 | 0.014 | 0.020 | 0.028 | 0.036 | 0.047 | 0.057 | 0.073 | 0.085 | 0.100 | 0.116 | 0.137 | 0.156 | 0.169 | 0.199 | 0.229 | 0.277 | 0.377 | 0.401 | 0.451 | 0.510 | 0.591 | 0.673 | 0.764 | 0.982 | 1.16 | 1.38 | 1.61 | 1.64 | 2.13 | 2.61 |
| | 10 | 0.004 | 0.008 | 0.018 | 0.027 | 0.036 | 0.046 | 0.061 | 0.073 | 0.093 | 0.109 | 0.128 | 0.149 | 0.175 | 0.200 | 0.217 | 0.253 | 0.292 | 0.352 | 0.482 | 0.503 | 0.556 | 0.638 | 0.734 | 0.833 | 0.955 | 1.26 | 1.51 | 1.80 | 2.06 | 2.11 | 2.55 | 3.19 |
| Choked Flow | 15 | 0.006 | 0.010 | 0.021 | 0.030 | 0.040 | 0.050 | 0.065 | 0.079 | 0.100 | 0.117 | 0.138 | 0.159 | 0.188 | 0.214 | 0.235 | 0.269 | 0.320 | 0.390 | 0.525 | 0.554 | 0.626 | 0.711 | 0.818 | 0.921 | 1.07 | 1.39 | 1.65 | 1.99 | 2.31 | 2.39 | 2.77 | 3.48 |
| | 20 | 0.006 | 0.010 | 0.021 | 0.030 | 0.040 | 0.050 | 0.065 | 0.079 | 0.100 | 0.117 | 0.138 | 0.159 | 0.188 | 0.214 | 0.235 | 0.269 | 0.320 | 0.390 | 0.525 | 0.554 | 0.626 | 0.711 | 0.818 | 0.921 | 1.07 | 1.39 | 1.65 | 1.99 | 2.31 | 2.39 | 2.77 | 3.48 |
| | 30 | 0.006 | 0.010 | 0.021 | 0.030 | 0.040 | 0.050 | 0.065 | 0.079 | 0.100 | 0.117 | 0.138 | 0.159 | 0.188 | 0.214 | 0.235 | 0.269 | 0.320 | 0.390 | 0.525 | 0.554 | 0.626 | 0.711 | 0.818 | 0.921 | 1.07 | 1.39 | 1.65 | 1.99 | 2.31 | 2.39 | 2.77 | 3.48 |

# Sapphire Orifice Air Flow – SCFH

| | Orifice Diameter Inches | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 | 0.0035 | 0.0039 | 0.0043 | 0.0047 | 0.0051 | 0.0055 | 0.0059 | 0.0063 | 0.0067 | 0.0071 | 0.0079 | 0.0087 | 0.0094 | 0.0102 | 0.0110 | 0.0118 | 0.0126 | 0.0134 | 0.0142 | 0.0157 | 0.0173 | 0.0189 | 0.0205 | 0.0213 | 0.0228 | 0.0252 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size Number | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 40 | 44 | 48 | 52 | 54 | 58 | 64 |
| | $C_v$ | 0.000030 | 0.000053 | 0.000090 | 0.00012 | 0.00017 | 0.00022 | 0.00028 | 0.00035 | 0.00042 | 0.00050 | 0.00061 | 0.00071 | 0.00084 | 0.00094 | 0.0011 | 0.0012 | 0.0015 | 0.0018 | 0.0021 | 0.0024 | 0.0028 | 0.0032 | 0.0036 | 0.0040 | 0.0046 | 0.0057 | 0.0067 | 0.0080 | 0.0091 | 0.010 | 0.011 | 0.013 |
| Supply Pressure – psig | 1 | 0.007 | 0.011 | 0.021 | 0.030 | 0.042 | 0.053 | 0.072 | 0.085 | 0.106 | 0.123 | 0.144 | 0.169 | 0.201 | 0.225 | 0.254 | 0.294 | 0.341 | 0.411 | 0.549 | 0.583 | 0.636 | 0.720 | 0.833 | 0.945 | 1.06 | 1.43 | 1.74 | 2.04 | 2.33 | 2.37 | 2.92 | 3.58 |
| | 5 | 0.019 | 0.027 | 0.056 | 0.075 | 0.100 | 0.124 | 0.161 | 0.197 | 0.228 | 0.288 | 0.337 | 0.407 | 0.471 | 0.542 | 0.577 | 0.663 | 0.740 | 0.911 | 1.24 | 1.32 | 1.47 | 1.70 | 1.98 | 2.25 | 2.53 | 3.20 | 3.83 | 4.58 | 5.30 | 5.44 | 6.90 | 8.60 |
| | 10 | 0.021 | 0.034 | 0.076 | 0.104 | 0.138 | 0.174 | 0.227 | 0.280 | 0.347 | 0.409 | 0.483 | 0.559 | 0.653 | 0.756 | 0.809 | 0.911 | 1.02 | 1.25 | 1.76 | 1.84 | 2.05 | 2.31 | 2.69 | 3.07 | 3.45 | 4.26 | 5.15 | 6.14 | 7.03 | 7.31 | 9.39 | 11.8 |
| | 15 | 0.030 | 0.044 | 0.097 | 0.131 | 0.174 | 0.220 | 0.284 | 0.352 | 0.434 | 0.508 | 0.604 | 0.697 | 0.818 | 0.939 | 1.02 | 1.13 | 1.30 | 1.60 | 2.22 | 2.35 | 2.63 | 3.01 | 3.45 | 3.92 | 4.43 | 5.42 | 6.53 | 7.82 | 9.03 | 9.39 | 11.8 | 15.0 |
| | 20 | 0.034 | 0.053 | 0.117 | 0.157 | 0.210 | 0.265 | 0.337 | 0.417 | 0.515 | 0.602 | 0.714 | 0.826 | 0.968 | 1.11 | 1.21 | 1.35 | 1.55 | 1.93 | 2.65 | 2.80 | 3.14 | 3.60 | 4.13 | 4.66 | 5.25 | 6.44 | 7.71 | 9.24 | 10.7 | 11.3 | 13.9 | 17.6 |
| | 25 | 0.040 | 0.064 | 0.133 | 0.184 | 0.244 | 0.305 | 0.390 | 0.485 | 0.593 | 0.693 | 0.824 | 0.953 | 1.11 | 1.28 | 1.39 | 1.55 | 1.79 | 2.22 | 3.05 | 3.22 | 3.60 | 4.13 | 4.75 | 5.34 | 6.02 | 7.42 | 8.88 | 10.7 | 12.3 | 12.9 | 16.0 | 20.2 |
| | 30 | 0.046 | 0.072 | 0.152 | 0.208 | 0.280 | 0.347 | 0.441 | 0.551 | 0.672 | 0.784 | 0.932 | 1.08 | 1.26 | 1.45 | 1.50 | 1.78 | 2.03 | 2.52 | 3.45 | 3.58 | 4.05 | 4.64 | 5.34 | 6.02 | 6.76 | 8.39 | 10.1 | 12.1 | 13.9 | 14.6 | 18.0 | 22.7 |
| | 40 | 0.057 | 0.091 | 0.189 | 0.258 | 0.345 | 0.430 | 0.544 | 0.680 | 0.826 | 0.966 | 1.15 | 1.34 | 1.56 | 1.79 | 1.86 | 2.20 | 2.50 | 3.11 | 4.28 | 4.47 | 4.98 | 5.66 | 6.50 | 7.33 | 8.26 | 10.4 | 12.4 | 14.9 | 17.2 | 18.0 | 22.0 | 27.8 |
| | 50 | 0.068 | 0.110 | 0.225 | 0.311 | 0.413 | 0.511 | 0.648 | 0.811 | 0.981 | 1.15 | 1.38 | 1.60 | 1.85 | 2.13 | 2.22 | 2.63 | 2.99 | 3.71 | 5.06 | 5.30 | 5.89 | 6.69 | 7.69 | 8.64 | 9.72 | 12.4 | 14.7 | 17.7 | 20.4 | 21.4 | 26.1 | 32.8 |
| | 60 | 0.079 | 0.129 | 0.261 | 0.362 | 0.481 | 0.593 | 0.754 | 0.943 | 1.14 | 1.33 | 1.59 | 1.85 | 2.14 | 2.46 | 2.61 | 3.07 | 3.47 | 4.30 | 5.87 | 6.12 | 6.78 | 7.69 | 8.83 | 9.94 | 11.2 | 14.3 | 17.2 | 20.5 | 23.5 | 24.8 | 30.1 | 37.9 |
| | 70 | 0.089 | 0.149 | 0.299 | 0.413 | 0.549 | 0.674 | 0.854 | 1.07 | 1.29 | 1.52 | 1.81 | 2.11 | 2.43 | 2.80 | 2.97 | 3.52 | 3.96 | 4.89 | 6.65 | 6.95 | 7.67 | 8.73 | 10.0 | 11.3 | 12.7 | 16.3 | 19.6 | 23.3 | 26.9 | 28.2 | 33.9 | 42.8 |
| | 80 | 0.100 | 0.168 | 0.335 | 0.424 | 0.619 | 0.756 | 0.960 | 1.21 | 1.45 | 1.70 | 2.03 | 2.37 | 2.72 | 3.13 | 3.33 | 3.94 | 4.43 | 5.49 | 7.44 | 7.75 | 8.56 | 9.75 | 11.2 | 12.6 | 14.2 | 18.3 | 22.0 | 26.1 | 30.3 | 31.4 | 37.9 | 47.9 |
| | 90 | 0.111 | 0.188 | 0.371 | 0.517 | 0.686 | 0.839 | 1.06 | 1.34 | 1.60 | 1.89 | 2.25 | 2.62 | 3.01 | 3.47 | 3.71 | 4.36 | 4.92 | 6.08 | 8.24 | 8.58 | 9.47 | 10.7 | 12.4 | 13.9 | 15.7 | 20.3 | 24.4 | 29.0 | 33.3 | 34.7 | 41.7 | 52.8 |
| | 100 | 0.122 | 0.208 | 0.409 | 0.570 | 0.754 | 0.922 | 1.17 | 1.47 | 1.76 | 2.07 | 2.47 | 2.88 | 3.30 | 3.81 | 4.07 | 4.81 | 5.40 | 6.67 | 9.03 | 9.41 | 10.4 | 11.8 | 13.5 | 15.2 | 17.2 | 22.5 | 26.7 | 31.8 | 36.4 | 38.1 | 45.8 | 57.8 |
| Vacuum Level In. Hg. | 5 | 0.007 | 0.013 | 0.029 | 0.043 | 0.059 | 0.076 | 0.100 | 0.121 | 0.154 | 0.180 | 0.212 | 0.246 | 0.290 | 0.331 | 0.358 | 0.422 | 0.485 | 0.587 | 0.799 | 0.850 | 0.956 | 1.08 | 1.25 | 1.43 | 1.62 | 2.08 | 2.46 | 2.92 | 3.41 | 3.47 | 4.51 | 5.53 |
| | 10 | 0.009 | 0.018 | 0.039 | 0.057 | 0.076 | 0.098 | 0.128 | 0.155 | 0.197 | 0.231 | 0.271 | 0.316 | 0.371 | 0.424 | 0.460 | 0.536 | 0.619 | 0.746 | 1.02 | 1.07 | 1.18 | 1.35 | 1.56 | 1.76 | 2.02 | 2.67 | 3.19 | 3.81 | 4.36 | 4.47 | 5.40 | 6.76 |
| Choked Flow | 15 | 0.012 | 0.020 | 0.045 | 0.063 | 0.085 | 0.107 | 0.138 | 0.168 | 0.212 | 0.248 | 0.292 | 0.337 | 0.398 | 0.453 | 0.498 | 0.570 | 0.678 | 0.826 | 1.11 | 1.17 | 1.33 | 1.51 | 1.73 | 1.95 | 2.26 | 2.95 | 3.50 | 4.22 | 4.89 | 5.06 | 5.87 | 7.37 |
| | 20 | 0.012 | 0.020 | 0.045 | 0.063 | 0.085 | 0.107 | 0.138 | 0.168 | 0.212 | 0.248 | 0.292 | 0.337 | 0.398 | 0.453 | 0.498 | 0.570 | 0.678 | 0.826 | 1.11 | 1.17 | 1.33 | 1.51 | 1.73 | 1.95 | 2.26 | 2.95 | 3.50 | 4.22 | 4.89 | 5.06 | 5.87 | 7.37 |
| | 30 | 0.012 | 0.020 | 0.045 | 0.063 | 0.085 | 0.107 | 0.138 | 0.168 | 0.212 | 0.248 | 0.292 | 0.337 | 0.398 | 0.453 | 0.498 | 0.570 | 0.678 | 0.826 | 1.11 | 1.17 | 1.33 | 1.51 | 1.73 | 1.95 | 2.26 | 2.95 | 3.50 | 4.22 | 4.89 | 5.06 | 5.87 | 7.37 |

Standard Conditions 70°F, 14.7 psia

SCFH – Standard Cu. Ft. Per Hour
SLPM – Standard Liters Per Minute

Above data obtained with Type S restrictors. Flow rates for other sapphire types are essentially the same as for Type S. Above data supercedes previous publications.

O'Keefe Controls Co.
P.O. BOX Q • TRUMBULL, CONNECTICUT 06611 • CT PHONE (203) 261-6711 • TOLL FREE PHONE (800) 533-3285 • FAX (203) 261-8331
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# Metal Orifice Water Flow – Gallons/minute

| | Orifice Diameter Inches | 0.004 | 0.005 | 0.006 | 0.007 | 0.008 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.015 | 0.016 | 0.017 | 0.018 | 0.019 | 0.020 | 0.021 | 0.022 | 0.023 | 0.024 | 0.025 | 0.026 | 0.027 | 0.028 | 0.029 | 0.031 | 0.032 | 0.033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size Number | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 31 | 32 | 33 |
| | $C_v$ | 0.00035 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0019 | 0.0025 | 0.0028 | 0.0034 | 0.0038 | 0.0043 | 0.0050 | 0.0055 | 0.0067 | 0.0073 | 0.0080 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.016 | 0.017 | 0.018 | 0.019 | 0.022 | 0.024 | 0.025 |
| Supply Pressure – psig | 1 | 0.00035 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0019 | 0.0025 | 0.0028 | 0.0034 | 0.0038 | 0.0043 | 0.0050 | 0.0055 | 0.0067 | 0.0073 | 0.0080 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.016 | 0.017 | 0.018 | 0.019 | 0.022 | 0.024 | 0.025 |
| | 2 | 0.00049 | 0.0009 | 0.0012 | 0.0017 | 0.0021 | 0.0027 | 0.0035 | 0.0040 | 0.0048 | 0.0054 | 0.0061 | 0.0071 | 0.0078 | 0.0095 | 0.0103 | 0.0113 | 0.012 | 0.014 | 0.016 | 0.017 | 0.018 | 0.020 | 0.023 | 0.024 | 0.025 | 0.027 | 0.031 | 0.034 | 0.035 |
| | 3 | 0.00061 | 0.0011 | 0.0015 | 0.0021 | 0.0026 | 0.0033 | 0.0043 | 0.0048 | 0.0059 | 0.0066 | 0.0074 | 0.0087 | 0.0095 | 0.0116 | 0.0126 | 0.0139 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | 0.028 | 0.029 | 0.031 | 0.033 | 0.038 | 0.042 | 0.043 |
| | 4 | 0.00070 | 0.0012 | 0.0017 | 0.0024 | 0.0030 | 0.0038 | 0.0050 | 0.0056 | 0.0068 | 0.0076 | 0.0086 | 0.0100 | 0.0110 | 0.0134 | 0.0146 | 0.0160 | 0.018 | 0.019 | 0.022 | 0.024 | 0.026 | 0.028 | 0.032 | 0.034 | 0.036 | 0.038 | 0.044 | 0.048 | 0.050 |
| | 5 | 0.00078 | 0.0014 | 0.0019 | 0.0027 | 0.0034 | 0.0042 | 0.0056 | 0.0063 | 0.0076 | 0.0085 | 0.0096 | 0.0112 | 0.0123 | 0.0150 | 0.0163 | 0.0179 | 0.020 | 0.021 | 0.025 | 0.027 | 0.029 | 0.031 | 0.036 | 0.038 | 0.040 | 0.042 | 0.049 | 0.054 | 0.056 |
| | 6 | 0.00086 | 0.0015 | 0.0021 | 0.0029 | 0.0037 | 0.0047 | 0.0061 | 0.0069 | 0.0083 | 0.0093 | 0.0105 | 0.0122 | 0.0135 | 0.0164 | 0.0179 | 0.0196 | 0.022 | 0.024 | 0.027 | 0.029 | 0.032 | 0.034 | 0.039 | 0.042 | 0.044 | 0.047 | 0.054 | 0.059 | 0.061 |
| | 7 | 0.00093 | 0.0016 | 0.0023 | 0.0032 | 0.0040 | 0.0050 | 0.0066 | 0.0074 | 0.0090 | 0.0101 | 0.0114 | 0.0132 | 0.0146 | 0.0177 | 0.0193 | 0.0212 | 0.023 | 0.025 | 0.029 | 0.032 | 0.034 | 0.037 | 0.042 | 0.045 | 0.048 | 0.050 | 0.058 | 0.063 | 0.066 |
| | 8 | 0.00099 | 0.0017 | 0.0024 | 0.0034 | 0.0042 | 0.0054 | 0.0071 | 0.0079 | 0.0096 | 0.0107 | 0.0122 | 0.0141 | 0.0156 | 0.0190 | 0.0206 | 0.0226 | 0.025 | 0.027 | 0.031 | 0.034 | 0.037 | 0.040 | 0.045 | 0.048 | 0.051 | 0.054 | 0.062 | 0.068 | 0.071 |
| | 9 | 0.00105 | 0.0018 | 0.0026 | 0.0036 | 0.0045 | 0.0057 | 0.0075 | 0.0084 | 0.0102 | 0.0114 | 0.0129 | 0.0150 | 0.0165 | 0.0201 | 0.0219 | 0.0240 | 0.026 | 0.029 | 0.033 | 0.036 | 0.039 | 0.042 | 0.048 | 0.051 | 0.054 | 0.057 | 0.066 | 0.072 | 0.075 |
| | 10 | 0.00111 | 0.0019 | 0.0027 | 0.0038 | 0.0047 | 0.0060 | 0.0079 | 0.0089 | 0.0108 | 0.0120 | 0.0136 | 0.0158 | 0.0174 | 0.0212 | 0.0231 | 0.0253 | 0.028 | 0.030 | 0.035 | 0.038 | 0.041 | 0.044 | 0.051 | 0.054 | 0.057 | 0.060 | 0.070 | 0.076 | 0.079 |
| | 15 | 0.00136 | 0.0024 | 0.0033 | 0.0046 | 0.0058 | 0.0074 | 0.0097 | 0.0108 | 0.0132 | 0.0147 | 0.0167 | 0.0194 | 0.0213 | 0.0259 | 0.0283 | 0.0310 | 0.034 | 0.037 | 0.043 | 0.046 | 0.050 | 0.054 | 0.062 | 0.066 | 0.070 | 0.074 | 0.085 | 0.093 | 0.097 |
| | 20 | 0.00157 | 0.0027 | 0.0038 | 0.0054 | 0.0067 | 0.0085 | 0.0112 | 0.0125 | 0.0152 | 0.0170 | 0.0192 | 0.0224 | 0.0246 | 0.0300 | 0.0326 | 0.0358 | 0.039 | 0.043 | 0.049 | 0.054 | 0.058 | 0.063 | 0.072 | 0.076 | 0.080 | 0.085 | 0.098 | 0.107 | 0.112 |
| | 30 | 0.00192 | 0.0033 | 0.0047 | 0.0066 | 0.0082 | 0.0104 | 0.0137 | 0.0153 | 0.0186 | 0.0208 | 0.0236 | 0.0274 | 0.0301 | 0.0367 | 0.0400 | 0.0438 | 0.048 | 0.053 | 0.060 | 0.066 | 0.071 | 0.077 | 0.088 | 0.093 | 0.099 | 0.104 | 0.120 | 0.131 | 0.137 |
| | 40 | 0.00221 | 0.0039 | 0.0054 | 0.0076 | 0.0095 | 0.0120 | 0.0158 | 0.0177 | 0.0215 | 0.0240 | 0.0272 | 0.0316 | 0.0348 | 0.0424 | 0.0462 | 0.0506 | 0.056 | 0.061 | 0.070 | 0.076 | 0.082 | 0.089 | 0.101 | 0.108 | 0.114 | 0.120 | 0.139 | 0.152 | 0.158 |
| | 50 | 0.00247 | 0.0043 | 0.0061 | 0.0085 | 0.0106 | 0.0134 | 0.0177 | 0.0198 | 0.0240 | 0.0269 | 0.0304 | 0.0354 | 0.0389 | 0.0474 | 0.0516 | 0.0566 | 0.062 | 0.068 | 0.078 | 0.085 | 0.092 | 0.099 | 0.113 | 0.120 | 0.127 | 0.134 | 0.156 | 0.170 | 0.177 |
| | 60 | 0.00271 | 0.0047 | 0.0067 | 0.0093 | 0.0116 | 0.0147 | 0.0194 | 0.0217 | 0.0263 | 0.0294 | 0.0333 | 0.0387 | 0.0426 | 0.0519 | 0.0565 | 0.0620 | 0.068 | 0.074 | 0.085 | 0.093 | 0.101 | 0.108 | 0.124 | 0.132 | 0.139 | 0.147 | 0.170 | 0.186 | 0.194 |
| | 70 | 0.00293 | 0.0051 | 0.0072 | 0.0100 | 0.0125 | 0.0159 | 0.0209 | 0.0234 | 0.0284 | 0.0318 | 0.0360 | 0.0418 | 0.0460 | 0.0561 | 0.0611 | 0.0669 | 0.074 | 0.080 | 0.092 | 0.100 | 0.109 | 0.117 | 0.134 | 0.142 | 0.151 | 0.159 | 0.184 | 0.201 | 0.209 |
| | 80 | 0.00313 | 0.0055 | 0.0077 | 0.0107 | 0.0134 | 0.0170 | 0.0224 | 0.0250 | 0.0304 | 0.0340 | 0.0385 | 0.0447 | 0.0492 | 0.0599 | 0.0653 | 0.0716 | 0.079 | 0.086 | 0.098 | 0.107 | 0.116 | 0.125 | 0.143 | 0.152 | 0.161 | 0.170 | 0.197 | 0.215 | 0.224 |
| | 90 | 0.00332 | 0.0058 | 0.0082 | 0.0114 | 0.0142 | 0.0180 | 0.0237 | 0.0266 | 0.0323 | 0.0360 | 0.0408 | 0.0474 | 0.0522 | 0.0636 | 0.0693 | 0.0759 | 0.083 | 0.091 | 0.104 | 0.114 | 0.123 | 0.133 | 0.152 | 0.161 | 0.171 | 0.180 | 0.209 | 0.228 | 0.237 |
| | 100 | 0.00350 | 0.0061 | 0.0086 | 0.0120 | 0.0150 | 0.0190 | 0.0250 | 0.0280 | 0.0340 | 0.0380 | 0.0430 | 0.0500 | 0.0550 | 0.0670 | 0.0730 | 0.0800 | 0.088 | 0.096 | 0.110 | 0.120 | 0.130 | 0.140 | 0.160 | 0.170 | 0.180 | 0.190 | 0.220 | 0.240 | 0.250 |

| | Orifice Diameter Inches | 0.035 | 0.037 | 0.038 | 0.039 | 0.04 | 0.041 | 0.042 | 0.043 | 0.047 | 0.052 | 0.055 | 0.06 | 0.063 | 0.067 | 0.07 | 0.073 | 0.076 | 0.079 | 0.081 | 0.086 | 0.089 | 0.094 | 0.096 | 0.1 | 0.104 | 0.109 | 0.113 | 0.12 | 0.125 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size Number | 35 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 47 | 52 | 55 | 60 | 63 | 67 | 70 | 73 | 76 | 79 | 81 | 86 | 89 | 94 | 96 | 100 | 104 | 109 | 113 | 120 | 125 |
| | $C_v$ | 0.028 | 0.031 | 0.032 | 0.033 | 0.036 | 0.038 | 0.039 | 0.041 | 0.048 | 0.059 | 0.068 | 0.081 | 0.088 | 0.100 | 0.110 | 0.120 | 0.130 | 0.140 | 0.150 | 0.170 | 0.180 | 0.200 | 0.210 | 0.230 | 0.250 | 0.270 | 0.310 | 0.340 | 0.370 |
| Supply Pressure – psig | 1 | 0.028 | 0.031 | 0.032 | 0.033 | 0.036 | 0.038 | 0.039 | 0.041 | 0.048 | 0.059 | 0.068 | 0.081 | 0.088 | 0.100 | 0.110 | 0.120 | 0.130 | 0.140 | 0.150 | 0.170 | 0.180 | 0.200 | 0.210 | 0.230 | 0.250 | 0.270 | 0.310 | 0.340 | 0.370 |
| | 2 | 0.040 | 0.044 | 0.045 | 0.047 | 0.051 | 0.054 | 0.055 | 0.058 | 0.068 | 0.083 | 0.096 | 0.115 | 0.124 | 0.141 | 0.156 | 0.170 | 0.184 | 0.198 | 0.212 | 0.240 | 0.255 | 0.283 | 0.297 | 0.325 | 0.354 | 0.382 | 0.438 | 0.481 | 0.523 |
| | 3 | 0.048 | 0.054 | 0.055 | 0.057 | 0.062 | 0.066 | 0.068 | 0.071 | 0.083 | 0.102 | 0.118 | 0.140 | 0.152 | 0.173 | 0.191 | 0.208 | 0.225 | 0.242 | 0.260 | 0.294 | 0.312 | 0.346 | 0.364 | 0.398 | 0.433 | 0.468 | 0.537 | 0.589 | 0.641 |
| | 4 | 0.056 | 0.062 | 0.064 | 0.066 | 0.072 | 0.076 | 0.078 | 0.082 | 0.096 | 0.118 | 0.136 | 0.162 | 0.176 | 0.200 | 0.220 | 0.240 | 0.260 | 0.280 | 0.300 | 0.340 | 0.360 | 0.400 | 0.420 | 0.460 | 0.500 | 0.540 | 0.620 | 0.680 | 0.740 |
| | 5 | 0.063 | 0.069 | 0.072 | 0.074 | 0.080 | 0.085 | 0.087 | 0.092 | 0.107 | 0.132 | 0.152 | 0.181 | 0.197 | 0.224 | 0.246 | 0.268 | 0.291 | 0.313 | 0.335 | 0.380 | 0.402 | 0.447 | 0.470 | 0.514 | 0.559 | 0.604 | 0.693 | 0.760 | 0.827 |
| | 6 | 0.069 | 0.076 | 0.078 | 0.081 | 0.088 | 0.093 | 0.096 | 0.100 | 0.118 | 0.145 | 0.167 | 0.198 | 0.216 | 0.245 | 0.269 | 0.294 | 0.318 | 0.343 | 0.367 | 0.416 | 0.441 | 0.490 | 0.514 | 0.563 | 0.612 | 0.661 | 0.759 | 0.833 | 0.906 |
| | 7 | 0.074 | 0.082 | 0.085 | 0.087 | 0.095 | 0.101 | 0.103 | 0.108 | 0.127 | 0.156 | 0.180 | 0.214 | 0.233 | 0.265 | 0.291 | 0.317 | 0.344 | 0.370 | 0.397 | 0.450 | 0.476 | 0.529 | 0.556 | 0.609 | 0.661 | 0.714 | 0.820 | 0.900 | 0.979 |
| | 8 | 0.079 | 0.088 | 0.091 | 0.093 | 0.102 | 0.107 | 0.110 | 0.116 | 0.136 | 0.167 | 0.192 | 0.229 | 0.249 | 0.283 | 0.311 | 0.339 | 0.368 | 0.396 | 0.424 | 0.481 | 0.509 | 0.566 | 0.594 | 0.651 | 0.707 | 0.764 | 0.877 | 0.962 | 1.047 |
| | 9 | 0.084 | 0.093 | 0.096 | 0.099 | 0.108 | 0.114 | 0.117 | 0.123 | 0.144 | 0.177 | 0.204 | 0.243 | 0.264 | 0.300 | 0.330 | 0.360 | 0.390 | 0.420 | 0.450 | 0.510 | 0.540 | 0.600 | 0.630 | 0.690 | 0.750 | 0.810 | 0.930 | 1.020 | 1.110 |
| | 10 | 0.089 | 0.098 | 0.101 | 0.104 | 0.114 | 0.120 | 0.123 | 0.130 | 0.152 | 0.187 | 0.215 | 0.256 | 0.278 | 0.316 | 0.348 | 0.379 | 0.411 | 0.443 | 0.474 | 0.538 | 0.569 | 0.632 | 0.664 | 0.727 | 0.791 | 0.854 | 0.980 | 1.075 | 1.170 |
| | 15 | 0.108 | 0.120 | 0.124 | 0.128 | 0.139 | 0.147 | 0.151 | 0.159 | 0.186 | 0.229 | 0.263 | 0.314 | 0.341 | 0.387 | 0.426 | 0.465 | 0.503 | 0.542 | 0.581 | 0.658 | 0.697 | 0.775 | 0.813 | 0.891 | 0.968 | 1.046 | 1.201 | 1.317 | 1.433 |
| | 20 | 0.125 | 0.139 | 0.143 | 0.148 | 0.161 | 0.170 | 0.174 | 0.183 | 0.215 | 0.264 | 0.304 | 0.362 | 0.394 | 0.447 | 0.492 | 0.537 | 0.581 | 0.626 | 0.671 | 0.760 | 0.805 | 0.894 | 0.939 | 1.029 | 1.118 | 1.207 | 1.386 | 1.521 | 1.655 |
| | 30 | 0.153 | 0.170 | 0.175 | 0.181 | 0.197 | 0.208 | 0.214 | 0.225 | 0.263 | 0.323 | 0.372 | 0.444 | 0.482 | 0.548 | 0.602 | 0.657 | 0.712 | 0.767 | 0.822 | 0.931 | 0.986 | 1.095 | 1.150 | 1.260 | 1.369 | 1.479 | 1.698 | 1.862 | 2.027 |
| | 40 | 0.177 | 0.196 | 0.202 | 0.209 | 0.228 | 0.240 | 0.247 | 0.259 | 0.304 | 0.373 | 0.430 | 0.512 | 0.557 | 0.632 | 0.696 | 0.759 | 0.822 | 0.885 | 0.949 | 1.075 | 1.138 | 1.265 | 1.328 | 1.455 | 1.581 | 1.708 | 1.961 | 2.150 | 2.340 |
| | 50 | 0.198 | 0.219 | 0.226 | 0.233 | 0.255 | 0.269 | 0.276 | 0.290 | 0.339 | 0.417 | 0.481 | 0.573 | 0.622 | 0.707 | 0.778 | 0.849 | 0.919 | 0.990 | 1.061 | 1.202 | 1.273 | 1.414 | 1.485 | 1.626 | 1.768 | 1.909 | 2.192 | 2.404 | 2.616 |
| | 60 | 0.217 | 0.240 | 0.248 | 0.256 | 0.279 | 0.294 | 0.302 | 0.318 | 0.372 | 0.457 | 0.527 | 0.627 | 0.682 | 0.775 | 0.852 | 0.930 | 1.007 | 1.084 | 1.162 | 1.317 | 1.394 | 1.549 | 1.627 | 1.782 | 1.936 | 2.091 | 2.401 | 2.634 | 2.866 |
| | 70 | 0.234 | 0.259 | 0.268 | 0.276 | 0.301 | 0.318 | 0.326 | 0.343 | 0.402 | 0.494 | 0.569 | 0.678 | 0.736 | 0.837 | 0.920 | 1.004 | 1.088 | 1.171 | 1.255 | 1.422 | 1.506 | 1.673 | 1.757 | 1.924 | 2.092 | 2.259 | 2.594 | 2.845 | 3.096 |
| | 80 | 0.250 | 0.277 | 0.286 | 0.295 | 0.322 | 0.340 | 0.349 | 0.367 | 0.429 | 0.528 | 0.608 | 0.724 | 0.787 | 0.894 | 0.984 | 1.073 | 1.163 | 1.252 | 1.342 | 1.521 | 1.610 | 1.789 | 1.878 | 2.057 | 2.236 | 2.415 | 2.773 | 3.041 | 3.309 |
| | 90 | 0.266 | 0.294 | 0.304 | 0.313 | 0.342 | 0.360 | 0.370 | 0.389 | 0.455 | 0.560 | 0.645 | 0.768 | 0.835 | 0.949 | 1.044 | 1.138 | 1.233 | 1.328 | 1.423 | 1.613 | 1.708 | 1.897 | 1.992 | 2.182 | 2.372 | 2.561 | 2.941 | 3.226 | 3.510 |
| | 100 | 0.280 | 0.310 | 0.320 | 0.330 | 0.360 | 0.380 | 0.390 | 0.410 | 0.480 | 0.590 | 0.680 | 0.810 | 0.880 | 1.000 | 1.100 | 1.200 | 1.300 | 1.400 | 1.500 | 1.700 | 1.800 | 2.000 | 2.100 | 2.300 | 2.500 | 2.700 | 3.100 | 3.400 | 3.700 |

Above chart data calculated based on the $C_V$ for each orifice. Flow = $C_V \sqrt{\Delta P}$. $\Delta P$ = differential pressure in psid. It is assumed that the region on either side of the orifice is fully flooded with no air pockets.

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# Metal Orifice Water Flow – Liters/minute

| Orifice Diameter Inches | | 0.005 | 0.006 | 0.007 | 0.008 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.015 | 0.016 | 0.017 | 0.018 | 0.019 | 0.02 | 0.021 | 0.022 | 0.023 | 0.024 | 0.025 | 0.026 | 0.027 | 0.028 | 0.029 | 0.031 | 0.032 | 0.033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Size Number** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **31** | **32** | **33** |
| $C_v$ | 0.00035 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0019 | 0.0025 | 0.0028 | 0.0034 | 0.0038 | 0.0043 | 0.0050 | 0.0055 | 0.0067 | 0.0073 | 0.0080 | 0.009 | 0.010 | 0.011 | 0.012 | 0.013 | 0.014 | 0.016 | 0.017 | 0.018 | 0.019 | 0.022 | 0.024 | 0.025 |
| **Supply Pressure – psig** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0.0013 | 0.0023 | 0.0033 | 0.0045 | 0.0057 | 0.0072 | 0.0095 | 0.0106 | 0.0129 | 0.0144 | 0.0163 | 0.0189 | 0.0208 | 0.0254 | 0.0276 | 0.0303 | 0.033 | 0.036 | 0.042 | 0.045 | 0.049 | 0.053 | 0.061 | 0.064 | 0.068 | 0.072 | 0.083 | 0.091 | 0.095 |
| 2 | 0.0019 | 0.0033 | 0.0046 | 0.0064 | 0.0080 | 0.0102 | 0.0134 | 0.0150 | 0.0182 | 0.0203 | 0.0230 | 0.0268 | 0.0294 | 0.0359 | 0.0391 | 0.0428 | 0.047 | 0.051 | 0.059 | 0.064 | 0.070 | 0.075 | 0.086 | 0.091 | 0.096 | 0.102 | 0.118 | 0.128 | 0.134 |
| 3 | 0.0023 | 0.0040 | 0.0056 | 0.0079 | 0.0098 | 0.0125 | 0.0164 | 0.0184 | 0.0223 | 0.0249 | 0.0282 | 0.0328 | 0.0361 | 0.0439 | 0.0479 | 0.0525 | 0.058 | 0.063 | 0.072 | 0.079 | 0.085 | 0.092 | 0.105 | 0.111 | 0.118 | 0.125 | 0.144 | 0.157 | 0.164 |
| 4 | 0.0026 | 0.0046 | 0.0065 | 0.0091 | 0.0114 | 0.0144 | 0.0189 | 0.0212 | 0.0257 | 0.0288 | 0.0326 | 0.0379 | 0.0416 | 0.0507 | 0.0553 | 0.0606 | 0.067 | 0.073 | 0.083 | 0.091 | 0.098 | 0.106 | 0.121 | 0.129 | 0.136 | 0.144 | 0.167 | 0.182 | 0.189 |
| 5 | 0.0030 | 0.0052 | 0.0073 | 0.0102 | 0.0127 | 0.0161 | 0.0212 | 0.0237 | 0.0288 | 0.0322 | 0.0364 | 0.0423 | 0.0466 | 0.0567 | 0.0618 | 0.0677 | 0.074 | 0.081 | 0.093 | 0.102 | 0.110 | 0.119 | 0.135 | 0.144 | 0.152 | 0.161 | 0.186 | 0.203 | 0.212 |
| 6 | 0.0032 | 0.0057 | 0.0080 | 0.0111 | 0.0139 | 0.0176 | 0.0232 | 0.0260 | 0.0315 | 0.0352 | 0.0399 | 0.0464 | 0.0510 | 0.0621 | 0.0677 | 0.0742 | 0.082 | 0.089 | 0.102 | 0.111 | 0.121 | 0.130 | 0.148 | 0.158 | 0.167 | 0.176 | 0.204 | 0.223 | 0.232 |
| 7 | 0.0035 | 0.0061 | 0.0086 | 0.0120 | 0.0150 | 0.0190 | 0.0250 | 0.0280 | 0.0341 | 0.0381 | 0.0431 | 0.0501 | 0.0551 | 0.0671 | 0.0731 | 0.0801 | 0.088 | 0.096 | 0.110 | 0.120 | 0.130 | 0.140 | 0.160 | 0.170 | 0.180 | 0.190 | 0.220 | 0.240 | 0.250 |
| 8 | 0.0037 | 0.0065 | 0.0092 | 0.0128 | 0.0161 | 0.0203 | 0.0268 | 0.0300 | 0.0364 | 0.0407 | 0.0460 | 0.0535 | 0.0589 | 0.0717 | 0.0782 | 0.0857 | 0.094 | 0.103 | 0.118 | 0.128 | 0.139 | 0.150 | 0.171 | 0.182 | 0.193 | 0.203 | 0.236 | 0.257 | 0.268 |
| 9 | 0.0040 | 0.0069 | 0.0098 | 0.0136 | 0.0170 | 0.0216 | 0.0284 | 0.0318 | 0.0386 | 0.0432 | 0.0488 | 0.0568 | 0.0625 | 0.0761 | 0.0829 | 0.0908 | 0.100 | 0.109 | 0.125 | 0.136 | 0.148 | 0.159 | 0.182 | 0.193 | 0.204 | 0.216 | 0.250 | 0.273 | 0.284 |
| 10 | 0.0042 | 0.0073 | 0.0103 | 0.0144 | 0.0180 | 0.0227 | 0.0299 | 0.0335 | 0.0407 | 0.0455 | 0.0515 | 0.0599 | 0.0658 | 0.0802 | 0.0874 | 0.0958 | 0.105 | 0.115 | 0.132 | 0.144 | 0.156 | 0.168 | 0.192 | 0.203 | 0.215 | 0.227 | 0.263 | 0.287 | 0.299 |
| 15 | 0.0051 | 0.0089 | 0.0126 | 0.0176 | 0.0220 | 0.0279 | 0.0367 | 0.0411 | 0.0498 | 0.0557 | 0.0630 | 0.0733 | 0.0806 | 0.0982 | 0.1070 | 0.1173 | 0.129 | 0.141 | 0.161 | 0.176 | 0.191 | 0.205 | 0.235 | 0.249 | 0.264 | 0.279 | 0.323 | 0.352 | 0.367 |
| 20 | 0.0059 | 0.0103 | 0.0146 | 0.0203 | 0.0254 | 0.0322 | 0.0423 | 0.0474 | 0.0576 | 0.0643 | 0.0728 | 0.0846 | 0.0931 | 0.1134 | 0.1236 | 0.1354 | 0.149 | 0.163 | 0.186 | 0.203 | 0.220 | 0.237 | 0.271 | 0.288 | 0.305 | 0.322 | 0.372 | 0.406 | 0.423 |
| 30 | 0.0073 | 0.0126 | 0.0178 | 0.0249 | 0.0311 | 0.0394 | 0.0518 | 0.0581 | 0.0705 | 0.0788 | 0.0892 | 0.1037 | 0.1140 | 0.1389 | 0.1514 | 0.1659 | 0.182 | 0.199 | 0.228 | 0.249 | 0.270 | 0.290 | 0.332 | 0.352 | 0.373 | 0.394 | 0.456 | 0.498 | 0.518 |
| 40 | 0.0084 | 0.0146 | 0.0206 | 0.0287 | 0.0359 | 0.0455 | 0.0599 | 0.0670 | 0.0814 | 0.0910 | 0.1029 | 0.1197 | 0.1317 | 0.1604 | 0.1748 | 0.1915 | 0.211 | 0.230 | 0.263 | 0.287 | 0.311 | 0.335 | 0.383 | 0.407 | 0.431 | 0.455 | 0.527 | 0.575 | 0.599 |
| 50 | 0.0094 | 0.0163 | 0.0230 | 0.0321 | 0.0402 | 0.0509 | 0.0669 | 0.0749 | 0.0910 | 0.1017 | 0.1151 | 0.1338 | 0.1472 | 0.1793 | 0.1954 | 0.2141 | 0.236 | 0.257 | 0.294 | 0.321 | 0.348 | 0.375 | 0.428 | 0.455 | 0.482 | 0.509 | 0.589 | 0.642 | 0.669 |
| 60 | 0.0103 | 0.0179 | 0.0252 | 0.0352 | 0.0440 | 0.0557 | 0.0733 | 0.0821 | 0.0997 | 0.1114 | 0.1261 | 0.1466 | 0.1613 | 0.1965 | 0.2140 | 0.2346 | 0.258 | 0.281 | 0.323 | 0.352 | 0.381 | 0.411 | 0.469 | 0.498 | 0.528 | 0.557 | 0.645 | 0.704 | 0.733 |
| 70 | 0.0111 | 0.0193 | 0.0272 | 0.0380 | 0.0475 | 0.0602 | 0.0792 | 0.0887 | 0.1077 | 0.1203 | 0.1362 | 0.1584 | 0.1742 | 0.2122 | 0.2312 | 0.2534 | 0.279 | 0.304 | 0.348 | 0.380 | 0.412 | 0.443 | 0.507 | 0.538 | 0.570 | 0.602 | 0.697 | 0.760 | 0.792 |
| 80 | 0.0119 | 0.0207 | 0.0291 | 0.0406 | 0.0508 | 0.0643 | 0.0846 | 0.0948 | 0.1151 | 0.1287 | 0.1456 | 0.1693 | 0.1862 | 0.2268 | 0.2472 | 0.2709 | 0.298 | 0.325 | 0.372 | 0.406 | 0.440 | 0.474 | 0.542 | 0.576 | 0.609 | 0.643 | 0.745 | 0.813 | 0.846 |
| 90 | 0.0126 | 0.0219 | 0.0309 | 0.0431 | 0.0539 | 0.0682 | 0.0898 | 0.1006 | 0.1221 | 0.1365 | 0.1544 | 0.1796 | 0.1975 | 0.2406 | 0.2622 | 0.2873 | 0.316 | 0.345 | 0.395 | 0.431 | 0.467 | 0.503 | 0.575 | 0.610 | 0.646 | 0.682 | 0.790 | 0.862 | 0.898 |
| 100 | 0.0132 | 0.0231 | 0.0326 | 0.0454 | 0.0568 | 0.0719 | 0.0946 | 0.1060 | 0.1287 | 0.1438 | 0.1628 | 0.1893 | 0.2082 | 0.2536 | 0.2763 | 0.3028 | 0.333 | 0.363 | 0.416 | 0.454 | 0.492 | 0.530 | 0.606 | 0.644 | 0.681 | 0.719 | 0.833 | 0.908 | 0.946 |

| Orifice Diameter Inches | 0.035 | 0.037 | 0.038 | 0.039 | 0.04 | 0.041 | 0.042 | 0.043 | 0.047 | 0.052 | 0.055 | 0.06 | 0.063 | 0.067 | 0.07 | 0.073 | 0.076 | 0.079 | 0.081 | 0.086 | 0.089 | 0.094 | 0.096 | 0.1 | 0.104 | 0.109 | 0.113 | 0.12 | 0.125 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Size Number** | **35** | **37** | **38** | **39** | **40** | **41** | **42** | **43** | **47** | **52** | **55** | **60** | **63** | **67** | **70** | **73** | **76** | **79** | **81** | **86** | **89** | **94** | **96** | **100** | **104** | **109** | **113** | **120** | **125** |
| $C_v$ | 0.028 | 0.031 | 0.032 | 0.033 | 0.036 | 0.038 | 0.039 | 0.041 | 0.048 | 0.059 | 0.068 | 0.081 | 0.088 | 0.100 | 0.110 | 0.120 | 0.130 | 0.140 | 0.150 | 0.170 | 0.180 | 0.200 | 0.210 | 0.230 | 0.250 | 0.270 | 0.310 | 0.340 | 0.370 |
| **Supply Pressure – psig** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0.106 | 0.117 | 0.121 | 0.125 | 0.136 | 0.144 | 0.148 | 0.155 | 0.182 | 0.223 | 0.257 | 0.307 | 0.333 | 0.379 | 0.416 | 0.454 | 0.492 | 0.530 | 0.568 | 0.644 | 0.681 | 0.757 | 0.795 | 0.871 | 0.946 | 1.022 | 1.173 | 1.287 | 1.401 |
| 2 | 0.150 | 0.166 | 0.171 | 0.177 | 0.193 | 0.203 | 0.209 | 0.219 | 0.257 | 0.316 | 0.364 | 0.434 | 0.471 | 0.535 | 0.589 | 0.642 | 0.696 | 0.749 | 0.803 | 0.910 | 0.964 | 1.071 | 1.124 | 1.231 | 1.338 | 1.445 | 1.660 | 1.820 | 1.981 |
| 3 | 0.184 | 0.203 | 0.210 | 0.216 | 0.236 | 0.249 | 0.256 | 0.269 | 0.315 | 0.387 | 0.446 | 0.531 | 0.577 | 0.656 | 0.721 | 0.787 | 0.852 | 0.918 | 0.983 | 1.115 | 1.180 | 1.311 | 1.377 | 1.508 | 1.639 | 1.770 | 2.033 | 2.229 | 2.426 |
| 4 | 0.212 | 0.235 | 0.242 | 0.250 | 0.273 | 0.288 | 0.295 | 0.310 | 0.363 | 0.447 | 0.515 | 0.613 | 0.666 | 0.757 | 0.833 | 0.908 | 0.984 | 1.060 | 1.136 | 1.287 | 1.363 | 1.514 | 1.590 | 1.741 | 1.893 | 2.044 | 2.347 | 2.574 | 2.801 |
| 5 | 0.237 | 0.262 | 0.271 | 0.279 | 0.305 | 0.322 | 0.330 | 0.347 | 0.406 | 0.499 | 0.576 | 0.686 | 0.745 | 0.846 | 0.931 | 1.016 | 1.100 | 1.185 | 1.270 | 1.439 | 1.524 | 1.693 | 1.778 | 1.947 | 2.116 | 2.285 | 2.624 | 2.878 | 3.132 |
| 6 | 0.260 | 0.287 | 0.297 | 0.306 | 0.334 | 0.352 | 0.362 | 0.380 | 0.445 | 0.547 | 0.631 | 0.751 | 0.816 | 0.927 | 1.020 | 1.113 | 1.205 | 1.298 | 1.391 | 1.576 | 1.669 | 1.854 | 1.947 | 2.133 | 2.318 | 2.504 | 2.874 | 3.153 | 3.431 |
| 7 | 0.280 | 0.310 | 0.320 | 0.331 | 0.361 | 0.381 | 0.391 | 0.411 | 0.481 | 0.591 | 0.681 | 0.811 | 0.881 | 1.002 | 1.102 | 1.202 | 1.302 | 1.402 | 1.502 | 1.703 | 1.803 | 2.003 | 2.103 | 2.304 | 2.504 | 2.704 | 3.105 | 3.405 | 3.706 |
| 8 | 0.300 | 0.332 | 0.343 | 0.353 | 0.385 | 0.407 | 0.418 | 0.439 | 0.514 | 0.632 | 0.728 | 0.867 | 0.942 | 1.071 | 1.178 | 1.285 | 1.392 | 1.499 | 1.606 | 1.820 | 1.927 | 2.141 | 2.248 | 2.463 | 2.677 | 2.891 | 3.319 | 3.640 | 3.961 |
| 9 | 0.318 | 0.352 | 0.363 | 0.375 | 0.409 | 0.432 | 0.443 | 0.466 | 0.545 | 0.670 | 0.772 | 0.920 | 0.999 | 1.136 | 1.249 | 1.363 | 1.476 | 1.590 | 1.703 | 1.931 | 2.044 | 2.271 | 2.385 | 2.612 | 2.839 | 3.066 | 3.520 | 3.861 | 4.202 |
| 10 | 0.335 | 0.371 | 0.383 | 0.395 | 0.431 | 0.455 | 0.467 | 0.491 | 0.575 | 0.706 | 0.814 | 0.970 | 1.053 | 1.197 | 1.317 | 1.436 | 1.556 | 1.676 | 1.796 | 2.035 | 2.155 | 2.394 | 2.514 | 2.753 | 2.993 | 3.232 | 3.711 | 4.070 | 4.429 |
| 15 | 0.411 | 0.454 | 0.469 | 0.484 | 0.528 | 0.557 | 0.572 | 0.601 | 0.704 | 0.865 | 0.997 | 1.188 | 1.290 | 1.466 | 1.613 | 1.759 | 1.906 | 2.053 | 2.199 | 2.492 | 2.639 | 2.932 | 3.079 | 3.372 | 3.665 | 3.958 | 4.545 | 4.985 | 5.424 |
| 20 | 0.474 | 0.525 | 0.542 | 0.559 | 0.609 | 0.643 | 0.660 | 0.694 | 0.813 | 0.999 | 1.151 | 1.371 | 1.490 | 1.693 | 1.862 | 2.031 | 2.201 | 2.370 | 2.539 | 2.878 | 3.047 | 3.386 | 3.555 | 3.894 | 4.232 | 4.571 | 5.248 | 5.756 | 6.264 |
| 30 | 0.581 | 0.643 | 0.663 | 0.684 | 0.746 | 0.788 | 0.809 | 0.850 | 0.995 | 1.223 | 1.410 | 1.679 | 1.825 | 2.073 | 2.281 | 2.488 | 2.695 | 2.903 | 3.110 | 3.525 | 3.732 | 4.147 | 4.354 | 4.769 | 5.183 | 5.598 | 6.427 | 7.049 | 7.671 |
| 40 | 0.670 | 0.742 | 0.766 | 0.790 | 0.862 | 0.910 | 0.934 | 0.982 | 1.149 | 1.413 | 1.628 | 1.939 | 2.107 | 2.394 | 2.634 | 2.873 | 3.112 | 3.352 | 3.591 | 4.070 | 4.309 | 4.788 | 5.028 | 5.506 | 5.985 | 6.464 | 7.422 | 8.140 | 8.858 |
| 50 | 0.749 | 0.830 | 0.857 | 0.883 | 0.964 | 1.017 | 1.044 | 1.097 | 1.285 | 1.579 | 1.820 | 2.168 | 2.355 | 2.677 | 2.944 | 3.212 | 3.480 | 3.747 | 4.015 | 4.550 | 4.818 | 5.353 | 5.621 | 6.156 | 6.692 | 7.227 | 8.298 | 9.101 | 9.904 |
| 60 | 0.821 | 0.909 | 0.938 | 0.968 | 1.056 | 1.114 | 1.144 | 1.202 | 1.407 | 1.730 | 1.994 | 2.375 | 2.580 | 2.932 | 3.225 | 3.519 | 3.812 | 4.105 | 4.398 | 4.985 | 5.278 | 5.864 | 6.158 | 6.744 | 7.330 | 7.917 | 9.090 | 9.969 | 10.849 |
| 70 | 0.887 | 0.982 | 1.013 | 1.045 | 1.140 | 1.203 | 1.235 | 1.299 | 1.520 | 1.869 | 2.154 | 2.565 | 2.787 | 3.167 | 3.484 | 3.801 | 4.117 | 4.434 | 4.751 | 5.384 | 5.701 | 6.334 | 6.651 | 7.284 | 7.918 | 8.551 | 9.818 | 10.768 | 11.718 |
| 80 | 0.948 | 1.050 | 1.083 | 1.117 | 1.219 | 1.287 | 1.320 | 1.388 | 1.625 | 1.998 | 2.302 | 2.742 | 2.979 | 3.386 | 3.724 | 4.063 | 4.401 | 4.740 | 5.079 | 5.756 | 6.094 | 6.772 | 7.110 | 7.787 | 8.464 | 9.142 | 10.496 | 11.512 | 12.527 |
| 90 | 1.006 | 1.113 | 1.149 | 1.185 | 1.293 | 1.365 | 1.401 | 1.472 | 1.724 | 2.119 | 2.442 | 2.909 | 3.160 | 3.591 | 3.950 | 4.309 | 4.668 | 5.028 | 5.387 | 6.105 | 6.464 | 7.182 | 7.541 | 8.260 | 8.978 | 9.696 | 11.133 | 12.210 | 13.287 |
| 100 | 1.060 | 1.173 | 1.211 | 1.249 | 1.363 | 1.438 | 1.476 | 1.552 | 1.817 | 2.233 | 2.574 | 3.066 | 3.331 | 3.785 | 4.164 | 4.542 | 4.921 | 5.300 | 5.678 | 6.435 | 6.814 | 7.571 | 7.949 | 8.706 | 9.464 | 10.221 | 11.735 | 12.870 | 14.006 |

Above chart data calculated based on the $C_v$ for each orifice. Flow = 3.875 $C_v \sqrt{\Delta P}$. $\Delta P$ = differential pressure in psid. It is assumed that the region on either side of the orifice is fully flooded with no air pockets.

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