

C

Technical References

Common Terms and Definitions	C-02
Gas Purity Values	C-03
How to Use the FITOK Flow Charts	C-04
Conversion Factors	C-05
Material Compatibility for Gases	C-06
Ordering Details for Specialty Gas Application	C-08

Common Terms and Definitions

Inlet Pressure

The pressure of media of gas or liquid on the inlet port of the regulator or valve;
Typical units of measure: psig, bar and MPa.

Outlet Pressure

The pressure of media of gas or liquid on the outlet port of the regulator or valve.

Accuracy

The variation in control pressure which occurs under steady state conditions within the control range of a regulator.

Sensitivity

The ability of a pressure regulator to respond to change in discharge conditions: pressure, flow, temperature, etc.

Flow Coefficient (Cv)

A flow coefficient is numerically equal to the number of U.S. Gallons of water at 60°F/16°C that will flow through a valve or regulator in one minute when the pressure differential between the inlet and outlet is 1 psi. When gas is used instead of liquid, the equation is modified to account for the use of a compressible fluid. For a regulator, Cv is determined when the regulator is wide open and not regulating. When determining flow performance use actual flow curves.

Leakage - External

The loss of fluid from the external surfaces or joints of a regulator or valve. Example: From the body-bonnet-diaphragm joint. Leakage to atmosphere. The leakage rate is measured in std cm³/s Helium.

Leakage - Internal

The loss of fluid through a regulator or valve, between pressure zones normally expected to be sealed. Example: Between the inlet pressure and the outlet pressure zones.

Load Element

One of the three basic elements of a pressure reducing regulator. It provides the means by which the operator can set the force that determines the control pressure of a regulator. This element includes the spring and the stem.

Sensing Element

One of the three basic elements of a pressure reducing regulator. It senses the changes of the outlet pressure and acts as a physical connection between the load element and control element.

Control Element

One of the three basic elements of a pressure regulator to reduce the high inlet pressure to a stable lower outlet pressure by adjusting the orifice.

Unbalanced Poppet

A poppet where the effective area of the poppet is influenced by the inlet pressure.

Balanced Poppet

A poppet where the effective area of the poppet is not influenced by the inlet pressure.

Gas Purity Values

Type	Degree	Purity Value	Max. Contamination (ppm)
Pure	2.5	99.5%	5000
	3.0	99.9%	1000
High Purity	3.5	99.95%	500
	4.0	99.99%	100
	4.5	99.995%	50
	5.0	99.999%	10
	5.5	99.9995%	5
	6.0	99.9999%	1.0
Ultra High Purity	7.0	99.99999%	0.1

How to Use the FITOK Flow Charts

A FITOK Flow Chart is a graphic representation of test results in curves, showing the changes in outlet pressure of a regulator with the varying flow rate basing on different inlet pressures. The regulator is so designed that at the time the outlet pressure reaches the set pressure, the flow rate would be zero. The inlet pressure is indicated on the right end of each curve.

To use the FITOK Flow Charts, the first step is to select the chart that fits the following:

- Regulator model
- Expected flow range
- Inlet pressure range
- Outlet pressure range

Subsequently, select a curve, if available, plotted for the exact inlet pressure and set pressure of the outlet (zero flow). Locate the set pressure on the vertical axis. Follow the curve until it crosses the vertical line corresponding to the desired flow rate. Read horizontally from the cross point to the vertical axis to locate the actual working pressure for this flow rate. If no curve is plotted for the exact pressure, extrapolate a new curve between and referring to the two closest existing curves.

Example:

Using the flow chart to determine the pressure drop (from the set pressure to the outlet pressure at 30 SCFM condition).

Given Conditions: Inlet pressure=3000 psig, Set pressure=2250 psig

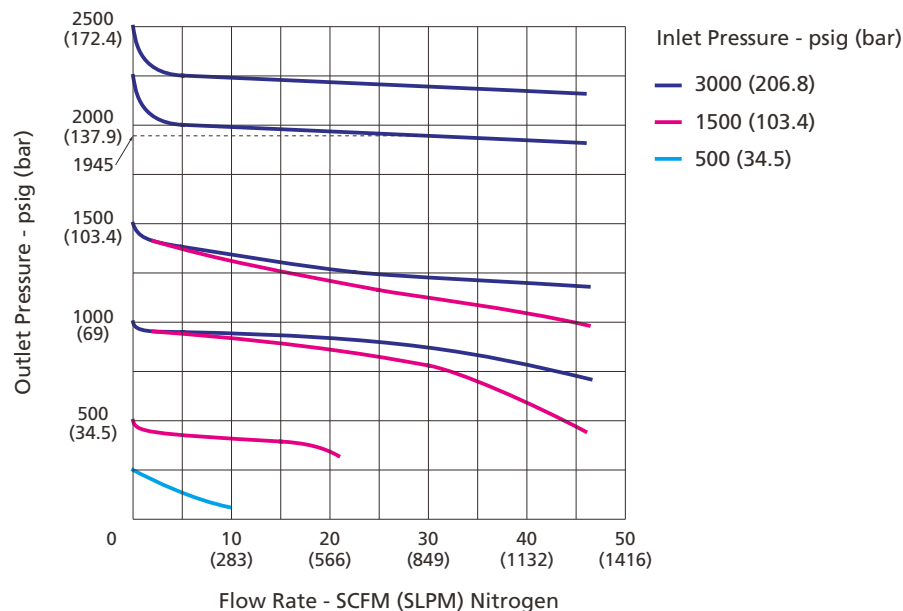
Steps: 1. Locate the curve based on inlet pressure (3000 psig) and set outlet pressure (2250 psig)

2. Follow the curve until it crosses the vertical line corresponding to 30 SCFM;

3. Read horizontally from the cross point to the vertical axis. The corresponding pressure read is 1945 psig.

Therefore, the pressure drop is 305 psig.

Flow Chart



Notes:

1. The performance of regulator is more accurate in the range where the curve is comparatively flat.
2. All test results on the FITOK Flow Charts are based on utilization of nitrogen as a medium in standard testing conditions. Please contact FITOK for additional information.

Conversion Factors

Pressure

From \ To	psi	bar	atm	KPa	ft. of H ₂ O	in. of H ₂ O	mm of Hg	in. of Hg	Kg/cm ²
psi	1	0.068948	0.06805	6.89465	2.3089	27.708	51.175	2.036	0.070307
bar	14.5038	1	0.98692	100	33.4883	401.8596	750.062	29.53	1.0197
atm	14.696	1.01325	1	101.3171	33.932	407.1827	760	29.921	1.0332
KPa	0.14504	0.010	0.00987	1	0.33456	4.01472	7.5006	0.29613	0.0102
ft. of H ₂ O	0.433107	0.029891	0.02947	2.989	1	12	22.4198	0.882646	0.03048
in. of H ₂ O	0.03609	0.002499	0.00246	0.0249089	0.08333	1	1.86832	0.073556	0.00254
mm of Hg	0.019337	0.001333	0.00132	0.133322	0.044603	0.535240	1	0.03937	0.00136
in. of Hg	0.49115	0.033864	0.03342	3.376895	1.134	13.6	25.4	1	0.034532
Kg/cm ²	14.22334	0.980665	0.9678	98.03922	32.8084	393.7008	735.5592	28.95903	1

Flow

From \ To	cm ³ /min	cm ³ /sec	ft ³ /hr	ft ³ /min	m ³ /hr	m ³ /min	L/hr	L/min
cm ³ /min	1	0.0166667	0.0021189	0.0000353	0.00006	0.000001	0.06	0.001
cm ³ /sec	60	1	0.127134	0.0021189	0.0036	0.00006	3.6	0.06
ft ³ /hr	471.9474	7.86579	1	0.0166667	0.0283168	0.0004719	28.31685	0.4719474
ft ³ /min	28316.85	471.9474	60	1	1.699008	0.0283168	1699.008	28.31686
m ³ /hr	16666.67	277.7778	35.31467	0.5885777	1	0.0166667	1000	16.66667
m ³ /min	1000000	16666.67	2118.876	35.31467	60	1	60000	1000
L/hr	16.66667	0.2777778	0.0353147	0.0005885	0.001	0.0000167	1	0.0166667
L/min	1000	16.66667	2.118876	0.0353147	0.06	0.001	60	1

Density

From \ To	gms/cm ³	kg/m ³	lbs/ft ³	lbs/in ³	lbs/U.S. gal
gms/cm ³	1	1000	62.428	0.0361273	8.3454
kg/m ³	0.001	1	0.062428	3.61273×10 ⁻⁵	0.0083454
lbs/ft ³	0.0160185	16.018463	1	5.78704×10 ⁻⁴	0.13368
lbs/in ³	27.679905	27679.9	1728	1	231
lbs/U.S. gal	0.1198264	119.8264	7.4805195	0.004329	1

Material Compatibility for Gases

Codes

- 1 Recommended
- 2 Use with Limitations
- 3 Not Applicable
- 4 Insufficient Data

Material Media	Metals						Plastics				Elastomers		
	Copper	Brass	Aluminum	SS	Hastelloy C 22	Monel	PCTFE	Teflon PTFE	PEEK	Polyimide	FKM	Buna-N	EPDM
Acetylene	3	2	1	1	1	1	1	1	4	4	1	1	1
Ammonia	3	3	2	1	1	1	1	1	4	3	3	2	1
Argon	1	1	1	1	1	1	1	1	1	1	1	1	1
Argon/Methane	1	1	1	1	1	1	1	1	1	1	1	1	3
Arsine	3	2	3	1	1	1	1	1	4	4	1	4	1
Boron Trichloride	3	3	3	2	1	1	1	1	4	4	4	3	4
Boron Trifluoride	3	3	3	2	1	1	1	1	4	4	4	3	4
N-Butane	1	1	1	1	1	1	1	1	1	1	1	1	4
Carbon Dioxide	1	1	1	1	1	1	1	1	1	1	1	1	1
Carbon Monoxide	1	1	1	1	1	1	1	1	4	4	1	1	1
Chlorine	3	3	3	2	1	1	1	1	4	2	1	3	1
Deuterium	1	1	1	1	1	1	1	1	1	1	1	1	4
Diborane	1	1	1	1	1	1	1	1	1	1	1	3	4
Ethane	1	1	1	1	1	1	1	1	1	1	1	1	3
Ethylene	1	1	1	1	1	1	1	1	1	1	1	1	3
Fluorine	2	3	2	2	2	1	2	1	3	3	3	3	3
Hydrogen	1	1	1	1	1	1	1	1	1	1	1	1	1
Hydrogen Chloride	3	3	3	2	1	1	1	1	4	2	2	3	1
Hydrogen Flouride	3	3	3	3	2	1	1	1	4	4	4	3	1
Hydrogen Sulphide	3	3	3	1	1	4	4	4	4	4	1	4	1
Hydrogen Iodide	3	3	3	4	4	4	4	4	4	4	4	4	4
Helium	1	1	1	1	1	1	1	1	1	1	1	1	1
Hexafluoro Ethane	1	1	1	1	1	1	2	1	4	4	4	4	4

Media \ Material	Metals						Plastics				Elastomers		
	Copper	Brass	Aluminum	SS	Hastelloy C 22	Monel	PCTFE	Teflon PTFE	PEEK	Polyimide	FKM	Buna-N	EPDM
Isobutene	1	1	1	1	1	1	1	1	1	1	1	1	3
Isobutane	1	1	1	1	1	1	1	1	1	1	1	1	3
Krypton	1	1	1	1	1	1	1	1	1	1	1	1	4
Methane	1	1	1	1	1	1	1	1	1	1	1	1	3
Methyl Chloride	4	4	3	1	1	4	4	1	4	4	1	3	3
Methyl Mercaptan	3	2	1	1	4	4	1	1	4	4	4	4	4
Neon	1	1	1	1	1	1	1	1	1	1	1	1	1
Nitrogen	1	1	1	1	1	1	1	1	1	1	1	1	1
Nitrous Oxide	1	1	1	1	1	1	2	1	1	1	1	1	4
Nitrogen Dioxide	4	2	2	1	4	2	1	1	4	4	4	4	4
Nitrogen Trifluoride	2	4	4	2	4	1	4	4	4	4	4	4	4
Nitrogen Monoxide	3	3	1	1	1	3	1	1	4	4	4	4	4
Phosphine	2	1	2	1	1	1	1	1	4	4	2	4	1
Propane	1	1	1	1	1	1	1	1	1	1	1	1	3
Propylene	1	1	1	1	1	1	1	1	1	1	1	3	3
Oxygen	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulphur Dioxide	2	2	2	1	1	4	1	1	4	4	3	3	1
Sulphur Hexafluoride	1	1	1	1	1	1	1	1	1	1	1	1	1
Silane	1	1	1	1	1	1	1	1	4	4	1	4	4
Synthetic Air	1	1	1	1	1	1	1	1	1	1	1	1	1
Tetrafluoro Methane	1	1	1	1	1	1	1	1	4	4	1	4	4
Trifluoro Methane R23	1	1	1	1	1	1	1	1	4	4	4	4	4
Xenon	1	1	1	1	1	1	1	1	1	1	1	1	1

Ordering Details for Specialty Gas Application

Gas Control Equipment

Related Products

Technical References

<p>Company _____</p> <p>Name _____</p> <p>Tel _____</p> <p>E-mail _____</p>
<p>Application Information</p>
<p>Gas _____ Chemical formula _____ Purity _____</p> <p>Upstream pressure _____ psig, _____ bar, _____ Mpa</p> <p>Downstream pressure range _____ psig, _____ bar, _____ Mpa</p> <p>Temperature _____ °C _____ °F Cv or flow rate _____</p> <p>Application _____</p> <p>_____</p>
<p>Pressure Regulator Data</p>
<p>Single-stage <input type="checkbox"/> Dual-stage <input type="checkbox"/></p>
<p>Material (mostly gas type dependent): Stainless Steel <input type="checkbox"/> Brass <input type="checkbox"/> Hastelloy <input type="checkbox"/></p>
<p><input checked="" type="radio"/> Cylinder pressure regulator <input type="checkbox"/></p> <p style="padding-left: 20px;">Cylinder connection Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p style="padding-left: 20px;">Purge unit Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p><input checked="" type="radio"/> Panel and line pressure regulator <input type="checkbox"/></p> <p style="padding-left: 20px;">2 ports <input type="checkbox"/> 3 ports <input type="checkbox"/> 4 ports <input type="checkbox"/></p> <p><input checked="" type="radio"/> Pressure control panel <input type="checkbox"/></p> <p style="padding-left: 20px;">Purge unit Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p><input checked="" type="radio"/> Changeover system <input type="checkbox"/></p> <p style="padding-left: 20px;">With line regulator Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p><input checked="" type="radio"/> Point-of-use panel <input type="checkbox"/></p>