

# PRESSURE REGULATOR AND VALVE SELECTION GUIDE

## Technical Bulletin #208C

**Scope:** This document is a reference guide to help customers determine an appropriate AP Tech valve and regulator to be used in process gas systems. For information and specifications related to the specific model, please refer to the catalog data sheet.

## General Notes and Definitions

This guide's general recommendations are based upon typical applications and conditions. The proper regulator selection can be significantly affected by parameters such as system design, flow duration, frequency of use, ambient conditions and outlet pressure. Please consult the factory or your local representative for a specific recommendation beyond the scope of this document or if any doubt exists. It is important to understand that one may follow this guide's recommendation, yet have a failure due to a parameter specific to the given application, as noted. Restated, one may achieve higher or lower flow capacities than stipulated in this guide due to the parameters and conditions of a specific application and system design.

**Source valves** are those on the upstream side of the pressure regulator in the source gas cabinet or bulk delivery system.

**Distribution valves** are those on the downstream side of the pressure regulator in the source gas cabinet or bulk delivery system and used anywhere downstream of the source regulator(s) at point of use (POU) in valve manifold boxes (VMBs) and process tools.

**Source regulators** are those used in the source gas cabinet or bulk delivery system.

**Distribution regulators** are those used at point of use (POU) in valve manifold boxes (VMBs) and process tools. Recommendations are based on typical usage in semiconductor facilities. Operating practices at a specific facility may require a different component selection.

It is assumed that non-liquefied inert gas cylinders are switched over to a new cylinder when the pressure drops to 250 psig. Therefore, maximum recommended flow rates for **source regulators and source valves** assume 250 psig inlet pressure for these gases.

It is assumed that non-liquefied hazardous gas cylinders are switched over to a new cylinder when the pressure reaches 150 psig. Therefore, maximum recommended flow rates for **source regulators** assume 150 psig inlet pressure for these gases.

It is assumed that the cylinder pressure for liquefied gas systems is maintained at or above the vapor pressure at 60°F. It is assumed that cylinders are switched over before the liquid is all vaporized into gas. Therefore, maximum recommended flow rates for **source regulators** are based on 60°F vapor pressure at the regulator inlet for these gases.

Absolute or very low positive pressure delivery bear close scrutiny. The AP 1402TA delivers both sub-atmospheric and positive pressure equally well, whereas the AP 1101 is strictly intended for sub-atmospheric pressure delivery. If low flow and very low positive pressure delivery is desired, the AP 1001 should be selected instead of the AP 1101. The alternative is to select the AP 1402TSA which provides more flow capacity and the ability to deliver sub-atmospheric and positive pressure.

The SHP option is for certain point of use applications in lieu of the SH option. The SHP designation provides Hastelloy C-22 internals comprised of the poppet and diaphragm, whereas the SH option includes the nozzle. SHP is a cost effective solution for point of use applications.

If a **source regulator** is listed as a given "model & a second model", it means two stage regulation is required. The two regulators are in series with the first one listed as the first stage.

Valve recommendations are based on typical cylinder pressures and delivery line pressures. Pressure drop across valves at low pressures may be excessive and require a different valve selection.

Valve recommendations are for the process line isolation. Purge and vent valves are not addressed in this document but generally an AP 3000, AP 3625, or AP 3550 valve will provide sufficient flow capability. The valve series recommended were purposely limited for the sake of brevity. The model number indicates the basic size and rating. For example, manual valves are noted as AP 3625 but an AP 3600 or AP 3650 would also be appropriate and equivalent selections.

Vespe<sup>l</sup>® seats are recommended for all regulators for nitrous oxide and for source regulators for carbon dioxide with either continuous flow demand or flow rates in excess of 100 slpm.

Heating may be required in the source manifold for some gases even when not stated due to duration of flow, ambient conditions, etc. When heating is recommended, other options than contact electrical heating may be possible such as multiple cylinders or heat exchangers. In general, the gas should be heated upstream of the pressure regulator. Please refer to Product Note 407.

Distribution line pressure is assumed to be 60 psig minimum or typical source pressure whichever is less. If the actual line pressure is higher, then higher flow rates than listed in this guideline can be obtained. Conversely if the actual line pressure is lower, then it may not be possible to achieve the maximum flow rate stated with a reasonable pressure drop across the valve or regulator.

**CAUTION:** Product selection is the sole responsibility of the user, regardless of any recommendations or suggestions made by the factory. The user shall make selections based upon their own analysis and testing with regard to function, material compatibility and product ratings. Proper installation, operation and maintenance are also required to assure safe, trouble free performance.

Process Gas	Maximum Flow (slpm)	Source Valves	Maximum Flow (slpm)	Distribution Valves	Maximum Flow (slpm)	Source Regulator	Maximum Flow (slpm)	Distribution Regulator
Acetylene* (C <sub>2</sub> H <sub>2</sub> )	230	AP3000 AP3625	25	AP3550 AP3625	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
	280	AP3002 AP3625	45	AP4550 AP4625	50	AP/AZ/AK1400TS	6	AP/AZ/AK1000S HF
			400	AP3700 AP3800	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
Air	185	AP3000 AP3625	90	AP3550 AP3625	30	AP/AZ/AK1500S	30	AP/AZ/AK1000S
	225	AP3002 AP3625 AP3100	160	AP4550 AP4625 AP3800	100	AP1900S	50	AP/AZ/AK1000S HF
	550	AP3130	890	AP3700	200	AP/AZ/AK1400TS	150	AP/AZ/AK1400TS
	475	AP3125		AP3800	800	AP/AZ/AK1200S HR	400	AP/AZ/AK1200S
Ammonia (NH <sub>3</sub> )	250	AP3550 AP3625	100	AP3550 AP3625	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
	450	AP4550 AP4625	225	AP4550 AP4625	50	AP/AZ/AK1400TS	30	AP/AZ/AK1000S HF
	1000	AP3113 AP3125	1000	AP3700 AP3800	75	AP/AZ/AK1200S	60	AP/AZ/AK1400TS
					400	AP/AZ/AK1200S	125	AP/AZ/AK1200S
Argon (Ar)	200	AP3000 AP3625	80	AP3550 AP3625	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
	350	AP3002 AP3625	150	AP4550 AP4625	40	AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF
	1000	AP3130 AP3125	800	AP3700 AP3800	150	AP/AZ/AK1200S HR	150	AP/AZ/AK1400TS
					1100	AP/AZ/AK1200S HF AP9100S	1000	AP/AZ/AK1200S FC AP9100S
Arsine (AsH <sub>3</sub> )	140	AP3550 AP3625	55	AP3550 AP3625	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
	240	AP4550 AP4625	95	AP4550 AP4625	40	AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF
Arsine Mixtures (Nitrogen Balance)	185	AP3000 AP3625	90	AP3550 AP3625	15	AP/AZ/AK1500S	15	AP/AZ/AK1000S
	225	AP3002 AP3625	160	AP4550 AP4625	50	AP1900S	50	AP/AZ/AK1000S HF
Boron Trichloride (BCl <sub>3</sub> )	20	AP4550 AP4625	15	AP4550 AP4625	150	AP/AZ/AK1400TS	150	AP/AZ/AK1400TS
					6	AP/AZ/AK1402TSA	0.4	AP/AZ/AK1101SH
Boron Trichloride Mix (Nitrogen Balance)	185	AP3000 AP3625	90	AP3550 AP3625	6	AP/AZ/AK1402TSA	6	AP/AZ/AK1402TSA
	225	AP3002 AP3625	160	AP4550 AP4625	15	AP/AZ/AK1500S	15	AP/AZ/AK1000S
Boron Trifluoride (BF <sub>3</sub> )	115	AP3000 AP3625	60	AP3550 AP3625	60	AP/AZ/AK1400TS	30	AP/AZ/AK1000S HF
	145	AP3002 AP3625	100	AP4550 AP4625	60	AP/AZ/AK1400TS	60	AP/AZ/AK1400TS
Boron 11 Trifluoride (11BF <sub>3</sub> )	115	AP3000 AP3625	60	AP3550 AP3625	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
	145	AP3002 AP3625	100	AP4550 AP4625	25	AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF
Butene-1 (C <sub>4</sub> H <sub>8</sub> )	35	AP3550 AP3625	30	AP3550 AP3625	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
	65	AP4550 AP4625	60	AP4550 AP4625	25	AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF
Carbon Dioxide (CO <sub>2</sub> )	500	AP3000 AP3625	75	AP3550 AP3625	3	AP/AZ/AK1500S	8	AP/AZ/AK1000S
	700	AP3002 AP3625	140	AP4550 AP4625	75	AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF
					150	AP/AZ/AK1200S VS	40	AP/AZ/AK1400TS
					500	AP/AZ/AK1225S VS & AP/AZ/AK1200S HF VS	100	AP/AZ/AK1200S
							160	AP/AZ/AK1200S HF
							160	AZ/AK1300S

SOURCE VALVE GUIDELINE

DISTRIBUTION VALVE GUIDELINE

SOURCE REGULATOR GUIDELINE

DISTRIBUTION REGULATOR GUIDELINE

\*15 psig maximum source regulator outlet pressure

Red highlight denotes heating required to achieve stated flow.

Process Gas	Maximum Flow (slpm)	Source Valves	Maximum Flow (slpm)	Distribution Valves	Maximum Flow (slpm)	Source Regulator	Maximum Flow (slpm)	Distribution Regulator
<b>Carbon Dioxide</b> (CO <sub>2</sub> ) Con't	2500	AP3113 AP3125	750	AP3700 AP3800	1000	<b>AP9030S VS &amp; AP9100S VS</b>	325 800	AP/AZ/AK1200S FC AP9100S
<b>Carbon Monoxide</b> (CO)	185	AP3000 AP3625	90	AP3550 AP3625	5	AP/AZ/AK1500S AP1900S	5 15	AP/AZ/AK1000S AP/AZ/AK1000S HF
	225	AP3002 AP3625	160	AP4550 AP4625	50	AP/AZ/AK1400TS	50	AP/AZ/AK1400TS
	75	AP3550 AP3625	50	AP3550 AP3625	3	AP/AZ/AK1500SH	5	AP/AZ/AK1000SH
<b>Chlorine</b> (Cl <sub>2</sub> )	150	AP4550 AP4625	100	AP4550 AP4625	50	AP/AZ/AK1400TS	15	AP/AZ/AK1000SH HF
	300	AP3113 AP3125	400	AP3700 AP3800	75	AP/AZ/AK1200SH	30	AP/AZ/AK1000SH HF
					200	<b>AP/AZ/AK1200SH HF</b>	75	AP/AZ/AK1200SH
<b>Chlorine Trifluoride</b> (ClF <sub>3</sub> )	20	AP4550 AP4625	15	AP4550 AP4625	6	AP/AZ/AK1402TSA	125	AP/AZ/AK1200SH HF
							125	AZ/AK1300S
							250	AP/AZ/AK1200SH FC
<b>Diborane Mixtures</b> (Nitrogen Balance)	185	AP3000 AP3625	90	AP3550 AP3625	5	AP1700S	0.5	AP/AZ/AK1101S
	225	AP3002 AP3625	160	AP4550 AP4625	225	AP2700S	6	AP/AZ/AK1402TSA
							10	AP/AZ/AK1000S
<b>Dichlorosilane</b> (SiH <sub>2</sub> Cl <sub>2</sub> )	20	AP4550 AP4625	20	AP4550 AP4625	7	AP/AZ/AK1402TSA	20	AP/AZ/AK1000S HF
							7	AP/AZ/AK1402TSA
							1	AP1001S
<b>Diethyltelluride</b> (Te(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> )	70	AP3000 AP3625	35	AP3550 AP3625	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
	85	AP3002 AP3625	60	AP4550 AP4625	5	AP1900S	5	AP/AZ/AK1000S HF
					25	AP/AZ/AK1400TS	25	AP/AZ/AK1400TS
<b>Dimethylsilane</b> (C <sub>2</sub> SiH <sub>6</sub> )	14	AP4550 AP4625	7	AP4550 AP4625	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
	150	AP3700 AP3800	75	AP3700 AP3800	50	AP/AZ/AK1400TS	50	AP/AZ/AK1400TS
					75	AP/AZ/AK1200S	75	AP/AZ/AK1200S
<b>Disilane</b> (Si <sub>2</sub> H <sub>6</sub> )	14	AP4550 AP4625	7	AP4550 AP4625	1	AP/AZ/AK1000S	1	AP/AZ/AK1000S
					7	AP/AZ/AK1402TSA	7	AP/AZ/AK1402TSA
							3	AP/AZ/AK1000S
<b>Ethylene</b> (C <sub>2</sub> H <sub>4</sub> )	380	AP3000 AP3625	90	AP3550 AP3625	3	AP/AZ/AK1500S	5	AP/AZ/AK1000S HF
	485	AP3002 AP3625	160	AP4550 AP4625	50	AP/AZ/AK1400TS	50	AP/AZ/AK1000S HF
					75	AP/AZ/AK1200S	75	AP/AZ/AK1400TS
<b>Fluorine</b> (F <sub>2</sub> )	10	AP3200	10	AP3200	Consult Factory		Consult Factory	
<b>Fluorine Mixtures</b> (10%, 500 psig) (Nitrogen Balance)	185	AP3000 AP3625	90	AP3550 AP3625	5	AP/AZ/AK1500SH	5	AP/AZ/AK1000SH
	225	AP3002 AP3625	160	AP4550 AP4625	25	AP/AZ/AK1400TS	10 25	AP/AZ/AK1000SH HF AP/AZ/AK1400TS
<b>Germane</b> (GeH <sub>4</sub> )	10	AP3550 AP3625	4	AP3550 AP3625	1	AP/AZ/AK1000S	1	AP/AZ/AK1000S
	18	AP4550 AP4625	7	AP4550 AP4625	7	AP/AZ/AK1402TSA	7	AP/AZ/AK1402TSA
<b>Germane Mixtures</b> (Nitrogen Balance)	185	AP3000 AP3625	90	AP3550 AP3625	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
	225	AP3002 AP3625	160	AP4550 AP4625	20	AP1900S	20	AP/AZ/AK1000S HF
					50	AP/AZ/AK1400TS	50	AP/AZ/AK1400TS
<b>Halocarbon 12</b> (CCl <sub>2</sub> F <sub>2</sub> )	55	AP4550 AP4625	40	AP4550 AP4625	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
					50	AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
							50	AP/AZ/AK1400TS
<b>Halocarbon 12B2</b> (CBr <sub>2</sub> F <sub>2</sub> )	15	AP4550 AP4625	15	AP4550 AP4625	5	AP/AZ/AK1400TSA	0.5	AP/AZ/AK1101S
							5	AP/AZ/AK1402TSA
<b>Halocarbon 13</b> (CClF <sub>3</sub> )	140	AP3000 AP3625	40	AP3550 AP3625	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
	170	AP3002 AP3625	70	AP4550 AP4625	50	AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
							50	AP/AZ/AK1400TS

SOURCE VALVE GUIDELINE

DISTRIBUTION VALVE GUIDELINE

SOURCE REGULATOR GUIDELINE

DISTRIBUTION REGULATOR GUIDELINE

Red highlight denotes heating required to achieve stated flow.

Process Gas	Maximum Flow (slpm)		Source Valves		Maximum Flow (slpm)		Distribution Valves		Maximum Flow (slpm)		Source Regulator		Maximum Flow (slpm)		Distribution Regulator	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
<b>Halocarbon 13B1</b> (CBrF <sub>3</sub> )	110		AP3550		35		AP3550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
	190		AP3625 AP4550 AP4625		65		AP3625 AP4550 AP4625		50		AP/AZ/AK1400TS		50		AP/AZ/AK1000S HF AP/AZ/AK1400TS	
<b>Halocarbon 14</b> (CF <sub>4</sub> )	10		AP3000		50		AP3550		10		AP/AZ/AK1500S		5		AP/AZ/AK1000S	
			AP3625				AP3625		40		AP1900S		15		AP/AZ/AK1000S HF	
	200		AP3002		100		AP4550		80		AP1900S HF		30		AP/AZ/AK1400TS	
	600		AP3625 AP3130 AP3125		500		AP4625 AP3700 AP3800		500		AP/AZ/AK1200S HR		60		AP/AZ/AK1200S	
<b>Halocarbon 21</b> (CHCl <sub>2</sub> F)	25		AP4550		15		AP4550		5		AP/AZ/AK1402TSA		0.5		AP/AZ/AK1101S	
			AP4625				AP4625						0.5		AP1001S	
<b>Halocarbon 23</b> (CHF <sub>3</sub> )	115		AP3000		145		AP3550		10		AP/AZ/AK1500S		10		AP/AZ/AK1000S	
			AP3625				AP3625		50		AP/AZ/AK1400TS		20		AP/AZ/AK1000S HF	
	140		AP3002 AP3625		250		AP4550 AP4625						50		AP/AZ/AK1400TS	
<b>Halocarbon 32</b> (CH <sub>2</sub> F <sub>2</sub> )	140		AP3000		55		AP3550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
	175		AP3625 AP3002 AP3625		100		AP3625 AP4550 AP4625		50		AP/AZ/AK1400TS		6		AP/AZ/AK1000S HF	
<b>Halocarbon 114</b> (C <sub>2</sub> ClF <sub>4</sub> )	30		AP4550		25		AP4550		7		AP/AZ/AK1402TSA		0.5		AP/AZ/AK1101S	
			AP4625				AP4625						1		AP/AZ/AK1000S	
<b>Halocarbon 115</b> (C <sub>2</sub> ClF <sub>3</sub> )	60		AP4550		40		AP4550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
			AP4625				AP4625		50		AP/AZ/AK1400TS		5		AP/AZ/AK1000S HF	
									75		AP/AZ/AK1200S		50		AP/AZ/AK1400TS	
<b>Halocarbon 116</b> (C <sub>2</sub> F <sub>6</sub> )	60		AP3000		40		AP3550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
			AP3625				AP3625		50		AP/AZ/AK1400TS		10		AP/AZ/AK1000S HF	
	100		AP3002		80		AP4550		75		AP/AZ/AK1200S		25		AP/AZ/AK1400TS	
	275		AP3625 AP3113 AP3125		400		AP4625 AP3700 AP3800		125		AP/AZ/AK1200S HF		50		AP/AZ/AK1200S	
<b>Halocarbon 125</b> (C <sub>2</sub> HF <sub>5</sub> )	180		AP4550		70		AP4550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
			AP4625				AP4625		25		AP/AZ/AK1400TS		5		AP/AZ/AK1000S HF	
<b>Halocarbon 134A</b> (C <sub>2</sub> H <sub>2</sub> F <sub>4</sub> )	55		AP4550		40		AP4550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
			AP4625				AP4625		50		AP/AZ/AK1400TS		5		AP/AZ/AK1000S HF	
	350		AP3100 AP3700 AP3800		230		AP3800 AP3700 AP3800		75		AP/AZ/AK1200S		50		AP/AZ/AK1400TS	
<b>Halocarbon R218</b> (C <sub>3</sub> F <sub>8</sub> )	35		AP3550		20		AP3550		3		AP/AZ/AK1500S		3		AP/AZ/AK1000S	
	60		AP3625 AP4550 AP4625		40		AP3625 AP4550 AP4625		50		AP/AZ/AK1400TS		5		AP/AZ/AK1000S HF	
<b>Halocarbon C318</b> (C <sub>4</sub> F <sub>8</sub> )	25		AP4550		20		AP4550		6		AP/AZ/AK1402TSA		1		AP/AZ/AK1101S	
			AP4625				AP4625						6		AP/AZ/AK1402TSA	
<b>Helium</b> (He)	750		AP3000		250		AP3550		125		AP/AZ/AK1500S		65		AP/AZ/AK1000S	
			AP3625				AP3625		500		AP1900S		125		AP/AZ/AK1000S HF	
	1000		AP3002		450		AP4550		625		AP1900S HF		275		AP/AZ/AK1400TS	
		AP3625				AP4625		2000		AP/AZ/AK1200S HR		625		AP/AZ/AK1200S		
	2500		AP3130 AP3125		2500		AP3700 AP3800						900		AP/AZ/AK1200S HF	
												900		AZ/AK1300		
												1200		AP/AZ/AK1200S FC		
												2500		AP9100S		

SOURCE VALVE GUIDELINE

DISTRIBUTION VALVE GUIDELINE

SOURCE REGULATOR GUIDELINE

DISTRIBUTION REGULATOR GUIDELINE

Red highlight denotes heating required to achieve stated flow.

Process Gas	Maximum Flow (slpm)	Source Valves	Maximum Flow (slpm)	Distribution Valves	Maximum Flow (slpm)	Source Regulator	Maximum Flow (slpm)	Distribution Regulator			
Hydrogen (H <sub>2</sub> )	800	AP3000 AP3625	300	AP3550 AP3625	125 500	AP/AZ/AK1500S AP1900S	65 125	AP/AZ/AK1000S			
	1600	AP3002 AP3625		AP4550 AP4625				625 900	AP1900S HF AP2700S	125 275	AP/AZ/AK1000S HF AP/AZ/AK1400TS
	3000	AP3130 AP3125		AP3700 AP3800				1200	AP/AZ/AK1200S HR	625 900	AP/AZ/AK1200S AP/AZ/AK1200S HF
										900 1200	AZ/AK1300S AP/AZ/AK1200S FC
Hydrogen Bromide (HBr)	155	AP3000 AP3625	55	AP3550 AP3625	1	AP/AZ/AK1500SH AP/AZ/AK1400TS	1	AP/AZ/AK1000SH			
	190	AP3002 AP3625		AP4550 AP4625				30 50	AP/AZ/AK1200SH	2 30	AP/AZ/AK1000SH HF AP/AZ/AK1400TS
										50	AP/AZ/AK1200SH
Hydrogen Chloride (HCl)	350	AP3000 AP3625	75	AP3550 AP3625	2	AP/AZ/AK1500SH AP/AZ/AK1400TS	8	AP/AZ/AK1000SH			
	500	AP3002 AP3625		AP4550 AP4625				90 150	AP/AZ/AK1200SH	20 40	AP/AZ/AK1000SH HF AP/AZ/AK1400TS
	2000	AP3113 AP3125		AP3700 AP3800				600	AP1225SH & AP1210SH HF	85	AP/AZ/AK1200SH
								2000	AP9030S & AP9110S	160 160 300	AP/AZ/AK1200SH HF AZ/AK1300S AP/AZ/AK1200SH FC
Hydrogen Chloride Mixtures (Nitrogen Balance)	210	AP3000 AP3625	105	AP3550 AP3625	10	AP/AZ/AK1500SH AP1900SH	10	AP/AZ/AK1000SH			
	265	AP3002 AP3625		AP4550 AP4625				20 40	AP/AZ/AK1400TS	20 40	AP/AZ/AK1000SH HF AP/AZ/AK1400TS
Hydrogen Fluoride (HF)	20	AP4550 AP4625	20	AP4550 AP4625	5	AP/AZ/AK1402TSA	5	AP/AZ/AK1402TSA			
Hydrogen Selenide (H <sub>2</sub> Se)	125	AP3550 AP3625	55	AP3550 AP3625	5	AP/AZ/AK1500S AP/AZ/AK1400TS	5	AP/AZ/AK1000S			
	215	AP4550 AP4625		AP4550 AP4625				40		20 40	AP/AZ/AK1000S HF AP/AZ/AK1400TS
Hydrogen Selenide Mixtures (Nitrogen Balance)	185	AP3000 AP3625	90	AP3550 AP3625	10	AP/AZ/AK1500S AP1900S	10	AP/AZ/AK1000S			
	225	AP3002 AP3625		AP4550 AP4625				20 50	AP/AZ/AK1400TS	20 50	AP/AZ/AK1000S HF AP/AZ/AK1400TS
Hydrogen Sulfide (H <sub>2</sub> S)	210	AP3000 AP3625	80	AP3550 AP3625	5	AP/AZ/AK1500S AP/AZ/AK1400TS	5	AP/AZ/AK1000S			
	260	AP3002 AP3625		AP4550 AP4625				40		10 40	AP/AZ/AK1000S HF AP/AZ/AK1400TS
Krypton (Kr)	105	AP3000 AP3625	50	AP3550 AP3625	20	AP/AZ/AK1500S AP/AZ/AK1400TS	20	AP/AZ/AK1000S			
	130	AP3002 AP3625		AP4550 AP4625				60		30 60	AP/AZ/AK1000S HF AP/AZ/AK1400TS
Methane (CH <sub>4</sub> )	245	AP3000 AP3625	120	AP3550 AP3625	10	AP/AZ/AK1500S AP1900S	10	AP/AZ/AK1000S			
	295	AP3002 AP3625		AP4550 AP4625				20 40	AP/AZ/AK1400TS	20 40	AP/AZ/AK1000S HF AP/AZ/AK1400TS
Methanol (CH <sub>3</sub> OH)	40	AP3550 AP3625	25	AP3550 AP3625	3	AP/AZ/AK1500S AP/AZ/AK1400TS	3	AP/AZ/AK1000S			
	70	AP4550 AP4625		AP4550 AP4625				50		5	AP/AZ/AK1000S HF
Methyl Chloride (CH <sub>3</sub> Cl)	60	AP4550 AP4625	45	AP4550 AP4625	1	AP/AZ/AK1000S	10	AP/AZ/AK1402TSA			
Methylsilane (CH <sub>3</sub> SiH <sub>3</sub> )	200	AP3550 AP3625	70	AP3550 AP3625	3	AP/AZ/AK1500S AP/AZ/AK1400TS	3	AP/AZ/AK1000S			
	350	AP4550 AP4625		AP4550 AP4625				50 75	AP/AZ/AK1200S	5 50	AP/AZ/AK1000S HF AP/AZ/AK1400TS
										75	AP/AZ/AK1200S
Methyl Fluoride (CH <sub>3</sub> F)	400	AP3000 AP3625	120	AP3550 AP3625	5	AP/AZ/AK1500S AP/AZ/AK1400TS	5	AP/AZ/AK1000S			
	490	AP3002 AP3625		AP4550 AP4625				50		10 50	AP/AZ/AK1000S HF AP/AZ/AK1400TS

Red highlight denotes heating required to achieve stated flow.

Process Gas	Maximum Flow (slpm)	Source Valves	Maximum Flow (slpm)	Distribution Valves	Maximum Flow (slpm)	Source Regulator	Maximum Flow (slpm)	Distribution Regulator		
<b>Neon (Ne)</b>	215	AP3000	110	AP3550	20	AP/AZ/AK1500S	20	AP/AZ/AK1000S		
		AP3625		AP3625		40		AP1900S	40	AP/AZ/AK1000S HF
	260	AP3002		AP4550		300		AP/AZ/AK1200S HF	100	AP/AZ/AK1400TS
		AP3625		AP4625						
<b>Nitrogen (N<sub>2</sub>)</b>	250	AP3000	100	AP3550	50	AP/AZ/AK1500S	25	AP/AZ/AK1000S		
		AP3625		AP3625		200		AP1900S	50	AP/AZ/AK1000S HF
	400	AP3002		AP4550		250		AP1900S HF	150	AP/AZ/AK1400TS
		AP3625		AP4625		350		AP2700	250	AP/AZ/AK1200S
	1000	AP3130		AP3700		1000		AP/AZ/AK1200S HR	300	AP/AZ/AK1200S HF
		AP3125		AP3800			300	AZ/AK1300S		
							400	AP/AZ/AK1200S FC		
							1000	AP9100S		
<b>Nitrogen Trifluoride (NF<sub>3</sub>)</b>	75	AP3000	60	AP3550	5	AP/AZ/AK1500S	6	AP/AZ/AK1000S		
		AP3625		AP3625		60		AP/AZ/AK1400TS	15	AP/AZ/AK1000S HF
	100	AP3002		AP4550		150		AP/AZ/AK1400TS	30	AP/AZ/AK1400TS
		AP3625		AP4625		150		AP2700S	75	AP/AZ/AK1200S
		AP3130	500	AP3700	400	AP/AZ/AK1200S HR	125	AP/AZ/AK1200 S HF		
		AP3125		AP3800	1000	AP9030 & AP9110	125	AZ/AK1300S		
							250	AP/AZ/AK1200S FC		
							600	AP9100S		
<b>Nitric Oxide (NO)</b>	310	AP3000	75	AP3550	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S		
		AP3625		AP3625		50		AP/AZ/AK1400TS	6	AP/AZ/AK1000S HF
	380	AP3002		AP4550		75		AP/AZ/AK1200S	50	AP/AZ/AK1400TS
		AP3625		AP4625			75	AP/AZ/AK1200S		
<b>Nitrous Oxide (N<sub>2</sub>O)</b>	300	AP3000	70	AP3550	3	AP/AZ/AK1500S VS	8	AP/AZ/AK1000S VS		
		AP3625		AP3625		60		AP/AZ/AK1400TS VS	20	AP/AZ/AK1000S VS HF
	500	AP3002		AP4550		100		AP/AZ/AK1200S VS	35	AP/AZ/AK1400TS VS
		AP3625		AP4625		150		AP/AZ/AK1200S VS HF	85	AP/AZ/AK1200S VS
	1500	AP3113		AP3700		500		AP/AZ/AZ1225S VS & AP/AZ/AK1200S VS HF	160	AP/AZ/AK1200S VS HF
		AP3125		AP3800	1000	AP9030S VS & AP9100S VS	160	AZ/AK1300S		
							320	AP/AZ/AK1200S VS FC		
							800	AP9100S VS		
<b>Octafluorocyclopentene (C<sub>5</sub>F<sub>8</sub>)</b>	15	AP4550	15	AP4550	5	AP/AZ/AK1402TSA	0.3	AP/AZ/AK1101S		
		AP4625		AP4625			5	AP/AZ/AK1402TSA		
<b>Oxygen (O<sub>2</sub>)</b>	250	AP3000	75	AP3550	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S		
		AP3625		AP3625		80		AP1900S	25	AP/AZ/AK1000S HF
	400	AP3002		AP4550		150		AP1900S HF	50	AP/AZ/AK1400TS
		AP3625		AP4625		1000		AP/AZ/AK1200S HR	120	AP/AZ/AK1200S
									200	AP/AZ/AK1200S HF
							200	AZ/AK1300S		
							400	AP/AZ/AK1200S FC		
							1000	AP9100S		
<b>Perfluoropropane* (C<sub>3</sub>F<sub>8</sub>)</b>	70	AP3550	35	AP3550	2	AP/AZ/AK1500S	2	AP/AZ/AK1000S		
		AP3625		AP3625		20		AP/AZ/AK1400TS	4	AP/AZ/AK1000S HF
	125	AP4550	60	AP4550			20	AP/AZ/AK1400TS		
		AP4625		AP4625						
<b>Perfluorobutadiene (C<sub>4</sub>F<sub>6</sub>)</b>	25	AP4550	25	AP4550	5	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S		
		AP4625		AP4625			5	AP/AZ/AK1402TSA		
<b>Phosphine (PH<sub>3</sub>)</b>	320	AP3000	80	AP3550	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S		
		AP3625		AP3625		40		AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF
	390	AP3002		AP4550						
		AP3625		AP4625						
<b>Phosphine Mixtures (Nitrogen Balance)</b>	185	AP3000	90	AP3550	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S		
		AP3625		AP3625		20		AP1900S	20	AP/AZ/AK1000S HF
	225	AP3002	160	AP4550						
		AP3625		AP4625						
<b>Phosphorous Pentafluoride (PF<sub>5</sub>)</b>	15	AP3000	5	AP3550	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S		
		AP3625		AP3625		20		AP1900S	20	AP/AZ/AK1000S HF
	19	AP3002		AP4550						
		AP3625		AP4625						
	41	AP3130	52	AP3700						
		AP3125		AP3800						

SOURCE VALVE GUIDELINE

DISTRIBUTION VALVE GUIDELINE

SOURCE REGULATOR GUIDELINE

DISTRIBUTION REGULATOR GUIDELINE

\*Same as Halocarbon R218

Red highlight denotes heating required to achieve stated flow.

Process Gas	Maximum Flow (slpm)	Source Valves	Maximum Flow (slpm)	Distribution Valves	Maximum Flow (slpm)	Source Regulator	Maximum Flow (slpm)	Distribution Regulator
Propane (C <sub>3</sub> H <sub>8</sub> )	65	AP3550	42	AP3550	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3625		AP3625	50	AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
	115	AP4450 AP4625	75	AP4550 AP4625	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
Propene (C <sub>3</sub> H <sub>6</sub> )	185	AP3550	75	AP3550	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3625		AP3625	50	AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
	320	AP4550 AP4625	125	AP4550 AP4625			50	AP/AZ/AK1400TS
Silane (SiH <sub>4</sub> )	150	AP3000	75	AP3550	5	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3625		AP3625	40	AP/AZ/AK1400TS	25	AP/AZ/AK1000S HF
	250	AP3002	150	AP4550	50	AP2700S	50	AP/AZ/AK1400TS
		AP3625		AP4625	60	AP/AZ/AK1200S	120	AP/AZ/AK1200S HF
	600	AP3130 AP3125	750	AP3700 AP3800	100	AP/AZ/AK1200S HF	200	AP/AZ/AK1200S HF
					500	AP/AZ/AK1200S HF AP/AZ/AK1225S & AP/AZ/AK1200S HF	200	AZ/AK1300S
							400	AP/AZ/AK1200S FC
							1000	AP9100S
Silane Mixtures (Nitrogen Balance)	185	AP3000	90	AP3550	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3625		AP3625	20	AP1900S	20	AP/AZ/AK1000S HF
	225	AP3002 AP3625	160	AP4550 AP4625	40	AP/AZ/AK1400TS	40	AP/AZ/AK1400TS
Silicon Tetrachloride (SiCl <sub>4</sub> )	10	AP4550 AP4625	10	AP4550 AP4625	5	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S
							5	AP/AZ/AK1402TSA
Silicon Tetrafluoride (SiF <sub>4</sub> )	95	AP3000	45	AP3550	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3625		AP3625	40	AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF
	115	AP3002 AP3625	80	AP4550 AP4625			40	AP/AZ/AK1400TS
Sulfur Dioxide (SO <sub>2</sub> )	80	AP4550 AP4625	30	AP4550 AP4625	1	AP/AZ/AK1000S	6	AP/AZ/AK1402TSA
					6	AP/AZ/AK1402TSA	5	AP/AZ/AK1000S
Sulfur Hexafluoride (SF <sub>6</sub> )	125	AP3000	35	AP3550	3	AP/AZ/AK1500S	12	AP/AZ/AK1000S HF
		AP3625		AP3625	40	AP/AZ/AK1400TS	25	AP/AZ/AK1400TS
	200	AP3000	75	AP4550	60	AP/AZ/AK1200S	60	AP/AZ/AK1200S
		AP3625		AP4625	150	AP/AZ/AK1200S HF	90	AP/AZ/AK1200S HF
	500	AP3113 AP3125	400	AP3700 AP3800	500	AP/AZ/AK1200S HF AP9100S	90	AZ/AK1300S
							180	AP/AZ/AK1200S FC
							400	AP9100S
Sulfur Tetrafluoride (SF <sub>4</sub> )	200	AP4550 AP4625	80	AP4550 AP4625	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
					15	AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
							15	AP/AZ/AK1400TS
Trichlorosilane (SiHCl <sub>3</sub> )	35	AP4550 AP4625	30	AP4550 AP4625	10	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S
							10	AP/AZ/AK1402TSA
Trimethylsilane ((CH <sub>3</sub> ) <sub>3</sub> SiH)	30	AP4550 AP4625	25	AP4550 AP4625	7	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S
							7	AP/AZ/AK1402TSA
Tungsten Hexafluoride (WF <sub>6</sub> )	10	AP4550 AP4625	10	AP4550 AP4625	5	AP/AZ/AK1402TSA	0.3	AP/AZ/AK1101SH
							5	AP/AZ/AK1402TSA
Xenon (Xe)	85	AP3000	40	AP3550	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
		AP3625		AP3625	25	AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF
	100	AP3002 AP3625	70	AP4550 AP4625			25	AP/AZ/AK1400TS

### Alphabetical Listing by Gas Formula

11BF <sub>3</sub>	Boron 11 Trifluoride	C <sub>3</sub> H <sub>8</sub>	Propane	CH <sub>4</sub>	Methane	Kr	Krypton	SiH <sub>4</sub>	Silane
Ar	Argon	C <sub>4</sub> F <sub>8</sub>	Perfluorobutadiene	CHCl <sub>3</sub>	Halocarbon 21	N <sub>2</sub>	Nitrogen	SiHCl <sub>3</sub>	Trichlorosilane
AsH <sub>3</sub>	Arsine	C <sub>4</sub> F <sub>8</sub>	Halocarbon C318	CHF <sub>3</sub>	Halocarbon 23	N <sub>2</sub> O	Nitrous Oxide	SO <sub>2</sub>	Sulfur Dioxide
BCl <sub>3</sub>	Boron Trichloride	C <sub>4</sub> H <sub>8</sub>	Butene-1	Cl <sub>2</sub>	Chlorine	Ne	Neon	Te(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub>	Diethyltelluride
BF <sub>3</sub>	Boron Trifluoride	C <sub>8</sub> F <sub>8</sub>	Octafluorocyclopentene	ClF <sub>3</sub>	Chlorine Trifluoride	NF <sub>3</sub>	Nitrogen Trifluoride	WF <sub>6</sub>	Tungsten Hexafluoride
C <sub>2</sub> ClF <sub>4</sub>	Halocarbon 114	C <sub>8</sub> F <sub>8</sub>	Halocarbon 12B2	CO	Carbon Monoxide	NH <sub>3</sub>	Ammonia	Xe	Xenon
C <sub>2</sub> ClF <sub>5</sub>	Halocarbon 115	CBrF <sub>2</sub>	Halocarbon 13B1	CO <sub>2</sub>	Carbon Dioxide	NO	Nitric Oxide		
C <sub>2</sub> F <sub>6</sub>	Halocarbon 116	CCl <sub>2</sub> F <sub>2</sub>	Halocarbon 12	F <sub>2</sub>	Fluorine	O <sub>2</sub>	Oxygen		
C <sub>2</sub> H <sub>2</sub>	Acetylene	CClF <sub>3</sub>	Halocarbon 13	GeH <sub>4</sub>	Germane	PF <sub>5</sub>	Phosphorous Pentafluoride		
C <sub>2</sub> H <sub>4</sub> F <sub>4</sub>	Halocarbon 134A	CF <sub>4</sub>	Halocarbon 14	H <sub>2</sub>	Hydrogen	PH <sub>3</sub>	Phosphine		
C <sub>2</sub> H <sub>4</sub>	Ethylene	CH <sub>2</sub> F <sub>2</sub>	Halocarbon 32	H <sub>2</sub> Se	Hydrogen Selenide	SF <sub>4</sub>	Sulfur Tetrafluoride		
C <sub>2</sub> H <sub>6</sub>	Halocarbon 125	(CH <sub>3</sub> ) <sub>3</sub> SiH	Trimethylsilane	H <sub>2</sub> S	Hydrogen Sulfide	SF <sub>6</sub>	Sulfur Hexafluoride		
C <sub>2</sub> SiH <sub>6</sub>	Dimethylsilane	CH <sub>2</sub> Cl	Methyl Chloride	HBr	Hydrogen Bromide	Si <sub>2</sub> H <sub>6</sub>	Disilane		
C <sub>3</sub> F <sub>8</sub>	Halocarbon R218	CH <sub>3</sub> F	Methyl Fluoride	HCl	Hydrogen Chloride	SiCl <sub>4</sub>	Silicon Tetrachloride		
C <sub>3</sub> F <sub>8</sub>	Perfluoropropane	CH <sub>3</sub> OH	Methanol	He	Helium	SiF <sub>4</sub>	Silicon Tetrafluoride		
C <sub>3</sub> H <sub>6</sub>	Propene	CH <sub>3</sub> SiH <sub>3</sub>	Methylsilane	HF	Hydrogen Fluoride	SiH <sub>2</sub> Cl <sub>2</sub>	Dichlorosilane		

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