

Regulator and Valve Selection Guide

Valve and Regulator Recommendations for source and distribution application

This guide is a reference guide to help customers determine an appropriate AP Tech valve and regulator to be used in process gas systems. Before selecting a product, please make sure to read through this guide. For information and specifications related to the specific model, please refer to the catalog data sheet.

Precautions for selection

The guide's general recommendations are based upon typical applications from material point of view.

Some series are not available depending on the regulations in different countries so the selection should be made complying with the regulations in the countries where the product will be used.

In Japan since using compression fittings for toxic gas is prohibited, AP/AZ series should be used for toxic gas.

The proper regulator and valve selection can be significantly affected by parameters such as system design, flow duration, frequency of use, ambient conditions and outlet pressure. Please consult SMC 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 regulator (s) for cylinder applications 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. Operating practices at a specific facility may require a different component selection.
- It is assumed that non-liquefied gas cylinders are switched over to a new cylinder when the pressure drops to 150 to 250 psig (1.0 to 1.7 MPa). Therefore, maximum recommended flow rates for source regulators and source valves assume 150 to 250 psig (1.0 to 1.7 MPa) inlet pressure for this gas.
- It is assumed that the cylinder pressure for liquefied gas systems is maintained at or above the vapor pressure at 16 °C. 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 16 °C vapor pressure at the regulator inlet for these gases.
- Absolute or very low positive pressure delivery bear close scrutiny. The AP1402TA delivers both sub-atmospheric and positive pressure (30 psig) equally well, whereas the AP1101 is strictly intended for sub-atmospheric pressure delivery (10 psig or less). If low flow and very low positive pressure delivery is desired, the AP1001 should be selected instead of the AP1101. The alternative is to select the AP1402TA which provides more flow capacity and the ability to delivery 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 Ni-Cr-Mo alloy internals comprised of the poppet and diaphragm, whereas the SH option includes the nozzle.
- If a source regulator is listed as ① and ②, it means two stage regulation is required. The two regulators are in series with ① listed as the first stage and ② listed as the second stage.
- Valve recommendations are based on typical cylinder pressures and delivery line pressures. Pressure drop across valves at low pressures may be excessive and required 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 AP3000, AP3650, or AP3540 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, manually operated valves are noted as AP3650 but an AP3600 or AP3625 would also be appropriate and equivalent selections.
- Polyimide seats are recommended for nitrous oxide (N₂O) and for source applications for carbon dioxide (CO₂) 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, appropriate heating method shall be selected depending on gas type. In general, the gas should be heated upstream of the pressure regulator.
- Distribution line pressure is assumed to be 60 psig (0.4 MPa) 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.

Caution

Since the product specified here is used under various operating conditions, its compatibility with fluid and specific equipment must be decided by the person who designs the equipment or decided its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product regardless of any recommendation.

Proper installation, operation and maintenance are also required to assure safe, trouble free performance.

Recommended Model Selection Table

Please read page 656 before selecting a product.

How to read model number listed as recommendation.

Example

Valve	Regulator						
AP3650	AP/AZ/AK1200	S	VS	HF	AP/AZ/1402T	S	A
①	①	②	③	④	①	②	⑤

① Series

AP/AZ/AK1200: 3 series are recommended (AP1200, AZ1200, AK1200).

Valve: Only typical series is shown as recommendation and other models with same specifications (operating pressure, Cv) are also recommended.

For example, other than AP3650, AP3600/3625/3657 are also recommended.

② Material

S: Stainless steel body as standard design.

SH: Stainless steel body with Ni-Cr-Mo alloy internals as it further improves corrosion resistance than S (standard design).

Either SH or SHP can be used with AP series regulators and SHP is used with AZ series regulators. (SHP provides Ni-Cr-Mo alloy internals comprised of the poppet and diaphragm, whereas SH includes the nozzle.)

Material of stainless steel body varies depending on series.

- AP series (except AP9000&9100) ... 316L SS secondary remelt
- AZ series and AP9000&9100 ... 316L SS
- AK series ... 316 SS

③ VS: Seat material is made of Polyimide. (Only for specific series)

No code: PCTFE as standard design.

④ Option (Only for specific series)

- HF: High flow
- FC: Force compensation
- HR: High inlet pressure

⑤ A: Delivery of sub-atmospheric pressure. (Only for specific series)

For more details, please refer to catalog.

AP

SL

AZ

AK

BP

Application Process Gas	Valve				Regulator			
	Source applications		Distribution applications		Source applications		Distribution applications	
	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation
Acetylene* (C ₂ H ₂)	230	AP3000	25	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650	50	AP/AZ/AK1400TS	6	AP/AZ/AK1000S HF
	280	AP3002	45	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
		AP3650		AP4650			75	AP/AZ/AK1200S
				AP3700			95	AP/AZ/AK1200S HF
				AP3800				AZ/AK1300S
Air	185	AP3000	90	AP3540	30	AP/AZ/AK1500S	30	AP/AZ/AK1000S
		AP3650		AP3650	100	AP1900S	50	AP/AZ/AK1000S HF
	225	AP3002	160	AP4540	800	AP/AZ/AK1200S HR	200	AP/AZ/AK1400TS
		AP3650		AP4650			400	AP/AZ/AK1200S
		AP3100		AP3800				AP/AZ/AK1200S HF
				AP3700			600	AZ/AK1300S
550	AP3130	890	AP3700					
475	AP3125		AP3800					
Ammonia (NH ₃)	250	AP3540	100	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
		AP3650		AP3650	50	AP/AZ/AK1400TS	30	AP/AZ/AK1000S HF
	450	AP4540	225	AP4540	400	AP/AZ/AK1200S	75	AP/AZ/AK1400TS
		AP4650		AP4650			60	AP/AZ/AK1400TS
				AP3700			125	AP/AZ/AK1200S
				AP3113			250	AP/AZ/AK1200S HF
1000	AP3125	1000	AP3800	1100	AP9100S		AZ/AK1300S	
						500	AP/AZ/AK1200S FC	
Argon (Ar)	200	AP3000	80	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3650		AP3650	100	AP1900S	25	AP/AZ/AK1000S HF
	350	AP3002	150	AP4540	1500	AP/AZ/AK1200S HR	300	AP1900S HF
		AP3650		AP4650			50	AP/AZ/AK1400TS
				AP3700			100	AP/AZ/AK1200S
				AP3130			200	AP/AZ/AK1200S HF
1000	AP3125	800	AP3800			400	AZ/AK1300S	
						1000	AP/AZ/AK1200S FC	
							AP9100S	

* 15 psig (0.1 MPa) maximum source regulator outlet pressure.

■ denotes heating required to achieve stated flow.

Recommended Model Selection Table

Please read page 656 before selecting a product.

Application		Valve				Regulator			
		Source applications		Distribution applications		Source applications		Distribution applications	
Process Gas	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	
		Arsine (AsH ₃)	140	AP3540	55	AP3540	5	AP/AZ/AK1500S	5
AP3650	AP3650			40		AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF	
240	AP4540		95	AP4540					
	AP4650			AP4650					
Arsine Mixtures (Nitrogen Balance)	185	AP3000	90	AP3540	15	AP/AZ/AK1500S	15	AP/AZ/AK1000S	
		AP3650		AP3650	50	AP1900S		50	AP/AZ/AK1000S HF
	225	AP3002	160	AP4540	150	AP/AZ/AK1400TS	150	AP/AZ/AK1400TS	
		AP3650		AP4650					
Boron Trichloride (BCl ₃)	20	AP4540	15	AP4540	6	AP/AZ/AK1402TSA	0.4	AP/AZ/AK1101SH	
		AP4650		AP4650			6	AP/AZ/AK1402TSA	
Boron Trichloride Mix (Nitrogen Balance)	185	AP3000	90	AP3540	15	AP/AZ/AK1500S	15	AP/AZ/AK1000S	
		AP3650		AP3650	60	AP/AZ/AK1400TS	30	AP/AZ/AK1000S HF	
	225	AP3002	160	AP4540			60	AP/AZ/AK1400TS	
		AP3650		AP4650					
Boron Trifluoride (BF ₃)	115	AP3000	60	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S	
		AP3650		AP3650	25	AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF	
	145	AP3002	100	AP4540			25	AP/AZ/AK1400TS	
		AP3650		AP4650					
Boron 11 Trifluoride (11BF ₃)	115	AP3000	60	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S	
		AP3650		AP3650	25	AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF	
	145	AP3002	100	AP4540			25	AP/AZ/AK1400TS	
Butadiene (C ₄ H ₆)	60	AP4540	60	AP4540	3	AP/AZ1500S	3	AP/AZ1000S	
		AP4625		AP4625	40	AP/AZ1400T	5	AP/AZ1000S HF	
n-butane (C ₄ H ₁₀)	60	AP4540	60	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S	
		AP4625		AP4625	40	AP/AZ/AK1400T	5	AP/AZ/AK1000S HF	
Butene-1 (C ₄ H ₈)	35	AP3540	30	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S	
		AP3650		AP3650	50	AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF	
	65	AP4540	60	AP4540					
		AP4650		AP4650					
Carbon Dioxide (CO ₂)	500	AP3000	75	AP3540	3	AP/AZ/AK1500S	8	AP/AZ/AK1000S	
		AP3650		AP3650	75	AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF	
		AP3002		AP4540	150	AP/AZ/AK1200S VS	40	AP/AZ/AK1400TS	
	700	AP3650	140	AP4650	500	① AP/AZ/AK1225S VS	100	AP/AZ/AK1200S	
		AP3113		AP3700		② AP/AZ/AK1200S VS HF	160	AP/AZ/AK1200S HF	
	2500	AP3125	750	AP3800		① AP9030S VS		AZ/AK1300S	
						② AP9100S VS	325	AP/AZ/AK1200S FC	
Carbon Monoxide (CO)	185	AP3000	90	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S	
		AP3650		AP3650	15	AP1900S	15	AP/AZ/AK1000S HF	
	225	AP3002	160	AP4540	50	AP/AZ/AK1400TS	50	AP/AZ/AK1400TS	
		AP3650		AP4650					
Carbonyl fluoride (COF ₂)	115	AP3000	60	AP3540	5	AP/AZ1500S	3	AP/AZ1000S	
		AP3625		AP3625	25	AP/AZ1400TS	10	AP/AZ1000S HF	
	200	AP3625	100	AP4540					
Chlorine (Cl ₂)	75	AP3540	50	AP3540	3	AP/AZ/AK1500SH	5	AP/AZ/AK1000SH	
		AP3650		AP3650	50	AP/AZ/AK1400TS	15	AP/AZ/AK1000SH HF	
	150	AP4540	100	AP4540	75	AP/AZ/AK1200SH	30	AP/AZ/AK1400TS	
		AP4650		AP4650	200	AP/AZ/AK1200SH HF	75	AP/AZ/AK1200SH	
	300	AP3113	400	AP3700			125	AP/AZ/AK1200SH HF	
		AP3125		AP3800				AZ/AK1300S	
Chlorine Trifluoride (ClF ₃)	20	AP4540	15	AP4540	6	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S	
		AP4650		AP4650			6	AP/AZ/AK1402TSA	
Diborane Mixtures (Nitrogen Balance)	185	AP3000	90	AP3540	5	AP1700S	10	AP/AZ/AK1000S	
		AP3650		AP3650	225	AP2700S	20	AP/AZ/AK1000S HF	
	225	AP3002	160	AP4540					
		AP3650		AP4650					
Dichlorosilane (SiH ₂ Cl ₂)	20	AP4540	20	AP4540	7	AP/AZ1402TSA	1	AP1001S	
		AP4650		AP4650			7	AP/AZ/AK1402TSA	

■ denotes heating required to achieve stated flow. Please read page 657 regarding how to read model number listed as recommendation.

If ① and ② are indicated in front of a model number, it means two stage regulation is required. The two regulators are in series with ① listed as the first stage and ② listed as the second stage.

Recommended Model Selection Table

Please read page 656 before selecting a product.

Application Process Gas	Valve				Regulator			
	Source applications		Distribution applications		Source applications		Distribution applications	
	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation
Diethyltelluride (Te(C ₂ H ₅) ₂)	70	AP3000	35	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		5		AP1900S
	85	AP3002	60	AP4540	25	AP/AZ/AK1400TS	25	AP/AZ/AK1400TS
AP3650		AP4650						
Vinylidene fluoride (C ₂ H ₂ F ₂)	140	AP3000	55	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3625		AP3625		50		AP/AZ/AK1400TS
	200	AP3625	100	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
		AP4625						75
Dimethylsilane (C ₂ H ₆ Si)	14	AP4540	7	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP4650		AP4650		50		AP/AZ/AK1400TS
	150	AP3700	75	AP3700	75	AP/AZ/AK1200S	75	AP/AZ/AK1200S
AP3800		AP3800						
Disilane (Si ₂ H ₆)	14	AP4540	7	AP4540	1	AP/AZ/AK1000S	1	AP/AZ/AK1000S
		AP4650		AP4650		7		AP/AZ/AK1402TSA
Ethylene (C ₂ H ₄)	380	AP3000	90	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	485	AP3002	160	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
AP3650		AP4650						75
Fluorine(F ₂)	10	AP3200	10	AP3200	Consult Factory		Consult Factory	
Fluorine Mixtures (10 %, 3.4 MPa) (Nitrogen Balance)	185	AP3000	90	AP3540	5	AP/AZ/AK1500SH	5	AP/AZ/AK1000SH
		AP3650		AP3650		25		AP/AZ/AK1400TS
	225	AP3002	160	AP4540			25	AP/AZ/AK1400TS
AP3650		AP4650						
Germane (GeH ₄)	10	AP3540	4	AP3540	1	AP/AZ/AK1000S	1	AP/AZ/AK1000S
		AP3650		AP3650		7		AP/AZ/AK1402TSA
	18	AP4540	7	AP4540				
AP4650		AP4650						
Germane Mixtures (Nitrogen Balance)	185	AP3000	90	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3650		AP3650		20		AP1900S
	225	AP3002	160	AP4540	50	AP/AZ/AK1400TS	50	AP/AZ/AK1400TS
AP3650		AP4650						
Halocarbon 12 (CCl ₂ F ₂)	55	AP4540	40	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP4650		AP4650		50		AP/AZ/AK1400TS
							50	AP/AZ/AK1400TS
Halocarbon 12B2 (CBr ₂ F ₂)	15	AP4540	15	AP4540	5	AP/AZ/AK1400TSA	0.5	AP/AZ/AK1000S
		AP4650		AP4650				
Halocarbon 13 (CClF ₃)	140	AP3000	40	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	170	AP3002	70	AP4540			50	AP/AZ/AK1400TS
AP3650		AP4650						
Halocarbon 13B1 (CBrF ₃)	110	AP3540	35	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	190	AP4540	65	AP4540			50	AP/AZ/AK1400TS
AP4650		AP4650						
Halocarbon 14 (CF ₄)	10	AP3000	50	AP3540	10	AP/AZ/AK1500S	5	AP/AZ/AK1000S
		AP3650		AP3650		40		AP1900S
	200	AP3002	100	AP4540	80	AP1900S HF	30	AP/AZ/AK1400TS
		AP3650		AP4650		500		AP/AZ/AK1200S HR
	600	AP3130	500	AP3700			100	AP/AZ/AK1200S HF
		AP3125		AP3800				
						250	AP/AZ/AK1200S FC	
						500	AP1900S	
Halocarbon 21 (CHCl ₂ F)	25	AP4540	15	AP4540	5	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1000S
		AP4650		AP4650				
						5	AP/AZ/AK1402TSA	
Halocarbon 23 (CHF ₃)	115	AP3000	145	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	140	AP3002	250	AP4540			50	AP/AZ/AK1400TS
AP3650		AP4650						
Halocarbon 32 (CH ₂ F ₂)	140	AP3000	55	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	175	AP3002	100	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
AP3650		AP4650						75

AP
SL
AZ
AK
BP

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Recommended Model Selection Table

Please read page 656 before selecting a product.

Application	Valve				Regulator					
	Source applications		Distribution applications		Source applications		Distribution applications			
	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation		
Halocarbon 114 (C ₂ Cl ₂ F ₄)	30	AP4540	25	AP4540	7	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S		
		AP4650		AP4650		1		AP/AZ/AK1000S		
Halocarbon 115 (C ₂ ClF ₆)	60	AP4540	40	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S		
		AP4650		AP4650		50		AP/AZ/AK1000S HF		
						75		AP/AZ/AK1200S	50	AP/AZ/AK1400TS
Halocarbon 116 (C ₂ F ₆)	60	AP3000	40	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S		
		AP3650		AP3650		50		AP/AZ/AK1400TS	10	AP/AZ/AK1000S HF
	100	AP3002	80	AP4540	75	AP/AZ/AK1200S	25	AP/AZ/AK1400TS		
		AP3650		AP4650		125		AP/AZ/AK1200S HF	50	AP/AZ/AK1200S
	275	AP3113	400	AP3700				90	AP/AZ/AK1200S HF	
		AP3125		AP3800				450	AZ/AK1300	
Halocarbon 125 (C ₂ HF ₆)	180	AP4540	70	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S		
		AP4650		AP4650		25		AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
						75		AP/AZ/AK1200S	25	AP/AZ/AK1400TS
Halocarbon 134A (C ₂ H ₂ F ₄)	55	AP4540	40	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S		
		AP4650		AP4650		50		AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
		AP3100		AP3800		75		AP/AZ/AK1200S	50	AP/AZ/AK1400TS
	350	AP3700	230	AP3700			75	AP/AZ/AK1200S		
Halocarbon R218 (C ₃ F ₈)	35	AP3540	20	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S		
		AP3650		AP3650		50		AP/AZ/AK1400TS	5	AP/AZ/AK1000S HF
	60	AP4540	40	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS		
Halocarbon C318 (C ₄ F ₈)	25	AP4540	20	AP4540	6	AP/AZ/AK1402TSA	1	AP/AZ/AK1101S		
		AP4650		AP4650					6	AP/AZ/AK1402TSA
Helium (He)	750	AP3000	250	AP3540	125	AP/AZ/AK1500S	65	AP/AZ/AK1000S		
		AP3650		AP3650		500		AP1900S	125	AP/AZ/AK1000S HF
	1000	AP3002	450	AP4540	625	AP1900S HF	275	AP/AZ/AK1400TS		
	2500	AP3650	2500	AP4650	2000	AP/AZ/AK1200S HR	625	AP/AZ/AK1200S		
		AP3130		AP3700		900		AP/AZ/AK1200S HF		
	AP3125	AP3800				2500	AZ/AK1300			
Hexafluoropropane (C ₃ H ₂ F ₆)	20	AP4540	15	AP4540	6	AP/AZ/AK1402TSA	6	AP/AZ/AK1402TSA		
Hexafluoropropylene (C ₃ F ₆)	60	AP4540	40	AP4540	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
Hydrogen (H ₂)	800	AP3000	300	AP3540	125	AP/AZ/AK1500S	65	AP/AZ/AK1000S		
		AP3650		AP3650		500		AP1900S	125	AP/AZ/AK1000S HF
	1600	AP3002	600	AP4540	625	AP1900S HF	275	AP/AZ/AK1400TS		
		AP3650		AP4650		900		AP2700S	625	AP/AZ/AK1200S
	3000	AP3130	3000	AP3700	1200	AP/AZ/AK1200S HR	900	AP/AZ/AK1200S HF		
		AP3125		AP3800					1200	AP/AZ/AK1200S HF
						3000	AZ/AK1300			
							1200	AP/AZ/AK1200S FC		
							3000	AP9100S		
Hydrogen Bromide (HBr)	155	AP3000	55	AP3540	1	AP/AZ/AK1500SH	1	AP/AZ/AK1000SH		
		AP3650		AP3650		30		AP/AZ/AK1400TS	2	AP/AZ/AK1000S HF
	190	AP3002	95	AP4540	50	AP/AZ/AK1200SH	30	AP/AZ/AK1400TS		
Hydrogen Chloride (HCl)	350	AP3650	75	AP4650	2	AP/AZ/AK1500SH	8	AP/AZ/AK1000SH		
		AP3000		AP3540		90		AP/AZ/AK1400TS	20	AP/AZ/AK1000S HF
	500	AP3002	150	AP4540	150	AP/AZ/AK1200SH	40	AP/AZ/AK1400TS		
		AP3650		AP4650		600		① AP1225SH	85	AP/AZ/AK1200SH
	2000	AP3113	850	AP3700	2000	② AP1210SH HF	160	AP/AZ/AK1200S HF		
		AP3125		AP3800		① AP9030S		AZ/AK1300S		
					② AP9110S	300	AP/AZ/AK1200S FC			
						800	AP9100S			

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If ① and ② are indicated in front of a model number, it means two stage regulation is required. The two regulators are in series with ① listed as the first stage and ② listed as the second stage.

Recommended Model Selection Table

Please read page 656 before selecting a product.

Application Process Gas	Valve				Regulator			
	Source applications		Distribution applications		Source applications		Distribution applications	
	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation
Hydrogen Chloride Mixtures (Nitrogen Balance)	210	AP3000	105	AP3540	10	AP/AZ/AK1500SH	10	AP/AZ/AK1000SH
		AP3650		AP3540		20		AP1900SH
	265	AP3002	190	AP4540	40	AP/AZ/AK1400TS	40	AP/AZ/AK1400TS
		AP3650		AP4650				
Hydrogen Fluoride (HF)	20	AP4540	20	AP4540	5	AP/AZ/AK1402TSA	5	AP/AZ/AK1402TSA
		AP4650		AP4650				
Hydrogen Selenide (H ₂ Se)	125	AP3540	55	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
		AP3650		AP3650		40		AP/AZ/AK1400TS
	215	AP4540	95	AP4540			40	AP/AZ/AK1400TS
		AP4650		AP4650				
Hydrogen Selenide Mixtures (Nitrogen Balance)	185	AP3000	90	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3650		AP3650		20		AP1900S
	225	AP3002	160	AP4540	50	AP/AZ/AK1400TS	50	AP/AZ/AK1400TS
		AP3650		AP4650				
Hydrogen Sulfide (H ₂ S)	210	AP3000	80	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
		AP3650		AP3650		40		AP/AZ/AK1400TS
	260	AP3002	140	AP4540			40	AP/AZ/AK1400TS
		AP3650		AP4650				
Krypton (Kr)	105	AP3000	50	AP3540	20	AP/AZ/AK1500S	20	AP/AZ/AK1000S
		AP3650		AP3650		60		AP/AZ/AK1400TS
	130	AP3002	90	AP4540			60	AP/AZ/AK1400TS
		AP3650		AP4650				
Methane (CH ₄)	245	AP3000	120	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S
		AP3650		AP3650		20		AP1900S
	295	AP3002	210	AP4540	40	AP/AZ/AK1400TS	40	AP/AZ/AK1400TS
		AP3650		AP4650				
Methanol (CH ₃ OH)	40	AP3540	25	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	70	AP4540	40	AP4540				
		AP4650		AP4650				
Methyl bromide (CH ₃ Br)	25	AP4540	15	AP4540	5	AP/AZ/AK1402TSA	5	AP/AZ/AK1402TSA
		AP4625		AP4625				
Methyl Chloride (CH ₃ Cl)	60	AP4540	45	AP4540	1	AP/AZ/AK1000S	10	AP/AZ/AK1402TSA
		AP4650		AP4650		10		AP/AZ/AK1402TSA
Methylsilane (CH ₃ SiH ₃)	200	AP3540	70	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	350	AP4540	120	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS
		AP4650		AP4650				
Methyl Fluoride (CH ₃ F)	400	AP3000	120	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S
		AP3650		AP3650		50		AP/AZ/AK1400TS
	490	AP3002	200	AP4540			50	AP/AZ/AK1400TS
		AP3650		AP4650				
Neon (Ne)	215	AP3000	110	AP3540	20	AP/AZ/AK1500S	20	AP/AZ/AK1000S
		AP3650		AP3650		40		AP1900S
	260	AP3002	190	AP4540	300	AP/AZ/AK1200S HF	100	AP/AZ/AK1400TS
		AP3650		AP4650				
Nitrogen (N ₂)	250	AP3000	100	AP3540	50	AP/AZ/AK1500S	25	AP/AZ/AK1000S
		AP3650		AP3650		200		AP1900S
	400	AP3002	200	AP4540	250	AP1900S HF	150	AP/AZ/AK1400TS
		AP3650		AP4650		350		AP2700
	1000	AP3130	1000	AP3700	1000	AP/AZ/AK1200S HR	300	AP/AZ/AK1200S HF
		AP3125		AP3800				
						400	AP/AZ/AK1200S FC	
						1000	AP9100S	
Nitrogen Trifluoride (NF ₃)	75	AP3000	60	AP3540	5	AP/AZ1500S	6	AP/AZ1000S
		AP3650		AP3650		60		AP/AZ1400TS
	100	AP3002	110	AP4540	150	AP/AZ1400TS	30	AP/AZ1400TS
		AP3650		AP4650				
	350	AP3130	500	AP3700	400	AP/AZ1200S HR	125	AP/AZ1200S HF
		AP3125		AP3800				
				1000	①AP9030		AP/AZ1200S FC	
					②AP9110		AP9100S	
						250	AP/AZ1200S FC	
						600	AP9100S	

AP
SL
AZ
AK
BP

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Recommended Model Selection Table

Please read page 656 before selecting a product.

Application Process Gas	Valve				Regulator				
	Source applications		Distribution applications		Source applications		Distribution applications		
	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	
Nitric Oxide (NO)	310	AP3000	75	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S	
		AP3650		AP3650		50		AP/AZ/AK1400TS	6
	380	AP3002	125	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS	
		AP3650		AP4650				75	AP/AZ/AK1200S
Nitrous Oxide (N ₂ O)	300	AP3000	70	AP3540	3	AP/AZ/AK1500S VS	8	AP/AZ/AK1000S VS	
		AP3650		AP3650		60		AP/AZ/AK1400TS VS	20
	500	AP3002	140	AP4540	100	AP/AZ/AK1200S VS	35	AP/AZ/AK1400TS VS	
		AP3650		AP4650		150		AP/AZ1200S VS HF	85
	1500	AP3113	750	AP3700	500	① AP/AZ1225S VS	160	AP/AZ/AK1200S VS HF	
		AP3125		AP3800		② AP/AZ1200S VS HF		AZ/AK1300S	
Octafluorocyclopentene (C ₅ F ₈)	15	AP4540	15	AP4540	5	AP/AZ/AK1402TSA	0.3	AP/AZ1101S	
		AP4650		AP4650				5	AP/AZ/AK1402TSA
Oxygen (O ₂)	250	AP3000	75	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S	
		AP3650		AP3650		80		AP1900S	25
	400	AP3002	150	AP4540	150	AP1900S HF	50	AP/AZ/AK1400TS	
		AP3650		AP4650		1000		AP/AZ/AK1200S HR	120
				1000	AP3700				AP/AZ/AK1200S HF
					AP3800				200
					400				AP/AZ/AK1200S FC
Perfluorobutadiene (C ₄ F ₆)	25	AP4540	25	AP4540	5	AP/AZ1402TSA	0.5	AP/AZ1101S	
		AP4650		AP4650				5	AP/AZ1402TSA
Phosphine (PH ₃)	320	AP3000	80	AP3540	5	AP/AZ1500S	5	AP/AZ1000S	
		AP3650		AP3650		40		AP/AZ1400TS	10
	390	AP3002	145	AP4540					
Phosphine Mixtures (Nitrogen Balance)	185	AP3000	90	AP3540	10	AP/AZ1500S	10	AP/AZ1000S	
		AP3650		AP3650		20		AP1900S	20
	225	AP3002	160	AP4540					
Phosphorous Pentafluoride (PF ₅)	15	AP3000	5	AP3540	10	AP/AZ1500S	10	AP/AZ1000S	
		AP3650		AP3650		20		AP1900S	20
	19	AP3002	9	AP4540					
		AP3650		AP4650					
41	AP3130	52	AP3700						
	AP3125		AP3800						
Propane (C ₃ H ₈)	65	AP3540	42	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S	
		AP3650		AP3650		50		AP/AZ/AK1400TS	5
	115	AP4450	75	AP4540	75	AP/AZ/AK1200S	50	AP/AZ/AK1400TS	
AP4650	AP4650								
Propene (C ₃ H ₆)	185	AP3540	75	AP3540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S	
		AP3650		AP3650		50		AP/AZ/AK1400TS	5
	320	AP4540	125	AP4540			50	AP/AZ/AK1400TS	
AP4650	AP4650								
Silane (SiH ₄)	150	AP3000	75	AP3540	5	AP/AZ1500S	10	AP/AZ1000S	
		AP3650		AP3650		40		AP/AZ1000TS	25
	250	AP3002	150	AP4540	50	AP2700S	50	AP/AZ1400TS	
		AP3650		AP4650		60		AP/AZ1200S	120
	600	AP3130	750	AP3700	100	AP/AZ1200S HF	200	AP/AZ1200S HF	
		AP3125		AP3800		① AP/AZ1225S		AZ1300S	
				500	② AP/AZ1200S HF	400	AP/AZ1200S FC		
						1000	AP9100S		
Silane Mixtures (Nitrogen Balance)	185	AP3000	90	AP3540	10	AP/AZ1500S	10	AP/AZ1000S	
		AP3650		AP3650		20		AP1900S	20
	225	AP3002	160	AP4540	40	AP/AZ1400TS	40	AP/AZ1400TS	
AP3650	AP4650								
Silicon Tetrachloride (SiCl ₄)	10	AP4540	10	AP4540	5	AP/AZ1402TSA	0.5	AP/AZ1101S	
		AP4650		AP4650				5	AP/AZ1402TSA

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Recommended Model Selection Table

Please read page 656 before selecting a product.

Application Process Gas	Valve				Regulator				
	Source applications		Distribution applications		Source applications		Distribution applications		
	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	Maximum flow (slpm)	Recommendation	
Silicon Tetrafluoride (SiF ₄)	95	AP3000	45	AP3540	10	AP/AZ/AK1500S	10	AP/AZ/AK1000S	
		AP3650		AP3650	40	AP/AZ/AK1400TS		20	AP/AZ/AK1000S HF
	115	AP3002	80	AP4540			40	AP/AZ/AK1400TS	
		AP3650		AP4650					
Sulfur Dioxide (SO ₂)	80	AP4540	30	AP4540	1	AP/AZ/AK1000S	6	AP/AZ/AK1402TSA	
		AP4650		AP4650	6	AP/AZ/AK1402TSA			
Sulfur Hexafluoride (SF ₆)	125	AP3000	35	AP3540	3	AP/AZ/AK1500S	5	AP/AZ/AK1000S	
		AP3650		AP3650	40	AP/AZ/AK1400TS		12	AP/AZ/AK1000S HF
	200	AP3000	75	AP4540	60	AP/AZ/AK1200S	60	AP/AZ/AK1200S	
		AP3650		AP4650	150	AP/AZ/AK1200S HF		90	AP/AZ/AK1200S HF
	500	AP3113	400	AP3700	500	AP9100S	180	AP/AZ/AK1200S FC	
		AP3125		AP3800				400	AP9100S
Sulfur Tetrafluoride (SF ₄)	200	AP4540	80	AP4540	3	AP/AZ/AK1500S	3	AP/AZ/AK1000S	
		AP4650		AP4650	15	AP/AZ/AK1400TS		5	AP/AZ/AK1000S HF
								15	AP/AZ/AK1400TS
Trichlorosilane (SiHCl ₃)	35	AP4540	30	AP4540	10	AP/AZ/AK1402TSA	0.5	AP/AZ/AK1101S	
		AP4650		AP4650				10	AP/AZ/AK1402TSA
Trimethylsilane ((CH ₃) ₃ SiH)	30	AP4540	25	AP4540	7	AP/AZ/AK1402TSA	0.5	AP/AZ1101S	
		AP4650		AP4650				7	AP/AZ/AK1402TSA
Tungsten Hexafluoride (WF ₆)	10	AP4540	10	AP4540	5	AP/AZ/AK1402TSA	0.3	AP/AZ/AK1101SH	
		AP4650		AP4650				5	AP/AZ/AK1402TSA
Xenon (Xe)	85	AP3000	40	AP3540	5	AP/AZ/AK1500S	5	AP/AZ/AK1000S	
		AP3650		AP3650	25	AP/AZ/AK1400TS		10	AP/AZ/AK1000S HF
	100	AP3002	70	AP4540			25	AP/AZ/AK1400TS	
		AP3650		AP4650					

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