Sinclair Collins

K Series

Process Control Valves

Catalog PCV-1/USA

50 years 1961-2011

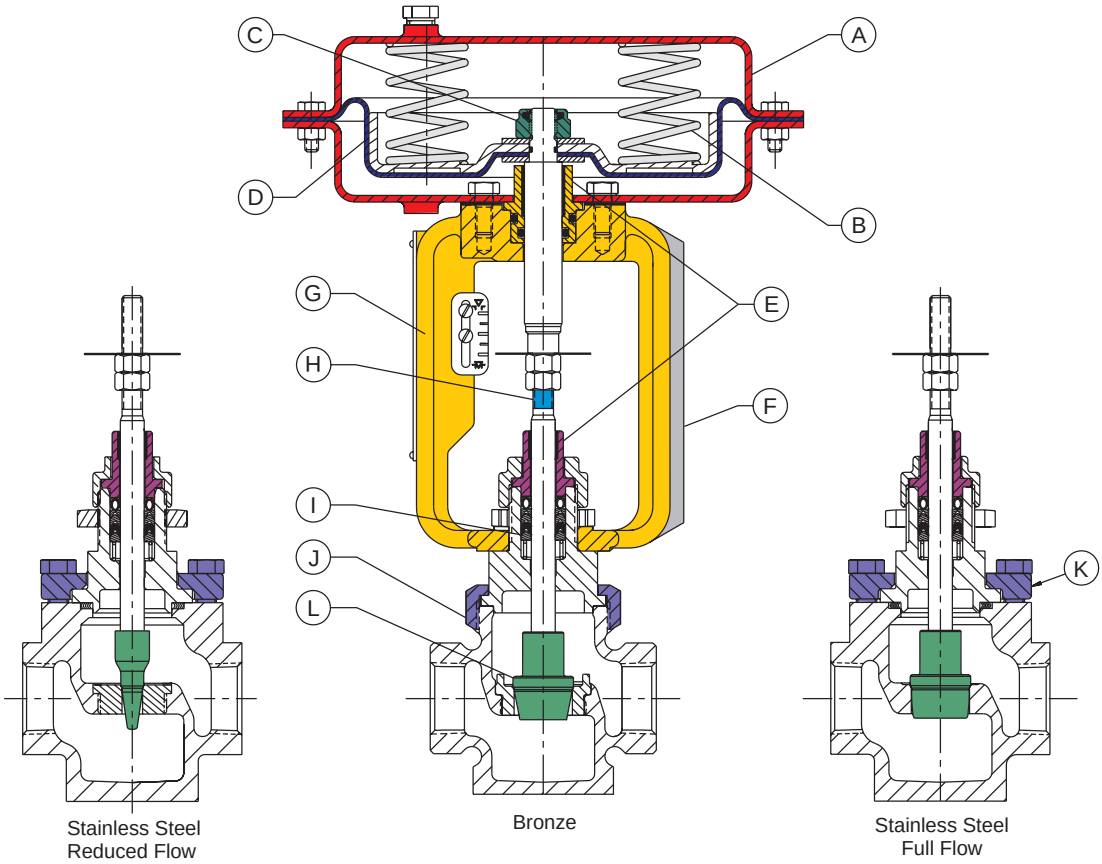
KUNDINGER

Parker

Climate & Industrial Controls

Sinclair Collins Valves – Designed for High Performance

For over 50 years, Sinclair Collins has been designing and manufacturing process control valves for a variety of industries. The rugged design and reliability of the K Series valves make them ideally suited for a variety of applications requiring the control of steam, gas, liquids or chemicals. All components must meet our high performance specifications and quality control standards. Prior to shipment, every valve is fully tested to assure the quality that is expected from Sinclair Collins.



Features

- (A) Actuators in sizes 37, 64 and 135 provide for a wide range of operating requirements.
- (B) Multiple-spring design reduces valve height.
- (C) Field reversible from "air-to-open" to "air-to-close" without disassembling the valve body.
- (D) Nylon-reinforced, molded EPDM rolling style diaphragm provides ease of maintenance and uniform thrust throughout the valve stroke.
- (E) Dual stem guides with integral bearings for maximum alignment and longer life.
- (F) Nemur mounting rail for accessory mounting.
- (G) Yoke is made of cast bronze for rugged construction and long service life. Stainless steel valves use the same quality yoke with particle/silicone resin coating for superior wash down service and is FDA approved for incidental food contact.
- (H) Extended threads on stem allow for easy adjustment to accommodate a wide range of inlet pressures.
- (I) Engineered and manufactured by Parker Hannifin, the combination of stainless steel filled PTFE seals and carbon filled PTFE seals provide optimum sealing, low friction and long life for a wide variety of temperatures and services. Other options are available.
- (J) Bronze valve with union nut retention of the bonnet allows for servicing without removal from the installation.
- (K) Stainless steel valve with bolted flange construction allows for easy servicing without removal from the installation.
- (L) Plugs are hardened stainless steel for maximum protection against erosive and corrosive services with Class IV shutoff. For Class VI shutoff, Sinclair Collins exclusive Duraseat™ combines the sealing qualities of PTFE with the toughness of stainless steel.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure, and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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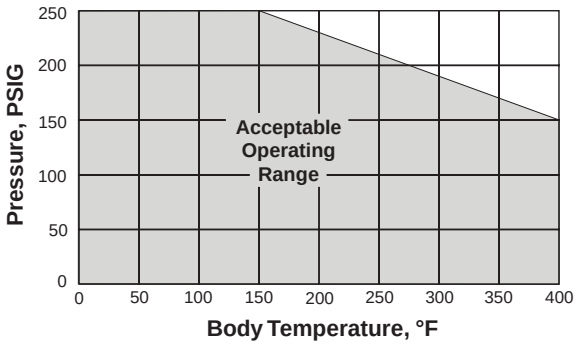
Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the full "Offer of Sale".

Technical Specifications

- Maximum media pressure = 250 PSI (2" valve maximum = 230 PSI)
- Body sizes 1/2", 3/4", 1", 1¼", 1½", 2"
- -40°F to 400°F (-40°C to 204°C) maximum temperature
- Actuator is field reversible, air to open, air to close
- Rolling style diaphragm provides uniform thrust
- Three actuator sizes: 37, 64, 135. Maximum 35 PSI on 37 and 64 sizes; maximum 25 PSI on 135 size.
- Stem diameter 7/16"
- Stem travel (stroke) 0.75" all sizes
- Multi-spring, low-profile actuators offer a 12 PSI control band. Other options available.
- 100% nitrogen gas tested
- Hard seat meets Class IV leakage standards; Duraseat™ meets Class VI standards

Body Pressure/Temperature Ratings



Materials of Construction

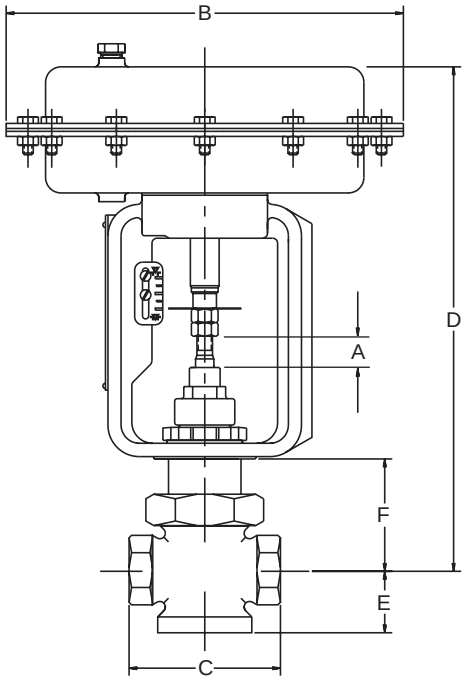
Part Name	Standard Material
Valve Body	Cast bronze ASTM B62
Plug, Hard Seat	17-4 stainless steel (linear & equal %)
Plug, Soft Seat	17-4 stainless steel with Duraseat (linear & equal %)
Seat	17-4 stainless steel, replaceable
Packing Nut	Cast bronze ASTM B62
Stem Packing	Combination of stainless steel filled PTFE and carbon filled PTFE seals; other options available
Bonnet	Brass ASTM B16
Packing Follower	Brass ASTM B16 with integral bearing
Stem Bearings	Engineered proprietary polymer
Yoke	Cast bronze, ASTM B62
Actuator Cover	Stamped steel with enamel finish. Stainless steel fasteners
Diaphragm	Molded EPDM reinforced with nylon fabric
Springs	Zinc-plated music wire

Flow Capacity & Pressure Drop

Body Size	Actuator Size	Flow Capacity (Cv)				Allowable Pressure Drop (PSI) Air to Close or Air to Open					
		Standard Trim Sizes				37		64		135	
		Full	Reduced			PSI	bar	PSI	bar	PSI	bar
1/2"	37, 64	6	2.5	1	—	250	17.2	250	17.2	—	—
3/4"	37, 64	8	2.5	1	—	250	17.2	250	17.2	—	—
1"	37, 64	13	8	6	2.5	190	13.1	250	17.2	—	—
1¼"	37, 64, 135	20	13	8	—	130	9.0	240	16.6	250	17.2
1½"	37, 64, 135	27	20	13	—	100	6.9	180	12.4	250	17.2
2"	64, 135	50	27	20	—	—	—	110	7.6	230	15.9

Actuator Selection

Air to Open							
Set Distance "A"		0.75	0.81	0.88	0.94	1.00	1.06
Actuator PSI at which Stroke Starts		3	4	5	6	7	8
Air to Close							
Set Distance "A"		1.87	1.87	1.87	1.87	1.87	1.87
Actuator PSI Required For Shutoff		18	19	20	21	22	23
Line Pressure to Shut-Off							
Body	**Actuator**	**Pressure Range (PSI)**					
1/2"	37	0-110	111-140	141-170	171-200	201-230	231-250
	64	0-200	201-250				
3/4"	37	0-110	111-140	141-170	171-200	201-230	231-250
	64	0-200	201-250				
1"	37	0-70	71-100	101-120	121-140	141-160	161-190
	64	0-140	141-180	181-220	221-250		
1¼"	37	0-50	51-60	61-80	81-100	101-110	111-130
	64	0-90	91-120	121-150	151-180	181-210	211-240
	135	0-200	201-250				
1½"	37	—	0-50	51-60	61-70	71-90	91-100
	64	0-70	71-90	91-120	121-140	141-160	161-180
	135	0-160	161-200	201-250			
2"	64	—	0-50	51-70	71-80	81-90	91-110
	135	0-90	91-120	121-150	151-170	171-200	201-230



Dimensions

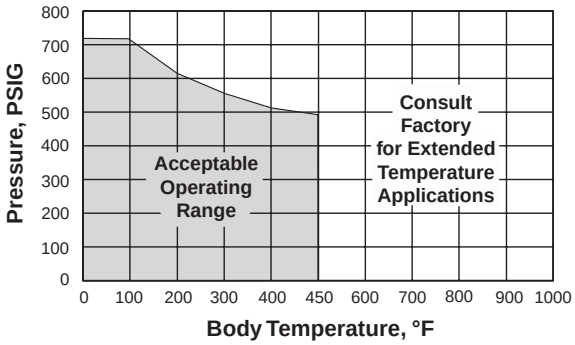
Millimeter equivalent of inch dimensions given in ( ).

Body Size	A (Set Distance)	B			C	D			E	F
		37	64	135		37	64	135		
1/2"	See chart above	9.50 (241.3)	11.75 (298.5)	—	3.62 (91.9)	12.03 (305.6)	12.97 (329.4)	—	1.50 (38.1)	2.66 (67.6)
3/4"		9.50 (241.3)	11.75 (298.5)	—	3.62 (91.9)	12.03 (305.6)	12.97 (329.4)	—	1.50 (3.81)	2.66 (67.6)
1"		9.50 (241.3)	11.75 (298.5)	—	4.12 (104.6)	12.03 (305.6)	12.97 (329.4)	—	1.75 (44.5)	2.66 (67.6)
1¼"		9.50 (241.3)	11.75 (298.5)	16.25 (412.8)	5.38 (136.7)	12.10 (307.3)	13.04 (331.2)	13.53 (343.7)	2.25 (57.2)	2.73 (69.3)
1½"		9.50 (241.3)	11.75 (298.5)	16.25 (412.8)	5.38 (136.7)	12.10 (307.3)	13.04 (331.2)	13.53 (343.7)	2.25 (57.2)	2.73 (69.3)
2"		—	11.75 (298.5)	16.25 (412.8)	7.50 (190.5)	—	13.96 (354.6)	14.45 (367.0)	2.50 (63.5)	3.65 (92.7)

Technical Specifications

- 300# Class stainless steel body per ANSI B16.34
- Body sizes 1/2", 1", 1½", 2"
- -40°F to 450°F (-40°C to 232°C) temperature range. For extended ranges, consult factory.
- Actuator is field reversible, air to open, air to close
- Rolling style diaphragm provides uniform thrust
- Three actuator sizes: 37, 64, 135. Maximum 35 PSI on 37 and 64 sizes; maximum 25 PSI on 135 size.
- Stem diameter 7/16"
- Stem travel (stroke) 0.75" all sizes
- Multi-spring, low-profile actuators offer a 12 PSI control band. Other options available.
- 100% nitrogen gas tested
- Hard seat meets Class IV leakage standards; Duraseat™ meets Class VI standards

Body Pressure/Temperature Ratings



Materials of Construction

Part Name	Standard Material
Valve Body	Investment cast 316 stainless steel with integrally machined seat
Plug, Hard Seat	17-4 stainless steel (linear & equal %)
Plug, Soft Seat	17-4 stainless steel with Duraseat (linear & equal %)
Seat	Full flow – integral to body Reduced orifice – 17-4 stainless steel
Packing Nut	Investment cast 316 stainless steel
Stem Packing	Combination of stainless steel filled PTFE and carbon filled PTFE seals; other options available.
Bonnet	Stainless steel type 316
Bonnet Flange	Investment cast 316 stainless steel secured with 18-8 stainless steel bolts
Bonnet Gasket	18-8 spiral wound gasket with graphite filler
Packing Follower	Stainless steel type 316 with integral bearing
Stem Bearings	Engineered proprietary polymer
Yoke	Cast bronze, ASTM B62 with stainless steel coating FDA approved for incidental food contact
Actuator Cover	Stamped steel with enamel finish, stainless steel fasteners
Diaphragm	Molded EPDM reinforced with nylon fabric
Springs	Zinc-plated music wire

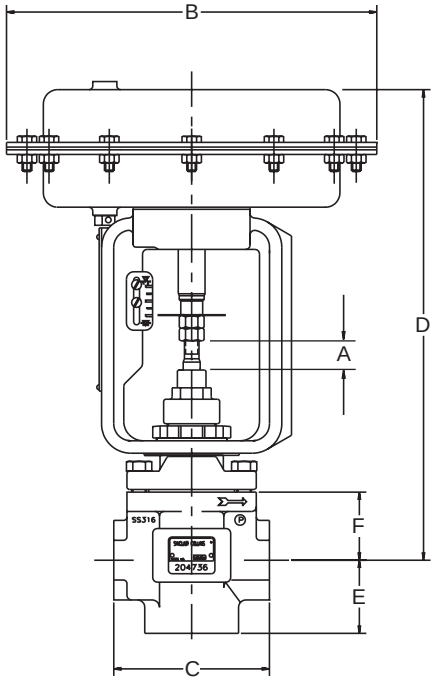
Flow Capacity & Pressure Drop

Port Size	Actuator Size	Flow Capacity (Cv)				Allowable Pressure Drop (PSI) Air to Close or Air to Open					
		Standard Trim Sizes				37		64		135	
		Full	Reduced			PSI	bar	PSI	bar	PSI	bar
1/2"	37, 64	6	2.5	1	—	250	17.2	250	17.2	—	—
1"	37, 64	13	8	6	2.5	190	13.1	250	17.2	—	—
1½"	37, 64, 135	27	20	13	—	100	6.9	180	12.4	250	17.2
2"	64, 135	50	27	20	—	—	—	110	7.6	230	15.9

Actuator Selection

Air to Open						
Set Distance "A"	0.75	0.81	0.88	0.94	1.00	1.06
Actuator PSI at which Stroke Starts	3	4	5	6	7	8
Air to Close						
Set Distance "A"	1.87	1.87	1.87	1.87	1.87	1.87
Actuator PSI Required For Shutoff	18	19	20	21	22	23

Line Pressure to Shut-Off							
Body	**Actuator**	**Pressure Range (PSI)**					
1/2"	37	0-110	111-140	141-170	171-200	201-230	231-250
	64	0-200	201-250				
1"	37	0-70	71-100	101-120	121-140	141-160	161-190
	64	0-140	141-180	181-220	221-250		
1½"	37	—	0-50	51-60	61-70	71-90	91-100
	64	0-70	71-90	91-120	121-140	141-160	161-180
	135	0-160	161-200	201-250			
2"	64	—	0-50	51-70	71-80	81-90	91-110
	135	0-90	91-120	121-150	151-170	171-200	201-230



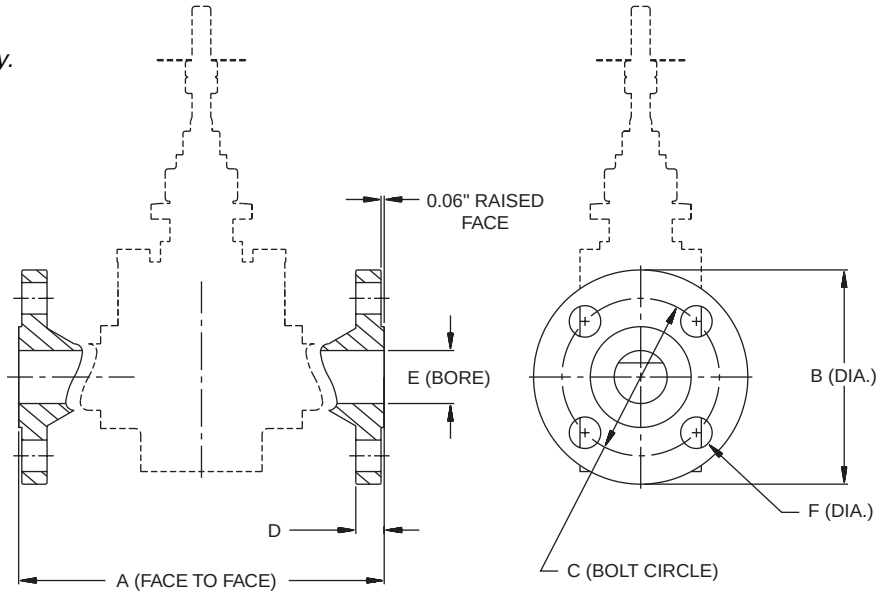
Dimensions

Millimeter equivalent of inch dimensions given in ( ).

Body Size	A (Set Distance)	B			C	D			E	F
		37	**64**	**135**		**37**	**64**	**135**		
1/2"	See chart above	9.50 (241.3)	11.87 (301.5)	—	3.10 (78.7)	12.00 (304.8)	12.94 (328.7)	—	1.50 (38.1)	2.62 (66.5)
1"		9.50 (241.3)	11.87 (301.5)	—	4.00 (101.6)	12.07 (306.6)	13.01 (330.5)	—	1.88 (47.8)	2.69 (68.3)
1½"		9.50 (241.3)	11.87 (301.5)	16.09 (408.7)	5.00 (127.0)	13.11 (333.0)	14.05 (356.9)	14.55 (369.6)	2.44 (62.0)	3.73 (94.7)
2"		—	11.87 (301.5)	16.09 (408.7)	7.50 (190.5)	—	15.39 (390.9)	15.39 (390.9)	3.83 (97.3)	4.57 (116.1)

Flange Mounting

Flanges are available on stainless steel valves only.



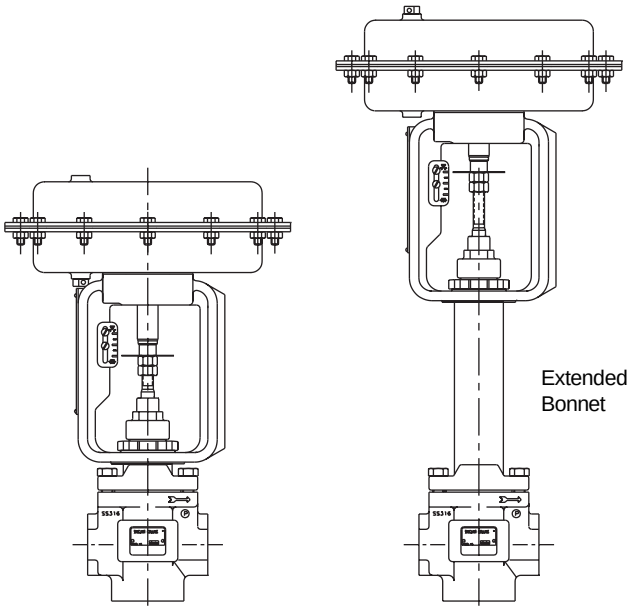
Dimensional Data

	150# Class						300# Class					
Body Size	**A***	**B**	**C**	**D**	**E**	**F**	**A***	**B**	**C**	**D**	**E**	**F**
1/2"	7.25 (184.2)	3.50 (88.9)	2.38 (60.5)	.44 (11.2)	.62 (15.7)	.62 (15.7)	7.50 (190.5)	3.75 (95.3)	2.62 (66.5)	.56 (14.2)	.62 (15.7)	.62 (15.7)
1"	7.25 (184.2)	4.25 (108.0)	3.12 (79.5)	.56 (14.2)	1.05 (26.7)	.62 (15.7)	7.75 (196.9)	4.88 (124.0)	3.50 (88.9)	.69 (17.5)	1.05 (26.7)	.75 (19.1)
1½"	8.75 (222.3)	5.00 (127.0)	3.88 (98.6)	.69 (17.5)	1.61 (40.9)	.62 (15.7)	9.25 (235.0)	6.13 (155.7)	4.50 (114.3)	.81 (20.6)	1.61 (40.9)	.88 (22.4)
2"	11.25 (285.8)	6.00 (152.4)	4.75 (120.7)	.75 (19.1)	2.07 (52.6)	.75 (19.1)	11.75 (298.5)	6.50 (165.1)	5.00 (127.0)	.88 (22.4)	2.07 (52.6)	.75 (19.1)

* Face to face dimension per ISA-S75.03 except 2".

Extended Bonnet

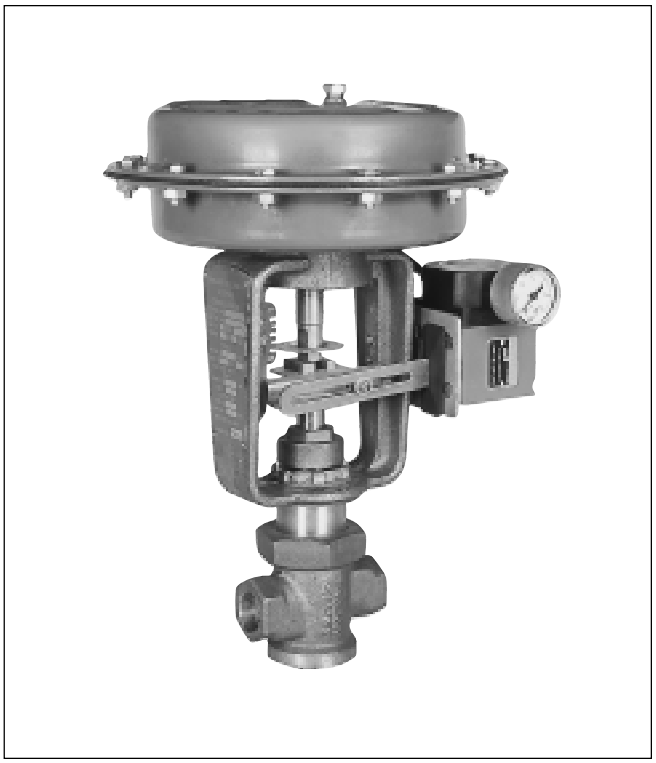
Extended bonnet available for cryogenics or high temperature ranges. Consult your local representative or Sinclair Collins with specific application.



Pneumatic Positioner

K10-1

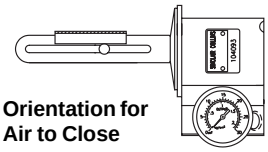
Single acting positioner assures an exact relationship between controlled input signal and actuator valve stem position.



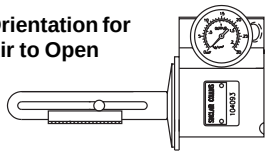
Specifications

Travel	3/4"
Signal Input	3-15 PSIG
Maximum Open Loop Gain	150:1
Minimum Open Loop Gain	50:1
Steady State Air Consumption @9 PSIG Signal & 30 PSIG Supply	.15 SCFM
Linearity	<±1.3% of Span
Hysteresis	<0.4% of Span
Dead Band	<0.2% of Span
Travel Time, 37 Actuator 3/4" Stroke @ 30 PSIG Supply*	1.2 Seconds, Air In 3.0 Seconds Air Out
Supply Pressure Effect	0.12% of Span
Ambient Temperature Effect	0.1% per 2°F
Ambient Temperature Range	-10° to +250°F
Connections	1/4" NPT Signal & Supply 1/8" NPT Output & Gauge
Manifold Body Material	Anodized Aluminum
Cover Material	Anodized Aluminum, Epoxy Coated
External Feedback Parts	Stainless Steel
Dimensions	2½" x 3¼" x 3¾"
Weight	1.75 lbs.

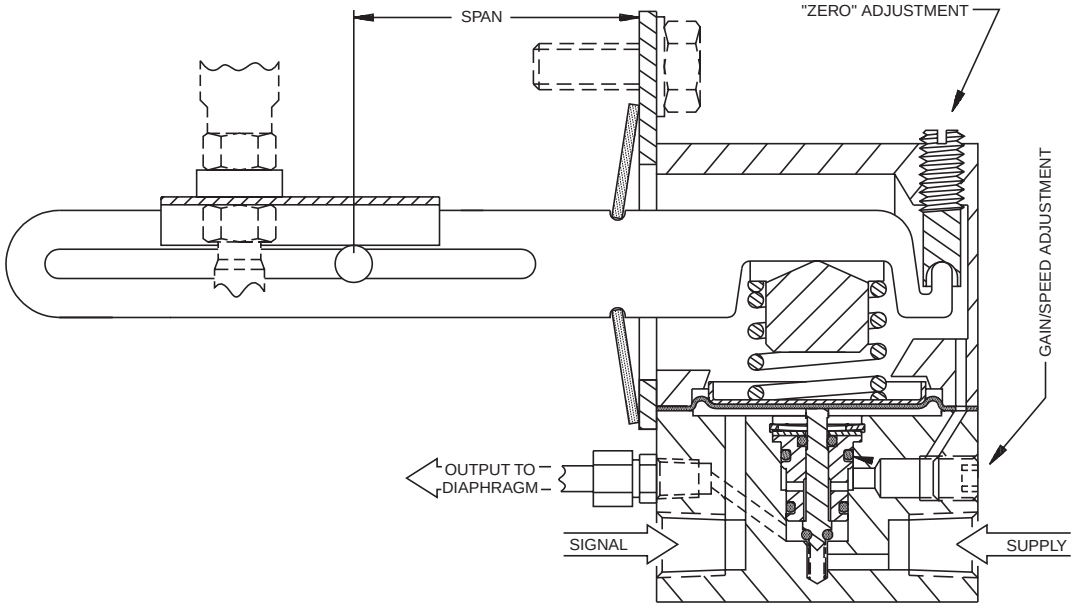
* At maximum speed setting (gain screw flush)



Orientation for Air to Close



Orientation for Air to Open



I/P Transducer

K10-7
I/P 3-15 PSI output for direct actuator or with pneumatic positioner.

K10-9
I/P 1-18 output for direct actuation only.

Air Preparation Unit

K10-4
Filter/Regulator "piggyback" includes 1/4" NPT, 5 micron filter and 1-60 PSI relieving type regulator.

Gauge must be ordered separately.

Other units are available. Consult factory.

Solenoid Valve

K10-30
Three-way universal solenoid valve, 110 VAC, NEMA4x enclosure.

Other units are available. Consult factory.

Series	Material/ Function		Basic Size	Flow Characteristic	Body Configuration	Packing	Trim Size	Accessories		
K		–								

Series	
K	K Series

Bronze Valve (1)	
01	37 Top, Air to Open
11	37 Top, Air to Close
02	64 Top, Air to Open
12	64 Top, Air to Close
03	135 Top, Air to Open
13	135 Top, Air to Close
Stainless Steel Valve (1)	
21	37 Top, Air to Open
31	37 Top, Air to Close
22	64 Top, Air to Open
32	64 Top, Air to Close
23	135 Top, Air to Open
33	135 Top, Air to Close

Flow Characteristic	
1	Hard Seat Linear
2	Hard Seat Equal %
3	Soft Seat Linear
4	Soft Seat Equal %

Body Configuration	
0	Bronze w/NPTF Ports
1	Stainless Steel w/NPTF Ports
2	S.S. w/150# ANSI Flanges
3	S.S. w/300# ANSI Flanges
4	S.S. w/Socket Weld Ports

Trim Size (4)	
0	Cv = 1.0
1	Cv = 2.5
2	Cv = 6.0
3	Cv = 8.0
4	Cv = 13.0
5	Cv = 20.0
6	Cv = 27.0
7	Cv = 50.0

Positioner (5)	
0	None
4	Positioner
5	Positioner with I/P Transducer (3-15)
6	I/P Transducer (1-18), Direct Mounting

Basic Valve Size	
2	1/2"
3	3/4" (2)
4	1"
5	1-1/4" (2)
6	1-1/2"
7	2"

Packing	
1	PTFE (Standard)
2	Graphite
3	PTFE w/Extended Bonnet (3)
4	Graphite w/Extended Bonnet (3)

Filter/Regulator (5)	
0	None
1	Standard Filter
2	Coalescing Filter
3	Filter/Regulator
4	Regulator

3-Way Solenoid Valve (5)	
0	None
1	NEMA4x (120VAC)
2	Explosion Proof (120VAC)
5	NEMA4x (12VDC)
6	Explosion Proof (12VDC)
7	Intrinsically Safe (12VDC)

Notes:
(1) See pages 2 & 4 for body size/actuator combinations
(2) Bronze only
(3) Consult factory for specific applications
(4) See pages 2 & 4 for body size/trim combinations
(5) Includes installation charge unless ordered separately.

Example: **K01-21012000 =** K Series, bronze air to open valve with 37 top, 1/2" hard seat linear body with NPTF ports, PTFE packing, Cv of 6, no accessories.

To size and select a process control valve, a number of factors must be considered. For more in-depth information, see following pages.

Valve Selection

1) **Service**
   a) Modulating
   b) On/Off
2) **Media**
   a) Gas
   b) Liquid
3) **System Pressure** (P1)
   a) Maximum and minimum
4) **Pressure Drop** (ΔP)
   a) Maximum and minimum
5) **Flow Required**
   a) Maximum and minimum
6) **Actuation**
   a) Air to Open (Fail to Close)
   b) Air to Close (Fail to Open)
7) **Actuator Signal** (Source)*
8) **Valve Characteristic**
   a) Equal percentage
   b) Linear
9) **Shutoff required**
   a) Class IV
   b) Class VI
10) **Body material**
   a) Bronze
   b) Stainless steel
11) **End connections**
   a) Threaded ports
   b) Flanges
   c) Socket weld
12) **Packing** (Seals)
13) **Accessories**
   a) Positioner
   b) I-P
   c) Airset
   d) Solenoid valve

* The actuator signal can come from an I-P transducer and/or a positioner. If the signal is from an I-P, specify the output span of the unit.

Calculating Flow Capacity (Cv)

Pressure Drop (ΔP)

For sizing a control valve when the pressure drop is unknown, use 5% of the system pressure for systems with pressure greater than 200 PSI (1375.95 kPa). For systems with pressure less than 200 PSI (1375.95 kPa), use 10 PSI (68.95 kPa).

Liquid

$$Cv = \frac{q_f}{N_1 F_p F_r} \sqrt{\frac{G_f}{\Delta P}}$$

Choked flow*: $\Delta P \geq F_L^2 (P_1 - F_f P_v)$.

If actual ΔP is greater than the value for choked flow, use the lower of the two values for sizing.

Gas/Steam

Flow by Volume

$$Cv = \frac{q_g}{N_7 F_p P_1 Y} \sqrt{\frac{G_g T_1 Z}{x}}$$

Flow by Weight

$$Cv = \frac{w}{N_8 F_p P_1 Y} \sqrt{\frac{T_1 Z}{xM}}$$

Choked flow*: $\Delta P \geq P_1 F_k x_t$

If actual ΔP is greater than the value for choked flow, substitute ($F_k x_t$) for x.

Non-choked

$$Y = 1 - \frac{(x)}{3\ F_k x_t}$$

Choked

$$Y = 1 - \frac{(F_k x_t)}{3\ F_k x_t} = \frac{2}{3}$$

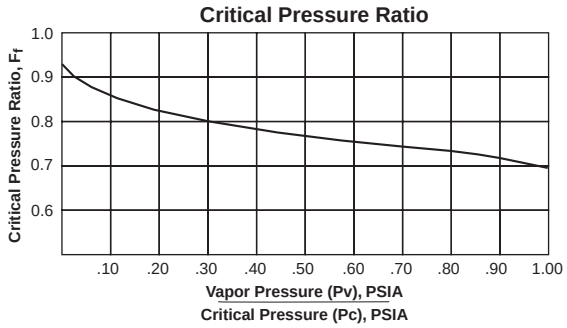
***Choked Flow**

This is the point where additional pressure drop will not result in an increase in flow.

Where:

C_v Universal valve sizing coefficient

F_f Liquid critical pressure ratio (see chart below). Use when the fluid has a high temperature and the vapor pressure is approaching that of the inlet pressure.



F_k Ratio of specific heat factor to air = k/1.4

F_L Factor for the amount of presure that a liquid recovers as it flows through the geometry of a valve and the effect it has on the maximum capacity. Representative value = 0.9

F_p Piping geometry factor. This value is an adjustment to the Cv of a valve that is to be installed between pipe reducers. Although this factor can be crucial for rotary valves the effect on globe style valves is minimal. If the valve selected has a full size trim, an addition of 5% to the calculated Cv will be sufficient. If the valve has reduced trim, then the effect of the reducers is even less and this adjustment can be ignored.

F_r Factor for Reynolds number. Use a factor of (1) unless the fluid has a viscosity greater than 40 centistokes or Cv's less than 0.2. This adjusts the Cv for non turbulent flow conditions.

Gf Specific gravity of liquids at flowing temperatures relative to water @ 60°F.

Gg Specific gravity of gas relative to air with both at standard pressure and temperature.

k Ratio of specific heat. Air = 1.4, Steam = 1.3

M Molecular weight (steam has a molecular weight of 18.03)

P_1 Upstream pressure (absolute)

P_2 Downstream pressure (absolute)

P_c Thermodynamic critical pressure.

P_v Vapor pressure. The pressure and temperature at which a fluid begins to boil

ΔP Pressure drop ($P_1 - P_2$)

q_f Flow rate by volume – liquid

q_g Flow rate by volume – gas

T Absolute temperature.
US = R (460 + °F) SI = K (273 + °C)

V_c Vena contracta. This is the point downstream of the valve orifice where the flow is at the greatest velocity and lowest pressure.

w Flow rate by weight

x Ratio of pressure drop to upstream pressure ($\Delta P / P_1$)

x_t Value of x when Y is at the lowest limit (.667). At this point an additional increase in ΔP will not result in an increase of flow. Representative value = 0.7

Y Expansion factor. This factor represents the change of the specific weight of a gas as it passes from the inlet of the valve to the vena contracta (V_c).

Z Compressibility Factor. This is a function for determining the relationship of the density of a gas to the actual temperature and pressure conditions. At pressures below 720 PSI, the effects are minimal and a factor of (1) can be used.

Additional Factors:

K_c Cavitation index. This describes the point where the flow begins to depart from the proportional relationship of flow versus the square root of pressure drop.
$K_c = \Delta P / P_1 - P_v$

ΔP_m The amount of pressure drop required to produce choked flow

$$\Delta Pm = F_L^2 (P_1 - F_f P_v) \text{ in PSI}$$

Commonly Used Units

	U.S.	S.I.
Steam and vapors (weight units)	lb/hr	kg/hr
Gases (volumetric units)	scfh	m^3/h
Liquids (volumetric units)	gpm	m^3/h
Pressure	psia	kPa

Values for Use in Calculations

	U.S.	S.I.
N1	1.0	.0865
N7	1,360	4.17
N8	19.3	.948
qf	gpm	m^3/h
qg	scfh	m^3/h
P	psia	kPa
w	lb/hr	kg/h
T	R	K
	(460 + °F)	(273 + °C)

Common Subscripts

1	upstream
2	downstream
f	liquid
g	gas

Trim Size

In the discussion of sizing and flow characteristics for Sinclair Collins valves, the components referred to as trim (full or reduced) will be the plug/stem assembly and the valve seat.

Actuator Selection

Air to Open and Air to Close

Actuators can be ordered air to open (fail to close) or air to close (fail to open).

Actuator Sizing

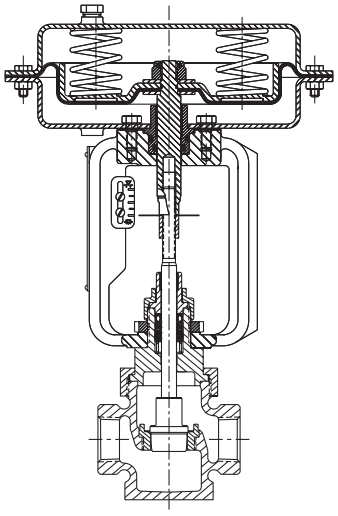
Select valve body size based on Cv and system requirements. Identify the maximum system pressure (P_1) that the valve has to seal against.

The tables to the right show pressure required to actuate an air to open or air to close actuator for various system pressure ranges. For example, a 1" valve with a 37 actuator air to open, will begin to actuate with a 3 PSI signal against a system pressure up to 70 PSI (full open at 15). If the same valve is used in a system that has a pressure of 150 PSI, then 7 PSI would be required to the actuator to start opening and 19 PSI would be required to fully open the valve.

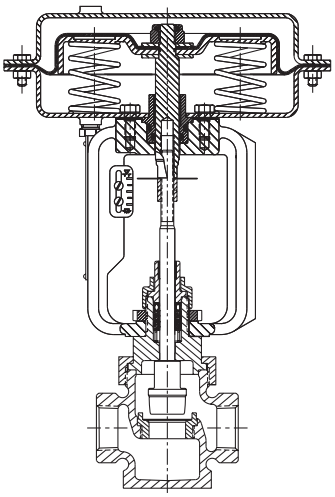
Actuation Pressure

If an I-P is supplying the air pressure (PSI) to the actuator, then identify the output span of the unit for proper selection. A common output range is 3-15 PSI. However, additional pressures and spans are available. The charts on the right identify the minimum pressure required to actuate the valve. Once the minimum pressure is identified, an additional 12 PSI will fully extend the actuator. Please note that an air to close valve requires a prssure greater than 15 PSI for shutoff. Therefore, an I-P will have to be selected with an output sufficient to met this requirement or consider the use of a positioner.

If a positioner is used, select an actuator based on the valve size and the system pressure. This is possible because the positioner is regulated by the valve's stem position and therefore can supply a higher pressure (PSI) to the actuator.



Air to Open Valve



Air to Close Valve

Air to Open						
Set Distance "A"	0.75	0.81	0.88	0.94	1.00	1.06
PSI to Actuator at which Stroke Starts	3	4	5	6	7	8
Air to Close						
Set Distance "A"	1.87	1.87	1.87	1.87	1.87	1.87
PSI to Actuator Required For Shutoff	18	19	20	21	22	23

Line/System Pressure to Shut-Off							
Port	**Actuator**	**Pressure Range (PSI)**					
1/2"	37	0-110	111-140	141-170	171-200	201-230	231-250
	64	0-200	201-250				
3/4"	37	0-110	111-140	141-170	171-200	201-230	231-250
	64	0-200	201-250				
1"	37	0-70	71-100	101-120	121-140	141-160	161-190
	64	0-140	141-180	181-220	221-250		
1¼"	37	0-50	51-60	61-80	81-100	101-110	111-130
	64	0-90	91-120	121-150	151-180	181-210	211-240
	135	0-200	201-250				
1½"	37	—	0-50	51-60	61-70	71-90	91-100
	64	0-70	71-90	91-120	121-140	141-160	161-180
	135	0-160	161-200	201-250			
2"	64	—	0-50	51-70	71-80	81-90	91-110
	135	0-90	91-120	121-150	151-170	171-200	201-230

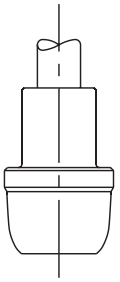
Shutoff

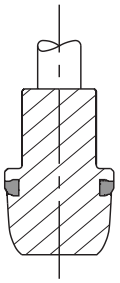
K Series valves are available with either hard or soft seat. Normally the hard seat offers Class IV sealing. For Class VI shutoff, Sinclair Collins features the exclusive Duraseat™ that combines the sealing qualities of PTFE with the toughness of stainless steel to the plug.

Class IV Sealing – Leakage rate of 0.01% of rated valve capacity

Class VI Sealing – Maximum permissible leakage associated with resilient seating valves. Expressed as bubbles per min as per RP39.6*.

Hard Seat





Duraseat™ (Soft Seat)

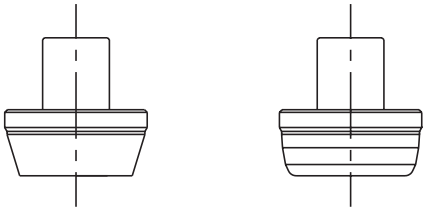
Flow Characteristic

Flow characteristic is the realtionship in a valve between a change of signal to the actuator and a corresponding change in flow.

Quick Opening – Normally used for on/off service and not throttling applications. A quick open contour is designed for a rapid increase in flow.

Equal % – Equal increments of stem travel will yield an equal percentage of change to the existing flow. In the installed condition, this design becomes more linear with a decreasing proportion of pressure drop across the valve.

Linear – Equal increments of stem travel will yield equal increments of flow. This is represented by a straight line on a chart depicting flow vs. stem travel. If smaller proportions of the system pressure drop are taken across the valve, this design results in a flow similar to a quick opening plug.



Linear Plug **Equal %**

NOTE: Many times a valve is sized at approximately 50% of capacity for various reasons. In this condition, a linear plug will use only 50% of the valve stroke. An equal percentage design will use approximately 80% of its stroke under the same conditions and therefore offer a larger span of control.

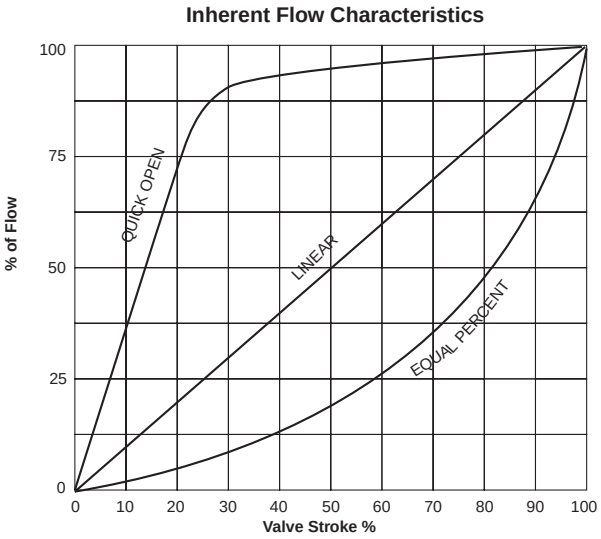
Installed Flow Characteristics

These charts graphically represent how flow through a valve changes in relation to the valve stroke for three common flow characteristics. The "inherent" graph reflects a constant pressure drop that is maintained throughout the stroke of the valve. The "installed" graph reflects a pressure drop that changes according to the valve stroke and the corresponding change in flow.

The graphs do not reflect piping losses that could affect an installed valve. These losses would further exaggerate the installed curve in relation to the inherent curve.

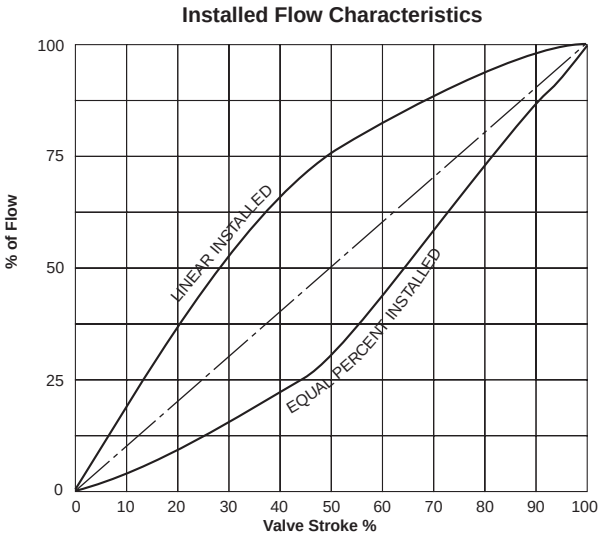
Inherent Flow Characteristic

This is the flow characteristic of the valve as designated by the manufacturer. It does **not** include system variables.



Installed flow characteristic

The installed flow characteristic of the valve does include certain system variables. This will better reflect the performance of the valve installed in a system.



% Stroke vs. Cv

Bronze Valves, Linear Plug

Valve Size	Trim Size	% Stroke									
		10	20	30	40	50	60	70	80	90	100
1/2"	6.0	0.50	1.80	2.70	3.50	4.20	4.70	5.20	5.80	6.20	6.3
	2.5	0.13	0.51	0.88	1.24	1.53	1.77	2.01	2.25	2.44	2.76
	1.0	0.12	0.23	0.34	0.45	0.55	0.64	0.73	0.82	0.90	1.0
3/4"	8.0	0.60	1.80	3.00	3.90	4.70	5.30	6.10	6.80	7.60	8.0
	2.5	0.13	0.51	0.88	1.24	1.53	1.77	2.01	2.25	2.44	2.76
	1.0	0.12	0.23	0.34	0.45	0.55	0.64	0.73	0.82	0.90	1.00
1"	13.0	1.30	2.80	4.20	5.40	6.50	7.20	8.10	9.70	11.00	13.0
	8.0	0.96	1.90	2.80	3.67	4.64	5.49	6.24	6.83	7.43	8.0
	6.0	0.98	1.85	2.49	2.98	3.47	3.98	4.50	4.85	5.35	6.0
	2.5	0.13	0.54	0.93	1.28	1.60	1.86	2.11	2.32	2.45	2.70
1¼"	20.0	1.3	3.9	6.2	8.2	10.3	12.3	14.4	16.5	19.1	21.5
	13.0	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13.0
	8.0	0.60	1.80	3.00	3.90	4.70	5.30	6.10	6.80	7.60	8.0
1½"	27.0	2.8	6.2	9.2	12.2	15.0	17.6	20.4	22.5	25.9	27.0
	20.0	1.3	3.9	6.2	8.2	10.3	12.3	14.4	16.5	19.1	21.5
	13.0	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13.0
2"	50.0	5.3	10.3	15.3	20.7	25.7	31.6	36.4	40.5	46.1	50.0
	27.0	2.8	6.2	9.2	12.2	15.0	17.6	20.4	22.5	25.9	27.0
	20.0	1.3	3.9	6.2	8.2	10.3	12.3	14.4	16.5	19.1	21.5

Bronze Valves, Equal % Plug

Valve Size	Trim Size	% Stroke									
		10	20	30	40	50	60	70	80	90	100
1/2"	6.0	0.30	0.50	0.60	0.70	1.00	1.50	2.20	2.90	4.20	6.3
	2.5	0.05	0.07	0.09	0.21	0.32	0.61	0.91	1.33	1.80	2.58
	1.0	0.04	0.05	0.06	0.08	0.15	0.23	0.39	0.56	0.81	1.00
3/4"	8.0	0.40	0.50	0.70	1.10	1.70	2.30	4.10	5.90	7.30	8.0
	2.5	0.05	0.07	0.09	0.21	0.32	0.61	0.91	1.33	1.80	2.58
	1.0	0.04	0.05	0.06	0.08	0.15	0.23	0.39	0.56	0.81	1.00
1"	13.0	0.50	0.80	1.30	1.90	2.50	3.60	6.50	9.00	11.10	13.0
	8.0	0.47	0.30	0.41	0.72	1.02	2.45	3.72	5.38	6.68	8.0
	6.0	0.33	0.43	0.61	0.82	1.13	1.46	2.04	2.72	4.00	6.0
	2.5	0.05	0.07	0.09	0.21	0.32	0.61	0.91	1.33	1.80	2.58
1¼"	20.0	0.8	1.7	2.4	3.8	5.1	6.3	9.3	14.1	16.4	20.0
	13.0	0.3	0.5	0.7	1.1	1.6	2.5	3.8	5.7	8.6	13.0
	8.0	0.40	0.50	0.70	1.10	1.70	2.30	4.10	5.90	7.30	8.0
1½"	27.0	0.9	1.7	2.8	4.8	7.1	12.1	17.5	21.8	24.4	27.0
	20.0	0.8	1.5	2.4	3.5	4.7	6.2	9.2	13.2	16.1	19.6
	13.0	0.3	0.5	0.7	1.1	1.6	2.5	3.8	5.7	8.6	13.0
2"	50.0	1.6	3.1	5.2	9.7	20.5	28.4	35.5	43.5	49.5	52.7
	27.0	0.9	1.7	2.8	4.8	7.1	12.1	17.5	21.8	24.4	27.0
	20.0	0.8	1.5	2.4	3.5	4.7	6.2	9.2	13.2	16.1	19.6

% Stroke vs. Cv

Stainless Steel Valves, Linear Plug

Valve Size	Trim Size	% Stroke									
		10	20	30	40	50	60	70	80	90	100
1/2"	6.0	1.00	2.10	3.10	4.00	4.10	4.30	4.80	5.10	5.50	6.0
	2.5	0.13	0.51	0.88	1.24	1.53	1.77	2.01	2.25	2.44	2.76
	1.0	0.12	0.23	0.34	0.45	0.55	0.64	0.73	0.82	0.90	1.00
1"	13.0	1.30	2.80	4.20	5.40	6.50	7.20	8.10	9.70	11.00	12.0
	8.0	0.96	1.90	2.80	3.67	4.64	5.49	6.24	6.83	7.43	8.0
	6.0	0.98	1.85	2.49	2.98	3.47	3.98	4.50	4.85	5.35	6.0
	2.5	0.13	0.54	0.93	1.28	1.60	1.86	2.11	2.32	2.45	2.70
1½"	27.0	2.3	5.7	9.3	12.0	14.6	16.8	19.0	20.9	25.1	27.7
	20.0	1.3	3.9	6.2	8.2	10.3	12.3	14.4	16.5	19.1	21.5
	13.0	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13.0
2"	50.0	4.7	10.8	15.9	20.5	25.1	30.1	34.7	39.5	46.6	52.1
	27.0	2.3	5.7	9.3	12.0	14.6	16.8	19.0	20.9	25.1	27.7
	20.0	1.3	3.9	6.2	8.2	10.3	12.3	14.4	16.5	19.1	21.5

Stainless Steel Valves, Equal % Plug

Valve Size	Trim Size	% Stroke									
		10	20	30	40	50	60	70	80	90	100
1/2"	6.0	0.40	0.50	0.70	1.00	1.60	2.10	3.30	4.60	5.70	6.0
	2.5	0.05	0.07	0.09	0.21	0.32	0.61	0.91	1.33	1.80	2.58
	1.0	0.04	0.05	0.06	0.08	0.15	0.23	0.39	0.56	0.81	1.00
1"	12.0	0.49	0.80	1.10	1.80	2.50	3.30	6.10	7.40	10.60	12.0
	8.0	0.47	0.30	0.41	0.72	1.02	2.45	3.72	5.38	6.68	8.0
	6.0	0.33	0.43	0.61	0.82	1.13	1.46	2.04	2.72	4.00	6.0
	2.5	0.05	0.07	0.09	0.21	0.32	0.61	0.91	1.33	1.80	2.58
1½"	27.0	1.2	2.0	3.3	5.4	7.6	12.3	18.9	24.1	26.3	27.0
	20.0	0.8	1.5	2.4	3.5	4.7	6.2	9.2	13.2	16.1	19.6
	13.0	0.3	0.5	0.7	1.1	1.6	2.5	3.8	5.7	8.6	13.0
2"	50.0	1.9	3.6	6.1	11.9	20.5	28.0	35.8	44.4	50.8	53.4
	27.0	0.9	1.7	2.8	4.8	7.1	12.1	17.5	21.8	24.4	27.0
	20.0	0.8	1.5	2.4	3.5	4.7	6.2	9.2	13.2	16.1	19.6

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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

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6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

Parker
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