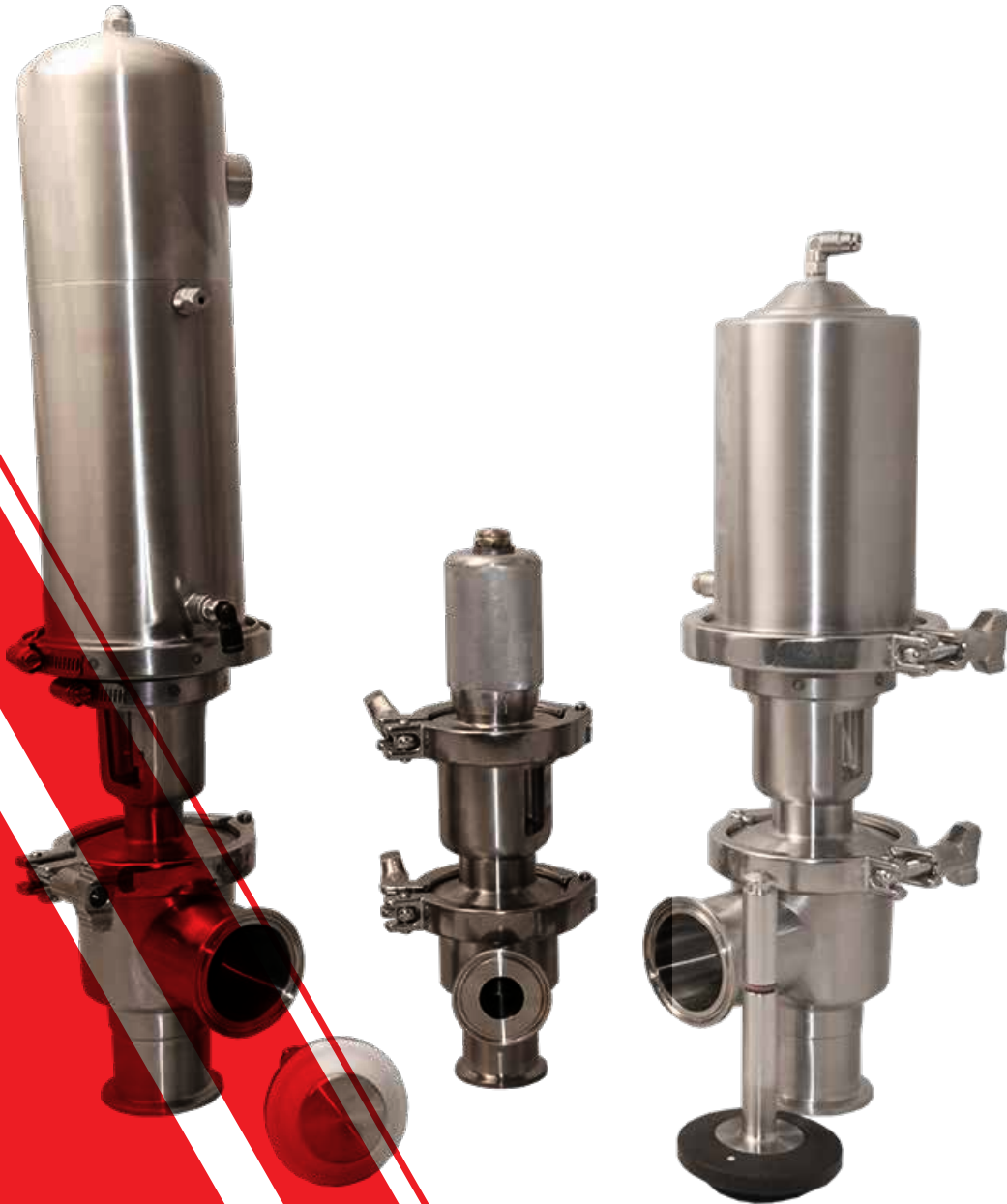


# VALVES



INSTALLATION  
OPERATION  
MAINTENANCE

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# INTRODUCTION

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## ABOUT

**Thank you for purchasing a valve from Stainless Products, LLC (SPI).**

This manual contains installation, operation, and maintenance instructions for the SP160 valve.

SPI valves are designed for minimal routine maintenance, but care and attention should be given to the instructions provided in this manual.

Do not remove any labeling on any SPI product. Immediately replace any label that is missing.

If, at any point, you have questions or concerns regarding your SPI valves, please call 1-800-558-9446 or 262-859-2826.

# SAFETY

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## IMPORTANT SAFETY INFORMATION

Read this manual before installing, operating, and maintaining this equipment. Failure to read the manual can result in personal injury and/or equipment damage.

Do not attempt to remove and/or modify any SPI product. Doing so can create unsafe conditions for the operator(s) and/or surrounding persons . Any change to SPI products will void any and all warranties.

Do not place any SPI product in an application where general product service ratings are exceeded. Doing so puts the operator(s) and/or surrounding persons at risk of personal injury and/or result in equipment damage.

**Do not remove any labeling on any SPI product. Immediately replace any label that is missing.**

## DISCLAIMER OF LIABILITY

SPI does not assume responsibility and expressly disclaims liability for loss, damage, or expenses that arise in any way from the installation, operation, use, or maintenance performed in accordance with this manual. SPI assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the module . No license is granted by implication or otherwise under any patent or patent rights.

SPI reserves the right to make changes to the product, specifications, or this manual without prior notice.

# TECHNICAL DATA

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## MATERIALS OF CONSTRUCTION

- Valve Body: 316L stainless steel
- Stem: 316L stainless steel
- Seat: EPDM / Viton / PTFE (all FDA approved)
- O-rings: EPDM / Viton (all FDA approved)
- Bonnet: 304 stainless steel
- Actuator parts: 304 stainless steel

## SEAL TYPES

- Non-replaceable over-molded EPDM
- Non-replaceable over-molded Viton
- Replaceable PTFE

## SURFACE FINISH

- 32Ra or less on product contact surfaces

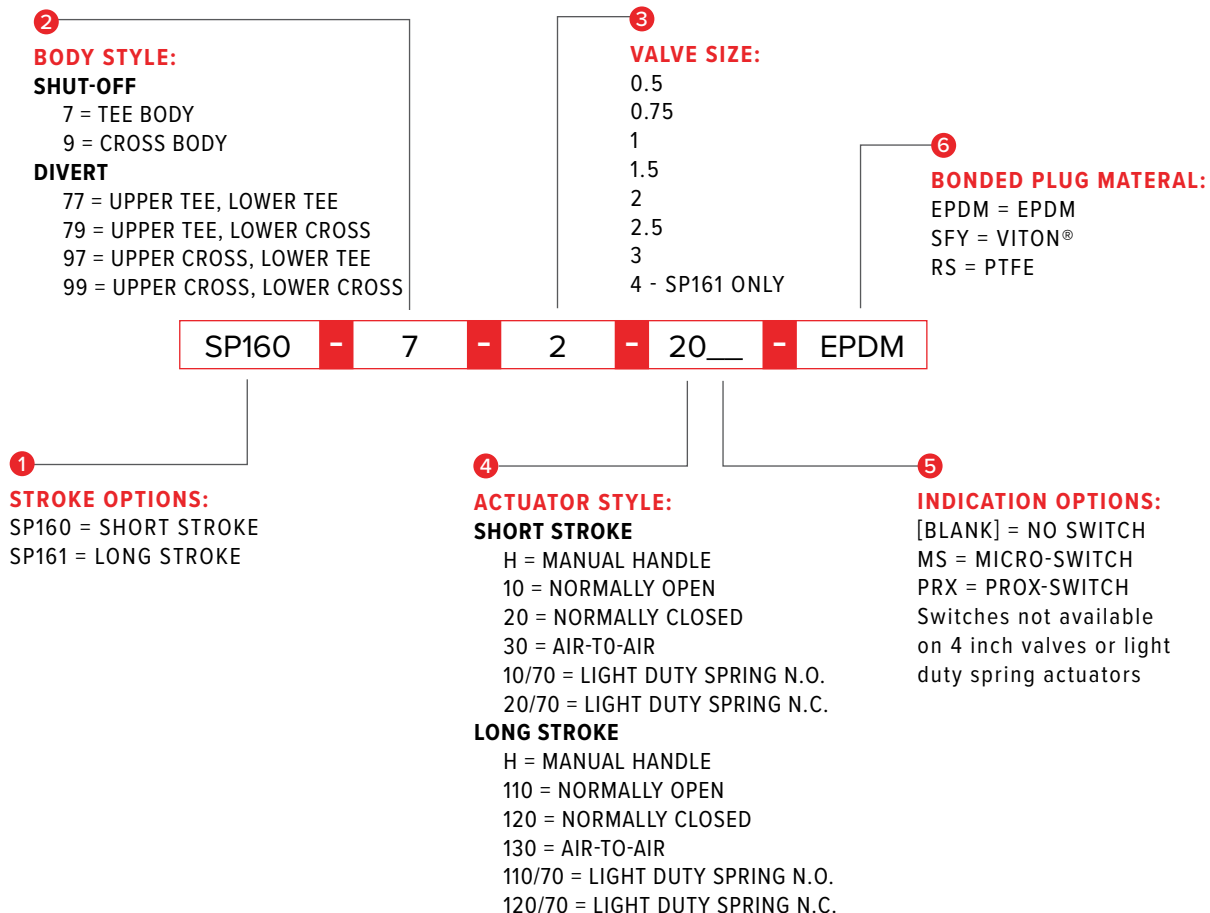
## APPROVALS

- [3-A per 53-06](#)
- Materials FDA approved

# SP160/SP161 SERIES SHUT-OFF AND DIVERT VALVES ORDERING INFORMATION

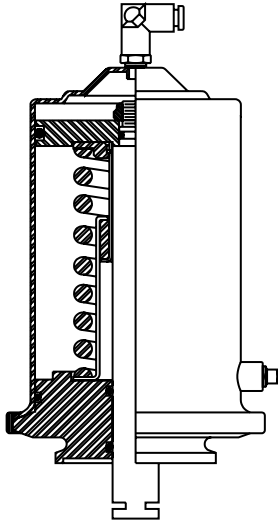
## FEATURES AND OPTIONS

- All stainless steel constructions (T316L wetted parts)
- Precision molded seat assures positive shut-off and long life
- Seat material includes:
  - EPDM (275°F Max)
  - Viton® (450°F Max)
  - P.T.F.E (replaceable seat) (140°F Max)
- Dual micro-switch or dual proximity switch optional
- Viton stem O-ring
- Open yoke provides leak detection and visual stem position
- No special tools needed for valve maintenance



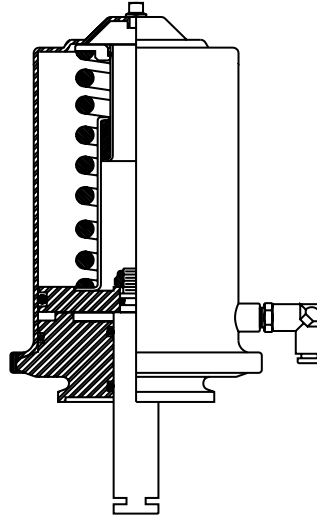
# SHORT STROKE ACTUATORS

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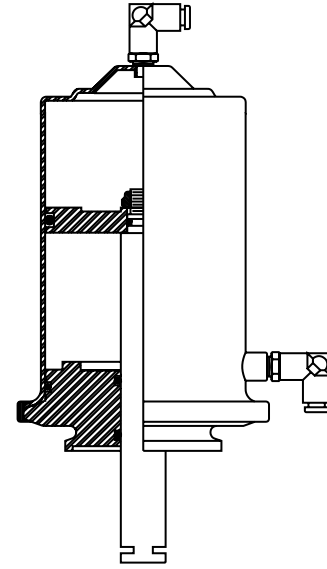
**SP10**

Normally Open  
Air-to-Close  
Spring-to-Open



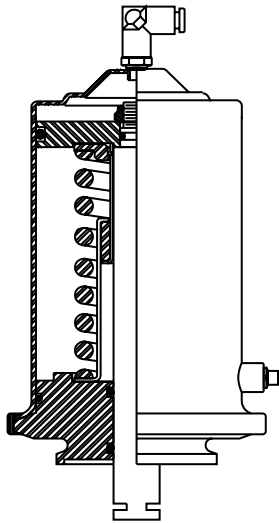
**SP20**

Normally Closed  
Air-to-Open  
Spring-to-Close



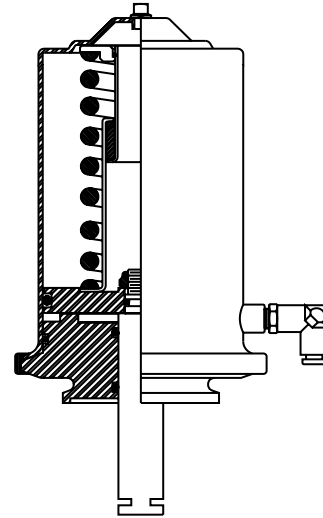
**SP30**

Air-to-Air  
Air-to-Open  
Air-to-Close



**SP10/70**

Light Duty Spring  
Normally Open  
Air-to-Close  
Spring-to-Open  
3-15 PSI Air Pressure



**SP20/70**

Light Duty Spring  
Normally Closed  
Air-to-Open  
Spring-to-Close  
3-15 PSI Air Pressure

# SHORT STROKE ACTUATORS

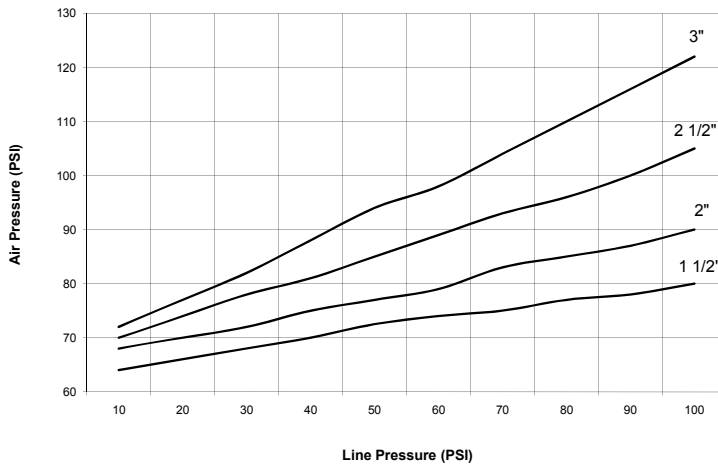
## SP20 SHUT-OFF CAPABILITIES

The following table gives the approximate maximum line pressure against which the spring in a normally closed, air-to-open valve will hold.

VALVE SIZE	SP20 ACTUATOR
1/2"	195 PSI
3/4"	50 PSI
1" AND 1 1/2"	190 PSI
2"	100 PSI
2 1/2"	60 PSI
3"	45 PSI

## SP10 ACTUATOR LINE PRESSURE CURVE

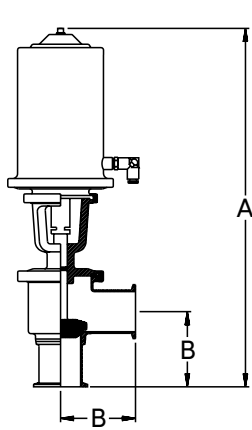
The chart below illustrates the air supply which must be available to a normally-open; air-to-close valve in order to fully shut off against the corresponding fluid pressure.



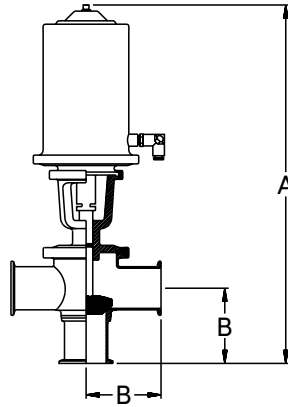


# SHORT STROKE VALVES

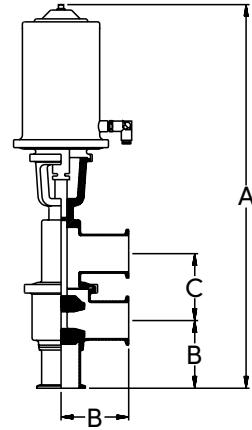
## SP160 SERIES – RUBBER COATED AND PTFE REPLACEABLE SEAT



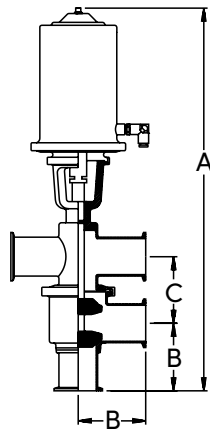
**SP160-7-X\*-ACT**



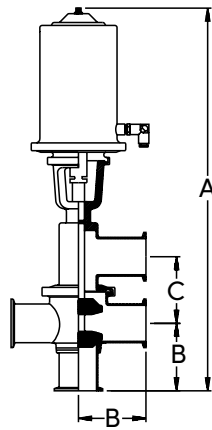
**SP160-9-X\*-ACT**



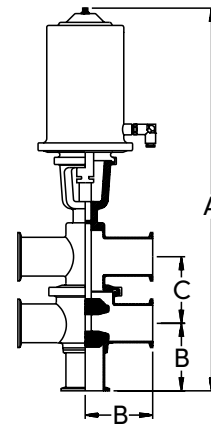
**SP160-77-X\*-ACT**



**SP160-79-X\*-ACT**



**SP160-97-X\*-ACT**



**SP160-99-X\*-ACT**

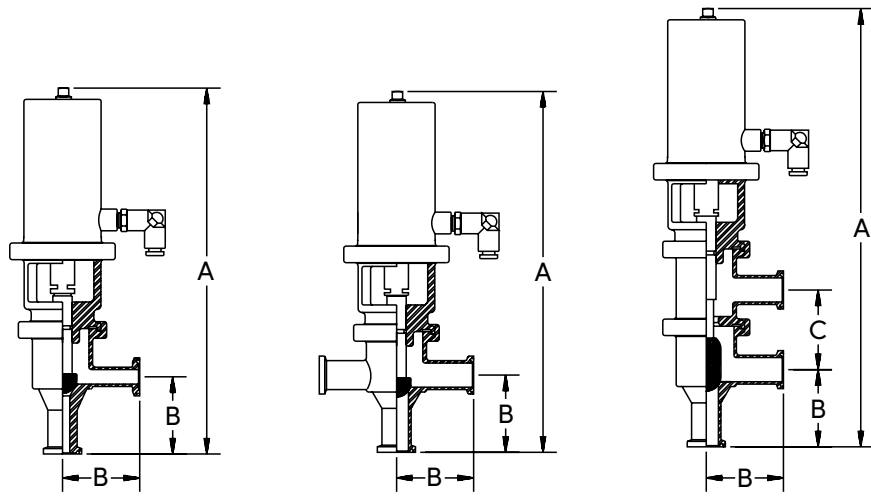
VALVE DIMENSIONS					SHIPPING #S	
SIZE	A		B	C	SHUT-OFF VALVE	DIVERT VALVE
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE		
1"	14 7/8"	17 9/16"	2 1/2"	2 27/32"	16 1/2 #	18 #
1.5"	15 5/8"	18 5/16"	2 3/4"	2 15/16"	16 1/2 #	18 #
2"	15 5/8"	19 13/16"	3 1/2"	3 7/16"	16 1/2 #	19 1/2 #
2.5"	17"	20 11/16"	3 1/2"	3 15/16"	18 #	20 1/2 #
3"	17 11/16"	22 1/4"	3 3/4"	4 9/16"	20 #	22 1/2 #

\*X=VALVE SIZE.

VALVES ARE SHOWN WITH #20 ACT. ALL VALVES ARE STANDARD WITH SANITARY CLAMP END-CONNECTIONS. PLEASE CONTACT FACTORY FOR OTHER OPTIONS.

# SHORT STROKE VALVES

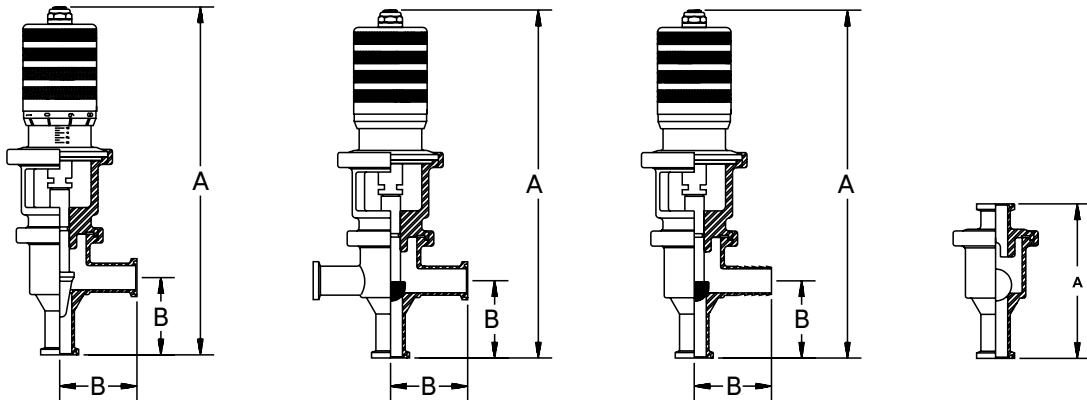
## SP160 SERIES FRACTIONAL VALVES – RUBBER COATED AND PTFE REPLACEABLE SEAT



**SP160-7-X\*-ACT**

**SP160-9-X\*-ACT**

**SP160-77-X\*-ACT**



**SP160-7MH-X\***

**SP160-9-X\*-H**

**SP160-7S-X\*-H**

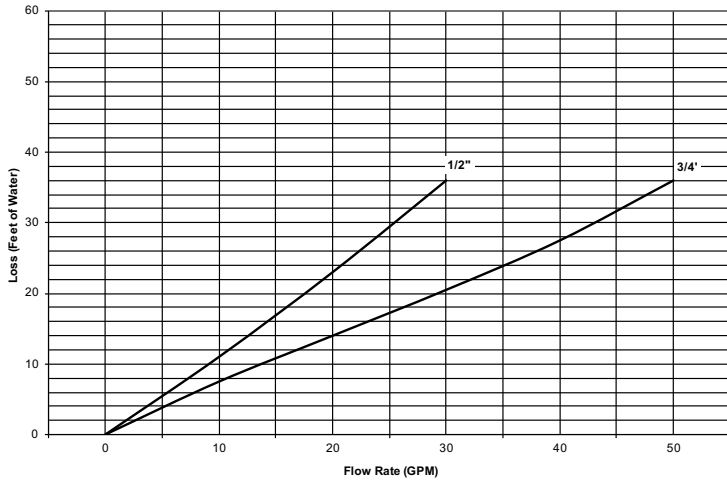
**SP45V-X\***

VALVE DIMENSIONS						
SIZE	A				B	C
	SHUT-OFF VALVE	DIVERT VALVE	HAND OPERATED	CHECK VALVE	SHUT-OFF VALVE	DIVERT VALVE
0.5"	9 3/16"	11 1/4"	7 1/2"	4"	2"	2 3/16"

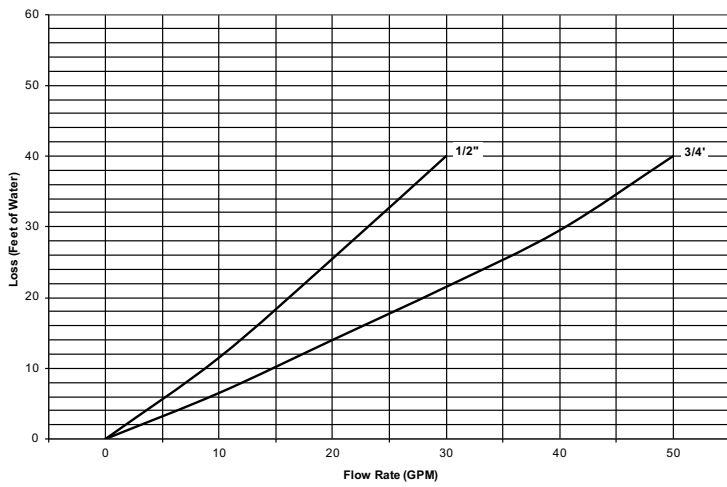
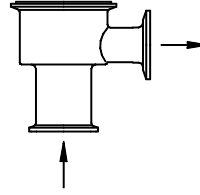
\*X=VALVE SIZE

# SHORT STROKE VALVES

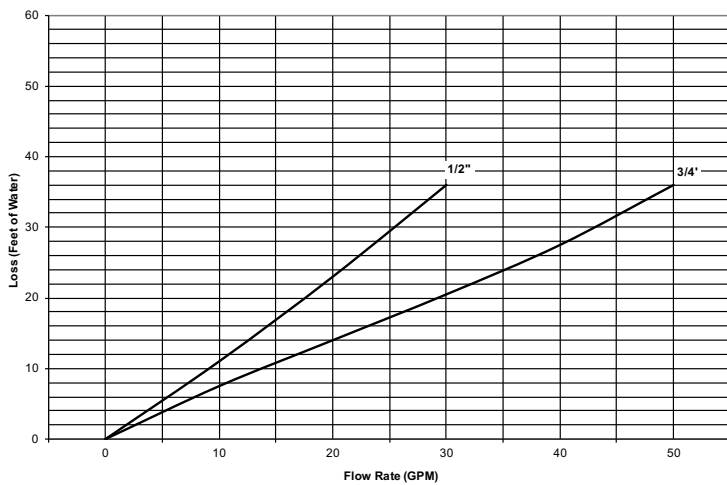
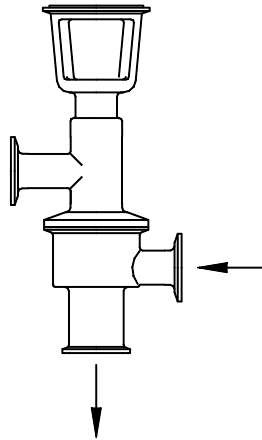
## SP160 SERIES – HEAD LOSS CURVES



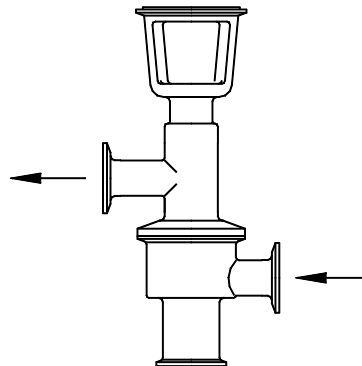
**SP160-7 Tee Body Valve**



**SP160-77 Divert Valve**

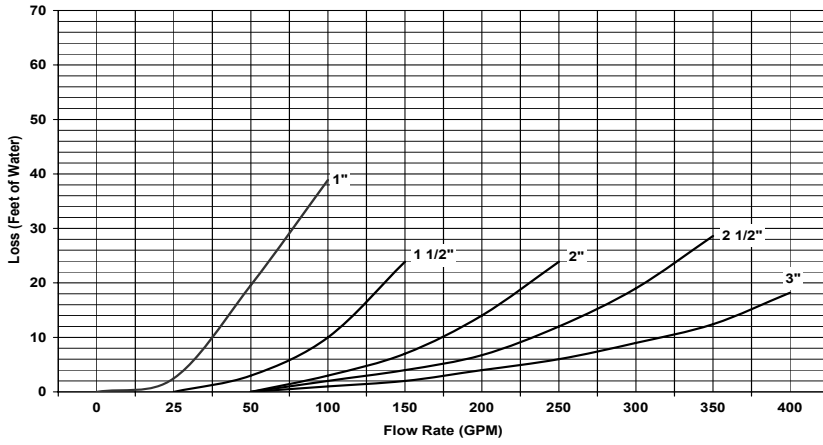


**SP160-77 Divert Valve**

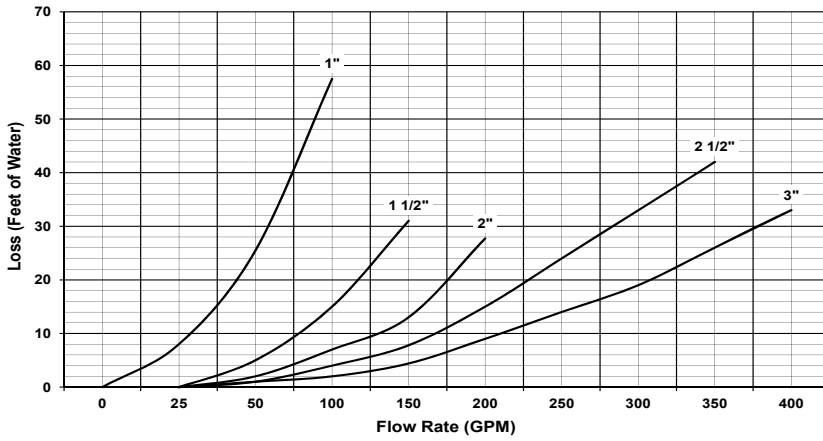
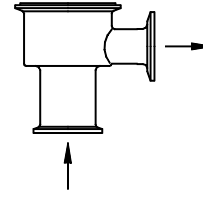


# SHORT STROKE VALVES

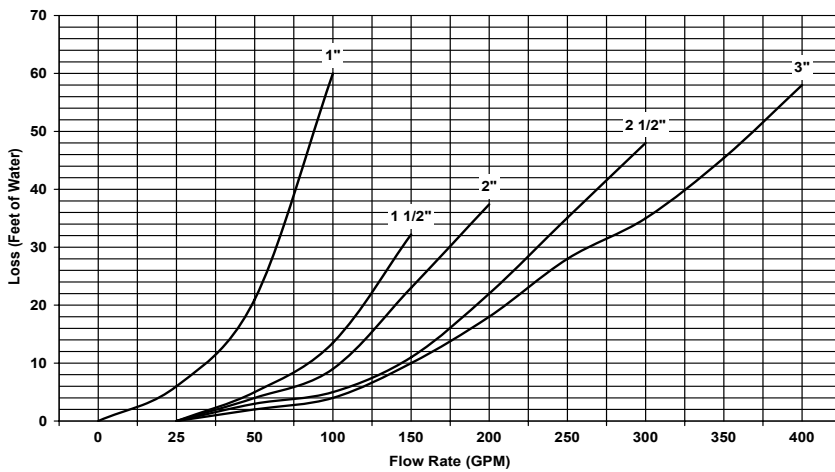
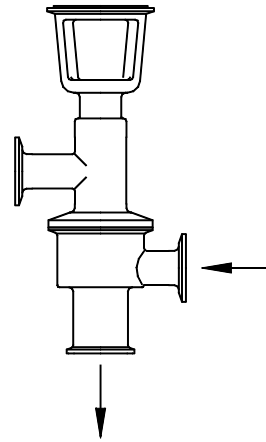
## SP160 SERIES FRACTIONAL – HEAD LOSS CURVES



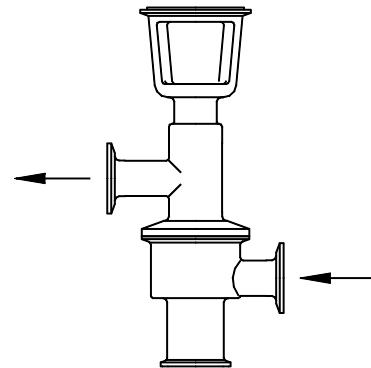
**SP160-7 Tee Body Valve**



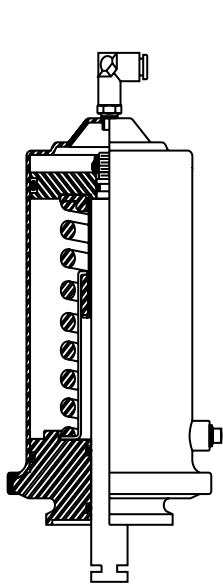
**SP160-77 Divert Valve**



**SP160-77 Divert Valve**

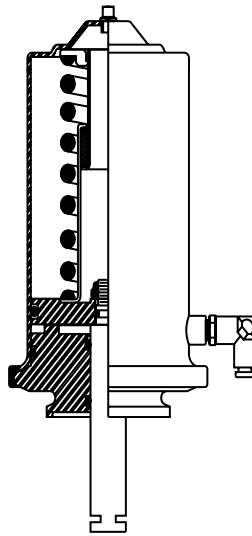


# LONG STROKE ACTUATORS



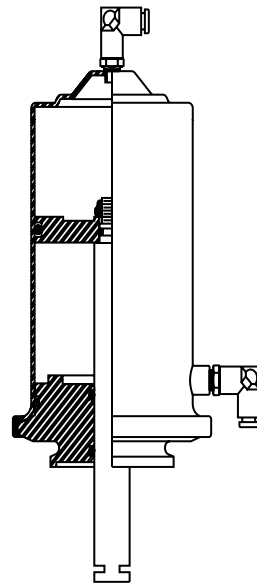
**SP110**

Normally Open  
Air-to-Close  
Spring-to-Open



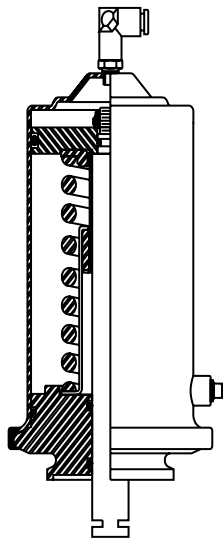
**SP120**

Normally Closed  
Air-to-Open  
Spring-to-Close



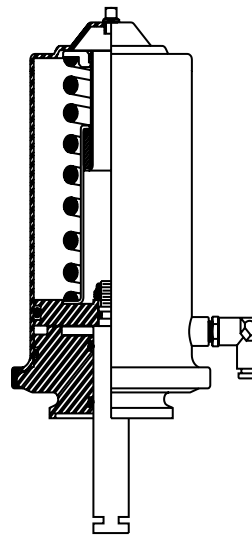
**SP130**

Air-to-Air  
Air-to-Open  
Air-to-Close



**SP110/70**

Light Duty Spring  
Normally Open  
Air-to-Close  
Spring-to-Open  
3-15 PSI Air Pressure



**SP120/70**

Light Duty Spring  
Normally Closed  
Air-to-Open  
Spring-to-Close  
3-15 PSI Air Pressure

# LONG STROKE ACTUATORS

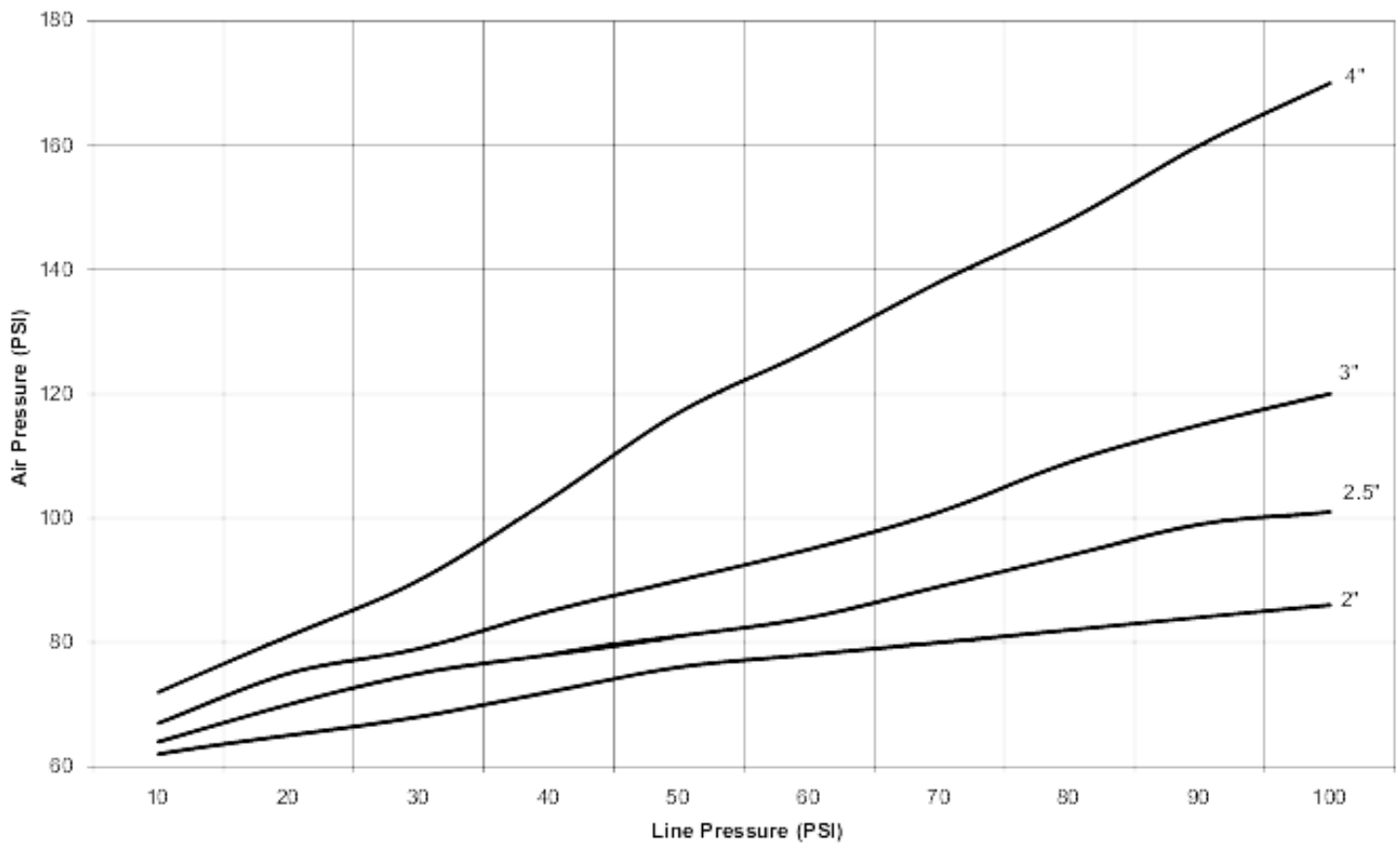
## SP120 SHUT-OFF CAPABILITIES

The following table gives the approximate maximum line pressure against which the spring in a normally closed, air-to-open valve will hold.

VALVE SIZE	SP120 ACTUATOR
2"	50 PSI
2 1/2"	30 PSI
3"	20 PSI
4"	Contact Factory

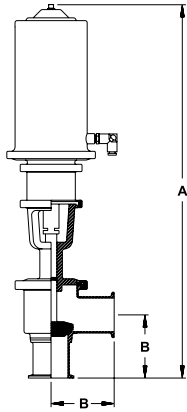
## SP110 ACTUATOR LINE PRESSURE CURVE

The chart below illustrates the air supply which must be available to a normally-open; air-to-close valve in order to fully shut off against the corresponding fluid pressure.

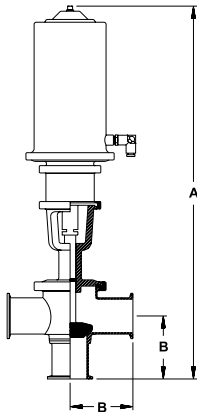


# LONG STROKE VALVES

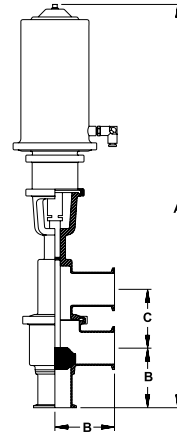
## SP161 SERIES — RUBBER COATED AND PTFE REPLACEABLE SEAT



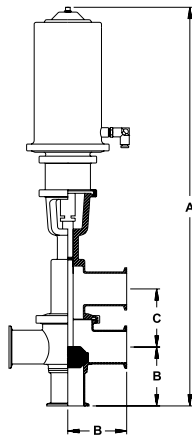
**SP161-7-X\*-ACT**



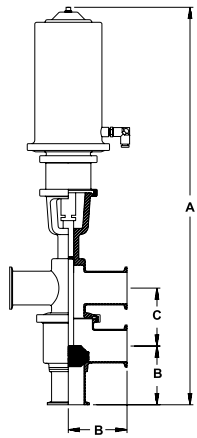
**SP161-9-X\*-ACT**



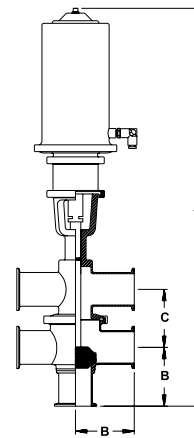
**SP161-77-X\*-ACT**



**SP161-97-X\*-ACT**



**SP161-79-X\*-ACT**



**SP161-99-X\*-ACT**

VALVE DIMENSIONS					SHIPPING #S	
SIZE	A		B	C	SHIPPING #S	
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE
2"	21 3/4"	25 3/4"	3 1/2"	3 7/16"	16 1/2 #	19 1/2 #
2.5"	22 1/2"	27 1/4"	3 1/2"	3 15/16"	18 #	20 1/2 #
3"	23 7/8"	29"	3 3/4"	4 9/16"	20 #	22 1/2 #

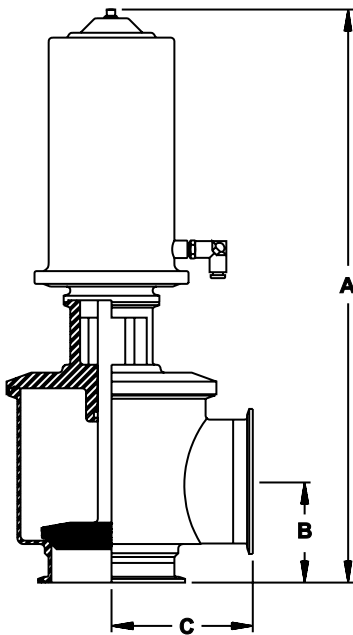
\*X=VALVE SIZE.

VALVES ARE SHOWN WITH #120 ACT.

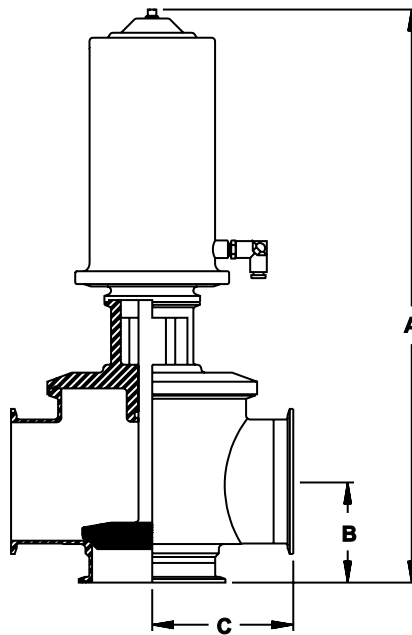
ALL VALVES ARE STANDARD WITH SANITARY CLAMP END-CONNECTIONS. PLEASE CONTACT FACTORY FOR OTHER OPTIONS.

# 4" LONG STROKE VALVES

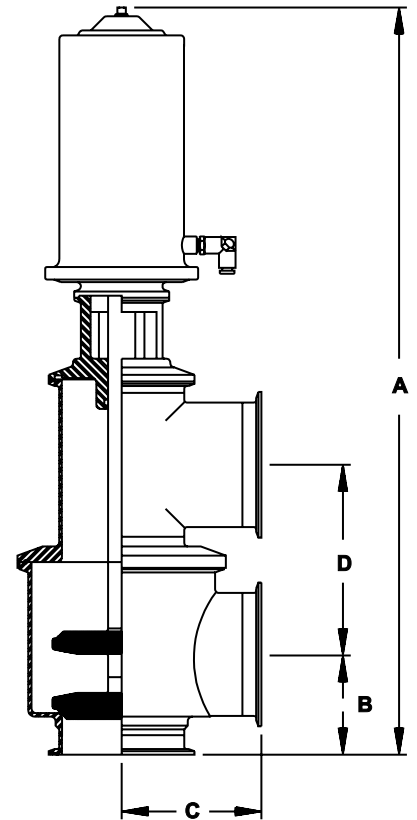
## SP161 SERIES - 4" RUBBER COATED AND PTFE REPLACEABLE SEAT



**SP161-7-4"-ACT**



**SP161-9-4"-ACT**



**SP161-77-4"-ACT**

VALVE DIMENSIONS						SHIPPING #S	
SIZE	A		B	C	D	SHUT-OFF VALVE	DIVERT VALVE
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE	DIVERT VALVE		
4"	19 1/8"	25 1/8"	3 3/8"	4 1/2"	6 1/8"	29 #	35 1/2 #

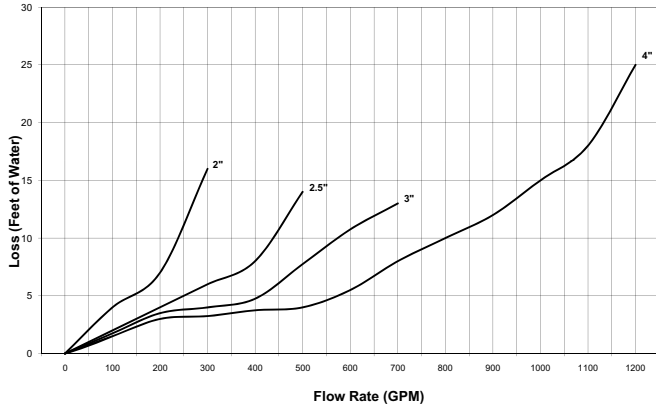
VALVES ARE SHOWN WITH #120 ACT.

ALL VALVES ARE STANDARD WITH SANITARY CLAMP END-CONNECTIONS. PLEASE CONTACT FACTORY FOR OTHER OPTIONS.

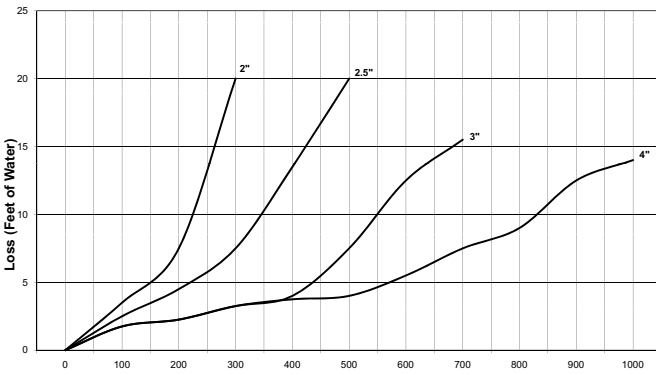
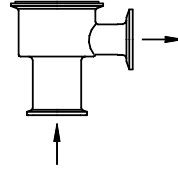


# LONG STROKE VALVES

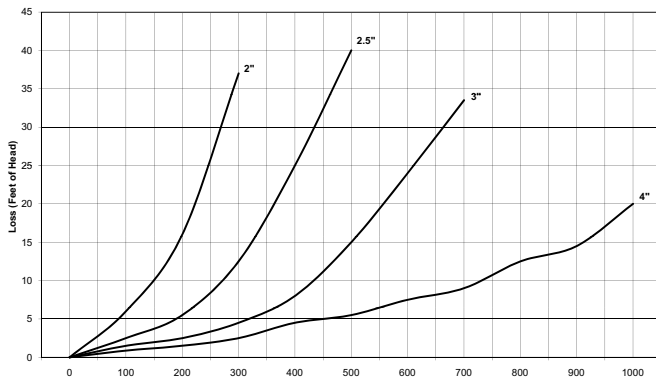
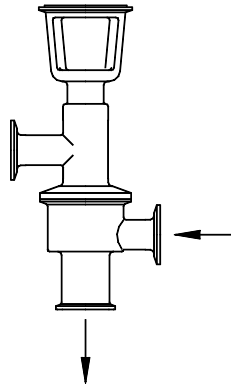
## SP161 SERIES - HEAD LOSS CURVES



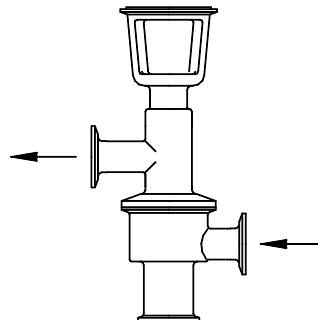
SP161-7 TEE BODY VALVE



SP161-77 DIVERT VALVE

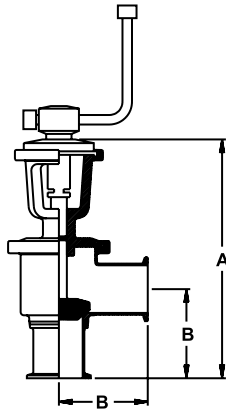


SP161-77 DIVERT VALVE

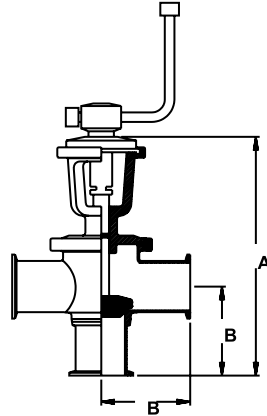


# MANUAL VALVES

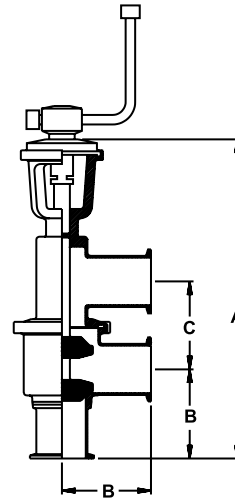
## SP160 SERIES / SP161 SERIES - RUBBER COATED AND PTFE REPLACEABLE SEAT



**SP160-7-X\*-H**  
**SP161-7-X\*-H**



**SP160-9-X\*-H**  
**SP161-9-X\*-H**



**SP160-77-X\*-H**  
**SP161-77-X\*-H**

SP160 SHORT STROKE VALVE DIMENSIONS					SHIPPING #S	
SIZE	A		B	C	SHIPPING #S	
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE
1"	7 1/8"	9 3/4"	2 1/2"	2 27/32"	2 1/2 #	3 1/2 #
1.5"	7 3/8"	10"	2 3/4"	2 27/32"	2 1/2 #	3 1/2 #
2"	8 3/8"	11"	3 1/2"	3 7/16"	3 1/2 #	4 1/2 #
2.5"	8 3/4"	12"	3 1/2"	3 15/16"	4 1/2 #	5 1/2 #
3"	9 1/16"	14"	3 3/4"	4 9/16"	7 #	8 #

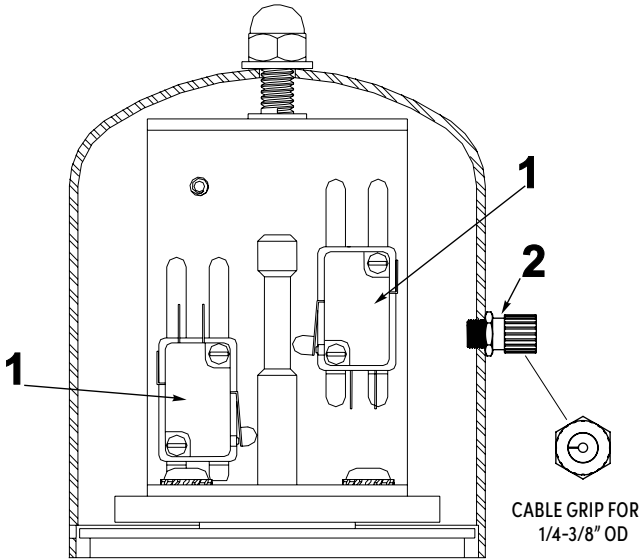
SP161 LONG STROKE VALVE DIMENSIONS					SHIPPING #S	
SIZE	A		B	C	SHIPPING #S	
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE
2"	9 7/8"	13 3/16"	3 1/2"	3 7/16"	8 #	10 #
2.5"	10 1/2"	14 1/4"	3 1/2"	3 15/16"	9 1/2 #	12 #
3"	11 3/4"	15 7/8"	3 3/4"	4 9/16"	11 #	13 1/4 #

\*X=VALVE SIZE

ALL VALVES ARE STANDARD WITH SANITARY CLAMP END-CONNECTIONS, PLEASE CONTACT FACTORY FOR OTHER OPTIONS.

# MICRO / PROXIMITY ACTUATORS

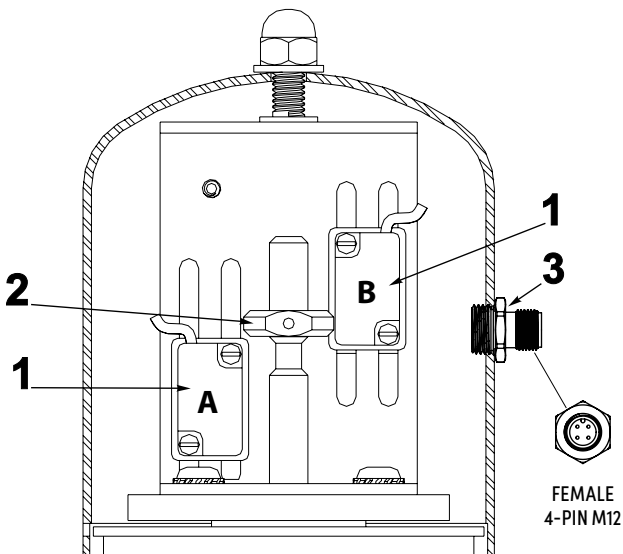
## SP120MS MICRO-SWITCH



SP10MS/SP20MS/SP30MS/SP110MS/SP120MS/SP130MS MICRO-SWITCH		
ITEM	PART NUMBER	DESCRIPTION
1	SP10MS-3B	Micro Switches (x2)
2	SP10MS-CG	1/2" NPT Nylon Cable Grip for 1/4-3/8" OD range

ELECTRICAL CONNECTIONS MADE BY USER/CUSTOMER

## SP20PRX PROXIMITY SWITCH



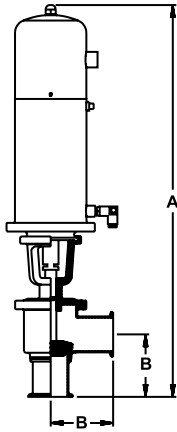
SP10PRX/SP20PRX/SP30PRX/SP110PRX/SP120PRX/SP 130PRX PROXIMITY SWITCH		
ITEM	PART NUMBER	DESCRIPTION
1	SP20-DPS	Proximity Switches (Dual Prewired) A = Bottom, B = Top
2	SP20PS-PD	Proximity Switch Indicator (Stainless Steel Prox Dog) with Set Screw
3	SP20-4P-NPT	1/2" NPT Adapter to Female 4-Pin M12
**	SP20-FWC-CONN	Male M12 to Cable Adapter (Included but Optional)

\*\* ITEM NOT SHOWN

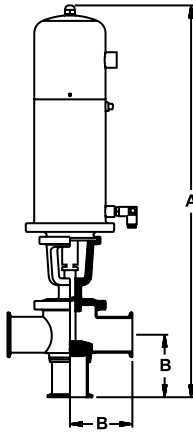
Stainless Products' micro/proximity switch offerings provide a solution for those needing open and closed feedback on the SP160 family of shutoff valves. A simple dual microswitch solution provides two roller-style microswitches, brackets, hardware, and a cable grip. A contactless dual proximity switch solution provides two proximity switches that are pre-wired. It also comes with accessories needed to use a four-pin M12 connector. An M12 patch cable or four-conductor cable can be used. Valve feedback provides true open and closed feedback from the valve itself via 24VDC signal to your control system.

# MICRO / PROXIMITY ACTUATORS

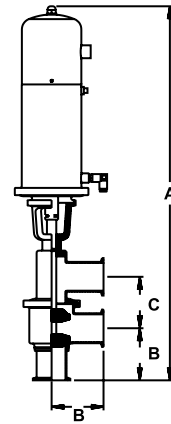
## SP160MS/PRX - SHORT STROKE



**SP160MS/PRX-7 BODY**



**SP160MS/PRX-9 BODY**

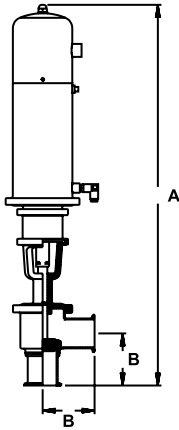


**SP160MS/PRX-77 BODY**

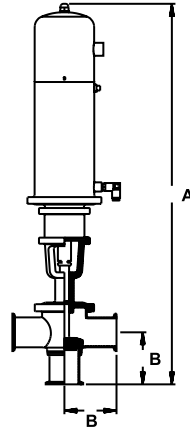
SIZE	VALVE DIMENSIONS				SHIPPING #S	
	A		B	C		
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE
1"	21 1/8"	23 13/16"	2 1/2"	2 27/32"	22 1/2 #	24 #
1.5"	21 3/8"	24 1/16"	2 3/4"	2 27/32"	22 1/2 #	24 #
2"	27 1/2"	25 9/16"	3 1/2"	3 7/16"	22 1/2 #	25 1/2 #
2.5"	28 1/4"	26 7/16"	3 1/2"	3 15/16"	24 #	26 1/2 #
3"	29 5/8"	28"	3 3/4"	4 9/16"	26 #	28 1/2 #

# MICRO / PROXIMITY ACTUATORS

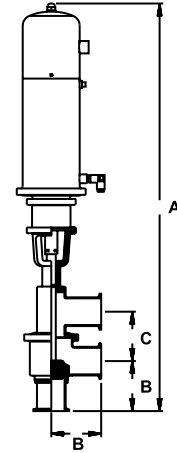
## SP161MS/PRX - LONG STROKE



**SP161MS/PRX-7 BODY**



**SP161MS/PRX-9 BODY**

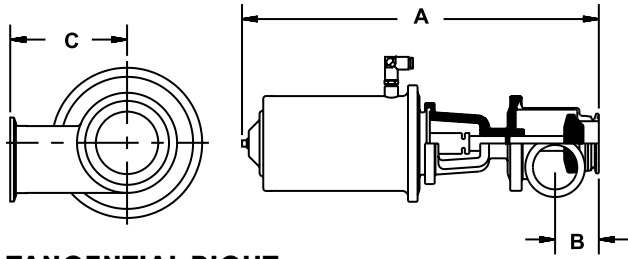


**SP161MS/PRX-77 BODY**

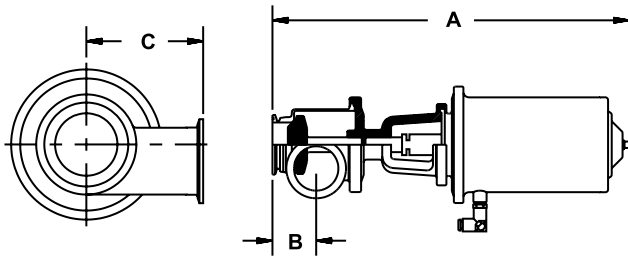
VALVE DIMENSIONS					SHIPPING #S	
SIZE	A		B	C	SHUT-OFF VALVE	DIVERT VALVE
	SHUT-OFF VALVE	DIVERT VALVE	SHUT-OFF VALVE	DIVERT VALVE		
2"	31 5/16"	33 5/8"	3 1/2"	3 7/16"	26 1/2 #	29 #
2.5"	32 7/16"	34 3/8"	3 1/2"	3 15/16"	26 1/2 #	29 #
3"	33 15/16"	35 3/4"	3 3/4"	4 9/16"	30 1/2 #	34 1/2 #

# TANK OUTLET VALVES

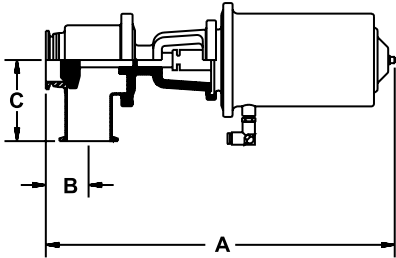
## SP163 AND SP1613 TANK OUTLET VALVES



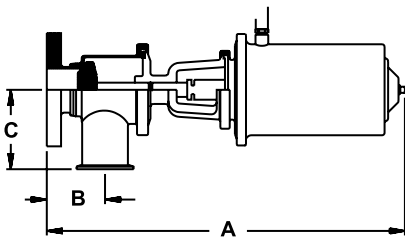
**TANGENTIAL RIGHT**



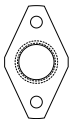
**TANGENTIAL LEFT**



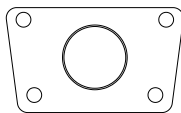
**STRAIGHT**



**FLANGE**



**2" VALVES**



**2-1/2" AND 3" VALVES**

SIZE	VALVE DIMENSIONS				SHIPPING #S	
	A		B	C	SHORT STROKE VALVE	LONG STROKE VALVE
	SHORT STROKE VALVE	LONG STROKE VALVE				
2"	14 31/32"	21 1/8"	127/32"	4 1/8"	16.5 #	22 #
2.5"	15 13/16"	21 13/16"	2 5/16"	4 1/8"	18 #	22 #
3"	16 9/16"	22 11/16"	2 5/8"	4 1/2"	20 #	25 #
4"	N/A	19"	3 3/16"	4 3/4"	N/A	28 #

SIZE	VALVE DIMENSIONS				SHIPPING #S	
	A		B	C	SHORT STROKE VALVE	LONG STROKE VALVE
	SHORT STROKE VALVE	LONG STROKE VALVE				
2"	14 31/32"	21 1/8"	127/32"	4 1/8"	16.5 #	22 #
2.5"	15 13/16"	21 13/16"	2 5/16"	4 1/8"	18 #	22 #
3"	16 9/16"	22 11/16"	2 5/8"	4 1/2"	20 #	25 #
4"	N/A	19"	3 3/16"	4 3/4"	N/A	28 #

SIZE	VALVE DIMENSIONS				SHIPPING #S	
	A		B	C	SHORT STROKE VALVE	LONG STROKE VALVE
	SHORT STROKE VALVE	LONG STROKE VALVE				
2"	14 31/32"	21 1/8"	127/32"	4 1/8"	16.5 #	22 #
2.5"	15 13/16"	21 13/16"	2 5/16"	4 1/8"	18 #	22 #
3"	16 9/16"	22 11/16"	2 5/8"	4 1/2"	20 #	25 #
4"	N/A	19"	3 3/16"	4 3/4"	N/A	28 #

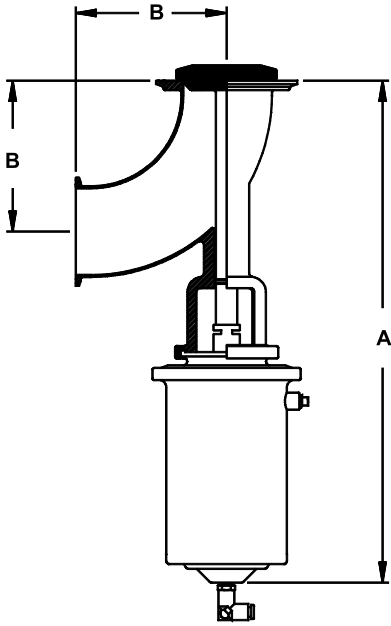
SIZE	VALVE DIMENSIONS				SHIPPING #S	
	A		B	C	SHORT STROKE VALVE	LONG STROKE VALVE
	SHORT STROKE VALVE	LONG STROKE VALVE				
2"	14 31/32"	21 1/8"	127/32"	4 1/8"	16.5 #	22 #
2.5"	15 13/16"	21 13/16"	2 5/16"	4 1/8"	18 #	22 #
3"	16 9/16"	22 11/16"	2 5/8"	4 1/2"	20 #	25 #

**2- AND 4-HOLE FLANGES**

Contact factory for options and dimensions.

# ELBOW VALVES

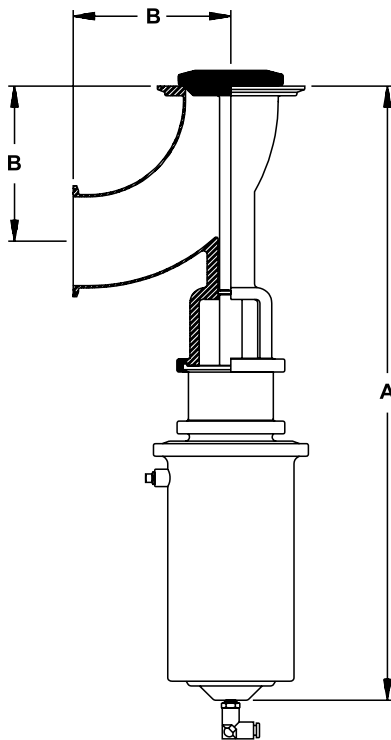
## SP164 SHORT STROKE ELBOW VALVE



VALVE DIMENSIONS			SHIPPING #S
SIZE	A	B	
2"	15 3/4"	3 1/2"	19 #
2.5"	16 1/2"	4 1/4"	19 #
3"	17 1/4"	5"	20 #

VALUES ARE SHOWN WITH #10 ACT.

## SP165 LONG STROKE ELBOW VALVE

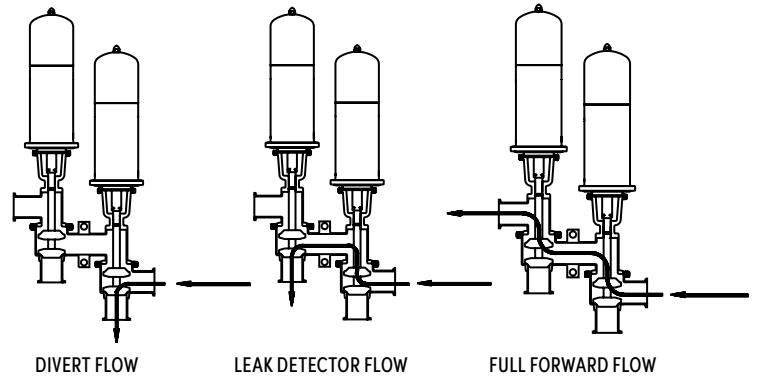
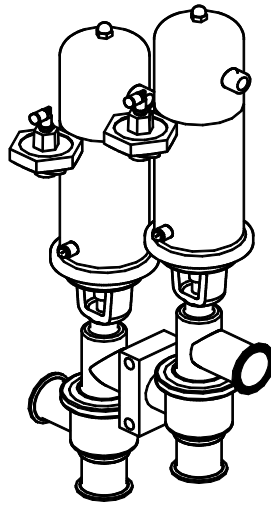
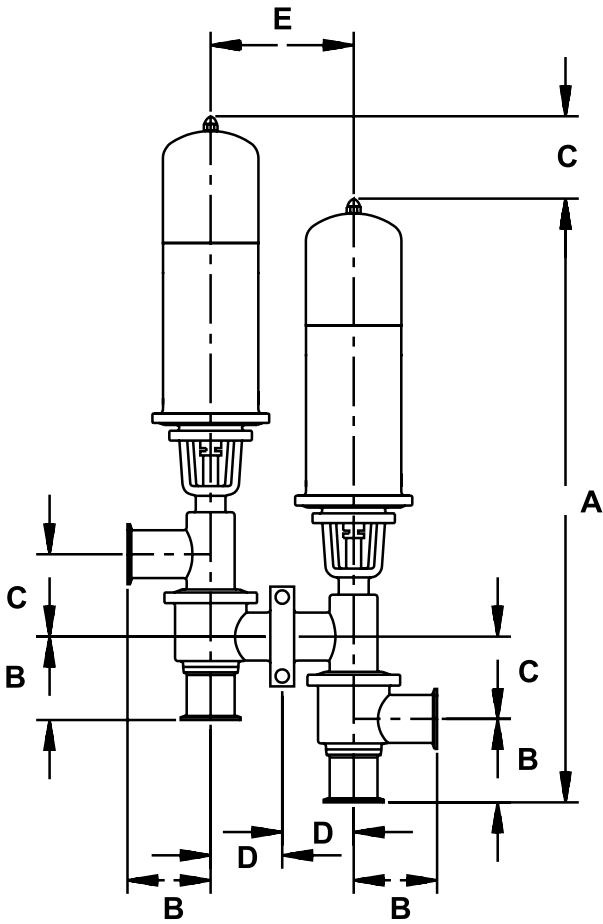


VALVE DIMENSIONS			SHIPPING #S
SIZE	A	B	
2"	20 1/4"	3 1/2"	22 #
2.5"	21"	4 1/4"	23 #
3"	21 3/4"	5"	25 #

VALUES ARE SHOWN WITH #10 ACT.

# FLOW DIVERSION VALVES

## SP160 FDV SERIES SHORT STROKE SP161 FDV SERIES LONG STROKE



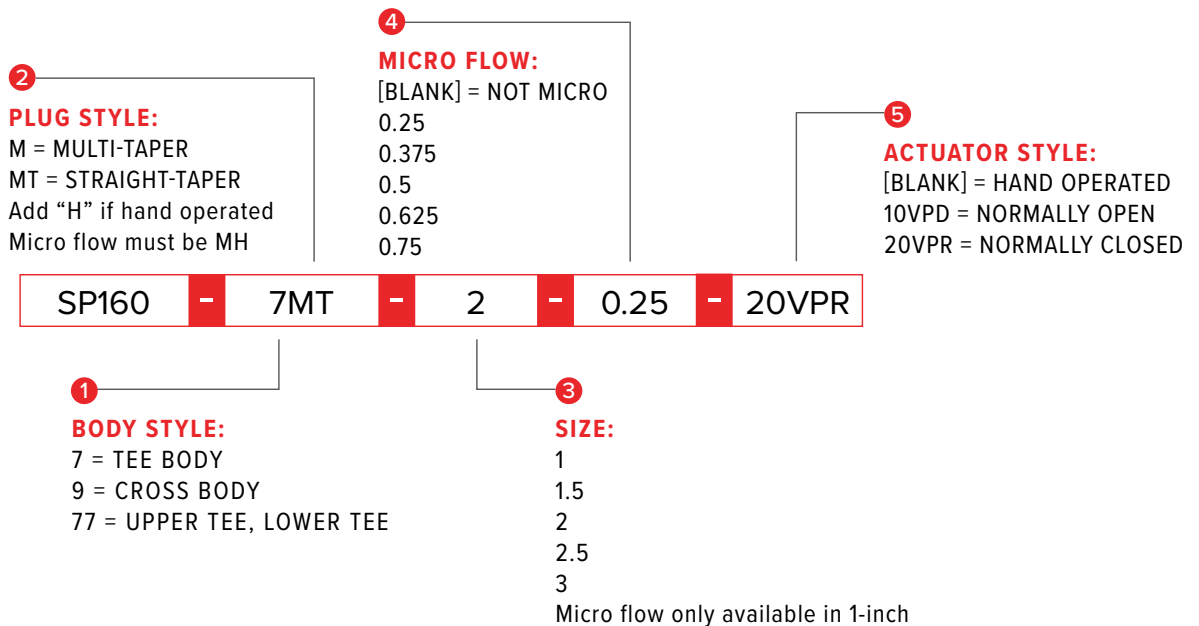
VALVE DIMENSIONS						
SIZE	A		B	C	D	E
	SHORT STROKE	LONG STROKE				
1.5"	23 1/2"	n/a	2 3/4"	2 27/32"	3"	6"
2"	25"	27 1/2"	3 1/2"	3 7/16"	3 3/4"	7 1/2"
2.5"	25 7/8"	28 1/4"	3 1/2"	3 15/16"	3 3/4"	7 1/2"
3"	27 7/16"	29 5/8"	3 3/4"	4 9/16"	4"	8"



# SP160 SERIES MODULATING VALVES ORDERING INFORMATION

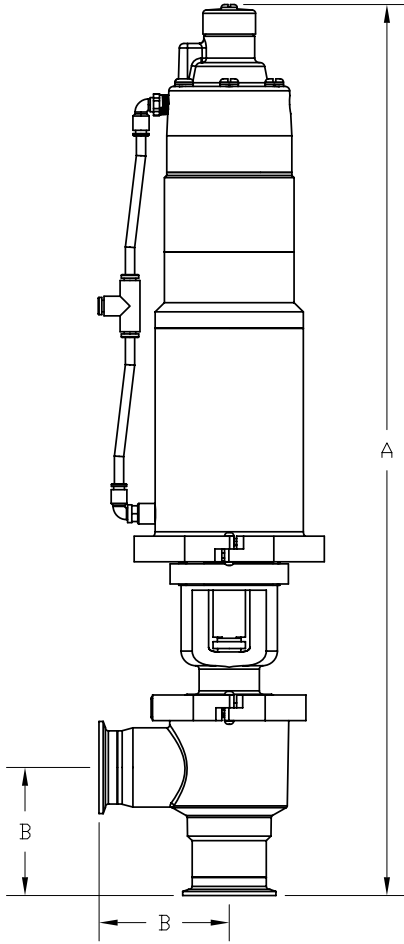
## FEATURES AND OPTIONS

- All stainless steel constructions (T316L wetted parts)
- Precision machined plug and stem assures precise control and long life
- Available with a valve positioner or hand operated
- Viton stem O-ring
- Open yoke provides leak detection and visual stem position
- No special tools needed for valve maintenance

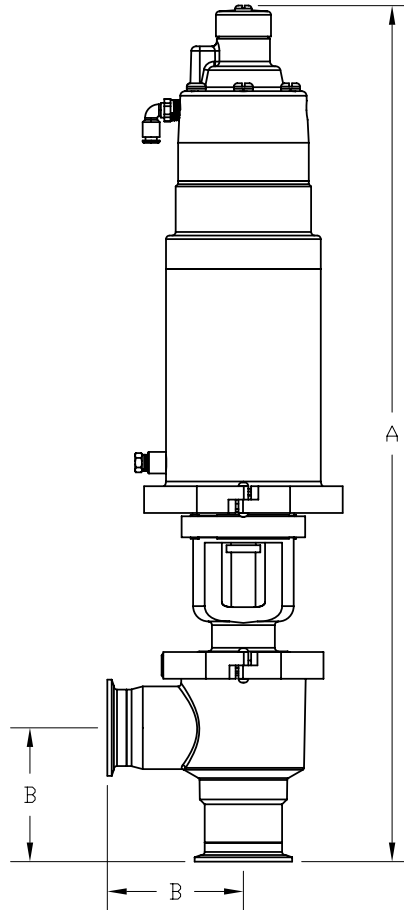


# MODULATING VALVES

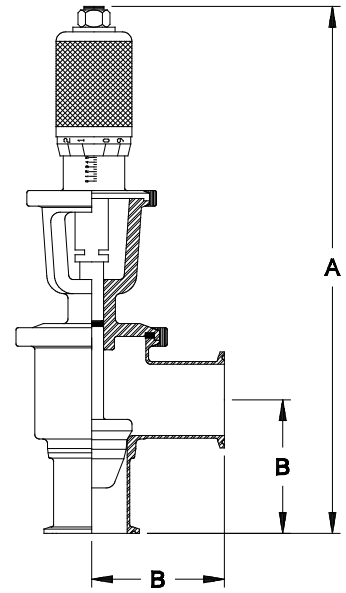
## SP160 SERIES 7MT STRAIGHT TAPER AND 7M MULTI-TAPER



**SP160-7MT-X\*-20VPR**



**SP160-7MT-X\*-10VPD**



**SP160-7MH-X\***

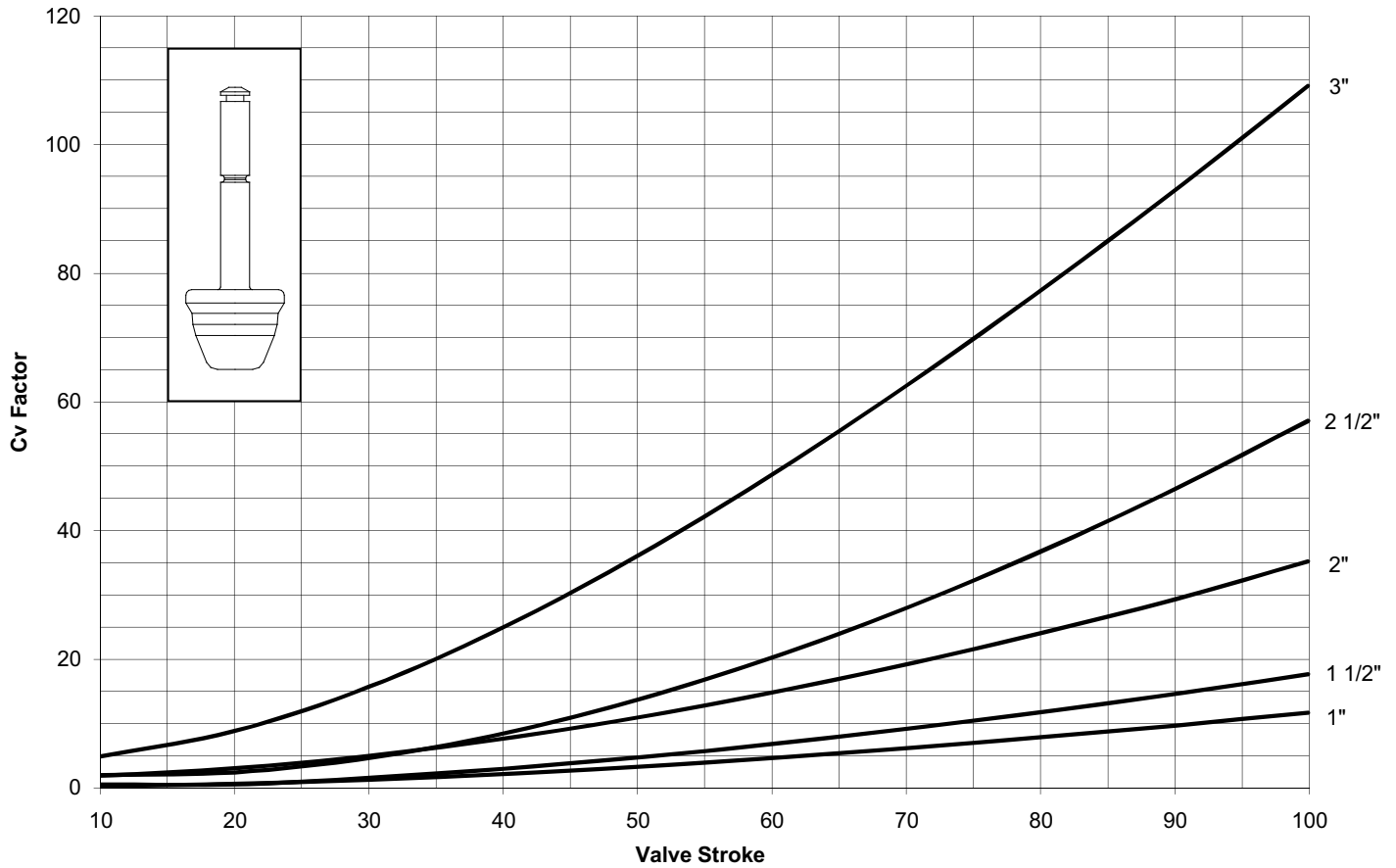
VALVE DIMENSIONS					SHIPPING #S	
SIZE	A			B	SHIPPING #S	
	SP20VPR	SP10VPD	HAND OPERATED	SHUT-OFF VALVE	SP20VPR SP10VPD	HAND OPERATED
1"	23 7/8"	22 1/8"	13 1/2"	2 1/2"	16#	11#
1.5"	23 7/8"	22 1/8"	13 1/2"	2 3/4"	16#	13#
2"	23 7/8"	22 1/8"	14 1/2"	3 1/2"	19#	13#
2.5"	25 1/4"	23 1/2"	14 7/8"	3 1/2"	19#	15#
3"	25 15/16"	24 3/16"	15 9/16"	3 3/4"	21#	17#

PLEASE CONTACT THE FACTORY FOR INFORMATION ON MODULATING DIVERT VALVES AND OTHER BODY CONFIGURATIONS.

\*X = VALVE SIZE

# MODULATING VALVES

## SP160 SERIES 7M MULTI-TAPER CV FACTORS



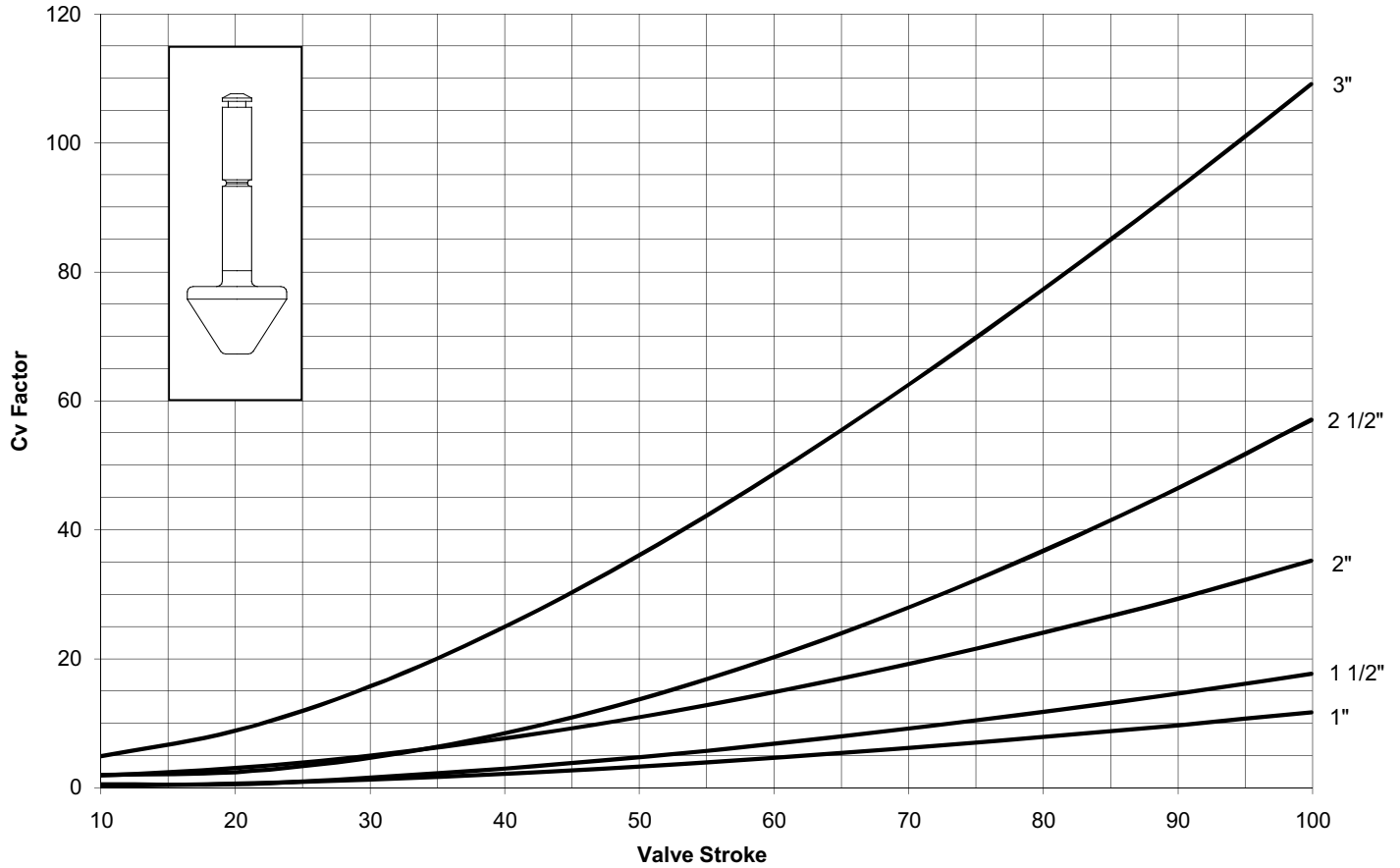
CV VS. % STROKE										
VALVE SIZE	OPERATING RANGE									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
1.0"	0.25	0.75	1.00	1.25	1.875	3.00	4.00	5.00	6.50	12.00
1.5"	0.50	1.00	2.00	3.00	4.00	6.50	6.80	8.30	9.30	14.30
2.0"	1.90	3.20	7.30	11.90	14.60	16.90	20.00	24.20	29.20	33.70
2.5"	2.00	3.90	8.70	14.80	20.40	26.00	31.00	37.00	47.00	53.50
3.0"	4.90	10.00	18.50	24.00	31.00	39.60	56.00	72.00	87.40	110.00

PLEASE CONTACT THE FACTORY FOR INFORMATION ON 7MR O-RING SEAT OPTIONS.

DATA IS BASED ON WATER AT 70°F

# MODULATING VALVES

## SP160 SERIES 7MT STRAIGHT-TAPER CV FACTORS



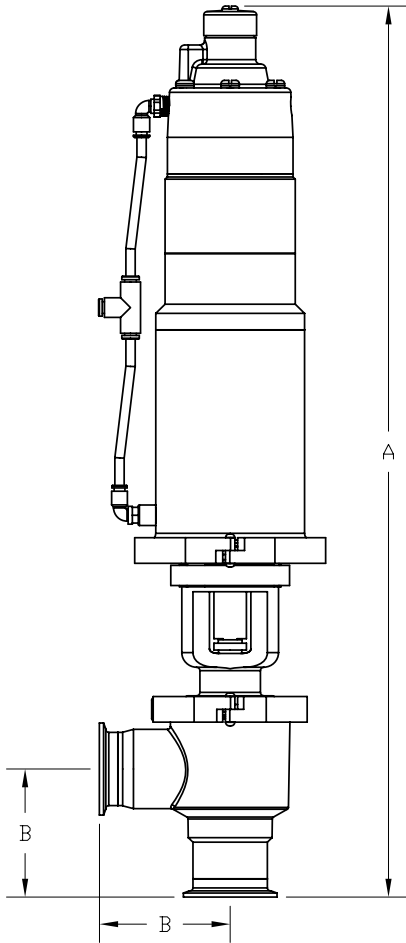
CV VS. % STROKE										
VALVE SIZE	OPERATING RANGE									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
1.0"	3.00	5.00	6.60	8.10	9.60	10.80	12.00	13.20	14.30	15.40
1.5"	6.60	11.00	15.50	19.40	23.00	26.50	30.00	33.20	36.80	40.00
2.0"	14.00	23.80	32.50	40.00	47.80	54.70	61.00	67.00	73.50	79.00
2.5"	21.60	36.00	49.00	58.80	70.00	80.00	89.50	98.00	109.00	118.00
3.0"	23.20	40.70	55.50	69.00	82.00	96.00	110.00	123.00	134.00	145.00

PLEASE CONTACT THE FACTORY FOR INFORMATION ON 7MTR O-RING SEAT OPTIONS.

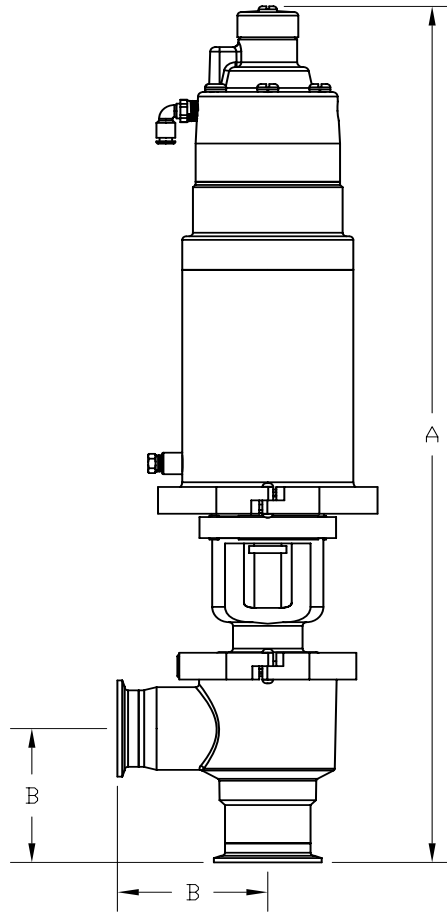
DATA IS BASED ON WATER AT 70°F

# MODULATING VALVES

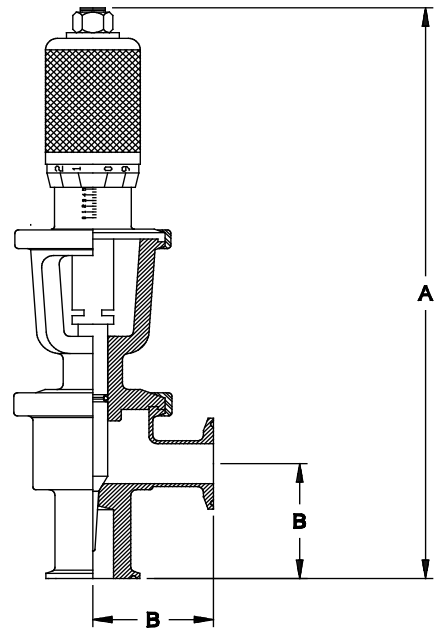
## SP160 MICRO FLOW MODULATING VALVES



**SP160-7M-1-X\*-20VPR**



**SP160-7M-1-X\*-10VPD**

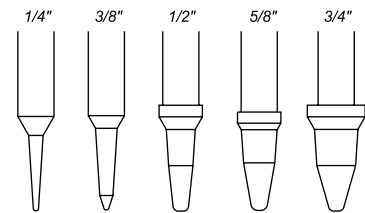


**SP160-7MH-1-X\***

VALVE DIMENSIONS					SHIPPING #S	
SIZE	A			B	SHIPPING #S	
	SP20VPR	SP10VPD	HAND OPERATED	SHUT-OFF VALVE	SP20VPR SP10VPD	HAND OPERATED
1"	23 7/8"	22 1/8"	13 1/2"	2 1/2"	17#	11#

ALL MICRO FLOW VALVES HAVE 1" SP-CLAMP END CONNECTIONS.

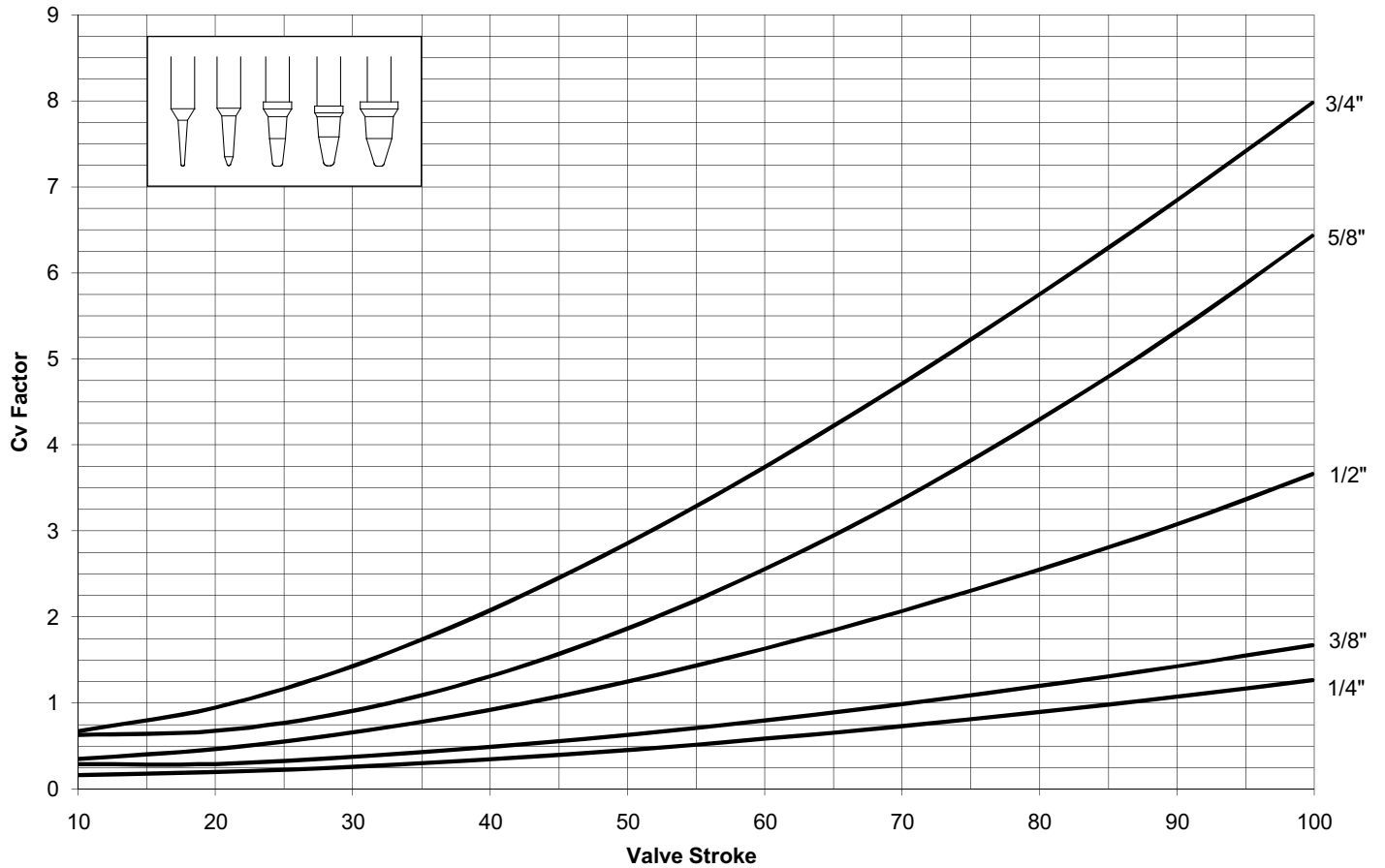
\*X = VALVE SIZE



**AVAILABLE PLUG SIZES**

# MODULATING VALVES

## SP160 SERIES MICRO FLOW CV FACTORS



CV VS. % STROKE										
VALVE SIZE	OPERATING RANGE									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.750"	0.67	0.95	1.43	2.08	2.86	3.74	4.71	5.75	6.84	7.98
0.625"	0.63	0.68	0.91	1.31	1.87	2.56	3.37	4.29	5.32	6.43
0.500"	0.35	0.46	0.66	0.92	1.25	1.63	2.07	2.55	3.08	3.66
0.375"	0.29	0.29	0.37	0.49	0.63	0.79	0.98	1.19	1.42	1.67
0.250"	0.16	0.19	0.26	0.34	0.45	0.58	0.73	0.89	1.07	1.26

PLEASE CONTACT THE FACTORY FOR INFORMATION ON 7MTR O-RING SEAT OPTIONS.

DATA IS BASED ON WATER AT 70°F

# MODULATING VALVES

## MODULATING VALVE SIZING INSTRUCTIONS

Use the formulas below to determine the correct throttling valve for your application.

$\Delta p$  = Pressure Drop Across in PSI  
(Inlet Pressure Minus Outlet Pressure)

Inlet Pressure (10 PSI) minus Outlet Pressure (3 PSI)  
( $\Delta p$ ) = 7 PSI

Formula for water and other products with a specific gravity equal to 1.0:

$$Cv = \sqrt{\frac{GPM}{\Delta p}}$$

Formula for water and other products with a specific gravity other than water:

$$Cv = \sqrt{\frac{GPM}{\Delta p / SG}}$$

GPM = Product flow rate

SG = Specific gravity of gravity

$\Delta p$  = Pressure Drop across valve in PSI

Example:

- 70 GPM of water
- Inlet pressure 10 PSI
- Outlet pressure 3 PSI

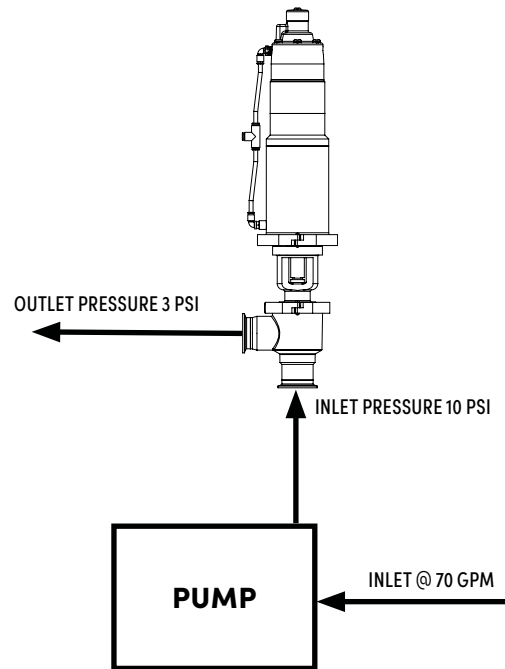
Solution:

$\Delta p = 10 \text{ PSI} - 3 \text{ PSI} = 7 \text{ PSI}$  (See above)

$$Cv = \sqrt{\frac{70}{\frac{1}{7 \text{ PSI}}}} = 26.45$$

Once your Cv factor has been calculated, locate your Cv factor on the charts from pages 2,3 or 5. Use the closest number to your figure. If you find that your Cv factor is listed on more than one chart, use the one that is closest to the optimum operating point. (optimum operating point is when the valve is 50% open).

FOR FURTHER ASSISTANCE SIZING A CONTROL VALVE FOR YOUR APPLICATION, PLEASE CONTACT THE FACTORY.



# MODULATING VALVES - 20VPR AND 10VPD VALVE POSITIONERS

## GENERAL SPECIFICATIONS

- Input Range 3-15 PSI
- Supply Pressure 100 PSI Max.
- Ambient Temp Limits -40° F to 180° F

## PNEUMATIC CONNECTIONS

- All connections are 1/4" NPT
- Recommended piping:
  - 1/4" OD Instrument (input)
  - 3/8" OD Supply
- Use pipe sealant sparingly on male threads only. A non-hardening sealant is strongly recommended.

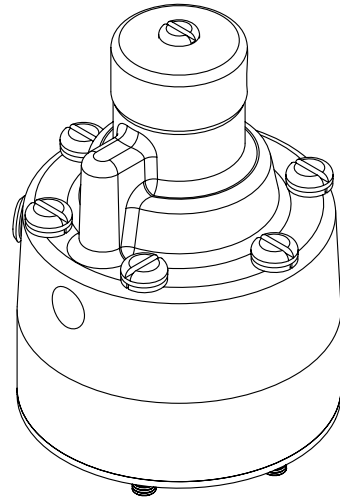
## INSTRUMENT AIR REQUIREMENTS

Connect the positioner to only clean, dry, oil free instrument air. Failure to do so will increase the possibility of a malfunction.

Caution- Synthetic compressor lubricants in the air stream at the instrument may cause the positioner to fail.

The requirements for quality instrument air can be found in the Instrument Society of America's "Quality Standard for Instrument Air" (ISA-S7.3).

- Particle Size: no larger than 3 microns
- Dew Point: at line pressure- should be at least 18°F below the minimum temperature to which any part of the instrument air system is exposed at any season of the year. Under no circumstances should the dew point-at line pressure- exceed 35.6°F.
- Oil Content: maximum total oil or hydrocarbon content, exclusive of noncondensibles, should not exceed 1 PPM under normal operating conditions.



20VPR 3# INSTRUMENT PRESSURE = VALVE CLOSED  
15# INSTRUMENT PRESSURE = VALVE OPEN

10VPD 3# INSTRUMENT PRESSURE = VALVE OPEN  
15# INSTRUMENT PRESSURE = VALVE CLOSED

## ADJUSTMENT

The only adjustment that can be made on the positioner is a zero adjustment. The zero adjusting screw is located under the positioner's top cover.

When valve shut off or opening is required at a specific instrument pressure you will need to zero the positioner at this point, set the instrument air at the specific pressure and turn the zero adjustment screw until the valve reaches the required position.

A slight change of the instrument pressure should start to move the valve.

## MAINTENANCE

Clean, dry, oil free instrument air will reduce most problems associated with pneumatic instruments. If all air requirements (see above) are observed, no routine maintenance is recommended.



# PARTS LISTS – SHUT-OFF VALVES AND DIVERT VALVES

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## ELASTOMER OPTIONS

- Actuator Elastomers: Buna, EPDM
- Valve Wetted Parts:
- Plug and Stem: EPDM, Viton®, PTFE
- Stem O-rings: Viton®, EPDM
- Body Gaskets: EPDM, Viton®, Buna

## ORDERING SPARE PARTS

For assistance with ordering spare parts, please call the factory at 800-558-9446 or send a fax to 262-859-2871.

If possible please have the valve serial number available.

## CLEANING

CIP cleaning methods can be used when air actuated valves are installed. Check with local suppliers for the ideal chemicals to be used based on your requirements for effective cleaning.

Valves should be “cycled” during each step of the CIP process... failure to do this can result in premature failure of valve seats and O-rings.

Using incorrect concentrations of CIP cleaning agents, excessive temperatures and exposure times can also lead to premature failure, consult your local chemical supplier for proper guidelines.

Note: Buna-N is not recommended for use with CIP Sanitizing Agent OXONIA; use EPDM or Viton® EPDM or Viton® is recommended for ozone treated water.

## INSPECTION

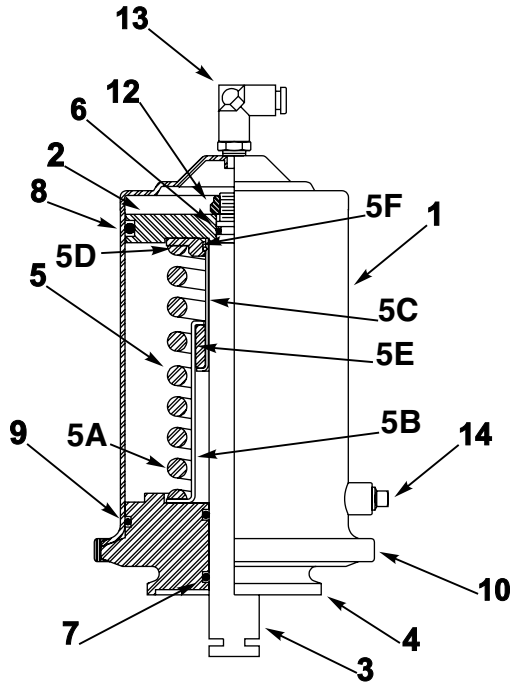
All components should be inspected based on your annual maintenance schedule. Valves that are “cycled” more often should follow their own maintenance schedule.

Inspect all valve seats and O-rings for excessive wear. Replace all parts that show any type of wear, failure to do so can cause permanent damage.

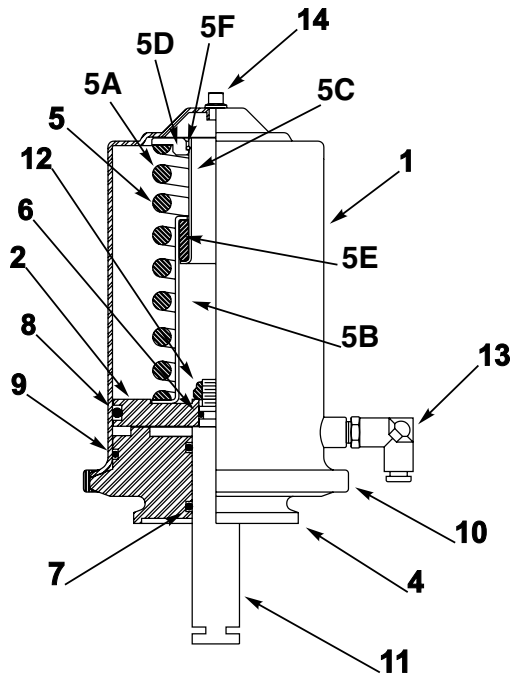
Always follow strict safety guidelines with servicing all valves. Please contact factory at 800-558-9446 for assistance if needed.

# PARTS LISTS – SHORT STROKE ACTUATORS

## SP10 - NORMALLY OPEN/AIR-TO-CLOSE/ SPRING-TO-OPEN ACTUATOR



## SP20 - NORMALLY CLOSED/AIR-TO-OPEN/ SPRING-TO-CLOSE ACTUATOR



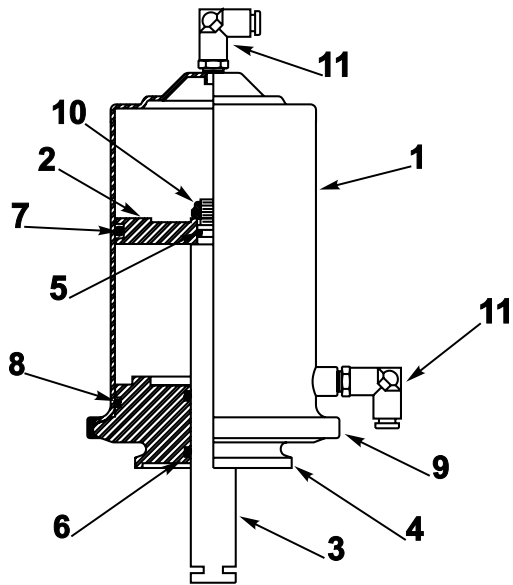
SP10 AND SP20 ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10-1	Cylinder Assembly	
2	SP10-2	Piston	
3	SP10-2D	Actuator Stem	
4	SP10-4	Actuator Foot	
5	SP10-5	Spring and Cage Assembly	
5A	SP10-5A	Spring	
5B	SP10-5B	O.D. Guide	
5C	SP10-5C	I.D. Guide	
5D	SP10-5D	Retaining Flange	
5E	SP10-5E	Brass Bushing	
5F	SP10-5R	Retaining Ring	
6	SP10-6	Upper Stem O-Ring	▲ ○
7	SP10-7	Lower Stem O-Ring	▲ ○
8	SP10-8	Piston O-Ring	▲ ○
9	SP10-9	Foot O-Ring	▲ ○
10	SP13HC-4	Actuator Clamp	
11	SP20-2D	Actuator Stem	
12	SP10-12	Stem Nut	
13	SP10-14	Poly Tube Connector	
14	SP10-15BV	Breather Vent Plug	

▲ INCLUDED IN SP20-SK ACTUATOR SERVICE KIT

○ INCLUDED IN SP20-RBK-SIZE SERVICE KIT

# PARTS LISTS – SHORT STROKE ACTUATORS

## SP30 - AIR-TO-AIR/AIR-TO-CLOSE/ AIR-TO-OPEN ACTUATOR



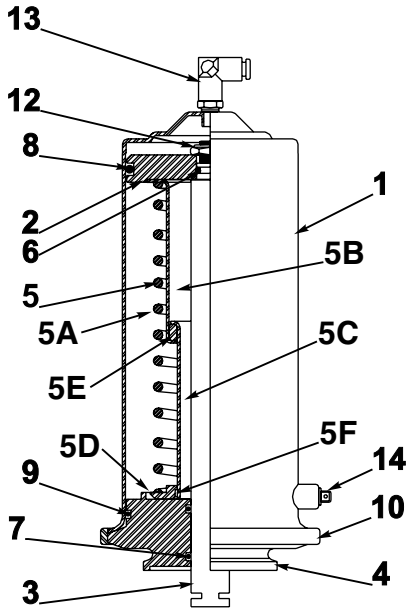
SP30 ACTUATOR			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10-1	Cylinder Assembly	
2	SP10-2	Piston	
3	SP10-2D	Actuator Stem	
4	SP10-4	Actuator Foot	
5	SP10-6	Upper Stem O-Ring	▲ ○
6	SP10-7	Lower Stem O-Ring	▲ ○
7	SP10-8	Piston O-Ring	▲ ○
8	SP10-9	Foot O-Ring	▲ ○
9	SP13HC-4	Actuator Clamp	
10	SP10-12	Stem Nut	
11	SP10-14-NBP	Air Coupling (x2)	

▲ INCLUDED IN SP20-SK ACTUATOR SERVICE KIT

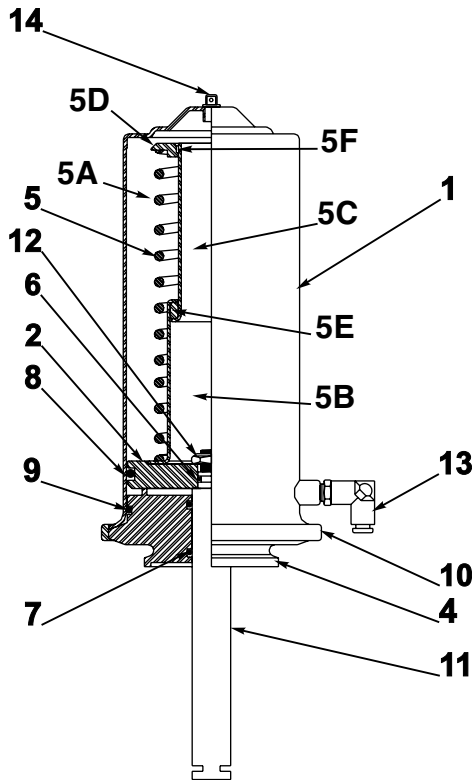
○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

# PARTS LISTS – LONG STROKE ACTUATORS

## SP110 - NORMALLY OPEN ACTUATOR



## SP120 - NORMALLY CLOSED ACTUATOR



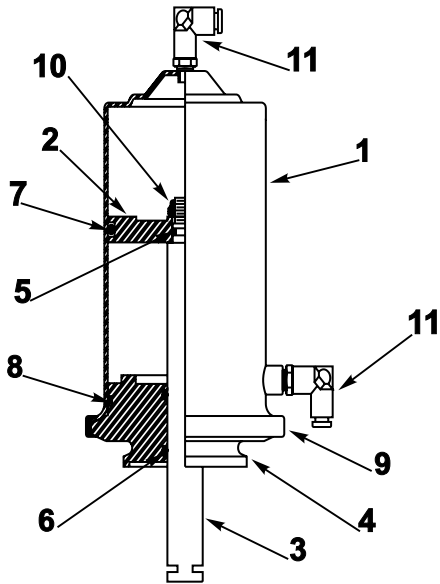
SP110 AND SP120 ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP110-1	Cylinder Assembly	
2	SP110-2	Piston	
3	SP110-2D	Actuator Stem	
4	SP110-4	Actuator Foot	
5	SP110-5	Spring and Cage Assembly	
5A	SP110-5A	Spring	
5B	SP110-5B	O.D. Guide	
5C	SP110-5C	I.D. Guide	
5D	SP110-5D	Retaining Flange	
5E	SP110-5E	Brass Bushing	
5F	SP110-5R	Retaining Ring	
6	SP10-6	Upper Stem O-Ring	▲ ○
7	SP10-7	Lower Stem O-Ring	▲ ○
8	SP10-8	Piston O-Ring	▲ ○
9	SP10-9	Foot O-Ring	▲ ○
10	SP13HC-4	Actuator Clamp	
11	SP120-2D	Actuator Stem	
12	SP10-12	Stem Nut	
13	SP10-14	Poly Tube Connector	
14	SP10-15BV	Breather Vent Plug	

▲ INCLUDED IN SP120-SK ACTUATOR SERVICE KIT

○ INCLUDED IN SP120-RBK-SIZE VALVE SERVICE KIT

# PARTS LISTS – LONG STROKE ACTUATORS

## SP130 - AIR-TO-AIR ACTUATOR



SP130 ACTUATOR			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP110-1	Cylinder Assembly	
2	SP110-2	Piston	
3	SP110-2D	Actuator Stem	
4	SP110-4	Actuator Foot	
5	SP10-6	Upper Stem O-Ring	▲ ○
6	SP10-7	Lower Stem O-Ring	▲ ○
7	SP10-8	Piston O-Ring	▲ ○
8	SP10-9	Foot O-Ring	▲ ○
9	SP13HC-4	Actuator Clamp	
10	SP10-12	Stem Nut	
11	SP10-14-NBP	Air Coupling (x2)	

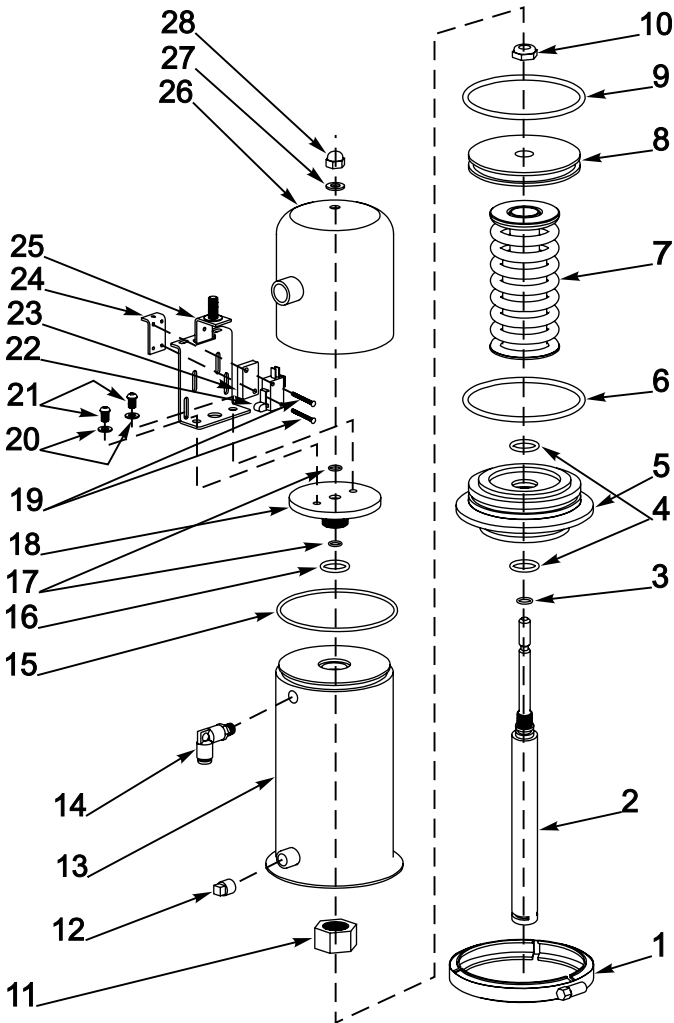
▲ INCLUDED IN SP120-SK ACTUATOR SERVICE KIT

○ INCLUDED IN SP120-RBK-SIZE VALVE SERVICE KIT

# PARTS LISTS – MICRO & PROXIMITY SWITCH ACTUATORS

## SP10MS - NORMALLY OPEN MS/PRX SHORT STROKE ACTUATOR (PICTURED)

## SP20MS - NORMALLY CLOSED MS/PRX SHORT STROKE ACTUATOR



SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP13HC-4	Actuator Clamp	
2	SP10MS-2D SP20MS-2D	Actuator Stem	
3	SP10-6	Upper Stem O-Ring	▲
4	SP10-7	Lower Stem O-Ring	▲
5	SP10-4	Actuator Foot	
6	SP10-9	Foot O-Ring	▲
7	SP10-5	Spring and Cage	
8	SP10-2	Piston	
9	SP10-8	Piston O-Ring	▲
10	SP10-12	Stem Nut	
11	SP10MS-1BN	Base Plate Nut	
12	SP10-15BV SP10MS-15BV	1/8" I/P Adapter Plug	
13	SP10MS-1	Cylinder	
14	SP10MS-14 SP10-14	1/4" Poly-Tube Connector	
15	SP10-9	Cover O-Ring	
16	SP10-7	Base Plate O-Ring	
17	SP10MS-40B	Indicator Stem O-Ring	
18	SP10MS-1B	Base Plate	
19	SP10MS-3C	Micro-Switch Screw (x2)	
20	SP10MS-3K	Micro-Switch Washer (x2)	
21	SP10MS-3L	MS Bracket Screw (x2)	
22	SP10MS-3B SP20-DPS	Micro-Switch (x2) Dual Prox Switch (x2)	
23	SP10MS-3A	MS Mounting Block	
24	SP10MS-3D	MS Adjusting Bracket	
25	SP10MS-3	Micro-Switch Bracket	
26	SP10MS-1A	Micro-Switch Housing	
27	SP10MS-1CW	MS Housing Washer	
28	SP10MS-1C	Acorn Nut	
**	SP20PS-PD	Prox Switch Indicator	

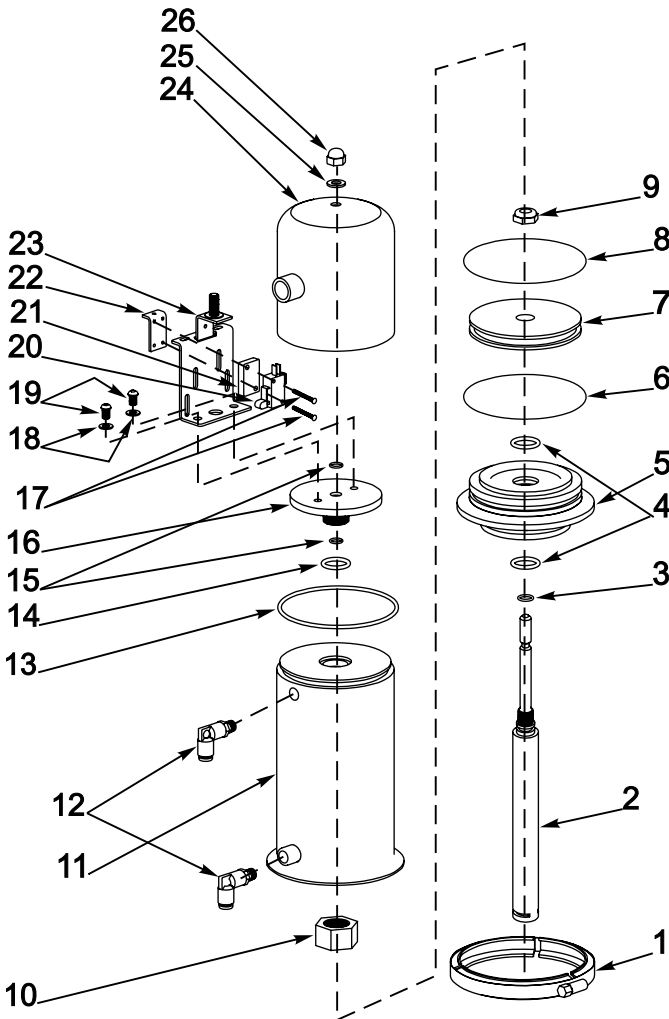
▲ INCLUDED IN SP20-SK ACTUATOR SERVICE KIT

\*\* ITEM NOT SHOWN

SEE PAGE XX FOR MORE INFORMATION ON MICRO AND PROX SWITCHES

# PARTS LISTS – MICRO & PROXIMITY SWITCH ACTUATORS

## SP30MS - AIR-TO-AIR MS/PRX SHORT STROKE ACTUATOR



SP30MS/SP30PRX ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP13HC-4	Actuator Clamp	
2	SP10MS-2D	Actuator Stem	
3	SP10-6	Upper Stem O-Ring	▲
4	SP10-7	Lower Stem O-Ring	▲
5	SP10-4	Actuator Foot	
6	SP10-9	Foot O-Ring	▲
7	SP10-2	Piston	
8	SP10-8	Piston O-Ring	▲
9	SP10-12	Stem Nut	
10	SP10MS-1BN	Base Plate Nut	
11	SP10MS-1	Cylinder	
12	SP10MS-14 SP10-14	1/4" Poly-Tube Connector (x2)	
13	SP10-9	Cover O-Ring	
14	SP10-7	Base Plate O-Ring	
15	SP10MS-40B	Indicator Stem O-Ring	
16	SP10MS-1B	Base Plate	
17	SP10MS-3C	Micro-Switch Screw (x2)	
18	SP10MS-3K	Micro-Switch Washer (x2)	
19	SP10MS-3L	MS Bracket Screw (x2)	
20	SP10MS-3B SP20-DPS	Micro-Switch (x2) Dual Prox Switch (x2)	
21	SP10MS-3A	MS Mounting Block	
22	SP10MS-3D	MS Adjusting Bracket	
23	SP10MS-3	Micro-Switch Bracket	
24	SP10MS-1A	Micro-Switch Housing	
25	SP10MS-1CW	MS Housing Washer	
26	SP10MS-1C	Acorn Nut	
**	SP20PS-PD	Prox Switch Indicator	

▲ INCLUDED IN SP20-SK ACTUATOR SERVICE KIT

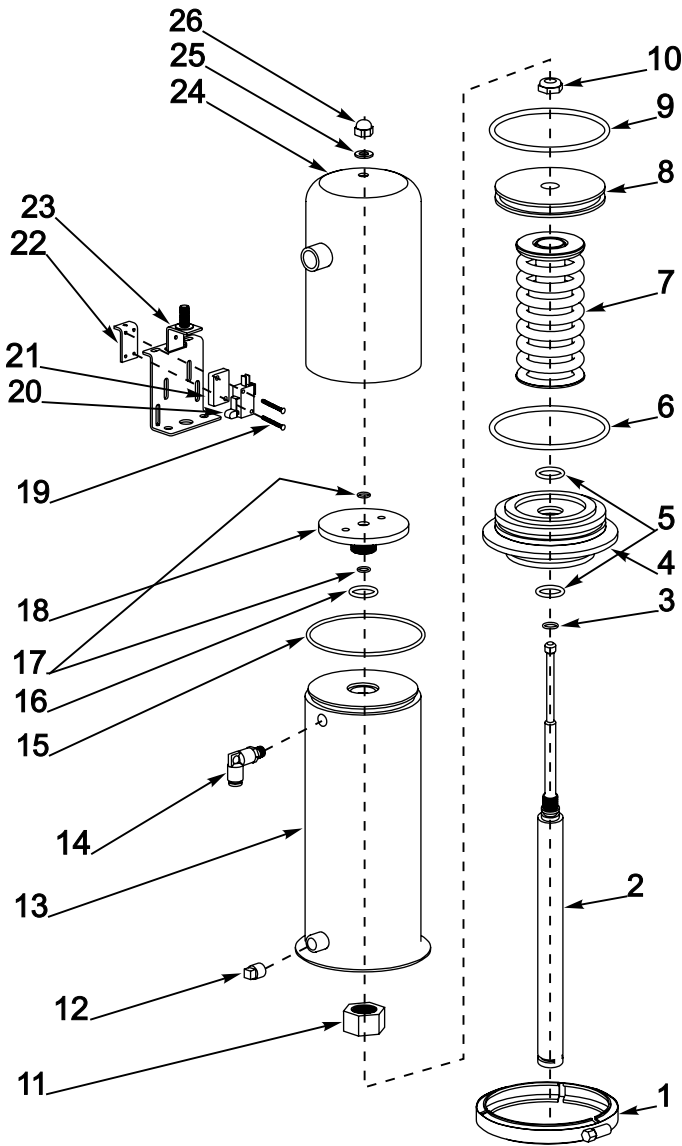
\*\* ITEM NOT SHOWN

SEE PAGE XX FOR MORE INFORMATION ON MICRO AND PROX SWITCHES

# PARTS LISTS – MICRO & PROXIMITY SWITCH ACTUATORS

## SP110MS - NORMALLY OPEN MS/PRX LONG STROKE ACTUATOR (PICTURED)

## SP120MS - NORMALLY OPEN MS/PRX LONG STROKE ACTUATOR



SP110MS/SP110PRX/SP120MS/SP120PRX ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP13HC-4	Actuator Clamp	
2	SP110MS-2D SP120MS-2D	Actuator Stem	
3	SP10-6	Upper Stem O-Ring	▲
4	SP10-7	Lower Stem O-Ring	▲
5	SP110-4	Actuator Foot	
6	SP10-9	Foot O-Ring	▲
7	SP110-5	Spring and Cage	
8	SP110-2	Piston	
9	SP10-8	Piston O-Ring	▲
10	SP10-12	Stem Nut	
11	SP10MS-1BN	Base Plate Nut	
12	SP10-15BV SP10MS-15BV	1/8" I/P Adapter Plug	
13	SP110MS-1	Cylinder	
14	SP10MS-14 SP10-14	1/4" Poly-Tube Connector	
15	SP10-9	Cover O-Ring	
16	SP10-7	Base Plate O-Ring	
17	SP10MS-40B	Indicator Stem O-Ring	
18	SP10MS-1B	Base Plate	
19	SP10MS-3C	Micro-Switch Screw (x2)	
20	SP10MS-3B SP20-DPS	Micro-Switch (x2) Dual Prox Switch (x2)	
21	SP10MS-3A	Micro-Switch Block (x2)	
22	SP10MS-3D	MS Adjusting Bracket (x2)	
23	SP110MS-3	Micro-Switch Bracket	
24	SP110MS-1A SP120MS-1A	Micro-Switch Housing	
25	SP10MS-1CW	MS Housing Washer	
26	SP10MS-1C	Acorn Nut	
**	SP20PS-PD	Prox Switch Indicator	

▲ INCLUDED IN SP120-SK ACTUATOR SERVICE KIT

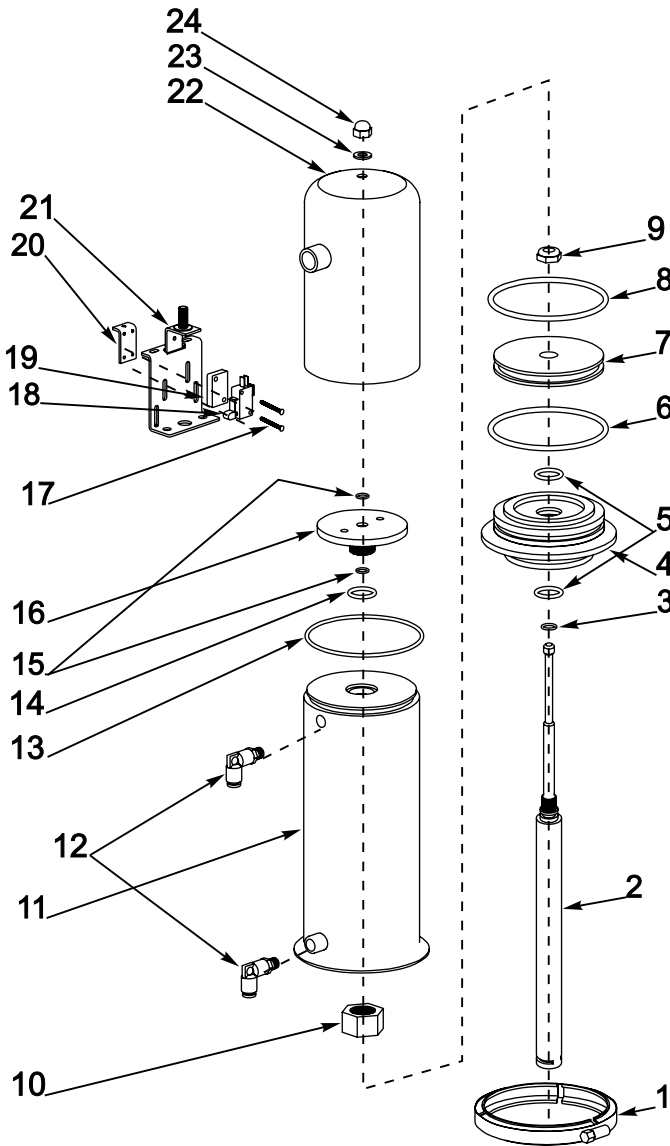
\*\* ITEM NOT SHOWN

SEE PAGE XX FOR MORE INFORMATION ON MICRO AND PROX SWITCHES



# PARTS LISTS – MICRO & PROXIMITY SWITCH ACTUATORS

## SP130MS - AIR-TO-AIR MS/PRX LONG STROKE ACTUATOR



SP130MS/SP130PRX ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP13HC-4	Actuator Clamp	
2	SP110MS-2D	Actuator Stem	
3	SP10-6	Upper Stem O-Ring	▲
4	SP10-7	Lower Stem O-Ring	▲
5	SP110-4	Actuator Foot	
6	SP10-9	Foot O-Ring	▲
7	SP110-2	Piston	
8	SP10-8	Piston O-Ring	▲
9	SP10-12	Stem Nut	
10	SP10MS-1BN	Base Plate Nut	
11	SP110MS-1	Cylinder	
12	SP10MS-14 SP10-14	1/4" Poly-Tube Connector (x2)	
13	SP10-9	Cover O-Ring	
14	SP10-7	Base Plate O-Ring	
15	SP10MS-40B	Indicator Stem O-Ring	
16	SP10MS-1B	Base Plate	
17	SP10MS-3C	Micro-Switch Screw (x2)	
18	SP10MS-3B SP20-DPS	Micro-Switch (x2) Dual Prox Switch (x2)	
19	SP10MS-3A	Micro-Switch Block (x2)	
20	SP10MS-3D	MS Adjusting Bracket (x2)	
21	SP110MS-3	Micro-Switch Bracket	
22	SP110MS-1A SP120MS-1A	Micro-Switch Housing	
23	SP10MS-1CW	MS Housing Washer	
24	SP10MS-1C	Acorn Nut	
**	SP20PS-PD	Prox Switch Indicator	

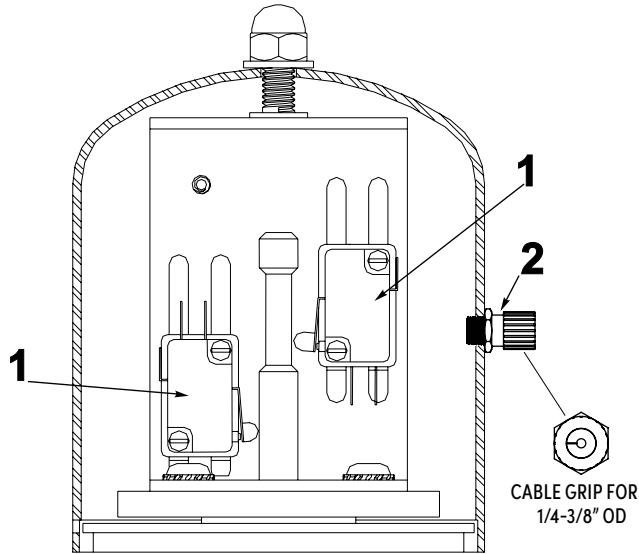
▲ INCLUDED IN SP120-SK ACTUATOR SERVICE KIT

\*\* ITEM NOT SHOWN

SEE PAGE XX FOR MORE INFORMATION ON MICRO AND PROX SWITCHES

# PARTS LISTS – MICRO & PROXIMITY SWITCH ACTUATORS

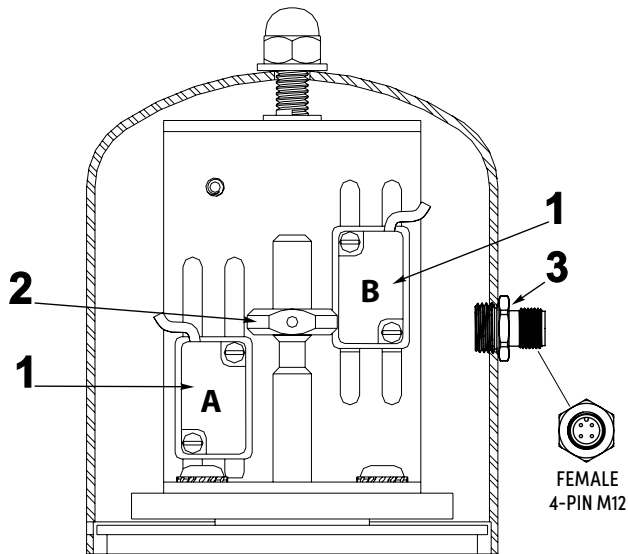
## SP120MS - MICRO-SWITCH



SP10MS/SP20MS/SP30MS/SP110MS/SP120MS/SP130MS MICRO-SWITCH		
ITEM	PART NUMBER	DESCRIPTION
1	SP10MS-3B	Micro Switches (x2)
2	SP10MS-CG	1/2" NPT Nylon Cable Grip for 1/4-3/8" OD range

ELECTRICAL CONNECTIONS MADE BY USER/CUSTOMER

## SP20PRX - PROXIMITY SWITCH

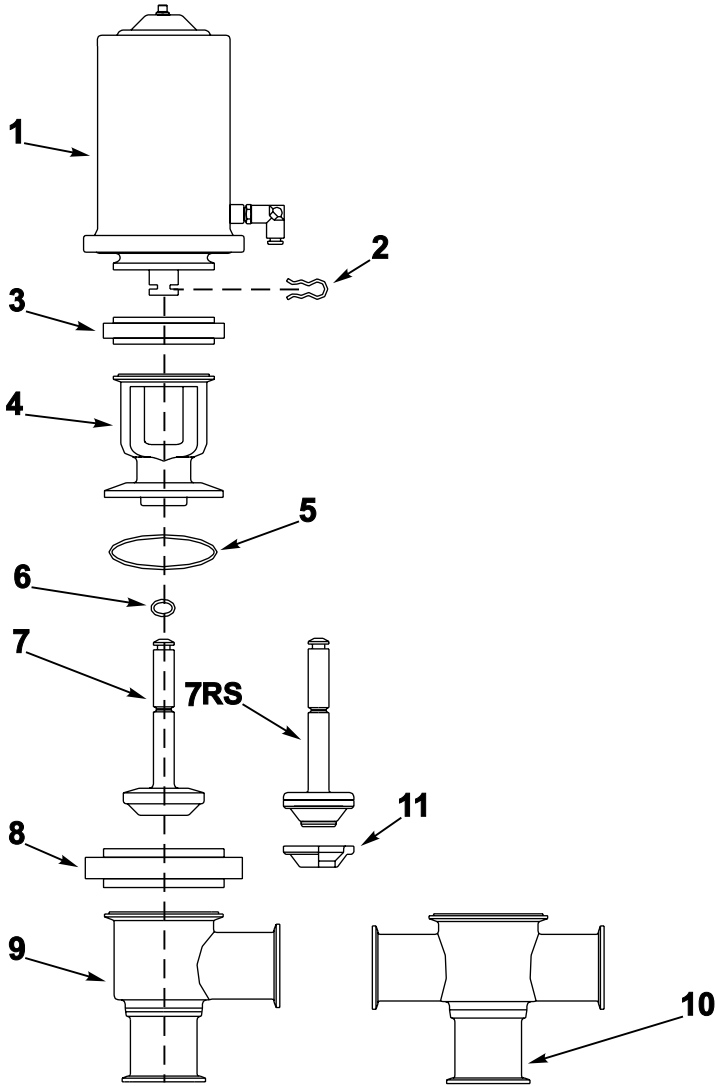


SP10PRX/SP20PRX/SP30PRX/SP110PRX/SP120PRX/SP 130PRX PROXIMITY SWITCH		
ITEM	PART NUMBER	DESCRIPTION
1	SP20-DPS	Proximity Switches (Dual Prewired) A = Bottom, B = Top
2	SP20PS-PD	Proximity Switch Indicator (Stainless Steel Prox Dog) with Set Screw
3	SP20-4P-NPT	1/2" NPT Adapter to Female 4-Pin M12
**	SP20-FWC-CONN	Male M12 to Cable Adapter (Included but Optional)

\*\* ITEM NOT SHOWN

# PARTS LISTS – SHORT STROKE SHUT OFF VALVES

## SP160 SHORT STROKE SHUT OFF VALVE

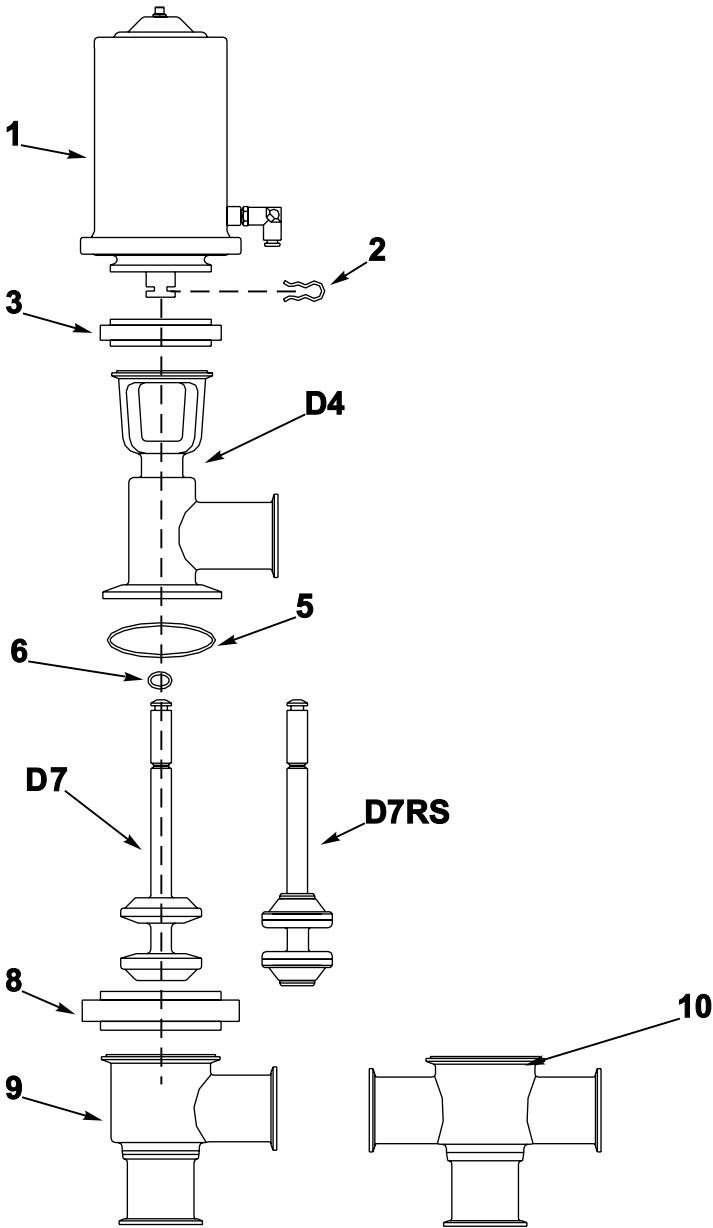


SHORT STROKE SHUT OFF VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10 SP20 SP30	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP160-7-1.5-9	Spring Clip	○
3	SP13Z-2.5	Bonnet Clamp	
4	SP160-7-Size-3	Shut Off Bonnet	
5	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Gasket for 1.5" Valve Gasket for 2" Valve Gasket for 2.5" Valve Gasket for 3" Valve	○
6	SP10-6	Stem O-Ring	○
7 7RS	SP160-7-Size-2E SP160-7-Size-2V SP160-7RS-Size-2TS	Shut-off Stem (EPDM) Shut-off Stem (Viton) Shut-off Stem (PTFE)	
8	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
9	SP160-7-Size-1	Tee Body	
10	SP160-9-Size-1	Cross Body	
11	SP160-7RS-Size-2TH	Seat (PTFE)	

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

# PARTS LISTS – SHUT OFF & DIVERT VALVES

## SP160 SHORT STROKE DIVERT VALVE

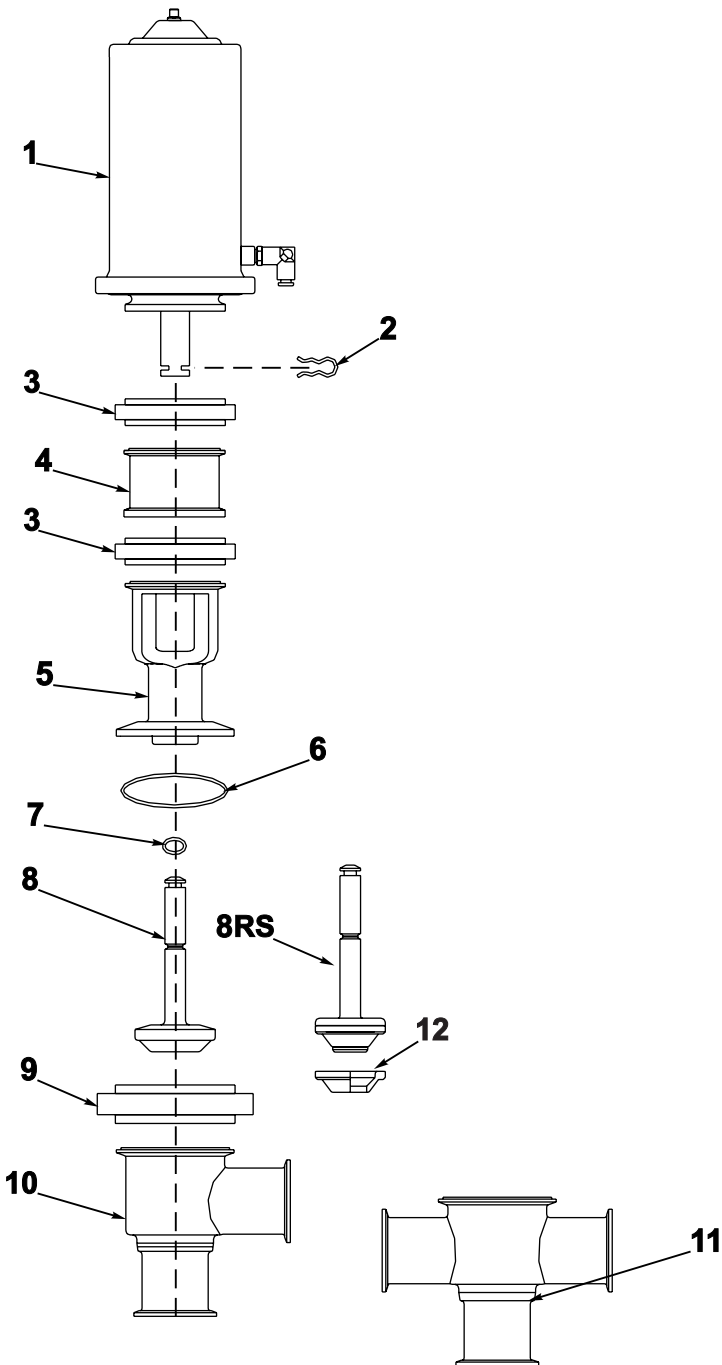


SHORT STROKE DIVERT VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10 SP20 SP30	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP160-7-1.5-9	Spring Clip	○
3	SP13Z-2.5	Bonnet Clamp	
D4	SP160-77-Size-1	Divert Upper Body	
5	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Gasket for 1.5" Valve Gasket for 2" Valve Gasket for 2.5" Valve Gasket for 3" Valve	○
6	SP10-6	Stem O-Ring	○
D7 D7RS	SP160-77-Size-2E SP160-77-Size-2V SP160-77RS-x-2TS	Divert Plug & Stem (EPDM) Divert Plug & Stem (Viton) Divert Plug & Stem (PTFE)	
8	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
9	SP160-7-Size-1	Tee Body	
10	SP160-9-Size-1	Cross Body	

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

# PARTS LISTS – SHUT OFF AND DIVERT VALVES

## SP161 LONG STROKE SHUT OFF VALVE

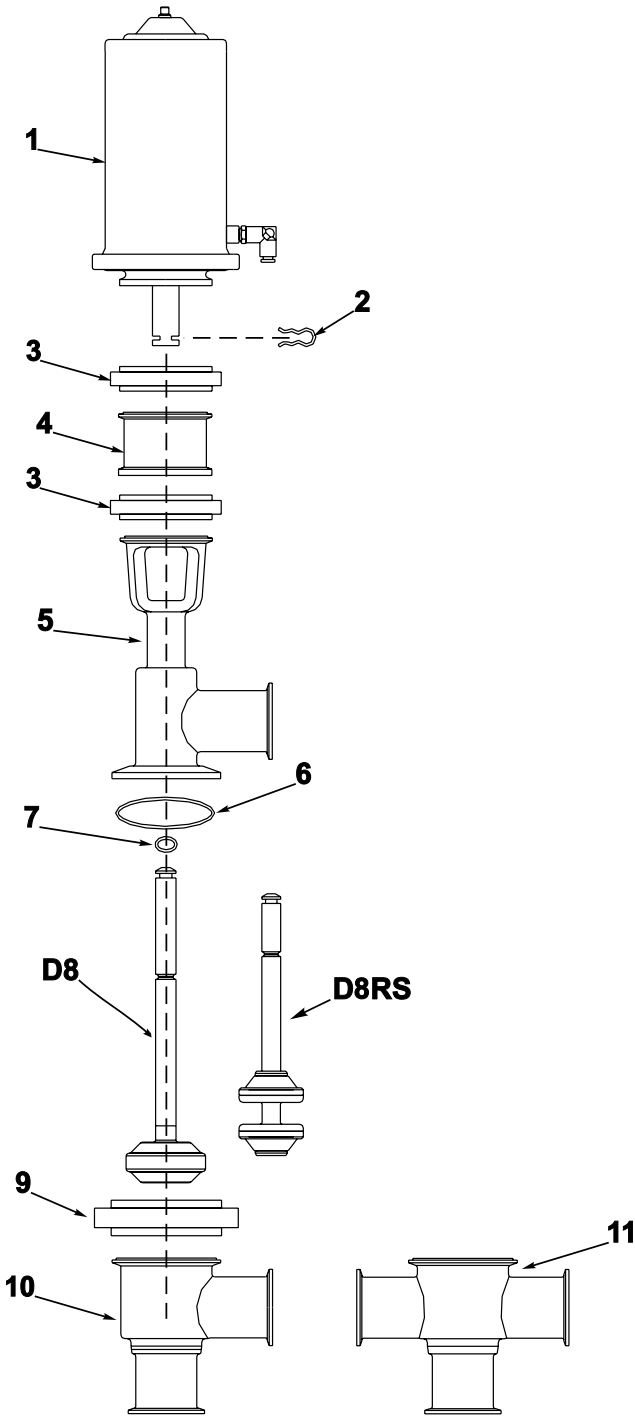


LONG STROKE SHUT OFF VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP110 SP120 SP130	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP160-7-1.5-9	Spring Clip	○
3	SP13Z-2.5	Bonnet Clamp	
4	SP161-4 SP161-4-DLS	Spool Piece 3" Valve Spool Piece	
5	SP161-7-Size-3	Bonnet	
6	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Gasket for 1.5" Valve Gasket for 2" Valve Gasket for 2.5" Valve Gasket for 3" Valve	○
7	SP10-6	Stem O-Ring	○
8 8RS	SP161-7-Size-2E SP161-7-Size-2V SP161-7RS-Size-2TS	Shut-off Stem (EPDM) Shut-off Stem (Viton) Shut-off Stem (PTFE)	
9	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
10	SP160-7-Size-1	Tee Body	
11	SP160-9-Size-1	Cross Body	
12	SP160-7RS-Size-2TH	Seat (PTFE)	

○ INCLUDED IN SP120-RBK-SIZE VALVE SERVICE KIT

# PARTS LISTS – SHUT OFF AND DIVERT VALVES

## SP161 LONG STROKE DIVERT VALVE

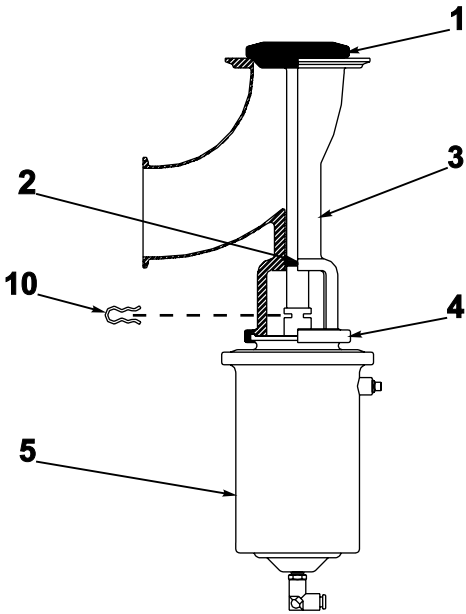


LONG STROKE DIVERT VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP110 SP120 SP130	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP160-7-1.5-9	Spring Clip	○
3	SP13Z-2.5	Bonnet Clamp	
4	SP161-4 SP161-4-DLS	Spool Piece 3" Valve Spool Piece	
D5	SP161-77-Size-1	Divert Upper Body	
6	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Gasket for 1.5" Valve Gasket for 2" Valve Gasket for 2.5" Valve Gasket for 3" Valve	○
7	SP10-6 SP10-6-3	Stem O-Ring Stem O-Ring 3" Divert Only	○
D8 D8RS	SP161-77-Size-2E SP161-77-Size-2V SP161-77RS-Size-2TS	Divert Plug & Stem (EPDM) Divert Plug & Stem (Viton) Divert Plug & Stem (PTFE)	
9	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
10	SP160-7-Size-1	Tee Body	
11	SP160-9-Size-1	Cross Body	

○ INCLUDED IN SP120-RBK-SIZE VALVE SERVICE KIT

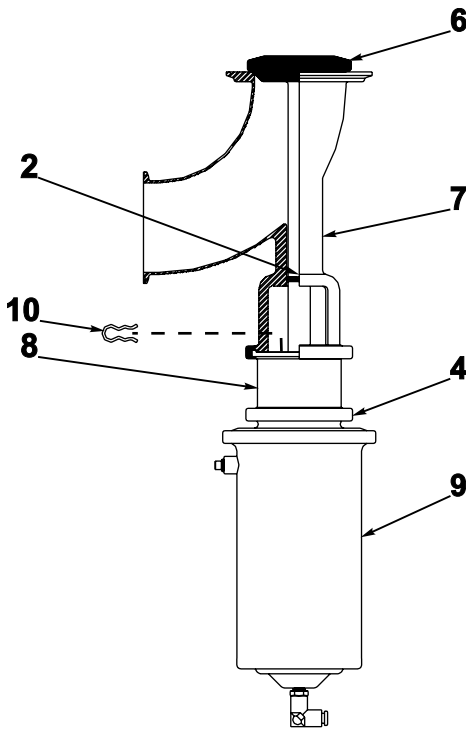
# PARTS LISTS – ELBOW VALVES

## SP 164 SHORT STROKE ELBOW VALVE



SP164 ELBOW VALVES		
ITEM	PART NUMBER	DESCRIPTION
1	SP164-7-Size-2	Plug and Stem
2	SP10-6	Stem O-Ring
3	SP164-7-Size-1	Body & Bonnet
4	SP13Z-2.5	Bonnet Clamp
5	SP10 SP20 SP30	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)
10	SP160-7-1.5-9	Spring Clip

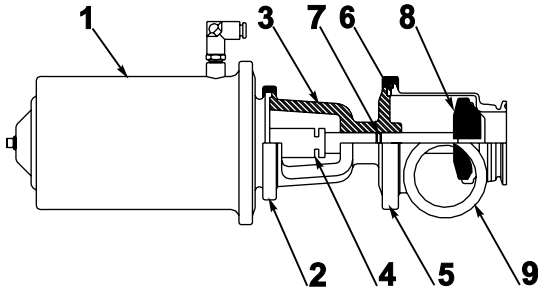
## SP 165 LONG STROKE ELBOW VALVE



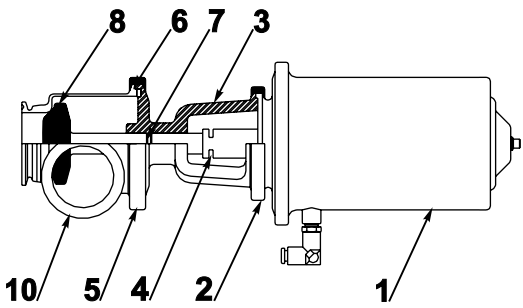
SP165 ELBOW VALVES		
ITEM #	PART NUMBER	DESCRIPTION
2	SP10-6	Stem O-Ring
4	SP13Z-2.5	Bonnet Clamp
6	SP165-7-Size-2	Plug and Stem
7	SP165-7-Size-1	Body and Bonnet
8	SP161-4	Adapter Spool
9	SP110 SP120 SP130	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)
10	SP160-7-1.5-9	Spring Clip

# PARTS LISTS – TANK OUTLET VALVES

## SP163 SHORT STROKE TANK OUTLET VALVE



## SP163 SHORT STROKE TANK OUTLET VALVE



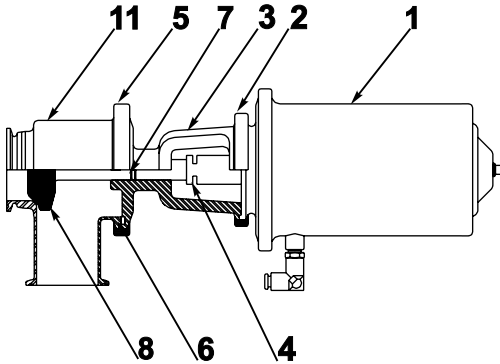
SP163 SHORT STROKE TANK OUTLET VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10 SP20 SP30	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP13Z-2.5	Bonnet Clamp	
3	SP160-7-Size-3	Bonnet	
4	SP160-7-1.5-9	Spring Clip	○
5	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
6	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Body Gasket for 1.5" Valve Body Gasket for 2" Valve Body Gasket for 2.5" Valve Body Gasket for 3" Valve	○
7	SP10-6	Stem O-Ring	○
8	SP160-7-Size-2E SP160-7-Size-2V	Plug and Stem (EPDM) Plug and Stem (Viton)	
9	SP163R-7-Size-1	Tang. Right Tee Body	
10	SP163L-7-Size-1	Tang. Left Tee Body	
11	SP163S-7-Size-1	Straight Tee Body	
12	SP163F-7-Size-1	Flange Tee Body	

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

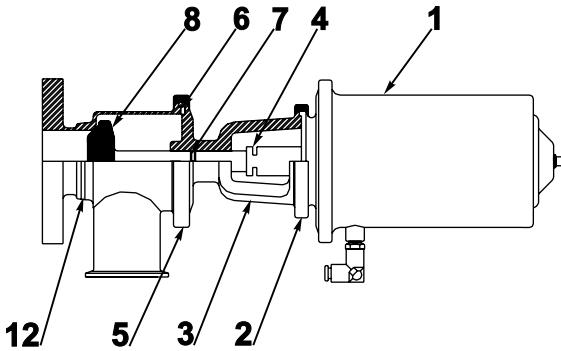


# PARTS LISTS – TANK OUTLET VALVES

## SP1613 LONG STROKE TANK OUTLET VALVE



## SP1613 LONG STROKE TANK OUTLET VALVE



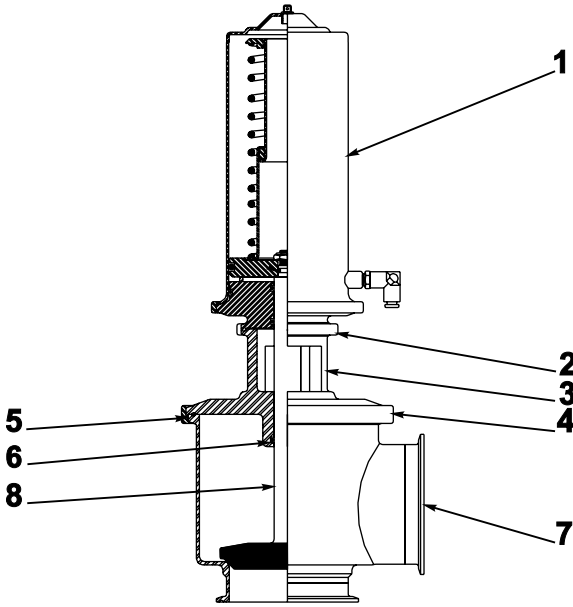
SP1613 LONG STROKE TANK OUTLET VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP110 SP120 SP130	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP13Z-2.5	Bonnet Clamp	
3	SP161-7-Size-3	Bonnet	
**	SP161-4	Spool Piece	
4	SP160-7-1.5-9	Spring Clip	○
5	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
6	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Body Gasket for 1.5" Valve Body Gasket for 2" Valve Body Gasket for 2.5" Valve Body Gasket for 3" Valve	○
7	SP10-6	Stem O-Ring	○
8	SP161-7-Size-2E SP160-7-Size-2V	Plug and Stem (EPDM) Plug and Stem (Viton)	
9	SP163R-7-Size-1	Tang. Right Tee Body	
10	SP163L-7-Size-1	Tang. Left Tee Body	
11	SP163S-7-Size-1	Straight Tee Body	
12	SP163F-7-Size-1	Flange Tee Body	

○ INCLUDED IN SP120-RBK-SIZE VALVE SERVICE KIT

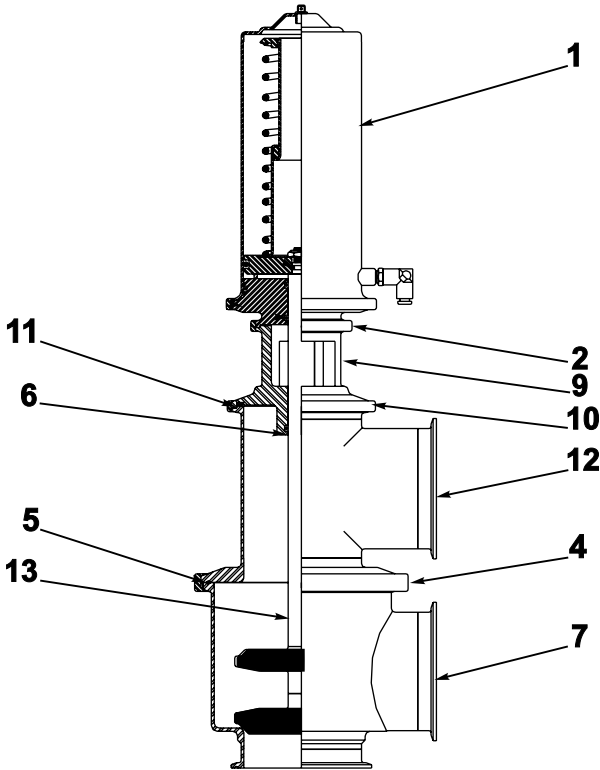
\*\* ITEM NOT SHOWN

# PARTS LISTS – 4-INCH SHUT OFF AND DIVERT VALVES

## SP161-7 4-INCH LONG STROKE SHUT OFF VALVE



## SP161-77 4-INCH LONG STROKE DIVERT VALVE



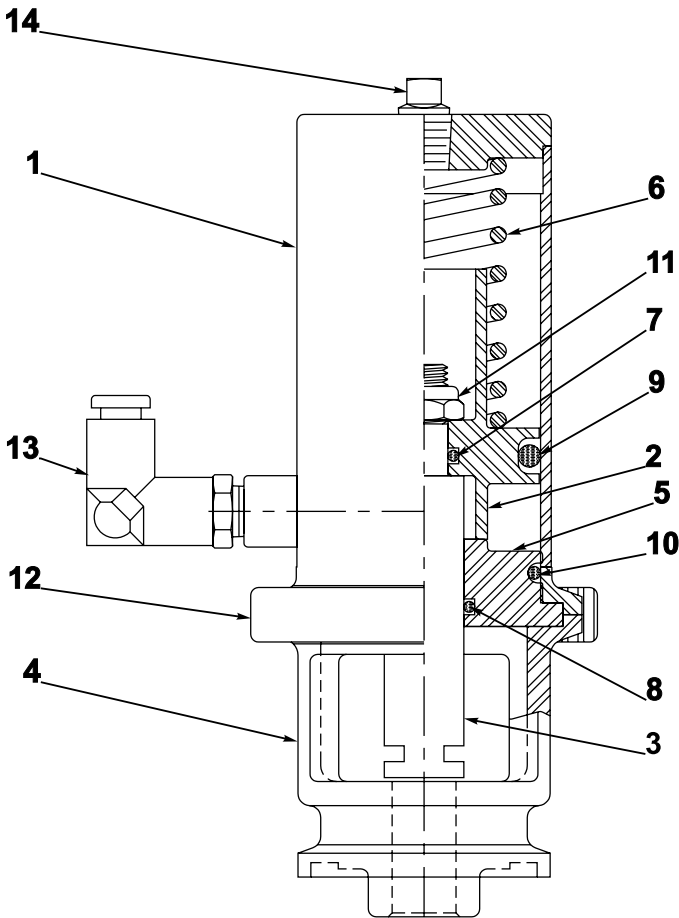
4-INCH SHUT OFF AND DIVERT VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP110 SP120 SP130	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP13Z-2.5	Bonnet Clamp	
3	SP161-7-4-3	Bonnet	
4	SP13HC-6	Body Clamp	
5	SP40-6	Body Gasket	○
6	SP10-7	Bonnet O-Ring	○
7	SP161-7-4-1 SP161-9-4-1	Tee Body Cross Body (not shown)	
8	SP161-7-4-2E-120 SP161-7-4-2V-120 SP161-7-4-2E-110 SP161-7-4-2V-110	Plug and Stem (N.C.) (EPDM) Plug and Stem (N.C.) (Viton) Plug and Stem (N.O.) (EPDM) Plug and Stem (N.O.) (Viton)	
9	SP161-77-4-3	Divert Bonnet	
10	SP13HC-4	Upper Body Clamp	
11	SP40-4	Upper Body Gasket	
12	SP161-77-4-1	Upper Divert Body	
13	SP161-77-4-2E-120 SP161-77-4-2V-120 SP161-77-4-2E-110 SP161-77-4-2V-110	Divert Plug and Stem (N.C.) (EPDM) Divert Plug and Stem (N.C.) (Viton) Divert Plug and Stem (N.O.) (EPDM) Divert Plug and Stem (N.O.) (Viton)	

○ INCLUDED IN SP120-RBK-4 VALVE SERVICE KIT

# FRACTIONAL VALVES PARTS LIST

## SP10-0.5 FRACTIONAL NORMALLY OPEN SHORT STROKE ACTUATOR

## SP20-0.5 FRACTIONAL NORMALLY CLOSED SHORT STROKE ACTUATOR



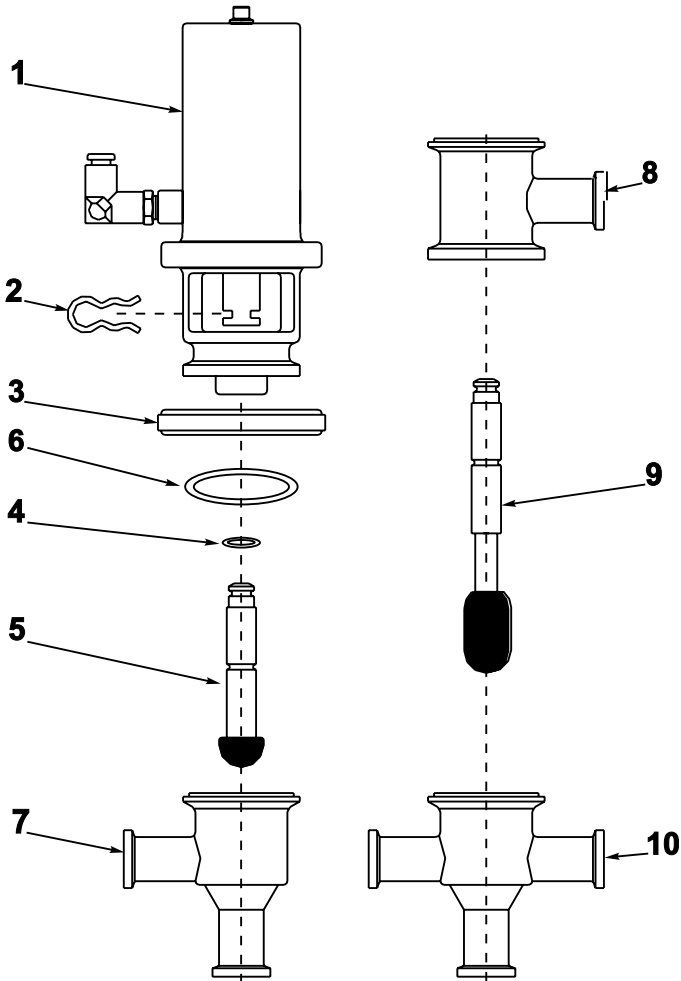
FRACTIONAL ACTUATOR			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10-0.5-1	Cylinder Assembly	
2	SP10-0.5-2	Piston	
3	SP10-0.5-2D SP20-0.5-2D	Stem (N.O.) Stem (N.C.)	
4	SP160-7-0.5-3	Bonnet	
5	SP10-0.5-4	Cylinder Foot	
6	SP10-0.5-5	Spring	
7	SP10-0.5-6	Upper Stem O-Ring	▲ ○
8	SP10-0.5-7	Lower Stem O-Ring	▲ ○
9	SP10-0.5-8	Piston O-Ring	▲ ○
10	SP10-0.5-9	Cylinder Foot O-Ring	▲ ○
11	SP10-0.5-12	Stem Nut	
12	SP13HC-2	Bonnet Clamp	
13	SP10-14	Poly-Tube Connector	
14	SP10-15BV	I/P Adapter	

▲ INCLUDED IN SP20-0.5-SK ACTUATOR SERVICE KIT

○ INCLUDED IN SP20-RBK-0.5 VALVE SERVICE KIT

# FRACTIONAL VALVES PARTS LIST

## SP160-7 FRACTIONAL SHORT STROKE SHUT OFF VALVE SP160-77 FRACTIONAL SHORT STROKE DIVERT VALVE



FRACTIONAL SHUT OFF AND DIVERT VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10-0.5 SP20-0.5 SP30-0.5	Actuator (N.O.) Actuator (N.C.) Actuator (A/A)	
2	SP160-7-1.5-9	Spring Clip	○
3	SP13HC-1.5	Clamp	
4	SP160-7-0.5-2OR	Stem O-Ring	○
5	SP160-7-0.5-2	Plug and Stem	
6	SP40B-0.75	Bonnet Gasket	○
7	SP160-7-Size-1	Tee Body	
8	SP160-77-Size-1	Divert Body	
9	SP160-77-0.5-2	Divert Plug and Stem	
10	SP160-9-Size-1	Cross Body	

○ INCLUDED IN SP20-RBK-0.5 VALVE SERVICE KIT

# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

1. To separate the body from the bonnet (see fig. 2) first check to see which model actuator is present. A normally-closed SP20/120 actuator (see fig. 4) will have the stem/seat in the down/closed position, thus **air pressure must be applied to the fitting toward the bottom of the actuator prior to removing clamp**. For a normally-open SP10/110 actuator (see fig. 3), energizing with air is not necessary. See figures 6–7 for stem/seat reference.

- Other ways to identify actuator:
  - Location of air fitting:
    - Installed further from valve/fluid side, on the top of the actuator = normally open SP10/110 (see fig. 3)
    - Installed closer to valve/fluid side = normally closed SP20/120 (see fig. 4)
    - Look in valve body, if possible, to see position of stem/plug when de-energized
  - An SP-30/130 actuator is air-to-air meaning the actuator must be energized in the appropriate direction to retract the stem/seat and disassemble the valve body. It will have two air fittings and no spring or “normal/de-energized” state. (See fig. 6-7.) Energize through fitting (see fig. 5) to open the valve.

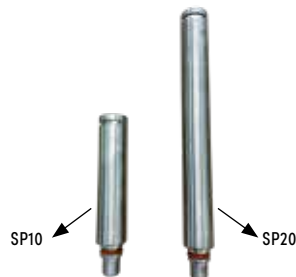


FIG. 1 - COMPARISON OF SP10 (NORMALLY CLOSED) ACTUATOR STEM VS. SP20 (NORMALLY OPEN) ACTUATOR STEM

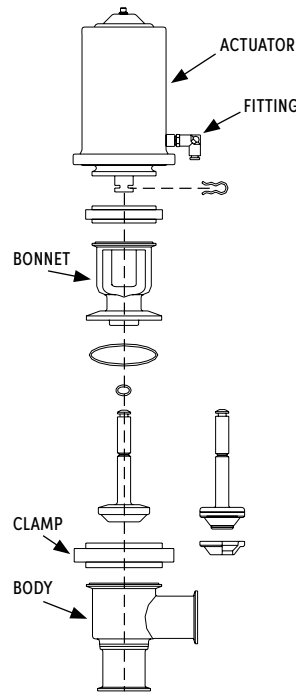


FIG. 2 - SP-160 SHORT STROKE SHUT-OFF VALVE

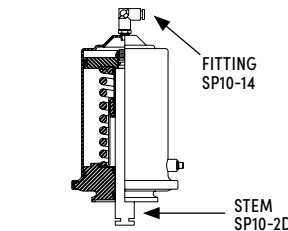


FIG. 3 - SP10 ACTUATOR (NORMALLY OPEN)

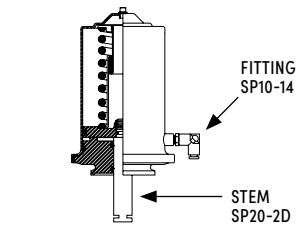


FIG. 4 - SP20 ACTUATOR (NORMALLY CLOSED)

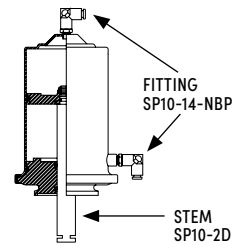


FIG. 5 - SP30 ACTUATOR

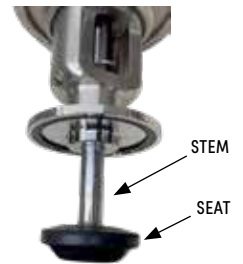


FIG. 6 - DE-ENERGIZED SP20/120 ACTUATOR (NORMALLY CLOSED) OR ENERGIZED SP-10/110 ACTUATOR (NORMALLY OPEN).

**NOTE:** CLAMP CANNOT BE REMOVED WITH PLUG “DOWN” AS SHOWN ABOVE IN FIGURE 7.

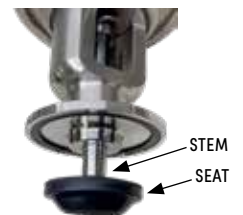


FIG. 7 - ENERGIZED SP-20/120 ACTUATOR (NORMALLY CLOSED) DE-ENERGIZED SP-10/110 ACTUATOR OR DE-ENERGIZED SP-20/120 ACTUATOR (NORMALLY OPEN).



FIG. 8 - SP-160 SHUTOFF VALVE

# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

2. Once the body is removed, remove gasket (see fig. 9) with a pick and replace.

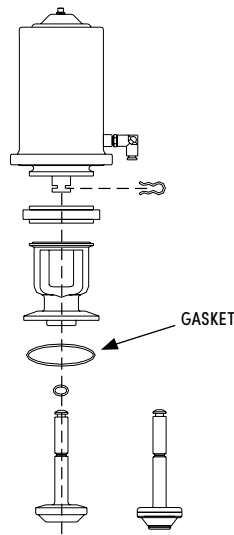


FIG. 9 - SP-160 SHORT STROKE SHUT-OFF VALVE



FIG. 10 - GASKET REMOVED TO BE REPLACED

3. Remove the spring clip (see fig. 11). This step will highlight details with images that will also help re-assembly of the spring clip into the stem (see fig. 11).

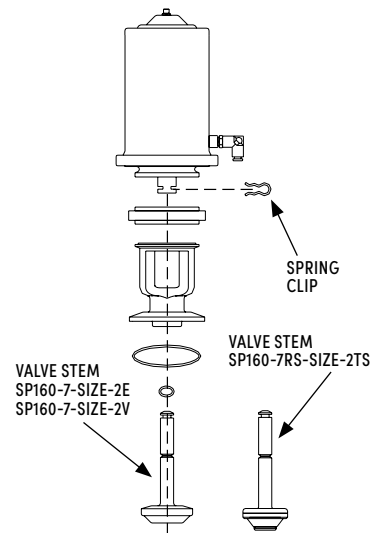


FIG. 11 - SP-160 SHORT STROKE SHUT-OFF VALVE



FIG. 12 - SPRING CLIP REMOVED FROM STEM

# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

The spring clip retains the valve stem by fitting into a groove on top of the valve stem, but first going through the slot in the actuator stem. To remove the spring clip, pry on the spring clip away from its open end. A screwdriver or small open-end wrench will aid in this step. Figure 13 shows the groove and retention mechanism. Figure 14 shows the clip fully installed without the bonnet (for reference).

Continue prying until the spring clip is free. It may stop in its intermediate position shown in figure 15, but continue to pry.

Replace the stem and seat (see fig. 17) or if the valve has a PTFE replacable seat (see fig. 18), keep stem and replace seat.



FIG. 13 - GROOVES IN VALVE STEM AND ACTUATOR STEM SHOWN WITHOUT BONNET FOR REFERENCE.



FIG. 14 - FULLY INSTALLED SPRING CLIP. REMOVE TO THE RIGHT AS ORIENTED IN THIS PHOTO.



FIG. 15 - SPRING CLIP HALFWAY REMOVED OR INSTALLED

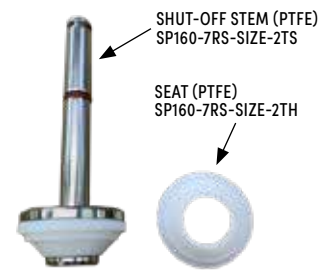


FIG. 16 - REMOVABLE SEAT WITH STEM (SEE ALSO FIG. 17)

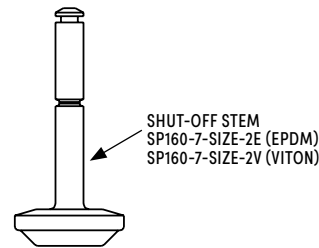


FIG. 17 - SP160 SHUT-OFF STEM

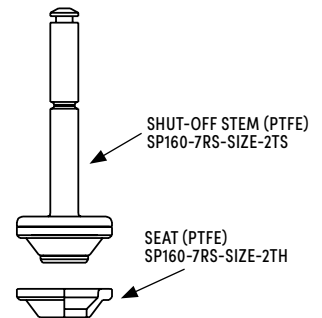


FIG. 18 - SP160 SHUT-OFF STEM AND SEAT

# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

- Remove the bonnet clamp (see fig. 19) by loosening the two socket head cap screws using a 3/16" hex wrench.

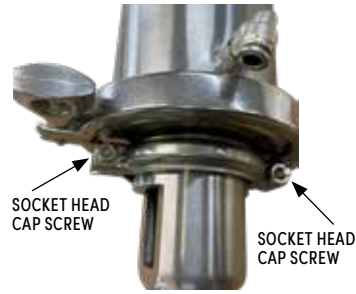


FIG. 19 - BONNET CLAMP WITH TWO SOCKET HEAD CAP SCREWS

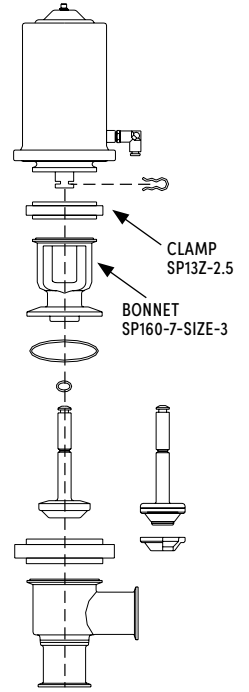


FIG. 21 - SP160 SHORT STROKE SHUT-OFF VALVE EXPLODED DIAGRAM



FIG. 20 - BONNET AND CLAMP REMOVED

- The fluid-side of the valve and the actuator are now totally separated and maintenance of the actuator can take place.



FIG. 22 - ACTUATOR ASSEMBLY



FIG. 23 - ALL VALVE BODY/FLUID END PARTS DISASSEMBLED



# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

6. Ensure air pressure is not present and remove actuator clamp (see fig. 25). The spring is not long enough to be under compression while the actuator does not have air applied on an SP10/20/30 so this clamp can be removed safely by hand.



FIG. 24 - ACTUATOR CYLINDER, SPRING ASSEMBLY AND PISTON ASSEMBLY REMOVED

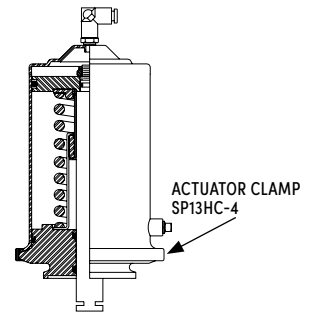


FIG. 25 - SP10 SHORT STROKE ACTUATOR (NORMALLY OPEN)

7. Remove piston (see fig. 27) and stem from actuator foot.



FIG. 26 - ACTUATOR FOOT AND ACTUATOR SHAFT/PISTON SEPARATED

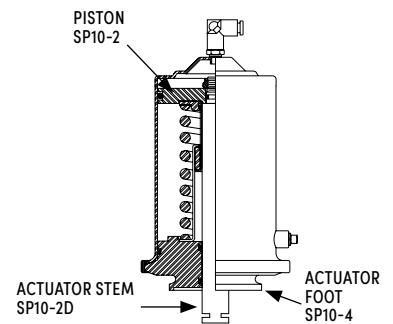


FIG. 27 - SP10 SHORT STROKE ACTUATOR (NORMALLY OPEN)

8. Ensure air pressure is not present and remove actuator clamp (see fig. 29). The spring is not long enough to be under tension while the actuator does not have air applied on an SP10/20/30 so this clamp can be removed safely by hand.



FIG. 28 - ACTUATOR CYLINDER, SPRING ASSEMBLY AND PISTON ASSEMBLY REMOVED

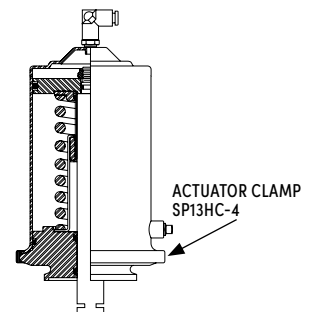


FIG. 29 - SP10 SHORT STROKE ACTUATOR (NORMALLY OPEN)

# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

9. Remove piston and stem from actuator foot (see figure 31). Replace actuator foot O-ring and 2x lower stem O-rings (see figure 30).



FIG. 30 - ACTUATOR FOOT HAS ONE FOOT O-RING (#SP10-9) AND TWO LOWER STEM O-RINGS (#SP10-7).

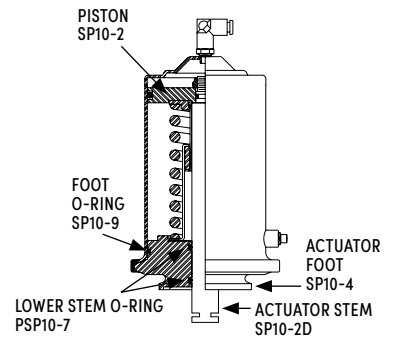


FIG. 31 - SP10 SHORT STROKE ACTUATOR (NORMALLY OPEN)

10. Remove the piston (SP10-2) from the actuator stem (SP10-2D) by holding the stem and removing the hex nut with an  $\frac{3}{4}$ " wrench. Replace the upper stem O-ring (SP10-6).

**NOTE:** Be careful not to damage the actuator stem.



FIG. 32 - ACTUATOR STEM (SP10-2D) REMOVED FROM ACTUATOR PISTON (SP10-2)

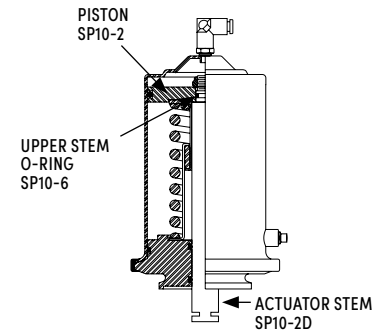


FIG. 33 - SP10 SHORT STROKE ACTUATOR (NORMALLY OPEN)



FIG. 34 - UPPER STEM O-RING (SP10-6) REMOVED FROM ACTUATOR STEM (SP10-2D).

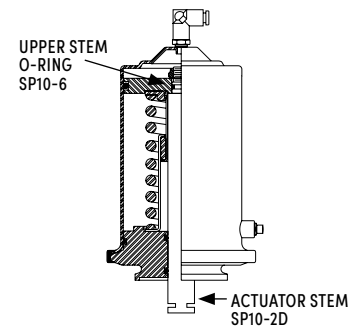


FIG. 35 - SP10 SHORT STROKE ACTUATOR (NORMALLY OPEN)

# DISASSEMBLY INSTRUCTIONS - SP-160 SHUTOFF VALVE

**NOTE:** The spring assembly (see fig. 37) does not need to be disassembled.

**NOTE:** Ensure that the bore/cup on the actuator piston (see fig. 36) fits into the spring's OD guide or retaining flange depending on orientation.



FIG. 36 - ACTUATOR PISTON  
"CUP" OR "BORE" WHERE  
SPRING ASSEMBLY FITS

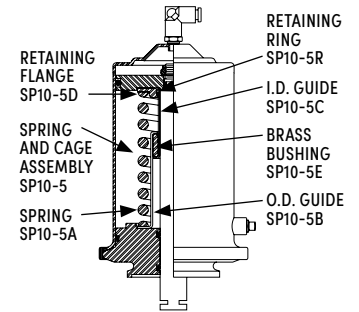
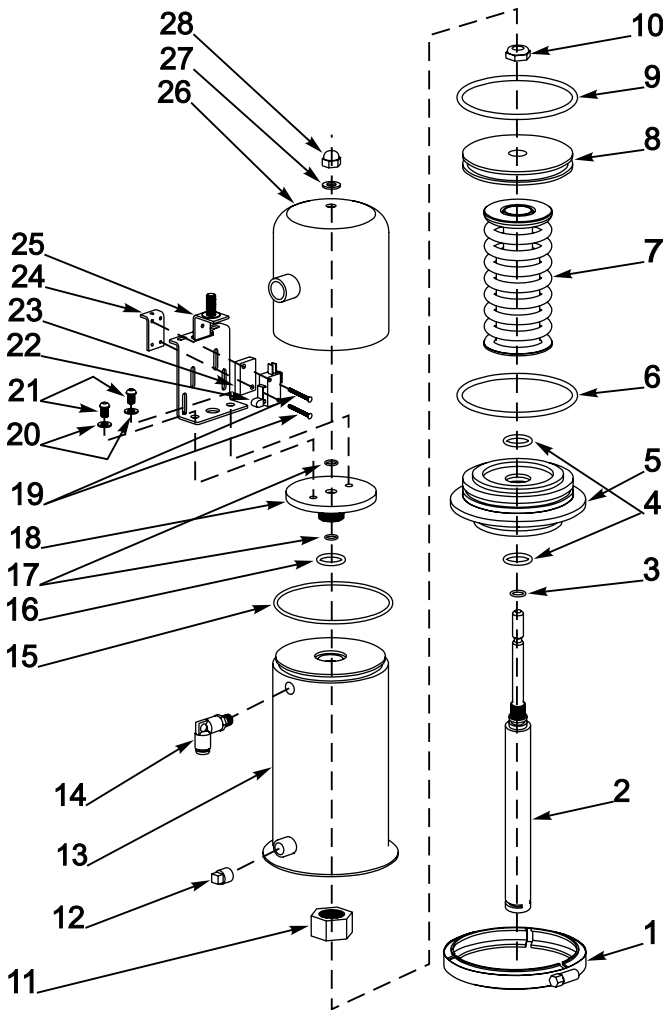


FIG. 37 - SP10 ACTUATOR WITH  
SPRING ASSEMBLY PARTS

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX



SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATORS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP13HC-4	Actuator Clamp	
2	SP10MS-2D SP20MS-2D	Actuator Stem	
3	SP10-6	Upper Stem O-Ring	▲
4	SP10-7	Lower Stem O-Ring	▲
5	SP10-4	Actuator Foot	
6	SP10-9	Foot O-Ring	▲
7	SP10-5	Spring and Cage	
8	SP10-2	Piston	
9	SP10-8	Piston O-Ring	▲
10	SP10-12	Stem Nut	
11	SP10MS-1BN	Base Plate Nut	
12	SP10-15BV SP10MS-15BV	1/8" I/P Adapter Plug	
13	SP10MS-1	Cylinder	
14	SP10MS-14 SP10-14	1/4" Poly-Tube Connector	
15	SP10-9	Cover O-Ring	
16	SP10-7	Base Plate O-Ring	
17	SP10MS-40B	Indicator Stem O-Ring	
18	SP10MS-1B	Base Plate	
19	SP10MS-3C	Micro-Switch Screw (x2)	
20	SP10MS-3K	Micro-Switch Washer (x2)	
21	SP10MS-3L	MS Bracket Screw (x2)	
22	SP10MS-3B SP20-DPS	Micro-Switch (x2) Dual Prox Switch (x2)	
23	SP10MS-3A	MS Mounting Block	
24	SP10MS-3D	MS Adjusting Bracket	
25	SP10MS-3	Micro-Switch Bracket	
26	SP10MS-1A	Micro-Switch Housing	
27	SP10MS-1CW	MS Housing Washer	
28	SP10MS-1C	Acorn Nut	
**	SP20PS-PD	Prox Switch Indicator	

▲ Included in SP20-SK Actuator Service Kit

\*\* Item not shown

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

The microswitch top requires some different parts versus the non-microswitch actuator in order to actuate the feedback microswitches.

- The actuator housing/cylinder (see fig. 2) has a flat top, with an O-ring groove and some threaded holes to accommodate the microswitch bracket and cover
- The actuator stem (see fig. 2) has a special shaft on top to actuate the microswitches for feedback. This shaft works through the top of the cylinder.



FIG. 1 - MICROSWITCH MODEL AND CIRCUIT INFORMATION

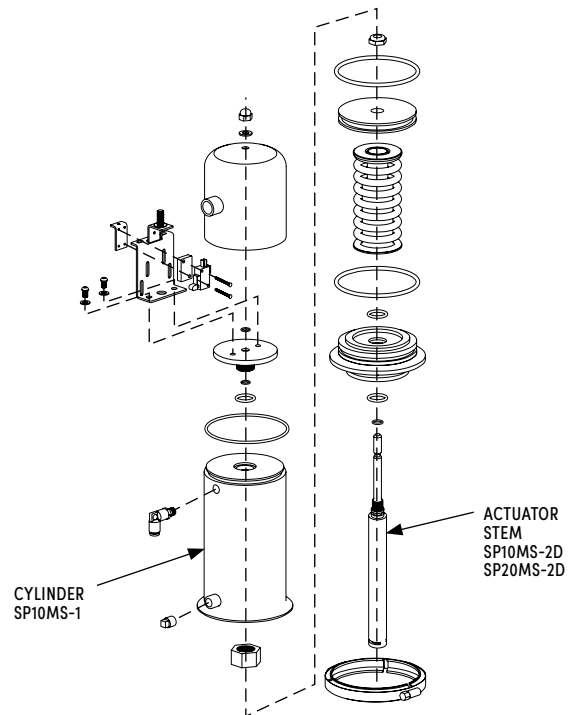


FIG. 2 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM



FIG. 3 - MICROSWITCH RELATED PARTS, HARDWARE AND O-RINGS

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

1. Prepare the base plate (see fig. 6) by installing 1x base plate O-ring and 2x indicator stem O-ring.



FIG. 4 - O-RING INSTALLATION ON BASE PLATE



FIG. 5 - O-RING INSTALLATION ON BASE PLATE

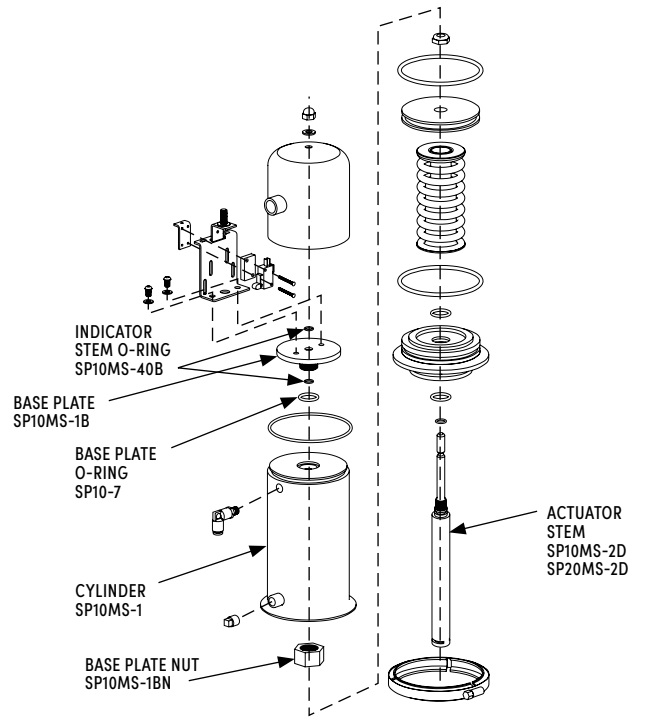


FIG. 6 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM

2. Install the base plate (see fig. 6) onto the cylinder by using the base plate nut. The baseplate nut is large, and requires a 1-5/16" socket and extension.



FIG. 7 - INSTALLATION OF BASE PLATE USING THE BASE PLATE NUT

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

3. Prepare the microswitch bracket (see fig. 9) for installation by installing the microswitches and gathering the hardware:

- Microswitch Screws (x2)
- Microswitch Washers (x2)
- Microswitch Bracket Screw (x2)
- Microswitch Mounting Block
- Microswitch Adjusting Bracket



FIG. 8 - MICROSWITCHES  
INSTALLED ON BRACKET AND  
BRACKET INSTALLED ON  
CYLINDER

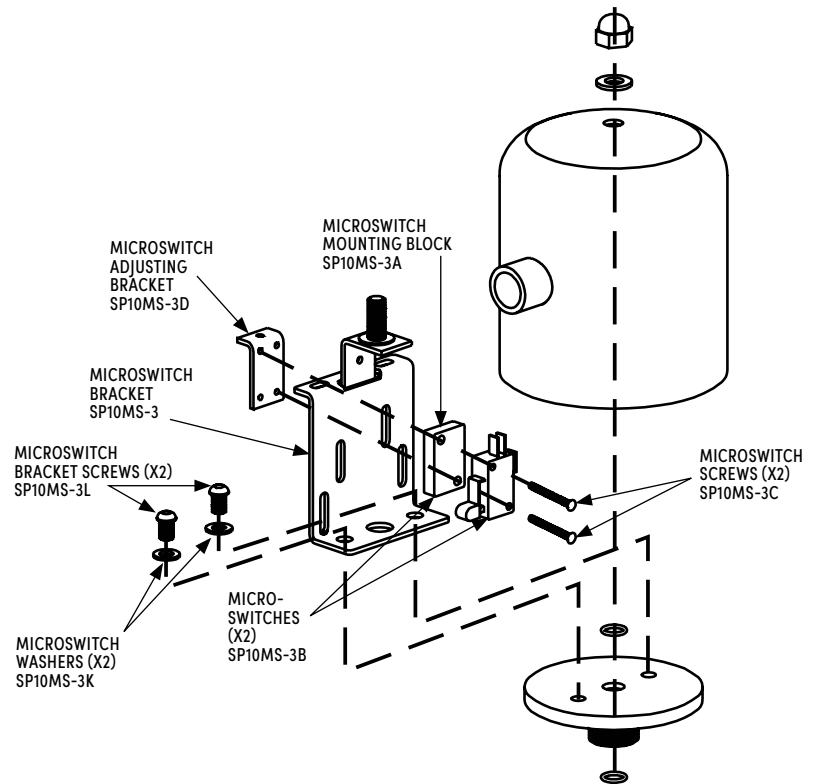


FIG. 9 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

Figures 10 and 11 show the order in which the installation of the microswitches, screws, microswitch mounting blocks, and microswitch adjusting bracket happens (see fig. 12). The mounting block spaces the microswitches into the center of the actuator stem and the adjusting bracket acts as a nut and sandwiches the microswitches to the microswitch bracket. Do not install the lower microswitch too low, as this will make installation more difficult, and it will need to be adjusted in a future step anyway.



FIG. 10 - SIDE VIEW OF INSTALLED MICROSWITCH



FIG. 11 - PARTS AND HARDWARE IN ORDER

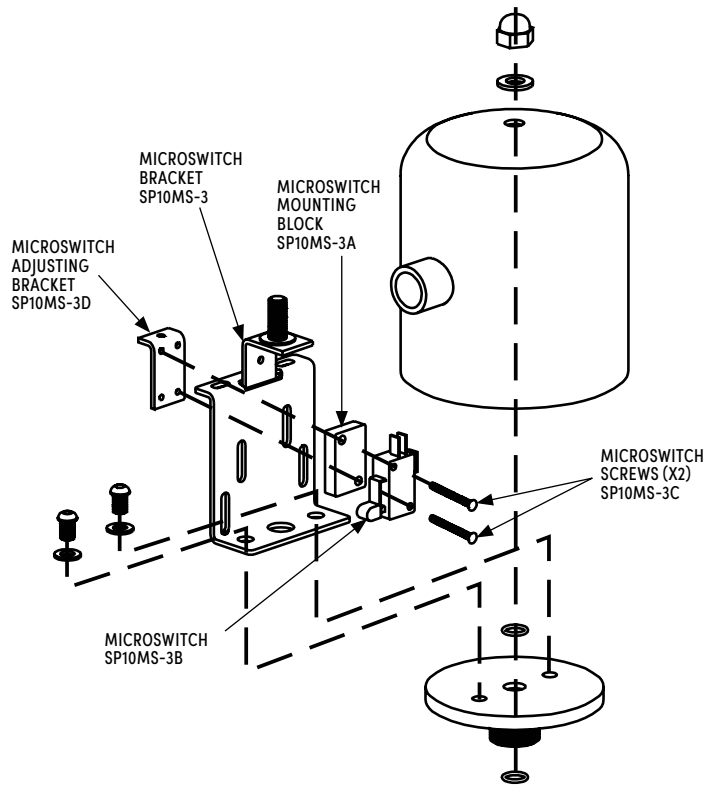


FIG.12 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM



# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

4. Install the microswitch bracket onto the cylinder using the two microswitch bracket screws and their washers. The screws require a 5/32" hex wrench. Ensure to align the center hole in the bracket so that it is concentric with the actuator stem as shown in Fig. 13.

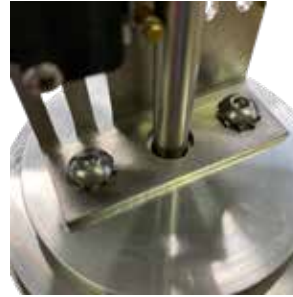


FIG. 13 - MICROSWITCH BRACKET INSTALLATION.

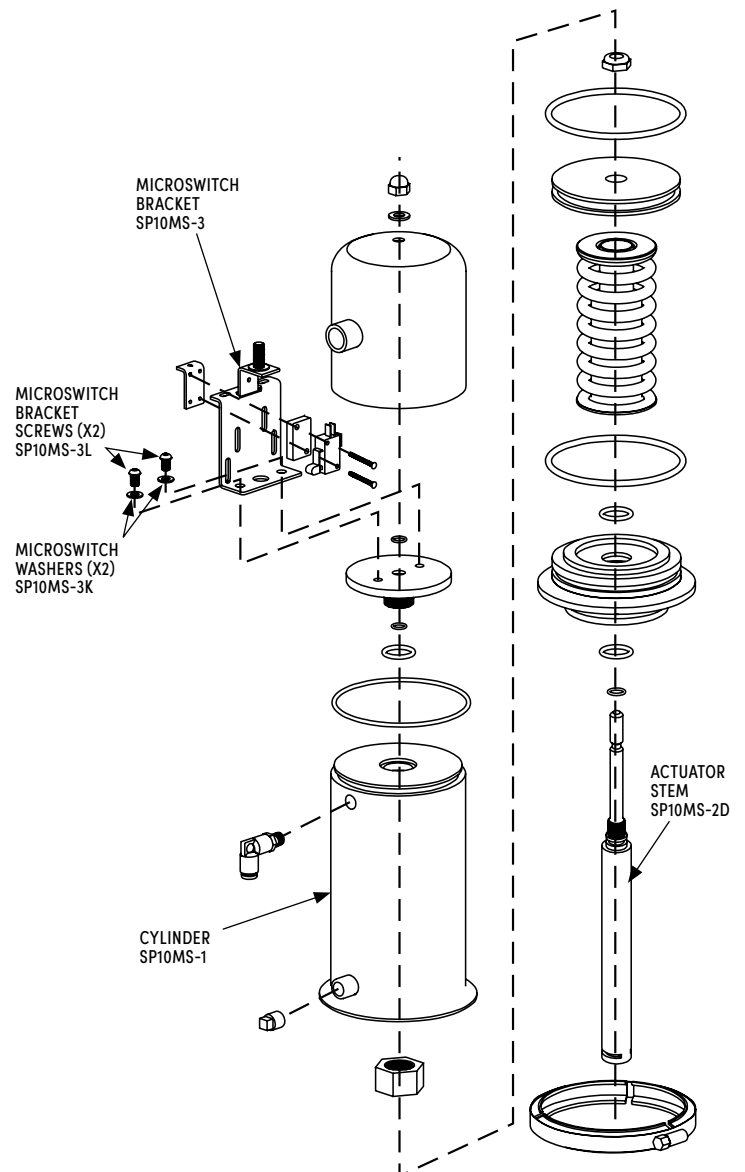


FIG. 14 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

5. Adjust the microswitches. This step will require air to apply to the actuator via fitting (see fig. 16) . Loosen the screws holding the microswitches to the microswitch bracket. Push the microswitches as far from the shaft as they will go transversely to the shaft and snug the screws, but do not fully tighten. Test the actuator and watch the actuator stem go up and down. The actuation zone (as shown in fig. 15) must depress the according microswitch when the valve is open and closed. Figure 15 shows the actuator stem "up" or the valve open. Set the microswitch such that the roller is in the center of the actuation zone, the switch is not too far or firmly depressed (thus risking damage to the microswitch) and the microswitch is parallel to the shaft. Repeat the process for the valve-closed microswitch (lower).



FIG. 15 - MICROSWITCH ADJUSTMENT

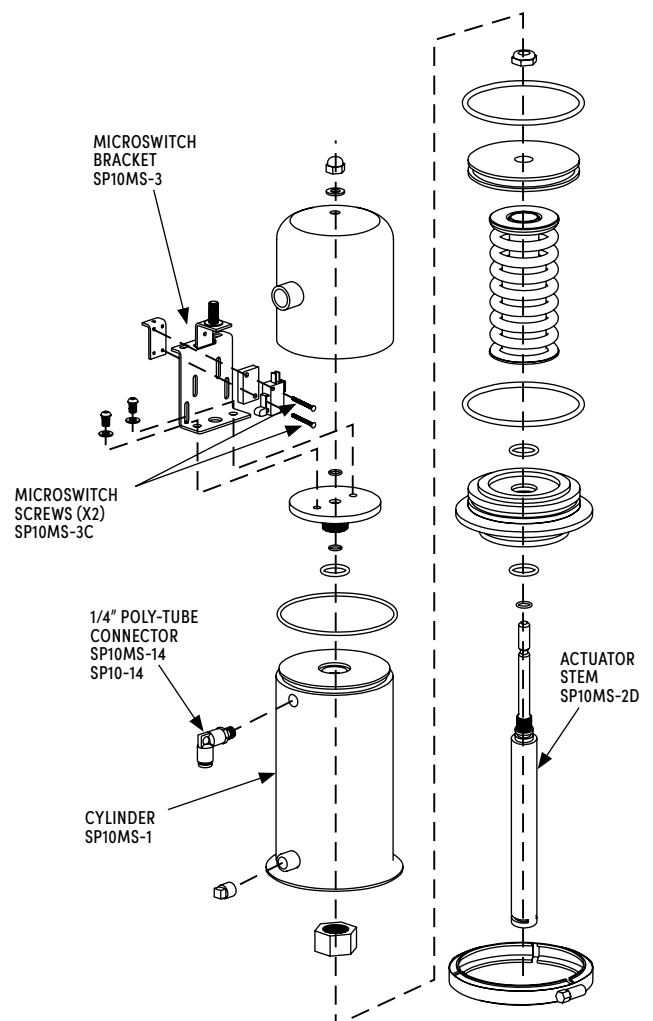


FIG. 16 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM

# MICROSWITCH ASSEMBLY INSTRUCTIONS - SP10MS/SP10PRX/SP20MS/SP20PRX

6. Wire the microswitches using the labels on the switch for the terminals (COM1 and NO or NC). Run the cable through the provided cable-grip and install the microswitch housing. The microswitch housing washer goes onto the stud on the bracket and then the acorn nut (see fig. 19).



FIG. 17 - MICROSWITCH HOUSING AND HARDWARE



FIG. 18 - MICROSWITCH HOUSING INSTALLED

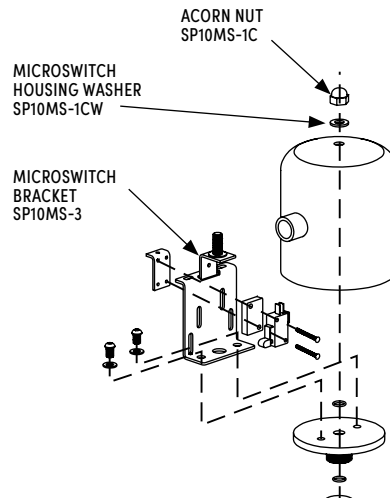
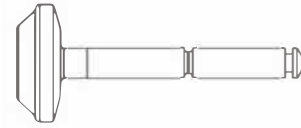


FIG. 19 - SP10MS/SP10PRX/SP20MS/SP20PRX ACTUATOR DIAGRAM

# VALVE BODY PLUG AND STEM IDENTIFICATION

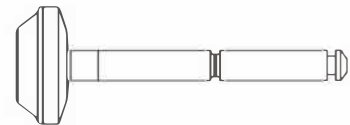
SHORT STROKE SHUT OFF VALVES			
PART NUMBER	OVERALL LENGTH	PLUG DIAMETER	SHAFT DIAMETER
SP160-7-1.5-2	4.819	1.937	0.625
SP160-7-2-2	5.312	2.437	0.625
SP160-7-2.5-2	5.781	2.937	0.625
SP160-7-3-2	6.35	3.438	0.625



DIVERT VALVES			
PART NUMBER	OVERALL LENGTH	PLUG DIAMETER	SHAFT DIAMETER
SP160-77-1.5-2	7.438	1.937	0.625
SP160-77-2-2	8.499	2.437	0.625
SP160-77-2.5-2	9.487	2.937	0.625
SP160-77-3-2	10.56	3.438	0.625



LONG STROKE SHUT OFF VALVES			
PART NUMBER	OVERALL LENGTH	PLUG DIAMETER	SHAFT DIAMETER
SP161-7-2-2	6.062	2.437	0.625
SP161-7-2.5-2	7.022	2.937	0.625
SP161-7-3-2	8.351	3.438	0.625
SP161-7-4-2 #110	14.969	4.438	0.875
SP161-7-4-2 #120	11.094	4.438	0.875

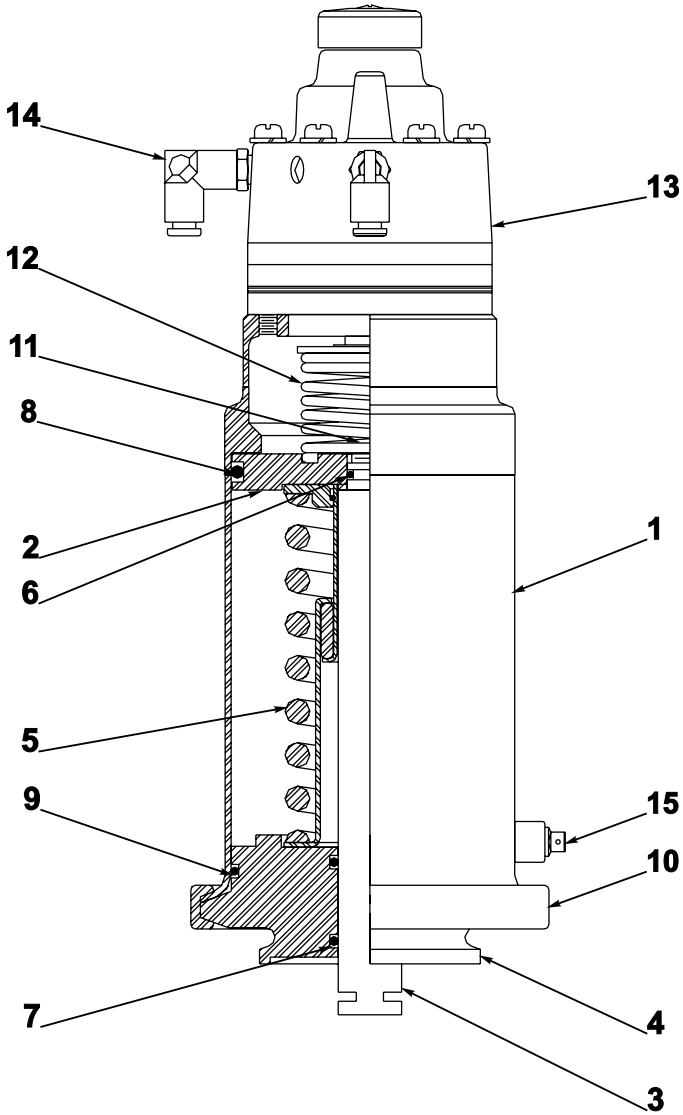


DIVERT VALVES			
PART NUMBER	OVERALL LENGTH	PLUG DIAMETER	SHAFT DIAMETER
SP161-77-2-2	9.687	2.437	0.625
SP161-77-2.5-2	10.874	2.937	0.625
SP161-77-3-2	12.18	3.438	0.875
SP161-77-4-2 #110	20.701	4.438	0.875
SP161-77-4-2 #120	16.707	4.438	0.875



# MODULATING ACTUATOR ASSEMBLY INSTRUCTIONS

## SP10VPD - DIRECT ACTING VALVE POSITIONER



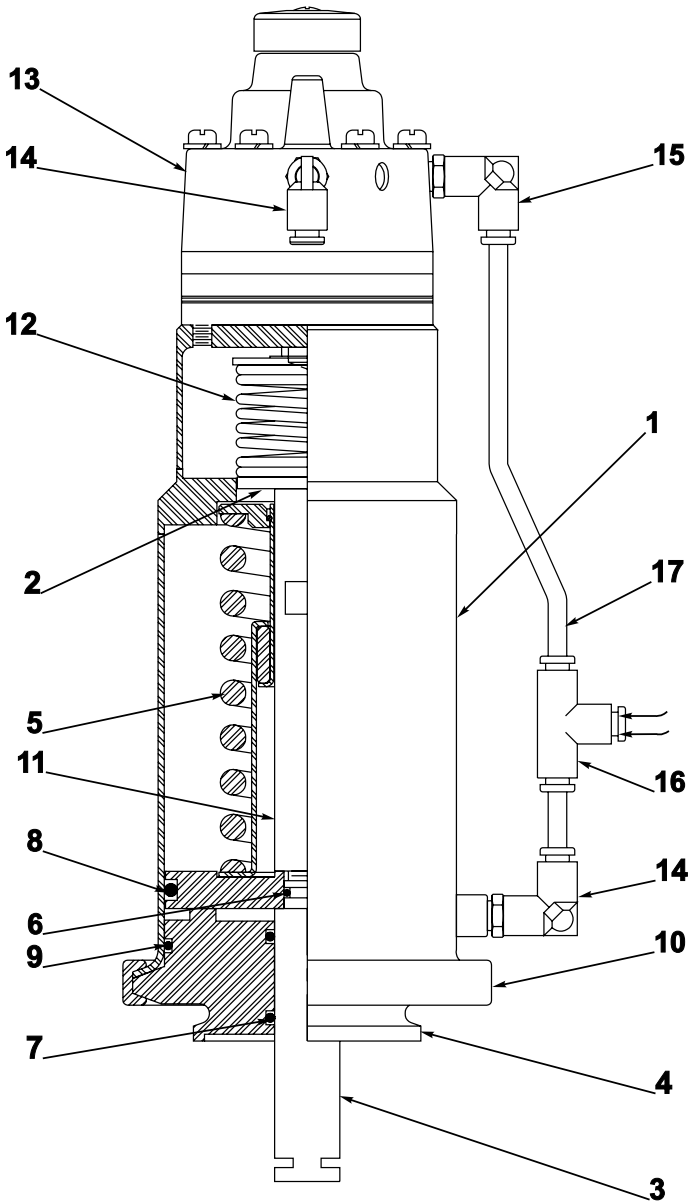
SP10VPD POSITIONER			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10VPD-1	Cylinder Assembly	
2	SP10VP-2	Piston	
3	SP10-2D	Actuator Stem	
4	SP10-4	Actuator Foot	
5	SP10-5	Spring and Cage Assembly	
6	SP10-6	Upper Stem O-Ring	▲ ○
7	SP10-7	Lower Stem O-Ring	▲ ○
8	SP10-8	Piston O-Ring	▲ ○
9	SP10-9	Foot O-Ring	▲ ○
10	SP13HC-4	Actuator Clamp	
11	SP10-12	Stem Nut	
12	12395-X-1612	Range Spring	
13	73N12F	Valve Positioner	
14	SP10MS-14	Poly Tube Connector	
15	SP10-15BV	Breather Vent Plug	

▲ INCLUDED IN SP20-SK ACTUATOR SERVICE KIT

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

# MODULATING ACTUATOR ASSEMBLY INSTRUCTIONS

## SP20VPR - REVERSE ACTING VALVE POSITIONER



SP20VPR REVERSE ACTING POSITIONER			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP20VP-1	Cylinder Assembly	
2	SP10-2	Piston	
3	SP20VP-2DA	Actuator Stem	
4	SP10-4	Actuator Foot	
5	SP10-5	Spring and Cage Assembly	
6	SP10-6	Upper Stem O-Ring	▲ ○
7	SP10-7	Lower Stem O-Ring	▲ ○
8	SP10-8	Piston O-Ring	▲ ○
9	SP10-9	Foot O-Ring	▲ ○
10	SP13HC-4	Actuator Clamp	
11	SP20VP-2DB	Range Spring Stem	
12	12395-X	Range Spring	
13	73NFR	Valve Positioner	
14	SP10-14	Poly Tube Connector	
15	SP10MS-14	Poly Tube Connector	
16	SP10MS-14-Tee	Poly Tube Tee	
17	-----	1/4" Poly Tube	

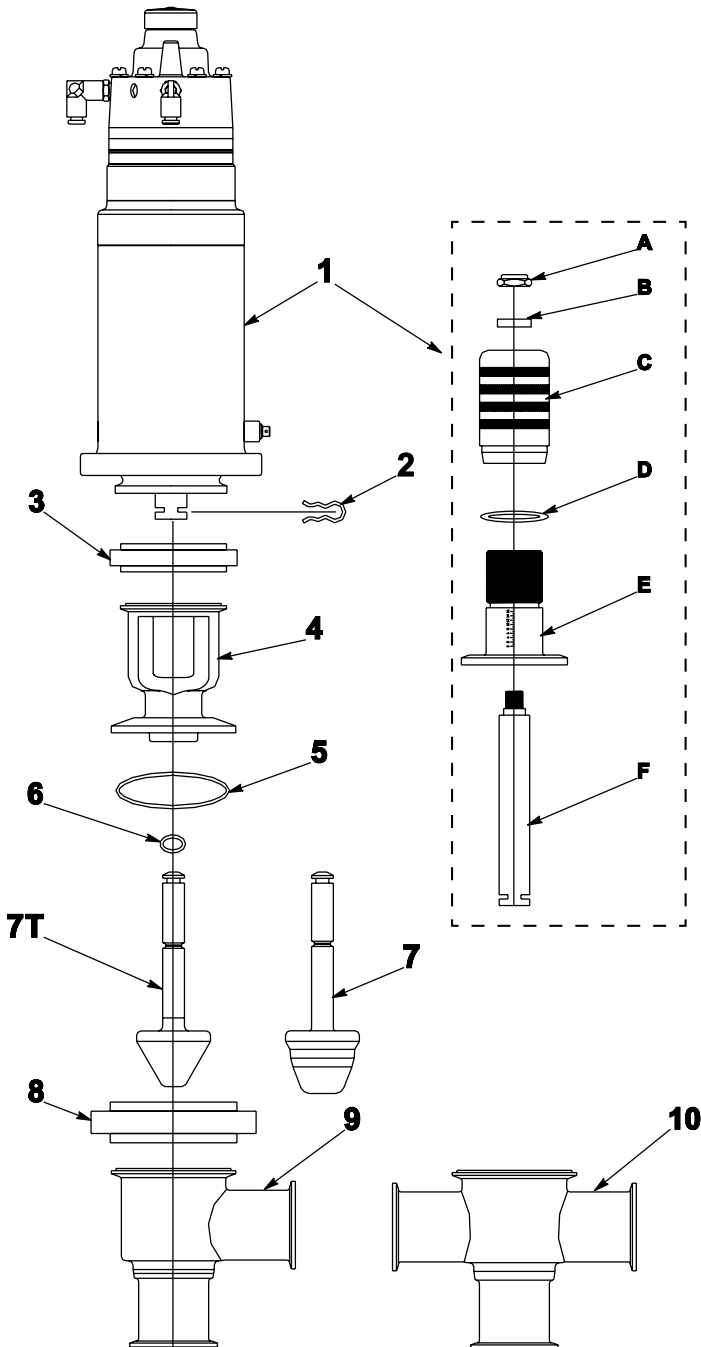
▲ INCLUDED IN SP20-SK ACTUATOR SERVICE KIT

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

# MODULATING ACTUATOR ASSEMBLY INSTRUCTIONS

## SP160-7M MULTI-TAPER MODULATING VALVE

## SP160-7MT STRAIGHT-TAPER MODULATING VALVE



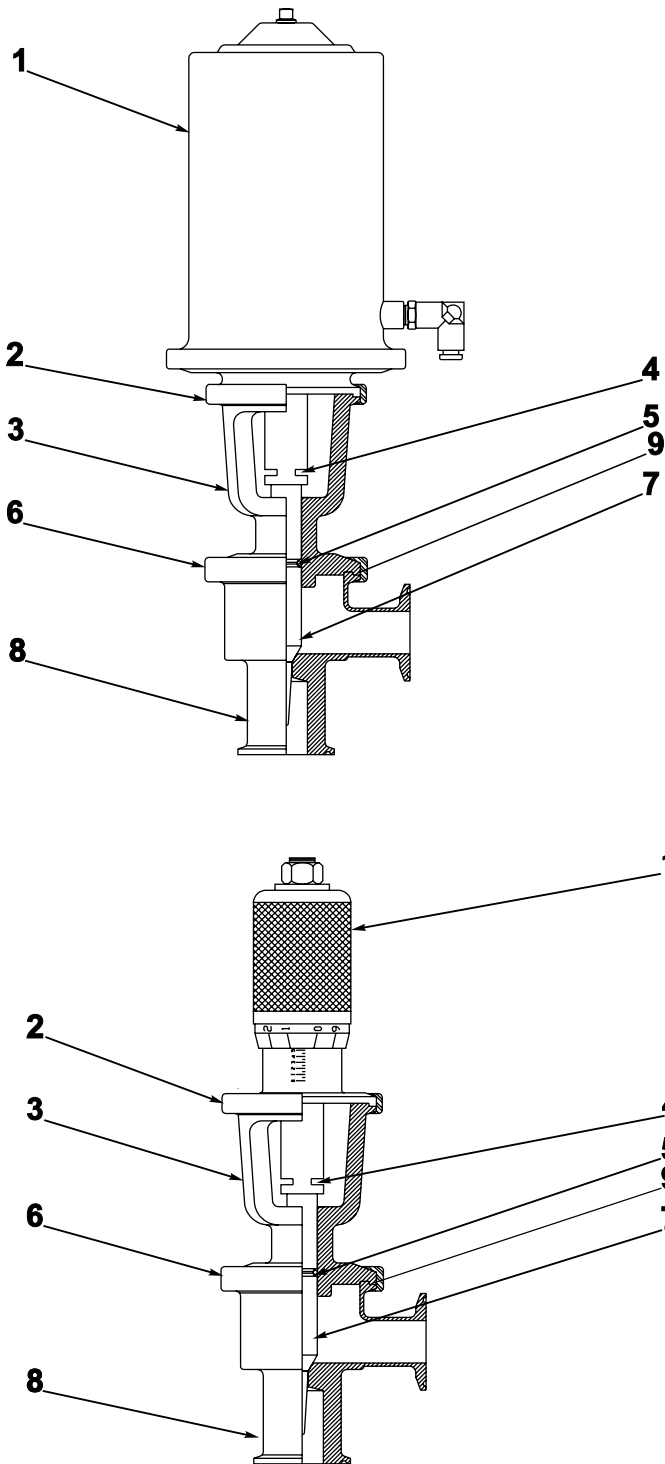
SP160 MODULATING VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10VPD SP20VPR SP160-7MH-H	Actuator (N.O.) Actuator (N.C.) Micrometer Handle	
2	SP160-7-1.5-9	Spring Clip	○
3	SP13Z-2.5	Bonnet Clamp	
4	SP160-7-Size-3	Bonnet	
5	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Gasket for 1.5" Valve Gasket for 2" Valve Gasket for 2.5" Valve Gasket for 3" Valve	○
6	SP10-6	Stem O-Ring	○
7	SP160-7M-Size-2 SP160-7MT-Size-2	Plug and Stem Multi-Taper Plug and Stem Straight-Taper	
8	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 3" Valve	
9	SP160-7MT-Size-1	Tee Body	
10	SP160-9MT-Size-1	Cross Body	

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

MICROMETER HANDLE			
ITEM	PART NUMBER	DESCRIPTION	KIT
A	SP10-12	Stem Nut	
B	SP160-7MH-SW	Space Washer	
C	SP160-7MH-H	Micrometer Handle	
D	SP160-7MH-40	Bonnet O-Ring	
E	SP160-7MH-H-3	Micrometer Bonnet	
F	SP160-7MTH-2D	Micrometer Stem	

# MODULATING ACTUATOR ASSEMBLY INSTRUCTIONS

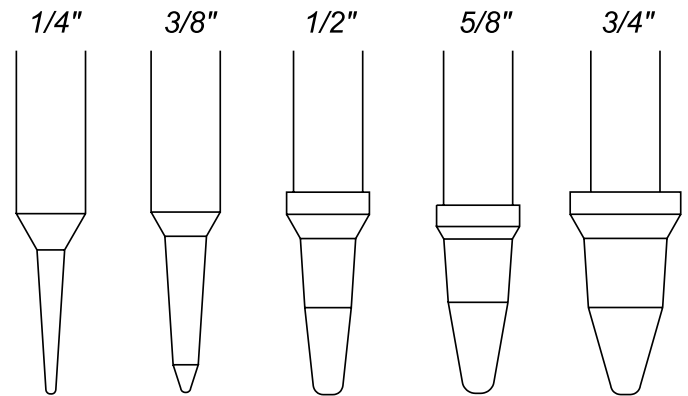
## SP160-7M - MICRO-FLOW MODULATING VALVE



MICRO-FLOW VALVES			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	SP10VPD SP20VPR SP160-7MH-H	Actuator (N.O.) Actuator (N.C.) Micrometer Handle	
2	SP13Z-2	Bonnet Clamp	
3	SP160-7-1.5-3	Bonnet	
4	SP160-7-1.5-9	Spring Clip	○
5	SP10-6	Stem O-Ring	○
6	SP13HC-2	Body Clamp	
7	SP160-7M-1-Size-2	Plug and Stem	
8	SP160-7M-1-Size-1	Body	
9	SP40B-2.5	Body Gasket	○

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

### PLUG OPTIONS

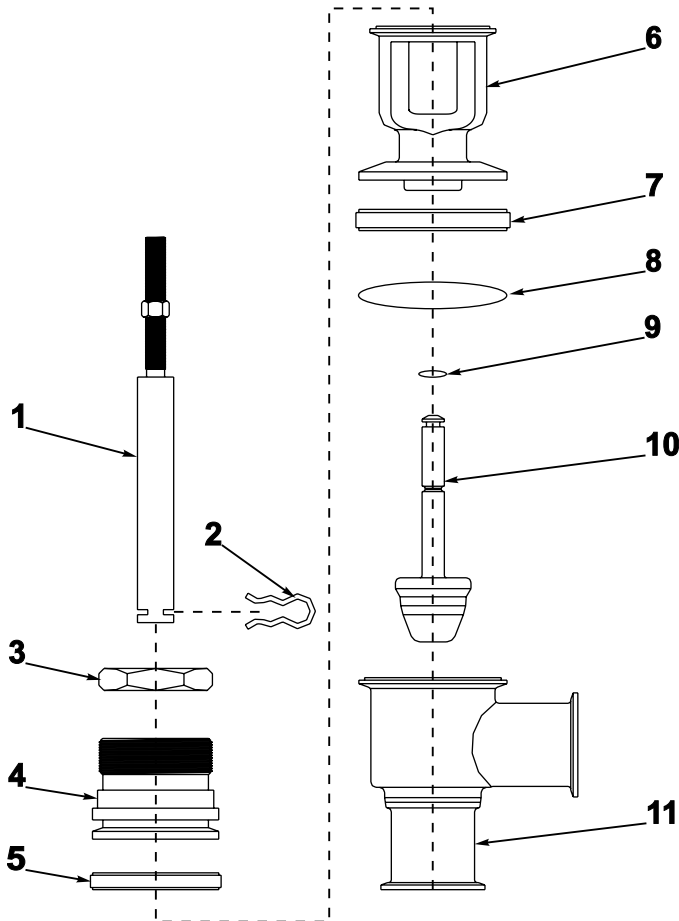


ALL MICRO-FLOW VALVES HAVE 1-INCH CLAMP END CONNECTIONS



# MODULATING ACTUATOR ASSEMBLY INSTRUCTIONS

## SP160 - TAYLOR ACTUATOR ADAPTERS



TAYLOR ADAPTER SPARE PARTS			
ITEM	PART NUMBER	DESCRIPTION	KIT
1	LT-160-7-2D ST-160-7-2D	Large Taylor Stem Small Taylor Stem	
2	SP160-7-1.5-9	Spring Clip	○
3	13H-2 1/16-FJ	Taylor Nut (Small Only)	
4	SP160-7-1.5-2 3/4 SP160-7-1.5-2 1/16	Large Taylor Adapter Small Taylor Adapter	
5	SP13Z-2.5	Bonnet Clamp	
6	SP160-7-Size-3	Bonnet	
7	SP13HC-2.5 SP13HC-3 SP13HC-3.5 SP13HC-4	Clamp for 1.5" Valve Clamp for 2" Valve Clamp for 2.5" Valve Clamp for 4" Valve	
8	SP40B-2.5 SP40B-3 SP40B-3.5 SP40B-4	Gasket for 1.5" Valve Gasket for 2" Valve Gasket for 2.5" Valve Gasket for 3" Valve	○
9	SP10-6	Stem O-Ring	○
10	SP160-7M-Size-2	Plug and Stem Multi-Taper	
	SP160-7MT-Size 2	Plug and Stem Straight-Taper	
11	SP160-7MT-Size-1	Tee Body	

○ INCLUDED IN SP20-RBK-SIZE VALVE SERVICE KIT

# MODULATING ACTUATOR ASSEMBLY INSTRUCTIONS

## SP10/110VPR VALVE POSITIONER: DIRECT - NORMALLY CLOSED

## SP20/120VPR VALVE POSITIONER: REVERSE - NORMALLY OPEN

The hose configuration on the SP10/110 connects the Moore positioner's supply port to the actuator's lower port AND the positioner's supply port. This is shown in Figure 1.

The hose configuration on the SP20/120 connects the Moore positioner's supply port to the actuator's lower port AND the positioner's supply port. This is shown in Figure 2.

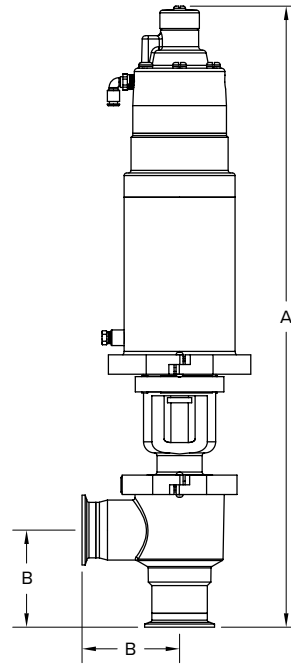


FIG. 1 - HOSE CONNECTIONS ON SP10/110 VPR ACTUATOR

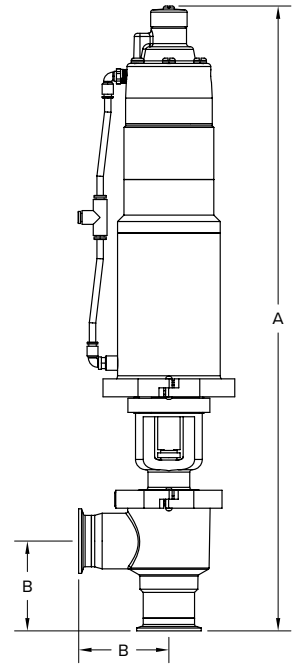


FIG. 2 - HOSE CONNECTIONS ON SP20/120 VPR ACTUATOR

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

The Model 73N (see fig. #) is a Built-in Valve Positioner which is mounted directly on the topworks of a valve. It is capable of utilizing the full force of its air supply to drive the piston or diaphragm, in a pneumatic actuator, to a position called for by the control instrument. The positioner incorporates a single-axis force-balance principle of operation to insure accurate and stable positioning of a control valve.



**Fast Response:** The fast response positioner is used on actuators with large volume topworks requiring a fast response action. Due to increased pilot plunger travel and larger ports in the fast response positioner, greater filling and exhausting capacities result. This permits a quicker response to a change in control conditions, plus increased speed of valve operation.

**Tapped Exhaust:** The Model 73N Positioner can be ordered with a tapped exhaust port. This feature permits piping of the pilot exhaust to a safe atmosphere on applications where noxious gases are used as a control medium instead of air.

**USM:** On actuators with small topworks and a low volume, a special hi-response positioner may be used. This positioner is denoted by the letters USM in the model number. There is no bleed on this model due to the low volume. A special valve plunger is used to ensure fast response for close control.

73N - 12 - F

**BASIC MODEL NUMBER**

**INPUT SPAN - PSIG**

**SPECIAL FEATURES**

- F = FAST RESPONSE
- R = REVERSE ACTING
- E = TAPPED EXHAUST
- USM = U.S. ELECTRICAL MOTORS TYPE

GENERAL SPECIFICATIONS		
Instrument Input Pressure Range	3-15, 3-9, 9-15, and 3-27 psig	
Supply Pressure	Minimum	3 psi above required actuator pressure
	Maximum	100 psi
Air Consumption	0.25 SCFM in balance condition with 20 psi supply and 9 psi dead ended output	
Valve Travel	Minimum	1/4"
	Maximum	4"
Ambient Temperature Limits	-40°C to +82°C (-40°F to +180°F)	

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

---

## INSTALLATION

Refer to Figure 1 for mounting dimensions and connections. A centering washer (customer provided) which fits the I.D. of the range spring should be used. This acts as a spring seat and keeps the spring from shifting.

Mounting hardware is included with the positioner in a plastic bag numbered 10448-88. It contains (6) mounting screws and washers, (1) range spring seat and (1) gasket.

### CAUTION

Exceeding the specified ambient temperature limits can adversely affect performance and may cause the positioner to fail.

1. Place centering washer on the actuator's diaphragm or piston.
2. Place the positioner range spring on the center of the actuator diaphragm or piston.
3. Place the gasket on the mounting flange of the actuator top works. Substitute the P/N 10636-59 centering diaphragm for the gasket if the P/N 12388-6412 or 12395-6412 range spring is used.
4. Place the positioner range spring seat on the center nut of the positioner diaphragm assembly.
5. Hold the spring seat and guide the positioner and seat onto the range spring.
6. Orient the positioner for desired location of connections.
7. Insert mounting screws and washers and tighten screws.

## PNEUMATIC CONNECTIONS

1. All connections are 1/4" NPT.
2. The piping recommended for the positioner is 1/4" O.D. tubing for the INSTRUMENT (input) connection and 3/8" O.D. tubing for the supply connection. However, any scale-free piping may be used.
3. Blow out all piping before connections are made to prevent dirt, chips, etc., from entering the positioner.
4. Use pipe sealant sparingly and then only on the male threads. A non-hardening sealant is strongly recommended.
5. Connect the positioner to a source of clean, dry, oil-free instrument air supply (see INSTRUMENT AIR REQUIREMENTS).

### CAUTION

Pressure in excess of 150 psig to any connection may cause damage.

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

## INSTRUMENT AIR REQUIREMENTS

Connect the positioner to a source of clean, dry, oil-free supply air. Failure to do so will increase the possibility of a malfunction or deviation from specified performance.

### CAUTION

Use of process fluids other than instrument air is not recommended. No claim is made as to the suitability of this product for use with other process fluids, such as hazardous gases, except as listed on the appropriate certificate. Non-approved instruments are suitable for use with instrument air only. Optional features and modifications such as tapped exhaust do not imply suitability for use with hazardous gases except as listed on the approval certificate.

### CAUTION

Synthetic compressor lubricants in the air stream at the instrument may cause the positioner to fail.

## INSTRUMENT AIR REQUIREMENTS

There are many types of synthetic lubricants. Some may not be compatible with the materials used in the construction of the positioner. Wetting of these materials by such an oil mist or oil vapor, etc., may cause them to deteriorate. This may ultimately result in failure of the positioner. The following materials are in contact with supply air: Aluminum, Brass, Stainless Steel, Neoprene and Buna-N.

The requirements for a quality air supply can be found in the Instrument Society of America's "Quality Standard for Instrument Air" (ISA-S7.3). Basically this standard calls for the following:

**Particle Size** – Maximum particle size in the air stream should be no larger than 3 microns.

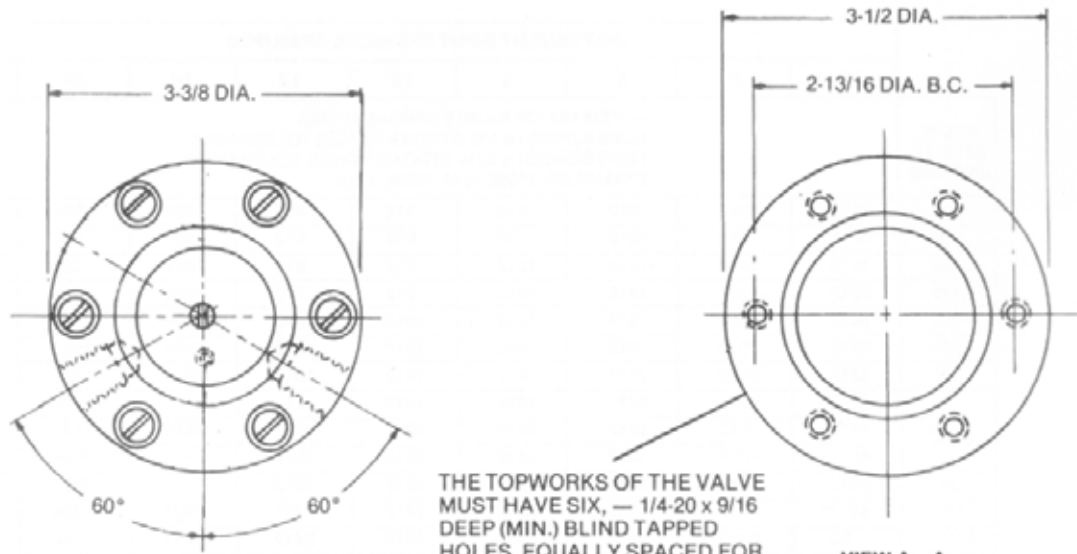
**Dew Point** – Dew point at line pressure should be at least 10°C (18°F) below the minimum temperature to which any part of the instrument air system is exposed at any season of the year. Under no circumstances should the dew point at line pressure exceed 2°C (35.6°F).

**Oil Content** – Maximum total oil or hydrocarbon content, exclusive of non-condensables, should not exceed 1 ppm under normal operating conditions.

### CAUTION

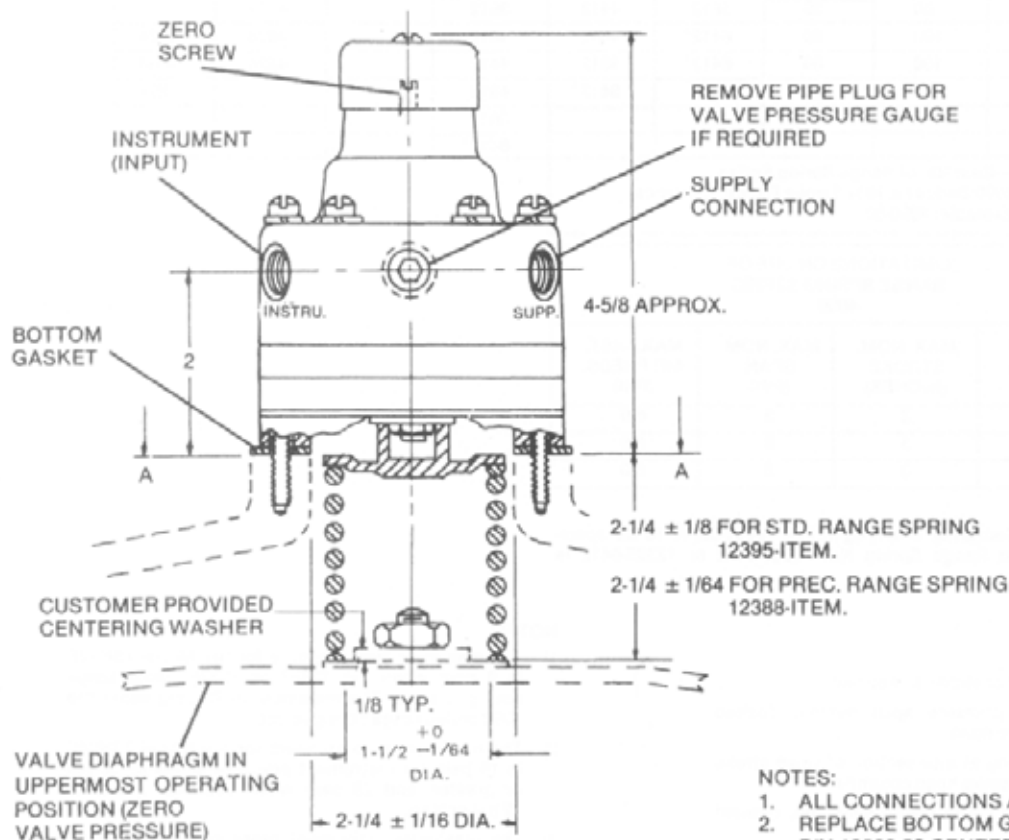
Exceeding the specified ambient temperature limits can adversely affect performance and may cause damage.

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS



THE TOPWORKS OF THE VALVE MUST HAVE SIX,  $\frac{1}{4}$ -20 x 9/16 DEEP (MIN.) BLIND TAPPED HOLES, EQUALLY SPACED FOR MOUNTING POSITIONER.

VIEW A-A



**NOTES:**

1. ALL CONNECTIONS ARE  $\frac{1}{4}$ " NPT.
2. REPLACE BOTTOM GASKET WITH P/N 10636-59 CENTERING DIAPHRAGM IF REQUIRED — SEE INSTALLATION SECTION.

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

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## ADJUSTMENT

The only adjustment that can be made on the positioner is a zero adjustment. The zero adjusting screw is located under the positioner top cover.

To adjust the zero, set the instrument pressure to the midpoint of its span, and turn the zero adjustment until the valve is at the mid-point of its stroke.

In some cases, valve shut-off or opening may be required at a specific instrument pressure. To zero the positioner at this point, set the instrument pressure at the specific pressure and turn the zero adjustment screw until the valve reaches the required position.

A slight change of the instrument pressure should start to move the valve.

The valve stroke for a given span may also be suppressed or shifted to the desired range by means of the zero adjusting screw.

## RANGE SPRING SELECTION

Range springs for the positioner are selected from the table in Figure 2. Color coding of the range springs is given by the table in Figure 3.

To find the proper spring, select the stroke listed which most nearly agrees with the desired stroke, and the pressure span which most nearly agrees with the desired span. The proper spring will be found at the intersection of these two columns.

Series 4090 and 12395 range springs are available for stroke range tolerances of  $\pm 10\%$ . Series 12388 range springs are available, at extra cost, for stroke range tolerances of  $\pm 5\%$ .

## SPECIAL NOTES

1. All range springs are identified as Part No. (P/N) 12395- \_\_\_\_ (# from table)
2. Input pressure span = pressure @ max. input – (minus) pressure @ min input, e.g. @ 3–15 psig range = @ 12 psig span

## SPRING SELECTION

1. Find valve stroke nearest desired valve stroke.
2. Find instrument input pressure span nearest desired instrument input pressure span.
3. Select proper range spring at intersection of valve stroke and instrument input pressure span columns

**Please note:** Springs purchased with models are quoted as model discounts; all others get spare parts pricing.

## NOTES

1. The maximum zero pressure for the Model 73N12F is 9 psig when the 12395 series range spring is used.
2. The maximum zero pressure for the Model 73N24F is 15 psig for instrument pressure spans of 16 psi or greater and 28 psig when used for spans of 12 psi or less.
3. The maximum instrument pressure for the Model 73N-FR is 15 psig for instrument pressure spans of 12 psi or less and 27 psi for spans of 16 psi or greater.

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

RANGE SPRING INDEX									
VALVE STROKE (INCHES)	INPUT PRESSURE SPAN (SEE SPECIAL NOTES ON PREVIOUS PAGE)								
	4	5	6	8	10	12	16	20	24
	ITEM NO. OF RANGE SPRING SERIES 12395 SERIES +/- 5% STROKE RANGE TOLERANCE								
1/4	1212	1012	812	612	512	412	624	524	424
5/16	1812	1212	1012	712	612	512	824	624	524
3/8	1812	1412	1212	1012	712	612	1024	724	624
7/16	2012	1812	1412	1012	812	712	1024	824	724
1/2	2412	2012	1612	1212	1012	812	1224	1024	824
9/16	2812	2012	1812	1412	1012	1012	1424	1024	
5/8	3212	2412	2012	1612	1212	1012	1624	1224	1024
3/4	3612	2812	2412	1812	1412	1212		1464	1224
7/8	4412	3612	2812	2012	1812	1412	2024	1624	1424
1	4812	4012	3212	2412	2012	1612	2424	2024	1624
1 1/8	5612	4412	3612	2812	2012	1812		2024	
1 1/4	6412	4812	4012	3212	2412	2012	2824	2424	2024
1 1/2		6412	4812	3612	2812	2412	4024	2824	2424
1 5/8		6412	4812	4012	3212	2612	4024	3224	
1 3/4		6412	5612	4412	3612	2812	4024	3224	2824
2			6412	4812	4012	3212	4824	4024	3224
2 1/4			6412	5612	4412	3612		4024	
2 1/2				6412	4812	4012		4824	4024
2 3/4				6412	4812	4412		4824	4824
3					6412	4812			4824
3 1/2						5612			
4						6412			



# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

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## MAINTENANCE GENERAL

Clean, dry, oil-free instrument air will reduce most problems associated with pneumatic instruments. Refer to INSTRUMENT AIR REQUIREMENTS. If these requirements are observed, no routine maintenance is recommended. Cleaning the plunger is the only maintenance which may be required on an occasional basis.

The system should be shut down or the valve isolated from the system before service or removal of the positioner is accomplished.

## CLEANING (REFER TO PARTS LIST)

The plunger can be cleaned without dismantling the positioner. Use the following procedure:

1. Turn off the supply air.
2. Remove the positioner top cover.
3. Remove the retaining nut.
4. Remove the plunger.
5. Use a non-abrasive solvent to clean the plunger.
6. Replace the plunger.
7. Replace and tighten the retaining nut.
8. Replace the top cover.

## DISASSEMBLY (REFER TO PARTS LIST)

1. Loosen the six socket head mounting screws holding the positioner to the actuator.
2. Remove the positioner.
3. Remove the two body screws holding the diaphragm stack assembly to the positioner body (located on the underside of the stack).
4. The diaphragm stack assembly can be further disassembled by removing the diaphragm jam nut.

## ASSEMBLY (REFER TO PARTS LIST)

To assemble, reverse the disassembly procedures. Take care to insure proper alignment of the diaphragms and rings. When tightening the jam nut on the diaphragm assembly, make sure the diaphragms do not rotate out of position.

An alignment slot is provided on the rings to facilitate proper assembly.

# MOORE POSITIONER INSTALLATION AND SERVICE INSTRUCTIONS

RANGE SPRING COLOR CODES		
12388 - ITEM 12395 - ITEM LH WOUND	COLOR CODE	
	12388	12395
412	Blue-White-Blue	Brown-White-Brown
424	White-Blue-White	Brown-Black-Brown
512	Blue-Brown-Blue	White-None-White
524	Brown-Blue-Brown	Black-None-Black
612	Blue-Black-Blue	Black-White-Black
624	Black-Blue-Black	Purple-Black-Purple
712	Blue-Green-Blue	Black-Green-Black
724	Green-Blue-Green	Black-Yellow-Black
812	Blue-Purple-Blue	Purple-White-Purple
824	Purple-Blue-Purple	Yellow-Black-Yellow
1012	Blue-Yellow-Blue	Yellow-White-Yellow
1024	Yellow-Blue-Yellow	Red-Black-Red
1212	Blue-Red-Blue	Red-White-Red
1224	Red-Blue-Red	Green-Black-Green
1412	Blue-Orange-Blue	White-Green-White
1424	Orange-Blue-Orange	Red-Green-Red
1612	Blue-Gray-Blue	Green-White-Green
1624	Gray-Blue-Gray	Orange-Black-Orange
1812	Gray-White-Gray	Yellow-Brown-Yellow
2012	Gray-Brown-Gray	Orange-White-Orange
2024	Brown-Gray-Brown	Purple-None-Purple
2412	Gray-Black-Gray	Yellow-None-Yellow
2424	Black-Gray-Black	Yellow-Purple-Yellow
2612	Gray-Green-Gray	Orange-Brown-Orange
2812	Gray-Purple-Gray	Green-Brown-Green
2824	Purple-Gray-Purple	Green-Red-Green

RANGE SPRING COLOR CODES		
12388 - ITEM 12395 - ITEM LH WOUND	COLOR CODE	
	12388	12395
3212	Gray-Yellow-Gray	Red-Yellow-Red
3224	Yellow-Gray-Yellow	Red-Purple-Red
3612	Gray-Red-Gray	White-Black-White
4012	Gray-Orange-Gray	Green-Yellow-Green
4024	Orange-Gray-Orange	Green-Purple-Green
4412	Blue-Red-White	Red-None-Red
4812	Blue-Black-White	Orange-Yellow-Orange
4824	Black-Gray-White	Orange-Purple-Orange
5612	Blue-Black-Green	Brown-Orange-Brown
6412	Blue-Black-Red	Brown-None-Brown

RANGE SPRING COLOR CODES	
4090 - ITEM RH WOUND	COLOR CODE
	12388
80	Red-Green
100	Red-Orange
126	Green-Green

ZERO SPRING COLOR CODES	
ZERO SPRING	COLOR CODE
	12388
10448-16	Orange
10448-23	Green
10613-13	White

# MOORE POSITIONER REMOVAL

1. Remove the air hose using the push-to-connect fittings. Remove the six screws holding the Moore positioner on the actuator with a 3/16" hex wrench. The Moore positioner will lift off of the actuator.



FIG. 3 - MOORE POSITIONER SOCKET HEAD CAP SCREWS



FIG. 4 - MOORE POSITIONER CORK GASKET AND RANGE SPRING CAP.

2. The cork gasket, range spring (see figure 6), and brass range spring cap can be removed.



FIG. 5 - MOORE POSITIONER ASSEMBLY REMOVED FROM ACTUATOR ASSEMBLY.

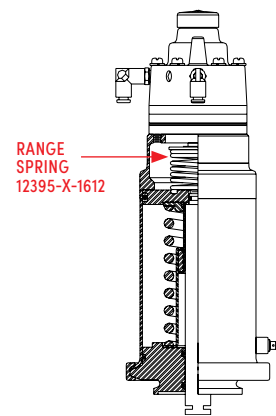


FIG. 6 - SP10VPD DIRECT ACTING VALVE POSITIONER

# SPRING, PISTON, AND ACTUATOR STEM REMOVAL

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1. Remove the actuator foot. With the Moore positioner removed the spring, piston and actuator stem assembly can be removed. See page 57 in the shutoff valve actuator disassembly section for final instructions for removal and replacement of the rest of the actuator components.



FIG. 7 - ACTUATOR FOOT REMOVED



FIG. 8 - PISTON, SPRING, AND ACTUATOR STEM REMOVED

# FRACTIONAL VALVES ASSEMBLY INSTRUCTIONS

1. To remove the valve clamp (see fig. 2), air must be applied to the actuator on an SP20-0.5, normally closed, air-to-raise actuator. On an SP10-0.5, normally open, air-to-close actuator, air does not need to be applied for valve clamp removal. See page 7 for more guidance on actuator types in the SP160 family.

2. Remove the valve clamp to gain access to the bonnet gasket (see fig. 2). Figure 3 shows the valve body removed with air still applied to the actuator, putting the valve plug in the open position.

3. Retract the valve to its de-energized state by removing the air source. In this case the SP20-05 actuator will push the plug downwards as shown in figure 4.



FIG. 1 - SP20-0.5 ACTUATOR/VALVE WITH AIR LINE CONNECTED

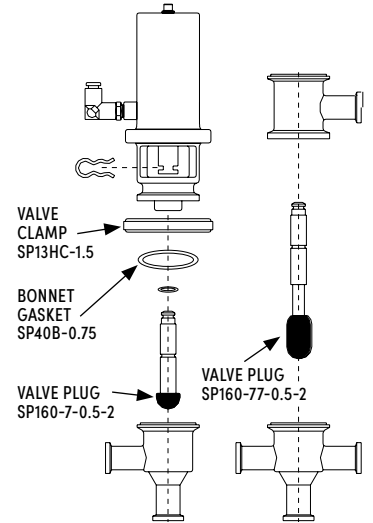


FIG. 2 - FRACTIONAL SHUT OFF AND DIVERT VALVES EXPLODED DIAGRAM



FIG. 3 - SP20-0.5 ACTUATOR WITH AIR PRESSURE APPLIED AND VALVE REMOVED



FIG. 4 - SP20-0.5 DE-ENERGIZED

# FRACTIONAL VALVES ASSEMBLY INSTRUCTIONS

4. Remove the spring clip (see fig. 5) through the opening in the bonnet. If access is difficult, carefully turn the assembly with a wrench or screwdriver by prying between the bonnet and spring clip. Figure 4 shows the installed clip. Remove the spring clip by prying with a small wrench, screwdriver, or by pulling with pliers. Now the plug and stem (see fig. 5) can be removed.
5. Remove the bonnet (see fig. 7) from the actuator by removing the bonnet clamp. Once the bonnet is removed, hold the actuator stem (see fig. 7) in a non-marring vise or utilize the spring clip slot. Pull on the actuator housing/cylinder (see fig. 7) and it will slide out of the cylinder foot.



FIG. 4 - FRACTIONAL VALVE SPRING CLIP ASSEMBLY

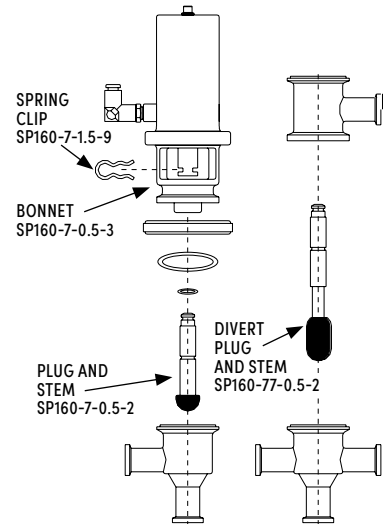


FIG. 5 - FRACTIONAL SHUT OFF AND DIVERT VALVES EXPLODED DIAGRAM



FIG. 6 - SPRING CLIP AND PLUG AND STEM REMOVED

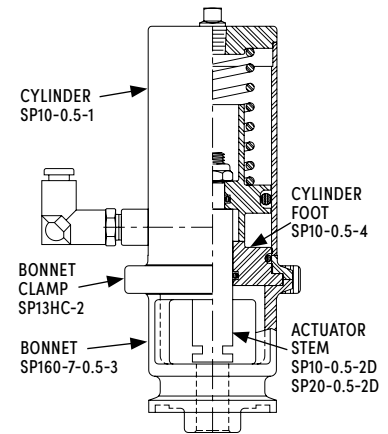


FIG. 7 - FRACTIONAL ACTUATOR EXPLODED DIAGRAM



FIG. 8 - BONNET REMOVED



FIG. 9 - CYLINDER REMOVED FROM ACTUATOR FOOT

# FRACTIONAL VALVES ASSEMBLY INSTRUCTIONS

6. Remove the spring and stem nut (see fig. 13) using a deep-well 9/16" socket. The same method of holding the actuator stem from step 5 will need to be utilized.

7. Once the nut is removed the actuator stem (see fig. 15) can be removed to gain access to and replace:

- Upper stem O-ring
- Lower stem O-ring
- Piston O-ring
- Cylinder foot O-ring



FIG. 10 - SPRING CLIP AND PLUG AND STEM REMOVED

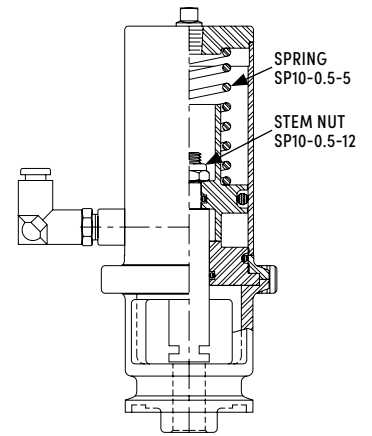


FIG. 11 - FRACTIONAL ACTUATOR EXPLODED DIAGRAM



FIG. 12 - STEM NUT REMOVED

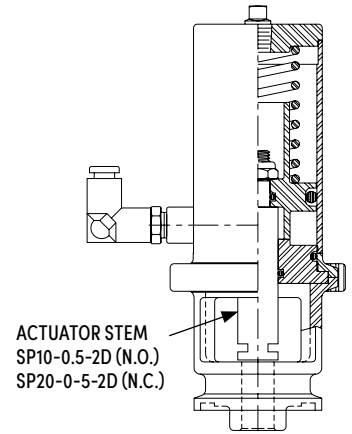


FIG. 13 - FRACTIONAL ACTUATOR EXPLODED DIAGRAM



FIG. 14 - ACTUATOR FULLY DISASSEMBLED

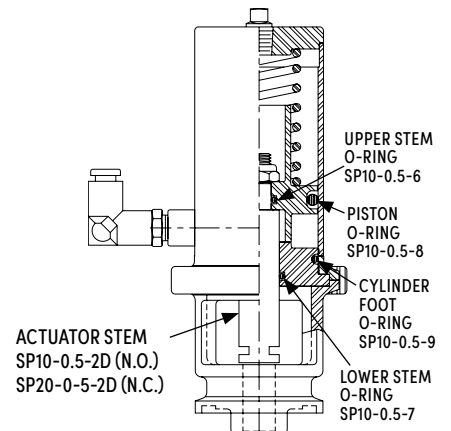


FIG. 15 - FRACTIONAL ACTUATOR EXPLODED DIAGRAM

# MICROMETER VALVES ASSEMBLY INSTRUCTIONS

1. The micrometer handle actuator assembly is held together by one hex nut on top. Remove the stem nut (see fig. 5) by holding micrometer stem in a non-marring vise or utilize the spring clip slot. Remove the stem nut with a  $\frac{3}{4}$ " wrench.
2. With the stem nut removed, the micrometer stem can be removed out the bottom of the actuator assembly.



FIG. 1 - MICROMETER ACTUATOR ASSEMBLED



FIG. 2 - MICROMETER ACTUATOR STEM NUT



FIG. 3 - STEM NUT AND WASHER



FIG. 4 - MICROMETER STEM REMOVED

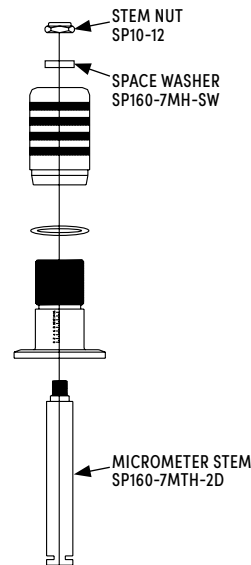


FIG. 5 - MICROMETER HANDLE EXPLODED DIAGRAM



# MICROMETER VALVES ASSEMBLY INSTRUCTIONS

3. Replace the bonnet O-ring.



FIG. 6 - MICROMETER HANDLE AND BONNET



FIG. 7 - MICROMETER BONNET

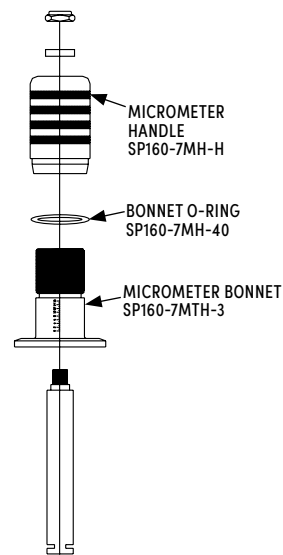


FIG. 8 - MICROMETER HANDLE EXPLODED DIAGRAM

# WARRANTY

- A. **GENERAL PROVISIONS:** Stainless Products, LLC (the “Company”) warrants exclusively to the original purchaser (the “Customer”) that equipment or parts thereof manufactured and sold by the Company will be free from defects in material and workmanship only, under normal use and service, for a period of one (1) year from the original shipment date. The Company shall not be liable for any loss of revenue or profit, loss by reason of plant shutdown, non-operation or increased cost of operation, loss of products or materials, or other special or consequential loss or damages resulting from any such warranted defects. This warranty will not apply to any equipment or parts which has been subjected to accident, alteration, abuse, or misuse. This warranty is in lieu of all other warranties. All other warranties, both express or implied (including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose) warranties are hereby excluded and waived. The Company’s only obligation and liability shall be to fulfill the warranty specifically stated herein. The Company will neither assume nor authorize any other person to assume for it any other obligation or liability in connection with the equipment or parts. In the event of a claim under this warranty, the Company’s sole and exclusive liability for any warranted equipment or parts shall be, at the Company’s option, limited to the following (a) the purchase price of the equipment or parts that are defective, (b) replacement of the defective equipment or parts or (c) repair of the defective equipment or parts.
- B. **RETURN OF PARTS OR EQUIPMENT TO COMPANY PLANT:** In the event the Company elects to inspect the alleged defective equipment or parts for possible repair, Company will notify Customer in writing, and the equipment or parts must be returned with transportation cost prepaid by the Customer. In the event the Company’s inspection confirms defective equipment or parts covered by this warranty, the Company shall have the option to select any of the remedies described in Section A above. No transportation for returned or replaced items will be paid by the Company unless written approval for transportation charges is given by the Company.
- C. **COMPONENTS NOT MANUFACTURED BY THE COMPANY:** Components not manufactured by the Company, but furnished as part of its equipment will be warranted by the Company only to the extent of the component manufacturer’s warranty.
- D. **REPAIR OF EQUIPMENT INSTALLED IN THE CONTINENTAL UNITED STATES:** In the event the Company elects to repair a covered item and it is, in the judgement of the Company, impractical to return the equipment or parts for repairs, the Company may arrange for the repairs to be made by its personnel or, at its option, sublet such repairs to a qualified company. The Customer will be expected to cooperate by making the equipment or parts available and accessible when the work is scheduled and is expected to provide the necessary utilities. If local labor conditions prohibit such work being done by Company personnel under the conditions and at the rates payable by its contracts with its employees, the Company obligation shall be limited to supervision of the work, replacement of defective parts, and labor costs in an amount equal to the amount which would be payable for a reasonable number of hours required to make the repairs at the rates payable under the terms of Company contracts with its employees. In such event, all labor costs shall be paid by the Customer and the Company will reimburse the Customer to the extent set forth above.
- E. **REPAIR OF EQUIPMENT INSTALLED OUTSIDE THE CONTINENTAL UNITED STATES:** In the event the Company elects to repair a covered item for a Customer located outside the continental United States and it is, in the judgement of the Company, impractical to return the equipment for repairs, the Company shall have the additional options (in addition to the other options described herein) of either sending a service representative to repair (or supervise the repairs) or paying Customer a reasonable amount to allow the Customer to have the repairs made locally; provided, that in such situation, Company shall have no obligation to repair or replace equipment or parts that are repaired on by third party contractors selected by Customer.

