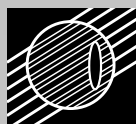
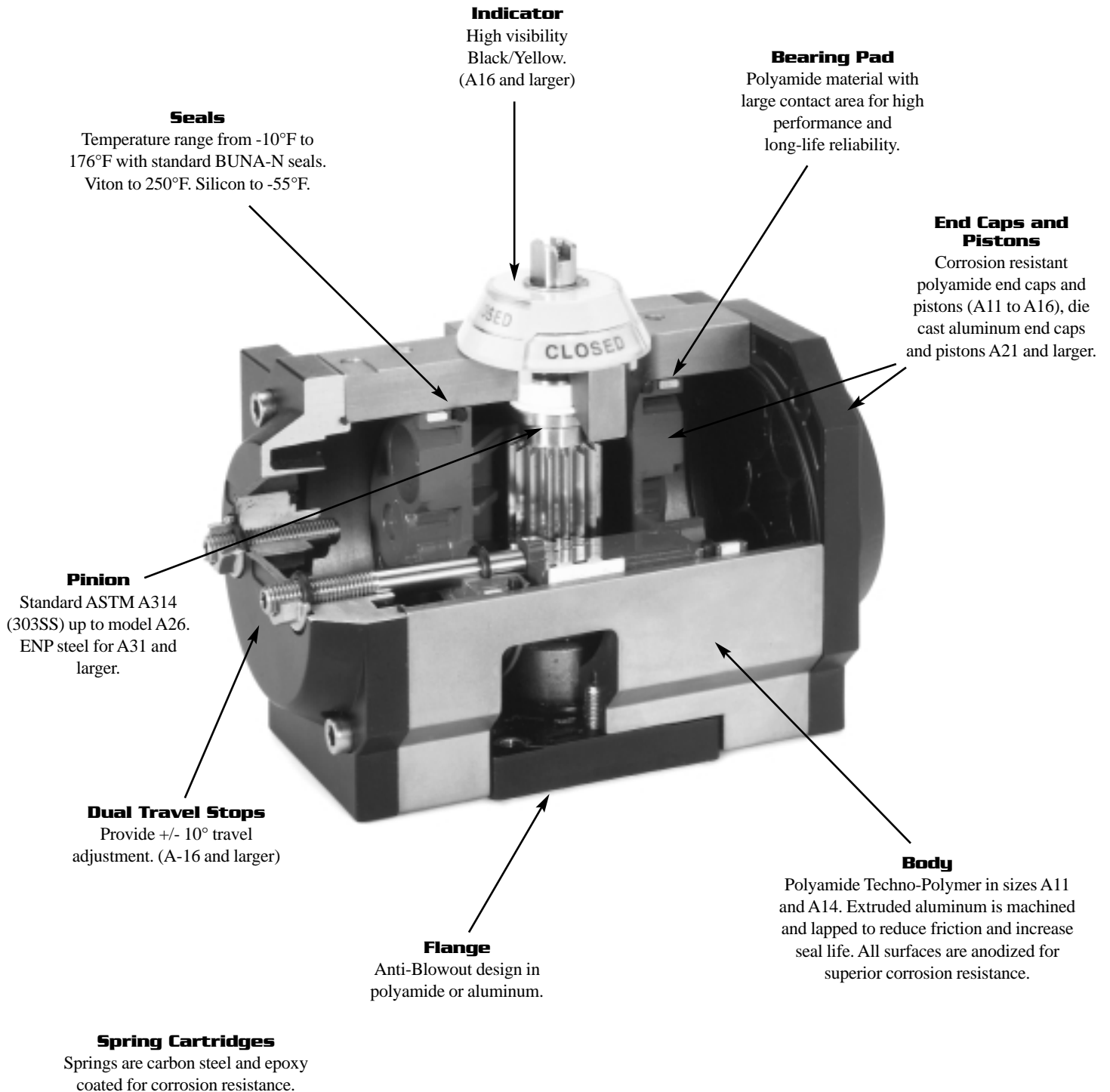


Aero



SVF Flow Controls
INCORPORATED

Aero



PNEUMATIC ACTUATORS

Aero actuators employ a double piston, double rack and pinion design, and incorporate the latest advances to ensure excellent corrosion resistance and long, trouble-free service.

■ SAMPLE SPECIFICATION

All *Aero* Pneumatic Actuators shall be double piston, double rack and pinion design with body materials of aluminum or polyamide. Shaft to be stainless steel with double O-ring sealing. Actuators to have 1/4" NPT air connections, visual position indicator. Spring return versions shall have parallel spring sets. All actuators to have ISO bolt circle and NAMUR dimensions for optional accessories, as manufactured by SVF/*Aero*.

■ OPERATION

Aero pneumatic actuators provide accurate and dependable control, especially in corrosive applications. Pressurized air enters via one port and displaces two opposed piston, transmitting a counter-clockwise quarter turn to the operator shaft and opening the valve. Pressure introduced via a second port reverses this process, transmitting a clockwise turn to close the valve. The units are compact, yet extremely durable. They are available in output torques from 180 to 9,000 inch-pounds.

- Double piston, double rack and pinion design results in constant torque output, minimal backlash and extreme durability.
- Stainless steel actuator shaft and fasteners provide corrosion resistance.
- Parallel spring sets on spring return allow the actuator to be accurately adjusted to the available air supply pressure by adding or removing springs.

■ ENGINEERING SPECIFICATIONS

- Body Material: Aluminum or Reinforced Polyamide
- Shaft: 303 SS with double O-ring seal
- Temperature Range: -10°F to 176°F
- O-rings: BUNA-N
- Output Torques: 180-9,000 lbf.in.
- Supply Air: 40 psi. min, 120 psi. max
- Air Connections: 1/4" NPT
- Mounting Dimensions: ISO and NAMUR

■ MATERIALS OF CONSTRUCTION

Aero pneumatic actuators are engineered from the finest materials, selected for long wear and corrosion resistance. On the outside, this means protection from adverse environments and corrosive process materials. On the inside, it means more efficient low friction operation.

Piston, guides and racks are molded Polyamide resin which is impact resistant and long wearing.

Piston seals, shaft seals and end cap seals are Nitrile O-rings. Nitrile rubber (BUNA-N) is a copolymer of Butadiene and Acrylonitrile. In addition to its elastomeric properties, it offers excellent corrosion resistance.

The actuator shafts are 303 Series stainless steel. This provides a smooth machined surface that is corrosion resistant, allowing the actuators to use water as a power source.

PNEUMATIC ACTUATOR SALES QUESTIONNAIRE

The following questions need to be asked to make a proper recommendation:

- **Air to Air or Air to Spring?**
- **Supply Air Available?**
- **On/Off, Modulating?**
- **Solenoid NEMA Rating? IV or VII?**
- **Environment? Temp, Corrosion Resistance?**
- **Feedback? Switches IV or VII?**
- **Positioner? 3-15 psi or 4-20 mA (analogue or digital)?**

The advantage of the double piston rack and pinion design lies in its accurate translation of linear to rotary torque, for both on-off and positioning modes. A major advantage of the double acting rack and pinion design is constant torque output throughout its travel.

Torque output on Spring Return models varies according to the compression rate of the springs. Output torque decreases on the air stroke as the springs are compressed, and it decreases in the spring stroke as the springs relax and extend. Reference the Spring Return torque chart. Use this to determine the correct number of springs required for your application.

■ TORQUE AND AIR PRESSURE

Two Items of information are required in order to select the appropriate size actuator:

1. Valve breakaway torque: the amount of torque (in inch-pounds) required to "break" the ball, plug or disc away from the seat is the valve breakaway torque. It is calculated from the pressure differential, type of media, contact area between sealing members, etc. The resultant calculation is then multiplied by a safety factor to take into account unknowns such as the time the valve has been in the closed position (certain sealing materials may take a set, making them difficult to separate) and corrosion buildup.
2. Air supply pressure (psig): A conservative approach is necessary. An actuator located adjacent to the compressor may receive a full 80 psi air supply. However, an actuator located 100 yards and several valves and leaky fittings away from the source may see only 60 psi air. If a valve's required torque equals an actuator's maximum torque output, the next largest actuator should be selected.

EXAMPLES OF PNEUMATIC ACTUATOR SELECTION

Select the actuator where torque output at a given air pressure exceeds the required valve torque. It is recommended that you increase actual valve torque by a 25% safety factor.

EXAMPLE 1

Air-to-Air

SPECS: Valve torque = 1200 in-lbs
Air Supply = 80 psig

ANSWER: Actuator = AD36

EXAMPLE 2

Spring Return - Fail Closed

Select the actuator possessing a torque output at the minimum air supply pressure at spring end and air end that exceeds the torque required to close the valve.

SPECS: Valve torque = 190 in-lbs
Air pressure = 80 psig

FIND: Spring end = 230 in-lbs

FIND: Air end @ 80 psi = 193 in-lbs

ANSWER: Actuator = AS-21-5

EXAMPLE 3

Spring Return - Fail Open

Select the actuator possessing a torque output at the minimum air supply pressure at the spring end and air end stroke that exceeds the torque required to open the valve.

SPECS: Valve torque = 300 in-lbs
Air pressure = 80 psig

FIND: Spring end = 309 in-lbs

FIND: Air end @ 80 psi = 319 in-lbs

ANSWER: Actuator = AS-26-5

TOP-MOUNTED SWITCH BOX



Limit switches are mounted on and coupled to the actuator in order to operate position-indicating lights on control panels, to control other equipment such as pumps, compressors and mixers, or to

sequence other valves. Two single-pole-double-throw (SPDT) switches are mounted in one enclosure and are activated by individual, adjustable cams.

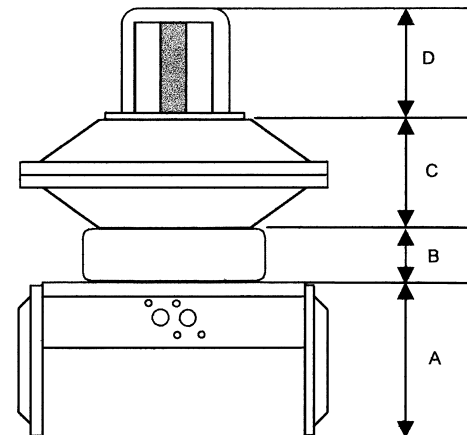
The cams are connected to the camshaft, which is coupled to the actuator shaft. Switches can be set to be acti-

vated in fully open or closed positions, or in any position in the quadrant of the actuator's operation.

The limit switch box is available in NEMA 4X and NEMA 7 enclosures, and switches can be supplied in mechanical or proximity models.

MODEL	A	B	C	D
A11	2.8	1.14	3.32	2.85
A14	3.6	1.14	3.32	2.85
A16	3.2	1.53	3.32	2.85
A21	3.2	1.53	3.32	2.85
A26	4.5	1.53	3.32	2.85
A31	5.1	1.53	3.32	2.85
A36	6.5	1.53	3.32	2.85
A41	6.5	1.53	3.32	2.85
A46	7	1.53	3.32	2.85
A56	8.5	1.53	3.32	2.85

INCHES



PNEUMATIC ACTUATOR WITH SOLENOID



The solenoid valve used for pneumatic actuators are 4-way or 3-way, on/off, electrically controlled valves. An electrical signal to the solenoid coil switches the compressed air supply to the actuator chamber, as follows:

The solenoid valve is used with the actuator, and simultaneously pressurizes Port A while exhausting the end cap cavities through Port B, or vice versa.

The solenoids are available with mufflers and speed controls. The muffler reduces the sound of the exhausting air, and the speed control determines the cycle time of the actuator.

The speed controls are manually set needle valves that can be adjusted. The cycle time can be slowed by restricting the flow of the exhausting air, thus maintaining back pressure on the opposite side of the pressurized actuator chamber.

Solenoids are available in NEMA 4X and NEMA 7 ratings, and in all voltages. The 115 VAC model has a 6.2-watt coil.

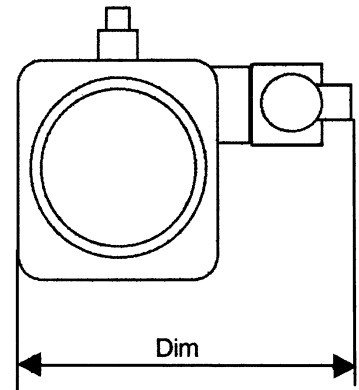
MODEL	Dim
A11	4.62
A14	5.42
A16	5.42
A21	5.82
A26	5.82
A31	6.52
A36	7.42
A41	7.42
A46	7.92
A56	9.32

INCHES

Upon electrical failure, actuators with single-coil solenoids will return to the de-energized position. This position can be OPEN or CLOSED depending upon how the valve is mounted to the manifold of the actuator, Port A or Port B.

Solenoids can be either close-coupled to the actuator (as shown), or they can be remotely installed, always considering that pneumatic air loses pressure over distance.

During the absence of electrical power, the actuator can be cycled by operating the manual override on the solenoid, providing that supply air is still available.

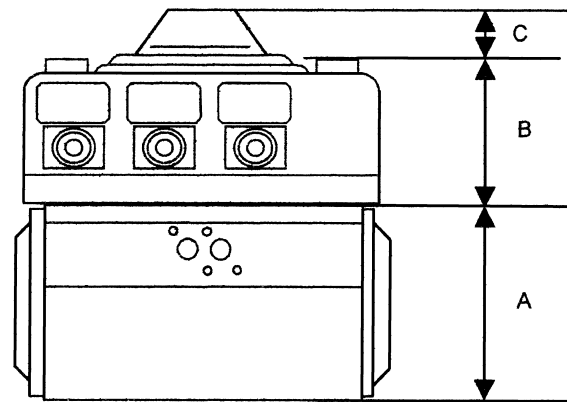


PNEUMATIC ACTUATOR WITH POSITIONER



The positioner is coupled to the actuator shaft via a linkage arm and a positioner cam. The cam rotates with actuator shaft and can be installed in various configurations to give the actuator a linear, equal percentage or quick-opening response.

The positioner accepts variable instrumentation signals, 3-15 psi or 4-20 mA, from a process controller (computer or set-point controller) and regulates the supply air



MODEL	A	B	C
A11	2.8	3.36	1.24
A14	3.6	3.36	1.24
A16	3.2	3.36	1.24
A21	3.2	3.36	1.24
A26	4.5	3.36	1.24
A31	5.1	3.36	1.24
A36	6.5	3.36	1.24
A41	6.5	3.36	1.24
A46	7	3.36	1.24
A56	8.5	3.36	1.24

INCHES

to and from the actuator. This process regulates the actuator's position within its operating quadrant. The positioner can be adjusted to accept a variety of instrumentation signals, such as split ranging (3-9 psi and 9-15 psi or 4-12 mA and 12-20 mA), or combinations thereof. Transmitters with output currents of 4-20 mA are also available.

SPECIFICATIONS

DIMENSIONS (INCHES)

MODEL	A	B	C	D	E	F (DBL SQ)	M	PCD(A)	G
A11	4.7	3.6	0.78	0.157	0.157	0.433	0.492	1.65	4 X 10-32
A14	6.3	4.4	0.78	0.157	0.157	0.551	0.748	1.969	4 X 1/4-20
A16	6.3	4.4	1.18	0.157	0.157	0.551	0.748	1.969	4 X 1/4-20
A21	6.96	4.4	1.18	0.157	0.157	0.67	0.906	2.756	4 X 5/16-18
A26	9.4	5.6	1.18	0.157	0.157	0.67	0.906	2.756	4 X 5/16-18
A31	9	6.3	1.18	0.157	0.157	0.67	0.906	2.756	4 X 5/16-18
A36	9.7	7.7	1.18	0.157	0.157	0.855	1.181	2.756	4 X 5/16-18
A41	11.4	7.7	1.18	0.157	0.157	0.866	1.181	2.756	4 X 5/16-18
A46	13.8	8.2	1.18	0.157	0.157	0.866	1.181	2.756	4 X 5/16-18
A56	16.5	9.7	1.18	0.157	0.157	1.063	1.457	4.921	4 X 1/2-13

DIMENSIONS (INCHES)

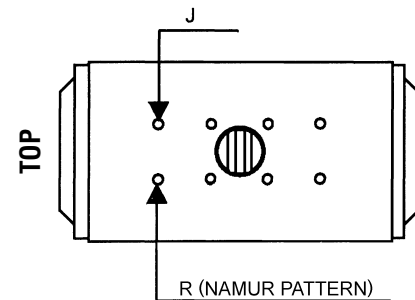
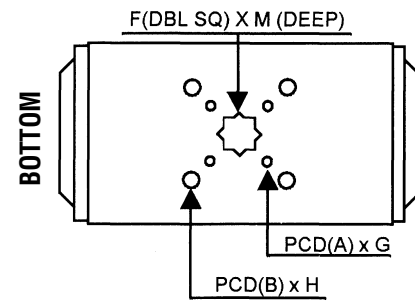
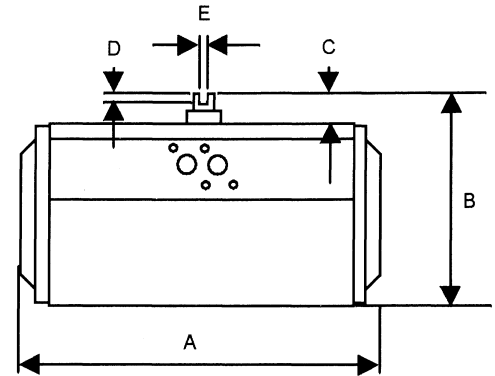
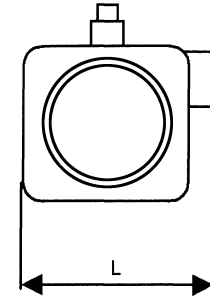
MODEL	PCD(B)	H	J	L	R
A11	X	X	4 X 10-32	2.6	3.15 X 1.18
A14	X	X	4 X 10-32	3.4	3.15 X 1.18
A16	X	X	4 X 10-32	3.4	3.15 X 1.18
A21	X	X	4 X 10-32	3.8	3.15 X 1.18
A26	X	X	4 X 10-32	3.8	3.15 X 1.18
A31	X	X	4 X 10-32	4.5	3.15 X 1.18
A36	4.016	4 X 3/8-16	4 X 10-32	5.4	3.15 X 1.18
A41	4.016	4 X 3/8-16	4 X 10-32	5.4	3.15 X 1.18
A46	4.016	4 X 3/8-16	4 X 10-32	5.9	3.15 X 1.18
A56	X	X	4 X 10-32	7.3	3.15 X 1.18

OUTPUT TORQUE FOR DOUBLE ACTING ACTUATORS

MODEL	Torque Output (lbf.in.)				
	40 PSIG	60PSIG	80PSIG	100PSIG	120PSIG
AD-11	62	94	125	156	187
AD-14	137	206	275	344	412
AD-16	137	206	275	344	412
AD-21	250	375	500	625	750
AD-26	375	562	750	937	1125
AD-31	500	750	1000	1250	1500
AD-36	800	1200	1600	2000	2400
AD-41	1000	1500	2000	2500	3000
AD-46	1562	2344	3125	3906	4687
AD-56	3000	4500	6000	7500	9000

SPECIFICATIONS

MODEL	BODY	END CAPS	PISTONS	SHAFT	FASTENERS	WT(AD) Lbs.	WT (AS) Lbs.	Air Consumption AD (Cu.In.)	Air consumption AS (Cu. In.)	Stroke (Sec.)
A11	Polyamide	Polyamide	Polyamide	AISI 303 SS	AISI 304 SS	1.2	1.5	13.5	8	0.5
A14	Polyamide	Polyamide	Polyamide	AISI 303 SS	AISI 304 SS	2.5	3	22	10.2	0.5
A16	Aluminum	Polyamide	Polyamide	AISI 303 SS	AISI 304 SS	4	4.5	26	11.2	0.5
A21	Aluminum	Aluminum	Aluminum	AISI 303 SS	AISI 304 SS	6.3	7.2	44	18	1.0
A26	Aluminum	Aluminum	Aluminum	AISI 303 SS	AISI 304 SS	8.9	9.9	69	30	1.0
A31	Aluminum	Aluminum	Aluminum	ENP Steel	AISI 304 SS	11	12	89	41	1.5
A36	Aluminum	Aluminum	Aluminum	ENP Steel	AISI 304 SS	17	20	153	75	2.5
A41	Aluminum	Aluminum	Aluminum	ENP Steel	AISI 304 SS	20	24	191	100	2.5
A46	Aluminum	Aluminum	Aluminum	ENP Steel	AISI 304 SS	27	33	275	116	3.0
A56	Aluminum	Aluminum	Aluminum	ENP Steel	AISI 304 SS	49	60	566	257	3.0

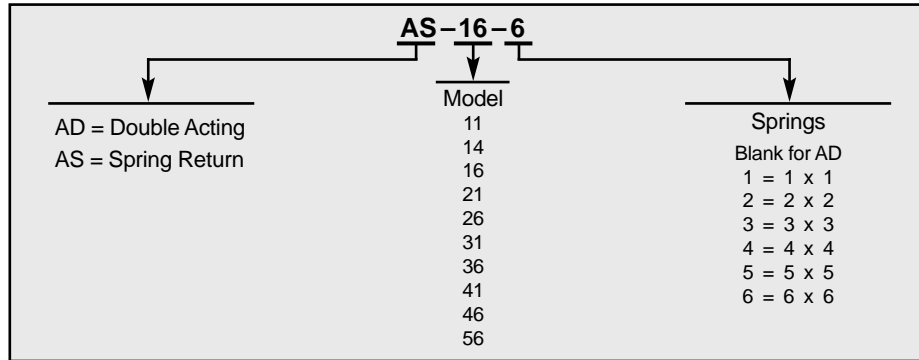


SPECIFICATIONS

OUTPUT TORQUE FOR SPRING RETURN ACTUATORS

Model	Qty/Springs	Torque Output (lb.in)		40 PSIG		60 PSIG		80 PSIG		100 PSIG		120 PSIG	
		START	END	START	END	START	END	START	END	START	END	START	END
AS-11	1 + 1	33	22	40	29	72	61	103	92	134	123	165	154
	2 + 2	66	44			50	28	81	59	112	90	143	121
	3 + 3	88	66					58	27	90	56	121	88
AS-14	1 + 1	37	27	110	100	179	169	248	238	317	307	385	375
	2 + 2	75	53	84	62	153	131	222	200	291	269	359	337
	3 + 3	112	81	56	25	125	94	194	163	263	232	331	300
	4 + 4	150	107			99	56	168	125	237	194	305	262
	5 + 5	187	134			72	19	141	88	210	157	278	225
	6 + 6	224	160					115	51	184	120	252	188
AS-16	1 + 1	37	27	110	100	179	169	248	238	317	307	385	375
	2 + 2	75	53	84	62	153	131	222	200	291	269	359	337
	3 + 3	112	81	56	25	125	94	194	163	263	232	331	300
	4 + 4	150	107			99	56	168	125	237	194	305	262
	5 + 5	187	134			72	19	141	88	210	157	278	225
	6 + 6	224	160					115	51	184	120	252	188
AS-21	1 + 1	61	46	204	189	329	314	454	439	579	564	704	689
	2 + 2	122	92	158	128	283	253	408	378	533	503	658	628
	3 + 3	184	138	112	66	237	191	362	316	487	441	612	566
	4 + 4	245	184			191	130	316	255	441	380	566	505
	5 + 5	307	230			145	68	270	193	395	318	520	443
	6 + 6	369	278					222	131	347	256	472	381
AS-26	1 + 1	86	62	313	289	500	476	688	664	875	851	1063	1039
	2 + 2	172	124	251	203	438	390	626	578	813	765	1001	953
	3 + 3	259	185	190	116	377	303	565	491	752	678	940	866
	4 + 4	345	247	128	30	315	217	503	405	690	592	878	780
	5 + 5	431	309			253	131	441	319	628	506	816	704
	6 + 6	518	372			190	44	378	232	565	419	753	607
AS-31	1 + 1	125	93	407	375	657	625	907	875	1157	1125	1407	1375
	2 + 2	251	187	313	249	563	499	813	749	1063	999	1313	1249
	3 + 3	376	280	220	124	470	374	720	624	970	974	1220	1124
	4 + 4	502	374			376	248	626	498	876	748	1126	989
	5 + 5	627	467			283	123	533	373	783	623	1033	873
	6 + 6	753	560					440	247	690	497	940	747
AS-36	1 + 1	205	152	647	595	1047	995	1447	1395	1847	1795	2247	2195
	2 + 2	412	306	494	388	894	788	1294	1188	1694	1588	2094	1988
	3 + 3	617	461	339	183	739	583	1139	983	1539	1383	1939	1783
	4 + 4	884	614			686	376	986	776	1384	1176	1786	1576
	5 + 5	1029	767			433	171	833	571	1233	971	1633	1371
	6 + 6	1236	921					679	364	1079	764	1479	1164
AS-41	1 + 1	252	185	815	748	1315	1248	1815	1748	2315	2248	2815	2748
	2 + 2	505	371	629	495	1129	995	1629	1495	2129	1995	2629	2495
	3 + 3	757	556	444	243	944	743	1444	1243	1944	1743	2444	2243
	4 + 4	1011	741			759	489	1259	989	1759	1489	2259	1989
	5 + 5	1263	928			572	237	1072	737	1572	1237	2072	1737
	6 + 6	1516	1113					887	484	1387	984	1887	1484
AS-46	1 + 1	445	280	1282	1117	2064	1899	2845	2680	3626	3461	4407	4242
	2 + 2	890	560	1002	672	1784	1454	2565	2335	3346	3016	4127	3797
	3 + 3	1334	840	722	228	1504	1010	2285	1791	3066	2572	3847	3353
	4 + 4	1779	1120			1224	565	2005	1346	2786	2127	3567	2908
	5 + 5	2224	1399			945	120	1726	901	2507	1682	3288	2463
	6 + 6	2669	1679					1446	456	2227	1237	3008	2018
AS-56	1 + 1	743	528	2472	2257	3972	3757	5472	5257	6972	6757	8472	8257
	2 + 2	1487	1055	1945	1513	3445	3013	4945	4513	6445	6013	7945	7513
	3 + 3	2231	1593	1417	769	2917	2269	4417	3769	5917	5269	7417	6769
	4 + 4	2974	2111			2389	1526	3889	3028	5389	4526	6889	6026
	5 + 5	3718	2638			1862	782	3362	2282	4862	3782	6362	5282
	6 + 6	4462	3166			1334	38	2834	1538	4334	3038	5834	4538

ORDERING INFORMATION



SVF Flow Controls, Inc. is a recognized leader in flow control technology. Our market focus and technical expertise have become the hallmark for our tradition of success.

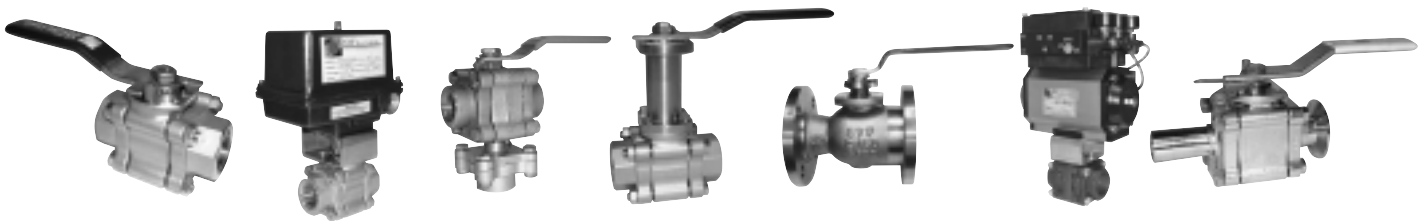
With a worldwide presence, SVF has developed a strategy in the marketplace that emphasizes a careful blend of technology and service. Our experienced in-house applications engineering department provides design assistance for all types of flow control schemes. This group translates customer requirements into a product specification that considers flow rates, materials of construction, actuation methods and all elements of a complete control package to ensure optimum systems performance.

SVF Flow Controls is dedicated to providing products, services and technical expertise to the marketplace by creating flow control packages that are reliable, available and backed by an industry-wide network of professional valve specialists.

Among the many factors that have contributed to our success is our total corporate commitment to the creation of value for our customers.

SVF manufactures a full line of process-quality valves and controls to meet industry-wide requirements.

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