

Design 461

Increased Outlet Angle Sweep-Flo Valve

The Design 461 Sweep-Flo valve, figure 1, is a self-cleaning, increased outlet, angle valve that is typically used in the chemical and petroleum industries where control of residual oils or other liquids with coking properties is necessary. The Design 461 features a venturi-type throat, which is useful in power plants or slurry services where high pressure drops and flashing might exist. Typical trim materials include an S44004 (440C) stainless steel plug, an S31600 (316) stainless steel with CoCr-A (alloy 6) hardfaced seat ring, and a hardened S41600 (416) stainless steel liner.

For increased protection, the Design 461 valve is offered with tungsten carbide trim. Use this trim only in the most severe abrasive conditions or in moderately corrosive environments. The hardness is 91.0-91.5 HRA.

Tungsten carbide inserts are used for the plug tip, seat ring, and the seat ring retainer. Typically, S17400 (17-4PH) stainless steel is used as the base material.

Construction Features

- Increased outlet size reduces outlet fluid velocity to reduce flashing and cavitation damage with proper trim material selection.
- Special cylinder-guided contour valve plug furnishes an equal percentage (Micro-Form™) flow characteristic in the 12.7 to 31.8 mm (0.5 to 1.25 inch) port size and a modified parabolic flow characteristic in the 38.1 to 114.3 mm (1.5 to 4.5 inch) port size.
- 2x3-inch, 3x4-inch, 4x6-inch, and 6x8-inch valves are available with either flanged or welding ends in ratings from ANSI Class 150 to 1500. 2x3-inch, 3x4-inch, and 4x6-inch sizes are available with ANSI Class 2500 rating. See figure 2.

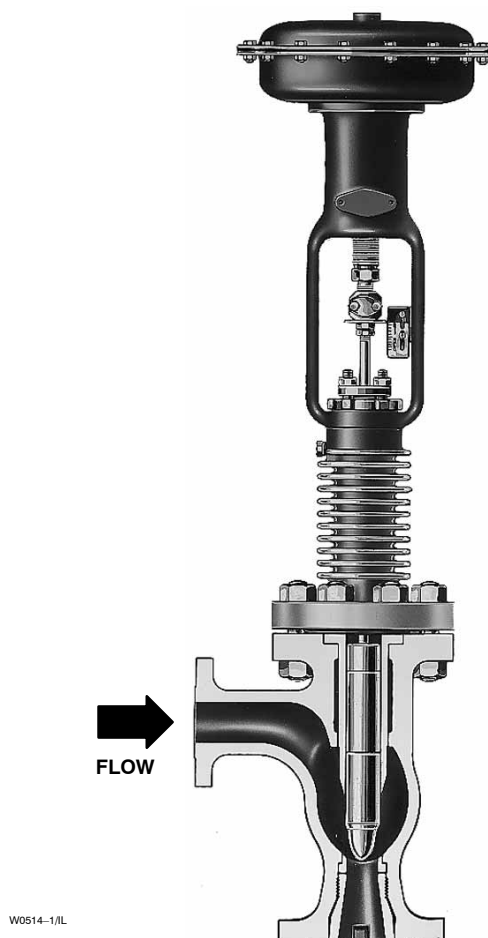


Figure 1. Design 461 Valve with Type 657 Actuator

- Connection on the side of the valve is furnished for flushing oil between liner and valve plug guide to prevent buildup of coke. An optional bonnet purge connection is also available with extension bonnet.



Table 1. Maximum Trim Size and Flow Coefficients

VALVE SIZE, INCHES	MAXIMUM SEAT RING DIAMETER		MAXIMUM PLUG TRAVEL		C _v AT MAXIMUM TRAVEL
	mm	Inches	mm	Inches	
2x3	41.3	1.625	28.6	1.125	106
3x4	57.2	2.25	28.6	1.125	122
4x6	76.2	3	38.1	1.5	331
6x8	114.3	4.5	50.8	2	764

NOTE: Several reduced diameter orifices are available for each valve size. See the section titled Coefficients in this bulletin or Fisher Catalog 12 for complete sizing coefficients.

Note

Neither Emerson, Emerson Process Management, nor Fisher assume responsibility for the selection, use, or maintenance of any product. Responsibility for proper selection, use, and maintenance of any Fisher product remains solely with the purchaser and end-user.

Standard Materials of Construction

Valve—Carbon steel or alloy steel

Valve Plug—Heat treated, hardened S44004 (440C) stainless steel

Seat Ring—S31600 (316) stainless steel with CoCr-A (alloy 6) face

Liner—Heat treated, hardened S41600 (416) stainless steel

Seat Ring Retainer—Heat treated, hardened S41600 stainless steel

Packing—PTFE and graphite ribbon/filament are available as standard packing.

Options—Other optional materials of construction available on request.

Special Constructions Available

- Extension bonnet to reduce conduction of heat to packing and actuator. (Pressure equalization piping from valve inlet to area above valve plug available to flush coke out of extension bonnet cavity and back into the flowstream as the valve plug opens.)

- Valve outlet extension nozzle can be provided to further reduce cavitation and erosion damage in tank-mounted installations.

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4.

Class IV is standard. Class V is optional.

Actuator Combinations

The Design 461 valve can be combined with Type 657 direct-acting, Type 667 reverse-acting, or Type 585C piston actuators. See the appropriate actuator bulletin.

Table 2. Class 300 and 600 ANSI Dimensions

SIZE	NPT	A INLET FLANGE				B OUTLET FLANGE				D BONNET		C
										Yoke Boss Size		
		300 RF	300 RTJ	600 RF	600 RTJ	300 RF	300 RTJ	600 RF	600 RTJ	3-9/16	5	
mm												
2 x 3	1/2-14	213	221	222	224	283	291	292	294	200	235	13
3 x 4	1/2-14	238	246	248	249	337	344	349	351	213	249	24
4 x 6	3/4-14	241	249	254	256	425	433	443	445	283	297	13
6 x 8	3/4-14	305	313	322	324	533	541	554	556	362	- - -	44
Inch												
2 x 3	1/2-14	8.38	8.69	8.75	8.81	11.13	11.44	11.50	11.56	7.88	9.25	0.50
3 x 4	1/2-14	9.38	9.69	9.75	9.81	13.25	13.56	13.75	13.81	8.38	9.81	0.94
4 x 6	3/4-14	9.50	9.81	10	10.06	16.75	17.06	17.44	17.50	11.13	11.69	0.50
6 x 8	3/4-14	12	12.31	12.69	12.75	21	21.31	21.81	21.88	14.25	- - -	1.75

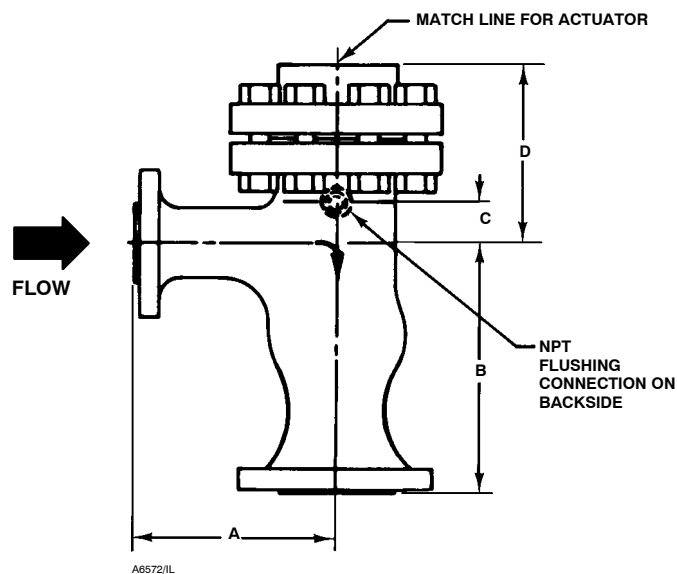


Figure 2. Dimensions (also see tables 2, 3, and 4)

Table 3. Class 900 and 1500 ANSI Dimensions

SIZE	NPT	A INLET FLANGE				B OUTLET FLANGE				D BONNET		C
										Yoke Boss Size		
		900 RF	900 RTJ	1500 RF	1500 RTJ	900 RF	900 RTJ	1500 RF	1500 RTJ	3-9/16	5	
mm												
2 x 3	1/2-14	241	243	241	243	297	298	306	308	219	259	25
3 x 4	1/2-14	254	256	264	265	356	357	365	367	251	- - -	38
4 x 6	3/4-14	295	297	305	306	433	435	461	464	- - -	354	51
6 x 8	3/4-14	- - -	- - -	381	383	- - -	- - -	579	583	- - -	583	25
Inch												
2 x 3	1/2-14	9.50	9.56	9.50	9.56	11.69	11.75	12.06	12.13	8.63	10.19	1.00
3 x 4	1/2-14	10	10.06	10.38	10.44	14	14.06	14.38	14.44	9.88	- - -	1.50
4 x 6	3/4-14	11.63	11.69	12	12.06	17.06	17.13	18.13	18.25	- - -	13.94	2.00
6 x 8	3/4-14	- - -	- - -	15.00	15.06	- - -	- - -	22.81	22.94	- - -	22.94	1.00

Table 4. Class 2500 ANSI Dimensions

SIZE	NPT	A INLET FLANGE		B OUTLET FLANGE		D BONNET		C
		Yoke Boss Size						
		2500 RF	2500 RTJ	2500 RF	2500 RTJ	3-9/16	5	
mm								
2 x 3	1/2-14	260	262	327	330	276	313	32
3 x 4	1/2-14	327	330	367	372	414	413	32
4 x 6	3/4-14	375	379	461	467	- - -	451	51
Inch								
2 x 3	1/2-14	10.25	10.31	12.88	13	10.88	12.31	1.25
3 x 4	1/2-14	12.88	13	14.44	14.63	16.31	16.25	1.25
4 x 6	3/4-14	14.75	14.94	18.13	18.38	- - -	17.75	2.00

Coefficients

Table 5. Design 461 (Flow Down)

Design 461 - Flow Down																
Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F _L ⁽¹⁾
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
2 x 3	12.7	0.5 ⁽²⁾	19	0.75	C _v	0.597	0.982	1.38	1.87	2.54	3.45	4.91	7.22	9.95	11.7	0.49
					K _v	0.516	0.849	1.19	1.62	2.20	2.98	4.25	6.25	8.61	10.1	----
					X _T	0.301	0.205	0.186	0.198	0.206	0.212	0.196	0.159	0.160	0.187	----
	19.1	0.75 ⁽²⁾	19	0.75	C _v	0.991	1.55	2.21	3.10	4.17	5.99	9.09	13.3	19.6	25.4	0.41
					K _v	0.857	1.34	1.91	2.68	3.61	5.18	7.86	11.5	17.0	22.0	----
					X _T	0.188	0.147	0.144	0.170	0.178	0.188	0.175	0.174	0.154	0.154	----
	25.4	1 ⁽²⁾	19	0.75	C _v	1.69	2.30	2.94	3.52	4.97	7.58	12.2	18.6	29.8	41.1	0.42
					K _v	1.46	1.99	2.54	3.05	4.30	6.56	10.6	16.1	25.8	35.6	----
					X _T	0.176	0.182	0.234	0.348	0.370	0.341	0.280	0.249	0.160	0.156	----
	31.8	1.25 ⁽²⁾	29	1.125	C _v	2.58	3.93	5.69	8.16	11.9	17.8	26.6	39.6	56.2	74.9	0.42
					K _v	2.23	3.40	4.92	7.06	10.3	15.4	23.0	34.3	48.6	64.8	----
					X _T	0.154	0.138	0.138	0.137	0.137	0.136	0.137	0.137	0.137	0.137	----
	38.1	1.5 ⁽³⁾	29	1.125	C _v	5.20	9.00	15.2	24.3	35.2	48.8	64.5	81.2	94.1	100	0.50
					K _v	4.50	7.79	13.1	21.0	30.4	42.2	55.8	70.2	81.4	86.5	----
					X _T	0.124	0.156	0.168	0.155	0.153	0.151	0.150	0.158	0.176	0.189	----
	41.3	1.625 ⁽³⁾	29	1.125	C _v	4.66	10.6	17.4	26.6	41.2	58.3	75.0	89.6	99.4	106	0.57
					K _v	4.03	9.17	15.1	23.0	35.6	50.4	64.9	77.5	86.0	91.7	----
					X _T	0.234	0.225	0.220	0.217	0.178	0.158	0.163	0.178	0.209	0.233	----
3 x 4	25.4	1 ⁽²⁾	19	0.75	C _v	1.58	2.40	3.25	4.02	5.92	9.04	14.2	22.5	35.7	45.2	0.42
					K _v	1.37	2.08	2.81	3.48	5.12	7.82	12.3	19.5	30.9	39.1	----
					X _T	0.324	0.315	0.372	0.503	0.434	0.357	0.290	0.218	0.150	0.135	----
	31.8	1.25 ⁽²⁾	29	1.125	C _v	2.38	3.97	6.03	8.02	9.05	12.7	20.0	36.9	61.9	79.4	0.42
					K _v	2.06	3.43	5.22	6.94	7.83	11.0	17.3	31.9	53.5	68.7	----
					X _T	0.274	0.198	0.182	0.213	0.324	0.333	0.291	0.173	0.125	0.124	----
	38.1	1.5 ⁽³⁾	29	1.125	C _v	6.34	12.3	19.8	28.3	40.0	57.4	73.8	86.2	96.7	104	0.47
					K _v	5.48	10.6	17.1	24.5	34.6	49.7	63.8	74.6	83.6	90.0	----
					X _T	0.192	0.155	0.146	0.149	0.140	0.117	0.117	0.129	0.146	0.160	----
	44.5	1.75 ⁽³⁾	29	1.125	C _v	4.59	9.97	18.9	31.4	42.0	57.2	75.6	91.8	105	112	0.55
					K _v	3.97	8.62	16.3	27.2	36.3	49.5	65.4	79.4	90.8	96.9	----
					X _T	0.244	0.244	0.193	0.171	0.184	0.179	0.174	0.192	0.218	0.243	----
	50.8	2 ⁽³⁾	29	1.125	C _v	9.72	23.0	37.0	53.1	70.1	85.0	97.4	109	117	123	0.62
					K _v	8.41	19.9	32.0	45.9	60.6	73.5	84.3	94.3	101	106	----
					X _T	0.246	0.150	0.148	0.151	0.160	0.179	0.218	0.259	0.295	0.314	----
	57.2	2.25 ⁽³⁾	29	1.125	C _v	7.08	16.0	32.9	46.4	59.4	79.2	94.2	106	116	122	0.70
					K _v	6.12	13.8	28.5	40.1	51.4	68.5	81.5	91.7	100	106	----
					X _T	0.292	0.247	0.180	0.212	0.251	0.258	0.305	0.353	0.380	0.410	----

-continued-

Table 5. Design 461 (Flow Down) (continued)

Design 461 - Flow Down (continued)																
Valve Size, Inches	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F _L ⁽¹⁾
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
4 x 6	50.8	2 ⁽³⁾	29	1.125	C _V	7.26	10.5	20.8	28.5	42.2	64.2	97.4	129	159	191	0.44
					K _V	6.28	9.08	18.0	24.7	36.5	55.5	84.3	112	138	165	---
					X _T	0.168	0.343	0.254	0.299	0.284	0.226	0.171	0.159	0.155	0.137	---
	57.2	2.25 ⁽³⁾	29	1.125	C _V	6.51	10.9	19.3	30.8	45.6	75.5	112	149	189	217	0.49
					K _V	5.63	9.43	16.7	26.6	39.4	65.3	96.9	129	163	188	---
					X _T	0.175	0.372	0.438	0.394	0.398	0.253	0.199	0.183	0.172	0.162	---
	63.5	2.5 ⁽³⁾	38	1.5	C _V	17.1	31.4	45.7	57.2	93.6	131	184	246	286	311	0.44
					K _V	14.8	27.2	39.5	49.5	81.0	113	159	213	247	269	---
					X _T	0.168	0.173	0.207	0.280	0.218	0.194	0.164	0.141	0.141	0.139	---
	69.9	2.75 ⁽³⁾	38	1.5	C _V	21.5	41.2	63.1	74.4	110	163	223	270	304	332	0.49
					K _V	18.6	35.6	54.6	64.4	95.2	141	193	234	263	287	---
					X _T	0.153	0.142	0.147	0.224	0.198	0.163	0.131	0.151	0.166	0.168	---
	76.2	3 ⁽³⁾	38	1.5	C _V	14.8	36.4	55.3	87.4	125	204	248	273	305	331	0.56
					K _V	12.8	31.5	47.8	75.6	108	176	215	236	264	286	---
					X _T	0.264	0.210	0.256	0.228	0.227	0.149	0.164	0.201	0.214	0.226	---
6 x 8	76.2	3 ⁽³⁾	38	1.5	C _V	16.9	34.5	56.5	84.6	120	162	213	273	322	342	0.42
					K _V	14.6	29.8	48.9	73.2	104	140	184	236	279	296	---
					X _T	0.244	0.244	0.241	0.241	0.238	0.235	0.229	0.216	0.199	0.209	---
	88.9	3.5 ⁽³⁾	51	2	C _V	27.5	43.9	55.4	84.8	128	209	329	395	429	475	0.52
					K _V	23.8	38.0	47.9	73.4	111	181	285	342	371	411	---
					X _T	0.179	0.284	0.464	0.448	0.388	0.263	0.168	0.183	0.211	0.202	---
	101.6	4 ⁽³⁾	51	2	C _V	29.7	61.7	100	151	214	289	372	474	568	605	0.53
					K _V	25.7	53.4	86.5	131	185	250	322	410	491	523	---
					X _T	0.244	0.244	0.242	0.240	0.236	0.234	0.231	0.220	0.198	0.207	---
	114.3	4.5 ⁽³⁾	51	2	C _V	38.7	79.2	127	193	272	378	498	620	722	764	0.57
					K _V	33.5	68.5	110	167	235	327	431	536	625	661	---
					X _T	0.244	0.243	0.242	0.240	0.237	0.234	0.229	0.215	0.199	0.207	---
1. At 100% travel. 2. Equal percentage characteristic (Micro-Form). 3. Modified parabolic characteristic.																

1. At 100% travel.

2. Equal percentage characteristic (Micro-Form).

3. Modified parabolic characteristic.

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