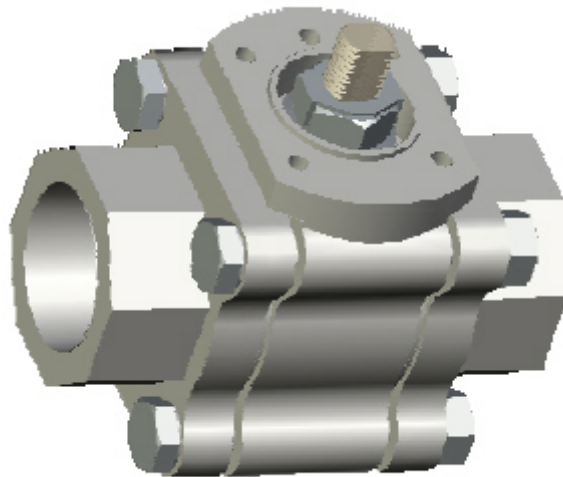


**Ball Valve Torques
and
Actuator Selection
Information**



General Information:

This bulletin contains basic information on determining the actual ball valve torques to be used for actuator selection. The following pages contain valve torque tables for the various Sharpe Valve models, along with Media and Service Factors which must be considered.

Ball Valve Torques:

The torque values listed in the following tables are breakaway torques from the closed position. Breakaway torques are determined by measured after the valve has been in the closed position under pressure for a set time period, and are the highest torques expected.

Seat Materials:

The seat materials used in a valve will significantly influence operating torque. Softer, lower-friction seats (such as TFE or TFMTM) will be lower in torque than the harder, higher friction factor materials such as Delrin or PEEK. Different tables have been provided where seat materials significantly affect operating torque

Service Application:

How the valve will be operated, and how frequently also affect actuator selection and torque. Infrequent operation will require higher torque values than for valves in modulating services, for example. Service factors are provided in the tables at the end of this bulletin.

Line Media:

What is flowing through the valve can have the most significant effect on valve

operating torques. Fine solids, slurries, or very viscous fluids can have great effect, not only on torque, but also on valve service life. Media factors are also provided in the tables at the end of this bulletin.

Torque Reduction Factor:

When being used with rack & pinion pneumatic spring return actuators, a 0.80 multiplier may be applied to the ball valve torque.

The valve torques are breakaway values from the closed position, and spring return actuators are selected on the minimum of either the spring ending or air ending torques. A "SR" actuator selected on this basis would probably be over-sized, since the valve torque is at maximum, and actuator torque is at minimum.

The 0.80 factor reflects the maximum valve torque expected other than breakaway, and considers that the maximum output torque of the spring return rack and pinion actuator is at the start of the stroke.

This would not apply to a scotch yoke or crank arm actuator, because the torque curve for these designs dips in the center, and may fall below the valve running torque if not sized based on full break torque for the valve.

The 0.80 torque factor does not apply to double acting rack & pinion actuators because the output torque is constant over the full stroke. Thus, double acting actuators are sized based on maximum valve torque and maximum actuator torque.

SHARPE 12 and 13 Series Dir-Act (lbf-in) TFM and NOVA Seats

1000 WOG Series 12 & 13

1/4, 3/8, 1/2"	40
3/4"	80
1"	110
1 1/4"	160
1 1/2"	190
2"	250

1500 WOG Series 12

1/4, 3/8, 1/2"	50
3/4"	100
1"	140
1 1/4"	200
1 1/2"	240
2"	320

SHARPE 66, 86 and 88 Series (lbf-in) Torque Values at Maximum Rating

Teflon Seats

1/2"	65
3/4"	80
1"	120
1 1/4"	180
1 1/2"	215
2"	300
2 1/2"	680
3"	800
4"	1750

RTFE Seats

1/2"	70
3/4"	85
1"	126
1 1/4"	190
1 1/2"	226
2"	315
2 1/2"	715
3"	840
4"	1838

Cavity Filler

1/2"	80
3/4"	110
1"	180
1 1/4"	215
1 1/2"	300
2"	450
2 1/2"	1000
3"	1600
4"	3000

Series 84 Torques (Lbf-In)

TFE SEATS

Pressure (PSID)	Valve Size								
	1/4 - 1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
0	25	27	60	95	160	280	300	400	700
100	25	28	61	96	162	282	338	488	820
200	25	29	62	97	164	284	376	576	940
300	25	30	63	98	166	286	414	664	1060
400	25	30	64	99	168	288	452	752	1180
500	25	30	65	100	170	290	484	827	1300
600	25	30	66	101	172	292	516	902	1420
720	25	30	67	102	174	294	548	977	1500
800	25	30	68	103	176	296	580		
900	25	30	69	104	178	298	600		
1000	25	30	70	105	180	300	600		

TFM^(tm) SEATS

Pressure (PSID)	Valve Size								
	1/4 - 1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
0	25	33	67	143	200	353	428	570	950
250	28	33	67	143	230	390	523	760	1266
500	30	33	67	143	260	426	646	950	1583
720	30	33	67	144	283	451	817	1140	1900
750	30	34	67	147	291	462	836		
1000	30	35	79	157	321	498	1026		
1250	30	38	91	176	352	534	1121		
1500	30	43	105	195	382	570	1216		

Series 84 Torques (lbf-in) – continued

REINFORCED TFE SEATS

Pressure (PSID)	Valve Size								
	1/4 - 1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
0	25	35	70	150	210	372	450	600	1000
250	27.5	35	70	150	242	410	550	800	1333
500	30	35	70	150	274	448	680	1000	1666
720	30	35	70	152	298	475	860	1200	2000
750	30	36	70	155	306	486	880		
1000	30	37	83	165	338	524	1080		
1250	30	40	96	185	370	562	1180		
1500	30	45	110	205	402	600	1280		

NOVA SEATS

Pressure	Valve Size								
	1/4 - 1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
0	30	40	70	110	210	350	600	750	1000
100	30	40	75	115	226	367	643	857	1143
200	30	40	80	120	242	384	686	964	1286
300	30	40	85	125	258	401	729	1071	1429
400	30	40	90	130	274	418	772	1178	1572
500	30	40	95	135	290	435	815	1286	1715
600	30	40	100	140	306	452	858	1393	1858
720	30	40	105	145	322	469	901	1500	2001
800	30	40	110	150	338	486	944		
900	30	40	115	155	354	503	987		
1000	30	40	120	160	370	520	1030		
1100	30	40	125	165	386	537	1073		
1200	30	43	130	170	402	554	1116		
1300	30	46	135	173	418	571	1159		
1400	30	49	140	176	434	588	1202		
1500	30	50	145	180	450	605	1245		

Series 84 Torques (lbf-in) – cont.

DELTRIN SEATS

Pressure (PSID)	Valve Size					
	1/4 - 1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
0	38	38	65	95	155	250
100	39	39	69	112	184	270
250	40	40	73	129	213	300
500	40	40	77	146	242	350
750	40	40	81	163	271	400
1000	42	42	82.3	180	300	450
1250	44	44	83.6	197	321	500
1500	46	46	84.9	214	342	550
1750	45	48	86.2	231	363	590
2000	44	50	87.5	248	384	650
2250	43	54	88.8	265		
2500	42	58	90.1	282		

PEEK SEATS

Pressure PSID	Valve Size								
	1/4 - 1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
0	42	56	98	154	294	490	840	1050	1400
100	42	56	105	161	316	514	900	1200	1600
200	42	56	112	168	339	538	960	1350	1800
300	42	56	119	175	361	561	1021	1499	2001
400	42	56	126	182	384	585	1081	1649	2201
500	42	56	133	189	406	609	1141	1800	2401
600	42	56	140	196	428	633	1201	1950	2601
720	42	56	147	203	451	657	1261	2100	2801
800	42	56	154	210	473	680	1322		
900	42	56	161	217	496	704	1382		
1000	42	56	168	224	518	728	1442		
1100	42	56	175	231	540	752	1502		
1200	42	60	182	238	563	776	1562		
1300	42	64	189	242	585	799	1623		
1400	42	69	196	246	608	823	1683		
1500	42	70	203	252	630	847	1743		

Series 99 Torques (lbf-in)

Use values in tables for Series 84 valves, except select one size larger. For example, to find the torque for a 1-1/2" Series 99 valve, use the torque value listed for a 2" Series 84 valve.

Series 50 /FS50 Valve Torques (lbf-in)

Class 150 and 300

RTFE and NOVA Seats

Pressure (PSID)	Valve Size											
	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	10"	12"
0	65	80	100	165	240	375	525	1000	2400	4500	8800	11000
50	65	80	100	166	240	398	579	1120	2800	5400	8800	11000
100	65	80	100	169	242	421	633	1240	3200	6300	9400	11000
150	65	80	100	174	250	444	687	1360	3600	7200	10100	11700
200	65	80	100	179	260	467	741	1480	4000	8100	10800	12400
250	65	80	100	184	270	490	795	1600	4500	9000	11500	13100
285	65	80	102	188	277	506	833	1670	4850	9630	11990	13590
300	65	80	104	189	280	513	849	1700	5000	9900	12200	13800
350	66	82	108	194	290	541	901	1780	5500	10800	12900	14500
400	68	83	112	204	300	569	951	1850	6000	11700	13600	15200
450	70	84	116	218	325	597	999	1905	6400	12600	14300	15900
500	72	87	120	232	350	625	1045	1945	6700	13500	15000	16600
550	74	90	124	246	375	653	1089	1985	7000	14400	15700	17300
600	76	93	128	260	400	681	1131	2025	7300	15300	16400	17900
650	78	96	132	274	425	709	1171	2065	7500	16200	17100	18400
700	80	99	136	288	450	737	1209	2105	7650	17100	17800	18800
740	82	102	140	302	475	765	1209	2130	7750	17200	18500	19000

Class 600 Valves

RTFE and NOVA Seats

Pressure (PSID)	Valve Size					
	1/2"	3/4"	1"	1-1/2"	2"	3"
0	25	42	85	305	400	660
100	27	45	95	330	445	760
285	31	52	105	345	460	840
500	33	57	115	355	515	915
740	40	65	125	385	550	1060
1100	46	76	135	395	585	1315
1480	60	85	145	430	680	1640

Series 54 Valve Torques (lbf-in)

RTFE and NOVA Seats

Pressure (PSID)	Valve Size						
	1-1/2"	2"	2-1/2"	3"	4"	6"	8"
0	100	240	340	375	525	1500	2400
50	100	240	349	398	579	1750	2800
100	100	242	358	421	633	2000	3200
150	100	250	367	444	687	2250	3600
200	100	260	376	467	741	2500	4000
250	100	270	385	490	795	2750	4500
285	104	280	394	513	849	3000	5000

Media and Service Factors:

Media Factors	Multiplier	Service Factors	Multiplier
Clean, particle free, non-lubricating (water, alcohol, etc.)	1.00	Simple On and Off Operations	1.00
Clean, particle free, lubricating (oils, hydraulic fluid, etc)	0.80	Throttling	1.20
Slurries or heavily corroded and contaminated systems	2.00	Positioner Control	1.50
Gas or saturated steam, clean and wet	1.00	Once per day Operations	1.20
Gas or superheated steam, clean and dry	1.30	Once every two days or a "Plant Critical" Operation	1.50
Gas, dirty unfiltered e.g. natural gas, Chlorine	1.50		

Design Factors	Multiplier
Spring Return - R & P Actuator	0.80
All Other Actuators	1.00

Torque Determination Example:

3" Series 84 w/Nova Seats, 600 PSIG, Nitrogen Gas, On-Off Service, Fail Closed Actuator

<u>Basic Torque</u>	<u>Design Factor</u>	<u>Media Factor</u>	<u>Service Factor</u>	<u>Sizing Torque</u>
1393	X 0.80	X 1.30	X 1.00	= 1449 lbf-in