A-T Controls, Inc.
9955 International Blvd. • Cincinnati, Ohio 45246
Phone: 513.247.5465 Fax: 513.247.5462
www.atcontrols.com

Engineer: CMB **No.:** DI00061
Date Created: 05/20/2020
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Application Sizing Guide

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Introduction: Actuator Sizing- Floating Ball Valves

Actuated Valve (AV) assemblies are being scrutinized and studied more, as actuator sizing recommended practices are being adopted by both end users and distributors in the valve industry. End users and distributors are requesting more valve torque data to assist in actuator sizing, and in some instances are sizing their own AV assemblies. Recognizing this need, A-T Controls, Inc. has undergone more extensive torque testing for its floating ball valves to provide more data and recommendations to our customer base while paying attention to how the industry is evolving. Torque data in some of our catalogs have changed because of this testing.

The updated catalog torques reflect calculations and sample selection from Recommended Practice S 2812-X-19 and represent the maximum torque value with three standard deviations. Our AV assemblies with 3R actuators are sized with these torques. Torques are also below at differential pressure differentials for clean, lubricating on/off service with standard seat materials. Safety shall be added to these torques, and the method to properly size using these torques is explained below.

Determine Baseline Torque

1. Determine valve size, series, and differential pressure. Consult the torque pressure tables in later pages to select the appropriate baseline torque.
    - Note: If your pressure is not listed, it is recommended to use the torque of the next highest differential pressure. Example: 360 psi should use 400 psi torques. However, it is acceptable to linear interpolate as well.

Series	
Size	
ΔP	
Baseline Torque	

Determine Safety Factors for Sizing

2. Using the 3 tables shown below, determine which safety factors apply to your service. If more than one safety factor applies in the ***same*** table, use the greater.
    - There is NO safety built into the numbers in the torque tables. Listed torques are for clean, lubricating fluid with frequent operation and standard seat material.
    - For highly elevated torques, an alternative stem material should be considered. Please consult A-T Controls, Inc. for proper stem material selection.

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Table 1	
Media/Application	**Safety Factor**
Clean, lubricating fluid	0
Clean, non-lubricating fluid	0.1
Saturated Steam	0.3
Superheated Steam	0.5
Filtered Natural Gas	0.3
Dirty Natural Gas	0.5
Abrasive Slurries	0.5
Chlorine	0.5
Dry Gas	0.3
Low Temperature (-20 °F and lower)	0.3
High Temperature (300 °F and above)	0.2

Table 2	
Frequency of Operation	**Safety Factor**
Multiple Times a Day/On-Off	0
Once Daily	0.2
Weekly	0.2
Monthly	0.5
Yearly	0.5
Modulating	0.2

Table 3	
Seat Type	**Safety Factor**
PTFE/RTFE/TFM™-1600/CTFE/MG1241	0
50/50 STFE and STFM	0.15
PEEK (17-4 PH® Stem Required)	2.0
UHMWPE	0.8
Delrin®	0.15
Cavity Filler	0.35
Cavity Filler with Viscous Fluid	0.4

Determine Net Torque

3. Add the safety factors and multiply by the previously determined baseline torque to determine the net torque. Use this net torque to select the proper actuator.
   - $Net\ Safety\ Factor = 1 + (Media/Application + Frequency\ of\ Operation + Seat\ Type)$
   - $Net\ Torque = Net\ Safety\ Factor\ \times Baseline\ Torque$

Media/Application	
Frequency of Operation	
Seat Type	
Net Safety Factor	
Net Torque	

Determine Actuator Needed

4. Actuator Type –
   - Pneumatic – Determine air supply pressure.
     - i: Double Acting – the net torque shall not exceed the listed output torque.
     - ii: Spring Return – the net torque shall not exceed the listed spring end, air break torques; and air end shall exceed 80% of net torque.
   - Electric – Determine voltage and the net torque shall not exceed the listed output torque.

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Air Supply Pressure	
OR	
Voltage Supply	

Baseline Torques at Differential Pressure

Note: torques of the valves below were tested using clean, lubricating fluid for on/off service using standard seat materials for each valve series. Please note some torques do not change with increasing pressure. Proper safety shall be added using the above methods for calculating Net Torque. Please note that these safety factors are guidelines, and the end user is ultimately responsible to determine the safety factors that should be used for their application:

Series 22:

Size	Pressure (psig)								
	0	100	200	300	400	600	740	1000	
1/4"	50	50	50	50	50	50	50	50	Torque (in*lbs)
3/8"	50	50	50	50	50	50	50	50	
1/2"	50	50	50	50	50	50	50	50	
3/4"	60	60	60	60	60	60	60	60	
1"	100	100	100	100	100	100	100	100	
1-1/4"	120	120	120	120	120	120	120	120	
1-1/2"	180	180	180	180	180	180	180	180	
2"	225	225	225	225	225	225	225	225	
2-1/2"	487	487	487	487	487	487	487	487	
3"	900	900	900	900	900	900	900	900	

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Series 24:

Size	Pressure (psig)																
	0	100	200	300	400	600	740	1000	1250	1500	1750	2000	2250	2500	2750	3000	
1/4"	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	Torque (in*lbs)
3/8"	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	
1/2"	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	
3/4"	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	
1"	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	
1-1/4"	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	
1-1/2"	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
2"	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	

Series 31:

Size	Pressure (psig)							
	0	100	200	285	400	600	740	
1-1/2"	343	343	343	343	347	350	354	Torque (in*lbs)
2"	532	532	532	546	575	600	613	
2-1/2"	769	769	769	769	775	818	946	
3"	914	914	975	1019	1115	1250	1353	
4"	1814	1814	1814	1814	1842	2067	2682	
6"	3235	3335	3500	3740	4213	4584	5348	

Series 33:

Size	Pressure (psig)								
	0	100	200	300	400	600	800	1000	
1/4"	117	117	117	117	117	117	117	117	Torque (in*lbs)
3/8"	146	146	146	146	146	146	146	146	
1/2"	184	184	184	184	184	184	184	184	
3/4"	200	200	200	205	208	211	286		
1"	211	211	211	214	258	425	554		
1-1/4"	419	419	419	419	419	611			
1-1/2"	1010	1010	1010	1010	1010	1010			
2"	1010	1010	1010	1010	1238	1269			
2-1/2"	1166	1166	1166	1323	1465				
3"	1166	1166	1166	1386	1770				
4"	1166	1865	2300	2624					

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Series 55:

Size	Pressure (psig)								
	0	100	200	300	400	600	800	1000	
1/4"	37	37	37	37	37	37	37	37	Torque (in*lbs)
3/8"	37	37	37	37	37	37	37	37	
1/2"	37	37	37	37	37	37	37	37	
3/4"	54	54	54	54	54	54	54	54	
1"	90	90	90	90	90	90	90	90	
1-1/4"	117	117	117	117	117	117	117	117	
1-1/2"	174	174	174	174	174	174	174	174	
2"	296	296	296	296	296	296	296		
2-1/2"	612	612	612	612	612	612	612		
3"	679	679	679	679	679	679			
4"	752	806	1035	1148	1218	1500			

Series 77:

Size	Pressure (psig)								
	0	100	200	300	400	600	800	1000	
1/2"	37	37	37	37	37	37	37	37	Torque (in*lbs)
3/4"	54	54	54	54	54	54	54	54	
1"	90	90	90	90	90	90	90	90	
1-1/2"	177	177	177	177	177	177			
2"	296	296	296	296	296	296			
2-1/2"	612	612	612	612	612	612			
3"	679	679	679	679	679				
4"	752	806	1035	1148	1218				

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Series 83/Series 88:

(Note: Series 83 is limited to 2" size)

Size	Pressure (psig)								
	0	200	400	600	740	1000	1250	1500	
1/4"	58	58	58	58	58	58	58	58	Torque (in*lbs)
3/8"	58	58	58	58	58	58	58	58	
1/2"	58	58	58	58	58	58	58	58	
3/4"	83	83	83	83	83	83	83	83	
1"	120	120	120	120	120	120	120	120	
1-1/4"	171	171	171	171	171	171	171	171	
1-1/2"	235	235	235	235	235	235	235	235	
2"	398	398	398	398	398	398			
2-1/2"	509	509	509	548	595	672			
3"	544	544	656	832	894				
4"	1065	1065	1091	1509					

Series 8R:

Size	Pressure (psig)								
	0	200	400	600	740	1000	1250	1500	
1/2"	58	58	58	58	58	58	58	58	Torque (in*lbs)
3/4"	58	58	58	58	58	58	58	58	
1"	83	83	83	83	83	83	83	83	
1-1/4"	120	120	120	120	120	120	120	120	
1-1/2"	171	171	171	171	171	171	171	171	
2"	235	235	235	235	235	235	235	235	
2-1/2"	398	398	398	398	398	398			

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Series 90/Series F90/Series D9-F1/Series FD9-F1:

Size	Pressure (psig)				
	0	100	200	285	
1/2'	45	45	45	45	Torque (in*lbs)
3/4"	73	73	73	73	
1"	85	85	88	91	
1-1/2"	220	228	230	230	
2"	264	264	264	297	
2-1/2"	398	445	502	535	
3"	437	465	465	768	
4"	700	700	756	1250	
6"	1477	1688	2232	3000	

Series F91:

Size	Pressure (psig)				
	0	100	200	285	
1/2'	45	45	45	45	Torque (in*lbs)
3/4"	73	73	73	73	
1"	85	85	88	91	
1-1/2"	149	149	149	149	
2"	230	230	230	230	
2-1/2"	297	297	297	297	
3"	472	472	500	535	
4"	700	700	712	768	
6"	800	900	1150	1250	

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Series F9R-F1:

Size	Pressure (psig)				
	0	100	200	285	
1/2'	50	50	50	50	Torque (in*lbs)
3/4"	65	65	65	65	
1"	145	145	145	145	
1-1/2"	200	200	200	200	
2"	250	250	250	250	
2-1/2"	400	400	400	400	
3"	600	600	600	600	
4"	1075	1075	1075	1075	
6"	1650	1650	1650	1650	
8"	2200	2200	2200	2200	

Series F9R-F3:

Size	Pressure (psig)							
	0	100	200	285	400	600	740	
1/2'	50	50	50	50	50	50	50	Torque (in*lbs)
3/4"	65	65	65	65	65	65	65	
1"	145	145	145	145	145	145	145	
1-1/2"	200	200	200	200	200	200	200	
2"	250	250	250	250	350	350	350	
2-1/2"	400	400	400	400	575	575	575	
3"	600	600	600	600	800	800	800	
4"	1075	1075	1075	1075	1400	1400	1400	
6"	1650	1650	1650	1650	2000	2000	2000	
8"	2200	2200	2200	2200	3275	3275	3275	

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Series D9-F3/FD9-F3:

Size	Pressure (psig)							
	0	100	200	285	400	600	740	
1/2'	45	45	45	45	45	45	45	Torque (in*lbs)
3/4"	73	73	73	73	73	73	73	
1"	85	85	88	91	95	98	101	
1-1/2"	220	228	230	230	233	233	233	
2"	264	264	264	297	335	350	360	
2-1/2"	398	445	502	535	550	565	577	
3"	437	465	465	768	780	800	852	
4"	700	700	756	1250	1375	1475	1553	
6"	1477	1688	2232	3000	3309	5090	6198	

Series FD9-F6:

Size	Pressure (psig)								
	0	200	400	600	740	1000	1250	1500	
1/2"	150	150	150	150	150	150	150	150	Torque (In*lbs)
3/4"	200	200	200	200	200	200	200	200	
1"	260	260	260	260	260	260	260	260	
1-1/2"	525	525	525	525	525	525	525	525	
2"	610	610	610	610	610	610	610	610	