ACTUATOR SELECTION GUIDE - BALL VALVES

Proper actuator selection is needed to ensure consistent operation of the automated valve. Selecting the proper actuator begins with establishing valve operating torque. Valve operating torque is determined by seating material, operation frequency, media type and line pressure. This guide provides a means of determining the valve operating torque based on these variables.

THE FOLLOWING STEPS ARE USED TO SELECT THE PROPER ACTUATOR

1. After selecting the desired seating material, refer to the charts on the following pages to determine the basic torque requirement for the valve.
2. Using the design or maximum operating line pressure and the valve size chose the Valve Torque Requirement from the tables.* If line pressure is not listed, the next highest pressure nearest the actual pressure should be selected (example: for 285 psi use 300 psi). Please reference the notes at the bottom of each page for additional instructions
3. Determine the Application Factor from Chart 1. Select the largest factor if the service application matches more than one of the listed factors.
4. Determine the Design Factor from Chart 2.
5. Determine the Frequency of Operation Factor from Chart 3.
6. Add the Application Factor, Design Factor, and the Frequency of Operation Factor to determine the Total Torque Factor.
7. Multiply the torque from the tables per item 2 by the Total Torque Factor per item 6 to determine the Total Valve Torque Requirement. This will be the torque needed to size the actuator.
8. If a Media Containment Unit is added between the valve and the actuator, the additional torque listed in Chart 4 must be added to the Total Valve Torque Requirement. This new value will now be the Total Valve Torque Requirement.
9. From the actuator output torque tables select an actuator with an output torque greater than the Total Valve Torque Requirement.

PNEUMATIC ACTUATORS

- Double Acting (Air-to-Air): Determine the air supply pressure available to the actuator and select the Actuator Size that exceeds the Total Valve Torque Requirement.
- Single Acting (Spring Return for fail safe operation, either Fail-Open or Fail-Close): Determine the air supply available to the actuator and select the Actuator Size that exceeds the Total Valve Torque Requirement for the END of stroke for BOTH the Air Stroke and the Spring Stroke. The actuator selection is optimized when the end of stroke torques are nearly equal.

ELECTRIC ACTUATORS

- Multiply the Total Valve Torque Requirement by a safety factor of 1.2. Select the Actuator Size that exceeds that amount.

10. From the EZ Ordering Code Matrix select the mounting kit required to connect the valve and actuator. EZ Ordering Codes are listed by valve series.

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Note: Safety factors are not built into the Valve Torque Requirements.

Examples of how to size an actuator can be found on page 10 of this Technical Bulletin.

TOTAL TORQUE FACTOR
Total Torque Factor = Application Factor (min. 1.0) (Chart 1) + Design Factor (Chart 2) + Frequency Factor (Chart 3)

CHART 1 - APPLICATION FACTORS

Media	Factor
Clean Particle-Free, Non-Lubricating (water)	1.0
Lubricating Fluid (clean oil)	1.0
Fluids with Solid Particles	1.4
Chilled Water	1.3
Condensed Water	1.4
River Water	1.4
Low Temperature 0°F to -150°F	1.3
Cryogenic Service from -150°F and below	2.0
Chlorine Service	1.5
Lubricant Free or Oxygen Cleaned	1.5
Saturated Steam	1.3
Superheated Steam	1.5
Clean Natural and Other Gasses	1.4
Slurries	1.8
Dry Powders	1.8

Factors listed above are to be used as a guide only. Actual conditions may vary causing an increase or decrease in the Application Factor.

CHART 2 - DESIGN FACTORS

Design	Factor
Round Port	0.0
V-Ball	0.3
Cavity Filler	0.3
Modulating	0.3

CHART 3 - FREQUENCY FACTORS

Frequency	Factor
One or More Cycles Per Day	0.0
Less Than One Cycle Per Week	0.3
Less Than One Cycle Per Month	0.4
Less Than One Cycle Per Six Months	0.5

CHART 4 - MEDIA CONTAINMENT UNIT TORQUES

	lb-ins	N m
MCU 1	20	2.3
MCU 2	30	3.4
MCU 3	40	4.6
MCU 3	50	5.7
MCU 4	60	6.8
MCU 5	70	8.0

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VALVE TORQUE REQUIREMENTS 2 WAY VALVES

RPTFE SEATS - FULL PORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI																
	0	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200
½	50	50	50	50	52	55	55	55	58	60	60	60	60	60	65	65	65
¾	85	85	87	87	87	90	90	90	90	92	95	95	95	98	100	100	105
1	120	120	130	130	130	135	135	135	135	140	140	145	150	150	155	160	165
1¼	155	160	165	165	180	180	180	185	185	190	195	200	205	215	235	255	275
1½	250	250	265	270	275	280	290	295	300	310	315	325	340	350	365	385	400
2	360	370	390	400	420	435	450	465	480	495	510	530	540	550	635	665	690
2½	450	480	520	560	585	625	660	700	730	765	800	872	942	1013	1083	1153	1224
3	550	610	665	720	770	820	875	930	990	1045	1100	1206	1315	1424	1533	1642	1751
4	1050	1300	1550	1800	2100	2300	2600	2850	3100	3350	3600	4122	4635	5147	5660	6173	6685
6	2400	2850	3300	3700	4150	4550	5000	5400	5700								
8	4600	5000	5400	5800	6200	6650	7100	7400	7800								
10	12500	12800	13200	13500	14700	16900	18100	19000	19400								
12	18500	19000	19500	20000	22000	24000	26000	28000	28400								

RPTFE SEATS - FULL PORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR																
	0	7	14	21	28	34	41	48	55	62	69	83	97	110	124	138	152
15	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7
20	10	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	12
25	14	14	15	15	15	15	15	15	15	16	16	16	17	17	18	18	19
32	18	18	19	19	20	20	20	21	21	21	22	23	23	24	27	29	31
40	28	28	30	31	31	32	33	33	34	35	36	37	38	40	41	43	45
50	41	42	44	45	47	49	51	53	54	56	58	60	61	62	72	75	78
65	51	54	59	63	66	71	75	79	82	86	90	99	105	115	120	130	140
80	62	69	75	81	87	93	99	105	110	120	125	135	150	160	175	185	200
100	120	145	175	205	235	260	295	320	350	380	405	465	525	580	640	695	755
150	270	320	375	420	470	515	565	610	645								
200	520	565	610	655	700	750	800	835	880								
250	1400	1450	1500	1550	1650	1900	2050	2150	2200								
300	2100	2150	2200	2250	2500	2700	2950	3150	3200								

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NOTES:

1. For Standard Port valves use torque for the next smaller size valve.
   Example: 1" Standard Port = 3/4" Full Port
2. For Triad Series valves multiply listed torque by 1.15

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VALVE TORQUE REQUIREMENTS 2 WAY VALVES

TFM, TEK-FIL OR PTFE SEATS - FULL PORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI																
	0	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200
½	35	35	35	36	40	40	40	40	40	42	42	45	47	47	49	50	51
¾	65	65	65	65	65	68	69	70	70	70	70	70	70	70	72	75	75
1	85	90	90	95	100	100	105	108	110	112	115	120	125	130	140	145	150
1¼	140	145	150	155	160	165	170	172	175	180	185	195	205	215	225	245	265
1½	210	215	225	230	240	250	255	265	270	280	285	305	320	330	350	360	375
2	355	370	380	390	400	410	425	435	445	455	465	490	510	530	550	575	600
2½	375	400	450	500	500	505	505	590	600	610	650	698	750	802	854	905	957
3	500	500	600	650	680	700	750	810	850	900	950	1035	1125	1216	1307	1398	1488
4	900	1100	1350	1505	1750	1950	2200	2400	2600	2800	3000	3442	3865	4289	4712	5136	5559
6	2000	2400	2850	3250	3625	4000	4450	4825	5300								
8	3000	3600	4200	4750	5325	5850	6450	7000	7600								
10	11300	12200	13000	13700	14800	15400	16200	17000	17800								
12	16600	17600	18700	19700	20600	21400	22500	23400	24500								

TFM, TEK-FIL OR PTFE SEATS - FULL PORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR																
	0	7	14	21	28	34	41	48	55	62	69	83	97	110	124	138	152
15	4	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	6
20	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	8
25	10	10	10	11	11	11	12	12	12	13	13	14	14	15	16	16	17
32	16	16	17	18	18	19	19	19	20	20	21	22	23	24	25	28	30
40	24	24	25	26	27	28	29	30	31	32	32	34	36	37	40	41	42
50	40	42	43	44	45	46	48	49	50	51	53	55	58	60	62	65	68
65	42	45	51	56	56	57	57	67	68	69	73	79	85	91	96	100	110
80	56	56	68	73	77	79	85	92	96	100	105	115	125	135	150	160	170
100	100	125	155	170	200	220	250	270	295	315	340	390	435	485	530	580	630
150	225	270	320	365	410	450	505	545	600								
200	340	405	475	535	600	660	730	790	860								
250	1300	1400	1450	1550	1650	1750	1850	1921	2000								
300	1900	2000	2100	2250	2350	2400	2550	2650	2750								

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NOTES:

1. For Standard Port valves use torque for the next smaller size valve.
   Example: 1" Standard Port = 3/4" Full Port
2. For Triad Series valves multiply listed torque by 1.15

VALVE TORQUE REQUIREMENTS 2 WAY VALVES

UHMWPE OR 50/50 SEATS - FULL PORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI																
	0	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200
½	50	50	51	55	56	57	58	60	60	60	61	62	65	70	71	75	76
¾	100	105	107	110	112	115	118	120	125	130	135	140	142	150	155	160	165
1	150	155	160	165	170	172	178	180	185	190	195	200	205	225	230	240	250
1¼	225	232	240	250	260	265	270	280	290	295	305	320	340	355	370	380	400
1½	350	360	370	385	395	410	420	430	440	450	465	485	510	530	555	580	600
2	500	550	650	700	750	780	850	950	1000	1100	1200	1300	1400	1500	1700	1750	1850
2½	750	850	1000	1100	1200	1300	1450	1500	1600	1700	1800						
3	1250	1350	1500	1650	1750	1850	2000	2200	2300	2350	2500						
4	1800	2000	2300	2600	2900	3200	3400	3750	3950	4250	4500						
6	3000	3500	4000	4500	4900	5450	5900	6400									
8	6000	6500	7000	7400	7900	8400	8800	9250									

UHMWPE OR 50/50 SEATS - FULL PORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR																
	0	7	14	21	28	34	41	48	55	62	69	83	97	110	124	138	152
15	6	6	6	6	6	6	7	7	7	7	7	7	7	8	8	8	9
20	11	12	12	12	13	13	13	14	14	15	15	16	16	17	18	18	19
25	17	18	18	19	19	19	20	20	21	21	22	23	23	25	26	27	28
32	25	26	27	28	29	30	31	32	33	33	34	36	38	40	42	43	45
40	40	41	42	43	45	46	47	49	50	51	53	55	58	60	63	66	68
50	56	62	73	79	85	88	96	105	115	125	135	145	160	170	190	200	210
65	85	96	115	125	135	145	165	170	180	190	205						
80	140	155	170	185	200	210	225	250	260	265	280						
100	205	225	260	295	330	360	385	425	445	480	510						
150	340	395	450	510	555	615	665	725									
200	680	735	790	835	895	950	995	1050									

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NOTES:

1. For Standard Port valves use torque for the next smaller size valve.
   Example: 1” Standard Port = 3/4” Full Port
2. For Triad Series Valves multiply listed torque by 1.15

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VALVE TORQUE REQUIREMENTS 2 WAY VALVES

PEEK SEATS - FULL PORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI																
	0	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200
½	82	85	85	90	90	95	95	100	100	100	105	110	115	120	130	140	145
¾	140	145	145	150	150	160	160	165	165	170	175	180	185	190	195	200	210
1	180	185	190	195	200	200	210	212	215	220	225	230	235	240	255	260	270
1¼	220	225	230	240	245	250	260	265	270	280	285	290	310	330	340	350	365
1½	335	345	360	375	385	400	410	425	435	450	460	490	515	540	565	590	615
2	350	450	550	650	700	850	900	1000	1100	1200	1300	1500	1650	1850	2000	2200	2400
2½	800	950	1000	1150	1250	1400	1500	1600	1700								
3	1350	1500	1700	1850	2000	2200	2300	2500	2600								
4	2100	2400	2650	2900	3200	3500	3800	4000	4200								
6	4600	5000	5400	5900	6300	6750	7200	7600	7800								
8	8260	8980	9690	10410	11130	11940	12750	13290	13700								
10	22440	22980	23700	24240	26390	30340	32500	34110	35600								
12	33210	34110	35010	35910	39500	43090	46680	50270	53700								

PEEK SEATS - FULL PORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR																
	0	7	14	21	28	34	41	48	55	62	69	83	97	110	124	138	152
15	9	10	10	10	10	11	11	11	11	11	12	12	13	14	15	16	16
20	16	16	16	17	17	18	18	19	19	19	20	20	21	21	22	23	24
25	20	21	21	22	23	23	24	24	24	25	25	26	27	27	29	29	31
32	25	25	26	27	28	28	29	30	31	32	32	33	35	37	38	40	41
40	38	39	41	42	43	45	46	48	49	51	52	55	58	61	64	67	69
50	40	51	62	73	79	96	100	115	125	135	145	170	185	210	225	250	270
65	90	105	115	130	140	160	170	180	190								
80	155	170	190	210	225	250	260	280	295								
100	235	270	300	330	360	395	430	450	475								
150	520	565	610	665	710	765	815	860	880								
200	935	1000	1100	1200	1250	1350	1450	1500	1550								
250	2550	2600	2700	2750	3000	3450	3650	3850	4000								
300	3750	3850	3950	4050	4450	4850	5250	5700	6050								

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NOTES:

1. For Standard Port valves use torque for the next smaller size valve.
   Example: 1” Standard Port = 3/4” Full Port
2. For Triad Series Valves multiply listed torque by 1.15

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VALVE TORQUE REQUIREMENTS - MULTIPORT VALVES

TFM 1600, PTFE OR TEK-FIL SEATS - FULL PORT - MULTIPORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI									
	0	100	200	300	400	500	600	700	800	1000
¼ & ⅜	71	75	80	84	89	93	97	102	106	115
½	106	108	111	113	115	117	120	122	124	128
¾	133	136	140	143	146	149	153	156	159	166
1	221	231	241	251	261	271	281	291	301	321
1¼	248	265	281	298	315	331	348	364	381	
1½	372	390	407	425	443	460	478	495	513	
2	496	545	593	642	691	739	788	836	885	
2½	938	976	1013	1051	1089	1126	1164	1201	1239	
3	1062	1206	1350	1494	1638	1781	1925	2069	2213	
4	2301	2367	2434	2500	2567	2633	2699	2766	2832	
6	3480	3800	4100	4450	4700	5050	5370	5700	6000	
8	5265	5600	5950	6300						

TFM 1600, PTFE OR TEK-FIL SEATS - FULL PORT - MULTIPORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR									
	0	7	14	21	28	34	41	48	55	69
8 & 10	8	9	9	10	10	11	11	12	12	13
15	12	13	13	13	13	14	14	14	15	15
20	16	16	16	17	17	17	18	18	18	19
25	25	27	28	29	30	31	32	33	35	37
32	29	30	32	34	36	38	40	42	44	
40	43	45	46	49	51	52	55	56	58	
50	57	62	67	73	79	84	90	95	100	
65	110	115	115	120	125	130	135	140	140	
80	120	140	155	170	190	205	220	235	255	
100	260	270	280	285	295	300	305	315	320	
150	395	430	465	505	535	575	610	645	680	
200	595	635	675	715						

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Notes:

1. Above torque values are based on TFM 1600, PTFE, or Tek-Fil seats in clear, non-viscous fluid.
2. For RPTFE Seats multiply listed torque by 1.15
3. For 50/50 Seats multiply listed torque by 1.50
4. For UHMWPE Seats multiply listed torque by 1.62

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VALVE TORQUE REQUIREMENTS - MULTIPORT VALVES

TFM 1600 - STANDARD PORT - MULTIPORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI									
	0	100	200	300	400	500	600	700	800	1000
¼ & ⅜	71	75	80	84	89	93	97	102	106	115
¾	106	108	111	113	115	117	120	122	124	128
1	133	136	140	143	146	149	153	156	159	166
1 ¼	221	231	241	251	261	271	281	291	301	321
1 ½	248	265	281	298	315	331	348	364	381	
2	372	390	407	425	443	460	478	495	513	

TFM 1600 - STANDARD PORT - MULTIPORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR									
	0	7	14	21	28	34	41	48	55	69
8 & 10	8	9	9	10	10	11	11	12	12	13
20	12	12	13	13	13	13	14	14	14	14
25	15	15	16	16	16	17	17	18	18	19
32	25	26	27	28	29	31	32	33	34	36
40	28	30	32	34	36	37	39	41	43	
50	42	44	46	48	50	52	54	56	58	

NOTE:

1. Above torque values are based on TFM 1600 seats in clear, non-viscous fluid.

VALVE TORQUE REQUIREMENTS - S19 SEGMENTED BALL VALVE

SOFT SEAT/METAL SEAT - CLASS 150/300 - S19 SEGMENTED BALL VALVE - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI								
	0	100	200	300	400	500	600	700	725
1	76	83	90	97	104	111	118	125	127
1½	125	139	153	167	181	195	209	223	227
2	137	159	181	203	225	247	269	291	296
3	187	250	313	376	439	502	565	628	645
4	282	366	450	534	618	702	786		
6	409	628	847	1,066	1,285	1,504	1,723		
8	739	1,085	1,431	1,777	2,123	2,469			
10	934	1,544	2,154	2,764	3,374	3,984			
12	1,354	2,353	3,352	4,351	5,350				

SOFT SEAT/METAL SEAT - CLASS 150/300 - S19 SEGMENTED BALL VALVE - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR								
	0	7	14	21	28	34	41	48	50
25	9	10	11	11	12	13	14	15	15
40	15	16	18	19	21	23	24	26	26
50	16	18	21	23	26	28	31	33	34
80	22	29	36	43	50	57	64	71	73
100	32	42	51	61	70	80	89		
150	47	71	96	125	150	170	195		
200	84	125	165	205	240	280			
250	110	175	245	315	385	455			
300	155	270	380	495	605				

NOTES:

1. Torque values shown are without considering safety factor.
2. Torque published for standard Bray packing.
3. Refer to the sizing program for Dynamic Torque requirements.

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VALVE TORQUE REQUIREMENTS - TRUNNION MOUNTED BALL VALVE

SOFT SEAT - FULL PORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI												
	CLASS 150				CLASS 300								
	0	100	200	285	0	100	200	300	400	500	600	700	740
2	444	575	628	682	584	628	673	717	761	797	841	885	903
3	1053	1354	1496	1620	1416	1522	1620	1726	1823	1929	2036	2133	2177
4	1640	2115	2337	2522	2248	2407	2567	2735	2894	3062	3222	3390	3452
6	3377	4355	4806	5195	4965	5328	5691	6045	6408	6771	7134	7497	7638
8	5201	6700	7408	8001	7966	8550	9125	9709	10285	10869	11444	12028	12258
10	7594	9789	10816	11683	11400	12232	13055	13878	14710	15542	16374	17206	17533
12	10793	13922	15365	16604	15551	16693	17808	18932	20065	21198	22330	23472	23915
14	15896	20498	22631	24455	23534	25260	26951	28659	30367	32093	33801	35527	36200
16	22437	28933	31942	34518	35677	38297	40864	43448	46033	48644	51237	53848	54875
18	29168	37616	41528	44873	48148	51671	55131	58627	62115	65646	69133	72665	74045
20	38120	49157	54273	58645	65203	69974	74665	79400	84126	88897	93632	98411	100279
24	57789	74523	82277	88906	92287	99049	105687	112387	119078	125831	132531	139293	141939

SOFT SEAT - FULL PORT VALVES - TORQUE (lb-in)

VALVE SIZE NPS	LINE PRESSURE, PSI															
	CLASS 600															
	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1480
2	797	823	850	876	912	938	965	1000	1027	1053	1080	1115	1142	1168	1195	1221
3	1983	2053	2133	2204	2275	2345	2416	2487	2567	2638	2708	2779	2850	2921	2992	3054
4	2761	2859	2965	3062	3160	3266	3363	3461	3567	3664	3770	3868	3965	4071	4169	4248
6	7868	8152	8435	8727	9010	9293	9585	9869	10152	10435	10727	11010	11294	11586	11869	12099
8	12055	12497	12940	13373	13816	14250	14692	15126	15568	16011	16445	16887	17321	17763	18197	18551
10	18109	18719	19321	19976	20631	21286	21941	22587	23242	23906	24561	25216	25871	26526	27181	27703
12	24853	25694	26526	27420	28322	29225	30119	31013	31916	32819	33712	34615	35518	36421	37315	38032
14	37359	38625	39855	41209	42563	43917	45263	46608	47962	49325	50671	52016	53370	54733	56078	57158
16	57388	59327	61229	63301	65372	67460	69531	71594	73674	75771	77833	79905	81984	84073	86135	87799
18	78966	81630	84250	87100	89959	92827	95668	98518	101376	104253	107103	109953	112812	115688	118529	120813
20	109448	113148	116777	120733	124689	128663	132611	136558	140514	144506	148454	152401	156366	160349	164288	167456
24	146480	151427	156286	161588	166881	172200	177475	182759	188069	193406	198690	203965	209285	214613	219879	224119

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NOTES:

1. Valve torques mentioned in above table are without factor of safety.
2. For running / dry run torque consider 0 PSI torque from above table for the corresponding size and class.
3. For PEEK seats multiply listed torque by 2.0.

VALVE TORQUE REQUIREMENTS - TRUNNION MOUNTED BALL VALVE

SOFT SEAT - FULL PORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR												
	CLASS 150				CLASS 300								
	0	7	14	20	0	7	14	21	28	34	41	48	51
50	51	65	71	77	66	71	76	81	86	90	95	100	102
80	119	153	169	183	160	172	183	195	206	218	230	241	246
100	186	239	264	285	254	272	290	309	327	346	364	383	390
150	382	492	543	587	561	602	643	683	724	765	806	847	863
200	588	757	837	904	900	966	1031	1097	1162	1228	1293	1359	1385
250	858	1106	1222	1320	1288	1382	1475	1568	1662	1756	1850	1944	1981
300	1220	1573	1736	1876	1757	1886	2012	2139	2267	2395	2523	2652	2702
350	1796	2316	2557	2763	2659	2854	3045	3238	3431	3626	3819	4014	4090
400	2535	3269	3609	3900	4031	4327	4617	4909	5201	5496	5789	6084	6200
450	3296	4250	4692	5070	5440	5838	6229	6624	7018	7417	7811	8210	8366
500	4307	5554	6132	6626	7367	7906	8436	8971	9505	10044	10579	11119	11330
600	6530	8420	9296	10045	10427	11191	11941	12698	13454	14217	14974	15738	16037

SOFT SEAT - FULL PORT VALVES - TORQUE (N m)

VALVE SIZE DN	LINE PRESSURE, BAR															
	CLASS 600															
	0	7	14	21	28	34	41	48	55	62	69	76	83	90	97	102
50	90	93	96	99	103	106	109	113	116	119	122	126	129	132	135	138
80	224	232	241	249	257	265	273	281	290	298	306	314	322	330	338	345
100	312	323	335	346	357	369	380	391	403	414	426	437	448	460	471	480
150	889	921	953	986	1018	1050	1083	1115	1147	1179	1212	1244	1276	1309	1341	1367
200	1362	1412	1462	1511	1561	1610	1660	1709	1759	1809	1858	1908	1957	2007	2056	2096
250	2046	2115	2183	2257	2331	2405	2479	2552	2626	2701	2775	2849	2923	2997	3071	3130
300	2808	2903	2997	3098	3200	3302	3403	3504	3606	3708	3809	3911	4013	4115	4216	4297
350	4221	4364	4503	4656	4809	4962	5114	5266	5419	5573	5725	5877	6030	6184	6336	6458
400	6484	6703	6918	7152	7386	7622	7856	8089	8324	8561	8794	9028	9263	9499	9732	9920
450	8922	9223	9519	9841	10164	10488	10809	11131	11454	11779	12101	12423	12746	13071	13392	13650
500	12366	12784	13194	13641	14088	14537	14983	15429	15876	16327	16773	17219	17667	18117	18562	18920
600	16550	17109	17658	18257	18855	19456	20052	20649	21249	21852	22449	23045	23646	24248	24843	25322

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NOTES:

1. Valve torques mentioned in above table are without factor of safety.
2. For running / dry run torque consider 0 BAR torque from above table for the corresponding size and class.
3. For PEEK seats multiply listed torque by 2.0.

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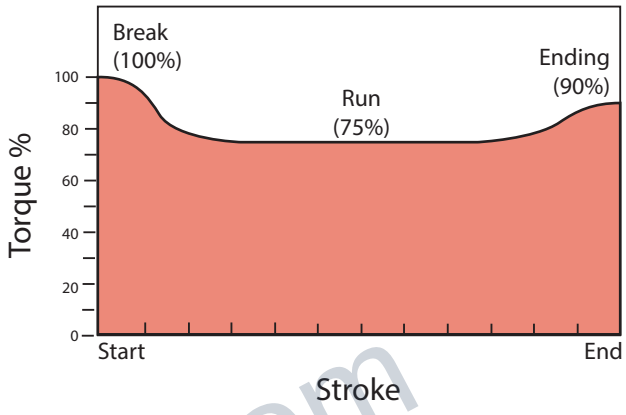
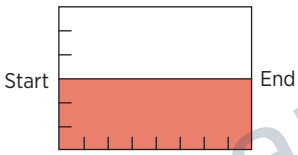
NOTE:

Floating ball valve torque is high at the beginning of each stroke, called Break Torque. This high initial torque is the result of the ball and seats taking a set after sitting in a static position for a period of time. As the ball is turned the torque decreases. This is known as the Run Torque, and it will be approximately 75% of the break torque. The torque will again increase at the end of the stroke as the ball and seats are returned to full contact. This torque is known as Ending Torque, and it will be approximately 90% of the Break Torque. This typical curve occurs in both directions when operating a ball valve open to closed or closed to open.

TYPICAL VALVE TORQUE CURVE

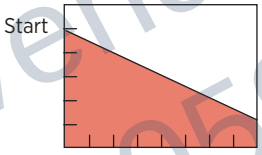


PNEUMATUIC ACTUATOR DOUBLE ACTING TORQUE CURVE

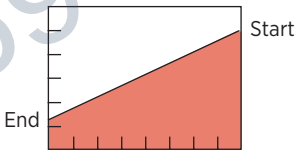


The Double Acting Actuator has a constant output torque throughout travel from start to end, clockwise or counterclockwise rotation

PNEUMATUIC ACTUATOR SINGLE ACTING TORQUE CURVE

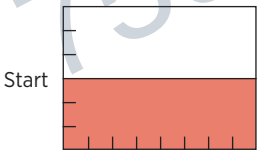


Counterclockwise (Air Stroke)



Clockwise (Spring Stroke)

ELECTRIC ACTUATOR TORQUE CURVE



Electric Actuators have a constant output torque throughout travel from start to end, clock-wise or counter-clock-wise rotation.

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SERIES 70 PREMIER ELECTRIC ACTUATOR TORQUES

Actuator Size	Torque Output		Maximum Valve Torque*	
	lb-ins.	N m	lb-ins.	N m
S70-003	300	21	250	17
S70-006	500	34	417	29
S70-008	800	55	667	46
S70-012	1,200	83	1000	69
S70-020	2,000	138	1667	115
S70-030	3,000	207	2500	172
S70-050	5,000	345	4167	287
S70-065	6,500	448	5417	374
S70-1306 S70-1316	13,000	1,468	10,833	1,223
S70-1806 S70-1816	18,000	2,033	15,000	1,694

***NOTE:**
When sizing S70 Electric Actuators, multiply Total Valve Torque Requirement by a safety factor of 1.2 before making an actuator selection.

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Double Acting Pneumatic Operated Torque Output (lb-in)

Actuator Size	Air Supply Pressure (PSIG)				
	40	60	80	100	120
48	75	113	150	188	225
63	145	221	297	373	449
83	351	536	721	906	1091
93	493	753	1013	1272	1532
119	1058	1615	2171	2728	3285
128	1410	2152	2894	3636	4378
160	2797	4270	5742	7214	8687
210	5783	8826	11870	14914	17957
255	14211	21691	29171	36650	44130

Double Acting Pneumatic Operated Torque Output (N m)

Actuator Size	Air Supply Pressure (BAR)				
	2.8	4.1	5.5	6.9	8.3
48	9	13	17	21	25
63	16	25	34	42	51
83	40	61	82	102	123
93	56	85	115	144	173
119	120	183	245	308	371
128	159	243	327	411	495
160	316	482	649	815	982
210	653	997	1341	1685	2029
255	1606	2451	3296	4141	4986

Spring Return Pneumatic Operated Torque Output (lb-in)

Actuator Size	No. Springs Per Piston	Air Supply Pressure (PSIG)					
		40	60	80	100	120	Spring Stroke
48	1	32	70	107	145	182	24
	2/1	10	48	85	123	160	36
	2		27	64	102	139	49
	3/2		5	42	80	117	61
	3			21	59	96	73
63	2	65	141	217	293	369	54
	3	27	103	179	255	331	81
	4		65	141	217	293	108
	5		27	103	179	255	135
	6			65	141	217	162
83	2	167	352	537	722	907	141
	3	76	261	446	631	816	195
	4		176	361	546	731	255
	5		97	282	467	652	316
	6			185	370	555	352
93	2	232	492	752	1011	1271	183
	3	101	361	621	880	1140	275
	4		231	491	750	1010	367
	5		94	354	613	873	459
	6			229	488	748	551
119	2	469	1026	1582	2139	2696	366
	3	174	731	1287	1844	2401	549
	4		437	993	1550	2107	732
	5		142	698	1255	1812	915
	6			404	961	1518	1098
128	2	465	1207	1949	2691	3433	530
	3		733	1475	2217	2959	795
	4		261	1003	1745	2487	1058
	5			529	1271	2013	1326
	6			57	799	1541	1592
160	2	1118	2591	4063	5535	7008	978
	3	349	1822	3294	4766	6239	1398
	4		1123	2595	4067	5540	1818
	5		353	1825	3297	4770	2240
	6			1196	2668	4141	2588
210	2	2508	5551	8595	11639	14682	1950
	3	868	3911	6955	9999	13042	2924
	4		2275	5319	8363	11406	3896
	5		638	3682	6726	9769	4877
	6			2031	5075	8118	5848
255	2	6747	14227	21707	29186	36666	4724
	3	3015	10495	17975	25454	32934	7086
	4		6762	14242	21721	29201	9448
	5		3030	10510	17989	25469	11811
	6			6778	14257	21737	14173

Spring Return Pneumatic Operated Torque Output (N m)

Actuator Size	No. Springs Per Piston	Air Supply Pressure (BAR)					
		2.8	41	5.5	6.9	8.3	Spring Stroke
48	1	4	8	12	16	21	3
	2/1	1	5	10	14	18	4
	2		3	7	12	16	6
	3/2		1	5	9	13	7
	3			2	7	11	8
63	2	7	16	25	33	42	6
	3	3	12	20	29	37	9
	4		7	16	25	33	12
	5		3	12	20	29	15
	6			7	16	25	18
83	2	19	40	61	82	103	16
	3	9	30	50	71	92	22
	4		20	41	62	83	29
	5		11	32	53	74	36
	6			21	42	63	40
93	2	26	56	85	114	144	21
	3	11	41	70	99	129	31
	4		26	56	85	114	42
	5		11	40	69	99	52
	6			26	55	85	62
119	2	53	116	179	242	305	41
	3	20	83	145	208	271	62
	4		49	112	175	238	83
	5		16	79	142	205	103
	6			46	109	172	124
128	2	53	136	220	304	388	60
	3		83	167	251	334	90
	4		30	113	197	281	120
	5			60	144	227	150
	6			6	90	174	180
160	2	126	293	459	625	792	111
	3	39	206	372	539	705	158
	4		127	293	460	626	205
	5		40	206	373	539	253
	6			135	301	468	292
210	2	283	627	971	1315	1659	220
	3	98	442	786	1130	1474	330
	4		257	601	945	1289	440
	5		72	416	760	1104	551
	6			230	573	917	661
255	2	762	1607	2453	3298	4143	534
	3	341	1186	2031	2876	3721	801
	4		764	1609	2454	3299	1068
	5		342	1188	2033	2878	1335
	6			766	1611	2456	1601

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NOTE: Only end of stroke values are shown on spring return charts.

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EXAMPLES OF HOW TO SIZE AN ACTUATOR

Select Bray Double Acting (Air-to-Air) pneumatic actuator, Single Acting (Spring Return) pneumatic actuator and a Bray Electric Actuator for the following application:

> Valve: 2" F15, Full Port – Line Pressure: 200 psi – Line Media: Saturated Steam – Seat Material: Tek-Fil®

> Actuator Air Supply Pressure: 80 psig — Frequency of operation: 4 times per day.

Step 1 Determine The Torque Requirement

Refer to the Valve Torque Requirements chart for a Tek-Fil® seat. A 2" valve with line pressure of 200 psi has a torque requirement of 380 lb-in. The application is for Saturated Steam so use an Application Factor of 1.3. The valve has a plain round port, so use a Design Factor of 0.0. The frequency of operation is 4 times per day so use a Frequency Factor of 0.0. The total torque factor is 1.3 (1.3 + 0.0 + 0.0 = 1.3).

> Valve Torque Requirement: 380 x 1.3 = 494 lb-in.

> Note: This valve does not use a Media Containment Unit so no additional torque is required.

Step 2 Select the Correct Actuator Size

Double Acting Pneumatic Actuator, with Air Supply pressure of 80 psig

From the Double Acting Pneumatic Operated Output chart select the size actuator that exceeds 494 lb-in with an 80 psig air supply. The size 83 actuator (smallest actuator size that has torque above valve torque) has a torque output of 721 lb-in.

Correct Actuator: Size 83

Spring Return Pneumatic Actuator, with Air Supply pressure of 80 psig

From the Spring Return Pneumatic Operated Output chart select the size actuator that exceeds 494 lb-in with an 80 psig air supply. FOR SPRING RETURN THE ENDING OF THE AIR STROKE AND THE SPRING STROKE MUST EXCEED THE VALVE TORQUE REQUIREMENT OF 494 lb-in. The first actuator to accomplish this is the size 119 with 3 springs (air end 1287 lb-in, spring stroke 549 lb-in). The next size actuator is a 119 with 4 springs (air end 993 lb-in, spring end 732 lb-in). The end stroke of torque on a 119-4 is more balanced and it allows for changes in service conditions.

Correct Actuator: Size 119-3 or 119-4. Depending on the application data and air supply consistency.

Electric Actuator

The Application Factors for Series 70 ON/OFF is 1.2. Valve Torque Requirement:
494 lb-in x 1.2 = 592.8 lb-in.

From the Electric Actuator Torque Output charts select the size actuator that exceeds 592.8 lb-in.

Correct Actuator: Size S70-006 (torque output of 600 lb-in)

Step 3 Select the Mounting Kit to Connect the Valve and Actuator

Refer to the EZ Ordering Code Matrix for 2" F15, Full Port valve.

Pneumatic Double Acting: 2" F15 valve with size 083 actuator requires EZ-005.

Pneumatic Spring Return: 2" F15 valve with size 119-4 actuator requires EZ-010.

Electric: 2" F15 valve with size S70-006 actuator requires EZ-005.

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ISO MOUNTING KIT - EZ CODE MATRIX "S" DRIVE

F15/30 SERIES VALVES

Valve Size		Type	ACTUATOR SIZE / MODEL								
F.P.		Electric[2]			003E, 006E, 008E		012E, 020E, 030E			050, 065, 1316, 1816	1306, 1806
NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160	B210	B255B
½	15		EZ-002S-3C		EZ-003S-3C						
¾	20										
1	25		EZ-008S-3C		EZ-009S-3C		EZ-021S		EZ-060S		
1½	40		EZ-004S-3C		EZ-005S-3C		EZ-010S-3C		EZ-059S		
2	50										
2½	65				EZ-011S		EZ-012S				
3	80										
4	100									EZ-013S	
6	150								EZ-014S	EZ-015S	EZ-074S
8	200										
10	250									EZ-040S	EZ-030S
12	300										

RF15/30 SERIES VALVES

Valve Size		Type	ACTUATOR SIZE / MODEL								
S.P.		Electric[2]			003E, 006E, 008E		012E, 020E, 030E			050, 065, 1316, 1816	1306, 1806
NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160	B210	B255B
1	25		EZ-002S-3C		EZ-003S-3C						
1½	40		EZ-003S-3C		EZ-009S-3C						
2	50		EZ-004S-3C		EZ-029S-3C		EZ-027-3C		EZ-059S		
3	80										
4	100				EZ-024S		EZ-025S			EZ-026S	
6	150									EZ-068S	EZ-074S
8	200								EZ-014S	EZ-015S	
10	250									EZ-040S	EZ-030S
12	300										

NOTES:

1. EZ CODE is not an actuator sizing guide. Size the actuator for the proper torque of the valve.
2. For electric actuation, use "D" in place of "S" for the drive type digit of the EZ Kit part number.
3. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number.
4. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless.

EZ KIT NUMBERING SYSTEM						
EZ	–	001	S	–	2	
Mount Kit		**EZ Kit #**	**Drive Type:** S - Star/square D - Double D or round with key		**Material:** 2 - Carbon Steel 3 - Stainless Steel	**Bracket Type:** C - Cast Bracket Blank - Fabricated Bracket L D - Locking Device

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ISO MOUNTING KIT - EZ CODE MATRIX "S" DRIVE

TRIAD SERIES VALVES

Valve Size				Type	ACTUATOR SIZE / MODEL								
S.P.		F.P.		Electric[2]			003E, 006E, 008E		012E, 020E, 030E			050, 065, 1316, 1816	1306, 1806
NPS	DN	NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160	B210	B255B
-	-	¼	8		EZ-002S-3C		EZ-003S-3C						
-	-	⅜	10										
¾	20	½	15										
1	25	¾	20										
1¼	32	1	25		EZ-004S-3C		EZ-005S-3C		EZ-010S-3C				
1½	40	1¼	32										
2	50	1½	40				EZ-006S-3C		EZ-007S-3C		EZ-056S-3		
2½	65	2	50										
		3	80						EZ-012S			EZ-013S	
		4	100						Contact Factory			EZ-015S	EZ-074S

7000/8000 SERIES VALVES

Valve Size		Type	ACTUATOR SIZE / MODEL							
F.P.		Electric[2]			003E, 006E, 008E		012E, 020E, 030E			050, 065,1316, 1816
NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160	B210
¼	8		EZ-002S-3C		EZ-003S-3C					
⅜	10									
½	15									
¾	20									
1	25		EZ-008S-3C		EZ-009S-3C					
1¼	32									
1½	40		EZ-004S-3C		EZ-005S-3C		EZ-010S-3C			
2	50									
2½	65				EZ-018S		EZ-019S-3C			
3	80				EZ-011S		EZ-012S			EZ-013S
4	100									
6	150								EZ-014S	EZ-015S
8	200									

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NOTES:

1. EZ CODE is not an actuator sizing guide. Size the actuator for the proper torque of the valve.
2. For electric actuation, use "D" in place of "S" for the drive type digit of the EZ Kit part number (as shown on the bottom of page 12).
3. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
4. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).

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ISO MOUNTING KIT - EZ CODE MATRIX "S" DRIVE

S7500/S7700 SERIES VALVES

Valve Size		Type	ACTUATOR SIZE / MODEL						
OD Tube Port		Electric[2]			003E, 006E, 008E		012E, 020E, 030E		
NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160
½	15		EZ-002S-3C		EZ-003S-3C				
¾	20								
1	25								
1½	40		EZ-008S-3C		EZ-009S-3C		EZ-021S		
2	50		EZ-004S-3C		EZ-005S-3C		EZ-010S-3C		
2½	65				EZ-018S				
3	80				EZ-011S		EZ-012S		
4	200						EZ-012S		

S70 / S90 SERIES VALVES

Valve Size		Type	ACTUATOR SIZE / MODEL			
S.P.		Electric[2]			003E, 006E, 008E	
NPS	DN	Pneumatic	B048	B063	B083	B093
¾	20		EZ-002S-3C		EZ-003S-3C	
1	25					
1½	40		EZ-031S		EZ-032S	
2	50		EZ-004S-3C		EZ-005S-3C	

S85 SERIES VALVES

Valve Size		Type	ACTUATOR SIZE / MODEL						
F.P.		Electric[2]			003E, 006E, 008E		012E, 020E, 030E		
NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160
½	15		EZ-002S-3C		EZ-0035-3C				
¾	20								
1	25		EZ-008S-3C		EZ-009S-3C				
1¼	32								
1½	40		EZ-004S-3C		EZ-005S-3C		EZ-010S-3C		
2	50								
2½	65				EZ-006S-3C		EZ-007S-3C		
3	80				EZ-018S			EZ-019S	EZ-055S

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NOTES:

1. EZ CODE is not an actuator sizing guide. Size the actuator for the proper torque of the valve.
2. For electric actuation, use "D" in place of "S" for the drive type digit of the EZ Kit part number (as shown on the bottom of page 12).
3. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
4. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).

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ISO MOUNTING KIT - EZ CODE MATRIX "S" DRIVE

MPT130 / MPC 130 SERIES VALVES

Valve Size				Type	ACTUATOR SIZE / MODEL						
MPT Size		MPC Size		Electric[2]			003E, 006E, 008E		012E, 020E, 030E		
NPS	DN	NSP	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160
¼-½	8-15	½	15		EZ-034S-3C		EZ-035S-3C				
¾	20	¾	20								
1	25	1	25		EZ-036S-3C		EZ-037S-3C				
1¼	32	-	-								
1½	40	1½	40		EZ-048S		EZ-038S		EZ-039S		
2	50	2	50								

MPT230 / MPC 230 AND MPF 150/300 SERIES VALVES

Valve Size						Type	ACTUATOR SIZE / MODEL								
MPT Size		MPC, MPB, MPS		MPF[5] Size		Electric[2]			003E, 006E, 008E		012E, 020E, 030E			050, 065	
NPS	DN	NPS	DN	NPS	DN	Pneumatic	B048	B063	B083	B093	B119	B128	B160	B210	B255B
¼ - ½	8-15	½	15	½	15		EZ-034S-3C		EZ-035-3C						
¾	20	¾	20	¾	20		EZ-036S-3C		EZ-037S						
1	25	1	25	1	25										
1¼	32	-	-	1¼	32		EZ-048S		EZ-041S						
1½	40	1½	40	1½	40				EZ-038S		EZ-039S				
2	50	2	50	2	50				EZ-042S		EZ-043S				
2½	65	2½	65	2½	65				EZ-044S						
3	80	3	80	3	80						EZ-045S			EZ-046S	
4	100	4	100	4	100										
		-	-	6	150								EZ-047S	EZ-073S	EZ-075S
		-	-	8[5]	200[5]										

NOTES:

1. EZ CODE is not an actuator sizing guide. Size the actuator for the proper torque of the valve.
2. For electric actuation, use "D" in place of "S" for the drive type digit of the EZ Kit part number (as shown on the bottom of page 11).
3. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
4. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).
5. 8" Available in MPF 150 only.

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S19 SEGMENTED BALL VALVE: EZ MOUNTING KITS

S19 – MOUNTING KITS FOR PNEUMATIC ACTUATOR ("DOUBLE D" DRIVE)

Valve Size		MOUNTING KIT CODE								
NPS	DN	B048	B063[2]	B083	B093	B119	B128	B160A	B210	B255A
1	25	EZ-200D		EZ-201D						
1½	40									
2	50		EZ-202D	EZ-203D		EZ-204D				
3	80			EZ-205D		EZ-206D				
4	100									
6	150					EZ-207D			EZ-208D	
8	200					EZ-209D			EZ-210D	EZ-211D
10	250									
12	300									

S19 – MOUNTING KITS FOR PNEUMATIC ACTUATOR ("S" DRIVE)

Valve Size		MOUNTING KIT CODE								
NPS	DN	B048	B063	B083	B093	B119	B128	B160	B210	B255
1	25	EZ-212S		EZ-213S						
1½	40									
2	50			EZ-214S		EZ-215S				
3	80					EZ-216S				
4	100							EZ-235S		
6	150					EZ-217S			EZ-218S	
8	200								EZ-219S	EZ-220S
10	250									
12	300									

NOTES:

1. EZ CODE is not an actuator sizing guide. Size the actuator for the proper torque of the valve.
2. When sizing a B063 "Double D" drive actuator for a 1" and 1½" valve, the pneumatic actuator will need an alternate pinion. Please specify that the pneumatic actuator should contain a pinion with part number 90-0630-94301

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BRAY MANUAL OPERATORS FOR S19 CL150/300 and PN10/PN16/PN25/PN40

	HANDLE SIZE SERIES 01					
VALVE SIZE		SIZE 0100 F05 - DD 10x8mm	SIZE 0200 F07 - DD 14x10mm	SIZE 0250 F07 - DD 16x11mm	SIZE 0600 F07 - DD 19x13mm	SIZE 0800 F07 - DD 22x16mm
DN25 F05 DD 10X8mm	➞	010100-21100007 + 19-0150-70602				
DN40 F05 DD 10X8mm	➞					
DN50 F07 DD 14X10mm	➞		010200-21100007			
DN65 F07 DD 14X10mm						
DN80 F07 DD 16X11mm	➞			010250-21141007	010600-21141007 + 301619-71500528	
DN100 F07 DD 16X11mm	➞					
DN125 F07 / F12 DD 22X16mm						010800-21141007
DN150 F07 / F12 DD 22X16mm	➞					

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BRAY MANUAL OPERATORS FOR S19 CL150/300 and PN10/PN16/PN25/PN40

VALVE SIZE		GEAR OPERATOR SIZE / MODEL S04						
		SIZE 0200 F07 - DD 19x13mm HW 8″	SIZE 0300 F12 - DD 30x22mm HW 8″	SIZE 0500 F12 - Ø 35mm HW 12″	SIZE 0800 F12/F16 - Ø50mm HW 12″	SIZE 1500 F16 -Ø63.5mm HW 18″	SIZE 1500 F16/F25/F30 - Ø63.5mm HW 24″	SIZE 1500 F16 -Ø76.2mm HW 18″
DN50 F07 DD 14X10mm	→	040200-21202002 + 301419-71500528						
DN65 F07 DD 14X10mm	→							
DN80 F07 DD 16X11mm	→	040200-21202002 + 301619-71500528						
DN100 F07 DD 16X11mm	→							
DN125 F07 / F12 DD 22X16mm	→		040300-21202002 + 302230-71500528	040500-21202002 + 302235-23200528				
DN150 F07 / F12 DD 22X16mm	→							
DN200 F12 DD 30X22mm	→		040300-21202002	040500-21202002 + 303035-71500528	040800-21206002 + 303050-23206528			
DN250 F12 DD 30X22mm	→							
DN300 F12 DD 30X22mm	→							
DN350 F16 Ø50mm	→				040800-21202002			041500-21212002 + 305076-23201528
DN400 F16 Ø63.5mm	→					041500-21219002	041500-21216002	

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BRAY MANUAL OPERATORS FOR S19 CL150/300 and PN10/PN16/PN25/PN40

DECLUTCHABLE GEAR OPERATOR SIZE / MODEL S05									
		S92/93 Actuator							
VALVE SIZE	S05 Gear Operator Size	S92/93 - 063x F05/F07 - DD 14x10mm	S92/93 - 083x - 093x F05/F07 - DD 19x13mm	S92/93 - 119x - 128x F07/F12 - DD 30x22mm	S92/93 - 160A F12 - DD 30x22mm	S92/93 - 160B F12 - 35mm	S92/93 - 210x F12/F16 - Ø 50mm	S92/93 - 255A F16/200x120 - Ø 63.5mm	S92/93 - 255B F16/200x120 - Ø 76mm
DN50 / DN65 F07 DD 14X10mm	SIZE 0200 F07 - DD 19x13mm	05-20A1-22600	05-21A1-22600	05-22A1-22600					
DN80 / DN100 F07 DD 16X11mm	SIZE 0200 F07 - DD 19x13mm	05-22B1-22600	05-20B1-22600	05-21B1-22600					
	SIZE 0300 F07/F12 - DD 30x22mm			05-30B2-22600		05-31B2-22600	05-32B2-22600		
DN125 / DN150 F07 / F12 DD 22X16mm	SIZE 0300 F07/F12 - DD 30x22mm			05-30D1-22600		05-31D1-22600	05-32D1-22600		
	SIZE 0800 F12/F16 - Ø50mm				05-83D4-22600	05-84D4-22600	05-80D4-22600	05-81D4-22600	05-82D4-22600
DN200 / DN250 / DN300 F12 DD 30X22mm	SIZE 0300 F07/F12 - DD 30x22mm			05-30E0-22600		05-31E0-22600	05-32E0-22600		
	SIZE 0500 F12 - 30x22mm				05-51E0-22600	05-52E0-22600	05-50E0-22600		
	SIZE 0800 F12/F16 - Ø50mm				05-83E2-22600	05-84E2-22600	05-80E2-22600	05-81E2-22600	05-82E2-22600
DN350 F16 Ø50mm	SIZE 0800 F12/F16 - Ø50mm				05-83G0-22600	05-84G0-22600	05-80G0-22600	05-81G0-22600	05-82G0-22600
DN400 F16 Ø63.5mm	SIZE 0800 F12/F16 - Ø63.5mm							05-81H0-22600	

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BRAY MANUAL OPERATORS FOR S19 CL600 and S19L CL150/300/600

	GEAR OPERATOR SIZE / MODEL S04							
VALVE SIZE		**SIZE 0200 F07 - DD 19x13mm HW 8″**	**SIZE 0300 F12 - DD 30x22mm HW 8″**	**SIZE 0500 F12 - Ø 35mm HW 12″**	**SIZE 0800 F12/F16 - Ø50mm HW 12″**	**SIZE 1500 F16 - Ø63.5mm HW 18″**	**SIZE 1500 F16/F25/F30 - Ø63.5mm HW 24″**	**SIZE 1500 F16 - Ø76.2mm HW 18″**
DN50 [150/300/600#] F07 - DD 14X10mm	→	040200-21202002 + 301419-71500528						
DN80 [150/300/600#] F07 - DD 19X13mm	→	040200-21202002						
DN100 [150/300/600#] F07 - DD 19X13mm	→							
DN150 [150/300/600# - up to 50dP] F12 - DD 22X16mm	→		040300-21202002 + 302230-71500528	040500-21202002 + 302235-23200528				
DN150 [600# - above 50dP] F12 - Ø25.4mm	→		040300-21202002 + 19-0600-22652		040800-21206002 + 19-0600-22650			
DN200 [150/300/600#] F12 - DD 30X22mm	→		040300-21202002	040500-21202002 + 303035-71500528	040800-2120600 + 303050-23206528			
DN250 [150/300#] F12 - Ø35mm	→			040500-21202002	040800-21206002 + 303550-23200528			
DN300 [150/300#] F12 - Ø35mm	→							
DN250 [600#] F12/F16 - Ø35mm	→					041500-21219002 + 303564-23200528	041500-21216002 + 303564-23200528	
DN300 [600# - upto 50dP] F12/F16 - Ø35mm	→							
DN300 [600# - above 50dP] F12/F16 - Ø44.5mm	→					041500-21219002 + 98-EH08-22650	041500-21216002 + 98-EH08-22650	
DN350 [150/300#] F16 - Ø50mm					040800-21202002			41500-21212002 + 30-5076-23201
DN400 [150/300#] F16 - Ø63.5mm	→					041500-21219002	041500-21216002	
DN400 [600#] F16/F25 - Ø63.5mm	→							

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BRAY MANUAL OPERATORS FOR S19 CL600 and S19L CL150/300/600

DECLUTCHABLE GEAR OPERATOR SIZE / MODEL S05									
		S92/93 Actuator							
VALVE SIZE	S05 Gear Operator Size	S92/93 - 063x F05/F07 - DD 14x10mm	S92/93 - 083x - 093x F05/F07 - DD 19x13mm	S92/93 - 119x - 128x F07/F12 - DD 30x22mm	S92/93 - 160A F12 - DD 30x22mm	S92/93 - 160B F12 - 35mm	S92/93 - 210x F12/F16 - Ø 50mm	S92/93 - 255A F16/200x120 - Ø 63.5mm	S92/93 - 255B F16/200x120 - Ø 76mm
DN50 [150/300/600#] F07 - DD 14X10mm	SIZE 0200 F07 - DD 19x13mm	05-20A1-22600	05-21A1-22600	05-22A1-22600					
DN80 [150/300/600#] / DN100 [150/300/600#] F07 - DD 19X13mm	SIZE 0200 F07 - DD 19x13mm	05-22C0-22600	05-20C0-22600	05-21C0-22600					
	SIZE 0300 F07/F12 - DD 30x22mm			05-30C1-22600		05-31C1-22600	05-32C1-22600		
DN150 [150/300/600# - up to 50dP] F12 - DD 22X16mm	SIZE 0300 F07/F12 - DD 30x22mm			05-30D1-22600		05-31D1-22600	05-32D1-22600		
	SIZE 0800 F12/F16 - Ø50mm				05-83D4-22600	05-84D4-22600	05-80D4-22600	05-81D4-22600	05-82D4-22600
DN200 [150/300/600#] F12- DD 30X22mm	SIZE 0300 F07/F12 - DD 30x22mm			05-30E0-22600		05-31E0-22600	05-32E0-22600		
	SIZE 0500 F12 - 30x22mm				05-51E0-22600	05-52E0-22600	05-50E0-22600		
	SIZE 0800 F12/F16 - Ø50mm				05-83E2-22600	05-84E2-22600	05-80E2-22600	05-81E2-22600	05-82E2-22600
DN250 [150/300#] / DN300 [150/300#] F12 - Ø35mm	SIZE 0500 F12 - Ø35mm				05-50F0-22600	05-51F0-22600	05-52F0-22600	05-53F0-22600	05-54F0-22600
	SIZE 0800 F12/F16 - Ø50mm				05-83F1-22600	05-84F1-22600	05-80F1-22600	05-81F1-22600	05-82F1-22600
DN250 [600#] / DN300 [600# - upto 50dP] F12/F16 - Ø35mm	SIZE 0500 F12 - Ø35mm				05-50F0-22600	05-51F0-22600	05-52F0-22600	05-53F0-22600	05-54F0-22600
	SIZE 0800 F12/F16 - Ø50mm				05-83F1-22600	05-84F1-22600	05-80F1-22600	05-81F1-22600	05-82F1-22600
DN350 [150/300#] F16 - Ø50mm	SIZE 0800 F12/F16 - Ø50mm				05-83G0-22600	05-84G0-22600	05-80G0-22600	05-81G0-22600	05-82G0-22600
DN400 [150/300#] F16 - Ø63.5mm	SIZE 0800 F12/F16 - Ø63.5mm							05-81H0-22600	
DN400 [600#] F16/F25 - Ø63.5mm									
Note : For DN150 & DN300 #600 above 50dp consult engineering									

Assembly Base Numbers [50 BAR]	S19 - 11010, 11011, 11012, 11013 & S19L -11024, 11025, 11026
Assembly Base Numbers [100 BAR]	S19 - 11014, 11015, 11016, 11017 & S19L - 11027

Note: This document shall be used for selecting mounting kit part number and not basis for Actuator selection

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DM7000/DM8000 – MOUNTING KITS FOR PNEUMATIC ACTUATOR ("S" DRIVE)

Valve Size		DIRECT MOUNTING KIT CODE					
NPS	DN	B048	B063	B083	B093	B119	B128
½	15	EZ-119S	EZ-107S				
¾	20						
1	25	EZ-108S		EZ-111S			
1¼	32						
1½	40			EZ117S		EZ-118S	
2	50						

NOTE:

1. EZ CODE is not an actuator sizing guide. Size the actuator for the proper torque of the valve.

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ISO MOUNTING KIT - EZ GEAR CODE MATRIX "S" DRIVE

F15/30 SERIES VALVES

Valve Size		GEAR SIZE / MODEL				
F.P.		FTG42L	FTG42	FTG60	FTG70	FTG88
NPS	DN					
½	15	EZ-003S-3C				
¾	20					
1	25	EZ-009S-3C				
1½	40	EZ-005S-3C	EZ-010S-3C			
2	50					
2½	65	EZ-011S	EZ-012S	EZ-013S		
3	80					
4	100					
6	150		EZ-014S	EZ-015S	EZ-069S	
8	200					
10	250				EZ-030S	EZ-041S
12	300					

RF15/30 SERIES VALVES

Valve Size		GEAR SIZE / MODEL				
S.P.		FTG42L	FTG42	FTG60	FTG70	FTG88
NPS	DN					
1	25	EZ-003S-3C				
1½	40	EZ-009S-3C				
2	50	EZ-029S-3C	EZ-010S-3C			
3	80	EZ-024S	EZ-025S			
4	100					
6	150			EZ-013S		
8	200		EZ-014S	EZ-015S		
10	250				EZ-069S	
12	300				EZ-030S	EZ-030S

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NOTES:

1. EZ CODE is not a gear sizing guide. Size the gear for the proper torque of the valve.
2. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
3. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).

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ISO MOUNTING KIT - EZ GEAR CODE MATRIX "S" DRIVE

TRIAD SERIES VALVES

Valve Size				GEAR SIZE / MODEL		
S.P.		F.P.		FTG42L	FTG42	FTG60
NPS	DN	NPS	DN			
-	-	¼	8			
-	-	⅜	10			
¾	20	½	15	EZ-003S-3C		
1	25	¾	20			
1¼	32	1	25	EZ-005S-3C		
1½	40	1¼	32			
2	50	1½	40	EZ-006S-3C	EZ-007S-3C	
2½	65	2	50			
-	-	3	80	EZ-011S	EZ-012S	
-	-	4	100		EZ-014S	EZ-015S

7000/8000 SERIES VALVES

Valve Size		GEAR SIZE / MODEL		
F.P.		FTG42L	FTG42	FTG60
NPS	DN			
¼, ⅜, ½	8, 10, 15	EZ-003S-3C		
¾	20			
1	25	EZ-009S-3C		
1¼	32			
1½	40	EZ-005S-3C		
2	50			
2½	65	EZ-006S-3C		
3	80	EZ-011S	EZ-012S	
4	100			
6	150		EZ-014S	EZ-015S
8	200			

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NOTES:

1. EZ CODE is not a gear sizing guide. Size the gear for the proper torque of the valve.
2. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
3. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).

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ISO MOUNTING KIT - EZ GEAR CODE MATRIX "S" DRIVE

S7500/S7700 SERIES VALVES

Valve Size		GEAR SIZE / MODEL			
OD Tube Port		FTG42L	FTG42	FTG60	FTG70
NPS	DN				
½	15	EZ-003S-3C			
¾	20				
1	25				
1½	40	EZ-009S-3C			
2	50	EZ-005S-3C			
2½	65	EZ-006-3C			
3	80	EZ-011S	EZ-012S		
4	100				

S70 / S90 SERIES VALVES

Valve Size		GEAR SIZE / MODEL			
S.P.		FTG42L	FTG42	FTG60	FTG70
NPS	DN				
¾	20	EZ-003S-3C			
1	25	EZ-009S-3C			
1½	40	EZ-005S-3C			
2	50				
2½	65				
3	80	EZ-006S-3C			

S85 SERIES VALVES

Valve Size		GEAR SIZE / MODEL			
F.P.		FTG42L	FTG42	FTG60	FTG70
NSP	DN				
½	15	EZ-003S-3C			
¾	20				
1	25	EZ-009S-3C			
1¼	32				
1½	40	EZ-005S-3C			
2	50				
2½	65	EZ-006S-3C			
3	80	EZ-018S	EZ-019S-3C		

NOTES:

1. EZ CODE is not a gear sizing guide. Size the gear for the proper torque of the valve.
2. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
3. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).

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ISO MOUNTING KIT - EZ GEAR CODE MATRIX "S" DRIVE

MPT130 / MPC 130 SERIES VALVES

Valve Size				GEAR SIZE / MODEL			
MPT		MPC		FTG42L	FTG42	FTG60	FTG70
NPS	DN	NPS	DN				
¼-½	8-15	½	15	EZ-035S			
¾	20	¾	20				
1	25	1	25	EZ-037S			
1¼	32	-	-				
1½	40	1½	40	EZ-038S	EZ-039S		
2	50	2	50				

MPT230 / MPC230 AND MPF150/300 SERIES VALVES

Valve Size						GEAR SIZE / MODEL			
MPT		MPC, MPB, MPS		MPF		FTG42L	FTG42	FTG60	FTG70
NPS	DN	NPS	DN	NPS	DN				
¼-½	8-15	½	15	½	15	EZ-035S-3C			
¾	20	¾	20	¾	20	EZ-037S-3C			
1	25	1	25	1	25				
1¼	32	-	-	-	-	EZ-038S-3C			
1½	40	1½	40	1½	40				
2	50	2	50	2	50	EZ-042S	EZ-043S		
2½	65	2½	65	2½	65	EZ-044S	EZ-045S	EZ-046S	
3	80	3	80	3	80				
4	100	4	100	4	100				
		-	-	6	150			EZ-051S	
		-	-	8[2]	200[2]				

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NOTES:

1. EZ CODE is not a gear sizing guide. Size the gear for the proper torque of the valve.
2. 8" available in MPF 150 only.
3. Carbon steel kits use 2 and stainless steel kits use 3 for the material digit of the EZ Kit part number (as shown on the bottom of page 12).
4. Where C is used for the bracket type digit in the EZ Code Matrix, these kits only come in stainless (as shown on the bottom of page 12).

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CONVERSIONS

Length Equivalents

Multiply Number of / To Obtain by	Meters	Inches	Feet	Millimeters	Miles	Kilometers
Meters	1	39.37	3.2808	1000	0.0006214	0.001
Inches	0.0254	1	0.0833	25.4	0.00001578	0.0000254
Feet	0.3048	12	1	304.8	0.0001894	0.0003048
Millimeters	0.001	0.03937	0.0032808	1	0.0000006214	0.000001
Miles	1609.35	63,360	5,280	1,609,350	1	1.60935
Kilometers	1,000	39,370	3280.83	1,000,000	0.62137	1

1 meter = 100 centimeters = 1000 millimeters = 0.001 kilometers = 1,000,000 micrometers
To convert metric units, adjust the decimal point
1 millimeter = 1000 microns = 0.03937 inches = 39.37 mils.

Pressure Equivalents

Multiply Number of / To Obtain by	Kg. Per Sq. Cm.	Lb. Per Sq. In.	Atmosphere	Bar	In. of Hg.	Kilopascals	In. of Water	Ft. of Water
Kg. Per Sq. Cm.	1	14.22	0.9678	0.98067	28.96	98.067	394.05	32.84
Lb. Per Sq. In.	0.07031	1	0.06804	0.06895	2.036	6.895	27.7	2.309
Atmosphere	1.0332	14.696	1	1.01325	29.92	101.325	407.14	33.93
Bar	1.01972	14.5038	0.98692	1	29.53	100	402.156	33.513
In. of Hg.	0.03453	0.4912	0.03342	0.033864	1	3.3864	13.61	1.134
Kilopascals	0.0101972	0.145038	0.0098696	0.01	0.2953	1	4.02156	0.33513
In. of Water	0.002538	0.0361	0.002456	0.00249	0.07349	0.249	1	0.0833
Ft. of Water	0.03045	0.4332	0.02947	0.029839	0.8819	2.9839	12	1

1 ounce/sq.inch = 0.0625 lbs./sq. inch

Volume Equivalents

Multiply Number of / To Obtain by	Liters	Cubic Inches	Cubic Feet	U.S. Quart	U.S. Gallon	Imperial Gallon	U.S. Barrel (Petroleum)
Liters	1	61.0234	0.03531	1.05668	0.264178	0.220083	0.00629
Cubic Inches	0.01639	1	5.787×10^{-4}	0.01732	0.004329	0.003606	0.000103
Cubic Feet	28.317	1728	1	29.9221	7.48055	6.22888	0.1781
U.S. Quart	0.94636	57.75	0.03342	1	0.25	0.2082	0.00595
U.S. Gallon	3.78543	231	0.13368	4	1	0.833	0.02381
Imperial Gallon	4.54374	277.274	0.16054	4.80128	1.20032	1	0.02877
U.S. Barrel (Petroleum)	158.98	9702	5.6146	168	42	34.973	1

1 cubic meter = 1,000,000 cubic centimeters 1 liter = 1000 milliliters

Volume Rate Equivalents

Multiply Number of / To Obtain by	Liters per Minute	Cubic Meters per Hour	Cubic Feet per Hour	Liters per Hour	U.S. Gallon per Minute	U.S. Barrel per Day
Liters per Minute	1	0.06	2.1189	60	0.264178	9.057
Cubic Meters per Hour	16.667	1	35.314	1000	4.403	151
Cubic Feet per Hour	0.4719	0.028317	1	28.317	0.1247	4.2746
Liters per Hour	0.016667	0.001	0.035314	1	0.004403	0.151
U.S. Gallon per Minute	3.785	0.2273	8.0208	227.3	1	34.28
U.S. Barrel per Day	0.1104	0.006624	0.23394	6.624	0.02917	1

Torque Conversion Factors

Multiply Number of / To Obtain by	Lb. Inches	Lb. Ft.	g - cm	kg - cm	kg - m	mN - m	cN - m	N - m
Lb. - Ins.	1	0.083	11.52.1	1.152	0.0115	113	11.3	0.113
Lb. - Ft.	12	1	13826	13.83	0.138	1356	135.6	1.356
g - cm	0.0009	0.0007	1	0.001	0.00001	0.098	0.01	0.0001
kg - cm	0.868	0.072	1000	1	0.01	98.07	9.807	0.098
kg - m	86.8	7.233	100000	100	1	9807	980.7	98.7
mN - m	0.009	0.0007	10.2	0.01	0.0001	1	0.1	0.001
cN - m	0.088	0.007	102	0.102	0.001	10	1	0.01
N - m	8.851	0.738	10197	10.2	0.102	1000	100	1
	American Standard		Metric Standard			International System - S.I.		

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Bray International, Inc.
13333 Westland East Blvd.
Houston, Texas 77041
Tel: +1.281.894.5454

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