HABONIM
An ITT Company

MAST

Data Sheet
Maximum Allowable Stem Torque (MAST)

PERFORMING IN DEMANDING APPLICATIONS

Maximum Allowable Stem Torque (MAST)

Introduction

MAST is the Maximum Allowable Stem Torque to which a quarter-turn valve stem can be subjected during operation without mechanical failure.

The MAST values shown in Table A are based on a laboratory test conducted by Habonim engineers at ambient temperature. The test included severe cycle operation under the maximum load shown in Table A, followed by a dimensional check and a die penetrant test to verify that the valve stem is in operable condition and within the elastic boundaries.

Table B represents the theoretical maximum allowable torque figures according to the Roark formula for stress and strain.

The yield strength values used for calculating the maximum allowable torque are in accordance with the technical specifications provided by Habonim to its stem material suppliers. These figures exceed the values required by the ASTM standards.

Habonim recommends the use of the data in Table B for severe service applications such as high cycle and modulating, as well as when sizing requires a larger safety factor such as valves complying with API6D and SIL certified packages.

Tables C, D and E are a detailed map of stem sizes designed by Habonim, sorted according to the various valve series at ambient temperature, cryogenic temperature and elevated temperature.

Example:

- Select the valve size and series, and search for the stem size according to Tables C-E.
- Use the stem size and stem material to obtain the MAST from Table A or Table B.
- Use the valve torque graphs and verify that the MAST does not exceed the valve's maximum torque at the application maximum differential pressure.

Important notes:

- For valves complying with API6D and SIL certified packages, the valve maximum torque must not exceed 50% of the MAST figures shown in Table B.
- In accordance with API6DX / ISO 12490, the actuator maximum torque must not exceed the valve MAST.

Table A - based on experimental results (Exist)

Stem	Unit	17-4PH A564 S17400	XM-19	Alloy C22 B574 N06022	Alloy 20 B473 N08020	Monel 400 A164 N04400	Duplex A479 S31803	Super Duplex A479 S32750	254 SMO A479 S31254	Titanium Gr.2 B348 R50400	Inconel 718 B637 N07718
1/2"	NM	40	50	17.2	15.6	15.4	21.1	22.4	14.5	15.8	48
	Inch*lbs	354	443	152	138	137	187	199	129	140	421
1"	NM	71	80	31.7	28.8	28.5	39.0	41.5	26.8	29.3	88
	Inch*lbs	628	708	281	255	253	346	367	238	259	777
1 1/2"	NM	170	180	63.2	57.3	57	78	83	53	58	175
	Inch*lbs	1505	1593	559	508	503	688	731	473	516	1549
2 1/2"	NM	570	600	250	227	225	307	326	211	230	691
	Inch*lbs	5045	5310	2209	2005	1988	2719	2889	1869	2039	6118
3"	NM	1000	1200	501	454	450	616	655	424	462	1386
	Inch*lbs	8851	10621	4430	4021	3987	5452	5793	3748	4089	12267
3" DD	NM	850	1000	474	430	427	583	620	401	438	1313
	Inch*lbs	7523	8851	4195	3808	3776	5163	5486	3550	3872	11617
6"	NM	3300	3300	1479	1343	1331	1821	1935	1252	1366	4097
	Inch*lbs	29207	29207	13094	11885	11784	16115	17123	11079	12087	36260
6" DD	NM	3000	3000	1436	1304	1293	1768	1878	1215	1326	3978
	Inch*lbs	26552	26552	12714	11540	11443	15648	16626	10758	11736	35208
10"	NM	6600	6600	2307	2367	2347	2909	3009	2006	2207	6520
	Inch*lbs	58415	58415	20418	20950	20773	25744	26632	17755	19530	57702
10" DD	NM	8500	8500	3045	3125	3098	3839	3972	2648	2913	8606
	Inch*lbs	75231	75231	26951	27655	27420	33982	35154	23436	25780	76167
12"	NM	14000	14000	5018	5148	5105	6326	6545	4363	4799	14180
	Inch*lbs	123911	123911	44409	45567	45181	55994	57924	38616	42478	125503

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Table B - Analytical calculations based on Roark formulas

Stem	Unit	17-4PH A564 H1150D S17400	XM-19	Alloy C22 B574 N06022	Alloy 20 B473 N08020	Monel 400 A164 N04400	Duplex A479 S31803	Super Duplex A479 S32750	254 SMO A479 S31254	Titanium Gr.2 B348 R50400	Inconel 718 B637 N07718
1/2"	NM	29	31	13.0	8.2	8.2	15.4	17.6	10.4	9.4	35
	Inch*lbs	257	274	115	73	73	136	156	92	83	313
1"	NM	63	65	29.7	18.7	18.7	35.1	40.2	23.8	21.5	81
	Inch*lbs	558	575	263	166	166	311	356	211	190	715
1 1/2"	NM	112	116	51.9	32.8	33	61	70	42	38	141
	Inch*lbs	991	1027	459	290	290	544	623	369	332	1251
2 1/2"	NM	380	400	180	114	114	213	244	144	130	490
	Inch*lbs	3363	3540	1591	1005	1005	1885	2157	1277	1152	4334
3"	NM	636	690	302	191	191	358	409	243	219	823
	Inch*lbs	5629	6107	2674	1689	1689	3167	3624	2146	1935	7284
3" DD	NM	560	595	265	167	167	314	359	213	192	722
	Inch*lbs	4956	5266	2346	1482	1482	2778	3180	1883	1698	6390
6"	NM	2190	2350	1038	656	656	1229	1407	833	751	2827
	Inch*lbs	19383	20799	9188	5803	5803	10880	12451	7374	6649	25024
6" DD	NM	1970	2100	936	591	591	1109	1269	751	677	2550
	Inch*lbs	17436	18587	8285	5233	5233	9811	11229	6650	5996	22566
10"	NM	4390	4760	2076	1311	1311	2459	2814	1666	1502	5655
	Inch*lbs	38855	42130	18375	11605	11605	21760	24903	14748	13298	50048
10" DD	NM	5650	5990	2669	1686	1686	3161	3618	2142	1932	7270
	Inch*lbs	50007	53016	23625	14921	14921	27977	32018	18962	17097	64347
12"	NM	9300	9500	4393	2775	2775	5202	5954	3526	3179	11966
	Inch*lbs	82312	84082	38883	24558	24558	46045	52697	31209	28139	105905

Habonim valve series - Table C

Valve Size		Temperature range: -60 °C ÷ +260 °C (-76 °F ÷ +500 °F)									
Std. Port	Full Port	47	26[1]	48	31/32	73[1]/74[1]	77[1]	78[1]	24	27	28
DN10	DN8-DN10	½″	-	-	-	-	-	-	½″	½″	½″
⅜"	¼"-⅜"										
DN15	DN8-DN10	½″	-	½″	½″	-	-	-	½″	½″	½″
½"	¼"-⅜"										
DN20	DN15	½″	-	½″	½″	½″	-	½″	½″	½″	1"
¾"	½"										
DN25	DN20	1"	-	1"	1"	1"	-	1"	1"	1"	1½″
1"	¾"										
DN32	DN25	1"	-	1"	-	1"	-	1"	1"	1"	1½″
1¼"	1"										
DN40	DN32	1½″	-	1½″	1½″	-	-	-	-	1½″	2½″
1½"	1¼"										
DN50	DN40	1½″	-	2½″	1½″	1½″	-	1½″	-	1½″	2½″
2"	1½"										
DN65	DN50	1½″	3"	3"	-	1½″	-	1½″	-	2½″	3"
2½"	2"										
DN80	DN65	3"	-	3"	3"	-	-	-	-	3"	6"
3"	2½"										
DN100	DN80	3"	6"	3"	3"	3"	3"	-	-	3"	6"
4"	3"										
-	DN100	3"	6"	3"	-	3"	3"	-	-	3"	6"
-	4"										
DN150	-	6"	-	6"	6"	-	-	-	-	6"	10"
6"	-										
DN200	DN150	-	10"	-	6"	6"	6"	-	-	10"	12"
8"	6"										
-	DN200	-	12"	-	-	6"	6"	-	-	10"	12"
-	8"										

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Cryogenic valve series - Table D

Valve Size		Temperature range: -269 °C ÷ +200 °C (-452 °F ÷ +392 °F)						
Std. Port	Full Port	C47	C26	C31/C32	C73/C74	C77	C78	C28
DN10	DN8-DN10	½″	-	-	-	-	-	½″
⅜"	¼"-⅜"							
DN15	DN8-DN10	½″	-	-	-	-	-	½″
½"	¼"-⅜"							
DN20	DN15	½″	-	½″	½″	-	½″	1"
¾"	½"							
DN25	DN20	1"	-	½″	1"	-	1"	1½″
1"	¾"							
DN32	DN25	1"	-	-	1"	-	1"	1½″
1¼"	1"							
DN40	DN32	1½″	-	1½″	-	-	-	2½″
1½"	1¼"							
DN50	DN40	1½″	-	1½″	1½″	-	1½″	2½″
2"	1½"							
DN65	DN50	2½″	3"	-	2½″	-	2½″	3"
2½"	2"							
DN80	DN65	3"	-	3"	-	-	-	6"
3"	2½"							
DN100	DN80	3"	6"	3"	3"	3"	-	6"
4"	3"							
-	DN100	3"	6"	-	3"	3"	-	6"
-	4"							
DN150	-	6"	-	6"	-	-	-	10"
6"	-							
DN200	DN150	-	10"	6"	6"	6"	-	12"
8"	6"							
-	DN200	-	12"		6"	6"	-	-
-	8"							

Metal seated valve series - Table E

Valve Size		Temperature range: -60 °C ÷ +650 °C (-76 °F ÷ +1200 °F)				
Std. Port	Full Port	Z47	Z73/Z74	Z77	Z78	Z28
DN10	DN8-DN10	½"	-	-	-	½"
⅜"	¼"-⅜"					
DN15	DN8-DN10	½"	-	-	-	½"
½"	¼"-⅜"					
DN20	DN15	½"	½"	-	½"	1"
¾"	½"					
DN25	DN20	1"	1"	-	1"	1½"
1"	¾"					
DN32	DN25	1"	1"	-	1"	1½"
1¼"	1"					
DN40	DN32	1½"	-	-	-	2½"
1½"	1¼"					
DN50	DN40	1½"	1½"	-	1½"	2½"
2"	1½"					
DN65	DN50	3"	2½"	-	2½"	3"
2½"	2"					
DN80	DN65	3"	-	-	-	6"
3"	2½"					
DN100	DN80	6"	3"	3"	-	6"
4"	3"					
-	DN100	6"	6"	6"	-	10"
-	4"					
DN150	-	-	-	-	-	10"
6"	-					
DN200	DN150	10"	6"	6"	-	-
8"	6"					
-	DN200	12"	10"	-	-	-
-	8"					

Technical Information-MAST 1306/24 v1

About Habonim

Ball Valves & Actuators for the most demanding, challenging and hazardous applications are our passion and profession for the last 70 years.

We believe in designing, manufacturing and supplying control and shutoff components and solutions that improves the overall safety, integrity and sustainability of the systems they are installed in.

Designed, manufactured and tested according to the highest standards, our products allow us to partner within systems that flow and control varied gases and liquids in diverse markets especially where extreme temperatures and pressures are involved, hazardous materials are used and system performances are critical.

We are leading in cryogenic ball valve-based control solutions, emergency shutoff and specially designed solutions.

Believing that supplying and developing the most effective, safe and reliable products for the global leaders in the LNG and Gas distribution market continually challenges us to improve our capabilities and products.

Best coping with our prestigious customers' most challenging requirements technically, operationally and commercially is our promise fulfilled for decades.

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