



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	316/316L A479 S31600/ S31603	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	13	40	50	17	16	15	21	22	15	16	48
	Inch*lbs	117	354	443	152	138	137	187	199	129	140	421
1"	NM	24	71	80	32	29	29	39	41	27	29	88
	Inch*lbs	216	628	708	281	255	253	346	367	238	259	777
1 1/2"	NM	49	170	180	63	57	57	78	83	53	58	175
	Inch*lbs	430	1,505	1,593	559	508	503	688	731	473	516	1,549
2 1/2"	NM	192	570	600	250	227	225	307	326	211	230	691
	Inch*lbs	1,699	5,045	5,310	2,209	2,005	1,988	2,719	2,889	1,869	2,039	6,118
3"	NM	385	1,000	1,200	501	454	450	616	655	424	462	1,386
	Inch*lbs	3,408	8,851	10,621	4,430	4,021	3,987	5,452	5,793	3,748	4,089	12,267
3" DD	NM	365	850	1,000	474	430	427	583	620	401	438	1,313
	Inch*lbs	3,227	7,523	8,851	4,195	3,808	3,776	5,163	5,486	3,550	3,872	11,617
6"	NM	1,138	3,300	3,300	1,479	1,343	1,331	1,821	1,935	1,252	1,366	4,097
	Inch*lbs	10,072	29,207	29,207	13,094	11,885	11,784	16,115	17,123	11,079	12,087	36,260
6" DD	NM	1,105	3,000	3,000	1,436	1,304	1,293	1,768	1,878	1,215	1,326	3,978
	Inch*lbs	9,780	26,552	26,552	12,714	11,540	11,443	15,648	16,626	10,758	11,736	35,208
10"	NM	2,006	6,600	6,600	2,307	2,367	2,347	2,909	3,009	2,006	2,207	6,520
	Inch*lbs	17,755	58,415	58,415	20,418	20,950	20,773	25,744	26,632	17,755	19,530	57,702
10" DD	NM	2,648	8,500	8,500	3,045	3,125	3,098	3,839	3,972	2,648	2,913	8,606
	Inch*lbs	23,436	75,231	75,231	26,951	27,655	27,420	33,982	35,154	23,436	25,780	76,167
12"	NM	4,363	14,000	14,000	5,018	5,148	5,105	6,326	6,545	4,363	4,799	14,180
	Inch*lbs	38,616	123,911	123,911	44,409	45,567	45,181	55,994	57,924	38,616	42,478	125,503

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Table B - Analytical calculations based on Roark formulas

Stem	Unit	316/316L A479 S31600/ S31603	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	10	29	31	13	8	8	15	18	10	9	35
	Inch*lbs	88	257	274	115	73	73	136	156	92	83	313
1"	NM	23	63	65	30	19	19	35	40	24	21	81
	Inch*lbs	200	558	575	263	166	166	311	356	211	190	715
1 1/2"	NM	40	112	116	52	33	33	61	70	42	38	141
	Inch*lbs	351	991	1,027	459	290	290	544	623	369	332	1,251
2 1/2"	NM	137	380	400	180	114	114	213	244	144	130	490
	Inch*lbs	1,215	3,363	3,540	1,591	1,005	1,005	1,885	2,157	1,277	1,152	4,334
3"	NM	231	636	690	302	191	191	358	409	243	219	823
	Inch*lbs	2,041	5,629	6,107	2,674	1,689	1,689	3,167	3,624	2,146	1,935	7,284
3" DD	NM	202	560	595	265	167	167	314	359	213	192	722
	Inch*lbs	1,790	4,956	5,266	2,346	1,482	1,482	2,778	3,180	1,883	1,698	6,390
6"	NM	792	2,190	2,350	1,038	656	656	1,229	1,407	833	751	2,827
	Inch*lbs	7,012	19,383	20,799	9,188	5,803	5,803	10,880	12,451	7,374	6,649	25,024
6" DD	NM	714	1,970	2,100	936	591	591	1,109	1,269	751	677	2,550
	Inch*lbs	6,323	17,436	18,587	8,285	5,233	5,233	9,811	11,229	6,650	5,996	22,566
10"	NM	1,584	4,390	4,760	2,076	1,311	1,311	2,459	2,814	1,666	1,502	5,655
	Inch*lbs	14,023	38,855	42,130	18,375	11,605	11,605	21,760	24,903	14,748	13,298	50,048
10" DD	NM	2,037	5,650	5,990	2,669	1,686	1,686	3,161	3,618	2,142	1,932	7,270
	Inch*lbs	18,030	50,007	53,016	23,625	14,921	14,921	27,977	32,018	18,962	17,097	64,347
12"	NM	3,353	9,300	9,500	4,393	2,775	2,775	5,202	5,954	3,526	3,179	11,966
	Inch*lbs	29,674	82,312	84,082	38,883	24,558	24,558	46,045	52,697	31,209	28,139	105,905

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"
¾"	¼"-¾"										
DN15	DN8-DN10	½"	-	½"	½"	-	-	-	½"	½"	½"
½"	¼"-¾"										
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 3/8"	DN8-DN10 1/4"-3/8"	1/2"	-	-	-	-	-	1/2"
DN15 1/2"	DN8-DN10 1/4"-3/8"	1/2"	-	-	-	-	-	1/2"
DN20 3/4"	DN15 1/2"	1/2"	-	1/2"	1/2"	-	1/2"	1"
DN25 1"	DN20 3/4"	1"	-	1/2"	1"	-	1"	1 1/2"
DN32 1 1/4"	DN25 1"	1"	-	-	1"	-	1"	1 1/2"
DN40 1 1/2"	DN32 1 1/4"	1 1/2"	-	1 1/2"	-	-	-	2 1/2"
DN50 2"	DN40 1 1/2"	1 1/2"	-	1 1/2"	1 1/2"	-	1 1/2"	2 1/2"
DN65 2 1/2"	DN50 2"	2 1/2"	3"	-	2 1/2"	-	2 1/2"	3"
DN80 3"	DN65 2 1/2"	3"	-	3"	-	-	-	6"
DN100 4"	DN80 3"	3"	6"	3"	3"	3"	-	6"
-	DN100 4"	3"	6"	-	3"	3"	-	6"
DN150 6"	-	6"	-	6"	-	-	-	10"
DN200 8"	DN150 6"	-	10"	6"	6"	6"	-	12"
-	DN200 8"	-	12"	-	6"	6"	-	-

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"
¾"	¼"-¾"					
DN15	DN8-DN10	½"	-	-	-	½"
½"	¼"-¾"					
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"					



About Habonim

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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.

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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.

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Performing in Demanding Applications

