

### Definition:

MAST is defined as the Maximum Allowable Stem Torque that a valve stem can undergo without mechanical failure occurring.

### Description:

As many ball valves contain different variations – 90°, 180°, and 360° rotation – MAST is considered when obstruction within a ball valve, i.e. ball, stem, etc., takes place. As obstruction occurs, increased torsional stress is accrued along the stem and plastic deformation begins. Plastic deformation, unlike elastic deformation, is a permanent distortion that occurs when a material is subjected to tensile, compressive, bending, or torsional stress that exceed its yield strength. If plastic deformation is prolonged, it will lead to mechanical failure.

### Testing:

MAST table below displays the extreme torsional stem testing for ¼" – 2" Series 8, H7 and P4 valves compared to standard valve torques. Testing was completed at ambient temperature to record "initial yield" (point when the stem first initiated bending) and permanent deformation (bending deformation 90° after "initial yield") for 17-4pH stem material. Once the valve torque was exceeded, deformation was observed along the thread of the stem. Similar deformation was observed for all stems tested.

MAST (Maximum Allowable Stem Torque) Results					
SIZE	VALVE TORQUE (in-lb.)			INITIAL YIELD (in-lb.)	PERMANENT DEFORMATION (in-lb.)
	SERIES 8	H7	P4	MATERIAL: 17-4PH STAINLESS STEEL	
¼"	45	N/A	N/A	457	531
½"	45	60	55	457	531
¾"	45	200	190	457	531
1"	100	300	290	1,016	1,119
1-¼"	130	N/A	N/A	1,016	1,119
1-½"	280	550	N/A	1,785	2,111
2"	360	1,100	N/A	1,785	2,111