

# WKM Triple Offset Valve

## Cycle Testing

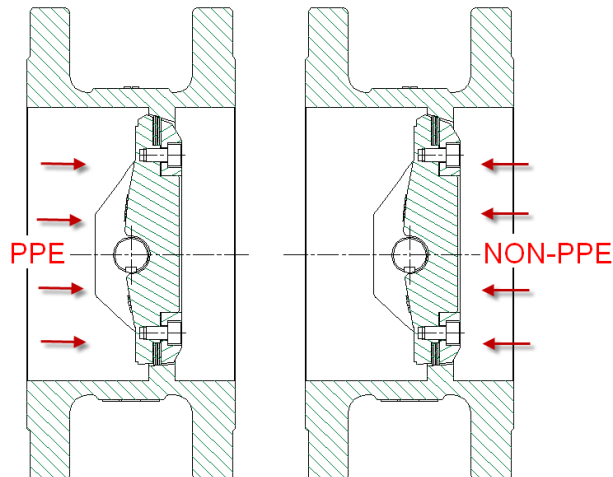
### Scope

Four WKM® triple offset valves in sizes 6", 12", 16", and 24", ANSI 300 were selected as benchmark valves and cycle testing was conducted on them to evaluate and qualify the performance of the full size range from 3" to 24", ANSI 150 and 300.

During the test, the torques required to operate each valve and valve leakages were recorded every 1000 cycles, up to 5000 cycles.

### Procedure

1. Every cycle, the valve shall be closed and pressurized to the maximum rated working pressure in the non-preferred pressure end (non-PPE) at ambient temperature and the valve shall be operated to open against the same rated working pressure.
2. Seat leakage and seating torque shall be measured and recorded for both the preferred pressure end (PPE) and non-PPE directions for every 1000 cycles, up to 5000 cycles.
3. Air and hydro seat test pressures and durations are to be in accordance with "API 598 – VALVE INSPECTION AND TESTING" and Cameron document X-339166.



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Cycle Testing - Test Results for Benchmark Valves After 5000 Cycles

## Seat Testing Results (All Sizes)

Air/Hydro	Pressure (psi)	Air Leakage in bubbles/min Hydro Leakage in drops/min			
		PPE		non-PPE	
		Primary Leak Path	Secondary Leak Path	Primary Leak Path	Secondary Leak Path
Air	80 psi (10 psi increment test)	0	0	0	0
Hydro	100	0	0	0	0
Hydro	200	0	0	0	0
Hydro	300	0	0	0	0
Hydro	400	0	0	0	0
Hydro	500	0	0	0	0
Hydro	600	0	0	0	0
Hydro	700	0	0	0	0
Hydro	750	0	0	0	0

**Primary Leakage path:** Leakage through disc seal-seat conical surface

**Secondary Leakage path:** Leakage through disc serration, GHR surface, retainer ID, and bolt hole surface

Held for 5 minutes at each 100 psi increment. Initial seat tests were conducted per API 598 at 1.1 x maximum rated pressure.

## Torques - Nm (in-lbs)

Test Pressure/Flow Direction	6", 300	12", 300	16", 300	24", 300
80 psi/PPE (Air)	200 (1770)	800 (7081)	1500 (13,276)	5260 (46,555)
750 psi/PPE (Hydro)	300 (2655)	800 (7081)	1500 (13,276)	5260 (46,555)
80 psi/non-PPE (Air)	400 (3540)	800 (7081)	1500 (13,276)	7890 (59,832)
750 psi/non-PPE (Hydro)	700 (6196)	3600 (31,863)	8400 (74,346)	24,985 (221,136)
Maximum Allowable Stem Torque (MAST)	1450 (12,834)	6566 (58,114)	17,837 (157,871)	52,526 (464,894)

## Observations and Comments

Actual torques were found to be lower than the theoretical values and significantly lower than the MAST.

The valves successfully passed the seat test in both directions after 5000 cycles with no visible leakage and meets design expectations.

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