

# JMAX 1-PIECE INSERT CAGE

## APPLICATIONS

- All kinds of sucker rod pumps
- Standing and Traveling valves
- Horizontal or Conventional wells
- High Gas and Sandy wells

## BENEFITS & FEATURES

- Zero restriction flow
- Up to 95% improvement on the compression ratio compared to other cages
- Highest compression ratio compared to any other API cage\*
- Up to 43% reduction in ball rattle compared to other cages
- Up to 69% reduction in pressure drop compared to other cages
- Consistent performance at different flow rates
- High performance corrosion resistant materials for harsh wellbore environments

The Ellis JMAX 1-piece patented insert cage gives unparallel compression ratio and no-restriction fluid flow compared to any cage\*. The cage is engineered to reduce ball rattle and provide zero-restriction flow without reducing wall thickness. It has been designed to perform in horizontal wells also. The high compression ratio and no-restriction flow makes it suitable for gassy and sandy environments. The cage also reduces the ball rattle up to 43% and the pressure drop up to 69% as the fluid flows through the cage when compared to other cages. Excessive ball rattle can beat out a cage causing premature failure. Reduced pressure drop results in lesser gas breakout into the pump intake. The Ellis JMAX Cages are available in traveling valve, standing valve and double valve configurations with high performance materials for corrosive environments.



Patented 1-piece insert cage

Ellis Manufacturing has developed an in-house flow loop to test the performance of diverse types of cages currently used in the sucker rod pump industry. A comparative study was performed between the JMAX Cage and 8 other cages from different manufacturers. The data revealed less ball rattle and lower pressure drop consistently at different flow rates without compromising on pressure rating.

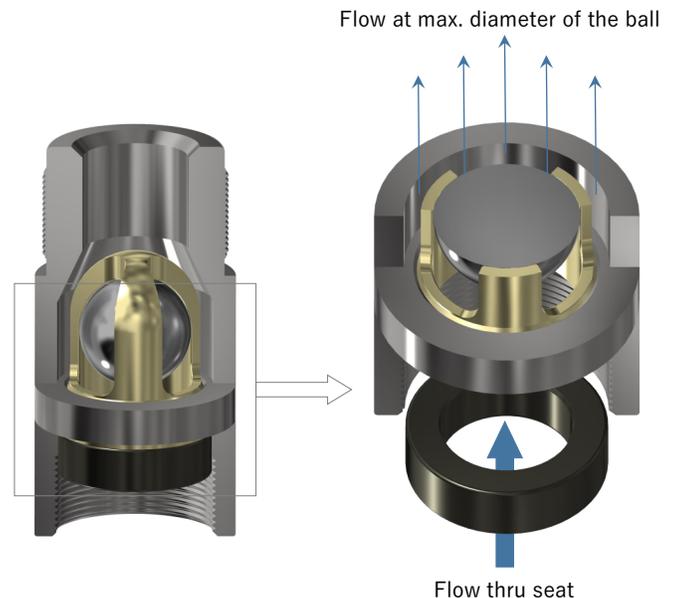
## FLOW AREA COMPARISON

CAGE (TV & SV)	<sup>1</sup> FLOW AREA THRU SEAT [in <sup>2</sup> ]	<sup>2</sup> FLOW AREA THRU JMAX CAGE [in <sup>2</sup> ]	JMAX FLOW AREA % OF SEAT
1-1/4	0.238	0.253	106.3%
1-1/2	0.353	0.364	103.1%
1-3/4	0.535	0.547	102.3%
2	0.724	0.747	103.2%
2-1/4	0.882	1.018	115.0%

1. The flow through the seat is calculated at the average API seat ID.

2. The flow through the JMAX cage is calculated at maximum diameter of the ball.

\* Tested against 8 other cages currently available in the market as of 07/01/2023 with different ball configurations.



RATED PRESSURE AND DEPTH

CAGE TYPE	CAGE SIZE	400 MONEL ALLOWABLE PRESSURE [psi]	400 MONEL ALLOWABLE DEPTH [ft]	316 STAINLESS STEEL ALLOWABLE PRESSURE [psi]	316 STAINLESS STEEL ALLOWABLE DEPTH [ft]	8620 ALLOY STEEL ALLOWABLE PRESSURE [psi]	8620 ALLOY STEEL ALLOWABLE DEPTH [ft]
TRAVELING & DOUBLE VALVE	1-1/4	9480	18012	5577	10596	13245	25166
	1-1/2	8581	16304	5047	9589	11988	22777
	1-3/4	8375	15913	4927	9361	11701	22232
	2	8765	16654	5156	9796	12246	23267
	2-1/4	8512	16173	5007	9513	11891	22593
STANDING VALVE	1-3/4	9093	17277	5349	10163	12703	24136
	1-3/4 OS	11315	21499	6656	12646	15808	30035
	2-1/4	9067	17227	5333	10133	12667	24067

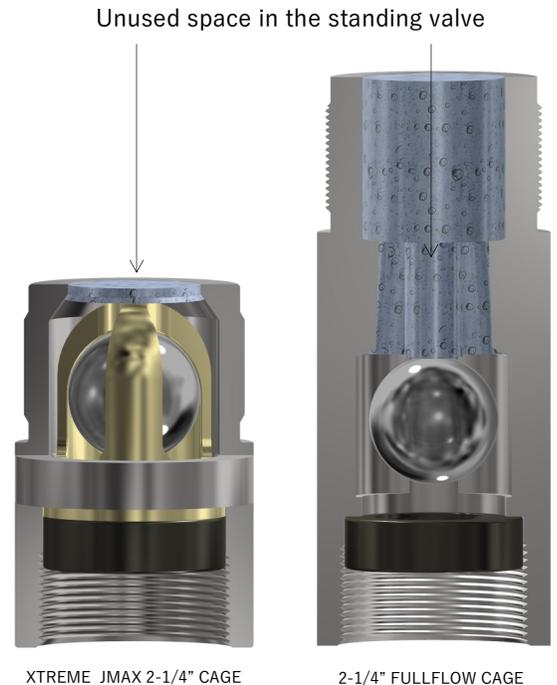
- 3. Allowable pressure rating is calculated with 1.66 factor of safety. All JMAX cage types are pressure tested to 4500 psi for 15 minutes.
- 4. Do not exceed pressure and depth rating for optimal performance.

COMPRESSION RATIO:

The JMAX standing valve cages are designed to have the least unused space to produce the highest compression ratio, which is a great benefit in gassy environments.

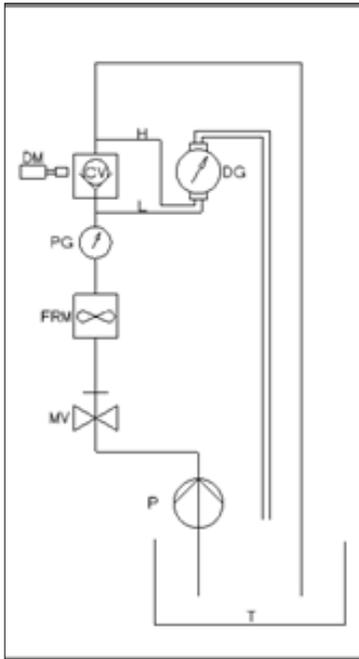
UNUSED VOLUME COMPARISON

STANDING VALVE	JMAX CAGE UNUSED VOLUME [in^3]	FULL FLOW CAGE UNUSED VOLUME [in^3]	JMAX CAGE COMPRESSION RATIO IMPROVEMENT [%]
1-3/4	1.14	2.33	51.0%
1-3/4 XTREME	0.10	2.33	95.6%
2-1/4	1.54	3.18	51.6%
2-1/4 XTREME	0.17	3.18	94.6%
2-1/4 COMP	0.14	2.10	93.3%



**BALL RATTLE AND PRESSURE DROP TEST:**

Special testing equipment was designed to measure the ball rattle and pressure drop as the fluid flows through the cage. The cages are designed to perform at the lowest ball rattle and maximum flow area to produce the lowest pressure drop across the cage. The JMAX cage was tested against 8 different cages available in the market.



**2 MILLION CYCLE TEST:**

The JMAX cages have undergone 2 million cycles test with the heaviest ball material, Nickel Carbide. The test was conducted at 50 strokes per minute which exerted higher impact load on the insert than it would at 8 strokes per minute in normal operating conditions. The inserts did not show any change in dimensions or deformation after the test.



JMAX Cage inserts after 2 Million cycle test.

**BALL RATTLE AND PRESSURE DROP RESULTS FOR THE JMAX 2-1/2 STANDING VALVE CAGE**

FLOW RATE US gpm (bpd)		ELLIS JMAX 2-1/2 SV	ELLIS 2-1/2 3-HOLE SV 1-3/8" BALL		ELLIS JMAX 2-1/2 SV	ELLIS 2-1/2 3-HOLE SV 1-3/8" BALL
2 (68.6)		46.3	74.3		6	14
3 (102.9)		45.8	76		6	13
4 (137.1)		45.8	76.1		7	11
6 (205.7)	Ball Rattle (db)	46.1	72.8	Max Pressure Drop (wc)	7	8
8 (274.3)		46.1	76.5		8	14
10 (342.9)		46.2	80.3		8	21
12 (411.4)		48.3	82.9		9	29
14.92 (511.5)		49.2	85.1		12	39

Maximum free flow through 2-1/2 JMAX SV Cage at lowest pressure drop is 14.92 gpm (511.5 bpd), highest compared to 8 other cages tested.

## JMAX 1-PIECE INSERT CAGE

PART NUMBER	DESCRIPTION
C13J-125-(M)	API CAGE, CLSD PLGR, JMAX, 1-1/4"
C13J-150-(M)	API CAGE, CLSD PLGR, JMAX, 1-1/2"
C13J-175-(M)	API CAGE, CLSD PLGR, JMAX, 1-3/4"
C13J-200-(M)	API CAGE, CLSD PLGR, JMAX, 2"
C13J-225-(M)	API CAGE, CLSD PLGR, JMAX, 2-1/4"
C14J-20-(M)	API CAGE, CLSD BBL, JMAX, 1-3/4"
C14J-25-(M)	API CAGE, CLSD BBL, JMAX, 2-1/4"
C14XJ-20-(M)	CAGE, XTREME COMP, JMAX, 1-3/4"
C14XJ-25-(M)	CAGE, XTREME COMP, JMAX, 2-1/4"
C18J-125-(M)	CAGE, CLSD DV, JMAX, 1-1/4"
C18J-150-(M)	CAGE, CLSD DV, JMAX, 1-1/2"
C18J-175-(M)	CAGE, CLSD DV, JMAX, 1-3/4"
C18J-200-(M)	CAGE, CLSD DV, JMAX, 2"
C18J-225-(M)	CAGE, CLSD DV, JMAX, 2-1/4"
C19AJ-20-(M)	CAGE, CLSD COMP, JMAX, 1-3/4" 1.875 OD
C19J-20-(M)	CAGE, CLSD COMP, JMAX, 1-3/4"
C19J-25-125-(M)	CAGE, CLSD COMP, JMAX, 2-1/4" x 1-1/4"
C19J-25-150-(M)	CAGE, CLSD COMP, JMAX, 2-1/4" x 1-1/2"
C19J-25-175-(M)	CAGE, CLSD COMP, JMAX, 2-1/4" x 1-3/4"

(M) - MATERIAL SELECTOR:

A3- 8620 ALLOY STEEL, D6 - 316 STAINLESS STEEL, A4 - 400 MONEL