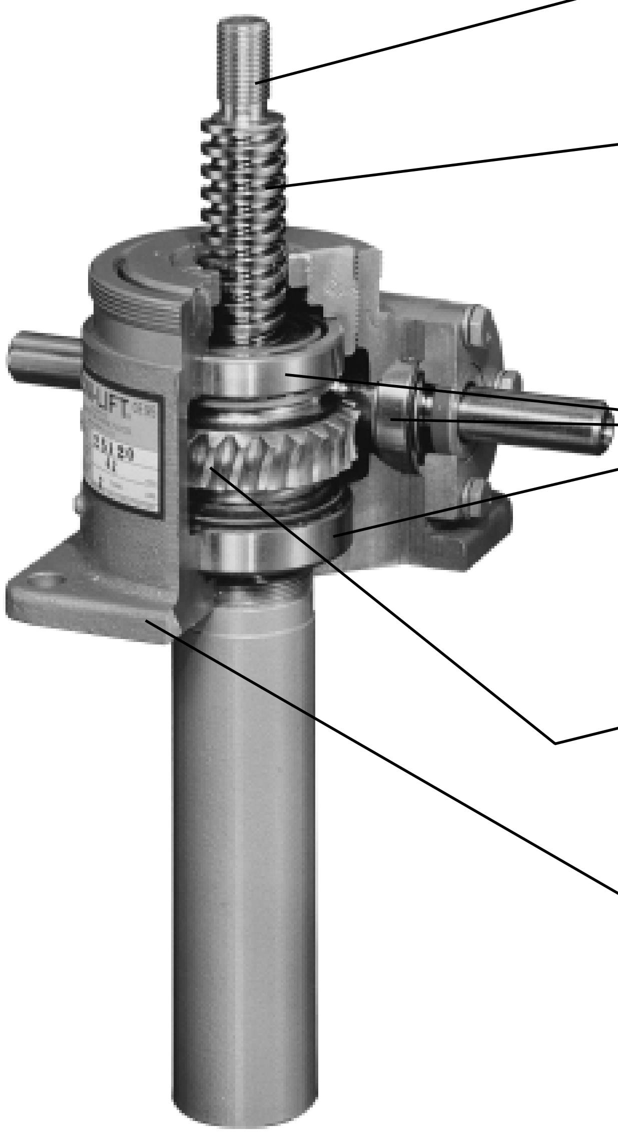
J-SERIES MACHINE SCREW ACTUATOR

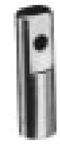
FEATURES & BENEFITS

J-Series machine screw actuators are available in 1/4 ton through 40 ton capacities.



"V" Threaded Screw End

- Easy mounting of optional screw end accessories, insures better alignment.



Clevis

Top Plate

High Strength Rolled Formed Thread Load Screws

- Provides minimum friction for smooth operation and longer life from a work hardened surface.
- Self locking design provides positive positioning, and no back driving.
- Minimal axial backlash with Class 3 fit.

Tapered Roller Bearings

- Preloaded for high thrust loads and side loading in horizontal applications.
- Maintains gear alignment under separating and thrust forces from gearing.
- Bearings sized for tough loading conditions.

High Efficiency Gearing

- Precision formed gears manufactured to close tolerance with minimum backlash, usually less than 1°.
- Large gear centers for longer life and higher efficiencies. (Approaching 50%.)
- Higher allowable input speeds for faster cycles.

Rugged Housings

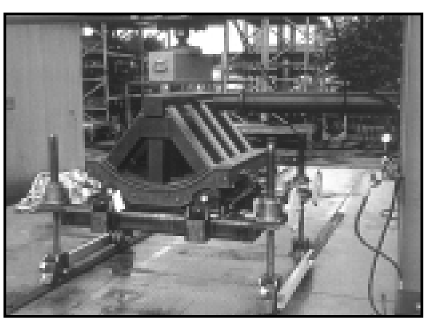
- Ductile iron on the larger J1 to J100 models.
- Smaller J3/4 housings are made of a lightweight, high strength aluminum alloy.
- Lower closed heights save space and weight.

Superior Performance

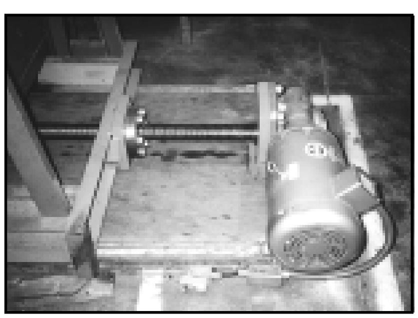
- Uni-Lift actuators provide design integrity and reliability for heavy duty jobs where precision is important. For lighter loads, Uni-Lifts often satisfy the requirements of higher velocity applications that would otherwise require more expensive ball screw actuators.

Synchronized Travel

- Uni-Lift actuators can be arranged in systems to provide synchronized travel when driven from a common source.



Structure and actuators are tested with an induced side load on top of the primary load. Each hand cranked Uni-Lift controls a corner of the assembly cart.



Motorized Uni-Lift pushes and pulls 10,000 lbs. of material in and out of a heat treatment oven. High worm ratio eliminates the need for external gear reducer.

H & J SERIES TECHNICAL SPECIFICATIONS (Table 4)

Model Type and Size		H1/4	H1/2	J3/4 -20	J3/4-40	J1	J2	J5	J10	J20	J25	J40
CAPACITY IN POUNDS (P)		500	1,000	1,500	1,500	2,000	4,000	10,000	20,000	40,000	50,000	80,000
DIAMETER OF LOAD SCREW		0.500	0.625	0.625	0.625	0.750	1.000	1.500	1.750	2.500	2.750	4.250
LEAD OF SCREW		0.250	0.250	0.250	0.125	0.250	0.250	0.333	0.333	0.500	0.500	0.667
GEAR CENTERS		0.946	0.946	0.941	0.941	1.504	1.835	2.260	3.014	3.675	4.009	5.164
GEAR RATIO	LOW	5:1	5:1	5:1	5:1	5:1	6:1	5 1/3:1	6:1	8:1	9:1	9:1
	MEDIUM						8:1	12:1				
	HIGH	10:1	10:1			10:1	12:1	24:1	12:1	16:1	18:1	
(TPI) TURNS OF INPUT SHAFT FOR 1" OF RISE	LOW	20	20	20	40	20	24	16	18	16	18	18
	MEDIUM						32	32				
	HIGH	40	40			40	48	72	36	32	36	
(Tp) TORQUE REQUIRED TO LIFT ONE POUND (lb-in)	LOW	0.024	0.026	0.026	0.021	0.028	0.028	0.042	0.046	0.050	0.039	0.032
	MEDIUM						0.024	0.027				
	HIGH	0.013	0.015			0.017	0.018	0.019	0.029	0.032	0.024	
NO LOAD TORQUE (lb-in)	(To)	1.5	2.0	1.0	2.0	3.0	4.0	5.0	7.0	9.0	10.0	12.0
MAXIMUM INPUT RPM		1725	1725	2587	2587	2587	2587	1725	1725	1725	1450	1450
APPROXIMATE WEIGHT IN POUNDS	0" TRAVEL	2.3	2.3	2	2	9	13	23	47	90	103	103
	PER INCH	0.1	0.1	0.1	0.1	0.2	0.4	0.7	0.9	1.8	2.1	2.1
RADIUS OF GYRATION (r)		0.094	0.125	0.125	0.125	0.156	0.218	0.334	0.396	0.566	0.628	0.985

1. Complete the Uni-Lift Selection Guide located in the inside front cover.

2. Determine the maximum load on one actuator: P_1

$$P_1 = \frac{P_2}{N}$$

P_2 = Total system load (lbs.)
N = Number of actuators in the system
On multi-unit systems where load is not equally distributed, change P_1 to the greatest load supported by one unit.

3. Check Load Screw Column Capacity:

- If the load screw is in tension, select a Uni-Lift with a rated capacity equal to or greater than the maximum load (P_1) on one actuator. Go to step 4.
- If the load screw is in compression, use the calculation steps on page 35 to determine the maximum permissible Extended Screw Length, (ESL). Select a Uni-Lift that has a load screw column length capacity equal to or greater than the length required for the load.

4. Determine the desired load screw velocity (in./min.): (V_d)

$$V_d = \frac{\text{Rise}}{t_2}$$

Rise = One way travel under load (in.)
t_2 = Required one way travel time (min.)

5. Determine Desired Input Speed: (RPM_d)

$$RPM_d = TPI \times V_d$$

TPI = Turns of the input shaft for 1 inch of rise. (See technical specification table 4.)

6. Determine Load Screw Velocity: (V)
From the catalog data, select the drive equipment with an output speed close to the desired input speed (RPM_d). Use the output speed to recalculate the actual load screw velocity (V).

$$V = \frac{RPM}{TPI}$$

7. Check the Duty Limit of the actuator:

$$D_1 = \frac{(2 \times \text{Rise} \times C_h)}{V}$$

D_1= Duty time per hour
C_h = Cycles per hour
Determine if D_1 is equal to or greater than D_2. If D_2 is less than D_1 reduce the input speed to the actuator, or reduce the load per actuator by adding more actuators to the system.
D_2 = Duty Limit (see page 34 for calculations)

Motor Sizing:

The following is a QUICK ESTIMATE FOR MOTOR SIZING FOR A ONE ACTUATOR SYSTEM. For detailed motor sizing and torque requirements on single or multi-unit systems, skip steps 8 and 9, and go to step 10.

8. Estimate the Input Torque T_e (lbs/in):

$$T_e = T_p \times P_3$$

T_p = Torque required to lift one pound (see table 4 for T_p values.)
P_3 = Maximum system running load.

9. Estimate Uni-Lift Horsepower: HP_e

$$HP_e = \frac{(T_e \times RPM)}{63025}$$

H & J SERIES MOTOR SIZING AND TORQUE CALCULATIONS (Table 5)

MODEL & SIZE	GEAR RATIO	Turns per inch TPI	Rated cap (lbs) P	STATIC TORQUE Ts	UNIT INPUT TORQUE AT RATED CAPACITY — T = RUNNING TORQUE (lb-in) at VARIOUS RPM (Theoretical): 50 RPM	115 RPM	172 RPM	345 RPM	600 RPM	870 RPM	1140 RPM	1725 RPM	NO LOAD TORQUE To
H 1/4	5:1	20	500	10.7	6.0	5.6	5.4	5.0	4.6	4.4	4.2	4.0	1.5
	10:1	40		6.7	3.6	3.3	3.2	3.0	2.7	2.5	2.5	2.3	
H 1/2	5:1	20	1,000	24.1	13.7	12.7	12.2	10.9	10.2	9.7	9.4	8.8	2
	10:1	40		15.4	8.2	7.6	7.3	6.7	6.1	5.7	5.5	5.1	
J 3/4	5:1	20	1,500	38	30.0	28.0	27.0	24.7	23.3	22.3	21.6	20.5	1
	5:1	40		28.7	22.0	20.3	19.4	17.3	16.2	15.3	14.7	13.7	2
J1	5:1	20	2,000	53.1	39.2	36.8	35.4	32.3	30.5	29.2	28.3	26.8	3
	10:1	40		33.1	23.2	21.7	20.9	19.2	17.5	16.7	16.1	15.2	
J 2	6:1	24	4,000	113	79.0	73.0	70.0	63.0	58.0	56.0	53.0	50.0	4
	8:1	32		93	64.0	59.0	56.0	50.0	47.0	44.0	42.0	40.0	
	12:1	48		73	49.0	45.0	43.0	39.0	35.0	33.0	31.0	29.0	
J 5	5.33:1	16	10,000	424	294	267	251	231	214	203	194	181	5
	12:1	36		261	168	153	144	126	116	109	104	97	
	24:1	72		191	114	103	96	85	75	68	64	59	
J 10	6:1	18	20,000	906	596	535	498	453	416	390	372	436	7
	12:1	36		584	365	329	308	268	245	229	218	202	
J 20	8:1	16	40,000	1973	1287	1154	1079	982	901	847	809	751	9
	16:1	32		1271	789	710	667	582	530	497	472	438	
J 25	9:1	18	50,000	1938	1526	1364	1273	1155	1057	991	945		10
	18:1	36		1215	935	841	787	685	624	583	554		
J 40	20:1	30	80,000	2557	1917	1698	1573	1377	1243	1156	1094		12

For RPM's not shown use the next slowest RPM. For speeds less than 50 RPM contact factory.

10. Determine Uni-Lift Running Load Proportion Factor: (f)

$$f = \frac{P_3}{(P \times N)}$$

P = Rated Capacity of Uni-lift
P_3 = Max. system running load N= Number of Uni-lifts

11. Determine Unit Running Torque: (T_1) (lb-in)

$$T_1 = (T \times f) + T_o$$

T_0 = No load torque from chart
T = Running torque from chart

12. Find the System Running Torque: (T_2) (lb-in)

$$T_2 = \frac{(T_1 \times N)}{e_1}$$

e_1 = System Arrangement Efficiency, see page 77

13. Find System Power:

$$\text{System HP} = \frac{(T_2 \times RPM)}{(63025 \times e_2)}$$

e_2 = Reducer Efficiency, see page 77
RPM = Uni-Lift input shaft speed

14. Determine System Starting Torque: (T_{s2})

$$T_{s2} = \frac{((T_s \times f) + T_o) \times N}{e_2}$$

T_s = Static torque from chart

15. Determine Motor Starting Torque: (T_{sm}) (lb in)

$$T_{sm} = \frac{T_{s2}}{(R \times e_2)}$$

R = Gear Reducer Ratio

16. Determine Motor Running Torque: (T_{rm})

$$T_{rm} = \frac{T_2}{(R \times e_1)}$$

- Select a motor with a power rating greater than HP requirement in step 13, a starting torque greater than T_{sm} requirement in step 15, and a motor running torque greater than T_{rm} in step 16. See motor chart page 64 for horsepower and torque ratings.

- Select system torque transmission equipment (reducer, mitre gear boxes, couplings, etc.) with ratings greater than the torque to be transmitted, see step 12 and system arrangements, page 77.

- Size shafting for system starting torque to be transmitted, see step 16, and Table B page 76.

H & J SERIES DUTY CYCLE (Table 6)

Uni-Lift Duty Limit at Full Rated Capacity and 80° F Ambient Temperature

MODEL and SIZE	RATIO	TPI	L2 - DUTY LIMIT SERVICE FACTOR @ VARIOUS RPM INPUT SPEEDS								
			50 RPM	115 RPM	172 RPM	345 RPM	600 RPM	870 RPM	1140 RPM	1725 RPM	2587 RPM
H 1/4	5:1	20	870	412	291	164	107	79	64	46	34
	10:1	40	1380	678	475	263	169	130	105	76	55
H 1/2	5:1	20	429	205	145	85	54	40	32	24	18
	10:1	40	705	336	236	132	85	65	52	38	28
J 3/4	5:1	40	220	105	73	46	27	21	17	13	9
	5:1	20	201	97	67	44	25	19	15	11	7
J 1	5:1	20	330	161	115	66	41	30	24	18	12
	10:1	40	508	243	172	94	61	46	39	28	17
J 2	6:1	24	211	102	74	48	30	22	18	13	9
	8:1	32	261	126	88	54	34	26	21	16	12
	12:1	48	340	164	117	67	45	34	27	20	15
J 5	5.33:1	16	102	51	36	24	15	11	9	6	
	12:1	36	172	85	60	36	24	17	15	11	
	24:1	72	201	98	75	45	31	24	19	15	
J 10	6:1	18	87	48	36	24	20	12	9	6	
	12:1	36	130	63	46	28	18	13	12	8	
J 20	8:1	16	72	36	26	17	11	8	6	4	
	16:1	32	117	57	41	27	16	12	10	7	
J 25	9:1	18	64	32	23	17	10	7	5		
	18:1	36	106	46	38	22	14	11	9		
J 40	20:1	30	81	39	29	17	12	9	8		

- Duty Limit Service factor (L_2) = Operating time allowed per hour. The numbers greater than 60 are theoretical values and exceed 100% duty, solely to provide base data for adjusting L_2.
- The L_2 values are based on Uni-Lifts loaded at rated capacity, operating in an ambient temperature of 80° F., with a maximum allowable temperature rise of 100° F.
- For ambient temperatures above 180° F or below -20° F, consult factory.
- For speeds not shown, use the next fastest RPM value.

1. Determine Adjusted Duty Limit : D_2

When the unit load is at rated capacity, and the ambient temperature is at 80° F, the L_2 value from the table equals D_2. If not, proceed to step 1A.

1A) For different temperature service, or a unit load less than rated capacity, use the following equation to determine the Adjusted Duty Limit Service Factor (D_2).

$$D_2 = \frac{(180 - T_A) \times P \times L_2}{100 \times P_4}$$

L_2 = Duty Limit Service Factor (see Table 6)
T_A = Ambient temperature (F°) P=Rated capacity (lbs.)
P_4 = Maximum running load per actuator (lbs.)
P = Rated capacity of the Uni-Lift

2. Determine if Duty Cycle is acceptable:
If **D_2> = 60** minutes, the application is rated for continuous duty.
If **D_2> = D_1** then the application is acceptable.
If **D_2<D_1** then the duty cycle limit has been exceeded for this application. You must do one of the following: select larger size Uni-Lift, reduce load by adding additional Uni-Lifts, or reduce speed. If you reduce speed, you must recalculate V_1 and D_1 from the Technical Specifications page 32 steps 6 and 7.

EXAMPLE

A. Consider for an J-5 low ratio 5:33:1 operating in 120°F ambient temperature, 5,000 lbs. load, and 600 RPM, with a rise of 20 inches and 5 cycles per hour:

$$D_1 = \frac{(2 \times Rise \times C_h)}{V_1}$$

$$D_1 = \frac{(2 \times 20 \times 5)}{37.5}$$

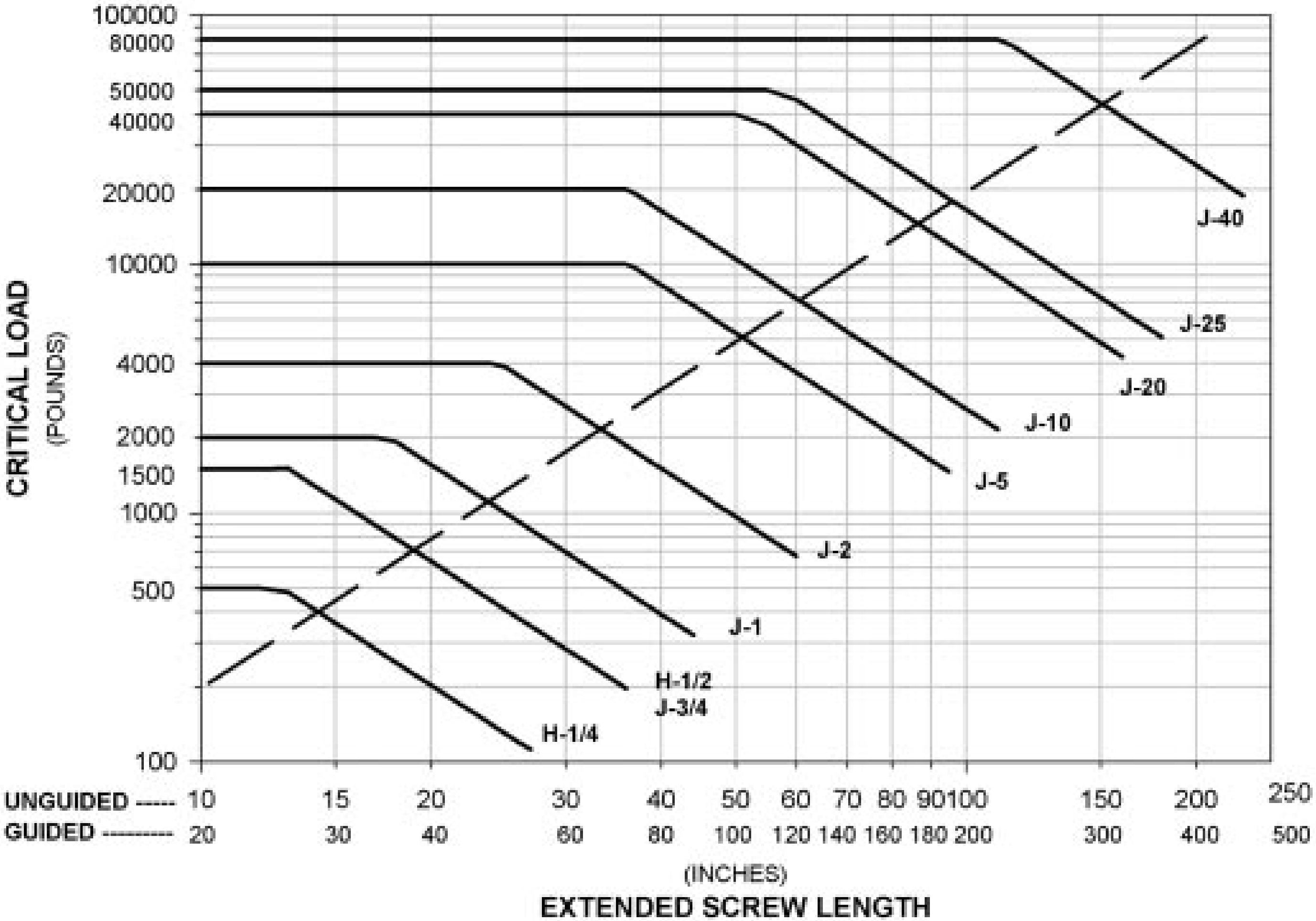
Duty time per hour = 5.33 minutes per hour

$$D_2 = \frac{(180 - 100) \times 10{,}000 \times 15}{100 \times 5{,}000}$$

Duty cycle limit = 18 minutes per hour

Since D_2 is greater than D_1 the application is OK for the duty cycle limit.

H & J SERIES MACHINE SCREW COLUMN BUCKLE CHART



(For guided and unguided loads)

The maximum ESL values in the chart above are based on a **2:1 factor of safety against column buckle,** and on a standard design with a top plate, or a rotating design travel nut. Increased load screw lengths are not shown where the slenderness ratio exceeds 400.

1. Determine extended screw length: (ESL)
The ESL is the distance in inches the load screw can extend from the housing. See layout page for the model selected to determine ESL.

2. Determine the adjusted screw length: (ASL)
The chart above is for a standard design top plate or the rotating design travel nut. For other design configurations you must adjust the ESL value using the F factor multiplier to determine the adjusted screw length.

ASL=ESL x F

3. Select correct size Uni-lift: On the chart above, draw a horizontal line to represent the maximum load (P_1). Using the set of ESL values that apply to your design (guided or un-guided), draw a vertical line to represent the ESL or ASL. All of the Uni-Lift's above the point of intersection will be acceptable.

Screw lengths above the dotted line comply with AISC maximum slenderness ratio KL/r=200 specified for design and fabrication of structural steel buildings. This data is for reference only and is not a limiting factor, except as required.

DESIGN CONFIGURATION	F factor	Guided K factor	Unguided K factor
Standard Design Top Plate	1	0.65	1.3
Rotating Design Traveling Nut	1	0.65	1.3
Standard Design Clevis End	1.25	0.8	1.6
Keyed Design Top Plate	1.25	0.65	1.3
Keyed Design Clevis End	2	0.65	1.6

K=Column Factor
L=Extended Screw Length (ESL)
r =Radius of Gyration
See Technical Specifications (Table 4) for r values