JTD

Cubic Ball Screw Jack

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2D/3D CAD

JACTON®



Descriptions

JACTON JTD Series Cubic Ball Screw Jacks featuring a compact and versatile cubic housing. They are born from the experience in Cubic Machine Screw Jacks. They have the greater efficiency and rolling action, the ball screw jacks can operate at higher speeds or increased duty cycle when compared with the machine screw jacks. The addition of a high efficiency ball screw and nut reduces the required input torque. Required approximately two-thirds less input torque to move the load than similarly rated machine screw jacks. They are not self-locking so a brake motor or external locking device needs to be included in the drive system and hand wheels are not a recommended option. Under normal operation, maintenance free. They are an excellent solution for industrial lifting, lowering, pushing and pulling applications.

Key Features

- 7 sizes in two gear ratios (high ratio, slow ratio) for high and slow linear speeds (up to 5 m/min).
- Static load capacities from 10kN to 300kN as Standard.
- High precision ball screw offers maximum stroke of 6m, diameter from 20 mm to 100 mm.
- Basic designs: Translating screw, Anti-rotation screw, and Rotating screw.
- Upright or Inverted mounting. Available in tension or compression loads.
- Standard with single lead ball screw, custom double or high lead ball screw which offers increased travel speed. Both of them require a brake or external locking device to hold position.
- Power source: manually by hand wheel is not recommended, electrically by brake motor driven.
- Can be applied either individually use or combined into a exactly synchronized lifting system(multiple jack systems), linked by connecting shafts, bevel gearboxes, couplings, electric motors, gear reducers, limit switches and pillow blocks etc.
- Custom double clevis ball screw jack, and trunnion mount ball screw jack.
- Can be used as alternatives to hydraulic and pneumatic systems.
- High accuracy, high efficiency, high performance, high duty cycle, low backlash, long service life, and uniform lifting speed.

Materials

We use the best materials to guarantee the performance and lifetime of the cubic ball screw jacks you purchased.

Housing

- High-strength Casting Housing, Ductile Iron.

Ball Screw

- SCM 450, S55C, Hardness: HRC 58-62.

Ball Nut

- SCM415H, Hardness: HRC 58-62.

Ball

- SUJ2, Hardness: HRC 60 UP.

Input Shaft (Worm)

- C45 Steel in high frequency heat treatment process. Custom Stainless Steel 304 or 316.

Worm Gear

- High Strength Bronze ZQA19-4 (Casting aluminum bronze) as Standard, Custom High Strength Bronze ZCuSn10Pbl(Casting tin bronze)

Bearing

- Anti-friction Ball Thrust Bearings for Worm Gear. Anti-friction Ball Bearings for Input Shaft(worm). Custom Stainless Steel 304

Motor Flange Adapter

- High-strength Casting Motor Adapter, Ductile Iron. Custom Stainless Steel 304 or 316.

Lubricants

- Synthetic Grease, Extreme Pressure EP2 Lithium Grease.

Materials



Selection Guide

Selection Notes

(01) Screw Jacks and Lifting Systems are for industrial use only, not recommended for transporting personnel.

(02) Carefully consider jack ratings before making a selection. Be sure that the dynamic or static load carried or sustained by jack does not exceed its maximum capacity.

(03) Carefully consider the combination of screw shaft speed (rpm) and rated load. Also, take extra care in verifying rated buckling load and screw shaft speed (rpm). Exceeding the data provided in this catalog can cause major damage to the system.

(04) Make sure that the surface temperature of the housing does not exceed temperature of -15ºC to +80ºC during operation.If using a traveling nut jack,measure the traveling nut surface temperature.Make sure all the rotating parts are completely stopped before proceeding to measure.

(05) The maximum input speed is 1500 rpm as long as the input power dose not exceed the jack's maximum allowable input power.

(06) Screw jack can not be operated continuously. Duty cycle based on 30 minutes.

- **Note:** Below duty cycles are based on ambient temperatures 20ºC. For ambient temperatures higher than 20 ºC, the duty cycle (ED) must be reduced.

  * Screw Jack with Trapezoidal Screw (Machine Screw Jack) duty cycle ≤ 20%ED.

  * Screw Jack with Ball Screw (Ball Screw Jack) duty cycle ≤ 30%ED.

- **Note:** For operation longer than that mentioned above or for any continuous operation, the jacks temperature must be monitored and should not exceed 80ºC maximum in order to determine its duty cycle.

Duty Cycle (%ED) = [1 Duty Cycle / (1 Duty Cycle + 1 Rest Cycle)] x 100%

(07) Be sure not to exceed the maximum input torque for multiple screw jack systems by verifying the rated input torque for each jack.

(08) Be sure that starting torque is 200% or more of required running torque.

(09) Be sure that ample driving power is available to drive the jack when using in temperatures below 0ºC. Low temperatures decrease the jack's efficiency due to the increased grease viscosity inside the jack's gearbox.

(10) Although Screw Jack with **Single-start** Trapezoidal Screw (Machine Screw Jack) has self-locking feature, vibration and shock may affect its efficiency, in which case a brake motor or extra braking device is required. Screw Jack with **Double-start** Trapezoidal Screw (Machine Screw Jack) is considered not self-locking will require a brake or other holding device. Screw Jack with Ball Screw (Ball Screw Jack) can backdrive because of their extremely high efficiencies and require some means of holding the load, such as a brake motor.

(11) When jacks are working, can not force to stop, may result in the jacks damage or injury personnel.

(12) When Ball Screw Jacks are under loads, can not change the motor drive to manual operation. Because the loads will cause the input shaft to rotate very dangerously.

(13) Mechanical stops (Stop Nuts) are not provided on the lifting screw unless requested. Therefore, it is possible to drive the screw out of the jack's housing

(14) Never approach or touch the rotary parts (input shaft, etc.) or the lifting screw during operation.

(15) Bellows Boots and Protective Tubes should be used to protect and keep the lifting screw clean in dusty or abrasive environments.

Unit Converter

- **1 ft** = 304.8 mm
- **1 in** = 25.4 mm
- **1 m** = 10 dm = 100 cm = 1000 mm
- **1 in-lb** = 0.113 Nm
- **1 Nm** = 0.737 ft-lb
- **1 ft-lb** = 1.356 Nm
- **1 lb** = 0.454 kg
- **1 kg** = 2.205 lb = 1000 g
- **1 N** = 0.1 kg
- **1 t** = 1000 kg = 10 kN = 2000 lb
- **1 m/min** = 1000 mm/min = 16.7 mm/sec
- **1 in/sec** = 25.4 mm/sec
- **1 ft/sec** = 304.8 mm/sec
- **1 hp** = 0.75 kW
- **°C** = (°F-32) / 1.8
- **°F** = °C x 1.8 + 32

Selection Guide

Calculation Formulas

(01) Calculate Total Load Ws (N)

$$Ws = W \times sf$$

Ws = Total Load (N) W = Maximum Load (N) sf = Safety Factor (**Table 1.**)

Table 1. Safety Factor sf

Load Conditions	Example Purposes	Safety Factor (sf)
Smooth movement with no shock, Light load	Opening and closing a valve, Adjusting a conveyor	1.0 ~ 1.3
Light shock, Medium load	Use with various kinds of transporting equipment and lifters	1.3 ~ 1.5
Severe shock and/or vibration, Heavy load	Use with large transporting carriages, Holding the position of a press roller	1.5 ~ 3.0

- **Note:** The above table is for general reference only. Consider particular operating conditions under which you operate before selecting a safety factor.

(02) Calculate Load Per Jack Wn (N)

$$W_n = Ws / (N_o \times fd \times \eta_g)$$

- **Note:** For a synchronous drive, use a synchronous drive coefficient (Table 2).
- **Note:** Don't ignore spiral bevel gearbox efficiency 94%.

W_n = Load Per Jack (N) Ws = Total Load (N)

N_o = Number of jacks fd = Multiple jacks system coefficient (**Table 2.**)

η_g = **Bevel Gearbox** efficiency = 94%

Table 2. Multiple Jacks System Coefficient fd

No. of jacks	1	2	3	4	5 ~ 8
Coefficient	1	0.95	0.9	**0.85**	0.8

(03) Jack Selection

Follow these steps to make a preliminary jack selection.

Points of preliminary jack selection

- Select (temporary) worm speed ratio by adjusting the screw shaft rpm. If difficult to select, inspect by H speed.
- Consider traveling space when selecting stroke.
- Select options based on your needs.

Selection Guide

(04) Confirming Required Input Speed n1 (rpm)

Determine the required input rpm, using the required screw shaft speed.

- **Note:** Input speed should not exceed 1500 rpm.

$$n1 = v \times i / TP$$

v = Lifting speed (mm/min) n1 = Input speed of worm shaft (rpm)

TP = Screw pitch (mm) i = Gear ratio

(05) Verifying Required Input Torque per T (Nm)

$$T = (F_{dyn} \times TP) / (2 \times \pi \times \eta \times i) + T_o$$

F_{dyn} = Dynamic axial force (= lifting force) (kN) F_{stat} = Static axial force (= retention force) (kN)

TP = Screw pitch (mm) π = 3.1416 i = Gear ratio

η = Screw jack efficiency (see the Specifications of Jack Series).

* For Machine Screw Jacks, normal η = 0.15 (H ratio), η = 0.12 (L ratio).

* For Ball Screw Jacks, normal η = 0.3~0.35 (H ratio), η = 0.22 (L ratio).

T_o = Idling torque (Nm) (see the Specifications of Jack Series)

(06) Verifying Required Input Power P (kW)

$$P = W1 \times v1 / (6000 \times \eta)$$

P = Input power (kW) W1 = Lifting force (kgf) v1 = Lifting speed (m/min)

η = Screw jack efficiency (see the Specifications of Jack Series).

* For Machine Screw Jacks, normal η = 0.15 (H ratio), η = 0.12 (L ratio).

* For Ball Screw Jacks, normal η = 0.3~0.35 (H ratio), η = 0.22 (L ratio).

(07) Verifying Required Input Power P (kW)

07.01) Lifting Speed: $v = n1 \times TP / i$

07.02) Stroke / Revolution: $SR = TP / i$

07.03) Input Torque: $T = 9550 \times P / n1 + T_o$

07.04) Input Power: $P = T \times n1 / 9550$

07.05) Starting Torque per Jack: $T_{st} \approx T \times 1.3$

07.06) Hand Wheel Turning Force: $W_{hw} = T / R_{hw}$

07.07) Input Power of Multiple Jacks System: $P_s = P \times N_o / (fd \times \eta_g)$

07.08) Input Torque of Multiple Jacks System: $T_s = T \times N_o / (fd \times \eta_g)$

07.09) Screw Shaft Pitch Diameter: $d_2 = D - 0.5 \times TP$

07.10) Screw Shaft Torque: $T_{hub} = F_{dyn} \times (d_2 / 2) \times \tan(\alpha \pm \varphi)$, $\varphi \approx 6°$

Selection Guide

Calculation Formulas

07.11) Lead Angle: $\alpha = \arctan[TP / (d_2 \times \pi)]$

- **Note:** A prerequisite is a vibration-free operation
  - * Self-locking at standstill (Static): $2.4^0 < \alpha < 4.5^0$, may require brake motor.
  - * Self-locking from movement (Dynamic): $\alpha < 2.4^0$, don't require brake motor.
  - * No self-locking: $\alpha > 4.5^0$, require brake motor.

07.12) Duty cycle based on 1 hour: $ED = [S \times As \times 5 / (3 \times v)] \times 100\%$

07.13) Ball Screw Service Life in Hours: $L_h = (C_{dyn} / F_{dyn})^3 \times 10^6 / (n2 \times 60)$, $n2 = n1 / i$

- **Note:** Trapezoidal Screw Service Life cannot be determined by the formula used to calculate a Ball Screw wear life. Use the information below as a reference.50kN(5 ton) and below models average expected life 5000 meters. 100kN(10 ton) and above average expected life 1000 meters.

v = Lifting speed (mm/min)
n1 = Input speed of worm shaft (rpm)
n2 = Output speed of screw shaft (rpm)
TP = Screw pitch (mm)
i = Gear ratio
SR = Stroke / Revolution (mm)
N_o = Number of jacks
fd = Multiple jacks system coefficient **(Table 2.)**
η_g = Bevel Gearbox efficiency, $\eta_g \approx 94\%$
P = Input power per jack (kW)
P_s = Input power of multiple jacks system (kW)
T_o = Idling torque (Nm)
T = Input torque per jack (Nm)
T_s = Input torque of multiple jacks system (Nm)
T_{st} = Starting torque per jack (Nm)
T_{hub} = Screw Shaft Torque (Nm)
L_h = Ball screw service life in hours (h)
C_{dyn} = Dynamic load capacity of ball screw (kN)
F_{dyn} = Dynamic axial force (= lifting force) (kN)
α = Lead Angle (°)
φ = Dynamic friction angle (°)
d_2 = Pitch diameter (mm)
D = Screw shaft diameter (mm)
W_{hw} = Hand wheel turning force (N)
R_{hw} = Hand wheel radius (m)
π = 3.1416
ED = Duty Cycle (%/hr)
S = Length of Stroke (mm)
As = Number of load cycles (up and down movement).
* **Example:** 5 times in and out movement of the screw shaft equals 10 double strokes.

Selection Guide

Sample Part Number (Example):

JTD50 - US - 300 - H - I - C - PP
(1) (2) (3) (4) (5) (6) (7)

(1) Models & (4) Gear Ratios

JTD10 (BS 20x5) **H**=5:1 **L**=20:1	JTD25 (BS 32x10) **H**=6:1 **L**=24:1	JTD50 (BS 40x10) **H**=7:1 **L**=28:1	JTD100 (BS 50x10) **H**=7:1 **L**=28:1
JTD150 (BS 63x10) **H**=10:1 **L**=40:1	JTD200 (BS 80x10) **H**=10:1 **L**=40:1	JTD300 (BS 100x20) **H**=10:1 **L**=40:1	**H:** High ratio **L:** Slow ratio

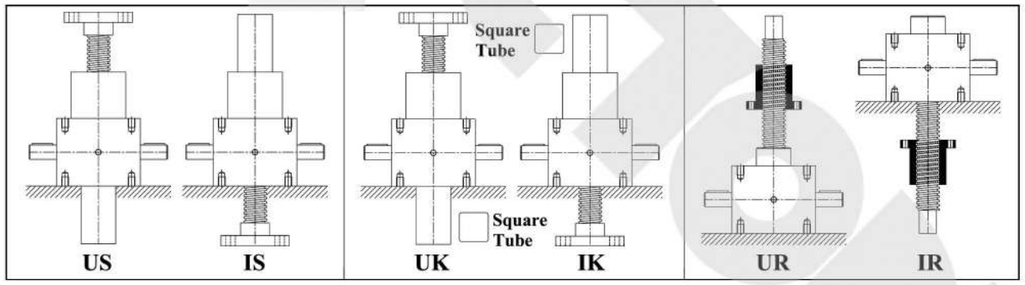
1.1) Model Note 1: the model indicates the maximum static load of this screw jack, but not the Maximum dynamic load. The dynamic load depends on the lifting speed, travel length and others working conditions.

1.2) Model Note 2: The slower the lifting speed, the greater the dynamic load.

1.3) Model Note 3: In the case of compressed loads and long strokes, please calculate maximum critical buckling force.

1.4) Gear Ratio Note: Every screw jack model with 2 gear ratios as a standard. Custom others gear ratios.

(2) Basic Designs and Configurations



2.1) "US" and"IS" are Translating Screw Jacks, they are the most commonly specified jack. All that is required for proper function is to restrain the rotation of the lifting screw and apply torque to the input shaft. This is often achieved through the use of guides (guided load) or by attaching a common load across multiple jacks. Most applications use this jack design.

Selection Guide

Sample Part Number

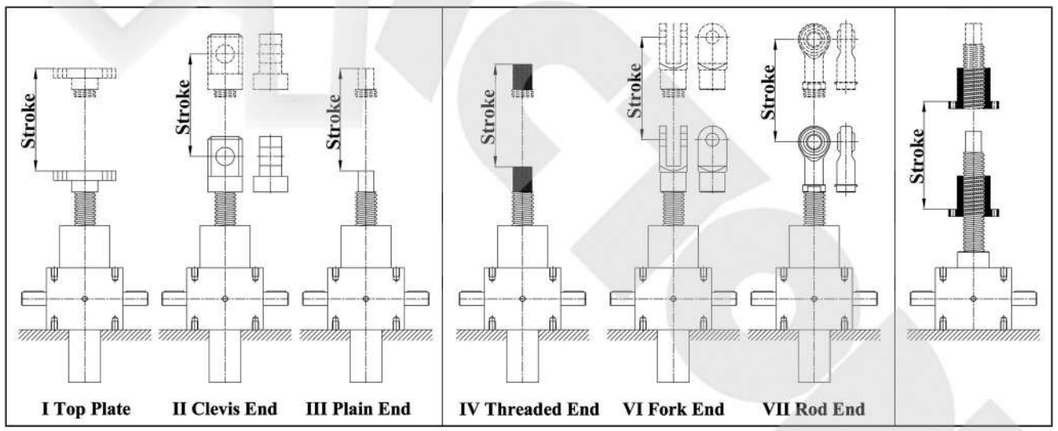
2.2) "UK" and "IK" are Anti-rotation Screw Jacks, they are attached Square Guide Tube for non-rotation. A square guide tube is attached to either the top or bottom of the Screw Jack. A square nut is attached to the end of the Lifting Screw which is then fitted inside the tube, preventing rotation. The Square Guide Tube is supplied with lube fittings. It is ideal for use in applications where a single jack must extend to meet and move a load to which it is not attached (unguided). Anti-rotating jacks are mostly used on larger Jacks and where the lifting force is high in relationship to the nominal capacity or where the travel is long.

- **Note:** Input torque required will increase by approximately 8%.

2.3) "UR" and "IR" are Rotating Screw Jacks, they are also called travelling nut screw jack. It is important to restrain the rotation of the traveling nut by applying a significant load, or more commonly by guiding the load or attaching the load across multiple jacks. The Rotating Jacks mount flush and they are ideal for applications where the physical space does not allow the lifting screw to extend below or above the housing.

2.4) Custom double clevis screw jacks, and trunnion mount screw jacks.

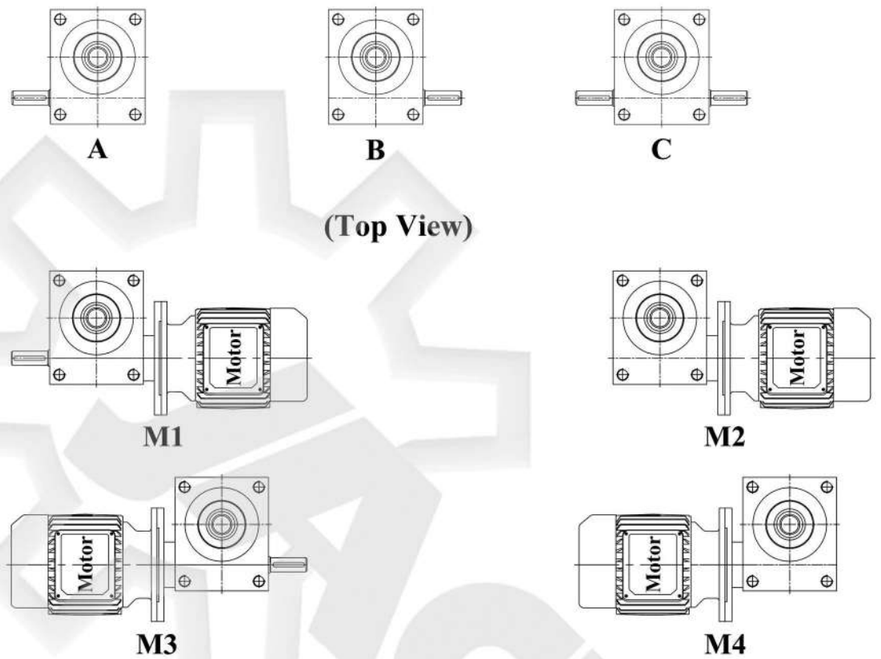
(3) Stroke and (5) Screw End Fittings



- Stroke is travel expressed in millimeter(mm) or inches and not the actual screw length.
- Standard Lifting Screw End Fittings: Top Plate (I), Clevis End (II), Plain End (III), Threaded End (IV), Forked End (VI) and Rod End (VII). Custom End Fittings are acceptable.

Selection Guide

(6) Input Shafts Codes and Motor Flange Adapters Codes (Top View)



6.1) A: Single Input, Left Side Shaft.

6.2) B: Single Input, Right Side Shaft.

6.3) C: Double Input Shafts

6.4) M1: Left Side Shaft, Right Side Motor Flange Adapter (Motor Mounts).

6.5) M2: Right Side Motor Flange Adapter (Motor Mounts).

6.6) M3: Right Side Shaft, Left Side Motor Flange Adapter (Motor Mounts).

6.7) M4: Left Side Motor Flange Adapter (Motor Mounts).

- **Note:** Screw Jacks with IEC Motor Flange Adapter as a standard. Custom NEMA Motor Flange Adapter(Stepper Motor), Servo Motor Flange Adapter and Other Non-standard Motor Flange Adapters.

Selection Guide

Sample Part Number

(7) Accessories



FC
Flex Coupling



UJ
Universal Joint



TUJ
Telescopic Universal Joint



CS
Connecting Shaft



RE
Rod End



FE
Fork End



PB
Pillow Blocks



FB
Flange Blocks



PP
Protective Tube



BB
Bellows Boots



SN
Stop Nut



MF
Motor Flange



TMP
Trunnion Mount Plate



SFN
Safety Nut



DPP
Double Clevis Protective Tube



SPP
Square Protective Tube



EM
Electric Motor



GM
Geared Motor



BGM
Bevel Geared Motor



WG
Worm Gearbox



DCM
DC Motor



SPM
Stepper Motor



SVM
Servo Motor



HW
Hand Wheel



RED
Rotary Encoder



PS
Proximity Switch

Specifications

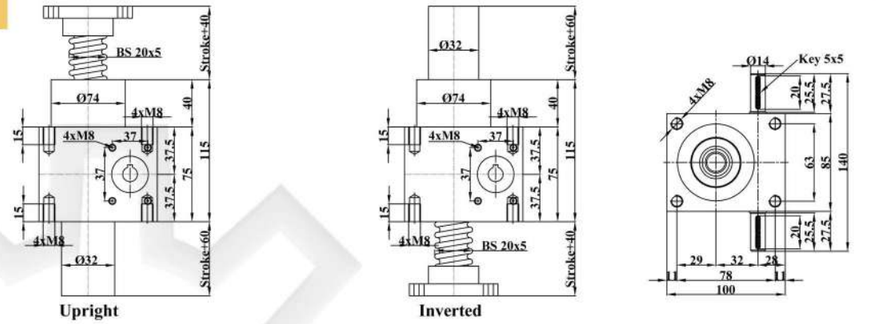
- **Remarks:**

1) H: high ratio, L: slow ratio
2) Max. allowable power is under the conditions that ambient temperature 20 degree C, duty cycle 20%h and input speed 1500rpm.
3) Overall efficiency is under grease lubrication.
4) Without self-locking, locking mechanisms or brake motors are required.

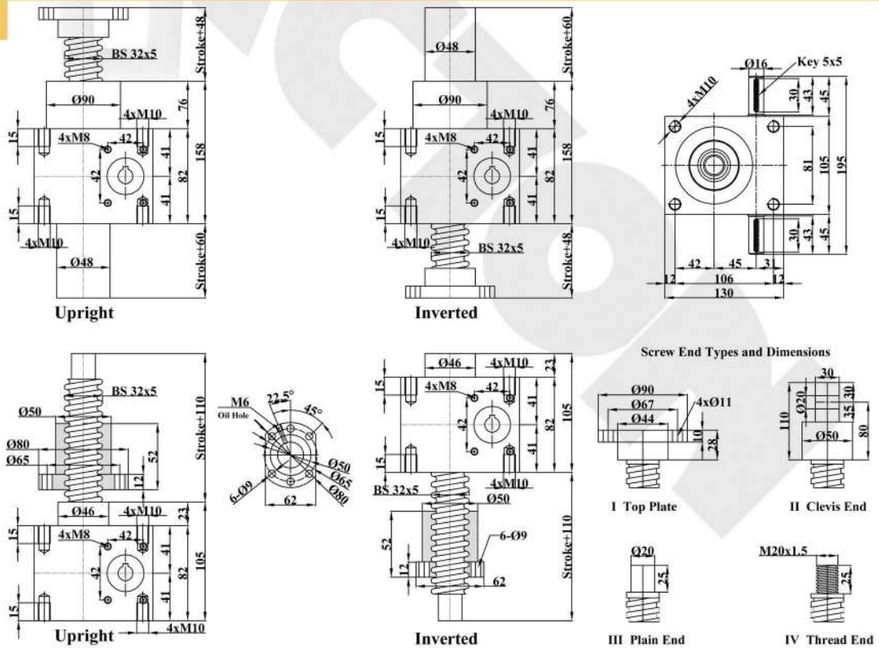
Model		JTD10	JTD25	JTD26	JTD27	JTD50	JTD51	JTD100	JTD101	JTD150	JTD151	JTD200	JTD201	JTD300
Max. static load capacity (kN)		10	25	25	25	50	50	100	100	150	150	200	200	300
Max. dynamic load capacity (kN)		10	17	25	25	46	30	60	60	80	70	90	100	150
Ball screw Dia.xLead (mm)		20x5	32x5	32x10	32x20	40x10	40x20	50x10	50x20	63x10	63x20	80x10	80x20	100x20
Gear ratio	H	5:1	6:1	6:1	6:1	7:1	7:1	9:1	9:1	9:1	9:1	10:1	10:1	10:1
	L	20:1	24:1	24:1	24:1	28:1	28:1	36:1	36:1	36:1	36:1	40:1	40:1	40:1
Lift screw travel (mm), per turn of input shaft	H	1.00	0.83	1.67	3.33	1.43	2.86	1.11	2.22	1.11	2.22	1.00	2.00	2.00
	L	0.25	0.21	0.42	0.83	0.36	0.71	0.28	0.56	0.28	0.56	0.25	0.50	0.50
Overall Efficiency %	H	36	32	35	36	33	34	32	33	32	34	31	31	30
	L	25	20	21	22	20	21	20	20	20	21	18	18	18
Maximum permissible input power (kW)	H	0.57	1.14	1.14	1.14	2.2	2.2	2.5	2.5	3.0	3.0	4.0	4.0	7.0
	L	0.27	0.55	0.55	0.55	1.1	1.1	1.5	1.5	2.2	2.2	3.5	3.5	5.5
Gear housing material		Alu.	Alu. Ductile Iron			Ductile Iron								
Weight without stroke (kg)		6	9.5	9.5	10	23	24	38	40	62	64	78	78	125
Weight of screw (kg), per 100 mm stroke		0.5	0.8	0.8	0.8	1.6	1.6	2.5	2.5	3.2	3.2	4.6	4.6	7.3

Overall Dimensions

JTD10



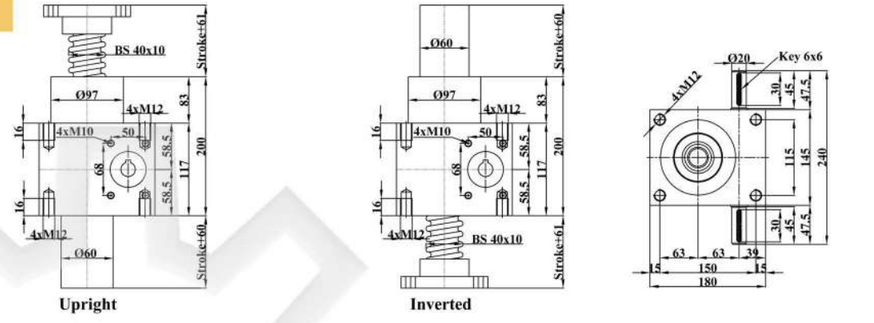
JTD25



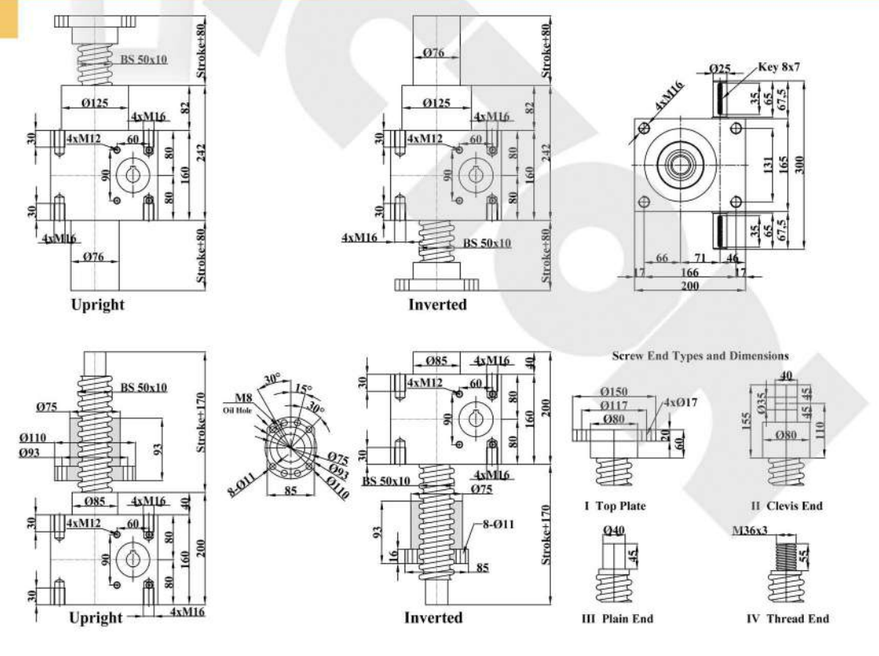
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Overall Dimensions

JTD50



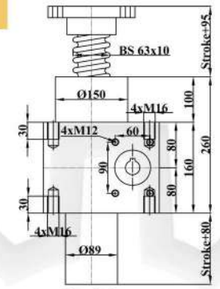
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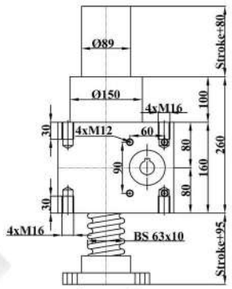
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Overall Dimensions

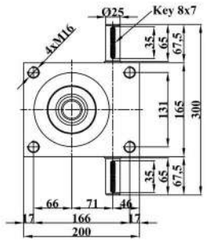
JTD150

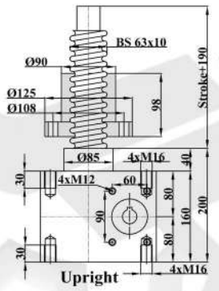


Upright



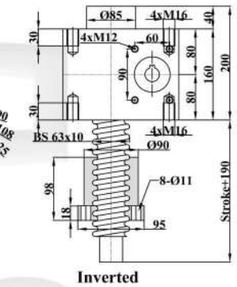
Inverted





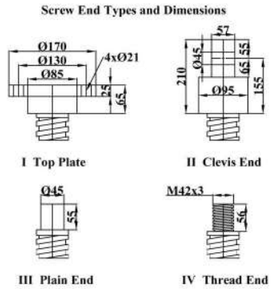
Upright



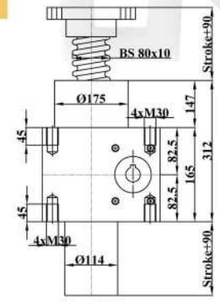


Inverted

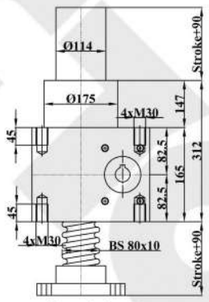
Screw End Types and Dimensions



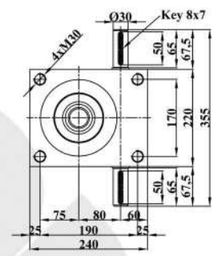
JTD200

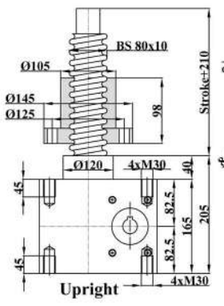


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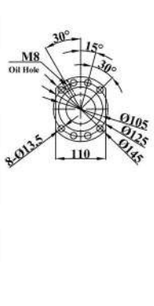


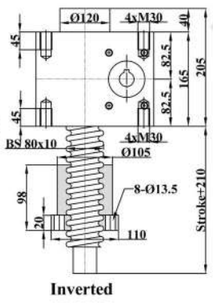
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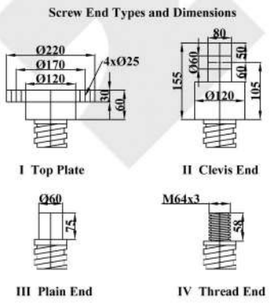
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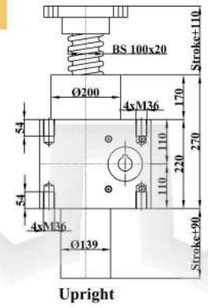
Screw End Types and Dimensions



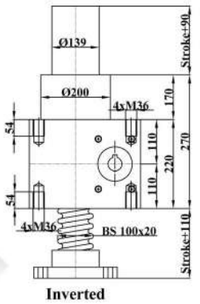
*. Dimensions are subject to change without notice

Overall Dimensions

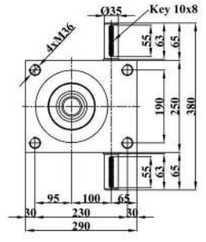
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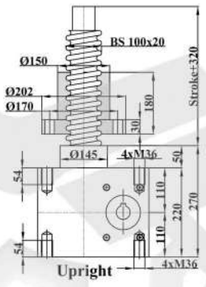


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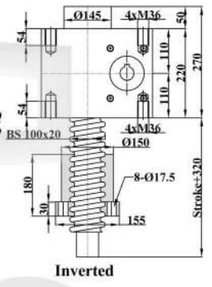
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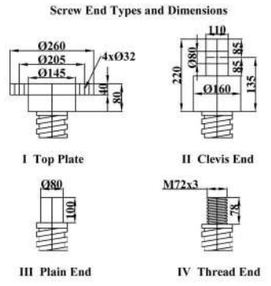
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Inverted

Screw End Types and Dimensions



*. Dimensions are subject to change without notice