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Descriptions

A **Square Ball Screw Jack** is a type of screw jack that features a square shaped housing and utilizes a ball screw mechanism to provide linear motion. Compared to traditional worm gear machine screw jacks, ball screw jacks offer advantages such as higher efficiency, greater accuracy, and faster travel speeds. Load capacities include **10kN, 25kN, 50kN, 100kN, 150kN, 200kN and 300kN**.

Key Features of Square Screw Jacks:

- **Square Housing:** The square design provides versatility in mounting options, allowing for upright or inverted installation and making it easier to integrate into various machine and system configurations. The square housing also offers a clean surface, ideal for environments where cleanliness is a priority, like the food industry.
- **Ball Screw Mechanism:** The ball screw and nut with rolling contact significantly reduce friction compared to other screw types like acme screws, enabling higher efficiency and faster operation.
- **High Performance:** square ball screw jacks are engineered for high accuracy,precision positioning, and the ability to handle various load capacities, making them suitable for demanding industrial applications.
- **Versatile Configurations:** They can be configured with translating screws (where the screw moves linearly) or rotating nuts (where the nut moves along a rotating screw) to suit different application needs.
- **Modular Design:** The modular design allows for easy integration into synchronized lifting systems, where multiple jacks can be connected to move simultaneously and synchronously.
- **Durability and Reliability:** Constructed with high-quality materials such as hardened alloy steel and ductile iron housings, these screw jacks are designed for long-lasting performance in challenging industrial environments.

Applications:

Square ball screw jacks are used in a wide range of industrial lifting, lowering, pushing, and pulling applications, including: Conveyor belt adjustments, Positioning of platforms and components, Platform lifts, damper adjustments, ergonomic lifts, maintenance lifts, roll, adjustments, earth station antennas, solar trackers, packaging equipment, and gate adjustments.

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

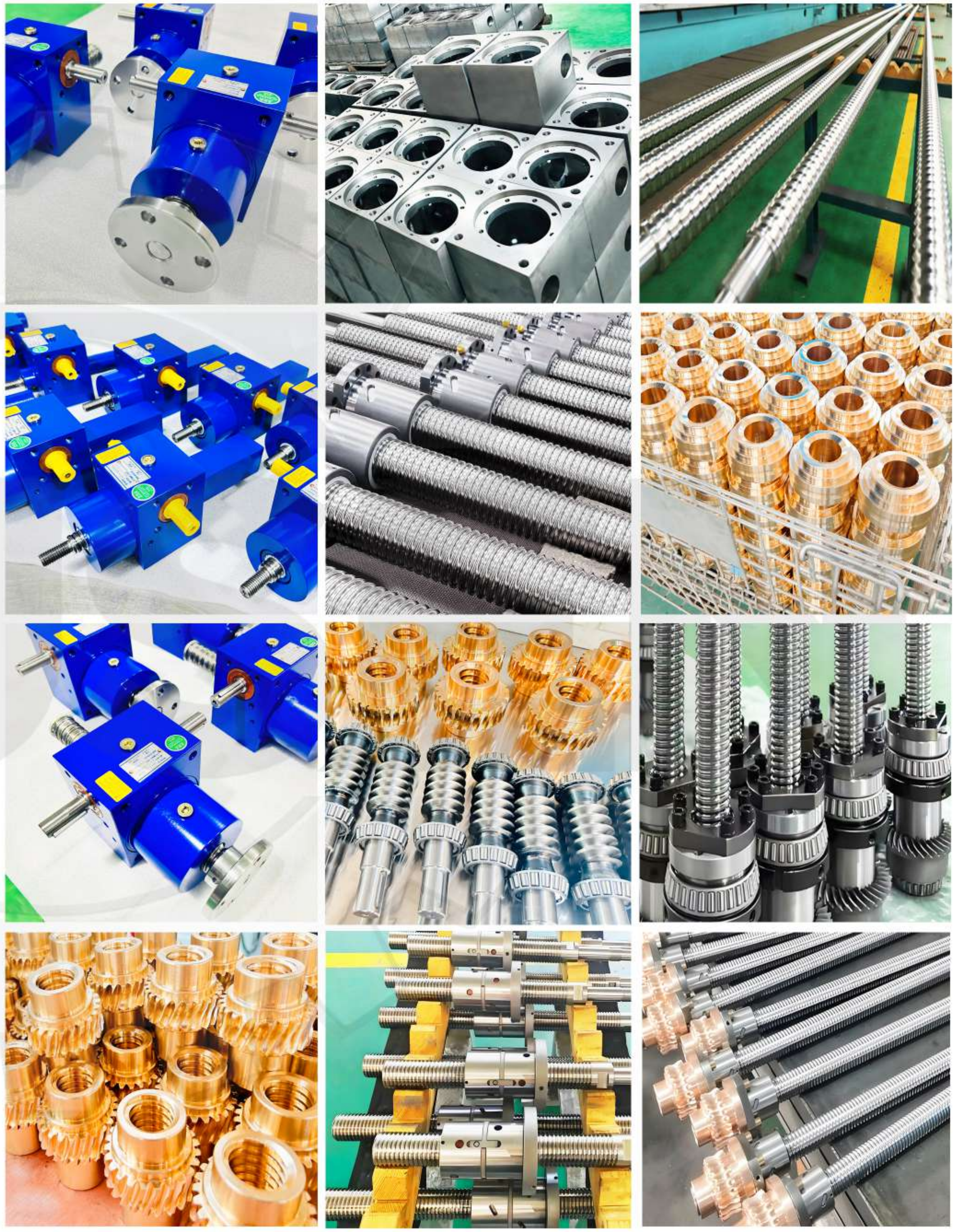
Motor Flange Adapter

- 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.

Selection Guide

(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):

KMB10LAS300TPSLRZB

(1) Models and Gear Ratios

KMB10 (BS 20x5) **H**=5:1 **L**=20:1	KMB25 (BS 32x10) **H**=6:1 **L**=24:1	KMB50 (BS 40x10) **H**=7:1 **L**=28:1	KMB100 (BS 50x10) **H**=7:1 **L**=28:1
KMB150 (BS 63x10) **H**=10:1 **L**=40:1	KMB200 (BS 80x10) **H**=10:1 **L**=40:1	KMB300 (BS 100x20) **H**=10:1 **L**=40:1	**H:** High ratio **L:** Slow ratio

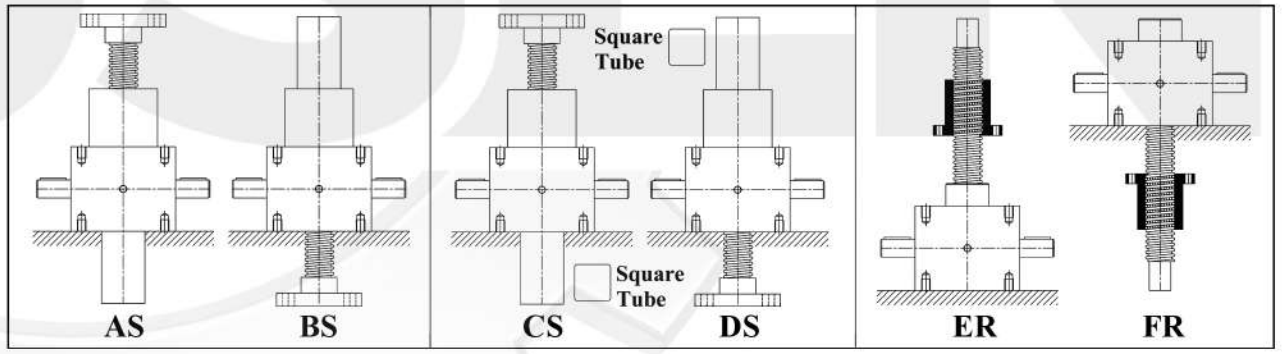
1.1) Model Note 1: the model indicates the maximum static load of this screw jack, but not the Maximum dynamic load. The dynamic load depends on the lifting speed, travel length and others working conditions.

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) "AS" and"BS"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

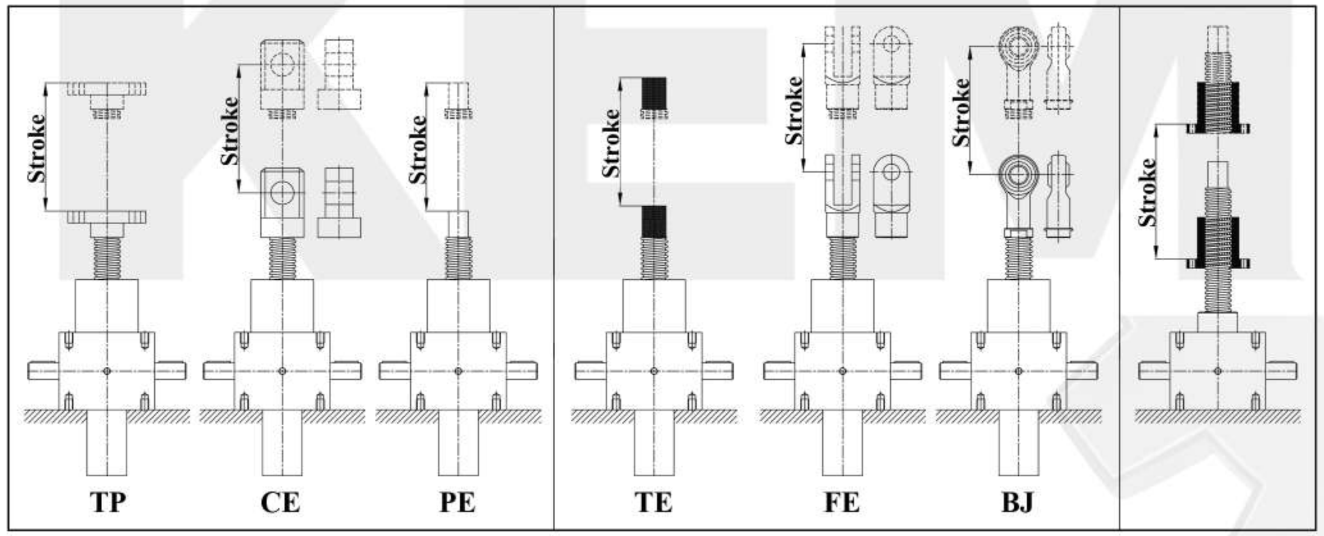
2.2) "CS" and "DS" are Anti-rotation Screw Jacks, they are attached Square Guide Tube for non-rotation. A square guide tube is attached to either the top or bottom of the Screw Jack. A square nut is attached to the end of the Lifting Screw which is then fitted inside the tube, preventing rotation. The 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) "ER" and "FR" 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.

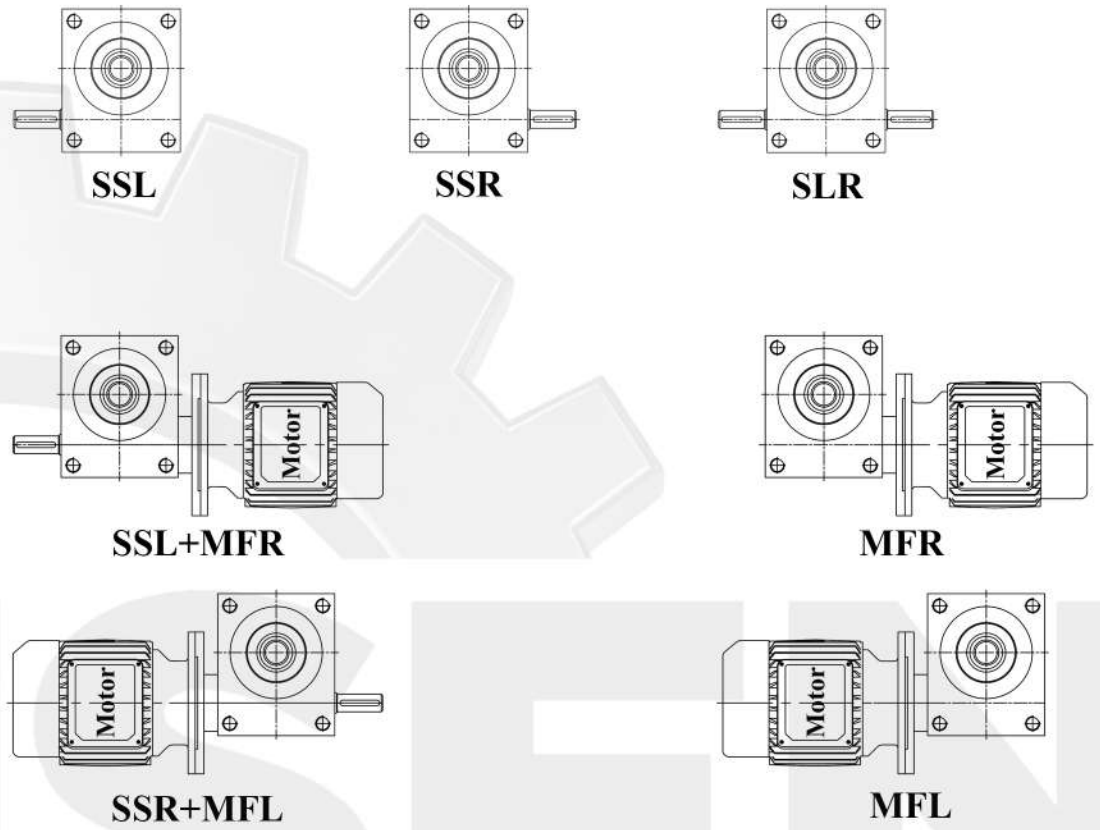
(3) Stroke and Screw End Fittings



- Stroke is travel expressed in millimeter(mm) or inches and not the actual screw length.
- Standard Lifting Screw End Fittings: (TP)Top Plate , (CE)Clevis End , (PE)Plain End , (TE)Threaded End , (FE)Forked End and (BJ)Rod End . Custom End Fittings are acceptable.

Selection Guide

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



4.1) SSL: Single Input, Left Side Shaft.

4.2) SSR: Single Input, Right Side Shaft.

4.3) SLR: Double Input Shafts

4.4) SSL+MFR: Left Side Shaft, Right Side Motor Flange Adapter (Motor Mounts).

4.5) MFR: Right Side Motor Flange Adapter (Motor Mounts).

4.6) SSR+MFL: Right Side Shaft, Left Side Motor Flange Adapter (Motor Mounts).

4.7) MFL: 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

(5) Accessories


C
Flex Coupling


U
Universal Joint


T
Telescopic Universal Joint


L
Connecting Shaft


BJ
Rod End


FE
Fork End


PB
Pillow Blocks


FB
Flange Blocks


Z
Protective Tube


B
Bellows Boots


SN
Stop Nut


MF
Motor Flange


SP
Trunnion Mount Plate


SF
Safety Nut


DZ
Double Clevis Protective Tube


FZ
Square Protective Tube


M
Electric Motor


R
Geared Motor


K
Bevel Geared Motor


RV
Worm Gearbox


DC
DC Motor


SM1
Stepper Motor


SM2
Servo Motor


CH
Hand Wheel


EN
Rotary Encoder


P
Proximity Switch

Specifications

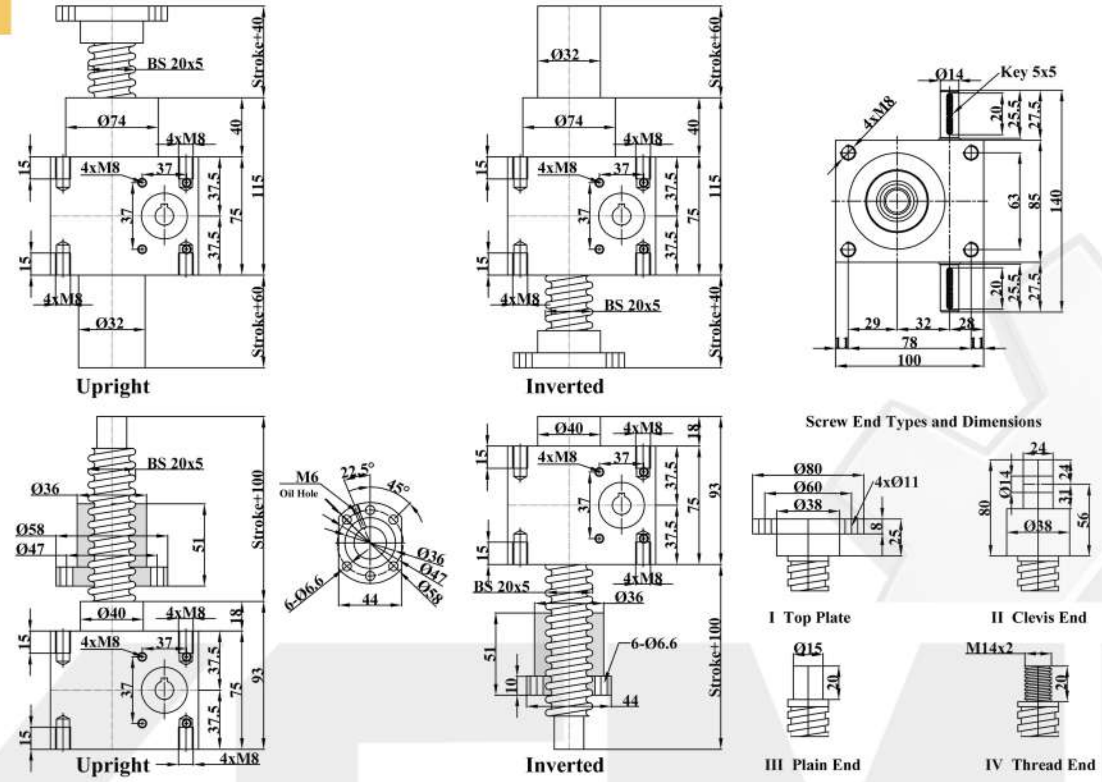
- **Remarks:**

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.

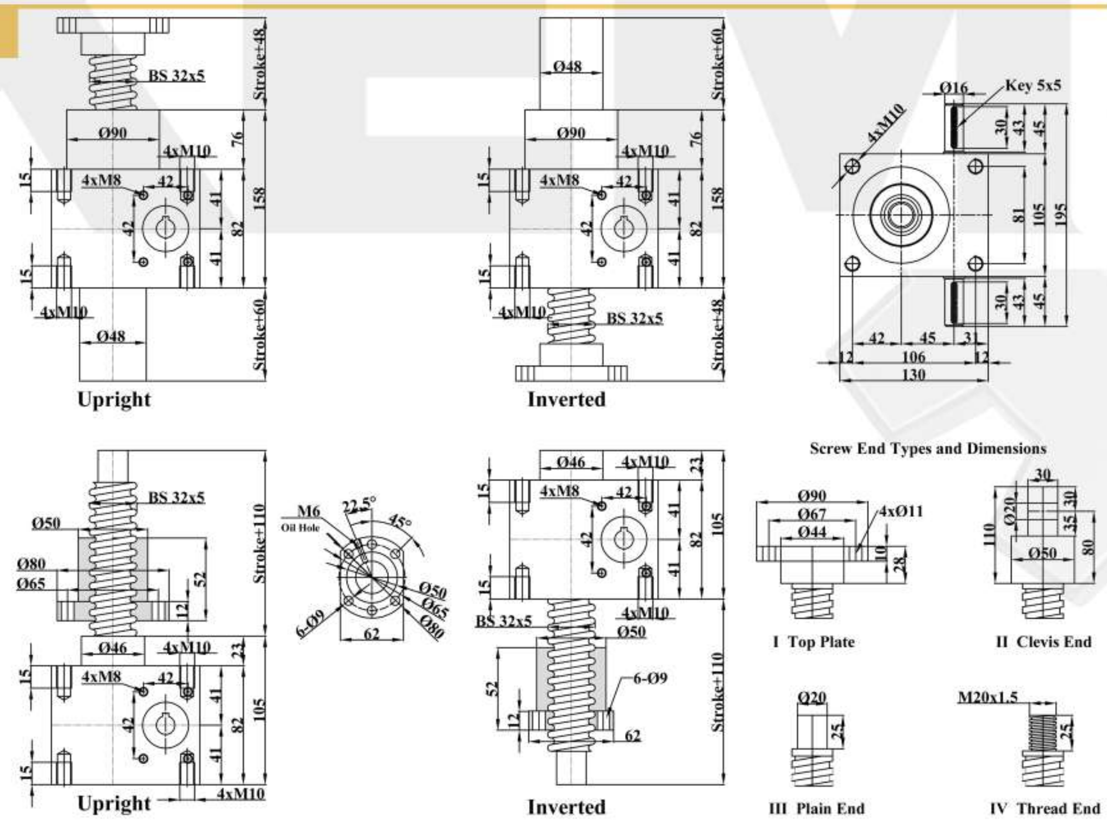
Model		KMB10	KMB25	KMB26	KMB27	KMB50	KMB51	KMB100	KMB101	KMB150	KMB151	KMB200	KMB201	KMB300
Max. static load capacity (kN)		10	25	25	25	50	50	100	100	150	150	200	200	300
Max. dynamic load capacity (kN)		10	17	25	25	46	30	60	60	80	70	90	100	150
Ball screw Dia.xLead (mm)		20x5	32x5	32x10	32x20	40x10	40x20	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

KMB10



KMB25



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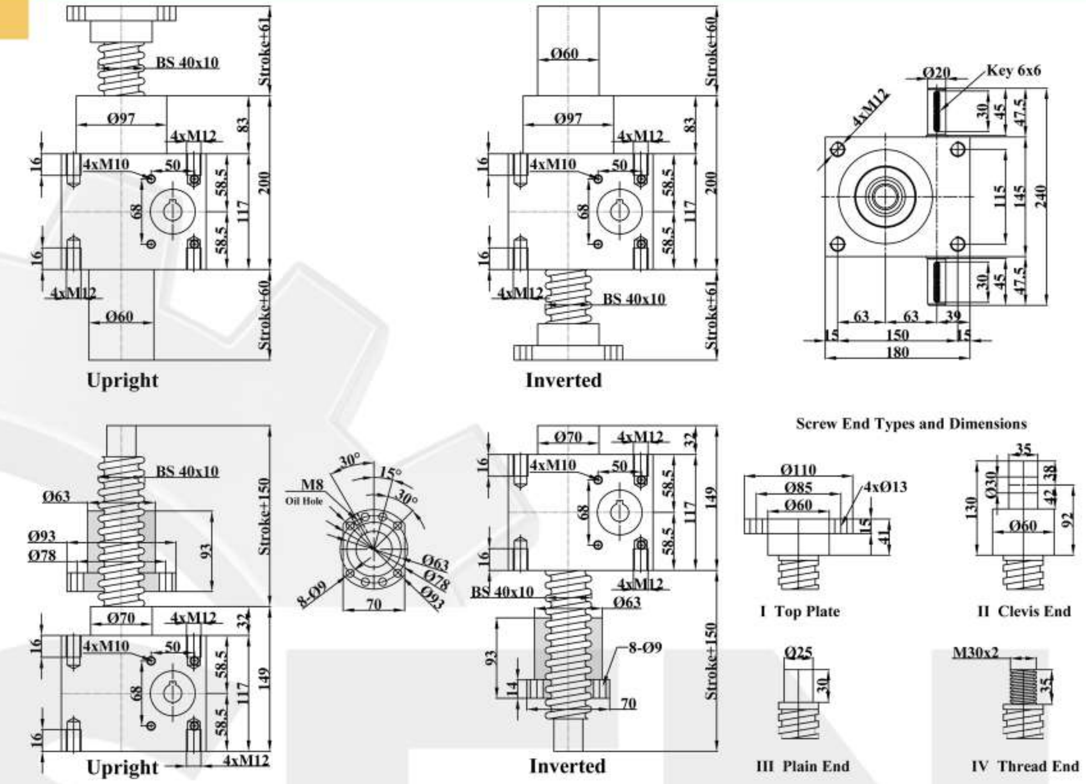
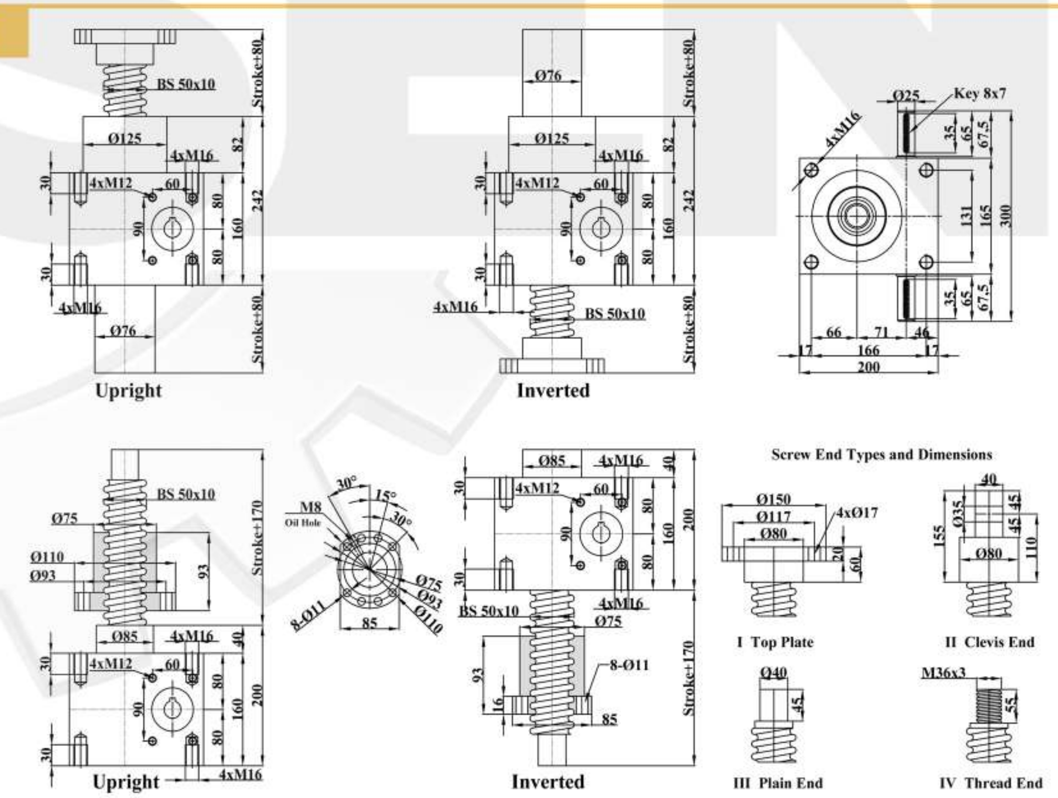
Overall Dimensions

KMB50



KMB100



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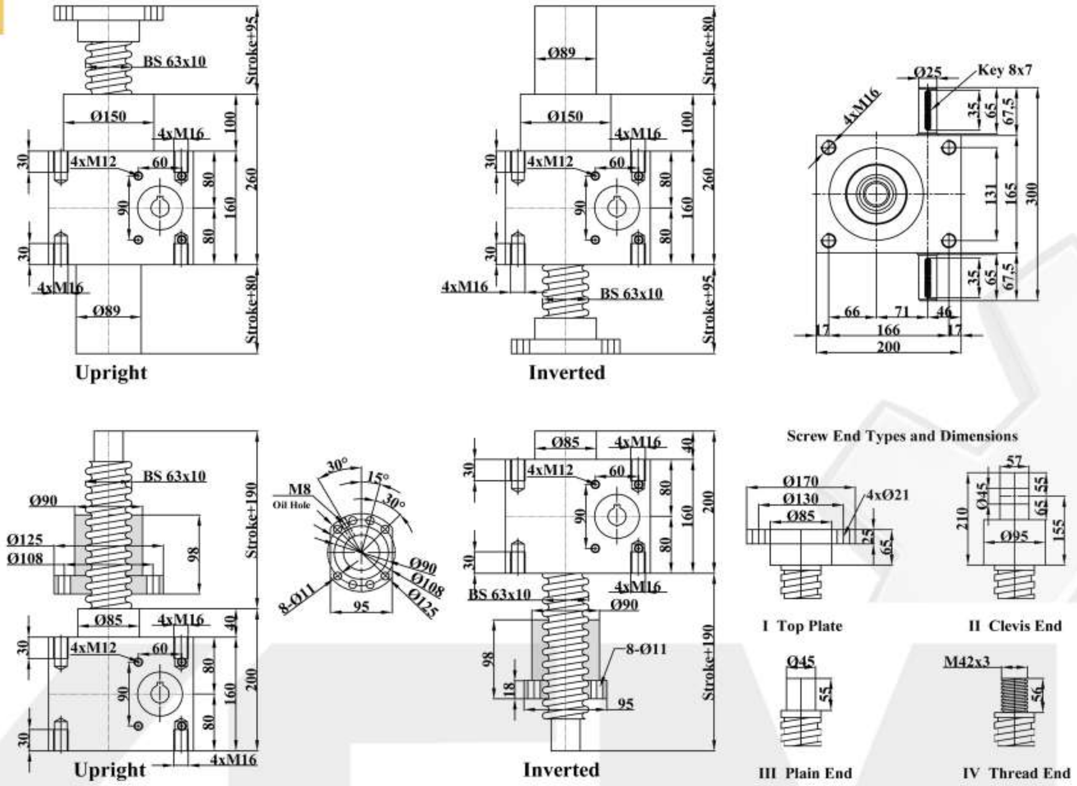
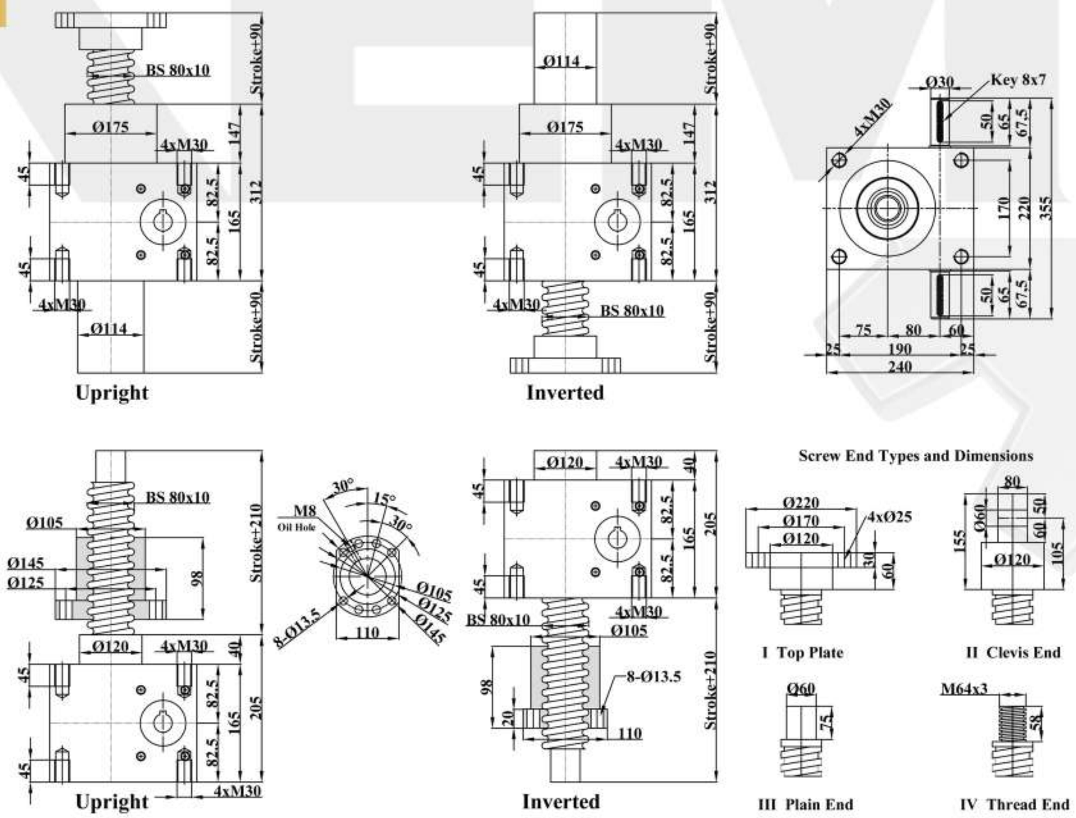
Overall Dimensions

KMB150



KMB200



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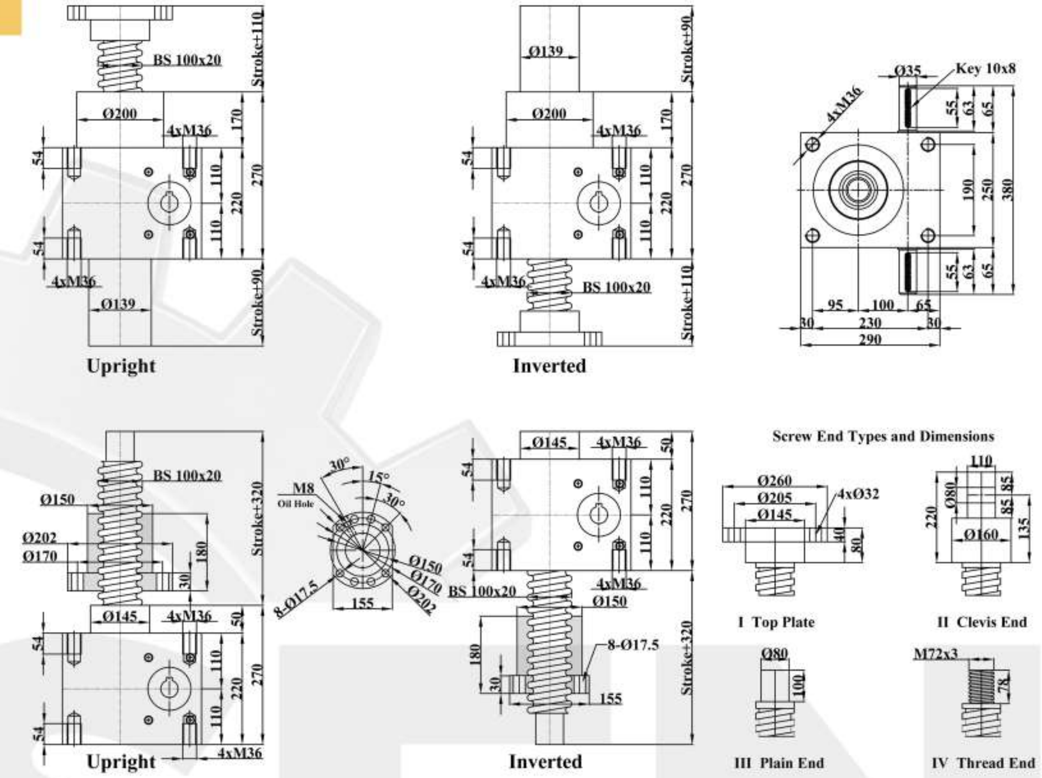
Overall Dimensions

KMB300



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