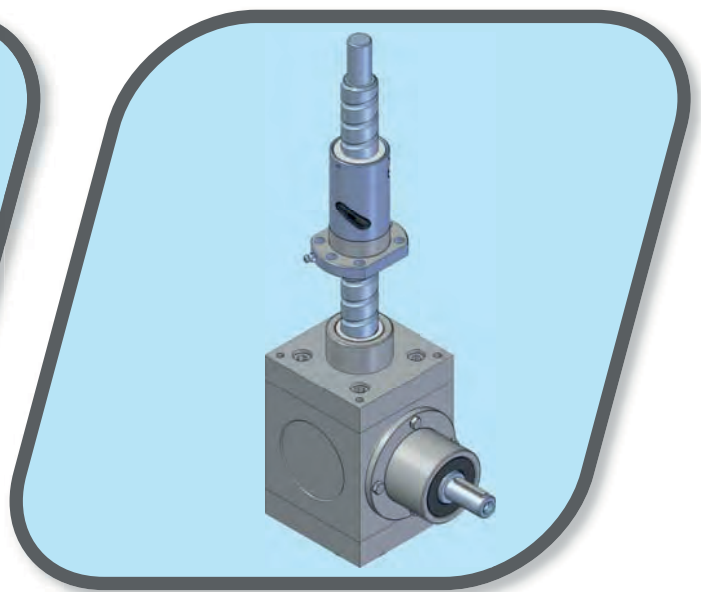
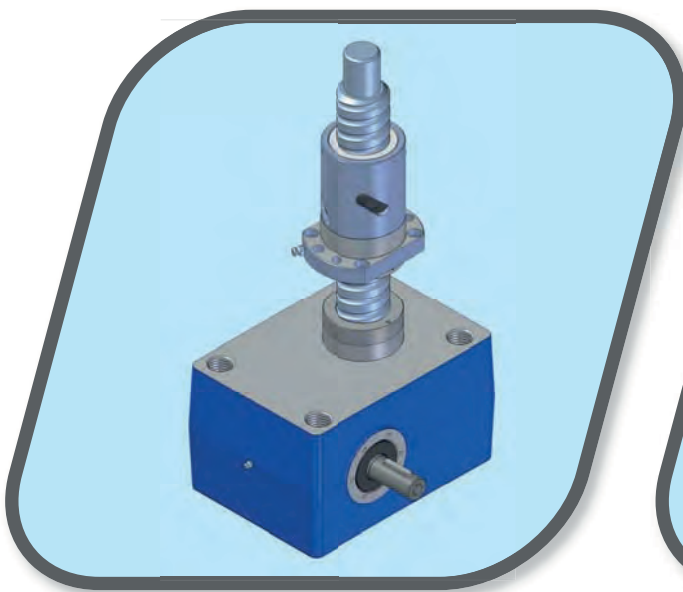
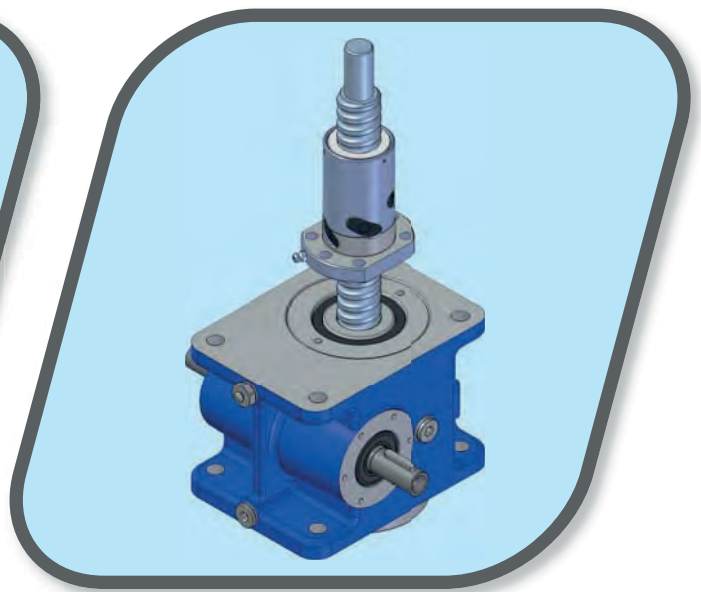
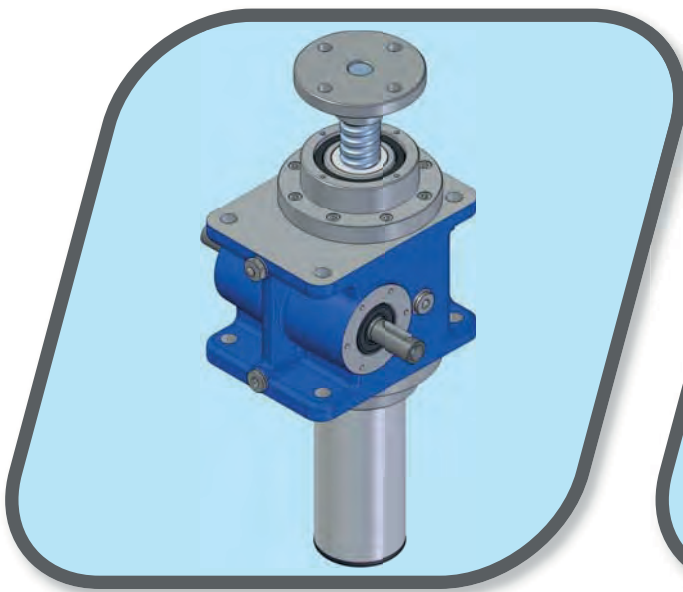


Ball Screw Jacks



Catalogue

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Ball screw jacks

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1.1 Ball screw jacks description

Screw jacks transform a rotary motion of an electric, hydraulic or pneumatic motor or even a manual operation into a vertical linear lifting motion (push or pull) or into a horizontal positioning motion.

Screw jacks can be installed as a single unit or in lifting systems with different layouts connected by transmission shafts, couplings and bevel gearboxes. Screw jacks enable the synchronized constant movement of lifting systems even with a not uniformly distributed load.

Ball screw jacks combine the gear unit with a linear drive performed by a ball screw that, in comparison with the traditional acme screw, offers following advantages:

- higher total efficiency
- longer life of the whole linear drive system

The following two comparative examples give an idea of the higher efficiency that can be obtained with this system:

- considering a screw jack consisting of a worm gear with linear drive performed by an acme screw, the total efficiency of the screw jack is between 10 % and 40 %
- considering a screw jack consisting of a worm gear with linear drive performed by a ball screw, the total efficiency of the screw jack is between 30 % and 70 %

With same performance requirements in both systems (speed and applied load), the second solution allows a 45 - 50 % reduction of the installed power.

SERVOMECH screw jacks are able to work under either push or pull load and can be mounted vertically upward and downward or horizontally.

SERVOMECH ball screw jacks are available in two different models:

- travelling screw (Model A)
- travelling nut (Model B)

SERVOMECH ball screw jacks range offers three main families: MA BS, SJ BS and HS. Each family is designed and developed to represent a series of sizes with an adequate reciprocal gauge, to allow an easier selection of the most suitable size in terms of performances and costs for each application.

MA BS Series (high performance and duty cycle)

Linear drive with travelling ball screw (Mod.A) or with travelling ball nut (Mod.B), worm gear with ratio from 1 : 4 to 1 : 32, input speed up to 3 000 rpm, oil lubricated, duty cycle up to 100 % at 25°C ambient temperature.

SJ BS Series (standard performance and duty cycle)

Linear drive with travelling ball nut (Mod.B), worm gear with ratio from 1 : 4 to 1 : 36, input speed up to 1 500 rpm, grease lubricated, duty cycle up to 70 % at 25°C ambient temperature.

HS Series (high speed, performance and duty cycle)

Linear drive with travelling ball nut (Mod.B), bevel gear with ratio from 1 : 1 to 1 : 4, input speed up to 3 000 rpm, oil lubricated, duty cycle up to 100% at 25°C ambient temperature.

Ball screw jacks

1.2 Manufacturing features

SERVOMECH screw jacks are designed and manufactured using high technology and CNC machine tools. All working processes inside SERVOMECH comply to its Quality Management System, developed according to ISO 9001:2008 and certified by TÜV Italia. Check tests are carried out in-line during all manufacturing processes to monitor and adjust possible errors, obtaining a constant quality of the production without reject. Final control and functional checks are carried out to ensure high quality and reliability of the final product.

MA BS and SJ BS Series screw jacks

- Input drive: precision worm gearbox, high efficiency design, ZI involute profile, reduced angular backlash; bronze wormwheel; hardened and ground steel wormshaft, with true involute worm thread and shaft ground.
- Housing: monobloc housing designed for a more compact and robust shape, able to carry heavy loads and ensure a high precision level of machining.

HS Series screw jacks

- Input drive: bevel gear, gears made in high quality alloy steel, cut according to GLEASON spiral toothing system, case-hardened, tempered and lapped in pairs; the accurate and consolidated manufacturing technology allows to produce bevel gears able to work quietly and with high efficiency. The angular backlash on the output shaft is max. 10' arcmin (on request controlled and reduced backlash, max. 5...6' arcmin).
- Housing: cubic design, compact and robust.

Ball screws

- Nuts: made in case-hardened alloy steel, with ball tracks hardness within the range (58 ... 61) HRc; with flange DIN 69051 (for Mod.B only) or with cylindrical flange designed by SERVOMECH; standard with backlash or preloaded on request; radial or frontal recirculation system; with ball nut end seals and grease nipple.
- Threaded shafts in alloy steel, with rolled (accuracy grade IT 7) or whirled thread (accuracy grade IT 5 or IT 3 on request); the ball track hardness (58 ... 61) HRc.
- Grease lubricated.
- Wide range of diameter - thread helix lead combinations: the nominal diameter range is (16 ... 120) mm, the nominal lead range is (5 ... 40) mm.
- Geometrical checks according to ISO 3408 and DIN 69051.
- Threaded shafts with machined ends and nuts to customer's drawing available on request.

1.3 Materials and Components

Ball screws used in screw jacks

- Threaded shafts: quenched and tempered alloy steel 42 CrMo 4 or 50 CrMo 4 (UNI EN 10083)

Threaded bars available on stock (nominal diameter × nominal lead, in mm):

ROLLED, accuracy grade IT 7				
BS 16×5	BS 20×5	BS 25×5	BS 32×5	BS 40×5
BS 16×10	BS 20×10	BS 25×10	BS 32×10	BS 40×10
BS 16×16	BS 20×20	BS 25×25	BS 32×20	BS 40×20
			BS 32×32	BS 40×40

MACHINED, accuracy grade IT 5 (IT 3)									
BS 16×5	BS 20×5	BS 25×5	BS 32×5	BS 40×5	BS 50×10	BS 63×10	BS 80×10	BS 100×16	BS 120×20
BS 16×10	BS 20×10	BS 25×10	BS 32×10	BS 40×10	BS 50×20	BS 63×20	BS 80×16	BS 100×20	
	BS 20×20		BS 32×20	BS 40×20			BS 80×20		
			BS 32×32	BS 40×40					

- Nuts: case-hardened alloy steel 18 NiCrMo 5 (UNI EN 10084)

MA Series and SJ Series screw jacks

- Housing:
 - casting in hardened and tempered aluminium alloy EN 1706 - AC-ALSi10Mg T6
 - casting in grey cast iron EN-GJL-250 (UNI EN 1561)
 - casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)
 - welded steel S355J2 (UNI EN 10025)
- Wormwheel: bronze EN 1982 – CuSn12-C
- Worm shaft: case-hardened steel 20 MnCr 5 (UNI EN 10084) , ground involute profile ZI

HS Series screw jacks

- Housing: casting in grey cast iron EN-GJL-250 (UNI EN 1561)
- Solid shafts: quenched and tempered carbon steel C45E +H +QT (UNI EN 10083-2)
- Input hollow shaft: case-hardened steel 20 MnCr 5 (UNI EN 10084)
- Output hollow shaft: quenched and tempered steel 39 NiCrMo 3 (UNI EN 10083-3)
- Bevel gears: case-hardened steel 20 MnCr 5 (UNI EN 10084)

Ball screw jacks

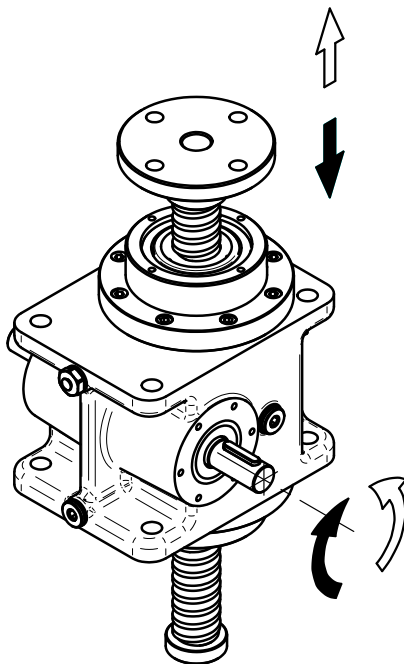
1.4 Ball screw jacks overview

Ball screw jacks			
Travelling screw (Mod. A)		Travelling nut (Mod. B)	
MA BS Series		MA BS Series	
MA 5	BS 16 × 5 BS 16 × 10 BS 16 × 16	MA 5	BS 16 × 5 BS 16 × 10 BS 16 × 16 BS 20 × 5 BS 20 × 10 BS 20 × 20
MA 10	BS 25 × 5 BS 25 × 10 BS 25 × 25	MA 10	BS 25 × 5 BS 25 × 10 BS 25 × 25
MA 25	BS 32 × 10 BS 32 × 20 BS 32 × 32	MA 25	BS 32 × 5 BS 32 × 10 BS 32 × 20 BS 32 × 32
MA 50	BS 40 × 10 BS 40 × 20 BS 40 × 40	MA 50	BS 40 × 10 BS 40 × 20 BS 40 × 40
MA 100	BS 50 × 10 BS 50 × 20	MA 80	BS 50 × 10 BS 50 × 20
MA 150	BS 63 × 10 BS 63 × 20	MA 150	BS 63 × 10 BS 63 × 20
MA 200	BS 80 × 10 BS 80 × 20	MA 200	BS 80 × 10 BS 80 × 16 BS 80 × 20
MA 350	BS 100 × 16 BS 100 × 20	MA 350	BS 100 × 16 BS 100 × 20
MA BS Series		SJ BS Series	
high efficiency screw jacks, suitable for continuous operation, duty cycle up to 100 %, ratio from 1 : 4 to 1 : 32, input speed up to 3 000 rpm		standard performances screw jacks, available only in Mod. B - travelling nut, duty cycle up to 70 %, ratio from 1 : 4 to 1 : 36, input speed up to 1 500 rpm	
8 standard sizes with load capacity from 5 kN to 350 kN		8 standard sizes with load capacity from 5 kN to 400 kN	
Model A: travelling ball screw Model B: travelling ball nut		Model B: travelling ball nut	
ball screw from BS 16 × 5 to BS 100 × 20		ball screw from BS 16 × 5 to BS 120 × 20	
6 different input versions for each size and ratio: Vers.1: single input shaft Vers.2: double input shaft Vers.3: flange and hollow shaft for IEC/servo motor Vers.4: flange and hollow shaft for IEC/servo motor with second input shaft Vers.5: Vers.1 + bell housing and coupling for IEC/servo motor Vers.6: Vers.2 + bell housing and coupling for IEC/servo motor		3 different input versions for each size and ratio S: solid shaft with key, standard diameter R: solid shaft with key, larger diameter MF: flange and hollow shaft for IEC motor MA: flange and hollow shaft for servo motor Additional output shaft (S or R)	
long-life synthetic oil lubricated worm gear		long-life synthetic grease lubricated worm gear	
wide range of accessories available			
MA BS Series		SJ BS Series	
MA 5	BS 16 × 5 BS 16 × 10 BS 16 × 16	SJ 5	BS 16 × 5 BS 16 × 10 BS 16 × 16 BS 20 × 5 BS 20 × 10 BS 20 × 20
MA 10	BS 25 × 5 BS 25 × 10 BS 25 × 25	SJ 10	BS 25 × 5 BS 25 × 10 BS 25 × 25
MA 25	BS 32 × 10 BS 32 × 20 BS 32 × 32	SJ 25	BS 32 × 5 BS 32 × 10 BS 32 × 20 BS 32 × 32
MA 50	BS 40 × 10 BS 40 × 20 BS 40 × 40	SJ 50	BS 40 × 10 BS 40 × 20 BS 40 × 40
MA 100	BS 50 × 10 BS 50 × 20	SJ 100	BS 50 × 10 BS 50 × 20
MA 150	BS 63 × 10 BS 63 × 20	SJ 150	BS 63 × 10 BS 63 × 20
MA 200	BS 80 × 10 BS 80 × 20	SJ 200	BS 80 × 10 BS 80 × 16 BS 80 × 20
		SJ 250	BS 100 × 16 BS 100 × 20
		SJ 300	BS 100 × 16 BS 100 × 20
		SJ 400	BS 120 × 20
MA BS Series		HS Series	
high efficiency screw jacks, suitable for continuous operation, duty cycle up to 100 %, ratio from 1 : 4 to 1 : 32, input speed up to 3 000 rpm		high speed screw jacks, available only in Mod. B - travelling nut, suitable for continuous operation, duty cycle up to 100 %, ratio from 1 : 1 to 1 : 4, input speed up to 3 000 rpm	
8 standard sizes with load capacity from 5 kN to 350 kN		6 standard sizes with load capacity from 10 kN to 200 kN	
Model A: travelling ball screw Model B: travelling ball nut		Model B: travelling ball nut	
ball screw from BS 16 × 5 to BS 100 × 20		ball screw from BS 25 × 5 to BS 80 × 20	
6 different input versions for each size and ratio: Vers.1: single input shaft Vers.2: double input shaft Vers.3: flange and hollow shaft for IEC/servo motor Vers.4: flange and hollow shaft for IEC/servo motor with second input shaft Vers.5: Vers.1 + bell housing and coupling for IEC/servo motor Vers.6: Vers.2 + bell housing and coupling for IEC/servo motor		3 different input versions for each size and ratio S: solid shaft with key, standard diameter R: solid shaft with key, larger diameter MF: flange and hollow shaft for IEC motor MA: flange and hollow shaft for servo motor Additional output shaft (S or R)	
long-life synthetic oil lubricated worm gear		long-life synthetic oil lubricated bevel gear	

1.5 Models

Ball screw jacks are available in two different models:

- travelling screw (Model A)
- travelling nut (Model B)



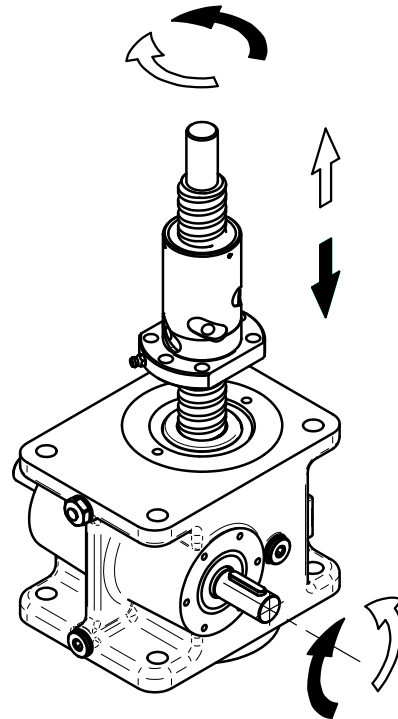
Model A - travelling screw

The ball nut is integral with the worm wheel.

The linear motion is performed by the ball screw being driven by the nut through the screw jack housing, therefore there must be enough space on both screw jack sides. In operation, the screw does not rotate and its translation is possible only if the reacting torque is applied.

Accessories:

- protective tube
- protective bellows
- safety nut
- various screw end attachments
- limit switches
- anti-turn device
- stop nut
- trunnion mount
- bronze guides



Model B - travelling nut

The ball screw is fixed to the worm wheel. In operation the screw rotates with the worm wheel at the same speed, driving the bronze nut up and down along the ball screw. The linear motion of the nut is possible only if the reacting torque is applied, avoiding the integral rotation with the ball screw.

Accessories:

- protective bellows
- safety nut
- nut support with pivoting pins
- nut at customer's drawing
- trunnion mount

Ball screw jacks

1.5 Models

MA BS Series screw jacks are available in both models, while SJ BS and HS Series are available only with travelling nut.

The choice of the model depends on the selected screw jack type or on the specific requirements of the application, but in case it can be chosen between the two models (only for MA BS Series), it should be considered that, with same ball screw diameter and lead, the performances of the screw jack MA BS Series Mod. A are higher than those obtained with Mod.B. This is due to the fact that the travelling screw model has an integrated structure between the gear parts and the ball screw that allows higher performances in terms of:

- Efficiency
- Load capacity
- Life
- Stiffness

Considering the several advantages obtained, SERVOMECH has registered an industrial patent right for this screw jack model.

SERVOMECH screw jacks can operate in vertical, horizontal or inclined plane. Different input options are available, such as:

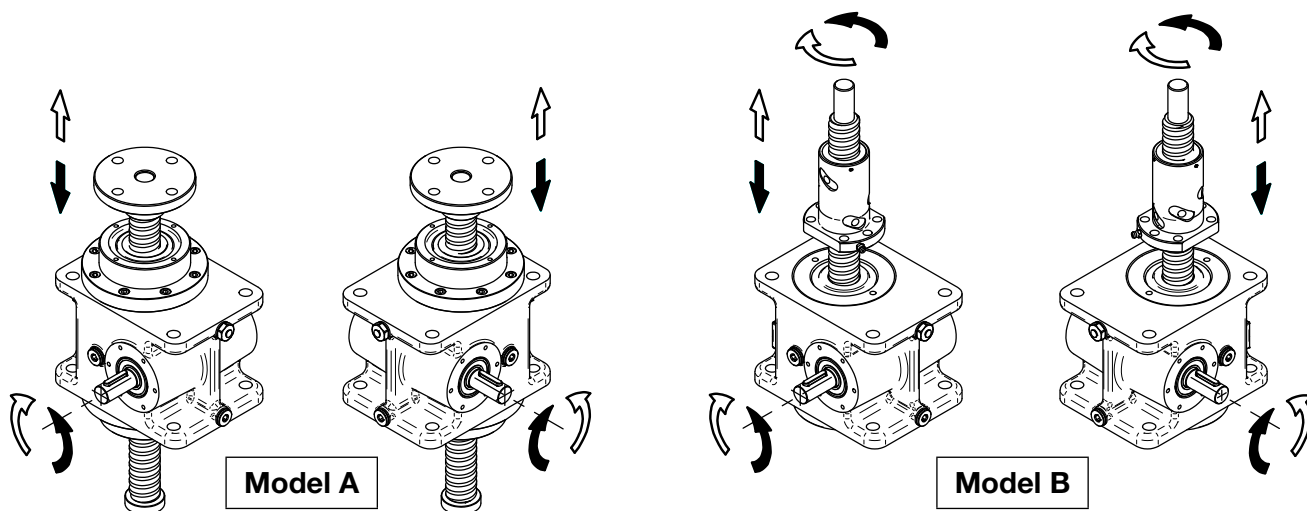
- MA BS Series and SJ BS Series: single or double shaft, motor flange or motor flange with second input shaft.
- HS Series: single solid shaft or flange as motor attachment and second solid output shaft.

All screw jacks are available with flange or bell housing + coupling for:

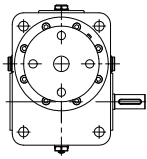
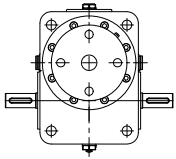
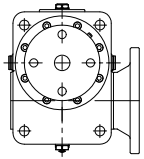
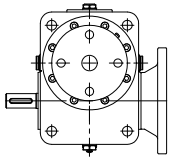
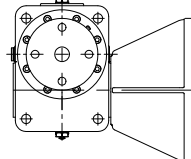
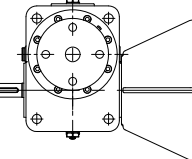
- AC 3-phase electric motors with IEC UNEL-MEC flange
- servomotors
- hydraulic motors

1.6 Design – screw jacks MA BS Series and SJ BS Series

INPUT SHAFT ROTATION – SCREW OR NUT LIFTING DIRECTION

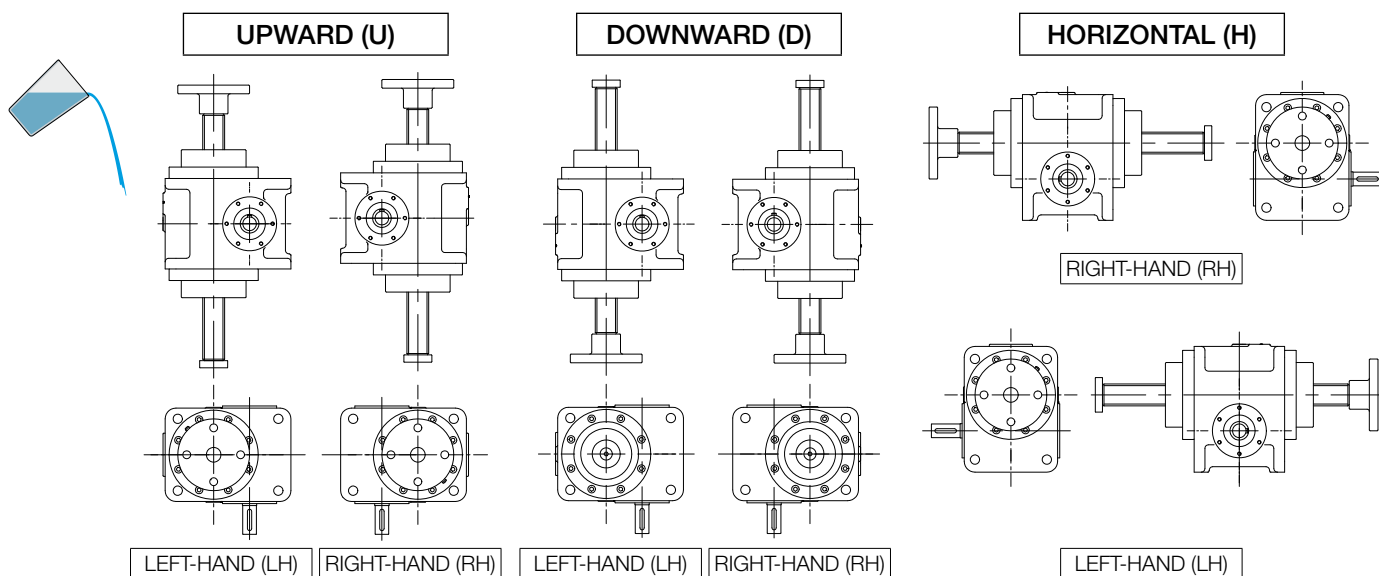


INPUT VERSIONS

Vers.1	Vers.2	Vers.3	Vers.4	Vers.5	Vers.6
					

- Vers.1: single input shaft
- Vers.2: double input shaft
- Vers.3: flange and hollow shaft for IEC/servo motor
- Vers.4: flange and hollow shaft for IEC/servo motor + second input shaft
- Vers.5: Vers.1 + bell housing and coupling for IEC/servo motor
- Vers.6: Vers.2 + bell housing and coupling for IEC/servo motor

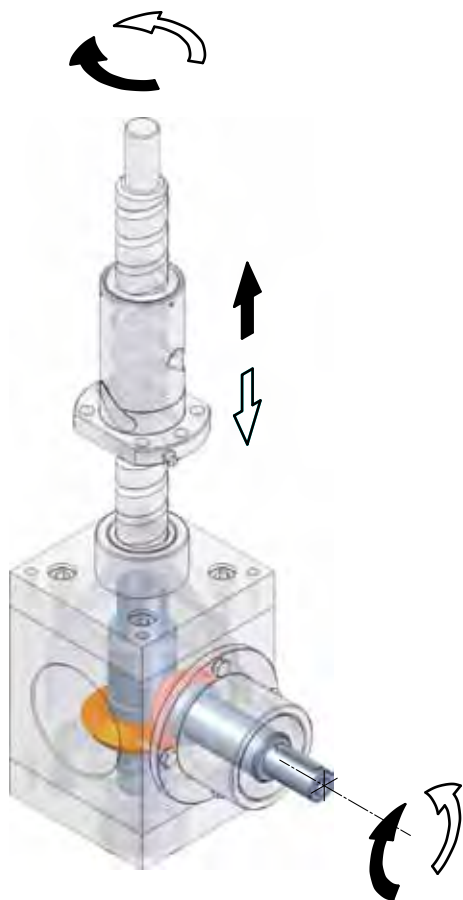
SCREW JACK MOUNTING POSITIONS



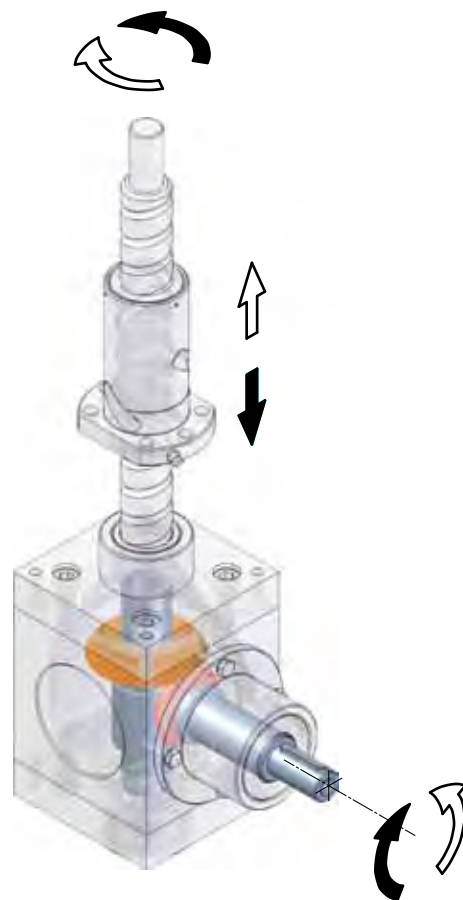
Ball screw jacks

1.7 Design – screw jacks HS Series

KINEMATICS SCHEME

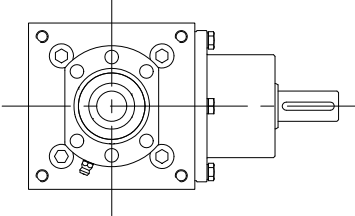
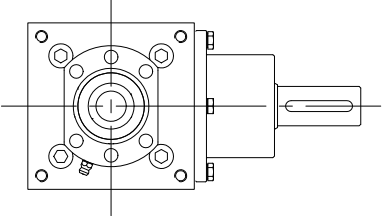
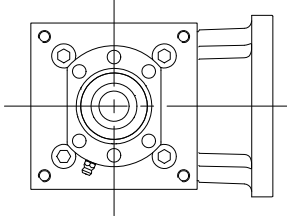


Scheme 10
Bevel gear wheel
on side opposite to nut



Scheme 20
Bevel gear wheel
on nut side

INPUT SHAFT

S	R	MF / MA
		

- Designation S: solid shaft with key, standard diameter
- Designation R: solid shaft with key, larger diameter
- Designation MF: flange and hollow shaft for IEC/servo motor
- Designation MA: special flange for servo or hydraulic motor

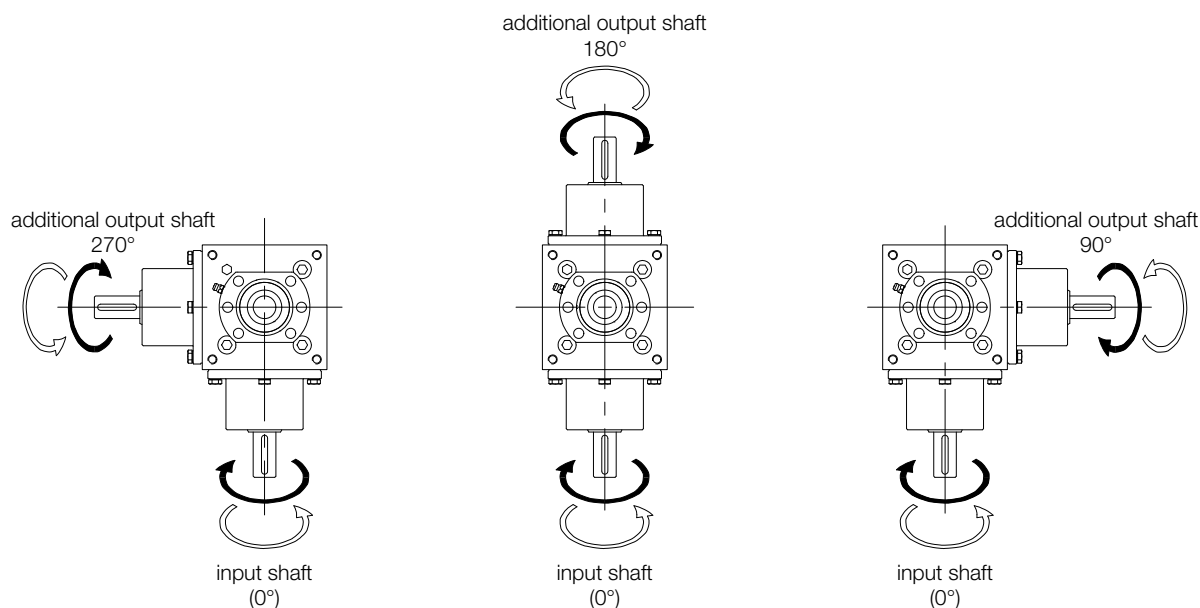
1.7 Design – screw jacks HS Series

ADDITIONAL OUTPUT SHAFT

Screw jacks HS Series can be equipped with one or more additional output shafts. Available versions are:

- S: solid shaft with key, standard diameter
- R: solid shaft with key, larger diameter

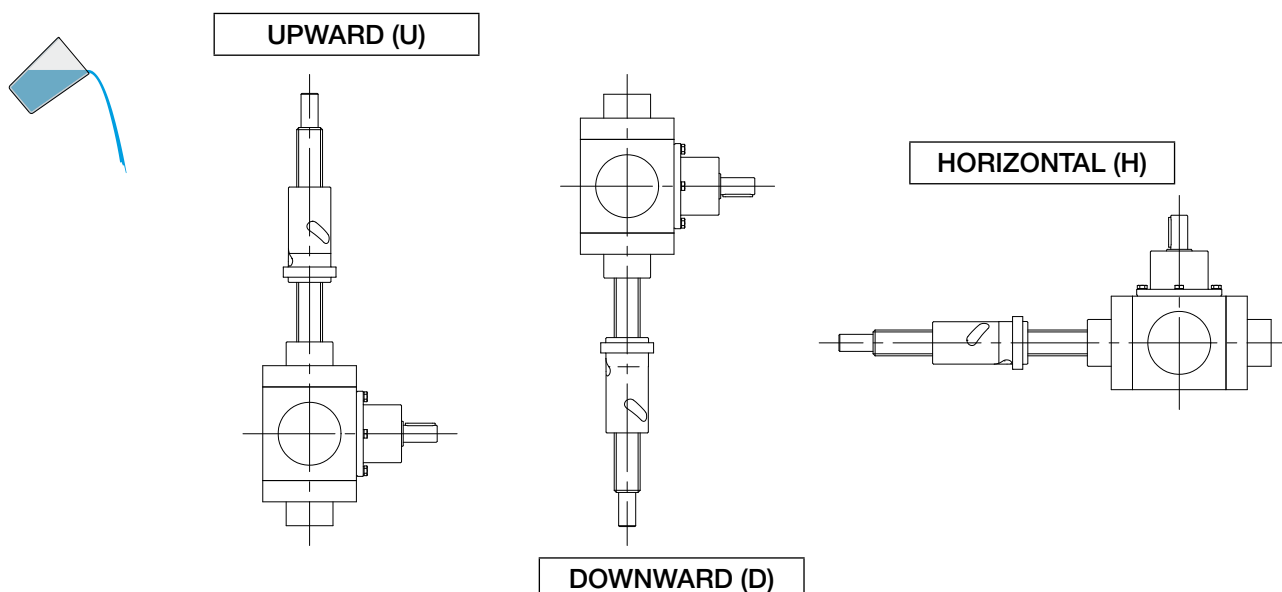
The shafts position refers to the main input shaft and is expressed by an angle with counter-clockwise positive direction and screw jack top view (ball nut side).



WARNING! The rotating speed of the additional output shaft is always the same as the input shaft rotating speed, independently from the screw jack ratio.

SCREW JACK MOUNTING POSITION

The mounting position refers to the output axis with ball screw.

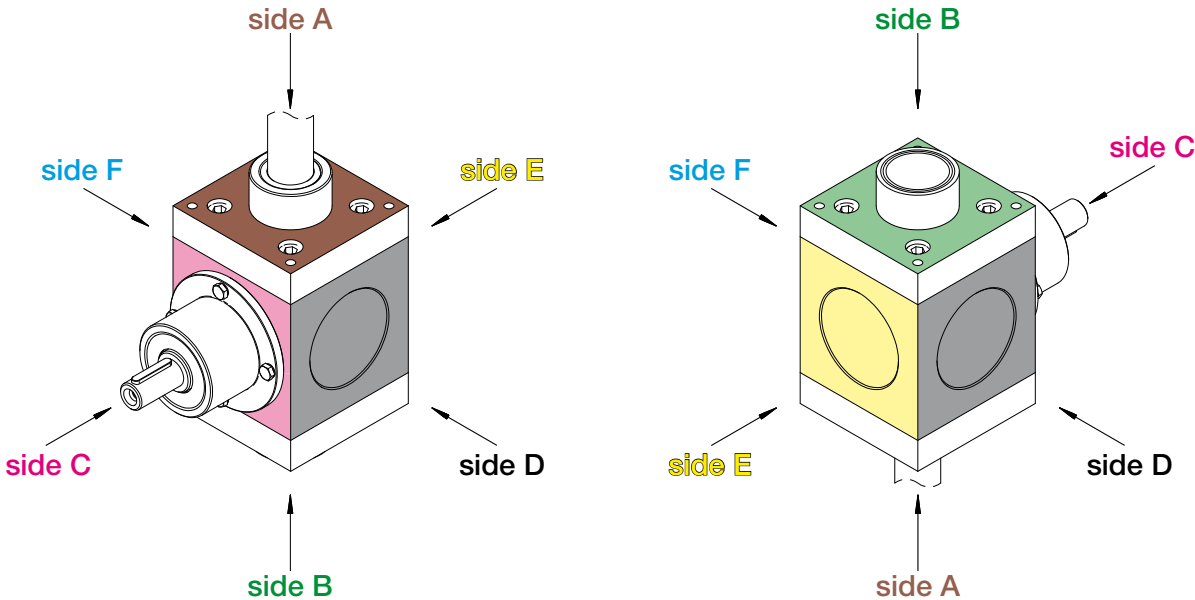


Ball screw jacks

1.7 Design – screw jacks HS Series

SCREW JACK MOUNTING SIDE

The screw jack is fixed on a surface of the supporting structure by means of proper threaded holes. It is essential to precisely define the fixing surface of the screw jack since this determines a specific position of the fixing holes.



Side C is the side of the **main input** (solid shaft or IEC motor coupling).

Side A and **side B** correspond to the **ball screw** axis, on ball nut side and opposite side respectively.

Side D, **side E** and **side F** are the sides where it is possible to mount an **additional output** shaft, in version 90°, 180° or 270° respectively.

1.8 Self-locking conditions

- A ball screw jack is in self-locking condition when:
- a push or pull load applied on a not working screw jack does not cause the linear motion (static self-locking condition);
 - by interrupting the motor power supply of a working screw jack with push or pull load, the motion stops (dynamic self-locking condition).

Due to the high efficiency of ball screw jacks, it is not possible to ensure the static or dynamic self-locking condition without using a brake motor.

According to the total direct efficiency value of the screw jack the following conditions are possible:

- 1) **Uncertain Self-locking:** with total direct efficiency values between 0.30 and 0.50, the screw jacks are in an uncertain condition. The self-locking condition depends on the load and the inertia of the system. In this case we recommend to use a brake motor to guarantee the self-locking condition or to contact SERVOMECH to evaluate the application.
- 2) **Back-driving:** with total direct efficiency values higher than 0.50 the screw jacks are always not self-locking.

UNCERTAIN SELF-LOCKING				BACK-DRIVING						
0.3			0.5							1

Direct efficiency values and calculation formulas to determine the required braking torque to ensure a self-locking condition are stated for each screw jack in the specific chapters.

1.9 Ball screw buckling

One of the most important screw jack selection criteria is the buckling resistance of the ball screw. Buckling limits are relevant for push load only.

Three cases are considered:

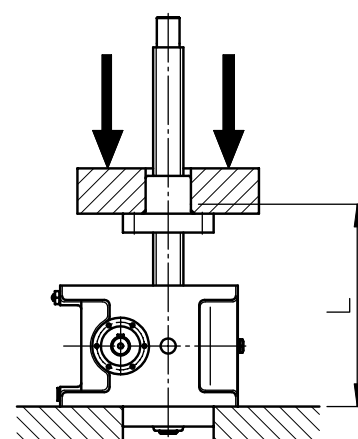
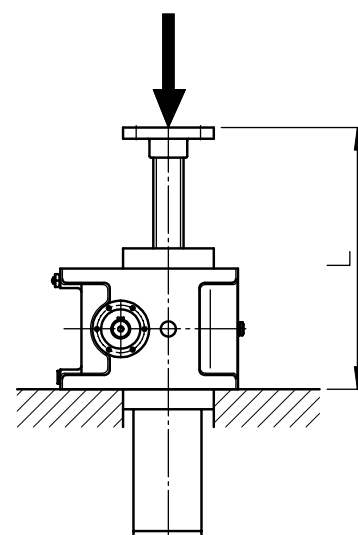
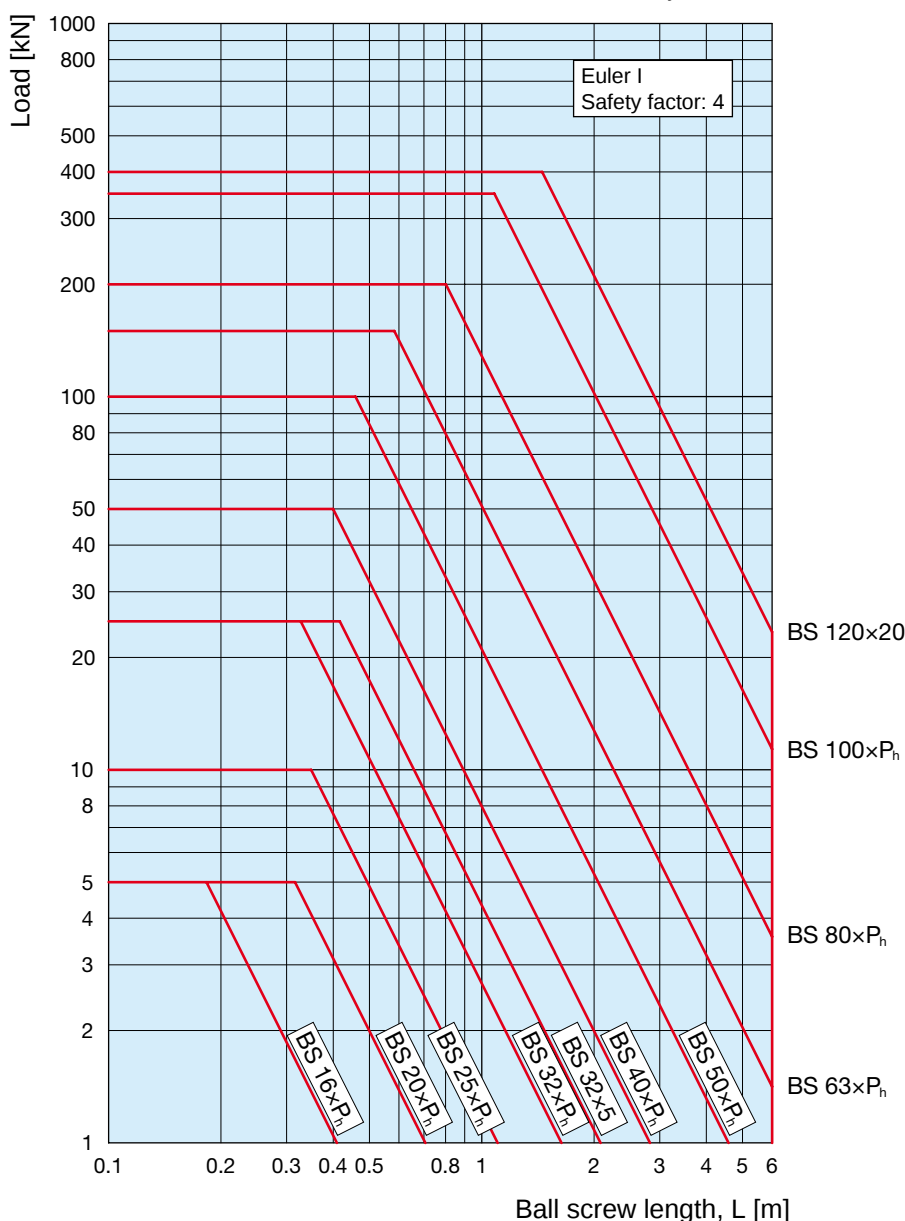
- Euler I: screw jack housing firmly fixed to the base – free travelling screw end
screw jack housing firmly fixed to the base – free travelling nut
- Euler II: screw jack housing and travelling screw end fixed to pivoting supports
screw jack housing and travelling nut fixed to pivoting supports
- Euler III: screw jack housing firmly fixed to the base – guided travelling screw end
screw jack housing firmly fixed to the base – guided travelling nut

Following diagrams (known as Euler curves) show the max. push load allowed on the ball screw, considering a buckling safety factor equals 4.

For particular or critical applications in terms of safety (e.g. theatre lifts), please contact SERVOMECH.

Euler I: screw jack housing firmly fixed to the base - free screw end screw jack housing firmly fixed to the base - free travelling nut

Example: with a push load of 7 kN applied on a screw length of 1 000 mm, the right selection is a screw with nominal diameter 40 mm, mounted on a screw jack MA 50 BS or SJ 50 BS or HS 50.

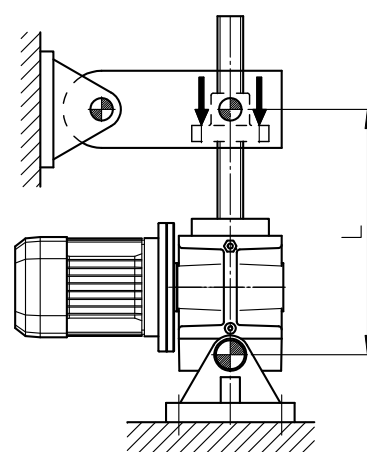
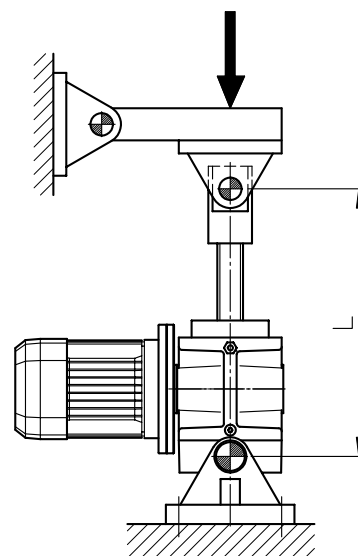
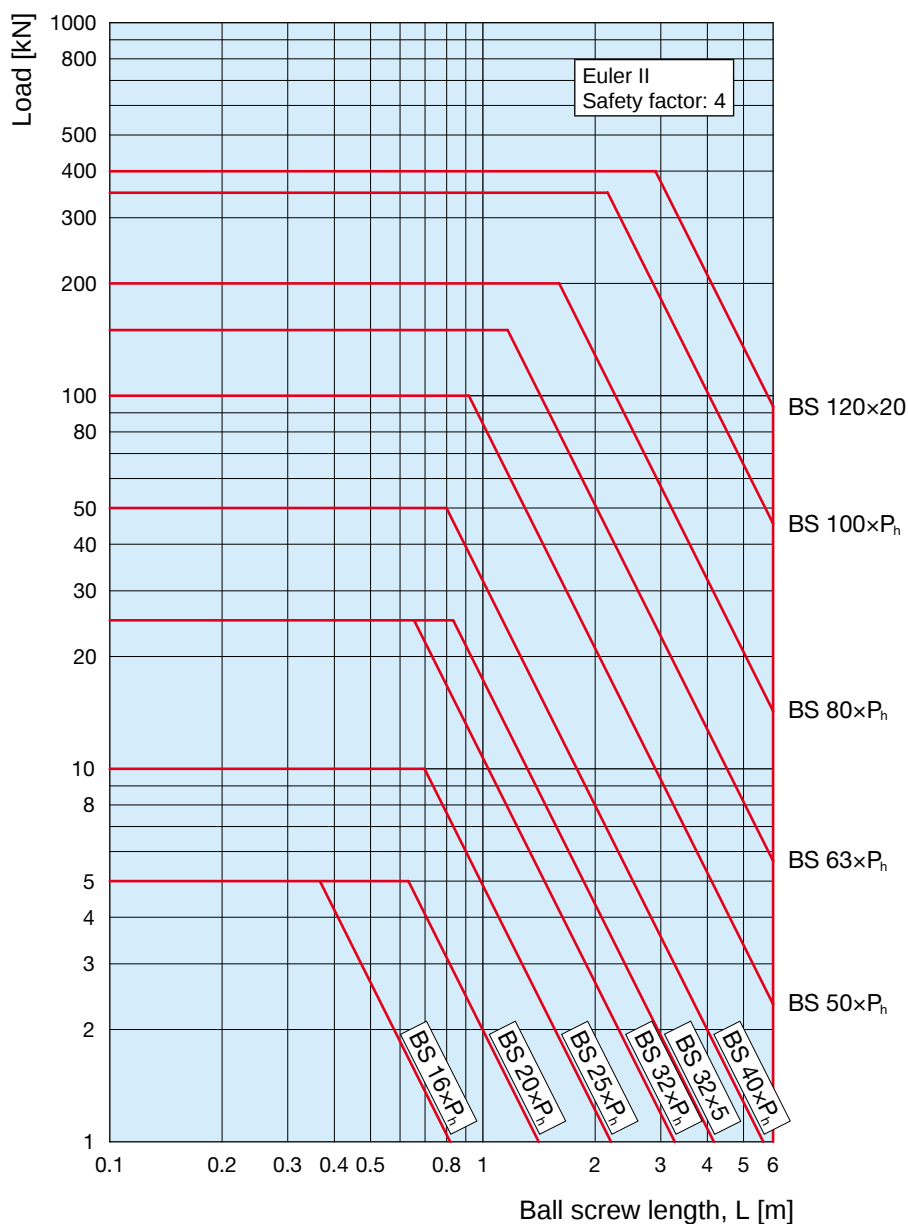


Ball screw jacks

1.9 Ball screw buckling

Euler II: screw jack housing and travelling screw end fixed to pivoting supports
screw jack housing and travelling nut fixed to pivoting supports

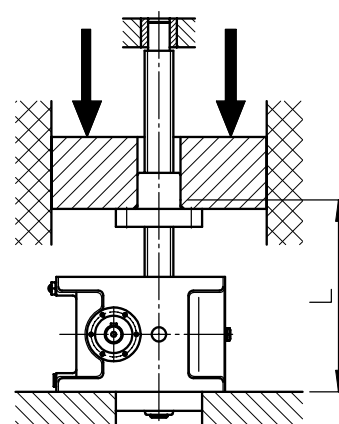
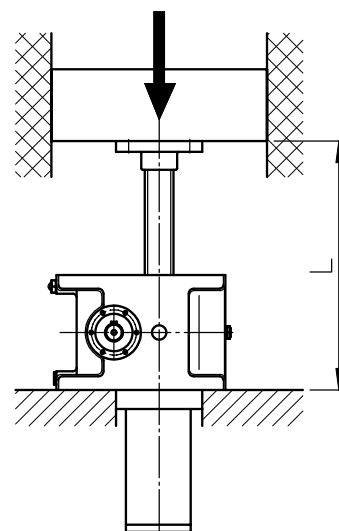
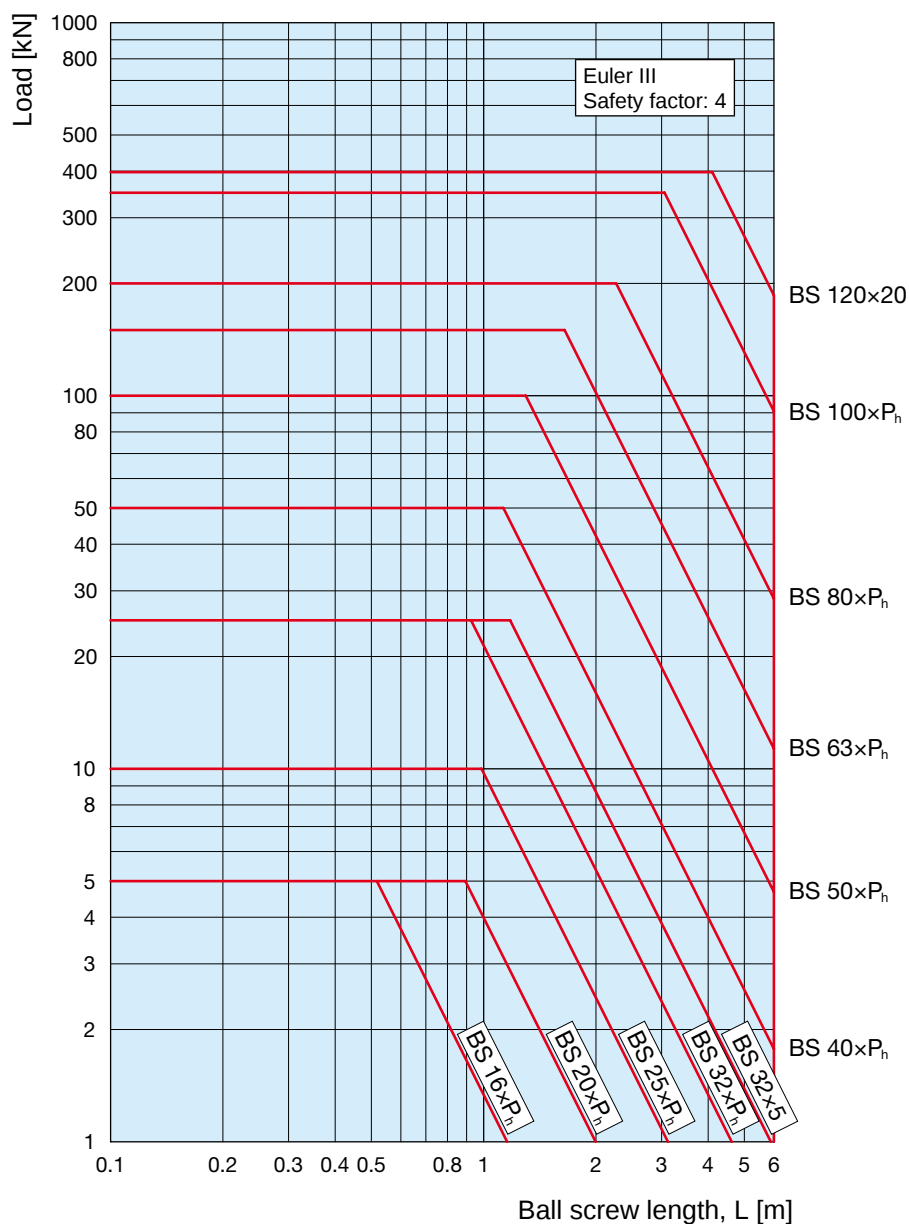
Example: with a push load of 10 kN applied on a screw length of 1 000 mm, the right selection is a screw with nominal diameter 32, mounted on a screw jack MA 25 BS or SJ 25 BS or HS 25.



1.9 Ball screw buckling

Euler III: screw jack housing firmly fixed to the base - guided travelling screw end
screw jack housing firmly fixed to the base - guided travelling nut

Example: with push load of 40 kN applied on a screw length of 4 000 mm, the right selection is a screw with nominal diameter 63, mounted on a screw jack MA 150 BS or SJ 150 BS or HS 150.



Ball screw jacks

1.10 Ball screw critical rotating speed

Following factors limit the ball screw rotating speed:

- 1) external factors (screw length and screw end supports)
- 2) internal factors (ball material, geometry and material of the recirculation elements)

1) External factors

In order to ensure a proper working of a ball screw system and to prevent imbalances which could damage the ball screw, the rotating speed must not reach the critical level. Therefore, this limit exists only for Model B screw jacks with travelling nut and rotating screw.

The critical rotating speed depends on the threaded shaft diameter, the type of screw end and the length of the free ball screw.

The following formulas are used to calculate the max. allowed rotating speed. They restrict the rotating speed to 80 % of the critical value and they are valid for threaded shafts without an axial through hole:

Free screw end

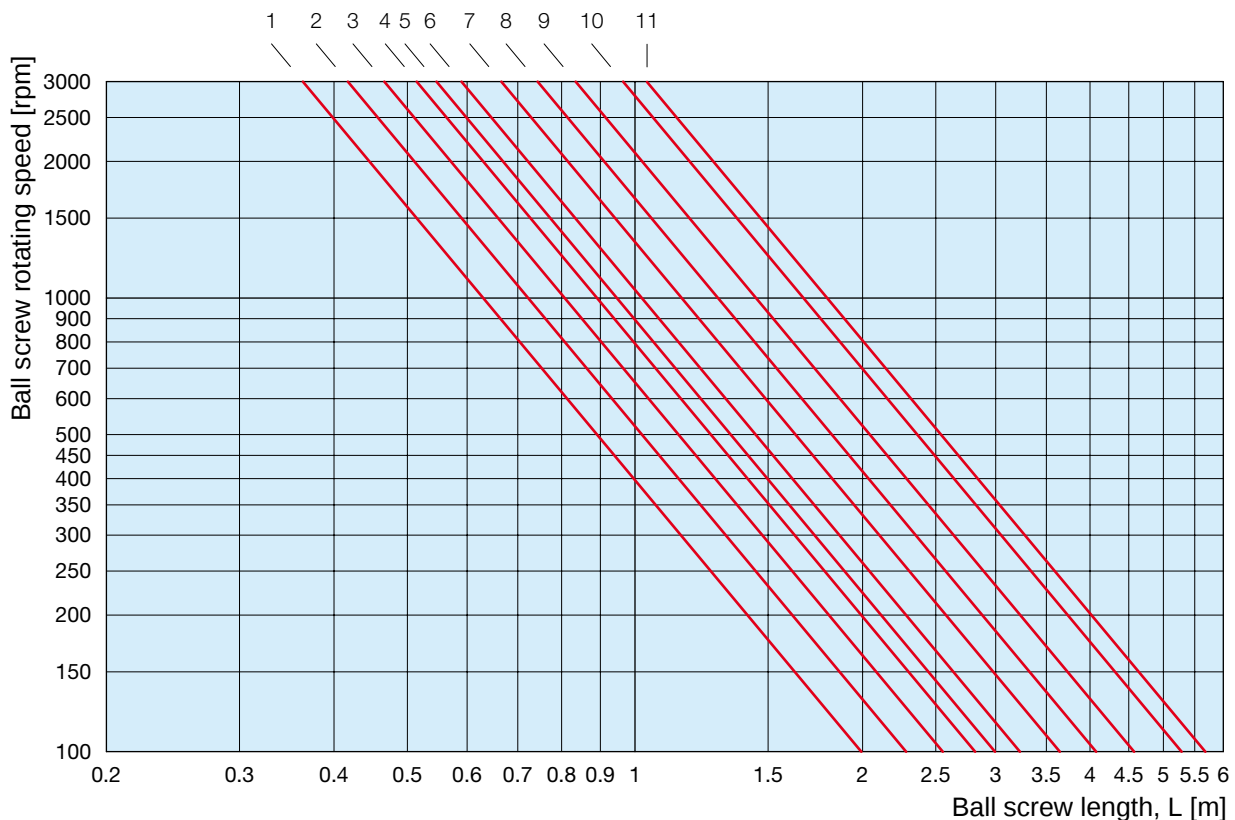
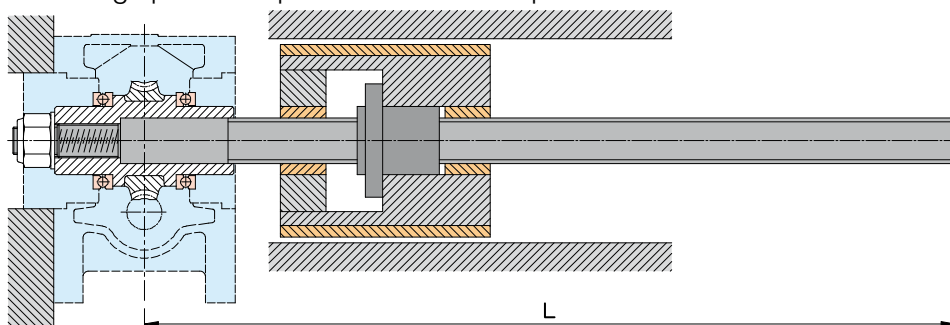
$$n_{max} = 2.17 \cdot 10^8 \cdot \frac{0.144 \cdot d_2}{L^2}$$

n_{max} [rpm] = max. allowed rotating speed

d_2 [mm] = ball screw shaft root diameter

L [mm] = length of screw without end support

Example: For a screw BS 40×10, 1 m long, with not supported end, the max. allowed rotating speed is 1 046 rpm. This rotating speed is equivalent to a linear speed of 175 mm/s.



ATTENTION! By horizontal mounting a ball screw static deflection, caused by its weight and possibly aggravated by the presence of the push load, should always be considered. Therefore, we recommend an accurate evaluation and use of a screw supporting system on both nut sides, integral and travelling with the nut itself; this will ensure the correct alignment and concentricity between the screw and the nut. In case of doubts, please contact SERVOMECH.

Supported screw end

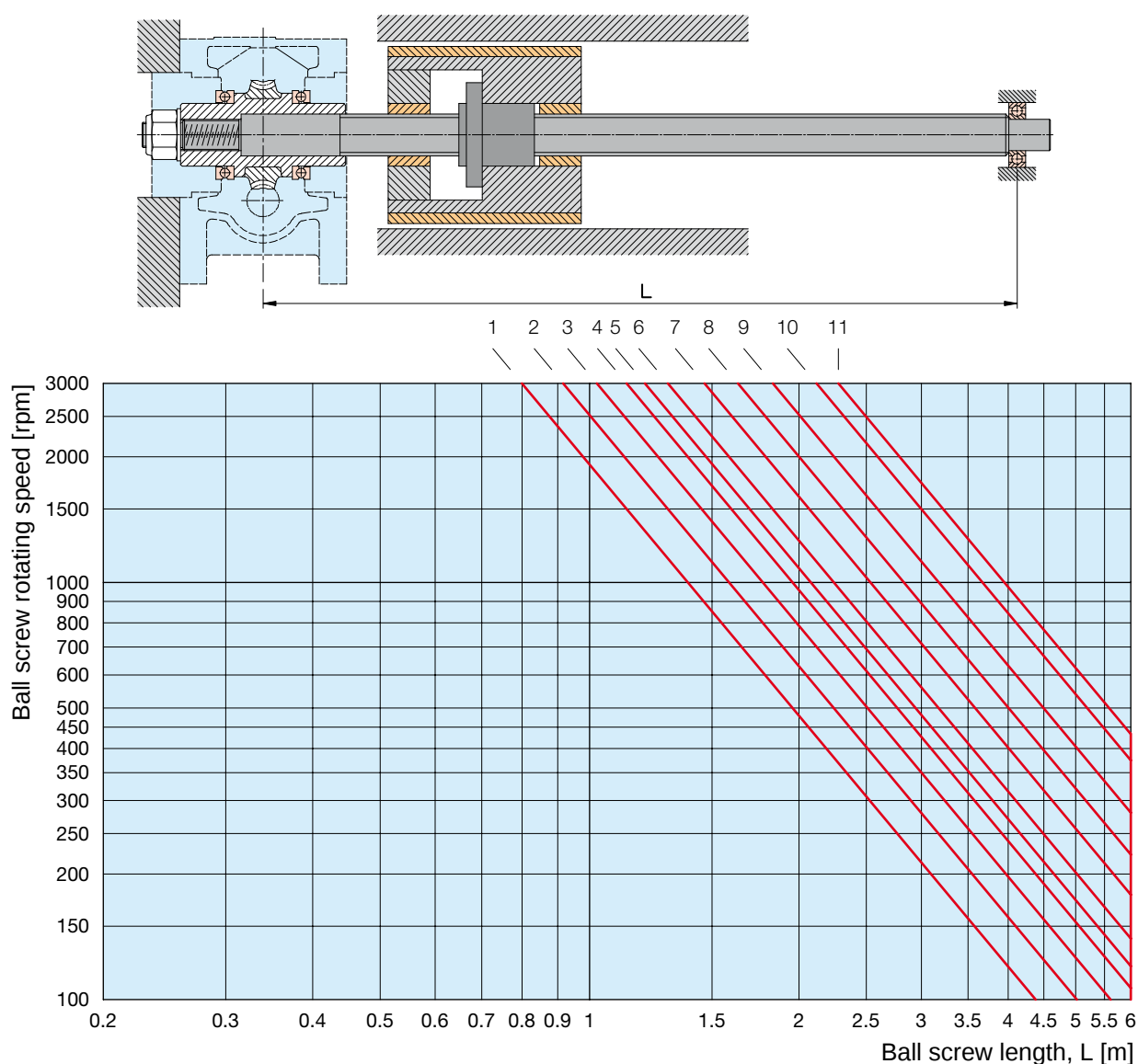
$$n_{max} = 2.17 \cdot 10^8 \cdot \frac{0.694 \cdot d_2}{L^2}$$

n_{max} [rpm] = max. allowed rotating speed

d_2 [mm] = ball screw shaft root diameter

L [mm] = length of screw with end support

Example: For a screw BS 40×10, 3 m long, with end support, the max. allowed rotating speed is 560 rpm. This rotating speed is equivalent to a linear speed of 93 mm/s



1 - BS 16×5-10-16 3 - BS 25×5-10-25 5 - BS 32×5 7 - BS 50×10-20 9 - BS 80×10-16-20 11 - BS 120×20
2 - BS 20×5-10-20 4 - BS 32×10-20-32 6 - BS 40×10-20-40 8 - BS 63×10-20 10 - BS 100×16-20

Ball screw jacks

1.10 Ball screw critical rotating speed

2) Internal Factors

Depending on screw material, geometry and material of the recirculation elements and screw diameter, there is a specific limit of the max. rotating speed. For ball screws used in screw jacks, SERVOMECH considers following max. rotating speed values:

Ball screw nominal diameter [mm]	Max. rotating speed [rpm]
16	5625
20	4500
25	3600
32	2810
40	2250
50	1800
63	1430
80	1125
100	875
120	730

NOTE: by travelling screw jack (Mod.A), only the limit due to internal factors (2) is effective; by screw jack with travelling nut (Mod.B), the max. allowed rotating speed is the lower speed value calculated using both criteria (1) and (2).

1.11 Ball screw life calculation

Ball screws life corresponds to the number of revolutions that the screw can perform with regard to its nut before any sign of fatigue appears on the material of screw, nut and rolling elements.

The **nominal ball screw life** (L_{10}) is calculated with the following formula:

$$L_{10} = \left(\frac{C_a}{F_m \cdot f_{sh}} \right)^3 \cdot 10^6$$

where:

L_{10} [revolutions] = ball screw nominal life

C_a [N] = ball screw dynamic load

F_m [N] = equivalent dynamic load

f_{sh} = shocks factor

- $f_{sh} = 1$: load without shocks
- $1 < f_{sh} \leq 1.3$: load with light shocks
- $1.3 < f_{sh} \leq 1.8$: load with medium shocks
- $1.8 < f_{sh} \leq 3$: load with heavy shocks

The result of the calculation corresponds to the number of revolutions of the screw with regard to the nut, reached by the 90 % of the ball screw, seemingly identical, subject to the same load conditions, motion laws and environment conditions.

The **equivalent dynamic load** (F_m) is defined as an hypothetical load concentric to the screw, axial only, with constant width and direction that, if applied, would have the same effects on the ball screw life as the real applied load. To determine it, the working cycle is divided in distinct and separate phases, each of them characterized by its load level, the specific rotating speed and the relevant time of load application.

$$F_m = \sqrt[3]{\sum_{i=1}^n F_i^3 \cdot \frac{n_i}{n_m} \cdot \frac{t_i}{t_{tot}}}$$

where:

t_i = duration of each single phase

F_i = load level for each single phase

n_i = rotating speed for each single phase

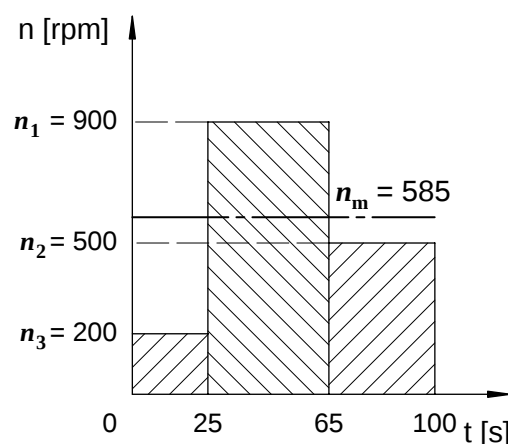
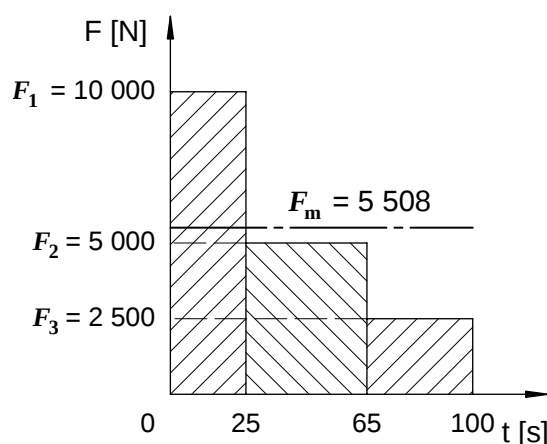
$$n_m = \sum_{i=1}^n n_i \cdot \frac{t_i}{t_{tot}}$$

$$t_{tot} = \sum_{i=1}^n t_i$$

If a preloaded nut is used, the equivalent dynamic load is determined taking into consideration also the pre-load force, adding it to the load level of each single phase of the working cycle.

Example:

i	t_i [s]	n_i [rpm]	F_i [N]	n_m [rpm]	F_m [N]
1	25	200	10 000	585	5 508
2	40	900	5 000		
3	35	500	2 500		



The ball screw life expressed in hours (L_{10h}) is calculated as follows:

$$L_{10h} = \frac{L_{10}}{60 \cdot n_m}$$

where:

n_m [rpm] = equivalent rotating speed

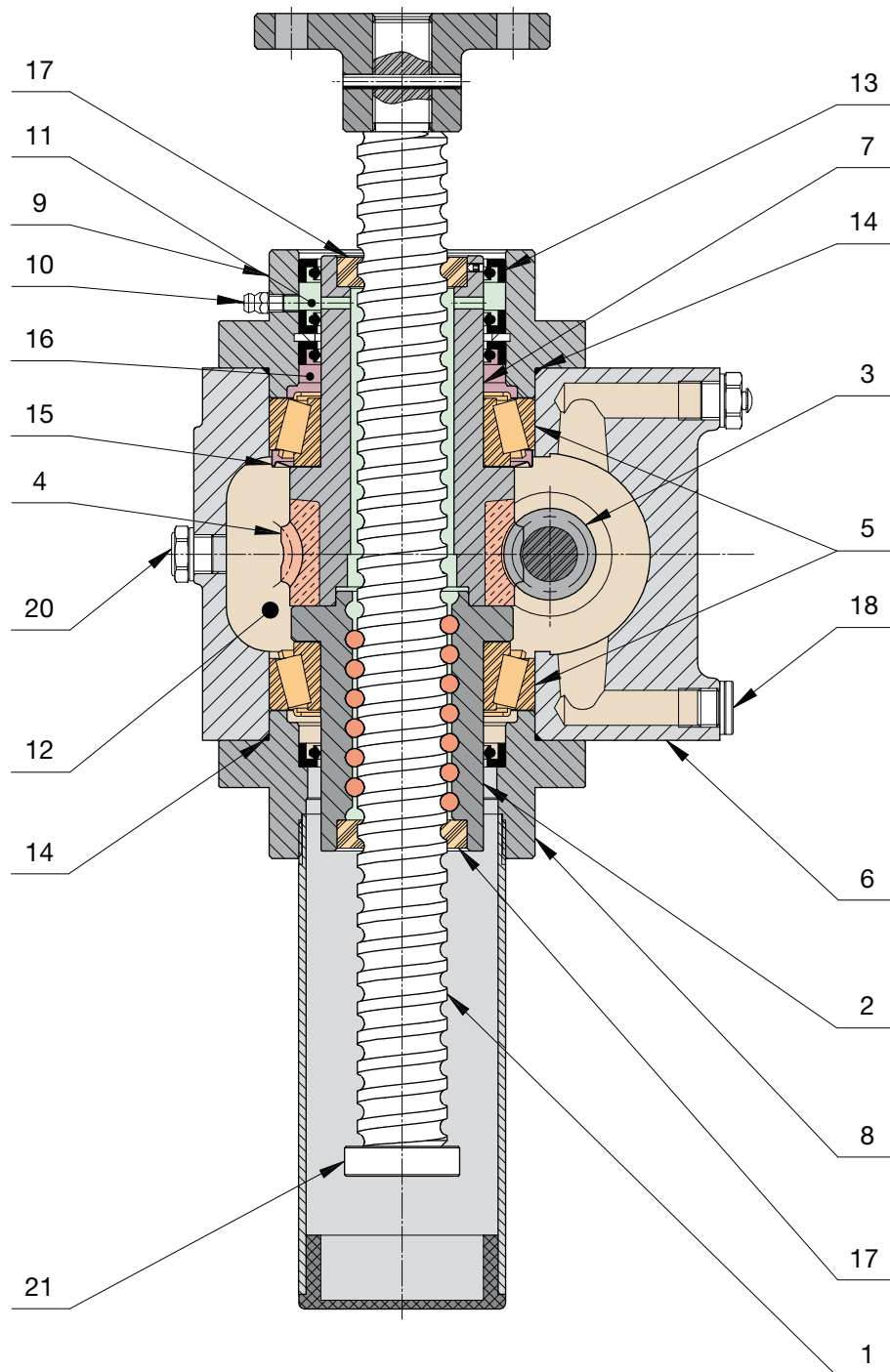
The previous formulas regarding the life refer to a ball screw reliability of 90 %. If a higher life reliability is required (**modified ball screw life**, L_{10m}), the corrective factor f_a must be applied:

$$L_{10m} = L_{10} \cdot f_a$$

Reliability [%]	90	95	96	97	98	99
Factor f_a	1	0.62	0.53	0.44	0.33	0.21

Screw Jacks with travelling ball screw (Mod.A)

2.1 MA BS Series Mod.A - STRUCTURAL ELEMENTS



DESIGN PATENTED

Screw Jacks with travelling ball screw (Mod.A)

2.1 MA BS Series Mod.A - STRUCTURAL ELEMENTS

- 1 - ball screw in quenched and tempered alloy steel
- 2 - ball nut in case-hardened and ground steel with frontal recirculation system that ensures higher performances compared to the radial system, because of greater number of balls which transmit the load
- 3 - worm with ground ZI involute thread profile (UNI 4760) in case-hardened steel
- 4 - bronze wormwheel with true involute profile ZI (UNI 4760)
- 5 - taper roller bearings that provide system high stiffness and allow to maximize the ball screw diameter thanks to the minimum radial size
- 6 - gear box shape which allows effective heat dissipation and 100 % duty cycle
- 7 - cast iron support of the worm wheel rim
- 8 - bottom cover with outer diameter in tolerance **g7**, it can be used for the screw jack centring
- 9 - top cover with re-lubrication system for the ball screw: through the grease nipple (10) it is possible to put in grease which goes through the lubrication pipe (11) and reaches the ball nut. The radial lubricant seals (13) and the sealing scrapers (17) ensure the seal and create a lubricant reserve for the ball nut. This system allows to keep the ball nut constantly lubricated increasing its life.
- 10 - grease nipple
- 11 - lubrication pipe
- 12 - synthetic oil lubricated worm gearbox for a better heat dissipation; this allows higher input speed, improved efficiency and a longer life
- 13 - radial lubricant seal
- 14 - O-ring as lubricant seal
- 15 - NILOS seal which allows to create a chamber for the lubricant (16) of the upper bearing, that would otherwise be sparsely lubricated because not reached by the gear oil; the seal is used only in case of vertical mounting position
- 16 - bearing lubricant chamber
- 17 - sealing scraper
- 18 - oil drain plug
- 19 - breather
- 20 - oil level plug
- 21 - ball screw stop nut

Screw Jacks with travelling ball screw (Mod.A)

2.2 MA BS Series Mod.A - TECHNICAL DATA

SIZE			MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS
Load capacity [kN], (push - pull)			5	10	25	50
Ball screw diameter [mm]			20	25	32	40
Worm gear centre distance [mm]			30	40	50	63
Ratio	fast	RV	1 : 4 (4 : 16)	1 : 5 (4 : 20)	1 : 6 (4 : 24)	1 : 7 (4 : 28)
	normal	RN	1 : 16 (2 : 32)	1 : 20	1 : 18 (2 : 36)	1 : 14 (2 : 28)
	slow	RL	1 : 24	1 : 25	1 : 24	1 : 28
Ball screw code “1”	Diameter × Lead		16 × 5	25 × 5	32 × 10	40 × 10
	Ball [mm]		3.175 (1/8")	3.175 (1/8")	6.350 (1/4")	6.350 (1/4")
	Accuracy grade ⁽¹⁾		IT 7	IT 7	IT 7	IT 7
	Number of starts		1	1	1	1
	Number of circuits		5	5	5	5
	C _a [kN]		12.9	16.9	44.8	52
	C _{0a} [kN]		20.9	36.4	83	111
Stroke [mm] for 1 input shaft revolution	Ratio	RV	1.25	1.00	1.67	1.43
		RN	0.31	0.25	0.56	0.71
		RL	0.21	0.20	0.42	0.36
Ball screw code “2”	Diameter × Lead		16 × 10	25 × 10	32 × 20	40 × 20
	Ball [mm]		3.175 (1/8")	3.969 (5/32")	6.350 (1/4")	6.350 (1/4")
	Accuracy grade ⁽¹⁾		IT 7	IT 7	IT 7	IT 7
	Number of starts		1	1	1	1
	Number of circuits		3	3	3	3
	C _a [kN]		8.6	14.2	29.8	34.3
	C _{0a} [kN]		13.3	25.8	53	70
Stroke [mm] for 1 input shaft revolution	Ratio	RV	2.50	2	3.33	2.86
		RN	0.63	0.50	1.11	1.43
		RL	0.42	0.40	0.83	0.71
Housing material			casting in aluminium alloy EN 1706 - AC-AISi10Mg T6		casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)	
Mass of screw jack without ball screw [kg]			2.2	4.3	13	26
Mass for every 100 mm of ball screw [kg]			0.14	0.35	0.57	0.91

⁽¹⁾ - on request, ball screws with accuracy grade IT 5 or IT 3 can be supplied

Ball screw code "3" on request	Diameter × Lead	16 × 16	25 × 25	32 × 32	40 × 40
	Ball [mm]	3.175 (1/8")	3.175 (1/8")	6.35 (1/4")	6.35 (1/4")
	Accuracy grade	IT 7	IT 7	IT 7	IT 7
	Number of starts	2	2	2	2
	Number of circuits	2	2	2	2
	C _a [kN]	10.0	13.1	35.0	40.3
	C _{0a} [kN]	14.5	25.2	58	77

Screw Jacks with travelling ball screw (Mod.A)

2.2 MA BS Series Mod.A - TECHNICAL DATA

MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS	SIZE	
100	150	200	350	Load capacity [kN], (push - pull)	
50	63	80	100	Ball screw diameter [mm]	
80	80	100	125	Worm gear centre distance [mm]	
1 : 8 (4 : 32)	1 : 8 (4 : 32)	1 : 8 (4 : 32)	3 : 32	RV fast	Ratio
1 : 24	1 : 24	1 : 24	1 : 16 (2 : 32)	RN normal	
1 : 32	1 : 32	1 : 32	1 : 32	RL slow	
50 × 10	63 × 10	80 × 10	100 × 16	Diameter × Lead	
7.144 (9/32")	7.144 (9/32")	7.144 (9/32")	9.525 (3/8")	Ball [mm]	
IT 5	IT 5	IT 5	IT 5	Accuracy grade (1)	
1	1	1	1	Number of starts	
7	6	6	6	Number of circuits	
107	117	132	189	C _a [kN]	
271	340	448	638	C _{0a} [kN]	
1.25	1.25	1.25	1.50	RV	Ratio Stroke [mm] for 1 input shaft revolution
0.42	0.42	0.42	1.00	RN	
0.31	0.31	0.31	0.50	RL	
50 × 20	63 × 20	80 × 20	100 × 20	Diameter × Lead	
7.144 (9/32")	9.525 (3/8")	12.700 (1/2")	12.700 (1/2")	Ball [mm]	
IT 5	IT 5	IT 5	IT 5	Accuracy grade (1)	
1	1	1	1	Number of starts	
4	5	5	6	Number of circuits	
64	122	228	312	C _a [kN]	
147	292	585	963	C _{0a} [kN]	
2.50	2.50	2.50	1.87	RV	Ratio Stroke [mm] for 1 input shaft revolution
0.83	0.83	0.83	1.25	RN	
0.63	0.63	0.63	0.62	RL	
casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)				Housing material	
48	48	75	145	Mass of screw jack without ball screw [kg]	
1.44	2.26	3.70	6.16	Mass for every 100 mm of ball screw [kg]	

⁽¹⁾ - on request, ball screws with accuracy grade IT 3 can be supplied

Screw Jacks with travelling ball screw (Mod.A)

2.3 MA 5 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 16 × 5							LOAD																	
							5 kN						4 kN						3 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW
3 000	62.5	15.6	10.4	1.20	0.38	0.32	1.45	0.46	0.41	0.13	0.30	0.09	1.16	0.37	0.33	0.10	0.24	0.08	0.87	0.27	0.24	0.08	0.18	0.06
1 500	31.3	7.8	5.2	0.87	0.25	0.23	1.50	0.24	0.43	0.07	0.33	0.05	1.20	0.19	0.34	0.05	0.26	0.04	0.90	0.14	0.26	0.04	0.20	0.03
1 000	20.8	5.2	3.5	0.67	0.20	0.17	1.52	0.16	0.44	0.05	0.34	0.04	1.21	0.13	0.36	0.04	0.27	0.03	0.91	0.10	0.27	0.03	0.20	0.02
750	15.6	3.9	2.6	0.57	0.17	0.15	1.54	0.12	0.46	0.04	0.35	0.03	1.23	0.10	0.37	0.03	0.28	0.02	0.92	0.07	0.27	0.02	0.21	0.02
500	10.4	2.6	1.7	0.43	0.13	0.12	1.55	0.08	0.47	0.02	0.36	0.02	1.24	0.07	0.38	0.02	0.29	0.02	0.93	0.05	0.28	0.01	0.22	0.01
300	6.3	1.6	1.0	0.33	0.09	0.09	1.59	0.05	0.48	0.02	0.38	0.01	1.27	0.04	0.39	0.01	0.31	0.01	0.95	0.03	0.29	0.01	0.23	0.01
100	2.1	0.5	0.3	0.15	0.04	0.04	1.67	0.02	0.52	0.01	0.42	0.00	1.33	0.01	0.42	0.00	0.34	0.00	1.00	0.01	0.31	0.00	0.25	0.00
START.	-	-	-	-	-	-	1.79	-	0.57	-	0.49	-	1.43	-	0.46	-	0.39	-	1.07	-	0.34	-	0.29	-

BS 16 × 10							LOAD																	
							5 kN						4 kN						3 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW
3 000	125.0	31.3	20.8	1.20	0.38	0.32	2.82	0.89	0.79	0.25	0.58	0.18	2.26	0.71	0.63	0.20	0.47	0.15	1.69	0.53	0.47	0.15	0.35	0.11
1 500	62.5	15.6	10.4	0.87	0.25	0.23	2.92	0.46	0.83	0.13	0.63	0.10	2.33	0.37	0.66	0.10	0.51	0.08	1.75	0.27	0.50	0.08	0.38	0.06
1 000	41.7	10.4	6.9	0.67	0.20	0.17	2.95	0.31	0.86	0.09	0.65	0.07	2.36	0.25	0.69	0.07	0.52	0.05	1.77	0.19	0.52	0.05	0.39	0.04
750	31.3	7.8	5.2	0.57	0.17	0.15	2.98	0.23	0.89	0.07	0.68	0.05	2.39	0.19	0.71	0.06	0.55	0.04	1.79	0.14	0.53	0.04	0.41	0.03
500	20.8	5.2	3.5	0.43	0.13	0.12	3.02	0.16	0.91	0.05	0.71	0.04	2.41	0.13	0.73	0.04	0.56	0.03	1.81	0.09	0.55	0.03	0.42	0.02
300	12.5	3.1	2.1	0.33	0.09	0.09	3.09	0.10	0.94	0.03	0.74	0.02	2.47	0.08	0.75	0.02	0.59	0.02	1.85	0.06	0.56	0.02	0.44	0.01
100	4.2	1.0	0.7	0.15	0.04	0.04	3.24	0.03	1.01	0.01	0.83	0.01	2.59	0.03	0.81	0.01	0.66	0.01	1.94	0.02	0.61	0.01	0.50	0.01
START.	-	-	-	-	-	-	3.47	-	1.11	-	0.95	-	2.78	-	0.89	-	0.76	-	2.08	-	0.67	-	0.57	-

BS 16 × 16							LOAD																	
							5 kN						4 kN						3 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW
3 000	200.0	50.0	33.3	1.20	0.38	0.32					0.92	0.29	3.58	1.12	1.00	0.31	0.74	0.23	2.68	0.84	0.75	0.24	0.55	0.17
1 500	100.0	25.0	16.7	0.87	0.25	0.23	4.62	0.73	1.32	0.21	1.00	0.16	3.69	0.58	1.05	0.17	0.80	0.13	2.77	0.44	0.79	0.12	0.60	0.09
1 000	66.7	16.7	11.1	0.67	0.20	0.17	4.67	0.49	1.37	0.14	1.03	0.11	3.74	0.39	1.09	0.11	0.83	0.09	2.80	0.29	0.82	0.09	0.62	0.06
750	50.0	12.5	8.3	0.57	0.17	0.15	4.72	0.37	1.40	0.11	1.08	0.09	3.78	0.30	1.12	0.09	0.87	0.07	2.83	0.22	0.84	0.07	0.65	0.05
500	33.3	8.3	5.6	0.43	0.13	0.12	4.78	0.25	1.44	0.08	1.12	0.06	3.82	0.20	1.15	0.06	0.89	0.05	2.87	0.15	0.87	0.05	0.67	0.04
300	20.0	5.0	3.3	0.33	0.09	0.09	4.89	0.15	1.48	0.05	1.17	0.04	3.91	0.12	1.19	0.04	0.94	0.03	2.93	0.09	0.89	0.03	0.70	0.02
100	6.7	1.7	1.1	0.15	0.04	0.04	5.13	0.05	1.60	0.02	1.31	0.01	4.11	0.04	1.28	0.01	1.05	0.01	3.08	0.03	0.96	0.01	0.78	0.01
START.	-	-	-	-	-	-	5.50	-	1.76	-	1.51	-	4.40	-	1.41	-	1.20	-	3.30	-	1.06	-	0.90	-

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.3 MA 5 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 16 x 5			BS 16 x 10			BS 16 x 16		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.74	0.66	0.60	0.77	0.68	0.62	0.77	0.69	0.62
1 500	0.72	0.63	0.55	0.74	0.65	0.57	0.75	0.66	0.57
1 000	0.71	0.61	0.54	0.73	0.63	0.55	0.74	0.63	0.56
750	0.70	0.59	0.51	0.72	0.61	0.53	0.73	0.62	0.53
500	0.70	0.58	0.50	0.72	0.59	0.51	0.72	0.60	0.52
300	0.68	0.56	0.47	0.70	0.58	0.49	0.71	0.58	0.49
100	0.65	0.52	0.42	0.67	0.54	0.44	0.67	0.54	0.44
START.	0.61	0.47	0.37	0.62	0.49	0.38	0.63	0.49	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (5 kN).

Static braking torque T_F [Nm] with 5 kN			
RATIO	BS 16 x 5	BS 16 x 10	BS 16 x 16
RV	0.8	1.6	2.6
RN	0.2	0.2	0.2
RL	0.2	0.2	0.2

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 0.2 \text{ Nm}$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.4 MA 10 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 25 × 5							LOAD																				
				10 kN								8 kN								6 kN							
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO								
							RV		RN		RL		RV		RN		RL		RV		RN		RL				
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW			
3 000	50.0	12.5	10.0	2.05	0.85	0.67	2.40	0.75	0.69	0.22	0.56	0.18	1.92	0.60	0.55	0.17	0.45	0.14	1.44	0.45	0.41	0.13	0.34	0.11			
1 500	25.0	6.3	5.0	1.49	0.60	0.48	2.45	0.39	0.73	0.12	0.61	0.10	1.96	0.31	0.59	0.09	0.49	0.08	1.47	0.23	0.44	0.07	0.37	0.06			
1 000	16.7	4.2	3.3	1.15	0.47	0.38	2.48	0.26	0.77	0.08	0.64	0.07	1.98	0.21	0.62	0.06	0.51	0.05	1.49	0.16	0.46	0.05	0.38	0.04			
750	12.5	3.1	2.5	1.08	0.40	0.31	2.51	0.20	0.79	0.06	0.66	0.05	2.01	0.16	0.63	0.05	0.53	0.04	1.50	0.12	0.47	0.04	0.39	0.03			
500	8.3	2.1	1.7	0.78	0.32	0.25	2.56	0.13	0.82	0.04	0.69	0.04	2.05	0.11	0.66	0.03	0.55	0.03	1.54	0.08	0.49	0.03	0.41	0.02			
300	5.0	1.3	1.0	0.55	0.22	0.18	2.59	0.08	0.87	0.03	0.72	0.02	2.08	0.07	0.70	0.02	0.58	0.02	1.56	0.05	0.52	0.02	0.43	0.01			
100	1.7	0.4	0.3	0.26	0.10	0.08	2.72	0.03	0.96	0.01	0.80	0.01	2.18	0.02	0.77	0.01	0.64	0.01	1.63	0.02	0.58	0.01	0.48	0.01			
START.	-	-	-	-	-	-	2.94	-	1.09	-	0.91	-	2.35	-	0.88	-	0.73	-	1.76	-	0.66	-	0.55	-			

BS 25 × 10							LOAD																	
							10 kN						8 kN						6 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW
3 000	100.0	25.0	20.0	2.05	0.85	0.67	4.59	1.44	1.32	0.41	1.08	0.34	3.67	1.15	1.05	0.33	0.86	0.27	2.75	0.87	0.79	0.25	0.65	0.20
1 500	50.0	12.5	10.0	1.49	0.60	0.48	4.69	0.74	1.40	0.22	1.17	0.18	3.75	0.59	1.12	0.18	0.94	0.15	2.81	0.44	0.84	0.13	0.70	0.11
1 000	33.3	8.3	6.7	1.15	0.47	0.38	4.74	0.50	1.48	0.16	1.22	0.13	3.79	0.40	1.19	0.12	0.98	0.10	2.85	0.30	0.89	0.09	0.73	0.08
750	25.0	6.3	5.0	1.08	0.40	0.31	4.80	0.38	1.50	0.12	1.26	0.10	3.84	0.30	1.20	0.09	1.00	0.08	2.88	0.23	0.90	0.07	0.75	0.06
500	16.7	4.2	3.3	0.78	0.32	0.25	4.91	0.26	1.57	0.08	1.31	0.07	3.93	0.21	1.26	0.07	1.05	0.06	2.94	0.15	0.94	0.05	0.79	0.04
300	10.0	2.5	2.0	0.55	0.22	0.18	4.96	0.16	1.67	0.05	1.38	0.04	3.97	0.12	1.33	0.04	1.10	0.03	2.98	0.09	1.00	0.03	0.83	0.03
100	3.3	0.8	0.7	0.26	0.10	0.08	5.21	0.05	1.84	0.02	1.52	0.02	4.16	0.04	1.47	0.02	1.22	0.01	3.12	0.03	1.10	0.01	0.91	0.01
START.	-	-	-	-	-	-	5.62	-	2.09	-	1.74	-	4.49	-	1.67	-	1.39	-	3.37	-	1.26	-	1.05	-

BS 25 × 25							LOAD																		
							5 kN						4 kN						3 kN						
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO						
	RV	RN	RL	RV	RN	RL	RV		RN		RL		RV		RN		RL		RV		RN		RL		
							T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm
3 000	250.0	62.5	50.0	2.05	0.85	0.67										2.57	0.81	2.10	0.66			1.92	0.60	1.58	0.50
1 500	125.0	31.3	25.0	1.49	0.60	0.48				3.42	0.54	2.85	0.45	9.14	1.44	2.73	0.43	2.28	0.36	6.85	1.08	2.05	0.32	1.71	0.27
1 000	83.3	20.8	16.7	1.15	0.47	0.38				3.61	0.38	2.97	0.31	9.24	0.97	2.89	0.30	2.38	0.25	6.93	0.73	2.16	0.23	1.78	0.19
750	62.5	15.6	12.5	1.08	0.40	0.31	11.7	0.92	3.66	0.29	3.06	0.24	9.34	0.73	2.93	0.23	2.45	0.19	7.01	0.55	2.20	0.17	1.83	0.14	
500	41.7	10.4	8.3	0.78	0.32	0.25	12.0	0.63	3.82	0.20	3.20	0.17	9.56	0.50	3.06	0.16	2.56	0.13	7.17	0.38	2.29	0.12	1.92	0.10	
300	25.0	6.3	5.0	0.55	0.22	0.18	12.1	0.38	4.06	0.13	3.35	0.11	9.67	0.30	3.25	0.10	2.68	0.08	7.25	0.23	2.44	0.08	2.01	0.06	
100	8.3	2.1	1.7	0.26	0.10	0.08	12.7	0.13	4.48	0.05	3.71	0.04	10.2	0.11	3.58	0.04	2.97	0.03	7.60	0.08	2.69	0.03	2.23	0.02	
START.	-	-	-	-	-	-	13.7	-	5.09	-	4.24	-	11.0	-	4.08	-	3.39	-	8.20	-	3.06	-	2.54	-	

(1) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.4 MA 10 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 25 x 5			BS 25 x 10			BS 25 x 25		
	RATIO			RATIO			RATIO		
n_1 [rpm]	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.72	0.63	0.61	0.75	0.66	0.64	0.77	0.67	0.66
1 500	0.71	0.59	0.57	0.74	0.62	0.59	0.76	0.63	0.61
1 000	0.70	0.56	0.54	0.73	0.58	0.57	0.75	0.60	0.58
750	0.69	0.55	0.53	0.72	0.58	0.55	0.74	0.59	0.57
500	0.67	0.53	0.50	0.71	0.55	0.53	0.72	0.57	0.54
300	0.67	0.50	0.48	0.70	0.52	0.50	0.72	0.53	0.52
100	0.64	0.45	0.43	0.66	0.47	0.45	0.68	0.48	0.47
START.	0.59	0.40	0.38	0.62	0.41	0.40	0.63	0.42	0.41

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (10 kN).

Static braking torque T_F [Nm] with 10 kN			
RATIO	BS 25 x 5	BS 25 x 20	BS 25 x 25
RV	1.2	2.5	6.5
RN	0.4	0.4	0.4
RL	0.4	0.4	0.4

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 0.35 \text{ Nm}$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.5 MA 25 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 32 × 10							LOAD																	
							25 kN						20 kN						15 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	83.3	27.8	20.8	3.31	1.19	1.22	9.65	3.03	3.52	1.11	2.80	0.88	7.72	2.43	2.82	0.88	2.24	0.70	5.79	1.82	2.11	0.66	1.68	0.53
1 500	41.7	13.9	10.4	2.36	0.80	0.80	9.88	1.55	3.72	0.58	3.00	0.47	7.90	1.24	2.97	0.47	2.40	0.38	5.93	0.93	2.23	0.35	1.80	0.28
1 000	27.8	9.3	6.9	1.89	0.64	0.69	10.1	1.05	3.83	0.40	3.12	0.33	8.02	0.84	3.06	0.32	2.49	0.26	6.02	0.63	2.30	0.24	1.87	0.20
750	20.8	6.9	5.2	1.54	0.57	0.58	10.2	0.80	3.93	0.31	3.20	0.25	8.12	0.64	3.14	0.25	2.56	0.20	6.09	0.48	2.36	0.19	1.92	0.15
500	13.9	4.6	3.5	1.23	0.43	0.46	10.4	0.54	4.08	0.21	3.39	0.18	8.27	0.43	3.27	0.17	2.71	0.14	6.20	0.32	2.45	0.13	2.03	0.11
300	8.3	2.8	2.1	0.87	0.30	0.34	10.6	0.33	4.20	0.13	3.53	0.11	8.44	0.27	3.36	0.11	2.82	0.09	6.33	0.20	2.52	0.08	2.12	0.07
100	2.8	0.9	0.7	0.43	0.14	0.15	11.1	0.12	4.59	0.05	3.92	0.04	8.86	0.09	3.67	0.04	3.13	0.03	6.65	0.07	2.75	0.03	2.35	0.02
START.	-	-	-	-	-	-	12.0	-	5.23	-	4.58	-	9.57	-	4.18	-	3.66	-	7.18	-	3.14	-	2.75	-

BS 32 × 20							LOAD																	
							20 kN						15 kN						12.5 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW
3 000	166.7	55.6	41.7	3.31	1.19	1.22											3.26	1.02	9.38	2.95	3.42	1.07	2.72	0.85
1 500	83.3	27.8	20.8	2.36	0.80	0.80					4.66	0.73	11.5	1.81	4.33	0.68	3.50	0.55	9.60	1.51	3.61	0.57	2.91	0.46
1 000	55.6	18.5	13.9	1.89	0.64	0.69	15.6	1.63	5.95	0.62	4.85	0.51	11.7	1.22	4.46	0.47	3.64	0.38	9.75	1.02	3.72	0.39	3.03	0.32
750	41.7	13.9	10.4	1.54	0.57	0.58	15.8	1.24	6.11	0.48	4.98	0.39	11.9	0.93	4.58	0.36	3.73	0.29	9.87	0.77	3.82	0.30	3.11	0.24
500	27.8	9.3	6.9	1.23	0.43	0.46	16.1	0.84	6.35	0.33	5.26	0.28	12.1	0.63	4.76	0.25	3.95	0.21	10.1	0.53	3.97	0.21	3.29	0.17
300	16.7	5.6	4.2	0.87	0.30	0.34	16.4	0.52	6.53	0.21	5.49	0.17	12.3	0.39	4.90	0.15	4.11	0.13	10.3	0.32	4.08	0.13	3.43	0.11
100	5.6	1.9	1.4	0.43	0.14	0.15	17.2	0.18	7.14	0.07	6.09	0.06	12.9	0.14	5.35	0.06	4.57	0.05	10.8	0.11	4.46	0.05	3.80	0.04
START.	-	-	-	-	-	-	18.6	-	8.13	-	7.11	-	14.0	-	6.10	-	5.34	-	11.6	-	5.08	-	4.45	-

BS 32 × 32							LOAD																		
							15 kN						12.5 kN						10 kN						
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO						
							RV		RN		RL		RV		RN		RL		RV		RN		RL		
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW			
3 000	266.7	88.9	66.7	3.31	1.19	1.22																		3.44	1.08
1 500	133.3	44.4	33.3	2.36	0.80	0.80											4.61	0.72	12.2	1.91	4.57	0.72	3.69	0.58	
1 000	88.9	29.6	22.2	1.89	0.64	0.69					5.76	0.60	15.5	1.62	5.89	0.62	4.80	0.50	12.4	1.29	4.71	0.49	3.84	0.40	
750	66.7	22.2	16.7	1.54	0.57	0.58	18.7	1.47	7.25	0.57	5.91	0.46	15.6	1.23	6.05	0.47	4.93	0.39	12.5	0.98	4.84	0.38	3.94	0.31	
500	44.4	14.8	11.1	1.23	0.43	0.46	19.1	1.00	7.54	0.39	6.25	0.33	15.9	0.83	6.28	0.33	5.21	0.27	12.8	0.67	5.03	0.26	4.17	0.22	
300	26.7	8.9	6.7	0.87	0.30	0.34	19.5	0.61	7.75	0.24	6.52	0.20	16.2	0.51	6.46	0.20	5.43	0.17	13.0	0.41	5.17	0.16	4.34	0.14	
100	8.9	3.0	2.2	0.43	0.14	0.15	20.5	0.21	8.47	0.09	7.23	0.08	17.1	0.18	7.06	0.07	6.02	0.06	13.7	0.14	5.65	0.06	4.82	0.05	
START.	-	-	-	-	-	-	22.1	-	9.66	-	8.45	-	18.4	-	8.05	-	7.04	-	14.7	-	6.44	-	5.63	-	

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.5 MA 25 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 32 x 10			BS 32 x 20			BS 32 x 32		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.75	0.68	0.64	0.77	0.70	0.66	0.78	0.71	0.67
1 500	0.73	0.65	0.60	0.75	0.67	0.62	0.76	0.67	0.63
1 000	0.72	0.63	0.58	0.74	0.65	0.59	0.75	0.65	0.60
750	0.71	0.61	0.56	0.73	0.63	0.58	0.74	0.64	0.59
500	0.70	0.59	0.53	0.72	0.61	0.55	0.72	0.61	0.55
300	0.68	0.57	0.51	0.70	0.59	0.53	0.71	0.60	0.53
100	0.65	0.52	0.46	0.67	0.54	0.47	0.68	0.54	0.48
START.	0.60	0.46	0.39	0.62	0.47	0.41	0.63	0.48	0.41

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (25 kN).

Static braking torque T_F [Nm] with 25 kN			
RATIO	BS 32 x 10	BS 32 x 20	BS 32 x 32
RV	5.1	10.4	16.9
RN	1.5	1.5	1.8
RL	1.5	1.5	1.5

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 1.5 Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.6 MA 50 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 40 × 10							LOAD																	
							50 kN						35 kN						25 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	71.4	35.7	17.9	5.10	3.04	1.99			8.80	2.76	4.89	1.54	11.7	3.66	6.16	1.93	3.43	1.08	8.33	2.62	4.40	1.38	2.45	0.77
1 500	35.7	17.9	8.9	3.76	2.19	1.43	17.0	2.67	9.11	1.43	5.15	0.81	11.9	1.87	6.37	1.00	3.61	0.57	8.51	1.34	4.55	0.72	2.58	0.40
1 000	23.8	11.9	6.0	2.99	1.73	1.14	17.4	1.82	9.43	0.99	5.51	0.58	12.2	1.28	6.60	0.69	3.86	0.40	8.70	0.91	4.72	0.49	2.76	0.29
750	17.9	8.9	4.5	2.42	1.45	0.95	17.4	1.37	9.67	0.76	5.67	0.45	12.2	0.96	6.77	0.53	3.97	0.31	8.70	0.68	4.83	0.38	2.84	0.22
500	11.9	6.0	3.0	1.87	1.11	0.74	17.8	0.93	9.79	0.51	5.84	0.31	12.5	0.65	6.85	0.36	4.09	0.21	8.90	0.47	4.89	0.26	2.92	0.15
300	7.1	3.6	1.8	1.40	0.82	0.54	18.2	0.57	10.2	0.32	6.21	0.20	12.8	0.40	7.12	0.22	4.35	0.14	9.11	0.29	5.08	0.16	3.11	0.10
100	2.4	1.2	0.6	0.66	0.38	0.25	19.1	0.20	11.1	0.12	6.87	0.07	13.4	0.14	7.72	0.08	4.81	0.05	9.55	0.10	5.51	0.06	3.43	0.04
START.	-	-	-	-	-	-	20.6	-	12.5	-	7.39	-	14.4	-	8.70	-	5.17	-	10.3	-	6.21	-	3.69	-

BS 40 × 20							LOAD																	
							40 kN						30 kN						20 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW
3 000	142.9	71.4	35.7	5.10	3.04	1.99											5.67	1.78	12.9	4.04	6.79	2.13	3.78	1.19
1 500	71.4	35.7	17.9	3.76	2.19	1.43					7.95	1.25	19.7	3.10	10.6	1.66	5.96	0.94	13.2	2.06	7.03	1.10	3.98	0.62
1 000	47.6	23.8	11.9	2.99	1.73	1.14	26.9	2.81	14.6	1.53	8.51	0.89	20.2	2.11	10.9	1.14	6.38	0.67	13.5	1.41	7.28	0.76	4.26	0.45
750	35.7	17.9	8.9	2.42	1.45	0.95	26.9	2.11	14.9	1.17	8.76	0.69	20.2	1.58	11.2	0.88	6.57	0.52	13.5	1.05	7.46	0.59	4.38	0.34
500	23.8	11.9	6.0	1.87	1.11	0.74	27.5	1.44	15.1	0.79	9.02	0.47	20.6	1.08	11.4	0.59	6.77	0.35	13.8	0.72	7.56	0.40	4.51	0.24
300	14.3	7.1	3.6	1.40	0.82	0.54	28.1	0.88	15.7	0.49	9.59	0.30	21.1	0.66	11.8	0.37	7.20	0.23	14.1	0.44	7.85	0.25	4.80	0.15
100	4.8	2.4	1.2	0.66	0.38	0.25	29.5	0.31	17.1	0.18	10.6	0.11	22.1	0.23	12.8	0.13	7.95	0.08	14.8	0.15	8.51	0.09	5.30	0.06
START.	-	-	-	-	-	-	31.8	-	19.2	-	11.4	-	23.9	-	14.4	-	8.55	-	15.9	-	9.59	-	5.70	-

BS 40 × 40							LOAD																	
							25 kN						20 kN						15 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	285.7	142.9	71.4	5.10	3.04	1.99																	5.57	1.75
1 500	142.9	71.4	35.7	3.76	2.19	1.43									13.8	2.17	7.81	1.23	19.4	3.04	10.4	1.63	5.86	0.92
1 000	95.2	47.6	23.8	2.99	1.73	1.14					10.5	1.09	26.4	2.76	14.3	1.50	8.36	0.88	19.8	2.07	10.8	1.12	6.27	0.66
750	71.4	35.7	17.9	2.42	1.45	0.95			18.4	1.44	10.8	0.84	26.4	2.07	14.7	1.15	8.61	0.68	19.8	1.55	11.0	0.86	6.45	0.51
500	47.6	23.8	11.9	1.87	1.11	0.74	33.8	1.77	18.6	0.97	11.1	0.58	27.0	1.41	14.9	0.78	8.86	0.46	20.3	1.06	11.2	0.58	6.65	0.35
300	28.6	14.3	7.1	1.40	0.82	0.54	34.5	1.08	19.3	0.61	11.8	0.37	27.6	0.87	15.4	0.48	9.43	0.30	20.7	0.65	11.6	0.36	7.07	0.22
100	9.5	4.8	2.4	0.66	0.38	0.25	36.2	0.38	20.9	0.22	13.0	0.14	29.0	0.30	16.8	0.18	10.4	0.11	21.7	0.23	12.6	0.13	7.81	0.08
START.	-	-	-	-	-	-	39.1	-	23.6	-	14.0	-	31.3	-	18.9	-	11.2	-	23.5	-	14.2	-	8.40	-

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.6 MA 50 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 40 x 10			BS 40 x 20			BS 40 x 40		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.74	0.70	0.63	0.77	0.73	0.65	0.78	0.74	0.67
1 500	0.73	0.68	0.60	0.75	0.70	0.62	0.77	0.72	0.63
1 000	0.71	0.65	0.56	0.74	0.68	0.58	0.75	0.69	0.59
750	0.71	0.64	0.54	0.74	0.66	0.56	0.75	0.67	0.57
500	0.69	0.63	0.53	0.72	0.65	0.55	0.73	0.67	0.56
300	0.68	0.61	0.50	0.70	0.63	0.52	0.72	0.64	0.52
100	0.65	0.56	0.45	0.67	0.58	0.47	0.68	0.59	0.47
START.	0.60	0.50	0.42	0.62	0.52	0.43	0.63	0.52	0.44

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (50 kN).

Static braking torque T_F [Nm] with 50 kN			
RATIO	BS 40 x 10	BS 40 x 20	BS 40 x 40
RV	8.6	17.9	36.5
RN	2.4	4.9	10.1
RL	2.4	2.4	2.4

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 2.4 \text{ Nm}$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.7 MA 100 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 50 × 10							LOAD																	
							100 kN						75 kN						50 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	62.5	20.8	15.6	9.10	4.36	3.10			11.1	3.48	8.61	2.70	22.3	6.99	8.30	2.61	6.46	2.03	14.9	4.66	5.53	1.74	4.30	1.35
1 500	31.3	10.4	7.8	6.32	2.90	2.21	30.3	4.76	11.5	1.80	9.18	1.44	22.8	3.57	8.61	1.35	6.88	1.08	15.2	2.38	5.74	0.90	4.59	0.72
1 000	20.8	6.9	5.2	5.16	2.38	1.70	31.0	3.25	12.1	1.26	9.68	1.01	23.3	2.43	9.06	0.95	7.26	0.76	15.5	1.62	6.04	0.63	4.84	0.51
750	15.6	5.2	3.9	4.21	2.04	1.41	31.4	2.46	12.4	0.97	9.82	0.77	23.5	1.85	9.30	0.73	7.37	0.58	15.7	1.23	6.20	0.49	4.91	0.39
500	10.4	3.5	2.6	3.23	1.53	1.10	31.7	1.66	12.8	0.67	10.3	0.54	23.8	1.24	9.55	0.50	7.69	0.40	15.9	0.83	6.37	0.33	5.13	0.27
300	6.3	2.1	1.6	2.42	1.15	0.82	32.5	1.02	13.5	0.42	11.1	0.35	24.3	0.76	10.1	0.32	8.30	0.26	16.2	0.51	6.74	0.21	5.53	0.17
100	2.1	0.7	0.5	1.16	0.52	0.39	34.0	0.36	14.8	0.15	12.3	0.13	25.5	0.27	11.1	0.12	9.18	0.10	17.0	0.18	7.38	0.08	6.12	0.06
START	-	-	-	-	-	-	37.7	-	17.9	-	14.9	-	28.3	-	13.4	-	11.2	-	18.9	-	8.94	-	7.42	-

BS 50 × 20							LOAD																	
							80 kN						60 kN						40 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	125.0	41.7	31.3	9.10	4.36	3.10									12.7	3.99	9.88	3.10	22.7	7.13	8.47	2.66	6.59	2.07
1 500	62.5	20.8	15.6	6.32	2.90	2.21			17.6	2.76	14.1	2.21	34.8	5.47	13.2	2.07	10.6	1.65	23.2	3.64	8.78	1.38	7.02	1.10
1 000	41.7	13.9	10.4	5.16	2.38	1.70	47.5	4.97	18.5	1.94	14.8	1.55	35.6	3.73	13.9	1.45	11.1	1.16	23.7	2.48	9.24	0.97	7.41	0.78
750	31.3	10.4	7.8	4.21	2.04	1.41	48.0	3.77	19.0	1.49	15.1	1.18	36.0	2.83	14.3	1.12	11.3	0.89	24.0	1.88	9.49	0.75	7.52	0.59
500	20.8	6.9	5.2	3.23	1.53	1.10	48.5	2.54	19.5	1.02	15.7	0.82	36.4	1.91	14.6	0.77	11.8	0.62	24.3	1.27	9.75	0.51	7.85	0.41
300	12.5	4.2	3.1	2.42	1.15	0.82	49.7	1.56	20.6	0.65	17.0	0.53	37.3	1.17	15.5	0.49	12.7	0.40	24.8	0.78	10.3	0.32	8.47	0.27
100	4.2	1.4	1.0	1.16	0.52	0.39	52.1	0.55	22.6	0.24	18.7	0.20	39.1	0.41	17.0	0.18	14.1	0.15	26.1	0.27	11.3	0.12	9.36	0.10
START	-	-	-	-	-	-	57.7	-	27.4	-	22.7	-	43.3	-	20.5	-	17.1	-	28.9	-	13.7	-	11.4	-

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.7 MA 100 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 50 x 10			BS 50 x 20		
n_1 [rpm]	RATIO			RATIO		
	RV	RN	RL	RV	RN	RL
3 000	0.73	0.65	0.63	0.76	0.68	0.66
1 500	0.71	0.63	0.59	0.75	0.66	0.62
1 000	0.70	0.60	0.56	0.73	0.62	0.58
750	0.69	0.58	0.55	0.72	0.61	0.58
500	0.68	0.57	0.53	0.71	0.59	0.55
300	0.67	0.53	0.49	0.70	0.56	0.51
100	0.64	0.49	0.44	0.66	0.51	0.46
START.	0.57	0.40	0.36	0.60	0.42	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (100 kN).

Static braking torque T_F [Nm] with 100 kN		
RATIO	BS 50 x 10	BS 50 x 20
RV	14.2	29.8
RN	4.0	4.0
RL	4.0	4.0

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 4.0 \text{ Nm}$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.8 MA 150 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 63 × 10							LOAD																	
							150 kN						120 kN						80 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	62.5	20.8	15.6	9.10	4.36	3.32									13.6	4.27	10.6	3.32	24.3	7.63	9.06	2.84	7.04	2.21
1 500	31.3	10.4	7.8	6.32	2.90	2.23			17.6	2.77	14.1	2.21	37.2	5.84	14.1	2.21	11.3	1.77	24.8	3.90	9.39	1.48	7.51	1.18
1 000	20.8	6.9	5.2	5.16	2.38	1.70	47.6	4.98	18.5	1.94	14.9	1.56	38.1	3.98	14.8	1.55	11.9	1.24	25.4	2.66	9.88	1.03	7.92	0.83
750	15.6	5.2	3.9	4.21	2.04	1.49	48.1	3.78	19.0	1.49	15.1	1.18	38.5	3.02	15.2	1.19	12.1	0.95	25.7	2.01	10.2	0.80	8.04	0.63
500	10.4	3.5	2.6	3.23	1.53	1.10	48.6	2.55	19.6	1.02	15.8	0.82	38.9	2.04	15.7	0.82	12.6	0.66	26.0	1.36	10.4	0.55	8.39	0.44
300	6.3	2.1	1.6	2.42	1.15	0.82	49.8	1.56	20.7	0.65	17.0	0.53	39.8	1.25	16.6	0.52	13.6	0.43	26.6	0.83	11.0	0.35	9.06	0.28
100	2.1	0.7	0.5	1.16	0.52	0.39	52.2	0.55	22.7	0.24	18.8	0.20	41.8	0.44	18.1	0.19	15.0	0.16	27.9	0.29	12.1	0.13	10.0	0.10
START	-	-	-	-	-	-	57.8	-	27.5	-	22.8	-	46.3	-	22.0	-	18.2	-	30.9	-	14.7	-	12.2	-

BS 63 × 20							LOAD																	
							100 kN						80 kN						50 kN					
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO					
	RV	RN	RL	RV	RN	RL	RV		RN		RL		RV		RN		RL		RV		RN		RL	
	T ₁ Nm	P ₁ kW		T ₁ Nm	P ₁ kW		T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW		
3 000	125.0	41.7	31.3	9.10	4.36	3.32													28.7	9.02	10.7	3.37	8.33	2.62
1 500	62.5	20.8	15.6	6.32	2.90	2.23									17.8	2.79	14.2	2.23	29.4	4.61	11.1	1.75	8.88	1.39
1 000	41.7	13.9	10.4	5.16	2.38	1.70							48.0	5.03	18.7	1.96	15.0	1.57	30.0	3.14	11.7	1.22	9.37	0.98
750	31.3	10.4	7.8	4.21	2.04	1.49			24.0	1.88	19.0	1.49	48.6	3.81	19.2	1.51	15.2	1.19	30.4	2.38	12.0	0.94	9.51	0.75
500	20.8	6.9	5.2	3.23	1.53	1.10	61.4	3.21	24.7	1.29	19.9	1.04	49.1	2.57	19.7	1.03	15.9	0.83	30.7	1.61	12.4	0.65	9.92	0.52
300	12.5	4.2	3.1	2.42	1.15	0.82	62.8	1.97	26.1	0.82	21.4	0.67	50.2	1.58	20.9	0.66	17.2	0.54	31.4	0.99	13.1	0.41	10.7	0.34
100	4.2	1.4	1.0	1.16	0.52	0.39	65.9	0.69	28.6	0.30	23.7	0.25	52.7	0.55	22.9	0.24	19.0	0.20	32.9	0.34	14.3	0.15	11.9	0.12
START	-	-	-	-	-	-	73.0	-	34.6	-	28.7	-	58.4	-	27.7	-	23.0	-	36.5	-	17.3	-	14.4	-

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.8 MA 150 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 63 x 10			BS 63 x 20		
	RATIO			RATIO		
n_1 [rpm]	RV	RN	RL	RV	RN	RL
3 000	0.71	0.64	0.61	0.75	0.67	0.65
1 500	0.70	0.61	0.58	0.74	0.65	0.61
1 000	0.68	0.58	0.55	0.72	0.62	0.58
750	0.67	0.57	0.54	0.71	0.60	0.57
500	0.67	0.55	0.52	0.70	0.58	0.54
300	0.65	0.52	0.48	0.69	0.55	0.50
100	0.62	0.48	0.43	0.66	0.50	0.46
START.	0.56	0.39	0.36	0.59	0.42	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (150 kN).

Static braking torque T_F [Nm] with 150 kN		
RATIO	BS 63 x 10	BS 63 x 20
RV	19.0	40.6
RN	5.3	5.3
RL	5.3	5.3

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 5.3 \text{ Nm}$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.9 MA 200 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 80 × 10							LOAD																	
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P_{max} [kW]			200 kN						150 kN						100 kN					
							RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	62.5	20.8	15.6	15.88	7.82	5.84			23.0	7.22	17.9	5.61	46.8	14.7	17.3	5.42	13.4	4.21	31.2	9.80	11.5	3.61	8.94	2.81
1 500	31.3	10.4	7.8	11.36	5.29	4.09	63.1	9.90	23.9	3.74	18.6	2.91	47.3	7.43	17.9	2.81	13.9	2.19	31.5	4.95	11.9	1.87	9.28	1.46
1 000	20.8	6.9	5.2	8.76	4.27	3.12	64.4	6.75	24.8	2.59	19.6	2.05	48.3	5.06	18.6	1.94	14.7	1.53	32.2	3.37	12.4	1.30	9.77	1.02
750	15.6	5.2	3.9	7.44	3.59	2.72	65.2	5.12	25.4	1.99	20.4	1.60	48.9	3.84	19.1	1.49	15.3	1.20	32.6	2.56	12.7	1.00	10.2	0.80
500	10.4	3.5	2.6	5.95	2.79	2.14	65.9	3.45	26.8	1.40	21.0	1.10	49.4	2.59	20.1	1.05	15.7	0.82	33.0	1.72	13.4	0.70	10.5	0.55
300	6.3	2.1	1.6	4.20	1.98	1.56	67.4	2.12	27.9	0.88	22.2	0.70	50.6	1.59	21.0	0.66	16.7	0.52	33.7	1.06	14.0	0.44	11.1	0.35
100	2.1	0.7	0.5	2.08	0.95	0.72	70.7	0.74	30.6	0.32	24.9	0.26	53.0	0.55	22.9	0.24	18.7	0.20	35.3	0.37	15.3	0.16	12.4	0.13
START	-	-	-	-	-	-	78.2	-	37.6	-	30.6	-	58.6	-	28.2	-	22.9	-	39.1	-	18.8	-	15.3	-

BS 80 × 20							LOAD																	
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P_{max} [kW]			150 kN						100 kN						75 kN					
							RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	125.0	41.7	31.3	15.88	7.82	5.84									21.5	6.75	16.7	5.25	43.8	13.8	16.1	5.06	12.6	3.94
1 500	62.5	20.8	15.6	11.36	5.29	4.09			33.4	5.25	26.0	4.09	59.0	9.26	22.3	3.50	17.4	2.72	44.2	6.94	16.7	2.63	13.0	2.04
1 000	41.7	13.9	10.4	8.76	4.27	3.12			34.7	3.63	27.4	2.87	60.3	6.31	23.2	2.42	18.3	1.91	45.2	4.73	17.4	1.82	13.7	1.44
750	31.3	10.4	7.8	7.44	3.59	2.72	91.4	7.18	35.6	2.80	28.6	2.24	60.9	4.78	23.8	1.86	19.1	1.49	45.7	3.59	17.8	1.40	14.3	1.12
500	20.8	6.9	5.2	5.95	2.79	2.14	92.4	4.84	37.6	1.97	29.4	1.54	61.6	3.22	25.1	1.31	19.6	1.03	46.2	2.42	18.8	0.98	14.7	0.77
300	12.5	4.2	3.1	4.20	1.98	1.56	94.5	2.97	39.2	1.23	31.2	0.98	63.0	1.98	26.1	0.82	20.8	0.65	47.3	1.48	19.6	0.62	15.6	0.49
100	4.2	1.4	1.0	2.08	0.95	0.72	99.1	1.04	42.8	0.45	34.9	0.36	66.	0.69	28.6	0.30	23.3	0.24	49.6	0.52	21.4	0.22	17.4	0.18
START	-	-	-	-	-	-	110	-	52.7	-	42.8	-	73.1	-	35.2	-	28.6	-	54.8	-	26.4	-	21.4	-

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.9 MA 200 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 80 x 10			BS 80 x 20		
	RATIO			RATIO		
n_1 [rpm]	RV	RN	RL	RV	RN	RL
3 000	0.69	0.63	0.60	0.74	0.67	0.65
1 500	0.69	0.60	0.58	0.73	0.65	0.62
1 000	0.67	0.58	0.55	0.72	0.62	0.59
750	0.66	0.57	0.53	0.71	0.61	0.57
500	0.66	0.54	0.52	0.70	0.58	0.55
300	0.64	0.52	0.49	0.69	0.55	0.52
100	0.61	0.47	0.44	0.65	0.50	0.47
START.	0.55	0.38	0.35	0.59	0.41	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (200 kN).

Static braking torque T_F [Nm] with 200 kN		
RATIO	BS 80 x 10	BS 80 x 20
RV	24.7	53.7
RN	6.8	6.8
RL	6.8	6.8

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 6.8 \text{ Nm}$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.10 MA 350 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v , torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 100 × 16							LOAD																		
							350 kN						250 kN						200 kN						
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO						
							RV		RN		RL		RV		RN		RL		RV		RN		RL		
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW			
3 000	75.0	50.0	25.0	22.94	16.11	9.87																50.3	15.8	27.2	8.55
1 500	37.5	25.0	12.5	15.65	11.35	6.57							93.2	14.7	64.2	10.1	35.7	5.61	74.6	11.7	51.4	8.07	28.6	4.49	
1 000	25.0	16.7	8.3	12.68	8.81	5.27							94.2	9.87	65.7	6.88	36.7	3.84	75.4	7.89	52.6	5.50	29.3	3.07	
750	18.8	12.5	6.3	10.20	7.57	4.53			94.2	7.39	53.4	4.19	96.4	7.57	67.3	5.28	38.1	2.99	77.1	6.05	53.8	4.22	30.5	2.39	
500	12.5	8.3	4.2	8.28	5.98	3.60	138	7.22	96.4	5.05	55.6	2.91	98.6	5.16	68.9	3.61	39.7	2.08	78.9	4.13	55.1	2.88	31.8	1.66	
300	7.5	5.0	2.5	5.97	4.20	2.57	140	4.38	98.8	3.10	58.0	1.82	99.7	3.13	70.6	2.22	41.4	1.30	79.8	2.51	56.5	1.77	33.2	1.04	
100	2.5	1.7	0.8	2.76	1.93	1.23	145	1.51	107	1.12	65.6	0.69	104	1.08	76.2	0.80	46.9	0.49	82.7	0.87	61.0	0.64	37.5	0.39	
AVV.	-	-	-	-	-	-	167	-	123	-	81.7	-	119	-	88.0	-	58.3	-	95.3	-	70.4	-	46.7	-	

BS 100 × 20							LOAD																		
							300 kN						200 kN						150 kN						
n ₁ [rpm]	LINEAR SPEED v [mm/s]			Max. input power ¹ P _{max} [kW]			RATIO						RATIO						RATIO						
							RV		RN		RL		RV		RN		RL		RV		RN		RL		
	RV	RN	RL	RV	RN	RL	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW	T ₁ Nm	P ₁ kW			
3 000	93.8	62.5	31.3	22.94	16.11	9.87														67.7	21.3	46.1	14.5	25.0	7.84
1 500	46.9	31.3	15.6	15.65	11.35	6.57								91.2	14.3	62.8	9.87	35.0	5.49	68.4	10.8	47.1	7.40	26.2	4.12
1 000	31.3	20.8	10.4	12.68	8.81	5.27								92.2	9.65	64.3	6.73	35.9	3.75	69.1	7.24	48.2	5.05	26.9	2.81
750	23.4	15.6	7.8	10.20	7.57	4.53					55.9	4.39		94.2	7.40	65.8	5.17	37.3	2.93	70.7	5.55	49.4	3.87	28.0	2.20
500	15.6	10.4	5.2	8.28	5.98	3.60	145	7.57	101	5.29	58.3	3.05	96.4	5.05	67.4	3.53	38.8	2.03	72.3	3.79	50.5	2.65	29.1	1.52	
300	9.4	6.3	3.1	5.97	4.20	2.57	147	4.60	104	3.25	60.8	1.91	97.5	3.06	69.0	2.17	40.5	1.27	73.2	2.30	51.8	1.63	30.4	0.95	
100	3.1	2.1	1.0	2.76	1.93	1.23	152	1.59	112	1.17	68.8	0.72	101	1.06	74.6	0.78	45.8	0.48	75.8	0.79	55.9	0.59	34.4	0.36	
AVV.	-	-	-	-	-	-	175	-	129	-	85.6	-	117	-	86.0	-	57.1	-	87.4	-	64.5	-	42.8	-	

(¹) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

Screw Jacks with travelling ball screw (Mod.A)

2.10 MA 350 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:

η_{BS} : ball screw theoretical efficiency

η_R : worm - wormwheel efficiency

η_{CT} : bearings and seals total efficiency

η_{tot}	BS 100 x 16			BS 100 x 20		
	RATIO			RATIO		
n_1 [rpm]	RV	RN	RL	RV	RN	RL
3 000	0.70	0.69	0.64	0.72	0.70	0.65
1 500	0.70	0.67	0.61	0.71	0.69	0.62
1 000	0.69	0.66	0.59	0.70	0.67	0.60
750	0.67	0.64	0.57	0.69	0.66	0.58
500	0.66	0.63	0.54	0.67	0.64	0.56
300	0.65	0.61	0.52	0.67	0.63	0.53
100	0.63	0.57	0.46	0.64	0.58	0.47
START.	0.54	0.49	0.37	0.56	0.50	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (350 kN).

Static braking torque T_F [Nm] with 350 kN		
RATIO	BS 100 x 16	BS 100 x 20
RV	48.2	62.0
RN	22.9	29.4
RL	13.4	13.4

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value T_{Fmin} which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{Fmin} = 13.4 \text{ Nm}$$

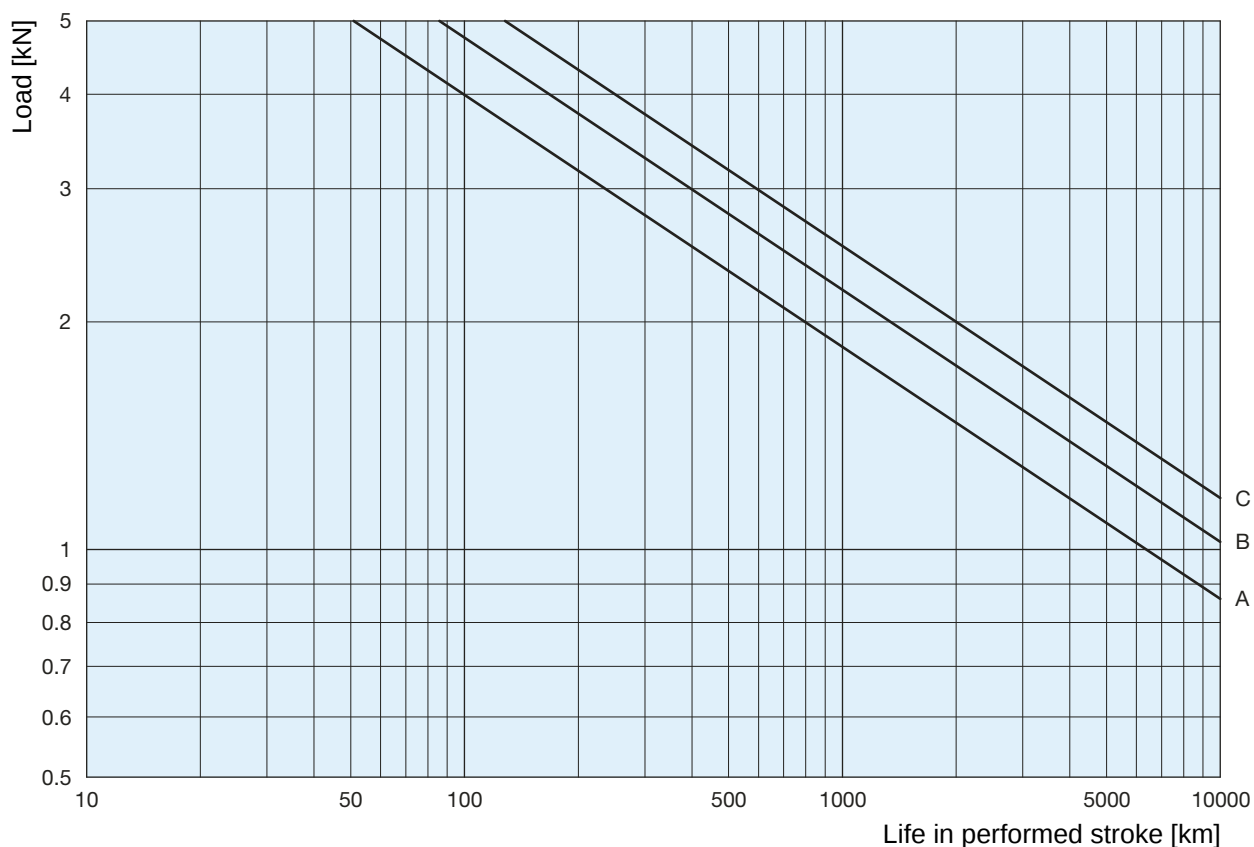
The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 5 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.



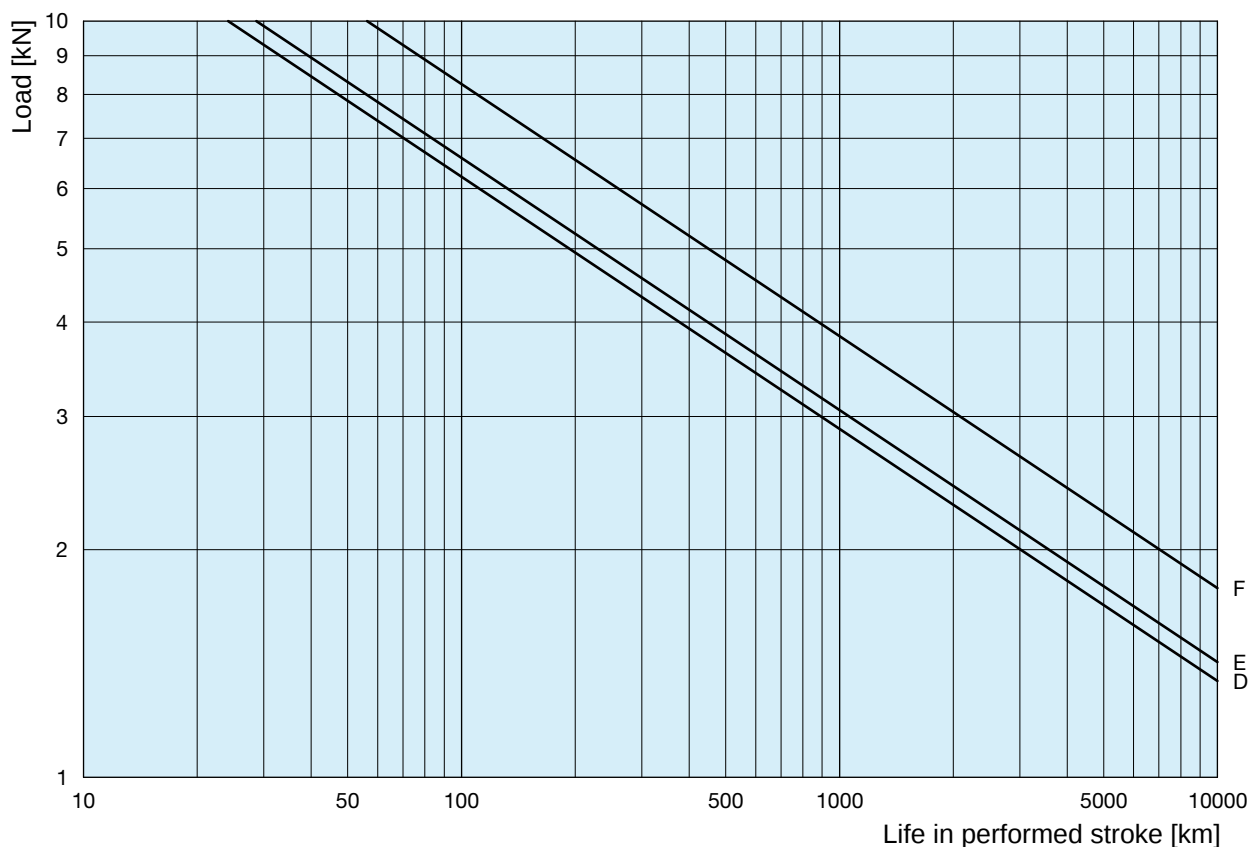
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 16x5	3.175	1	5	12.9	20.9	B
BS 16x10	3.175	1	3	8.6	13.3	A
BS 16x16	3.175	2	2	10.0	14.5	C

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 10 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 "Ball screws life calculation" on page 18 or contact SERVOMECH.



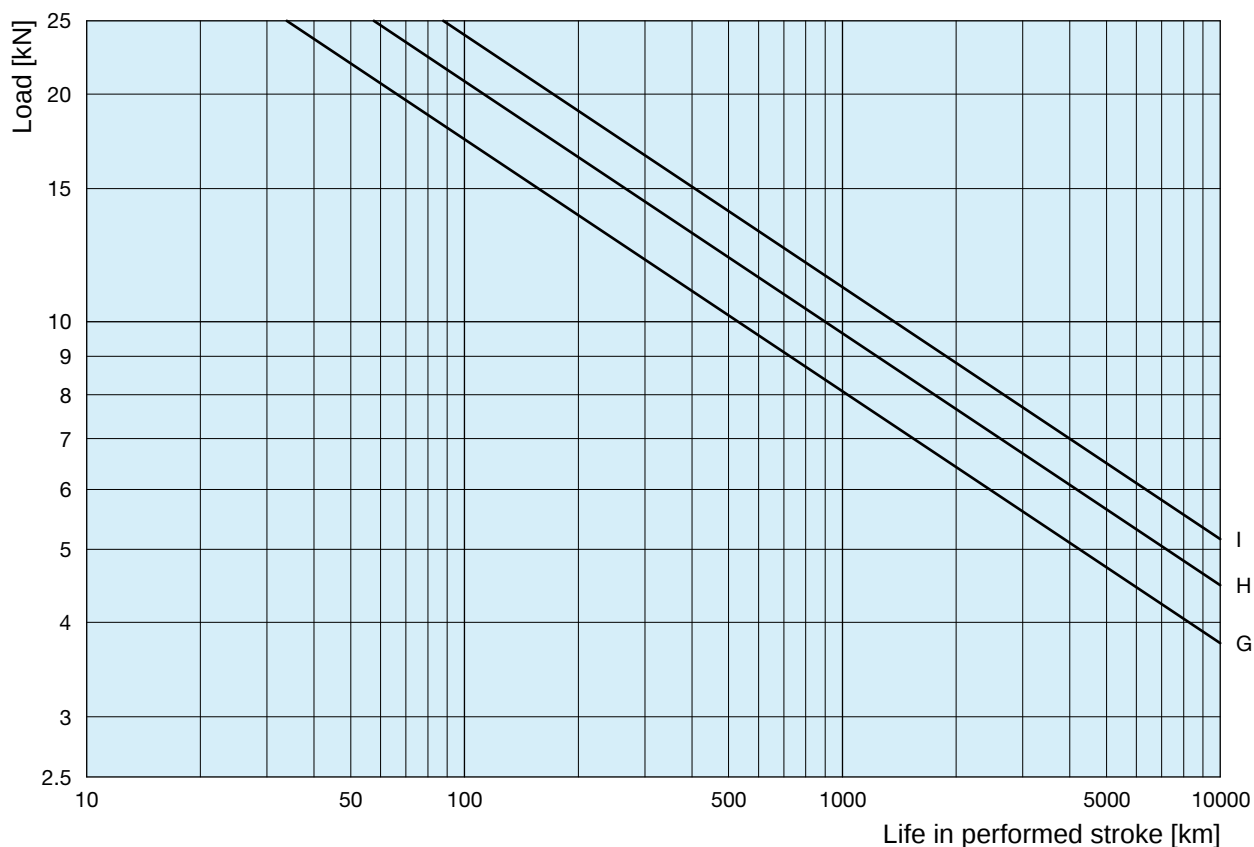
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 25x5	3.175	1	5	16.9	36.4	D
BS 25x10	3.969	1	3	14.2	25.8	E
BS 25x25	3.175	2	2	13.1	25.2	F

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 25 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 "Ball screws life calculation" on page 18 or contact SERVOMECH.



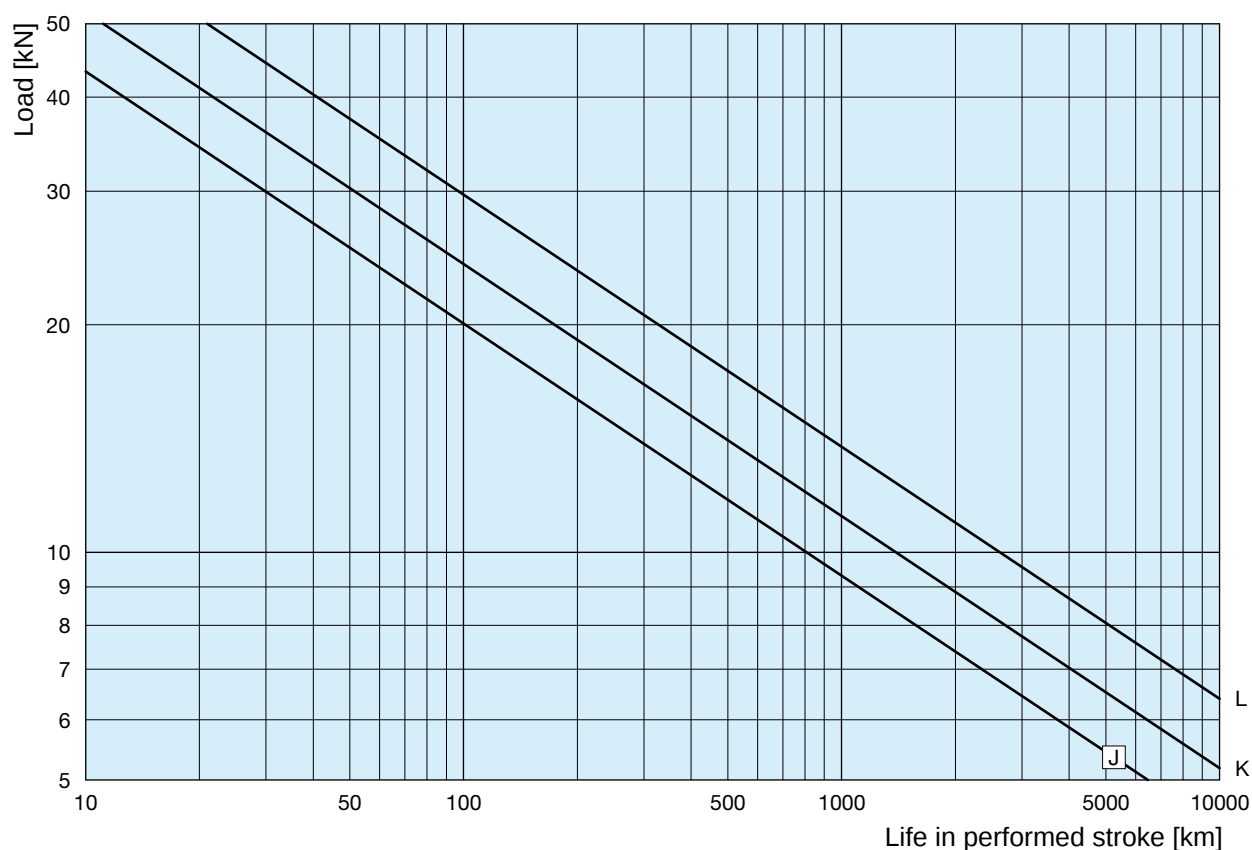
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 32×10	6.35	1	5	44.8	83.5	H
BS 32×20	6.35	1	3	29.8	53.2	G
BS 32×32	6.35	2	2	35.0	58.1	I

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 50 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 "Ball screws life calculation" on page 18 or contact SERVOMECH.



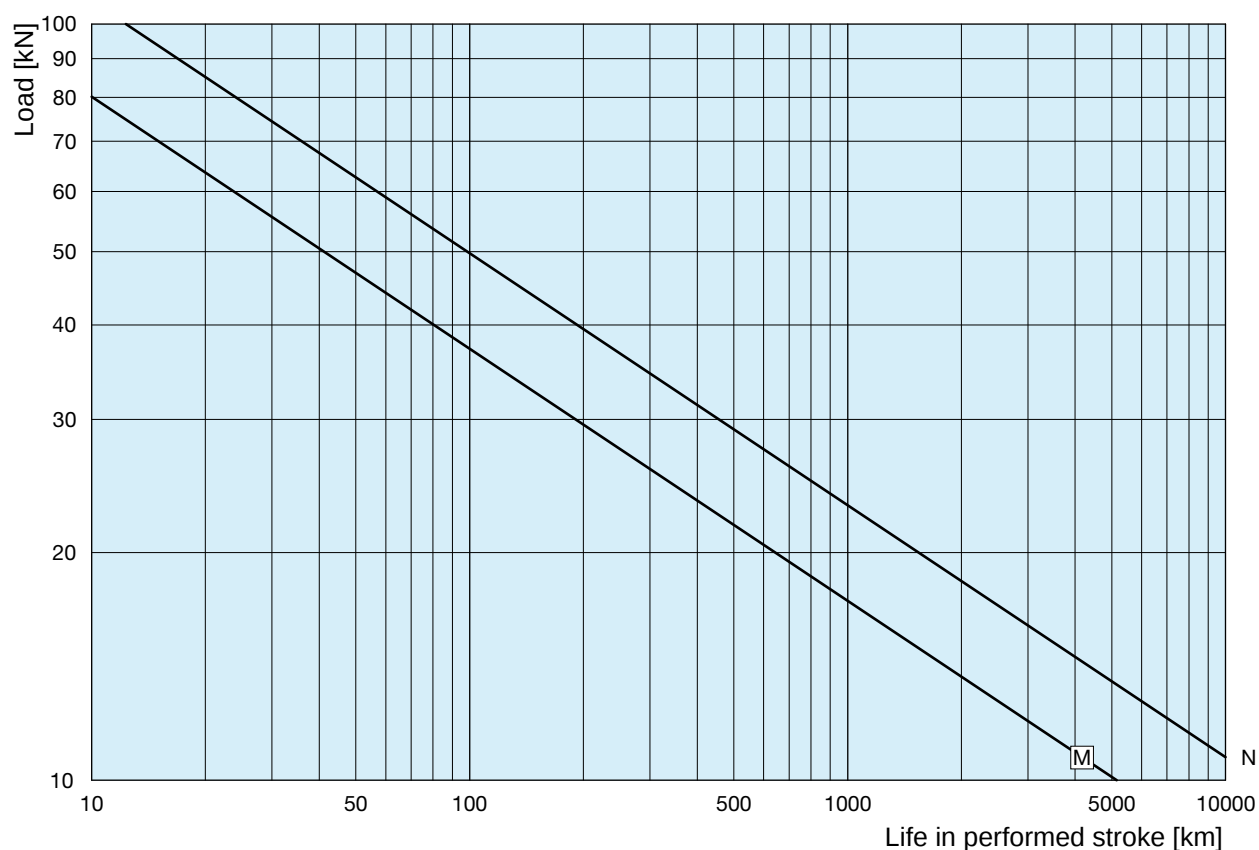
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 40×10	6.35	1	5	51.8	111.1	K
BS 40×20	6.35	1	3	34.3	69.9	J
BS 40×40	6.35	2	2	40.3	77.1	L

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 100 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 "Ball screws life calculation" on page 18 or contact SERVOMECH.



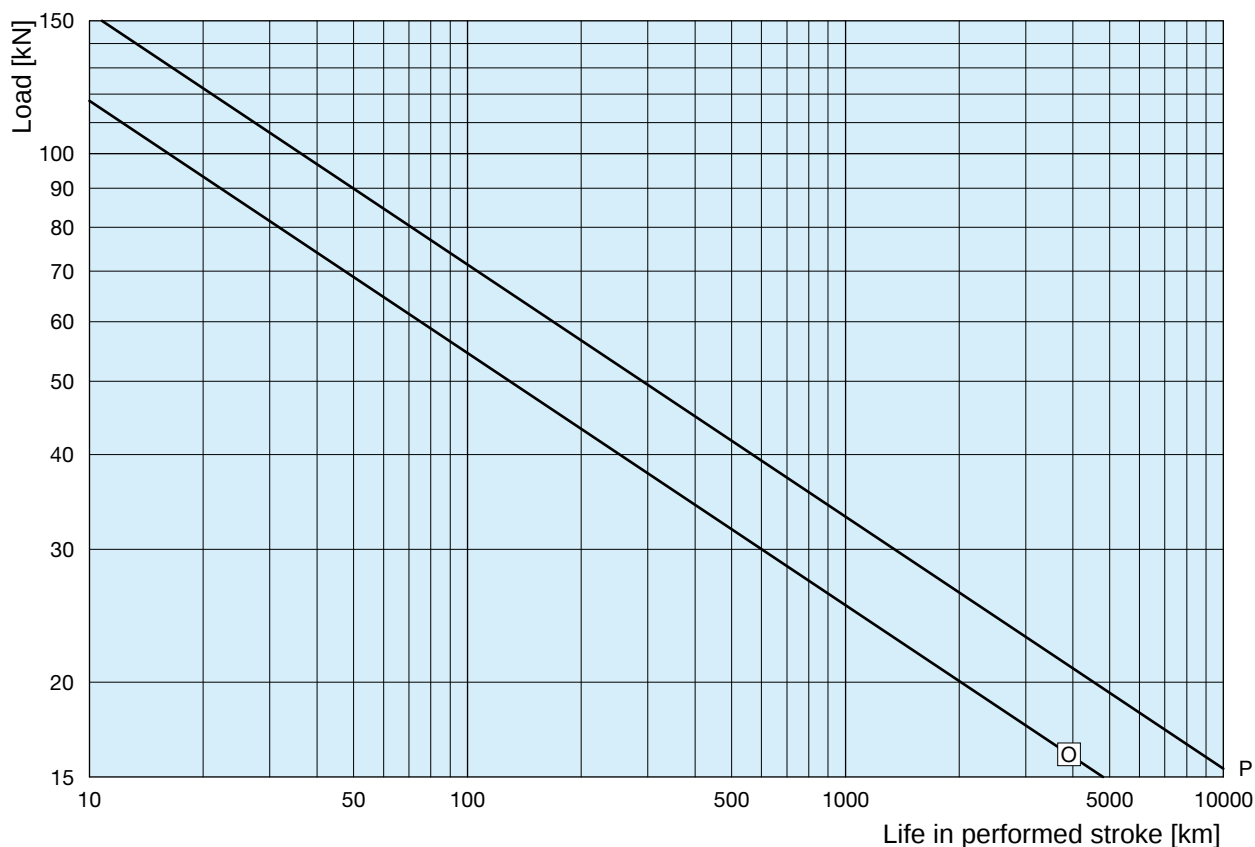
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 50×10	6.35	1	7	107.2	271.3	N
BS 50×20	6.35	1	4	63.6	146.8	M

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 150 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 "Ball screws life calculation" on page 18 or contact SERVOMECH.



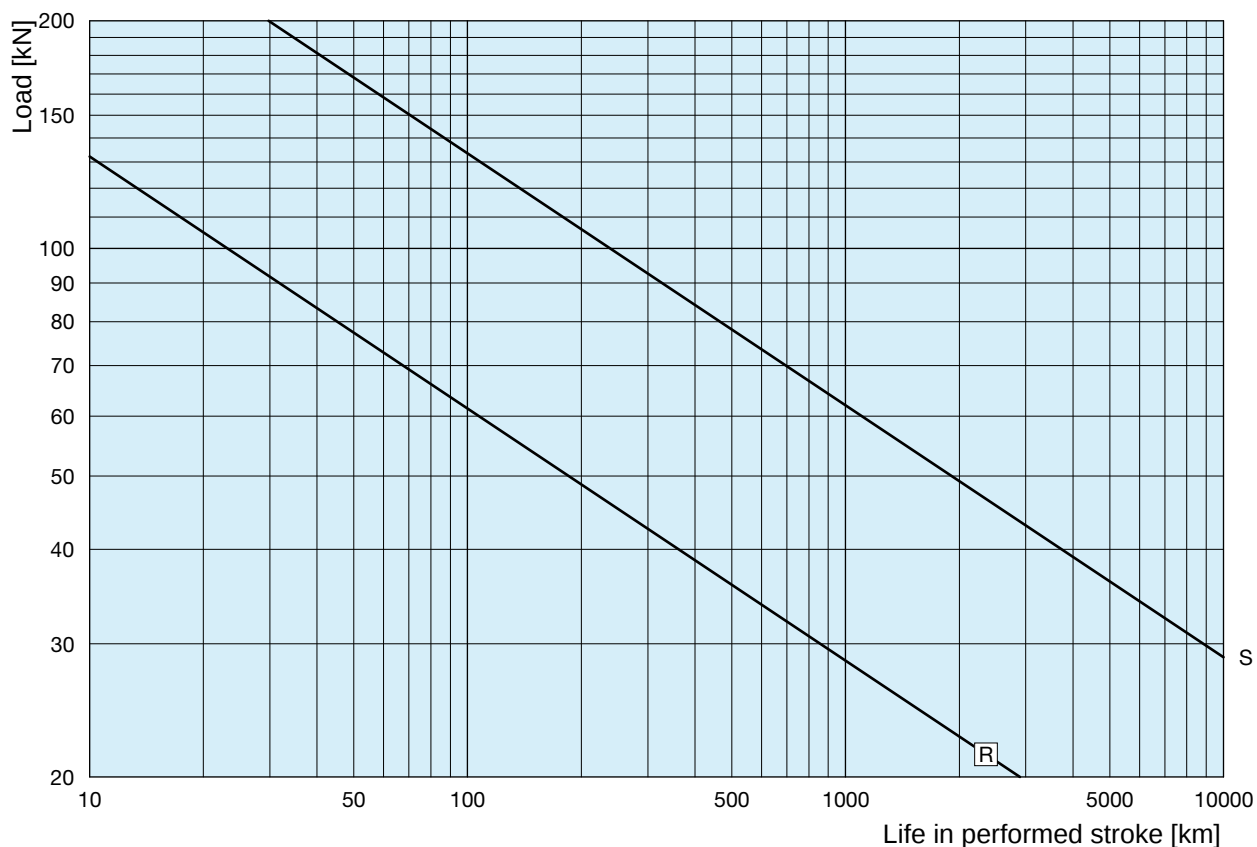
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 63×10	7.144	1	6	117.5	339.8	O
BS 63×20	9.525	1	4	122.1	291.8	P

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 200 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.



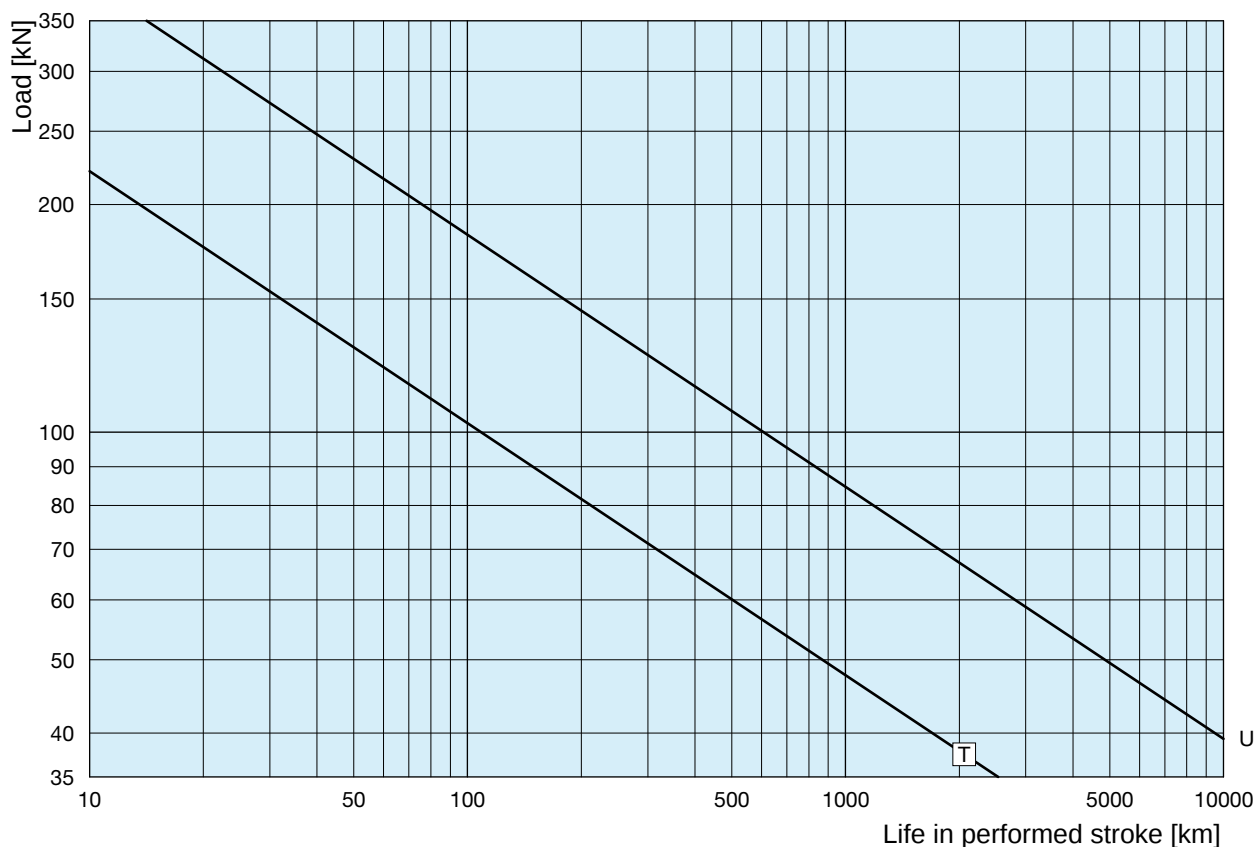
BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 80×10	7.144	1	7	132.3	448.5	R
BS 80×20	12.7	1	5	228.4	585.6	S

Screw Jacks with travelling ball screw (Mod.A)

2.11 Ball nut life

MA 350 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 "Ball screws life calculation" on page 18 or contact SERVOMECH.

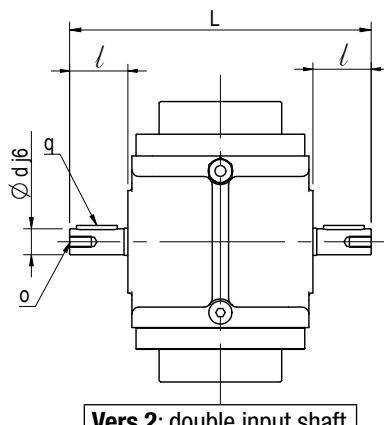
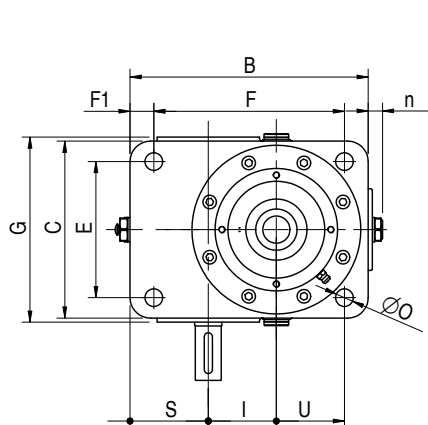
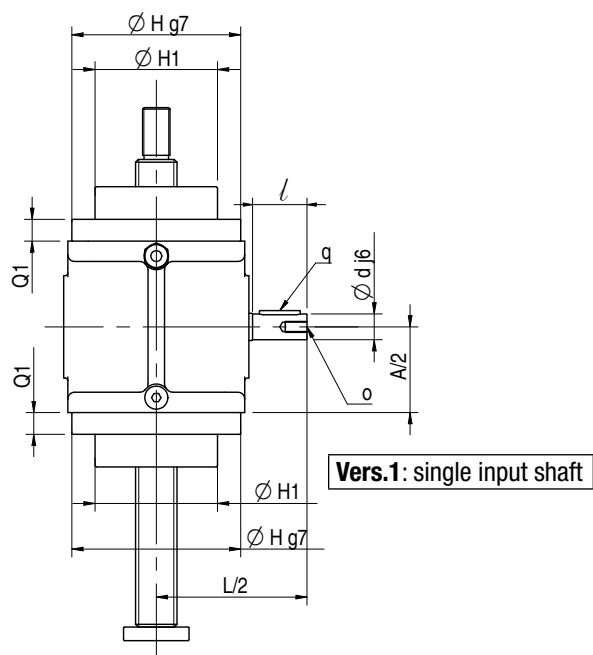
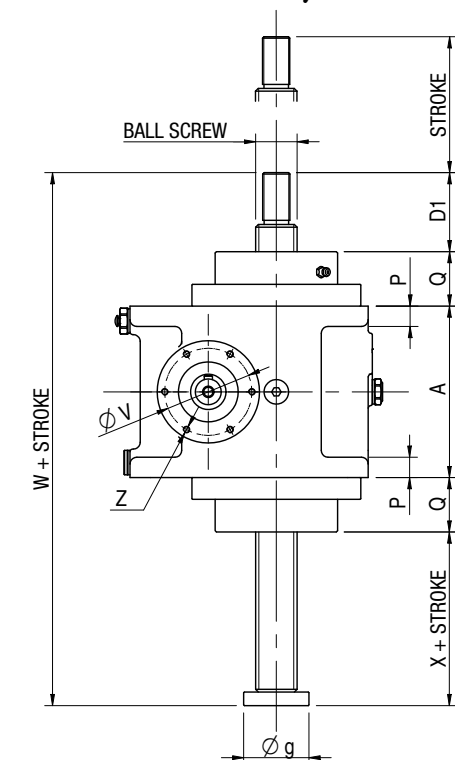


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 100×16	9.525	1	6	189.3	637.9	T
BS 100×20	12.7	1	6	311.9	962.8	U

Screw Jacks with travelling ball screw (Mod.A)

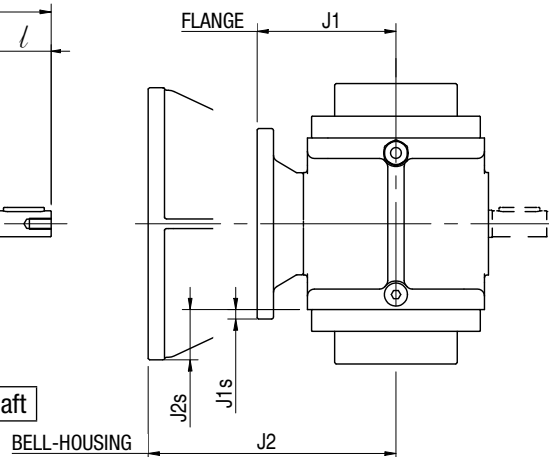
2.12 Overall dimensions

MA BS Series Mod.A, size 5 - 10 - 25 - 50 - 100 - 150



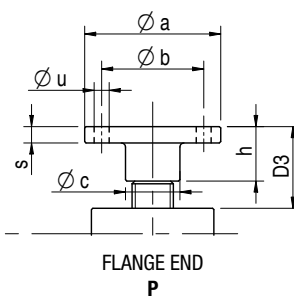
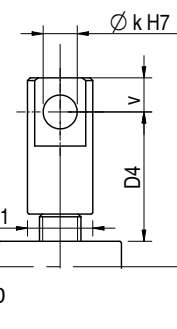
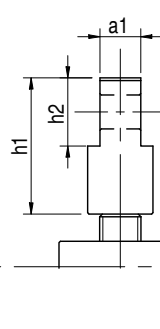
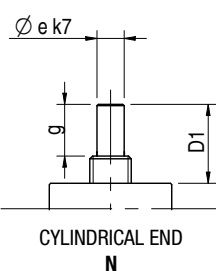
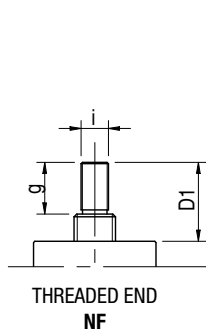
Vers.3: flange and hollow shaft IEC

Vers.4: flange and hollow shaft IEC + 2nd shaft



Vers.5: Vers.1 with bell-housing and coupling IEC

Vers.6: Vers.2 with bell-housing and coupling IEC



Screw Jacks with travelling ball screw (Mod.A)

2.12 Overall dimensions

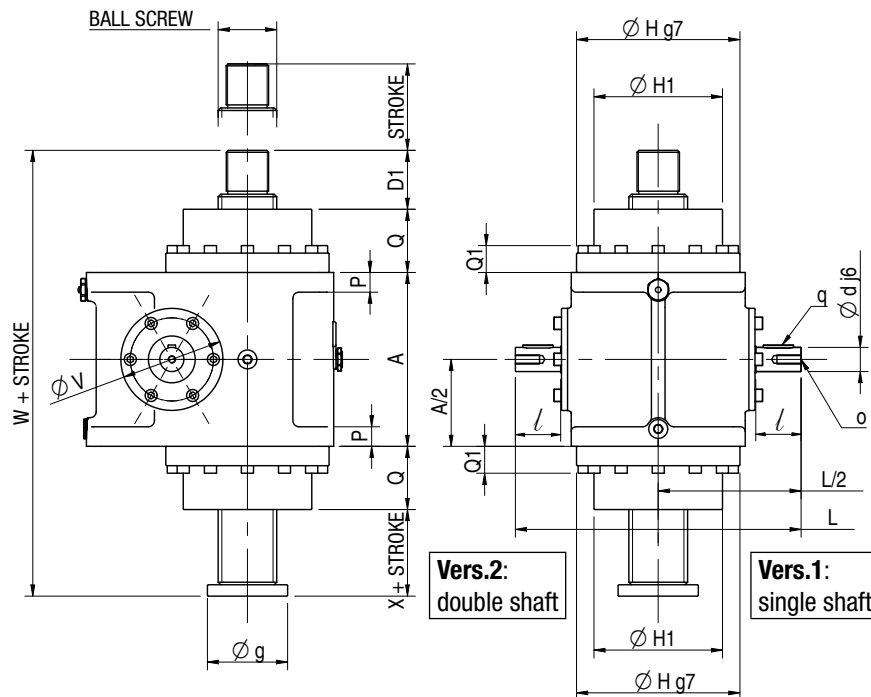
MA BS Series Mod.A, size 5 - 10 - 25 - 50 - 100 - 150

SIZE	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS
BALL SCREW	BS 16 × P _h	BS 25 × P _h	BS 32 × P _h	BS 40 × P _h	BS 50 × P _h	BS 63 × P _h
A	80	100	126	160	200	200
B	124	140	175	235	276	276
C	80	105	130	160	200	200
D1 (min.)	39	44	58	58	68	68
D3 (min.)	40	45	60	60	70	70
D4 (min.)	65	75	95	105	120	150
E	62	80	100	120	150	150
F	95	110	140	190	220	220
F1	12.5	14	17.5	23	26	26
G	100	114	136	165	205	205
Ø H	75	95	124	145	150	150
Ø H1	54	65	90	109	185	185
I	30	40	50	63	80	80
L	149	179	221.5	269	330	330
Ø O	9	9	13	17	21	21
P	10	12	15	19	22	22
Q	29.5	32	40	41.5	64	64
Q1	11	12	16	25	29	29
S	46.5	46	57.5	80	91	91
U	31	38	50	70	75	75
Ø V	42	46	64	63	74	74
W	191.5	229	291.5	330.5	394.5	424.5
X	13.5	21	27.5	29.5	-1.5	28.5
Z	M5, depth 10	M5, depth 12	M5, depth 10	M6, depth 14	M6, depth 14	M6, depth 14
Ø a	68	75	100	120	150	150
a1	20	25	30	40	60	60
Ø b	45	55	75	85	110	110
Ø c	25	30	40	50	70	70
Ø c1	32	38	48	68	90	90
Ø d	10	14	19	24	28	28
Ø e	12	15	20	30	40	40
Ø g	30	38	48	70	82	96
g	19	24	38	38	48	48
h	20	25	40	40	50	50
h1	60	75	100	120	180	180
h2	30	40	50	70	100	100
i	M12×1.75	M16×1.5	M20×1.5	M30×2	M42×3	M42×3
Ø k	14	20	25	35	50	50
l	22	30	40	50	60	60
n	—	—	10	10	12	12
o	M5, depth 10	M6, depth 14	M8, depth 16	M8, depth 16	M8, depth 16	M8, depth 16
q	3×3×15	5×5×20	6×6×30	8×7×40	8×7×40	8×7×40
s	8	10	12	15	20	20
Ø u, n° holes	Ø 7, 4 holes	Ø 9, 4 holes	Ø 11, 4 holes	Ø 17, 4 holes	Ø 21, 4 holes	Ø 21, 4 holes
v	15	20	25	35	50	50
J1	63 B5/B14: 62	63 B5/B14: 69	63/71 B5: 102	80 B5: 100	80/90 B5: 120	80/90 B5: 120
J1s	63 B5: 30 63 B14: 5	63 B5: 20 63 B14: —	63 B5: 7 71 B5: 17	80 B5: 20	80/90 B5: —	80/90 B5: —
J2	71 B5: 122 71 B14: 131	71 B5: 129 71 B14: 138	80 B5: 182 80 B14: 176 90 B5: 182 90 B14: 182	90 B5: 200 90 B14: 200 100 B5: 220 100 B14: 220	100/112 B5 240 100/112 B14: 240	100/112 B5 240 100/112 B14: 240
J2s	71 B5: 40 71 B14: 12.5	71 B5: 30 71 B14: 3	80 B5: 37 80 B14: — 90 B5: 37 90 B14: 7	90 B5: 20 90 B14: — 100 B5: 45 100 B14: —	100/112 B5 25 100/112 B14: —	100/112 B5 25 100/112 B14: —

Screw Jacks with travelling ball screw (Mod.A)

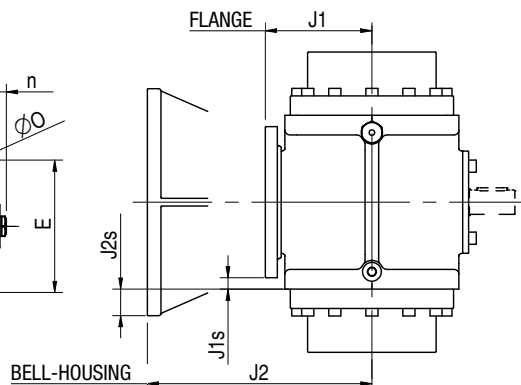
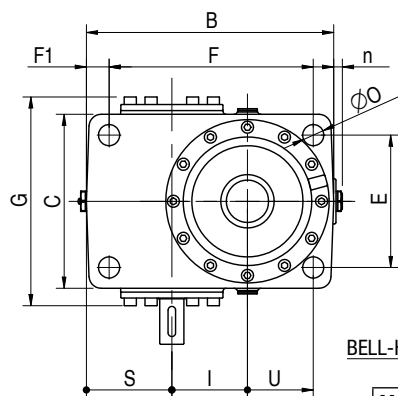
2.12 Overall dimensions

MA BS Series Mod.A, size 200 - 350



Vers.3: flange and hollow shaft IEC

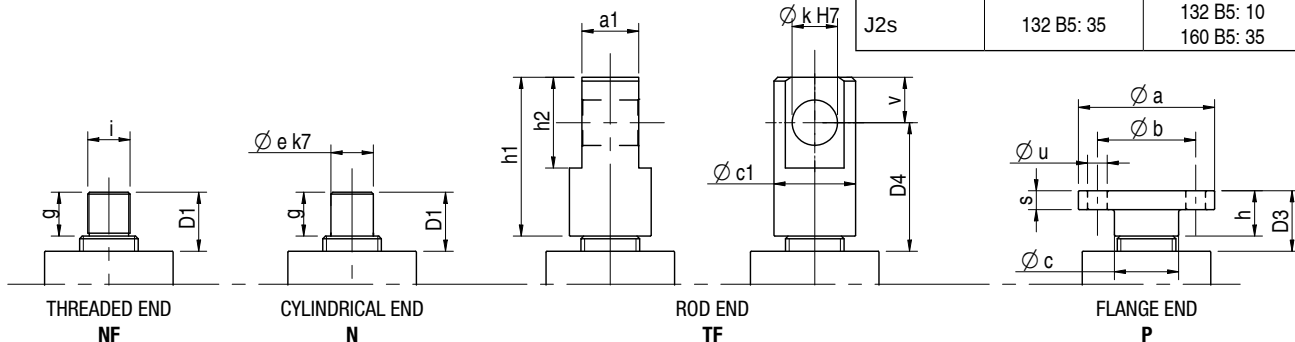
Vers.4: flange and hollow shaft IEC + 2nd shaft



Vers.5: Vers.1 with bell-housing and coupling IEC

Vers.6: Vers.2 with bell-housing and coupling IEC

SIZE	MA 200 BS	MA 350 BS
BALL SCR.	BS 80 × P _h	BS 100 × P _h
A	230	280
B	330	415
C	230	330
D1 (min.)	78	98
D3 (min.)	80	100
D4 (min.)	170	220
E	175	230
F	270	330
F1	30	42
G	256	326
Ø H	216	290
Ø H1	170	220
I	100	125
L	378	490
Ø O	28	34
P	26	30
Q	83.5	84
Q1	35.5	46
S	113	121
U	87	126
Ø V	110	118
W	489.5	549
X	14.5	3
Z	M10, depth 20	M10, depth 25
Ø a	180	250
a1	75	100
Ø b	130	180
Ø c	85	115
Ø c1	108	138
Ø d	32	38
Ø e	50	70
Ø g	106	146
g	58	78
h	60	80
h1	210	280
h2	120	160
i	M56×3	M80×3
Ø k	60	80
l	60	80
n	10	10
o	M10, depth 24	M12, depth 32
q	10×8×40	10×8×60
s	25	35
Ø u, n° holes	Ø 26, 6 holes	Ø 30, 6 holes
v	60	80
J1	90 B5: 142 100/112 B5: 142	—
J1s	90 B5: — 100/112 B5: 10	—
J2	132 B5: 297	132 B5: 353 160 B5: 365
J2s	132 B5: 35	132 B5: 10 160 B5: 35

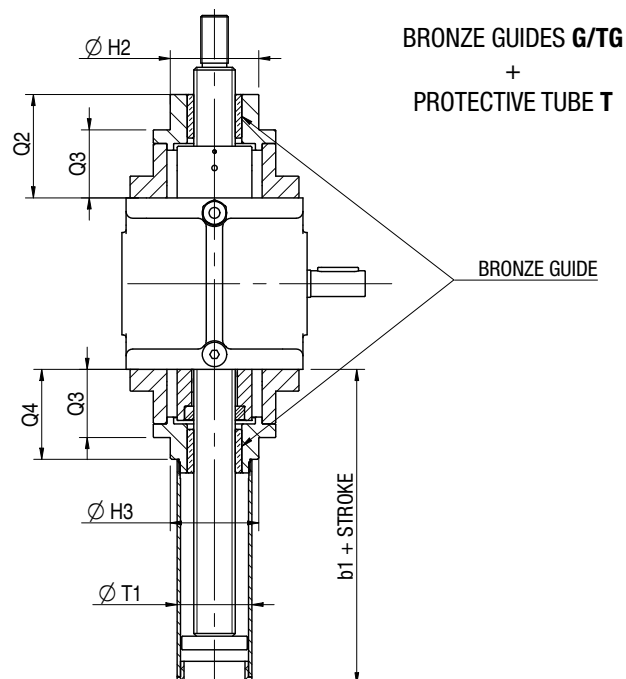
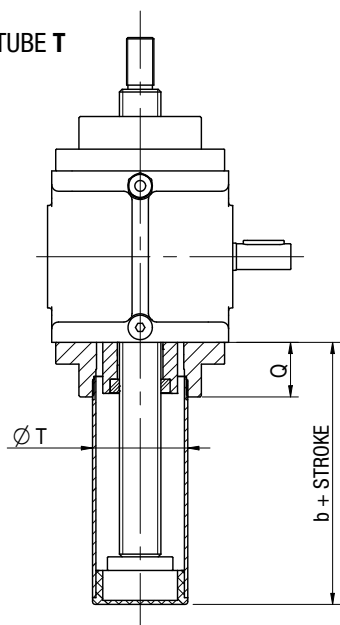


Screw Jacks with travelling ball screw (Mod.A)

2.12 Overall dimensions

MA BS Series Mod.A with protective tube T

PROTECTIVE TUBE T



SIZE	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
BALL SCREW	BS 16 × P _h	BS 25 × P _h	BS 32 × P _h	BS 40 × P _h	BS 50 × P _h	BS 63 × P _h	BS 80 × P _h	BS 100 × P _h
Ø H2	34	48	65	85	100	100	150	160
Q2	47.5	60	76	82.5	114	128	147.5	184
Q3	37.5	41	50	58.5	84	98	83.5	123
Q4	—	50	66	72.5	103	117	127.5	123
Ø T	exec. T	45	55	70	90	110	110	150
	exec. T+SN							
	exec. T+AR							
	exec. T+FCP							
	exec. T+AR+FCP							
Q	exec. T+FCM	45	55	55	55	—	—	—
	exec. T	29.5	32	40	41.5	64	64	83.5
	exec. T+SN							
	exec. T+AR							
	exec. T+FCP							
b	exec. T+AR+FCP							
	exec. T+FCM	29.5	32	50	54.5	—	—	—
	exec. T	68	78	92.5	96	107.5	137.5	143
	exec. T+SN	74	84	127.5	136	132.5	162.5	168
	exec. T+AR	97	110	132.5	136	127.5	157	164
Ø T1	exec. T+FCP	103.5	106	112.5	116	139	137	161.5
	exec. T+AR+FCP	107.5	110	132.5	136	152	157	177.5
	exec. T+FCM	96.5	106	140	144.5	—	—	—
	exec. TG	36	45	55	55	90	90	130
	exec. TG+FCM					—	—	—
Ø H3	exec. TG+FCP	40	50	55	60	100	100	130
	exec. TG+AR	45	55	70	90	110	110	150
	exec. TG	36	48	65	85	100	100	150
	exec. TG+FCP					—	—	—
	exec. TG+FCM					—	—	—
b1	exec. TG+AR	45	55	70	90	110	110	150
	exec. TG	98.5	113	131	157.5	169	183	233.5
	exec. TG+FCP	122.5	135	151	157.5	188	202	238.5
	exec. TG+FCM	122.5	135	156	162.5	—	—	—
	exec. TG+AR	137.5	145	171	177.5	209	223	248.5

Screw Jacks with travelling ball screw (Mod.A)

2.13 Electric motor fitting

IEC electric motors

		MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
63	B5	F	F	F					
	B14	F	F						
71	B5	B	B	F	F				
	B14	B	B	F					
80	B5			B	F	F	F		
	B14			B					
90	B5			B	B	F	F	F	
	B14			B	B				
100 - 112	B5				B	B	B	F	
	B14				B	B	B		
132	B5							B	B
160	B5								B

F - flange with hollow shaft IEC

B - bell-housing + coupling IEC



LINEARMECH Brushless Servomotors

Ball screw jacks can be equipped with Linearmech Brushless Servomotors BM Series with metric flange dimensions, according to IEC 34-7, UNEL 05513 regulations. Possible fittings are described below:

Servomotor	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
BM 45 L IEC								
BM 63 S IEC	•	•						
BM 63 L IEC	•	•	•					
BM 82 S IEC			•					
BM 82 L IEC			•					
BM 102 S IEC			•	•				
BM 102 L6 IEC			•	•				
BM 102 L8 IEC			•	•				

For technical data of servomotors, please refer to Chapter 5 "Servo motors" on page 115.

Flanges and bell-housings to specific drawing for hydraulic motors or servo motors are available on request.

Screw Jacks with travelling ball screw (Mod.A)

2.14 Accessories

Bronze guides

The bronze guide ensures the coaxial position of the ball screw with the its nut. This is extremely important to have the optimal contact between balls and ball tracks for a longer screw life. Guides are mounted **on both sides** of the screw jack housing.

Bronze guides are mostly recommended in case no other external guiding system is used.

Ordering code: **G-G**

If the screw jack needs a protective tube in addition to the bronze guides, it is possible to have a combination of the two accessories.

Ordering code: **G-TG**

In applications with trunnion mount SC, bronze guides are absolutely necessary!



2



Stop nut

The stop nut prevents the ball screw travelling out of the screw jack housing. It is a washer pinned at the screw end (opposite the attachment side) that blocks the screw translation when reaching the related stop. Unlike the standard washer, made of tecnopolimer, which prevents unscrewing, the stop nut is made of steel and can sustain the load in case it should reach the related mechanical stop.

The ball screw length is defined to have, during normal working condition, at its extreme (extended or retracted) position an extra-stroke (safety stroke) of at least 20 mm.

If the stop nut reaches accidentally the related stop, it is necessary to check the screw jack's components to verify possible damages.

Ordering code: **SN**

Screw Jacks with travelling ball screw (Mod.A)

2.14 Accessories

Protective tube

The protective tube is screwed in the cover and protects the ball screw from damages and/or environment pollution such as dust, water, etc. Furthermore, it allows the fitting of other options such as limit switches and/or anti-turn device.

The protective tube is in aluminium alloy or in steel in case of screw jack fitted with anti-turn device.

Ordering code: **T**



Anti-turn device

The anti-turn device is necessary when the load to be lifted is not guided and therefore the ball screw rotation is not prevented, or in case the application does not properly allow the screw reaction to permit the translation.

Functioning: a steel key is fitted along the protective tube, and a keyed bronze washer is fixed at the end of the ball screw; this prevents the screw rotation and forces the screw translation.

Up to screw jack size 50 (ball screw BS 40 × P_H) included, the anti-turn device has only one key; from size 100 (ball screw BS 50 × P_H) on, it has two keys mounted on opposite sides.

The bronze washer also acts as a stop nut against ball screw unthreading.

Ordering code: **AR**



Fixing attachments in stainless steel

For applications in particular environment conditions or in food industry, on request screw jacks can be supplied with end attachment in stainless steel. Available standard steels are AISI 303, AISI 304, on request AISI 316.

Ordering code: **P inox** stainless steel flange end P, for screw jacks Mod.A

Ordering code: **TF inox** stainless steel rod end TF, for screw jacks Mod.A

Screw Jacks with travelling ball screw (Mod.A)

2.14 Accessories

Magnetic limit switches

Available for screw jacks size 5, 10 or 25 only. Not supplied with anti-turn device AR.

Functioning: magnetic limit switches are sensors with reed contact and are fitted with a clamp on the aluminium, or other non-magnetic metal, protective tube T. They are activated by the magnetic field generated by a magnetic ring fitted on the travelling ball screw end.

In case the screw jack is not stopped after the sensor activation, without magnetic field the sensor restores the original state. In case the limit switches are used to stop the screw jack, we recommend to provide an electric connection in order to latch the signal and prevent the screw jack from moving again in the same direction.

Screw jacks with magnetic limit switches are supplied with two sensors for the ball screw extreme positions. On request, extra switches for intermediate positions can be supplied.

The position of the sensors along the tube is adjustable.

Technical details:

Contact:	normally CLOSED (NC)	normally OPEN (NO)
Voltage range:	(3 ... 130) Vdc / (3 ... 130) Vac	
Switching capacity:	20 W / 20 VA	
Max. switching current at 25°C:	300 mA (resistive load)	
Max. inductive load:	3 W (simple coil)	—
Wires:	2 × 0.25 mm ²	
Cable length:	2 m	



Ordering code: **FCM-NC** for screw jacks with normally closed magnetic switches FCM

Ordering code: **FCM-NO** for screw jacks with normally open magnetic switches FCM

Screw Jacks with travelling ball screw (Mod.A)

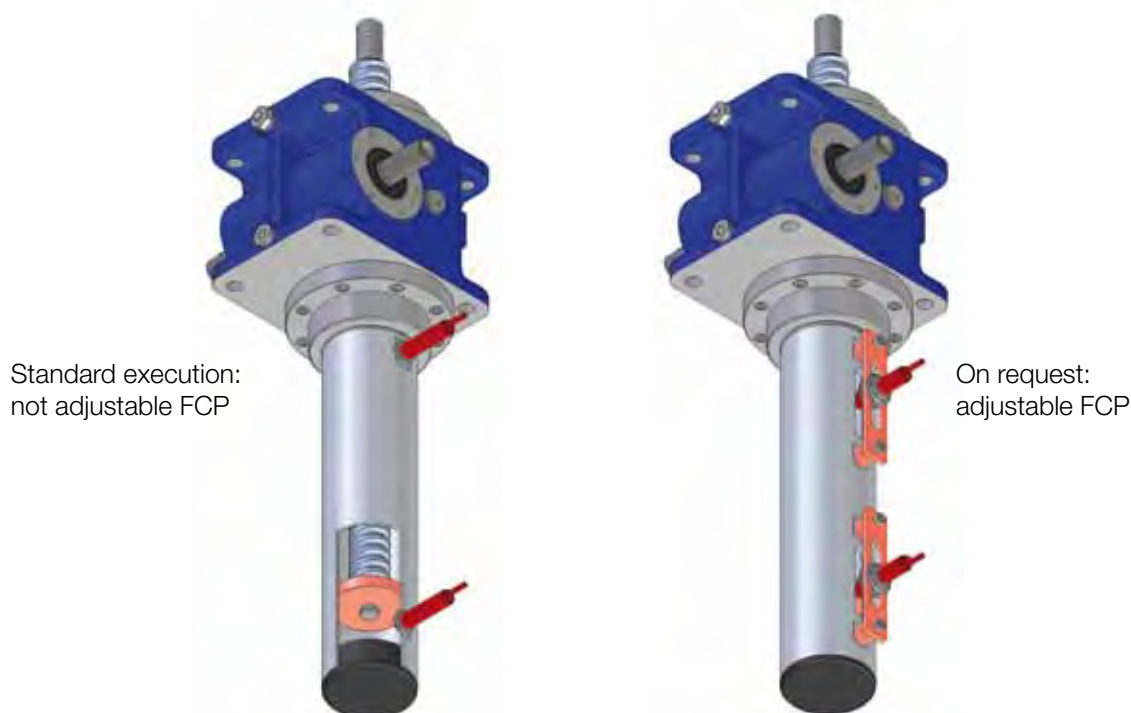
2.14 Accessories

Inductive proximity limit switches

Functioning: the limit switches are proximity sensors fixed on the protective tube and activated by the metallic ring placed on the ball screw end.

In case the screw jack is not stopped after the sensor activation, when the metallic ring moves away the sensor restores the original state (is deactivated). In case the limit switches are used to stop the screw jack, we recommend to provide an electric connection in order to latch the signal and to prevent the screw jack from moving again in the same direction.

Screw jacks with proximity limit switches are supplied with two sensors for the ball screw extreme positions. Extra switches for intermediate positions available on request.



By standard execution, the sensors position along the tube is not adjustable and it is not angularly fixed. On request, it can be supplied with angular position at customer's requirement.

Execution with axial adjustment of the sensors position available on request.

Technical details:

Type:	inductive, PNP
Contact:	normally CLOSED (NC)
Voltage range:	(10 ... 30) Vdc
Max. output current:	200 mA
Voltage drop (activated sensor):	< 1.8 V
Wires:	3 × 0.2 mm ²
Cable length:	2 m

Ordering code: **FCP** (standard, not adjustable)
FCPR (on request, adjustable)

Screw Jacks with travelling ball screw (Mod.A)

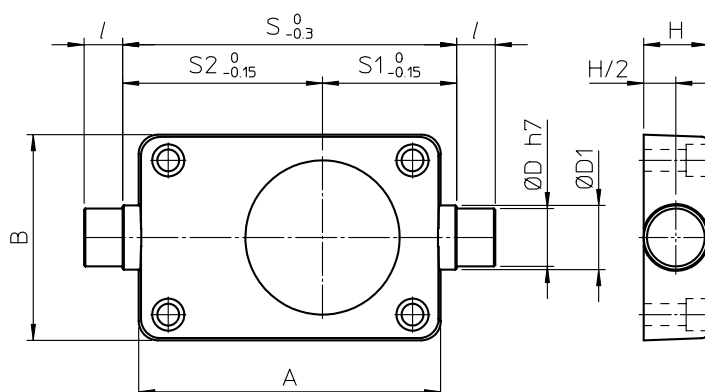
2.14 Accessories

Trunnion mount

The trunnion mount is bolted to either the top or the bottom of the screw jack housing and allows the screw jack pivoting around the axis defined by the trunnion mount's lateral pins.

NOTE: the attachment of the travelling ball screw must have a cylindrical hole with axes parallel to the trunnion mount pivots axis.

In applications with trunnion mount, bronze guides are absolutely necessary!



2

	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
A	134	155	199	260	301	301	360	465
B	90	120	154	185	225	225	260	350
ØD	15	20	25	45	50	50	70	80
ØD ₁	20	25	30	50	60	60	80	90
H	20	25	30	50	60	60	80	90
l	15	20	20	30	40	40	45	60
S	140	160	225	285	330	330	390	490
S ₁	55.5	64	92	117	132	132	147	206.5
S ₂	84.5	96	132	168	198	198	243	283.5
mass [kg]	1.4	2.6	5.1	14.8	23.5	23.5	45.5	81.9

Ordering code: **SC (TF side)** screw jacks with SC fixed on the screw attachment side

Ordering code: **SC (opposite TF side)** screw jacks with SC fixed on side opposite to the screw attachment

Bellows

In applications with particular environment conditions, bellows protect the screw from contaminants.

The usually supplied bellows are circular, sewn (double seam), in NYLON with a PVC outside and inside coating. For special application requirements, different executions or materials can be supplied on request.

The bellows cause changes to the retracted and extended lengths and screw jack overall dimensions stated in the catalogue. On request, orders will be acknowledged with a screw jack drawing giving exact dimensions.

Usually, bellows are fitted between the screw jack housing and the ball screw attachment and the protective tube is fitted on the opposite side.

In case the screw jack shall have a ball screw without attachment, it is recommended to order it with a sketch of the required bellows attachment dimensions.

Codice: **B**



Screw Jacks with travelling ball screw (Mod.A)

2.14 Accessories

Worm wheel rotation detector

Some applications require the possibility to verify if the worm wheel rotates while the worm shaft is moving in order to get information about the good condition and functioning of the worm wheel toothing.

A cylindrical element, machined in order to have a “crown” of empty and full spaces, is fixed to the worm wheel creating a phonic wheel that, while rotating, activates a corresponding proximity switches. As output of such proximity switch, activated and deactivated by the alternation of empty and full spaces, a “train” of impulses is generated which confirms the rotation of the worm wheel. On the contrary, the constant output signal of the proximity switch means the stop of the worm wheel.

The puls generator can be mounted on the screw end side or on the opposite side.



Safety nut

The safety nut is a back-up feature to prevent the load dropping in an uncontrolled manner in case of working nut balls failure. This can be caused by overload or by achieving a critical wear level.

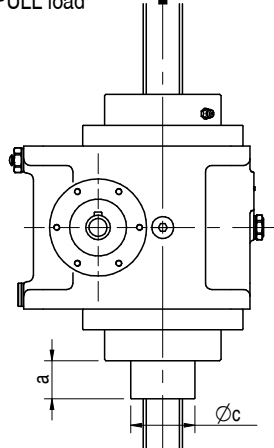
The safety nut is an extension to the main nut and changes the screw jack overall dimensions. It works with one particular load direction only. Its position as regards the main nut is therefore conditioned by the load direction: with pull load the safety nut is on the opposite side of the screw end, with push load it is on the screw end side.

The safety nut does not have balls inside, but a helical thread that traces the ball truck on the screw. With a not worn out main nut, the thread of the nut does not touch the screw; in case the balls of the main nut should fail, the safety nut will touch the screw and sustain the load, causing a slithering between the screw and the safety nut threads. The safety nut is made in steel and therefore, in case it is activated, it is then necessary to replace both screw and main nut.

Since the safety nut is a rotating component, if the screw jack is not provided with the protective tube, a protective device is supplied as standard.

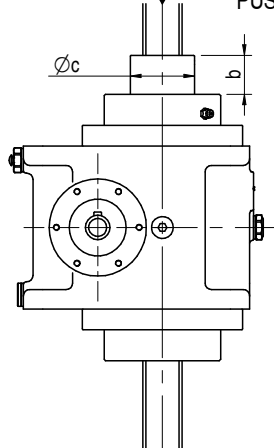


UPWARD mounting,
PULL load



DOWNWARD mounting,
PUSH load

UPWARD mounting,
PUSH load



	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
a	3.5	18	30	40	0	18.5	0	3
b	14.5	24	30	40	18	18.5	0	18
Øc	28	40	50	63	75	90	105	150

Ordering code: **MSA push** safety nut for push load

Ordering code: **MSA pull** safety nut for pull load

Screw Jacks with travelling ball screw (Mod.A)

2.14 Accessories

ROTARY ENCODER Code ENC.4

Hall-effect encoder, incremental, bi-directional

Resolution: 4 pulses per revolution

Output: PUSH-PULL
2 channels (A and B, phase difference 90°)

Input voltage: (8 ... 32) Vdc

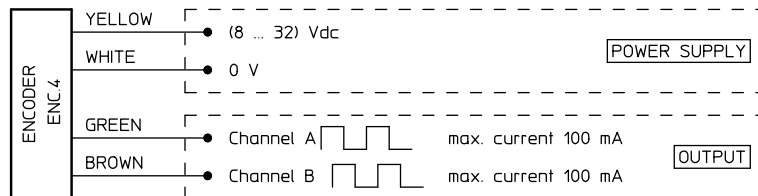
Max. commutable current (I_{out}): 100 mA

Max output voltage drop:
with load connected to 0 and $I_{out} = 100$ mA: 4.6 V
with load connected to + V and $I_{out} = 100$ mA: 2 V

Protection:
against short circuit
against input polarity inversion
against any incorrect output connection

Cable length: 1.3 m

Protection: IP 55



Ordering code: **ENC.4**

ROTARY ENCODER Code EH53

Optical encoder, incremental, bi-directional

Resolution: 100 or 500 pulses per revolution

Output: PUSH-PULL
2 channels (A and B, phase difference 90°)
channel ZERO

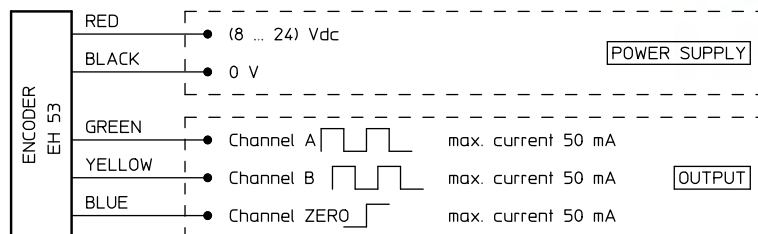
Input voltage: (8 ... 24) Vcc

No-load current: 100 mA

Max. commutable current: 50 mA

Cable length: 0.5 m

Protection: IP 54



Ordering code: **EH 53**

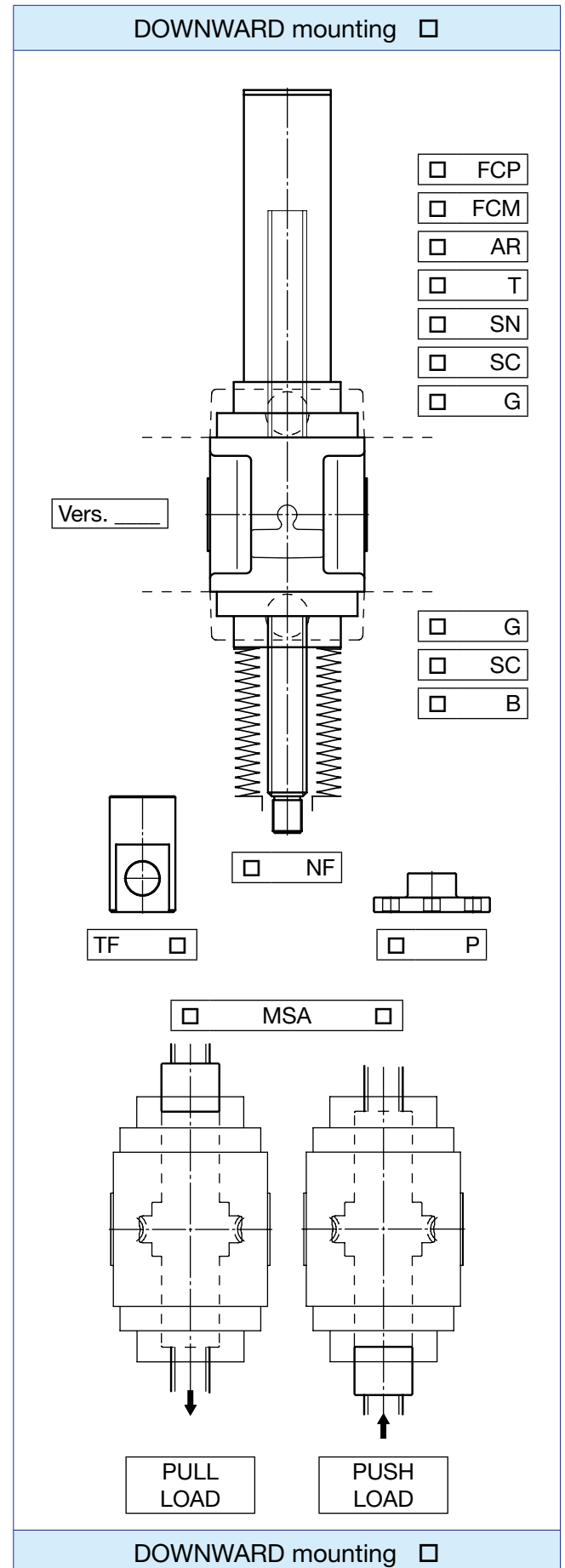
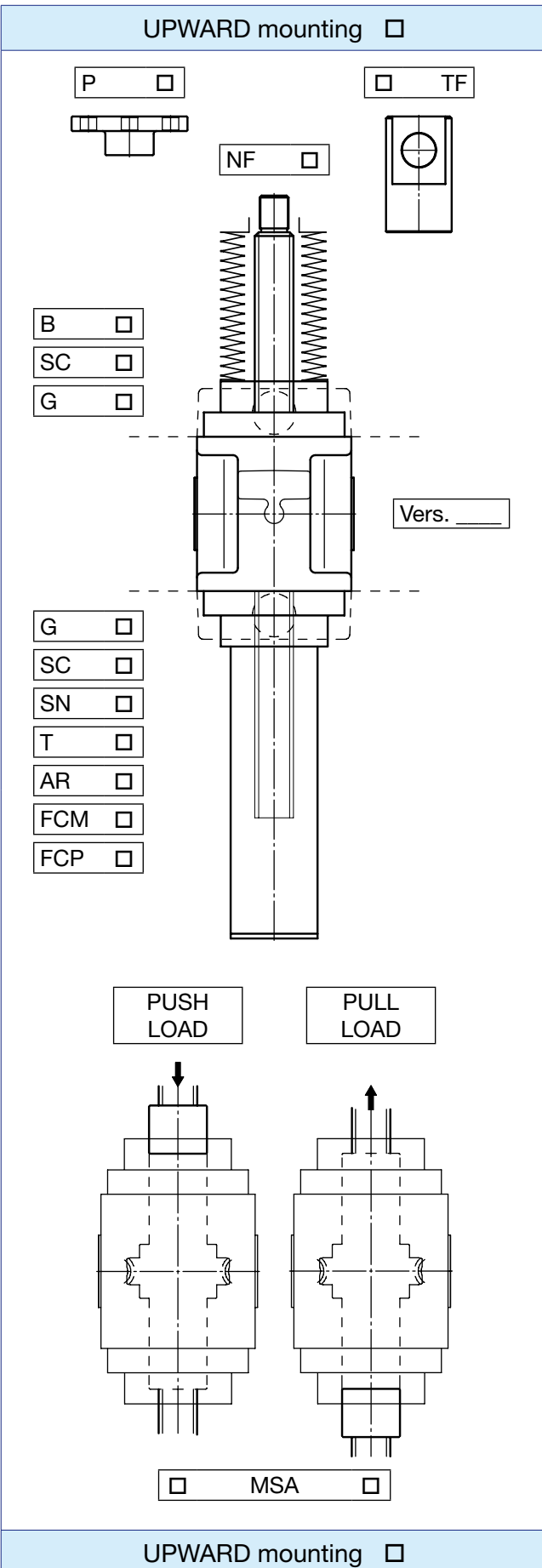
Screw Jacks with travelling ball screw (Mod.A)

2.15 Ordering code MA BS Series Mod.A

MA	50	BS 40 × 10		Mod.A	RL	Vers. 3 (80 B5)	U-RH	C300	
1	2	3		4	5	6	7	8	
TF	B	G	MSA	/	G	SC	T	AR	FCP
9									
...									
10									
...									
11									
AC	3-phase	brake motor		0.75 kW	4-pole	230/400 V	50 Hz	IP 55	Ins. F
12									

1	MA (screw jack MA BS Series)	
2	Screw jack size	
	5 ... 350	page 22 - 23
3	Ball screw	
	BS diameter × lead	
4	Mod.A (model: travelling screw)	
5	Worm gear ratio	
	RV , RN , RL	page 22 - 23
6	Input version	
	Vers.1, Vers.2, Vers.3, Vers.4, Vers.5, Vers.6	page 9
7	Screw jack mounting and input shaft position	
	U-RH, U-LH, D-RH, D-LH, H-RH, H-LH	page 9
8	Screw jack stroke length (ex.: C300 = 300 mm stroke)	
9	Accessories	
	NF, P, TF, N	Screw end
	B	Bellows
	SC	Trunnion mount
	G	Bronze guides
	SN	Stop nut
	T	Protective tube
	AR	Anti-turn device
	FCM-NC	Magnetic limit switches (normally closed)
	FCP-NC	Proximity limit switches (PNP, normally closed)
	MSA push (pull)	Safety nut for push (or pull) load
		Worm wheel rotation detector
10	Other accessories	
	example: encoder (with all relevant data)	page 59
11	Other specifications	
	example: lubricant for low temperature	
12	Motor data	
13	Filled in selection sheet	page 61
14	Application layout	

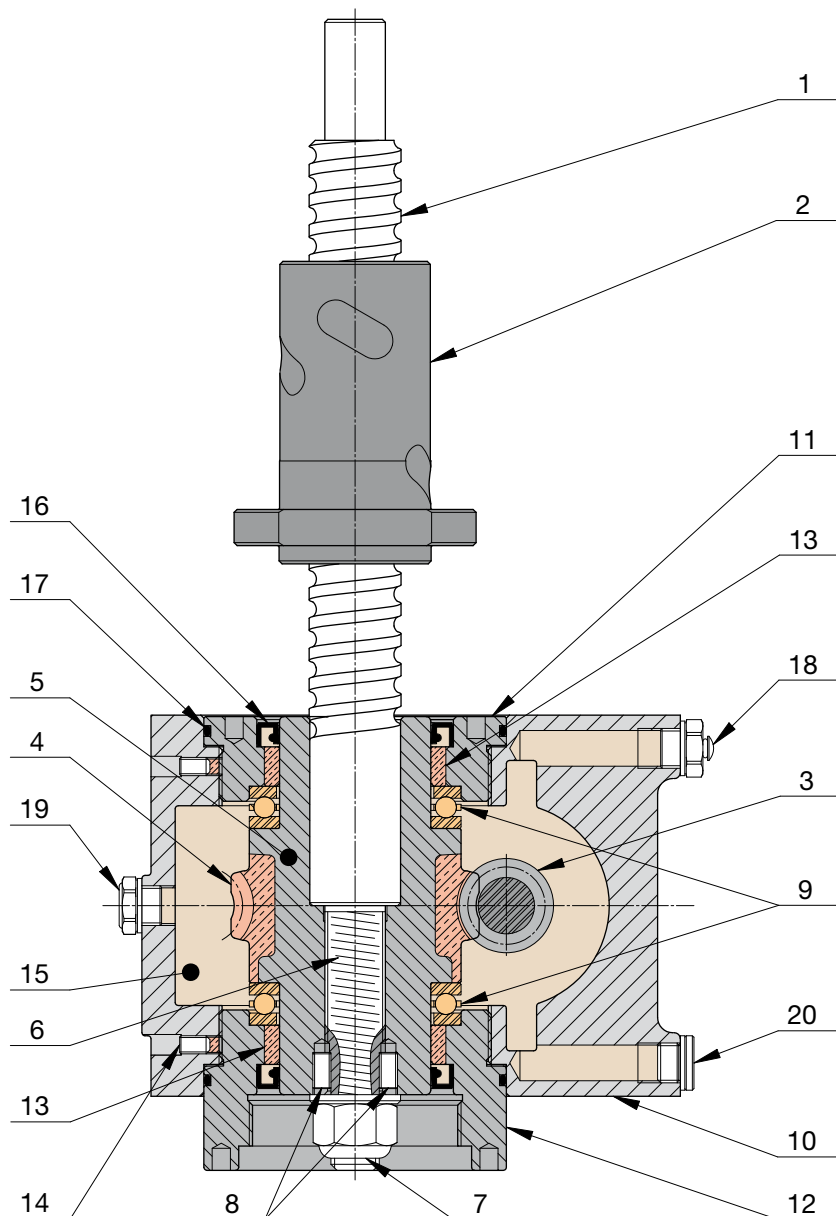
Screw Jacks with travelling ball screw (Mod.A)



2

Screw jacks with travelling ball nut (Mod.B)

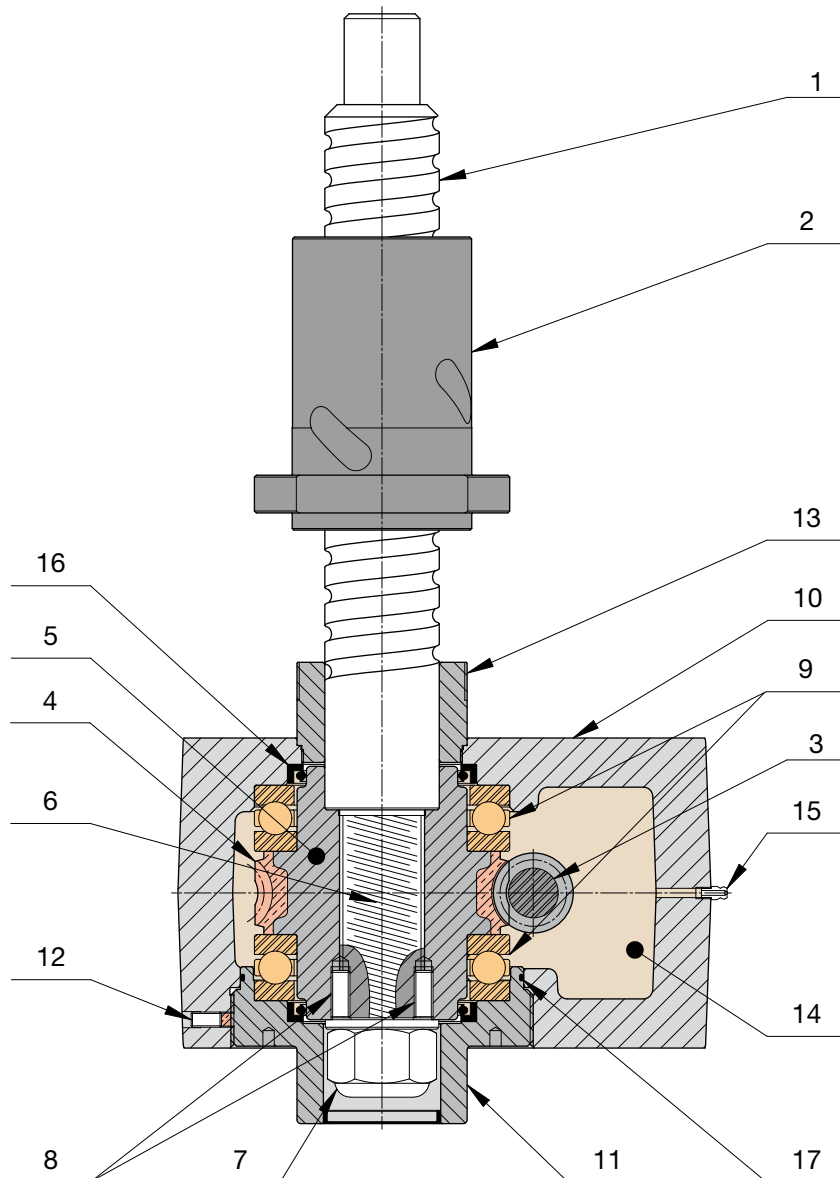
3.1 MA Series Mod.B - STRUCTURAL ELEMENTS



- | | |
|--|---|
| 1 - ball screw in quenched and tempered alloy steel | 11 - low cover |
| 2 - ball nut in case-hardened steel with flange according to DIN 69051 (available also with cylindrical flange), with grease nipple and end seals | 12 - raised cover; may also be used as a centring diameter |
| 3 - worm with ground ZI involute thread profile (UNI 4760) in case-hardened steel | 13 - wormwheel radial bronze guide for higher stiffness and better efficiency |
| 4 - bronze worm wheel with true involute profile ZI (UNI 4760) | 14 - grub screw to prevent the threaded cover unscrewing |
| 5 - cast iron support of the bronze worm wheel rim (size 5 and 10: entire wormwheel in bronze) | 15 - long-life synthetic oil lubricated worm gearbox |
| 6 - ball screw fixed to the worm wheel through the cylindrical centring part and metric thread LEFT-HAND for PUSH load or RIGHT-HAND for PULL load | 16 - radial lubricant seal |
| 7 - lock nut with opposite metric thread direction to ensure a safe ball screw fixing | 17 - O-ring |
| 8 - ball screw – wormwheel pins against unscrewing | 18 - breather |
| 9 - thrust ball bearing for high load capacity | 19 - oil level plug |
| 10 - gear box | 20 - oil drain plug |

Screw jacks with travelling ball nut (Mod.B)

3.2 SJ Series Mod.B - STRUCTURAL ELEMENTS

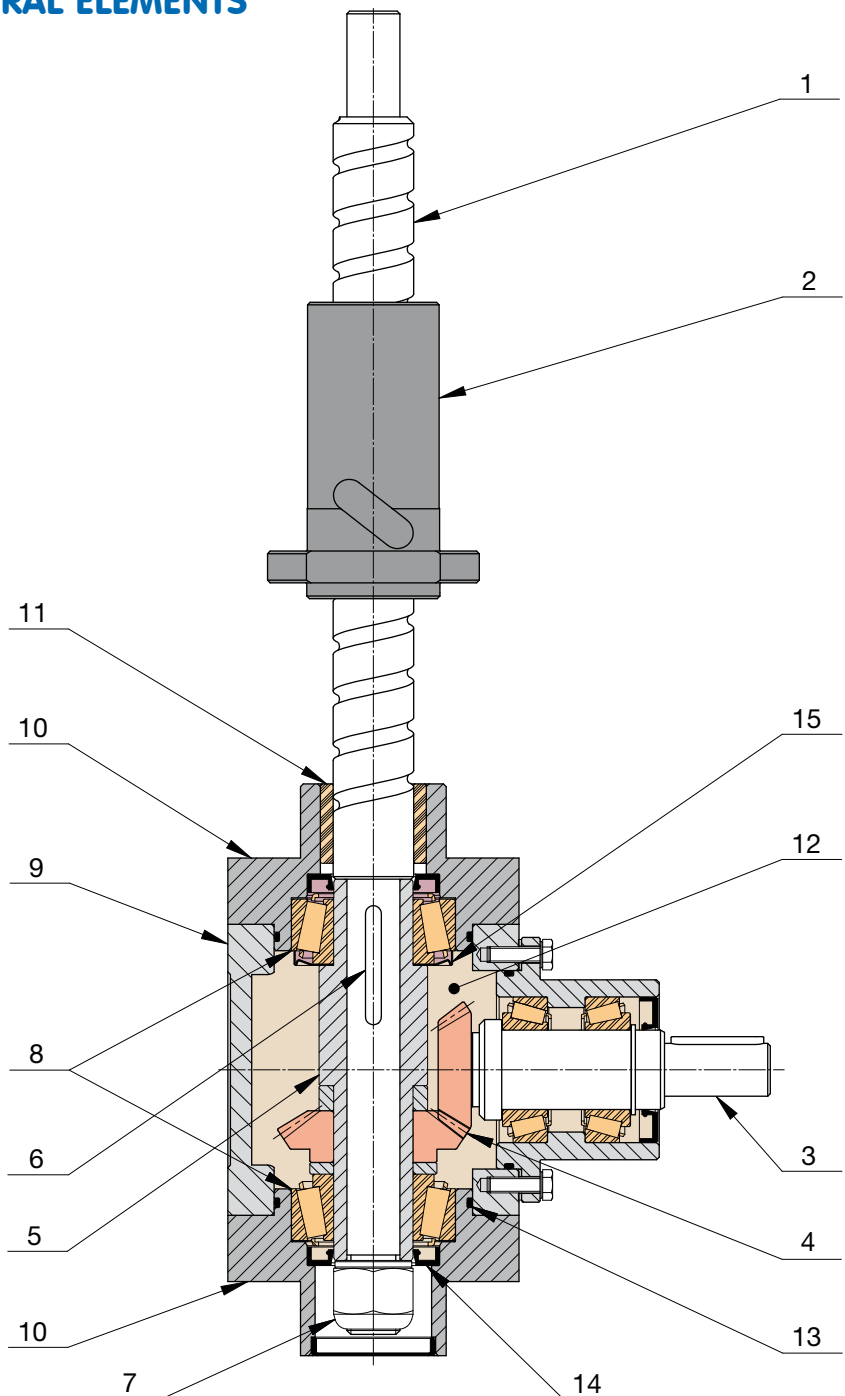


3

- | | |
|--|--|
| 1 - ball screw in quenched and tempered alloy steel | 10 - gear box |
| 2 - ball nut in case-hardened steel with flange according to DIN 69051 (available also with cylindrical flange), with grease nipple and end seals | 11 - threaded cover; may also be used as a centring diameter |
| 3 - worm with ground ZI involute thread profile (UNI 4760) in case-hardened steel | 12 - grub screw to prevent the threaded cover unscrewing |
| 4 - bronze worm wheel with true involute profile ZI (UNI 4760) | 13 - guide bush for ball screw, may be used as a spigot diameter |
| 5 - cast iron support of the bronze worm wheel rim (size 5 ... 100: entire wormwheel in bronze) | 14 - long-life synthetic grease lubricated worm gearbox |
| 6 - ball screw fixed to the worm wheel through the cylindrical centring part and metric thread LEFT-HAND for PUSH load or RIGHT-HAND for PULL load | 15 - grease nipple |
| 7 - lock nut with opposite metric thread direction to ensure a safe ball screw fixing | 16 - radial lubricant seal |
| 8 - ball screw – wormwheel pins against unscrewing | 17 - O-ring |
| 9 - thrust ball bearing for high load capacity | |

Screw jacks with travelling ball nut (Mod.B)

3.3 HS Series - STRUCTURAL ELEMENTS



- 1 - ball screw in quenched and tempered alloy steel
- 2 - ball nut in case-hardened steel with flange according to DIN 69051 (available also with cylindrical flange), with grease nipple and end seals
- 3 - solid input shaft with key (or flange and hollow shaft for motor coupling)
- 4 - bevel gear in case-hardened and tempered steel
- 5 - output hollow shaft in hardened and tempered steel
- 6 - key to transmit the torque to the output shaft
- 7 - key to transmit the torque to the output shaft

- 8 - thrust ball bearing for high load capacity

- 9 - gear box
- 10 - square covers with centring diameter for screw jack positioning
- 11 - plastic guide bush
- 12 - long-life synthetic oil lubricated worm gearbox and bearings
- 13 - O-ring
- 14 - radial lubricant seal
- 15 - NILOS seal which allows to create a chamber for the lubricant of the upper bearing; used only in case of vertical mounting position

Screw jacks with travelling ball nut (Mod.B)

3.4 Standard ball screw – gearbox arrangements

Diameter	16		20			25				32				40			50		63		80			100		120
Lead	5	10	5	10	20	5	6	10	25	5	10	20	32	10	20	40	10	20	10	20	10	16	20	16	20	20
MA	MA 5	•	•	•	•	•																				
	MA 10						•	•	•	•																
	MA 25									•	•	•	•													
	MA 50													•	•	•										
	MA 80																•	•								
	MA 150																		•	•						
	MA 200																				•	•	•			
	MA 350																							•	•	
SJ	SJ 5	•	•	•	•	•																				
	SJ 10						•	•	•	•																
	SJ 25									•	•	•	•													
	SJ 50													•	•	•										
	SJ 100																•	•								
	SJ 150																		•	•						
	SJ 200																				•	•	•			
	SJ 300																							•	•	
	SJ 400																									•
HS	HS 10						•	•	•	•																
	HS 25									•	•	•	•													
	HS 50													•	•	•										
	HS 100																•	•								
	HS 150																		•	•						
	HS 200																				•	•	•			

It is possible to supply screw-gearbox arrangements different from the standard ones. For more information please contact SERVOMECH.

3.5 Max. input power P_{max}

Following tables show the MAX. INPUT POWER P_{max} [kW] to the gearbox at different speeds, calculated for a gear life of 10 000 hours. For different life requirements, please contact SERVOMECH.

MA	5			10			25			50			80			150			200			350		
n_1 [rpm]	P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]		
	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO
	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	1.20	0.38	0.32	2.05	0.85	0.67	3.31	1.19	1.22	5.10	3.04	1.99	5.10	3.04	1.99	9.10	4.36	3.06	15.9	7.82	5.84	23.0	16.1	9.87
1 500	0.87	0.25	0.23	1.49	0.60	0.48	2.36	0.80	0.80	3.76	2.19	1.43	3.76	2.19	1.43	6.32	2.90	2.08	11.4	5.29	3.91	15.7	11.4	6.57
1 000	0.67	0.20	0.17	1.15	0.47	0.38	1.89	0.64	0.69	2.99	1.73	1.14	2.99	1.73	1.14	5.16	2.38	1.70	8.76	4.27	3.12	12.7	8.81	5.27
750	0.57	0.17	0.15	1.08	0.40	0.31	1.54	0.54	0.58	2.42	1.45	0.95	2.42	1.45	0.95	4.21	2.04	1.41	7.44	3.59	2.72	10.2	7.57	4.53
500	0.43	0.13	0.12	0.78	0.32	0.25	1.23	0.43	0.46	1.87	1.11	0.74	1.87	1.11	0.74	3.23	1.53	1.10	5.95	2.79	2.14	8.28	5.98	3.60
300	0.33	0.09	0.09	0.55	0.22	0.18	0.87	0.30	0.34	1.40	0.82	0.54	1.40	0.82	0.54	2.42	1.15	0.82	4.20	1.98	1.56	5.97	4.20	2.57
100	0.15	0.04	0.04	0.26	0.10	0.08	0.43	0.14	0.15	0.66	0.38	0.25	0.66	0.38	0.25	1.16	0.52	0.39	2.08	0.95	0.72	2.76	1.93	1.23

SJ	5			10			25			50			100			150			200			300			400		
n_1 [rpm]	P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]			P_{max} [kW]		
	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO	RATIO
	RH	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RL	RV	RL	RV	RL	RV	RL
1 500	0.48	0.35	0.21	0.13	0.82	0.24	0.22	2.24	0.76	0.76	3.57	2.08	1.35	3.57	2.08	1.35	6.00	2.76	1.97	9.66	3.09	11.7	4.65	22.0	8.67		
1 000	0.37	0.28	0.16	0.11	0.64	0.19	0.16	1.79	0.61	0.66	2.84	1.65	1.08	2.84	1.65	1.08	4.90	2.26	1.62	7.14	2.44	9.40	3.74	17.0	6.86		
750	0.33	0.24	0.14	0.09	0.54	0.16	0.14	1.47	0.52	0.55	2.30	1.38	0.90	2.30	1.38	0.90	4.00	1.94	1.33	6.33	2.15	7.84	3.23	14.5	5.79		
500	0.26	0.19	0.11	0.07	0.41	0.13	0.11	1.17	0.41	0.44	1.78	1.05	0.70	1.78	1.05	0.70	3.07	1.46	1.04	4.89	1.61	6.15	2.50	11.7	4.56		
300	0.19	0.14	0.08	0.05	0.32	0.09	0.08	0.83	0.29	0.32	1.33	0.78	0.51	1.33	0.78	0.51	2.29	1.09	0.78	3.51	1.23	4.46	1.77	8.38	3.27		
100	0.09	0.06	0.03	0.02	0.15	0.04	0.04	0.41	0.13	0.14	0.62	0.36	0.23	0.62	0.36	0.23	1.10	0.50	0.37	1.73	0.57	2.14	0.89	3.98	1.58		

HS	10					25					50					100					150					200				
n ₁ [rpm]	P _{max} [kW]					P _{max} [kW]					P _{max} [kW]					P _{max} [kW]					P _{max} [kW]					P _{max} [kW]				
	RATIO					RATIO					RATIO					RATIO					RATIO					RATIO				
	R1	R1.5	R2	R3	R4	R1	R1.5	R2	R3	R4	R1	R1.5	R2	R3	R4	R1	R1.5	R2	R3	R4	R1	R1.5	R2	R3	R4	R1	R1.5	R2	R3	R4
3 000	5.18	3.89	3.24	2.16	1.62	22.7	15.1	12.1	5.94	3.24	45.6	33.4	23.4	10.3	5.63	64.8	47.5	37.3	20.0	11.4	126	92.8	72.9	35.6	19.4	214	160	125	74.5	42.1
2 000	3.89	2.88	2.38	1.58	1.19	16.2	11.5	9.18	4.07	2.26	34.3	25.2	16.7	7.30	3.98	50.0	36.0	28.1	14.0	7.83	95.0	70.5	55.1	25.2	13.5	160	119	93.9	52.5	29.1
1 500	3.24	2.48	2.02	1.40	0.93	13.0	9.18	7.29	3.16	1.75	28.1	20.6	13.0	5.66	3.08	40.5	29.2	22.7	10.8	6.07	77.7	57.2	44.5	19.4	10.5	131	98.2	76.9	40.5	22.7
1 000	2.70	1.80	1.62	1.01	0.65	10.3	6.84	5.13	2.19	1.21	21.1	14.7	9.02	3.91	2.12	30.2	21.6	17.3	7.56	4.18	59.4	43.2	30.8	13.3	7.29	98.2	73.4	57.8	28.1	15.7
500	1.62	1.08	0.94	0.54	0.34	6.21	4.32	2.70	1.17	0.67	13.0	7.75	4.71	2.04	1.11	18.4	13.3	9.18	3.96	2.16	36.2	24.8	16.2	7.02	3.78	60.5	45.3	33.2	14.6	8.10
250	0.94	0.72	0.54	0.29	0.18	3.78	2.25	1.42	0.63	0.37	7.85	3.95	2.44	1.07	0.59	11.4	7.38	4.72	2.07	1.15	22.1	13.0	8.23	3.60	1.96	37.2	26.1	17.0	7.42	4.18

Screw jacks with travelling ball nut (Mod.B)

3.6 TECHNICAL DATA

MA BS Series Mod.B			MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS
Load capacity [kN], (push - pull)			5	10	25	50
Worm gear centre distance [mm]			30	40	50	63
Ratio	fast	RV	1 : 4 (4 : 16)	1 : 5 (4 : 20)	1 : 6 (4 : 24)	1 : 7 (4 : 28)
	normal	RN	1 : 16 (2 : 32)	1 : 20	1 : 18 (2 : 36)	1 : 14 (2 : 28)
	slow	RL	1 : 24	1 : 25	1 : 24	1 : 28
Gear box material			casting in aluminium alloy EN 1706 - AC-AISi10Mg T6		casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)	
Mass of gear box without ball screw [kg]			2.2	4.3	13	26

SJ BS Series Mod.B			SJ 5 BS	SJ 10 BS	SJ 25 BS	SJ 50 BS	SJ 100 BS
Load capacity [kN], (push - pull)			5	10	25	50	100
Worm gear centre distance [mm]			25	30	50	63	63
Ratio	high	RH	1 : 4 (5 : 20)	-	-	-	-
	fast	RV	1 : 6.25 (4 : 25)	1 : 4 (4 : 16)	1 : 6 (4 : 24)	1 : 7 (4 : 28)	1 : 7 (4 : 28)
	normal	RN	1 : 12.5 (2 : 25)	1 : 16 (2 : 32)	1 : 18 (2 : 36)	1 : 14 (2 : 28)	1 : 14 (2 : 28)
	slow	RL	1 : 25	1 : 24	1 : 24	1 : 28	1 : 28
Gear box material			casting in aluminium alloy EN 1706 - AC-AISi10Mg T6		casting in grey cast iron EN-GJL-250 (UNI EN 1561)		
Mass of gear box without ball screw [kg]			1.5	2.3	10.4	25	35

Serie HS		HS 10	HS 25	HS 50
Load capacity [kN], (push - pull)		10	25	50
Housing side dimensions [mm]		86	110	134
Ratio	R1	1 : 1	1 : 1	1 : 1
	R1.5	1 : 1.5	1 : 1.5	1 : 1.5
	R2	1 : 2	1 : 2	1 : 2
	R3	1 : 3	1 : 3	1 : 3
	R4	1 : 4	1 : 4	1 : 4
Gear box material		casting in grey cast iron EN-GJL-250 (UNI EN 1561)		
Mass of gear box without ball screw [kg]		5.9	11.3	20

Screw jacks with travelling ball nut (Mod.B)

3.6 TECHNICAL DATA

MA 80 BS	MA 150 BS	MA 200 BS	MA 350 BS	MA BS Series Mod.B
80	150	200	350	Load capacity [kN], (push - pull)
63	80	100	125	Worm gear centre distance [mm]
1 : 7 (4 : 28)	1 : 8 (4 : 32)	1 : 8 (4 : 32)	3 : 32	RV fast
1 : 14 (2 : 28)	1 : 24	1 : 24	1 : 16 (2 : 32)	RN normal
1 : 28	1 : 32	1 : 32	1 : 32	RL slow
casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)				Gear box material
26	48	75	145	Mass of gear box without ball screw [kg]

SJ 150 BS	SJ 200 BS	SJ 250 BS	SJ 300 BS	SJ 400 BS	SJ BS Series Mod.B
150	200	250	300	400	Load capacity [kN], (push - pull)
80	90	90	110	140	Worm gear centre distance [mm]
-	-	-	-	-	RH high
1 : 8 (4 : 32)	1 : 7 (4 : 28)	1 : 7 (4 : 28)	3 : 29	3 : 28	RV fast
1 : 24	-	-	-	-	RN normal
1 : 32	1 : 28	1 : 28	1 : 30	1 : 29	RL slow
casting in grey cast iron EN-GJL-250 (UNI EN 1561)				welded steel S355 J2 (UNI EN 10025)	Gear box material
55	75	75	120	260	Mass of gear box without ball screw [kg]

HS 100	HS 150	HS 200	Serie HS
80	150	200	Load capacity [kN], (push - pull)
166	200	250	Housing side dimensions [mm]
1 : 1	1 : 1	1 : 1	R1
1 : 1.5	1 : 1.5	1 : 1.5	R1.5
1 : 2	1 : 2	1 : 2	R2
1 : 3	1 : 3	1 : 3	R3
1 : 4	1 : 4	1 : 4	R4
casting in grey cast iron EN-GJL-250 (UNI EN 1561)			Gear box material
38	67	120	Mass of gear box without ball screw [kg]

Screw jacks with travelling ball nut (Mod.B)

3.7 Ball screws and nuts technical data

Ball screws produced with whirling process, accuracy grade IT 5 ⁽¹⁾

Ball screw BS $d_o \times P_h$	Ball nut code ⁽²⁾	Ball $D_w [mm]$	n° of starts N_p	n° of circuits i	Dynamic load $C_a [kN]$	Static load $C_{0a} [kN]$
BS 16 × 5	SFN-_.16.05.3R	3.175	1	3	9	13.5
BS 16 × 10	SFN-_.16.10.3R	3.175	1	3	9.1	13.7
BS 20 × 5	SFN-_.20.05.3R	3.175	1	3	10.4	18.4
	SFN-_.20.05.5R	3.175	1	5	15.7	28.5
BS 20 × 10	SFN-_.20.10.3R	3.175	1	3	10.5	18.3
BS 25 × 5	SFN-_.25.05.3R	3.175	1	3	12	24.4
BS 25 × 10	SFN-_.25.10.3R	3.969	1	3	15.6	28.6
BS 32 × 5	SFN-_.32.05.4R	3.175	1	4	17.6	43.9
BS 32 × 10	SFN-_.32.10.3R	6.35	1	3	28.3	49.6
	SFN-_.32.10.4R	6.35	1	4	36.3	63
	SFN-_.32.10.5R	6.35	1	5	44	77
BS 32 × 20	SFN-_.32.20.3R	6.35	1	3	27.9	45.6
BS 40 × 10	SFN-_.40.10.5R	6.35	1	5	52	107
BS 40 × 20	SFN-_.40.20.3R	6.35	1	3	33.4	64
BS 50 × 10	SFN-_.50.10.5R	7.144	1	5	72	163
BS 50 × 20	SFN-_.50.20.4R	7.144	1	4	56	121
BS 63 × 10	SFN-_.63.10.5R	7.144	1	5	80	209
BS 63 × 20	SFN-_.63.20.4R	9.525	1	4	88	191
BS 80 × 10	SFN-_.80.10.6R	7.144	1	6	112	370
BS 80 × 16	SFN-_.80.16.5R	9.525	1	5	129	341
BS 80 × 20	SFN-_.80.20.5R-F	9.525	1	5	145	419
BS 80 × 20	SFN-_.80.20.4R	12.7	1	4	185	462
BS 100 × 16	SFN-_.100.16.5R	9.525	1	5	147	454
BS 100 × 20	SFN-_.100.20.5R	12.7	1	5	251	732
BS 120 × 20	SFN-_.120.20.7R	15.875	1	7	500	1578

⁽¹⁾ - ball screws with accuracy grade IT 3 can be supplied on request

⁽²⁾ - the nut code in the table is incomplete; to complete it refer to Ch. 3.8 "Ball nuts dimensions"

Screw jacks with travelling ball nut (Mod.B)

3.7 Ball screws and nuts technical data

Rolled ball screws, accuracy grade IT 7

Ball screw $BS\ d_0 \times P_h$	Ball nut code ⁽²⁾	Ball $D_w [mm]$	n° of starts N_p	n° of circuits i	Dynamic load $C_a [kN]$	Static load $C_{0a} [kN]$
BS 16 × 5	SFN-_.16.05.3R	3.175	1	3	8.1	12.2
BS 16 × 10	SFN-_.16.10.3R	3.175	1	3	8.1	12.3
BS 16 × 16	SFN-_.16.16.2R-2	3.175	2	2	10.0	14.5
BS 20 × 5	SFN-_.20.05.3R	3.175	1	3	9.1	16.5
	SFN-_.20.05.5R	3.175	1	5	14.1	25.6
BS 20 × 10	SFN-_.20.10.3R	3.175	1	3	9.5	16.5
BS 20 × 20	SFN-_.20.20.2R-2	3.175	2	2	12.1	20.9
BS 25 × 5	SFN-_.25.05.3R	3.175	1	3	10.8	22
BS 25 × 10	SFN-_.25.10.3R	3.969	1	3	14	25.7
BS 25 × 25	SFN-_.25.25.2R-2	3.175	2	2	13.6	27.3
BS 32 × 5	SFN-_.32.05.4R	3.175	1	4	15.8	39.5
BS 32 × 10	SFN-_.32.10.3R	6.35	1	3	25.5	44.6
	SFN-_.32.10.4R	6.35	1	4	32.7	57
	SFN-_.32.10.5R	6.35	1	5	39.7	69
BS 32 × 20	SFN-_.32.20.3R	6.35	1	3	25.1	41
BS 32 × 32	SFN-_.32.32.2R-2	6.35	2	2	35.0	58
BS 40 × 10	SFN-_.40.10.5R	6.35	1	5	47.1	96
BS 40 × 20	SFN-_.40.20.3R	6.35	1	3	30	56
BS 40 × 40	SFN-_.40.40.2R-2	6.35	2	2	40.3	77

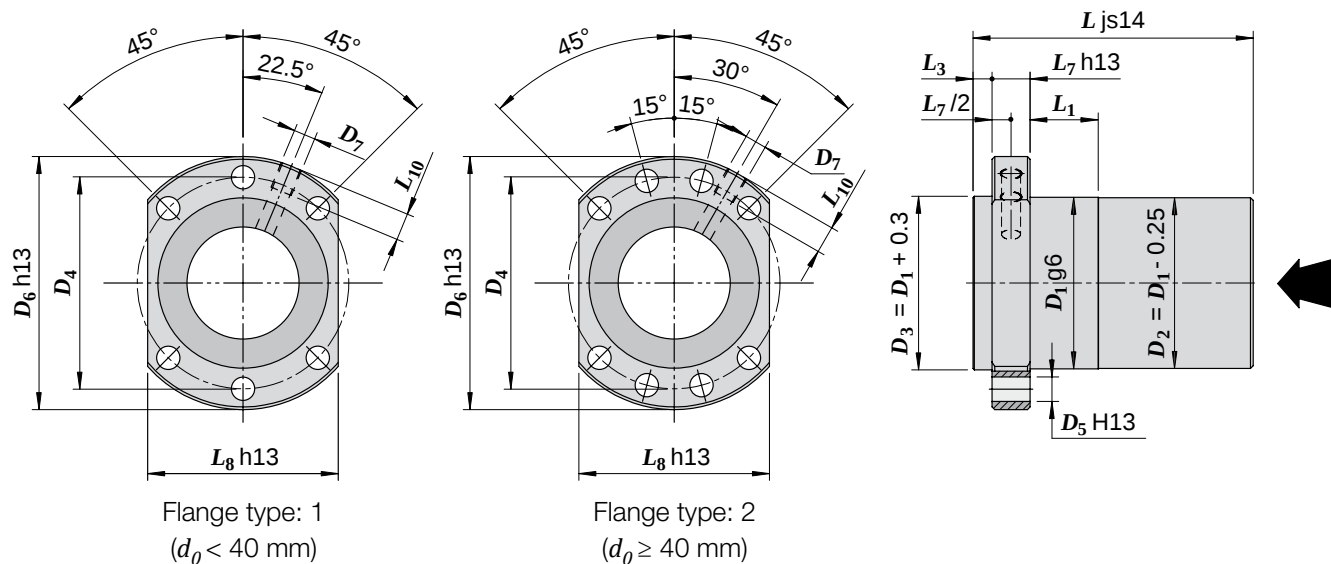
⁽²⁾ - the nut code in the table is incomplete; to complete it refer to Ch. 3.8 "Ball nuts dimensions"

Screw jacks with travelling ball nut (Mod.B)

3.8 Ball nut dimensions

Nuts with flange according to DIN 69051

Ball screw BS $d_0 \times P_h$	Nut code	Flange type	Dimensions [mm]										
			D_1	D_4	D_5	D_6	D_7	L_1	L_3	L_7	L_8	L_{10}	L
BS 16 × 5	SFN-D.16.05.3R	1	28	38	5.5	48	M6	10	5	10	40	8	48
BS 16 × 10	SFN-D.16.10.3R	1	28	38	5.5	48	M6	10	5	10	40	8	66
BS 16 × 16	SFN-D.16.16.2R-2	1	28	38	5.5	48	M6	10	5	10	40	8	53
BS 20 × 5	SFN-D.20.05.3R	1	36	47	6.6	58	M6	10	5	10	44	8	48
	SFN-D.20.05.5R	1	36	47	6.6	58	M6	10	5	10	44	8	63
BS 20 × 10	SFN-D.20.10.3R	1	36	47	6.6	58	M6	10	5	10	44	8	66
BS 20 × 20	SFN-D.20.20.2R-2	1	36	47	6.6	58	M6	10	5	10	44	8	70
BS 25 × 5	SFN-D.25.05.3R	1	40	51	6.6	62	M6	10	6	10	48	8	48
BS 25 × 10	SFN-D.25.10.3R	1	40	51	6.6	62	M6	10	6	10	48	8	69
BS 25 × 25	SFN-D.25.25.2R-2	1	40	51	6.6	62	M6	10	6	10	48	8	69
BS 32 × 5	SFN-D.32.05.4R	1	50	65	9	80	M6	16	6	12	62	8	57
BS 32 × 10	SFN-D.32.10.3R	1	50	65	9	80	M6	16	6	12	62	8	79
	SFN-D.32.10.4R	1	50	65	9	80	M6	16	6	12	62	8	89
	SFN-D.32.10.5R	1	50	65	9	80	M6	16	6	12	62	8	100
BS 32 × 20	SFN-D.32.20.3R	1	56	71	9	86	M6	16	6	14	65	8	88
BS 32 × 32	SFN-D.32.32.2R-2	1	56	71	9	86	M6	20	6	14	65	8	91
BS 40 × 10	SFN-D.40.10.5R	2	63	78	9	93	M8×1	16	7	14	70	10	103
BS 40 × 20	SFN-D.40.20.3R	2	63	78	9	93	M8×1	16	7	14	70	10	115
BS 40 × 40	SFN-D.40.40.2R-2	2	63	78	9	93	M8×1	16	7	14	70	10	107
BS 50 × 10	SFN-D.50.10.5R	2	75	93	11	110	M8×1	16	7	16	85	10	106
BS 50 × 20	SFN-D.50.20.4R	2	75	93	11	110	M8×1	16	7	16	85	10	142
BS 63 × 10	SFN-D.63.10.5R	2	90	108	11	125	M8×1	16	7	18	95	10	108
BS 63 × 20	SFN-D.63.20.4R	2	95	115	13.5	135	M8×1	25	9	20	100	10	155
BS 80 × 10	SFN-D.80.10.6R	2	105	125	13.5	145	M8×1	16	9	20	110	10	121
BS 80 × 16	SFN-D.80.16.5R	2	125	145	13.5	165	M8×1	25	9	25	130	10	157
BS 80 × 20	SFN-D.80.20.5R-F	2	125	145	13.5	165	M8×1	25	9	25	130	10	142
BS 80 × 20	SFN-D.80.20.4R	2	125	145	13.5	165	M8×1	25	9	25	130	10	161
BS 100 × 16	SFN-D.100.16.5R	2	150	176	17.5	202	M8×1	25	9	30	155	10	165
BS 100 × 20	SFN-D.100.20.5R	2	150	176	17.5	202	M8×1	25	9	30	155	10	190
BS 120 × 20	SFN-D.120.20.7R	2	190	230	22	270	M8×1	40	18	37	200	10	255

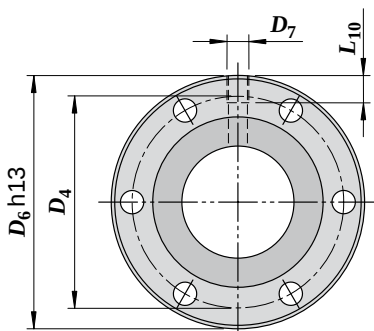


Screw jacks with travelling ball nut (Mod.B)

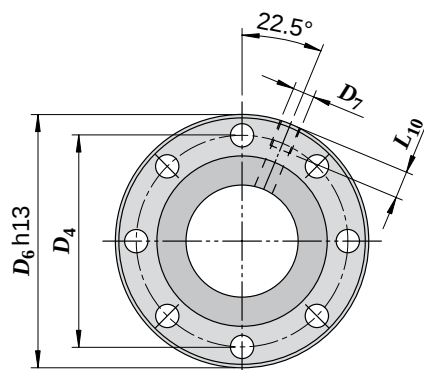
3.8 Ball nut dimensions

Nuts with flange at SERVOMECH drawing SERVOMECH

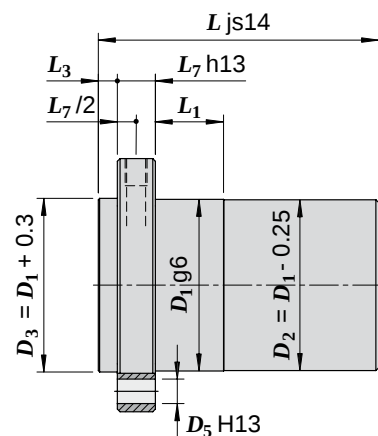
Ball screw BS $d_o \times P_h$	Nut code	Flange type	Dimensions [mm]									
			D_1	D_4	D_5	D_6	D_7	L_1	L_3	L_7	L_{10}	L
BS 16 × 5	SFN-S.16.05.3R	1	28	38	5.5	48	M6	10	5	10	8	48
BS 16 × 10	SFN-S.16.10.3R	1	28	38	5.5	48	M6	10	5	10	8	66
BS 16 × 16	SFN-S.16.16.2R-2	1	30	38	5.5	48	M6	10	5	10	8	53
BS 20 × 5	SFN-S.20.05.3R	1	36	47	6.6	58	M6	10	5	10	8	48
	SFN-S.20.05.5R	1	36	47	6.6	58	M6	10	5	10	8	63
BS 20 × 10	SFN-S.20.10.3R	1	36	47	6.6	58	M6	10	5	10	8	66
BS 20 × 20	SFN-S.20.20.2R-2	1	36	47	6.6	58	M6	10	5	10	8	70
BS 25 × 5	SFN-S.25.05.3R	1	40	51	6.6	62	M6	10	6	10	8	48
BS 25 × 10	SFN-S.25.10.3R	1	40	51	6.6	62	M6	10	6	10	8	69
BS 25 × 25	SFN-S.25.25.2R-2	1	40	51	6.6	62	M6	10	6	10	8	69
BS 32 × 5	SFN-S.32.05.4R	1	50	65	9	80	M6	16	6	12	8	57
BS 32 × 10	SFN-S.32.10.3R	1	50	65	9	80	M6	16	6	12	8	79
	SFN-S.32.10.4R	1	50	65	9	80	M6	16	6	12	8	89
	SFN-S.32.10.5R	1	50	65	9	80	M6	16	6	12	8	100
BS 32 × 20	SFN-S.32.20.3R	1	56	71	9	86	M6	16	6	14	8	88
BS 32 × 32	SFN-S.32.32.2R-2	1	56	71	9	86	M6	20	6	14	8	91
BS 40 × 10	SFN-S.40.10.5R	2	63	78	9	93	M8×1	16	7	14	10	103
BS 40 × 20	SFN-S.40.20.3R	2	63	78	9	93	M8×1	16	7	14	10	115
BS 40 × 40	SFN-S.40.40.2R-2	2	68	78	9	93	M8×1	16	7	14	10	107
BS 50 × 10	SFN-S.50.10.5R	2	75	93	11	110	M8×1	16	7	16	10	106
BS 50 × 20	SFN-S.50.20.4R	2	75	93	11	110	M8×1	16	7	16	10	142
BS 63 × 10	SFN-S.63.10.5R	2	90	108	11	125	M8×1	16	7	18	10	108
BS 63 × 20	SFN-S.63.20.4R	2	95	115	13.5	135	M8×1	25	9	20	10	155
BS 80 × 10	SFN-S.80.10.6R	2	105	125	13.5	145	M8×1	16	9	20	10	121
BS 80 × 16	SFN-S.80.16.5R	2	125	145	13.5	165	M8×1	25	9	25	10	157
BS 80 × 20	SFN-S.80.20.5R-F	2	125	145	13.5	165	M8×1	25	9	25	10	142
BS 80 × 20	SFN-S.80.20.4R	2	125	145	13.5	165	M8×1	25	9	25	10	161
BS 100 × 16	SFN-S.100.16.5R	2	150	176	17.5	202	M8×1	25	9	30	10	165
BS 100 × 20	SFN-S.100.20.5R	2	150	176	17.5	202	M8×1	25	9	30	10	190
BS 120 × 20	SFN-S.120.20.7R	2	190	230	22	270	M8×1	40	18	37	10	255



Flange type: 1
6 holes at 60°
($d_o < 40$ mm)



Flange type: 2
8 holes at 45°
($d_o \geq 40$ mm)

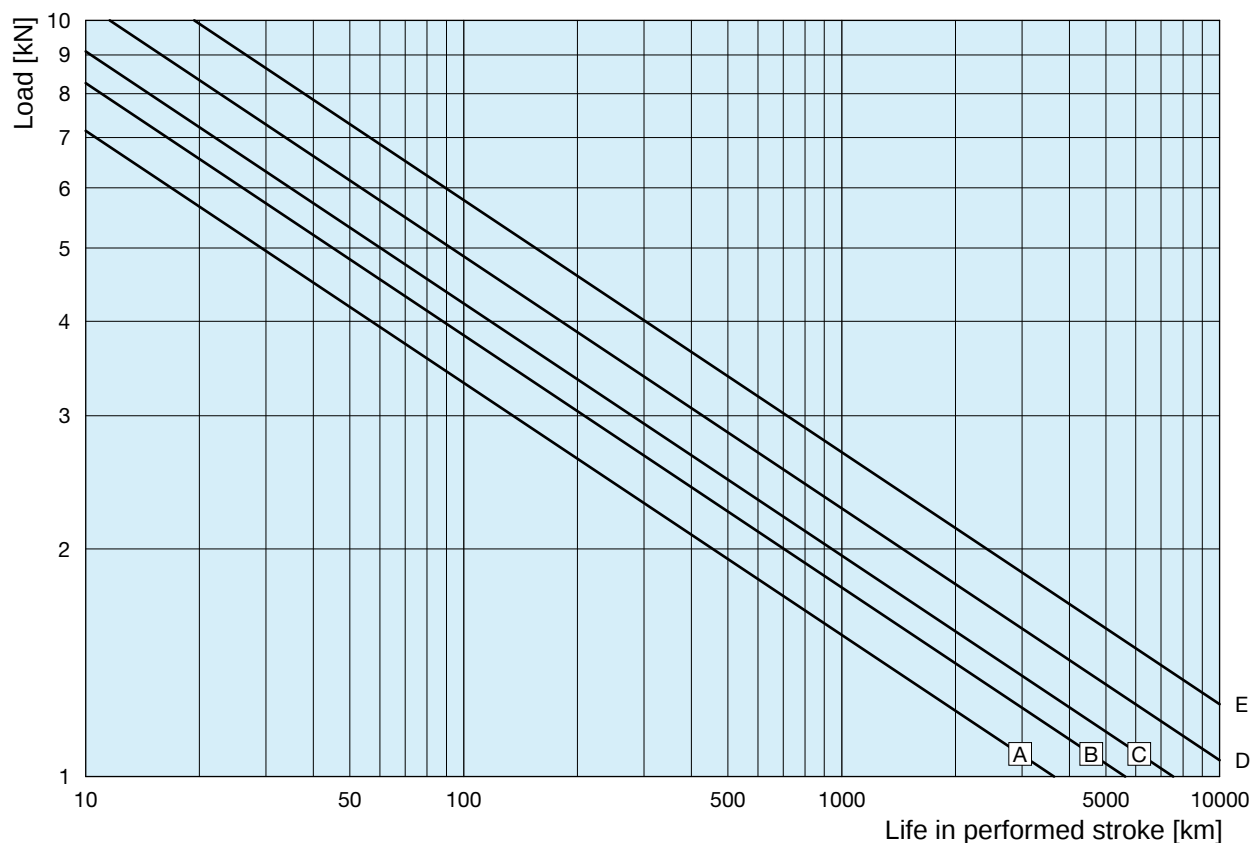


Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 16 - 20, accuracy grade IT 3 or IT 5

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



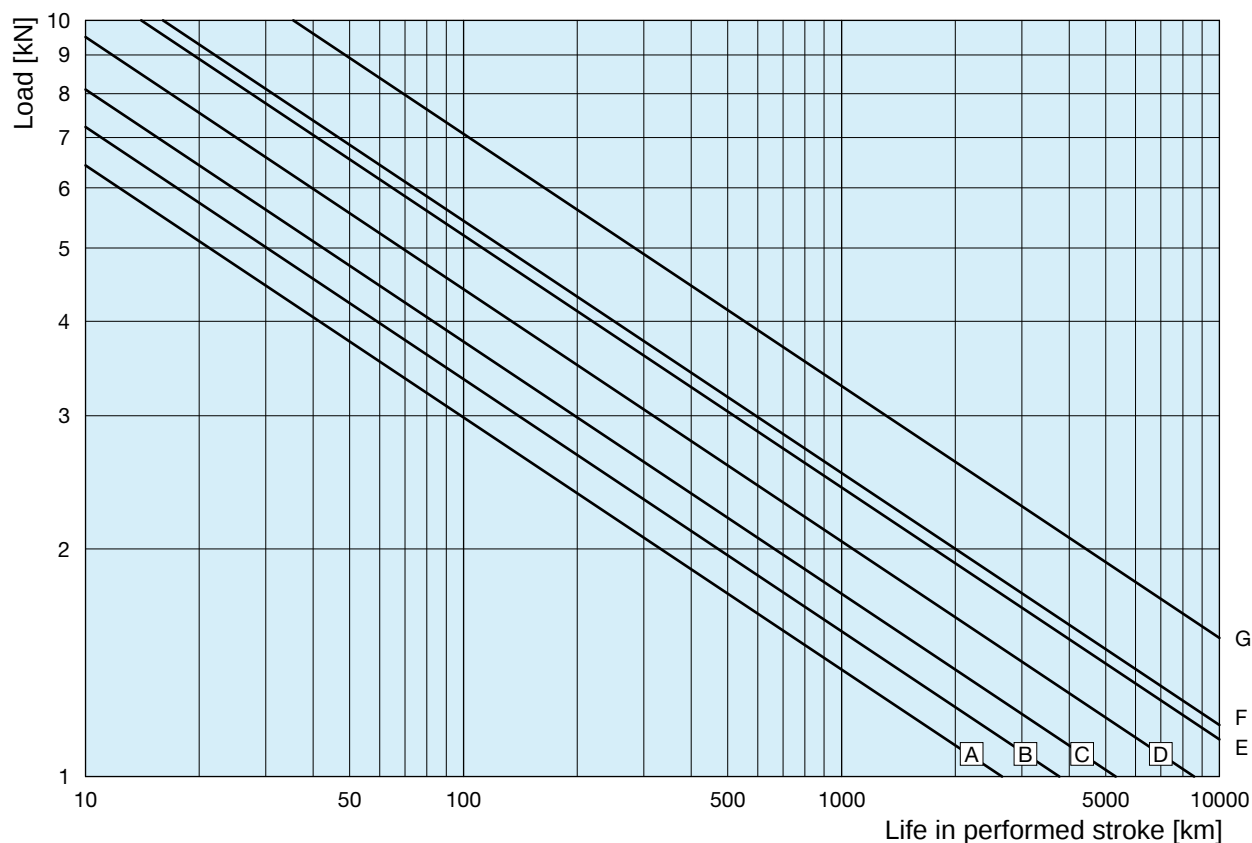
BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 16x5	3.175	1	3	9	13.5	A
BS 16x10	3.175	1	3	9.1	13.7	C
BS 20x5	3.175	1	3	10.4	18.4	B
BS 20x5	3.175	1	5	15.7	28.5	E
BS 20x10	3.175	1	3	10.5	18.3	D

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 16 - 20, accuracy grade IT 7

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



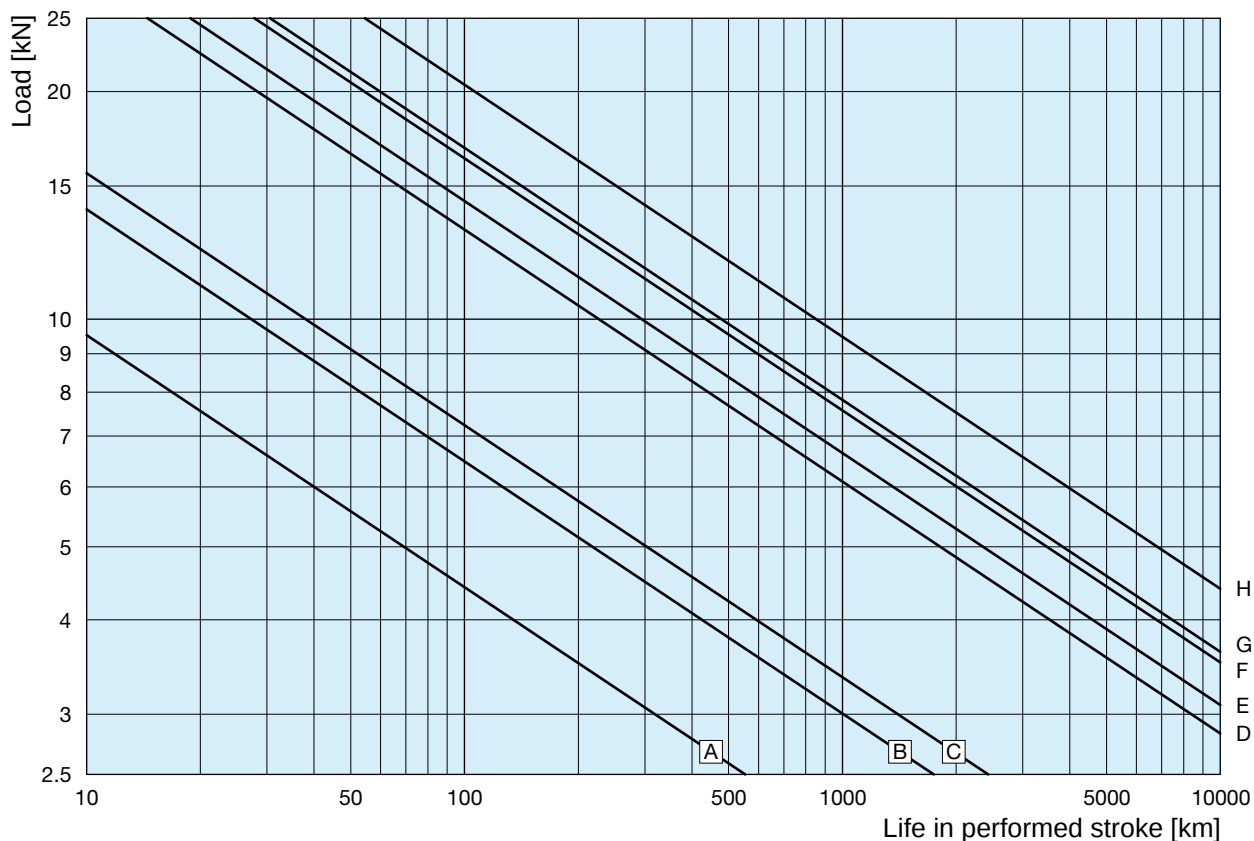
BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 16×5	3.175	1	3	8.1	12.2	A
BS 16×10	3.175	1	3	8.1	12.3	C
BS 16×16	3.175	2	2	10	14.5	F
BS 20×5	3.175	1	3	9.1	16.5	B
BS 20×5	3.175	1	5	14.1	25.6	E
BS 20×10	3.175	1	3	9.5	16.5	D
BS 20×20	3.175	2	2	12.1	20.9	G

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 25 - 32, accuracy grade IT 3 or IT 5

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



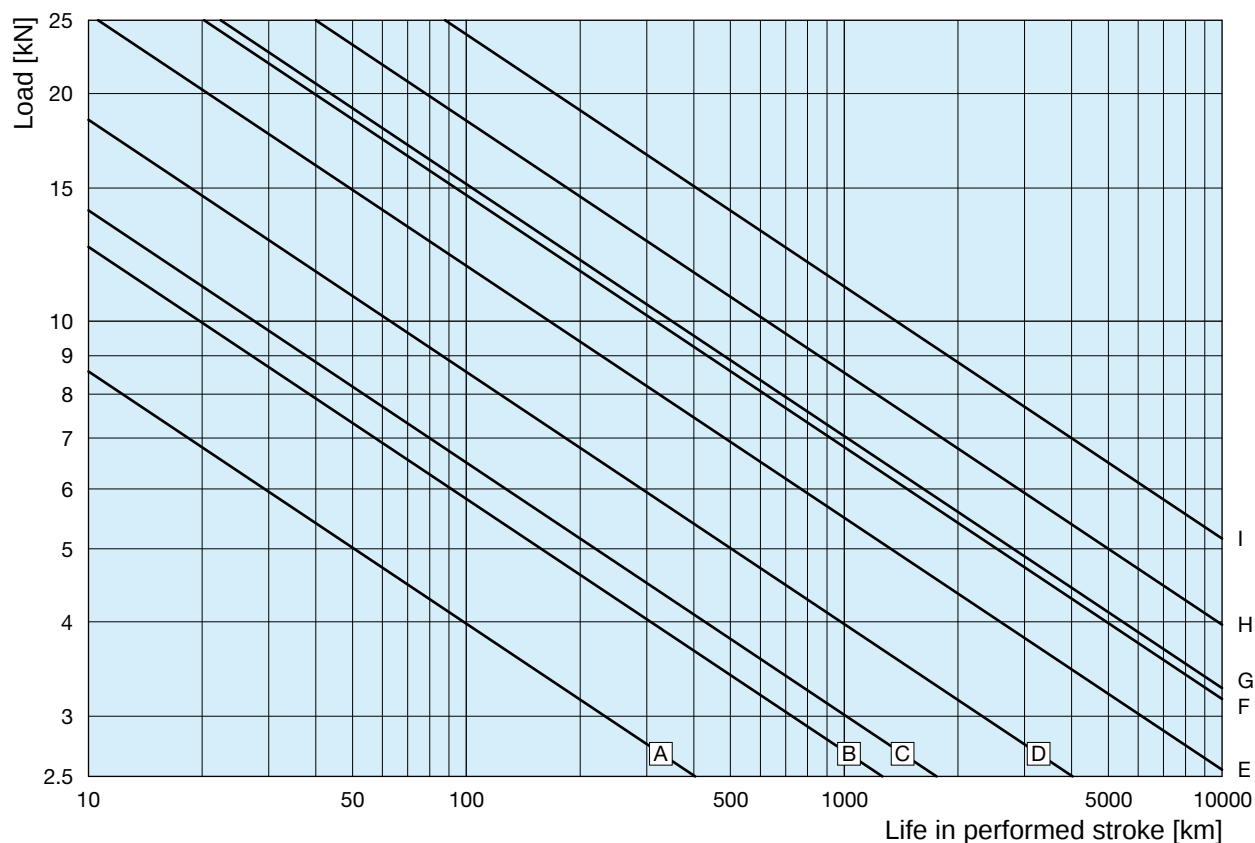
BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 25x5	3.175	1	3	12	24.4	A
BS 25x10	3.969	1	3	15.6	28.6	C
BS 32x5	3.175	1	4	17.6	43.9	B
BS 32x10	6.35	1	3	28.3	49.6	D
BS 32x10	6.35	1	4	36.3	63	G
BS 32x10	6.35	1	5	44	77	H
BS 32x20	6.35	1	3	27.9	45.6	F
BS 32x32	6.35	1	2	21.2	34.9	E

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 25 - 32, accuracy grade IT 7

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



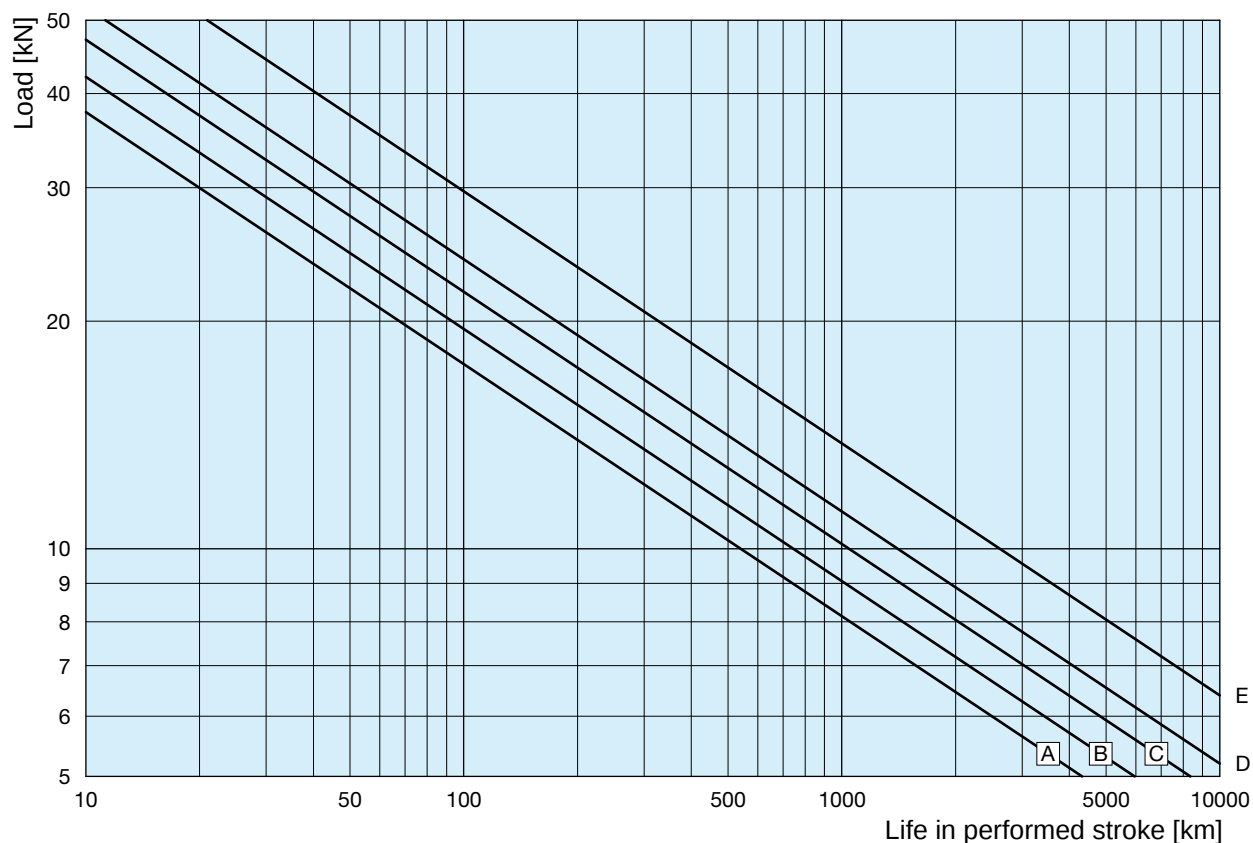
BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 25x5	3.175	1	3	10.8	22	A
BS 25x10	3.969	1	3	14	25.7	C
BS 25x25	3.175	2	2	13.6	27.3	D
BS 32x5	3.175	1	4	15.8	39.5	B
BS 32x10	6.35	1	3	25.5	44.6	E
BS 32x10	6.35	1	4	32.7	57	G
BS 32x10	6.35	1	5	39.7	69	H
BS 32x20	6.35	1	3	25.1	41	F
BS 32x32	6.35	2	2	35	58	I

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 40, accuracy grade IT 3 or IT 5, IT 7

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



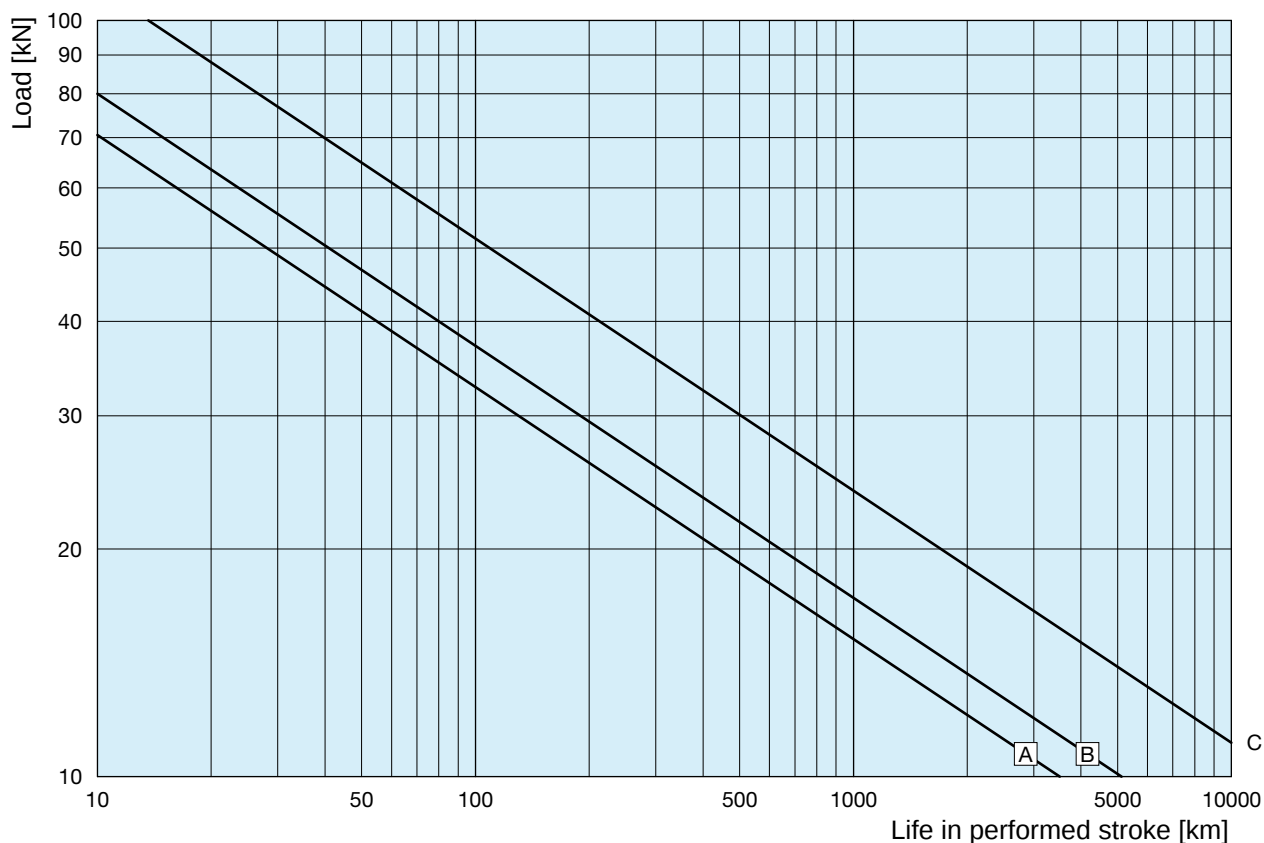
BALL SCREW	Ball [mm]	Accuracy grade	N° of starts	N° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 40×10	6.35	IT 3 or IT 5	1	5	52	107	D
		IT 7	1	5	47.1	96	C
BS 40×20	6.35	IT 3 or IT 5	1	3	33.4	64	B
		IT 7	1	3	30	56	A
BS 40×40	6.35	IT 7	2	2	40.3	77	E

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 50 - 63, accuracy grade IT 3 or IT 5

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



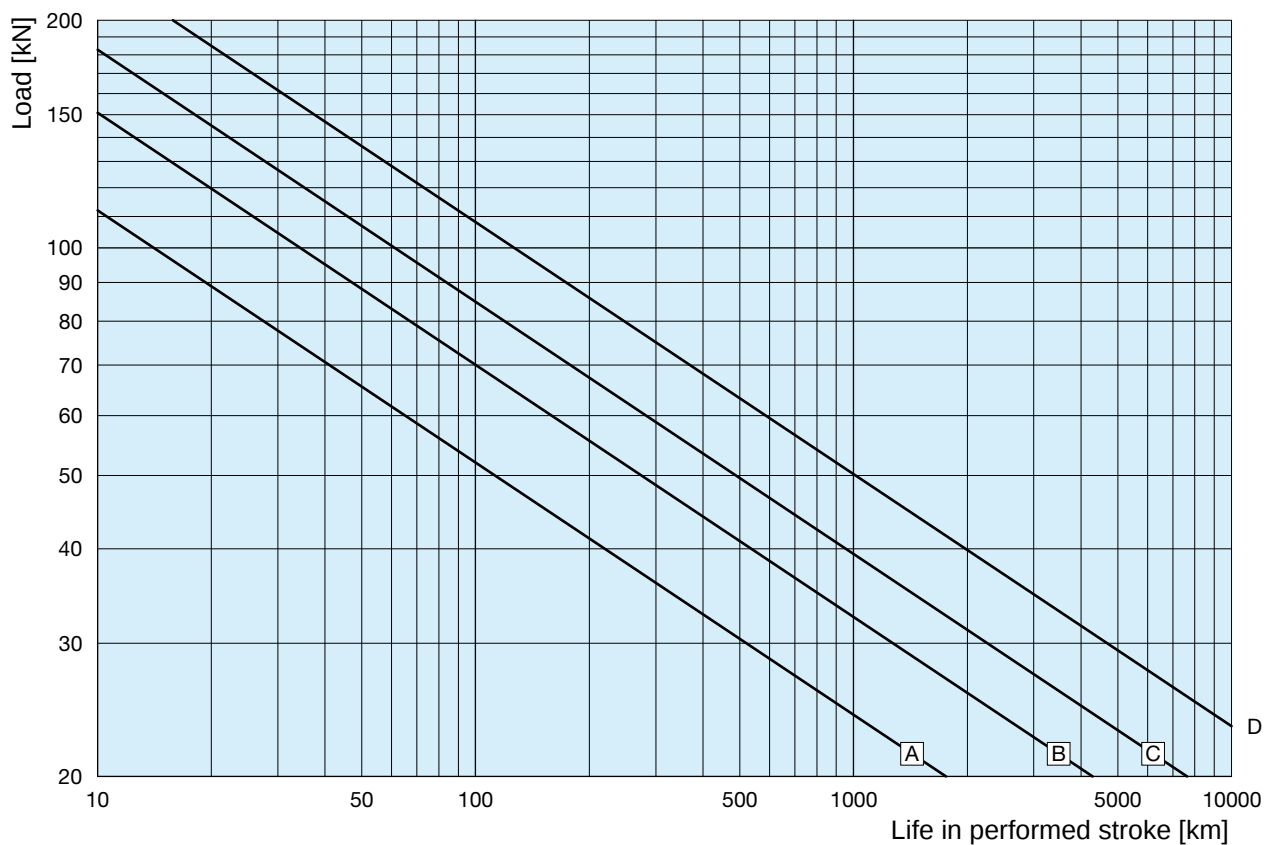
BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 50×10	7.144	1	5	72	163	A
BS 50×20	7.144	1	4	56	121	A
BS 63×10	7.144	1	5	80	209	B
BS 63×20	9.525	1	4	88	191	C

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 80, accuracy grade IT 3 or IT 5

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



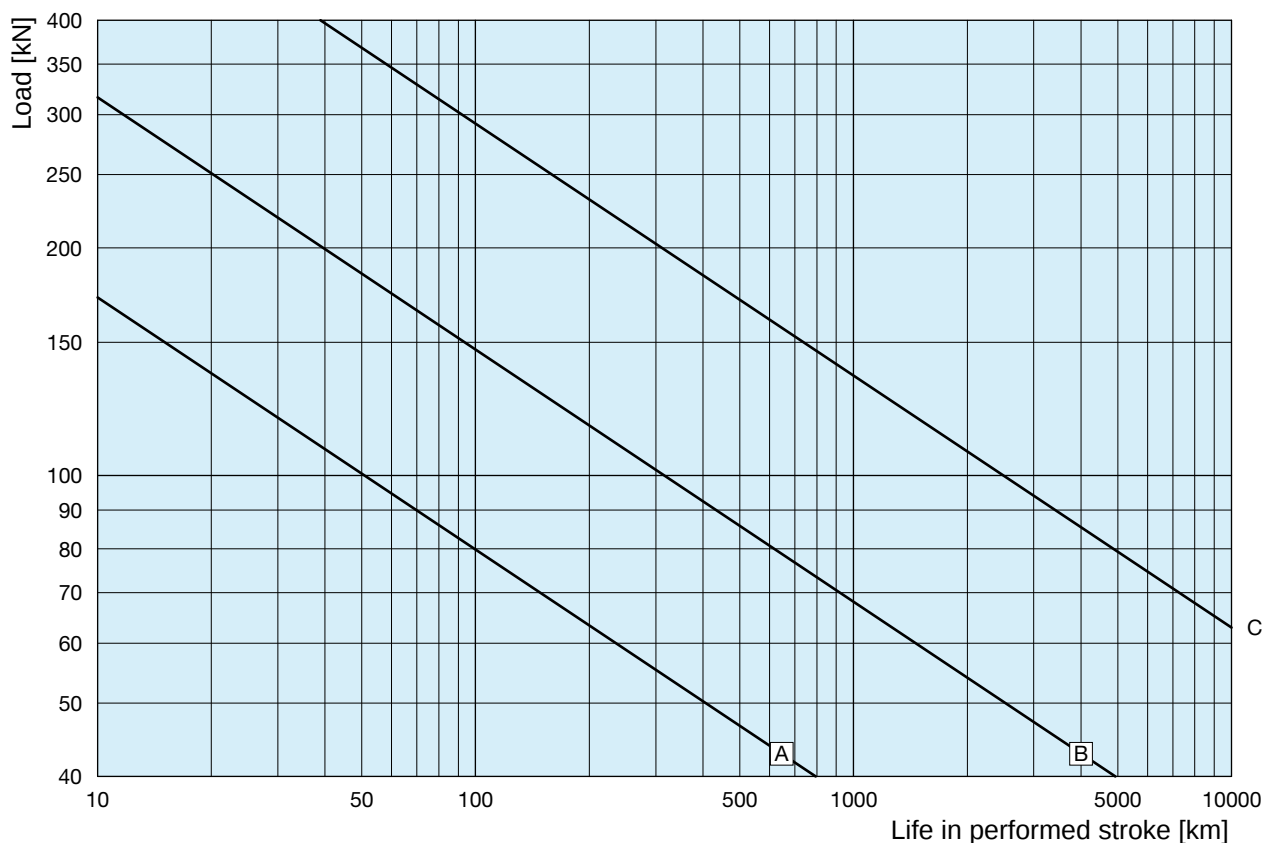
BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 80×10	7.144	1	6	112	370	A
BS 80×16	9.525	1	5	129	341	B
BS 80×20	9.525	1	5	145	419	C
BS 80×20	12.7	1	4	185	462	D

Screw jacks with travelling ball nut (Mod.B)

3.9 Ball nut life

Ball screw diameter 100 - 120, accuracy grade IT 3 or IT 5

Following life diagrams refer to a constant applied load, without shocks and 90 % ball screw reliability. For different load and/or reliability conditions, please refer to ch. 1.11 "Ball screw life calculation" on page 18 or contact SERVOMECH.



BALL SCREW	Ball [mm]	N° of starts	N° of circuits	C _a [kN]	C _{0a} [kN]	CURVE
BS 100×16	9.525	1	5	147	454	A
BS 100×20	12.7	1	5	251	732	B
BS 120×20	15.875	1	7	500	1578	C

Screw jacks with travelling ball nut (Mod.B)

3.10 Ball screw direct efficiency

Thanks to balls interposed between the threaded shaft and nut, the friction coefficient between balls and tracks is constant also in case of speed and load variations. This implies that also the ball screw efficiency can be considered as constant by varying working conditions and it is called theoretical ball screw efficiency.

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. **For a conservative calculation, it is recommended to apply a safety factor of 0.92 on the given efficiency in order to consider also the dependence on load and speed.**

The following tables show the theoretical efficiency of all ball screws available for screw jacks Mod.B with rotating screw and travelling nut.

d_o	16		20			25				32				40			50		63		80			100		120
P_h	5	10	5	10	20	5	6	10	25	5	10	20	32	10	20	40	10	20	10	20	10	16	20	16	20	20
η_{BS}	0.94	0.97	0.93	0.96	0.98	0.91	0.93	0.95	0.98	0.89	0.94	0.97	0.98	0.93	0.96	0.98	0.91	0.95	0.89	0.94	0.87	0.91	0.93	0.89	0.91	0.90

3.11 Worm gear direct efficiency

η_{RID}	MA 5			MA 10			MA 25			MA 50 MA 80			MA 150			MA 200			MA 350		
n_1 [rpm]	RATIO			RATIO			RATIO			RATIO			RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.84	0.75	0.68	0.84	0.73	0.71	0.84	0.77	0.72	0.85	0.80	0.72	0.85	0.76	0.73	0.85	0.77	0.74	0.84	0.82	0.76
1 500	0.81	0.71	0.62	0.82	0.68	0.66	0.82	0.73	0.68	0.83	0.77	0.68	0.83	0.73	0.68	0.84	0.74	0.71	0.83	0.80	0.72
1 000	0.80	0.68	0.60	0.81	0.65	0.63	0.81	0.71	0.65	0.81	0.75	0.64	0.81	0.69	0.65	0.82	0.71	0.68	0.82	0.78	0.70
750	0.79	0.67	0.58	0.80	0.64	0.61	0.80	0.69	0.63	0.81	0.73	0.62	0.80	0.68	0.64	0.81	0.69	0.65	0.80	0.77	0.68
500	0.78	0.65	0.56	0.78	0.61	0.59	0.78	0.66	0.60	0.79	0.72	0.60	0.79	0.66	0.61	0.80	0.66	0.63	0.78	0.75	0.65
300	0.77	0.63	0.53	0.77	0.58	0.56	0.77	0.64	0.57	0.77	0.69	0.57	0.77	0.62	0.57	0.78	0.63	0.59	0.77	0.73	0.62
100	0.73	0.59	0.48	0.74	0.52	0.50	0.73	0.59	0.52	0.74	0.64	0.51	0.74	0.57	0.51	0.75	0.58	0.53	0.75	0.68	0.55
START.	0.68	0.53	0.41	0.68	0.46	0.44	0.68	0.52	0.44	0.68	0.57	0.48	0.67	0.47	0.42	0.68	0.47	0.43	0.65	0.59	0.44

η_{RID}	SJ 5				SJ 10			SJ 25			SJ 50 SJ 100			SJ 150			SJ 200 SJ 250		SJ 300		SJ 400	
n_1 [rpm]	RATIO				RATIO			RATIO			RATIO			RATIO			RATIO		RATIO		RATIO	
	RH	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RL	RV	RL	RV	RL
1 500	0.71	0.71	0.65	0.56	0.72	0.63	0.55	0.73	0.65	0.60	0.74	0.69	0.61	0.74	0.65	0.61	0.74	0.63	0.73	0.63	0.73	0.63
1 000	0.70	0.70	0.63	0.53	0.71	0.61	0.54	0.72	0.63	0.58	0.72	0.66	0.57	0.72	0.62	0.58	0.73	0.60	0.72	0.60	0.72	0.61
750	0.70	0.69	0.62	0.52	0.70	0.59	0.51	0.71	0.61	0.56	0.72	0.65	0.55	0.71	0.60	0.57	0.72	0.58	0.71	0.58	0.72	0.59
500	0.68	0.67	0.61	0.50	0.70	0.58	0.50	0.70	0.59	0.53	0.70	0.64	0.54	0.70	0.58	0.54	0.71	0.56	0.70	0.56	0.70	0.56
300	0.67	0.66	0.59	0.48	0.68	0.56	0.47	0.68	0.57	0.51	0.69	0.62	0.50	0.69	0.55	0.50	0.70	0.51	0.68	0.53	0.68	0.53
100	0.64	0.64	0.56	0.44	0.65	0.52	0.42	0.65	0.52	0.46	0.66	0.57	0.46	0.66	0.50	0.46	0.66	0.47	0.64	0.47	0.64	0.47
START.	0.59	0.60	0.52	0.39	0.60	0.47	0.37	0.60	0.46	0.39	0.61	0.50	0.42	0.59	0.42	0.38	0.60	0.38	0.56	0.37	0.55	0.35

η_{RID}	Serie HS (all sizes, all ratios)
RUNNING	0.90
STARTING	0.93

Screw jacks with travelling ball nut (Mod.B)

3.12 Static braking torque

The braking torque is the necessary torque to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft.

Braking torque calculation

The braking torque value is calculated as follows:

$$T_f = \frac{1.2 \cdot F \cdot P_h \cdot \eta'_{BS} \cdot \eta'_{RID}}{2\pi \cdot u}$$

where:

- η'_{BS} - ball screw back-driving efficiency
- η'_{RID} - worm gear back-driving efficiency
- F [kN] - load applied on the screw jack
- P_h [mm] - ball screw thread helix lead
- u - worm gear ratio ($u > 1$)

The calculated T_f value must be compared with the minimum braking torque threshold value, which must always be assured. The real braking torque value is therefore the highest one of the two values.

$$T_{F\text{eff}} = \max(T_f; T_{F\text{min}})$$

Following tables show the $T_{F\text{min}}$ and the back-driving efficiency values.

NOTE: where no value is stated, it means that the system is ideally self-locking. Actually, due to hardly predictable external factors, such as vibrations and shocks, it still can be possible to have a not self-locking system and therefore, even in this case, it is necessary to apply a braking torque to sustain the load in position, equal to the minimum $T_{F\text{min}}$.

d_0	16		20			25				32				40			50		63		80			100		120
P_h	5	10	5	10	20	5	6	10	25	5	10	20	32	10	20	40	10	20	10	20	10	16	20	16	20	20
η'_{BS}	0.94	0.97	0.92	0.96	0.98	0.90	0.92	0.95	0.98	0.88	0.94	0.97	0.98	0.92	0.96	0.98	0.90	0.95	0.88	0.94	0.85	0.90	0.92	0.88	0.90	0.88

η'_{RID}	MA 5			MA 10			MA 25			MA 50 MA 80			MA 150			MA 200			MA 350		
	RATIO			RATIO			RATIO			RATIO			RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL
	0.68	0.26	-	0.69	-	-	0.68	0.21	-	0.68	0.38	-	0.66	-	-	0.66	0.02	-	0.60	0.42	-

η'_{RID}	SJ 5				SJ 10			SJ 25			SJ 50 SJ 100			SJ 150			SJ 200 SJ 250		SJ 300		SJ 400	
	RATIO				RATIO			RATIO			RATIO			RATIO			RATIO		RATIO		RATIO	
	RH	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RL	RV	RL	RV	RL
	0.66	0.68	0.42	-	0.68	0.26	-	0.68	0.21	-	0.68	0.38	-	0.66	-	-	0.66	-	0.57	-	0.53	-

η'_{RID}	Serie HS (all sizes, all ratios)	
	0.90	

$T_{F\text{min}}$ [Nm]	MA 5	MA 10	MA 25	MA 50 MA 80	MA 150	MA 200	MA 350
	0.2	0.35	1.5	2.4	5.3	6.8	13.4

$T_{F\text{min}}$ [Nm]	SJ 5	SJ 10	SJ 25	SJ 50 SJ 100	SJ 150	SJ 200 SJ 250	SJ 300	SJ 400
	0.2	0.35	1.5	2.4	5.3	6.8	11.5	14.4

$T_{F\text{min}}$ [Nm]	HS 10	HS 25	HS 50	HS 100	HS 150	HS 200
	0.45	2	3.2	5.5	7.2	9.3

Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

MA BS Series Mod.B

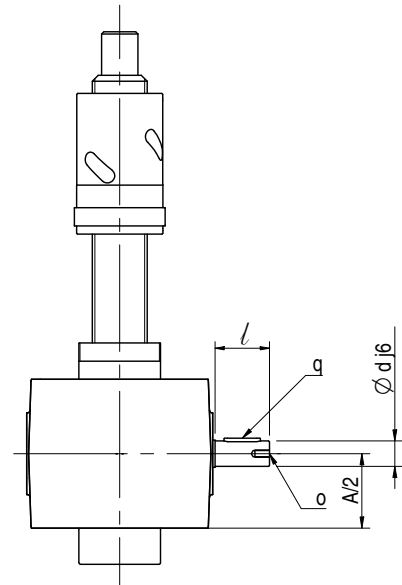
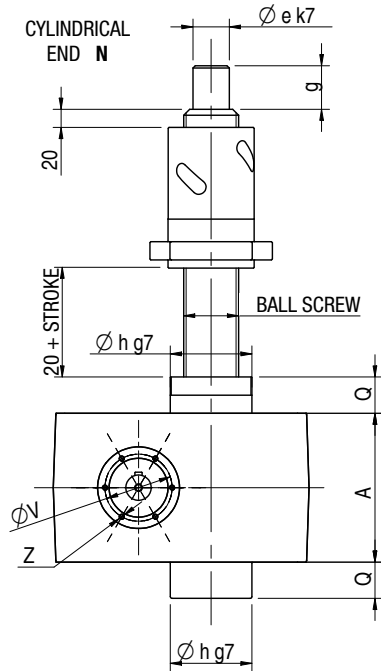
SIZE	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 80 BS	MA 150 BS	MA 200 BS	MA 350 BS
BALL SCREW	BS 16-20 × P _h	BS 25 × P _h	BS 32 × P _h	BS 40 × P _h	BS 50 × P _h	BS 63 × P _h	BS 80 × P _h	BS 100 × P _h
A	80	100	126	160	160	200	230	280
B	124	140	175	235	235	276	330	415
C	80	105	130	160	160	200	230	300
E	62	80	100	120	120	150	175	230
F	95	110	140	190	190	220	270	330
F1	12.5	14	17.5	23	23	26	30	42
G	100	114	136	165	165	205	256	326
Ø H	65	80	100	120	120	160	190	240
I	30	40	50	63	63	80	100	125
L	149	179	221.5	269	269	330	378	490
Ø O	9	9	13	17	17	21	28	34
Q	15	16	24	26	26	30	35	40
S	46.5	46	57.5	80	80	91	113	121
U	31	38	50	70	70	75	87	126
Ø V	42	46	64	63	63	74	110	118
Z	M5, depth 10	M5, depth 12	M5, depth 10	M6, depth 14	M6, depth 14	M6, depth 14	M10, depth 20	M10, depth 25
Ø d	10	14	19	24	24	28	32	38
Ø e	12	15	20	30	40	40	50	70
l	22	30	40	50	50	60	60	80
n	—	—	10	10	10	12	10	10
o	M5, depth 10	M6, depth 14	M8, depth 16	M8, depth 16	M8, depth 16	M8, depth 16	M10, depth 24	M12, depth 32
p	19	24	40	40	45	50	60	65
q	3×3×15	5×5×20	6×6×30	8×7×40	8×7×40	8×7×40	10×8×40	10×8×60
t	M45×1.5	M55×1.5	M70×2	M90×2	M90×2	M110×2	M150×3	M180×3
w	15	17	25	36	38	41	42	45
Ø z	50	60	77	95	95	120	160	200
J1	63 B5/B14: 62	63 B5/B14: 69	63/71 B5: 102	80 B5: 100	80 B5: 100	80/90 B5: 120	90 B5: 142 100/112 B5: 142	—
J1s	63 B5: 30 63 B14: 5	63 B5: 20 63 B14: —	63 B5: 7 71 B5: 17	80 B5: 20	80 B5: 20	80/90 B5: —	90 B5: — 100/112 B5: 10	—
J2	71 B5: 122 71 B14: 131	71 B5: 129 71 B14: 138	80 B5: 182 80 B14: 176 90 B5: 182 90 B14: 182	90 B5: 200 90 B14: 200 100 B5: 220 100 B14: 220	90 B5: 200 90 B14: 200 100/112 B5: 220 100/112 B14: 220	100/112 B5: 240 100/112 B14: 240	132 B5: 297	132 B5: 353 160 B5: 365
J2s	71 B5: 40 71 B14: 12.5	71 B5: 30 71 B14: 3	80 B5: 37 80 B14: — 90 B5: 37 90 B14: 7	90 B5: 20 90 B14: — 100 B5: 45 100 B14: —	90 B5: 20 90 B14: — 100/112 B5: 45 100/112 B14: —	100/112 B5: 25 100/112 B14: —	132 B5: 35	132 B5: 10 160 B5: 35

NOTE: for ball nut dimensions, see ch. 3.8 “Ball nuts dimensions” on page 70

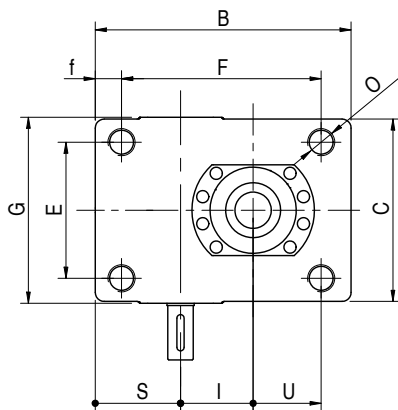
Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

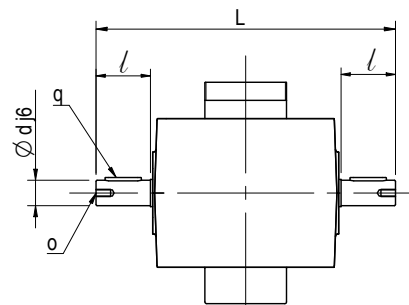
SJ BS Series Mod.B, size 5 - 10 - 25 - 50 - 100 - 150



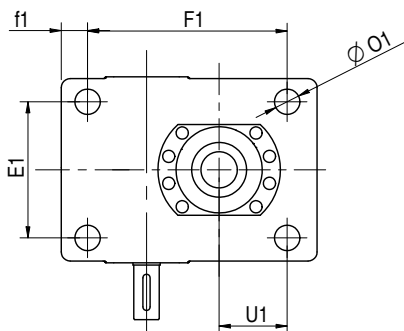
Vers.1: single input shaft



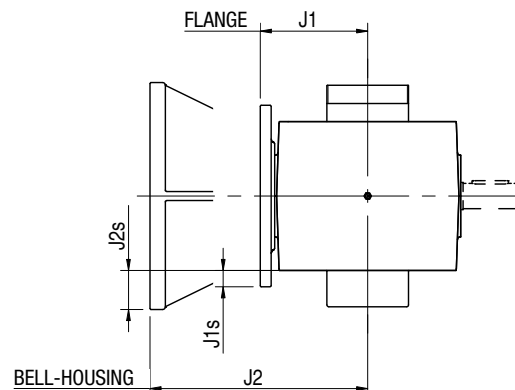
**THREADED
FIXING HOLES**



Vers.2: double input shaft



**THROUGH
FIXING HOLES**



Vers.5: Vers.1 with bell-housing and coupling IEC

Vers.6: Vers.2 with bell-housing and coupling IEC

Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

SJ BS Series Mod.B, size 5 - 10 - 25 - 50 - 100 - 150

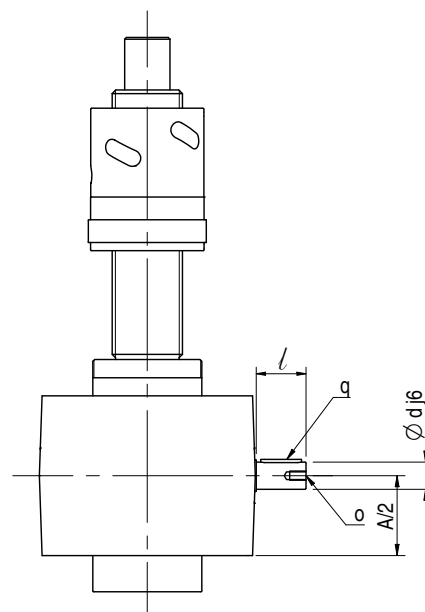
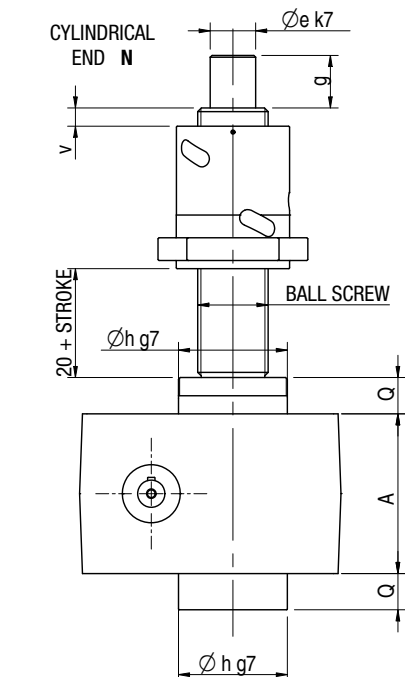
SIZE	SJ 5 BS	SJ 10 BS	SJ 25 BS	SJ 50 BS	SJ 100 BS	SJ 150 BS
BALL SCREW	BS 16-20 × P _h	BS 25 × P _h	BS 32 × P _h	BS 40 × P _h	BS 50 × P _h	BS 63 × P _h
A	62	76	82	118	160	164
B	100	110	160	200	220	282
C	86	96	130	160	170	201
E	52	63	81	115	134	150
E1	56	80	102	130	120	150
F	60	78	106	150	175	220
F1	80	85	131	165	180	220
G	90	100	136	165	165	205
I	25	30	50	63	63	80
L	135	165	221.5	269	269	330
O	M8, depth 14	M8, depth 15	M10, depth 15	M12, depth 16	M20, depth 30	M30, depth 45
Ø O1	9	9	11	13	17	28
Q	12	18	23	32	40	40
S	37	40	50	59	74	94
U	21	29	42	63	60	75
U1	28	30	48	60	63	75
Ø V	46	46	64	63	63	74
Z	M6, depth 13 (4 holes at 90°)	M5, depth 10 (6 holes at 60°)	M5, depth 10 (6 holes at 60°)	M6, depth 14 (6 holes at 60°)	M6, depth 14 (6 holes at 60°)	M6, depth 14 (6 holes at 60°)
Ø d	9	14	19	24	24	28
Ø e	12	15	20	30	40	40
f	23	21	36	35	22	29
f1	10	15	17	17	20	29
g	19	24	38	38	48	48
Ø h	30	38.7	46	60	90	90
l	20	30	40	50	50	60
o	M4, depth 8	M6, depth 14	M8, depth 16	M8, depth 16	M8, depth 16	M8, depth 16
q	3×3×15	5×5×20	6×6×30	8×7×40	8×7×40	8×7×40
v	20	20	20	20	20	20
Ø z	14	20	25	35	40	50
J1	56 B5/B14: 57.5	63 B5/B14: 62	63/71 B5: 102	80 B5: 100	80 B5: 100	80/90 B5: 120
J1s	56 B5: 29 56 B14: 9	63 B5: 32 63 B14: 7	63 B5: 29 71 B5: 39	80 B5: 41	80 B5: 20	80/90 B5: 18
J2	63 B5: 98	71 B5: 122 71 B14: 131	80 B5: 182 80 B14: 176 90 B5: 182 90 B14: 182	90 B5: 200 90 B14: 200 100 B5: 220 100 B14: 220	90 B5: 200 90 B14: 200 100/112 B5: 220 100/112 B14: 220	100/112 B5: 240 100/112 B14: 240
J2s	63 B5: 39	71 B5: 42 71 B14: 15	80 B5: 59 80 B14: 19 90 B5: 59 90 B14: 29	90 B5: 41 90 B14: 11 100 B5: 66 100 B14: 21	90 B5: 20 90 B14: — 100/112 B5: 45 100/112 B14: —	100/112 B5: 43 100/112 B14: —

NOTE: for ball nut dimensions, see ch. 3.8 "Ball nuts dimensions" on page 70

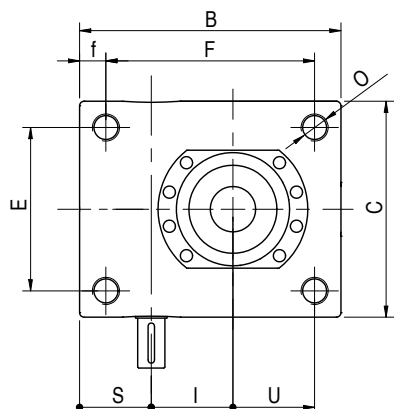
Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

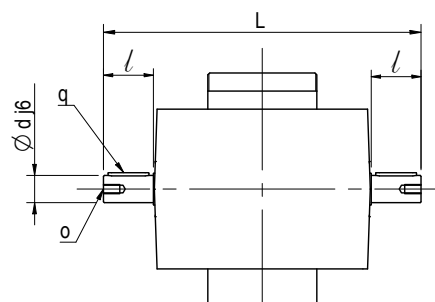
SJ BS Series Mod.B, size 200 - 250 - 300 - 400



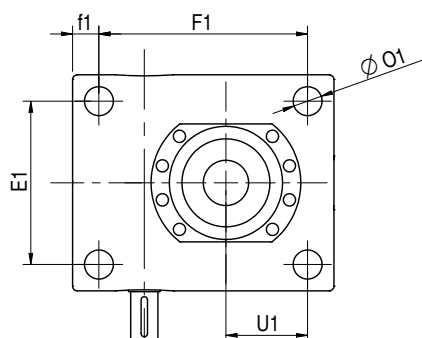
Vers.1: single input shaft



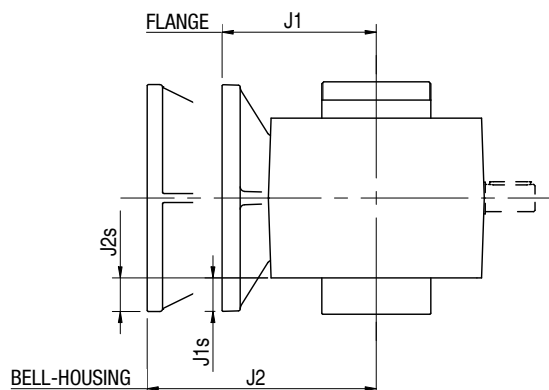
**THREADED
FIXING HOLES**



Vers.2: double input shaft



**THROUGH
FIXING HOLES**



Vers.5: Vers.1 with bell-housing and coupling IEC

Vers.6: Vers.2 with bell-housing and coupling IEC

Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

SJ BS Series Mod.B, size 200 - 250 - 300 - 400

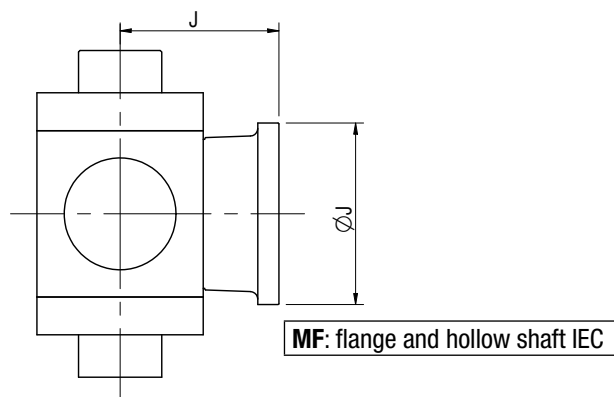
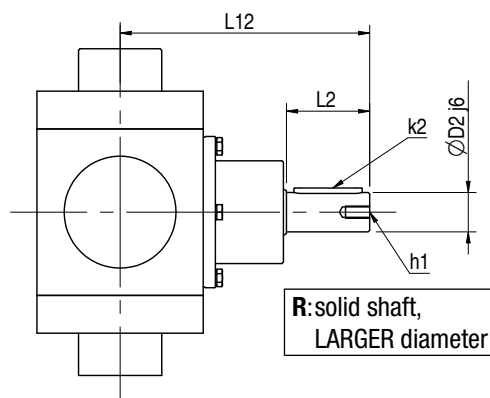
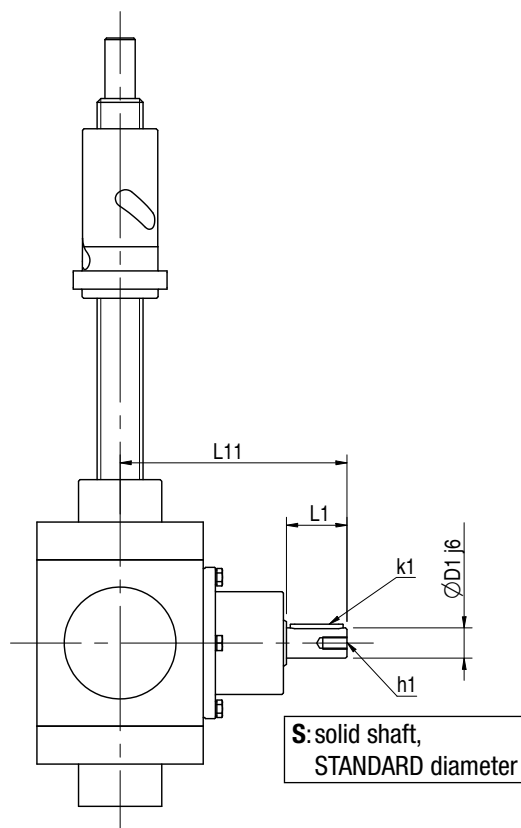
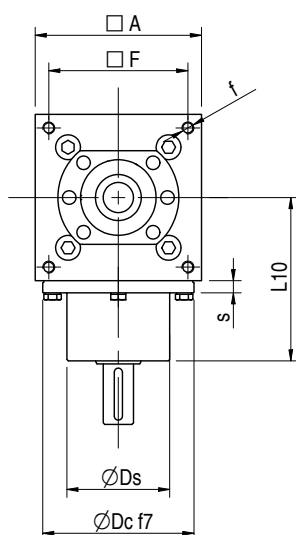
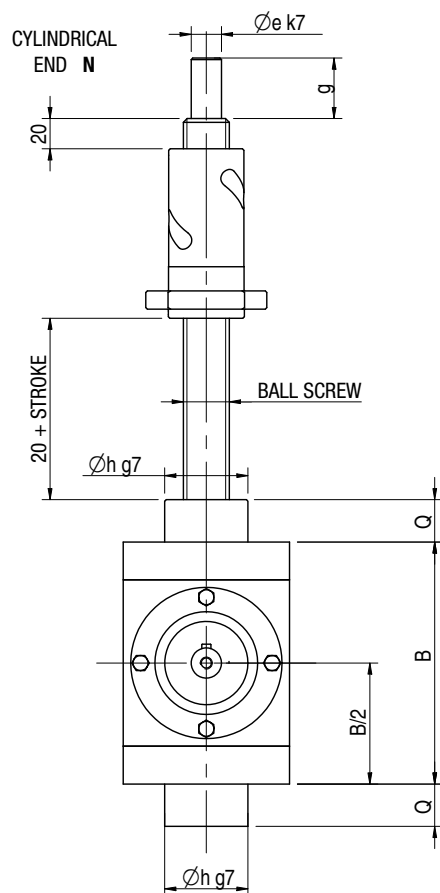
SIZE	SJ 200 BS	SJ 250 BS	SJ 300 BS	SJ 400 BS
BALL SCREW	BS 80 × P _h	BS 100 × P _h	BS 100 × P _h	BS 120 × P _h
A	176	176	230	270
B	280	280	320	428
C	230	230	250	322
E	180	180	200	230
E1	180	180	200	230
F	230	230	270	355
F1	230	230	270	355
I	90	90	110	140
L	350	350	390	490
O	M30, depth 45	M30, depth 45	M30, depth 45	M30, depth 45
Ø O1	32	32	32	32
Q	40	40	50	50
S	75	75	85	117
U	90	90	100	135
U1	90	90	100	135
Ø d	30	30	40	55
Ø e	50	50	70	85
f	25	25	25	37
f1	25	25	25	37
g	58	58	68	68
Ø h	120	120	150	210
l	55	55	65	75
o	M10, depth 18	M10, depth 18	M10, depth 22	M12, depth 28
q	8×7×45	8×7×45	12×8×55	16×10×60
v	20	20	40	40
Ø z	60	60	80	80
J1	100/112 B5: 170	100/112 B5: 170	—	—
J1s	100/112 B5: 37	100/112 B5: 37	—	—
J2	132 B5: 292	132 B5: 292	—	—
J2s	132 B5: 62	132 B5: 62	—	—

NOTE: for ball nut dimensions, see ch. 3.8 "Ball nuts dimensions" on page 70

Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

HS Series



Screw jacks with travelling ball nut (Mod.B)

3.13 Overall dimensions

HS Series

SIZE	HS 10	HS 25	HS 50	HS 100	HS 150	HS 200
BALL SCREW	BS 25 × P _h	BS 32 × P _h	BS 40 × P _h	BS 50 × P _h	BS 63 × P _h	BS 80 × P _h
□ A	86×86	110×110	134×134	166×166	200×200	250×250
B	122	160	190	230	292	332
∅ D1	16	20	24	32	42	55
∅ D2	24	26	32	45	55	70
∅ Dc	84	100	122	156	185	230
∅ Ds	59	68	80	107	120	152
□ F	74×74	92×92	112×112	140×140	170×170	190×190
L1	30	40	50	65	85	100
L2	50	55	65	90	110	140
L10	82	108	130	150	180	216
L11	114	150	182	217	267	318
L12	134	165	197	242	292	358
Q	25	28	32	42	38	55
∅ e	15	20	30	40	40	50
f	M6, depth 18	M8, depth 25	M12, depth 28	M16, depth 32	M18, depth 46	M24, depth 41
g	24	40	40	45	50	60
∅ h	48	55	65	85	100	125
h1	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
k1	5×5×25	6×6×35	8×7×45	10×8×60	12×8×80	16×10×90
k2	8×7×40	8×7×45	10×8×55	14×9×80	16×10×100	20×12×120
J	71 B5: 90 80 B5: 100 80 B14: 100	80 B5: 105 80 B14: 105 90 B5: 115 90 B14: 115	90 B5: 125 100-112 B5 135: 100-112 B14: 135	90 B5: 160 100-112 B5: 160 100-112 B14: 160	100-112 B5: 220 132 B5: 220 132 B14: 220	132 B5: 250 160 B5: 250
∅ J	71 B5: 160 80 B5: 200 80 B14: 120	80 B5: 200 80 B14: 120 90 B5: 200 90 B14: 140	90 B5: 200 100-112 B5 250: 100-112 B14: 160	90 B5: 200 100-112 B5: 250 100-112 B14: 160	100-112 B5: 250 132 B5: 300 132 B14: 200	132 B5: 300 160 B5: 350

NOTE: for ball nut dimensions, see ch. 3.8 "Ball nuts dimensions" on page 70

Screw jacks with travelling ball nut (Mod.B)

3.14 Electric motors fitting

IEC electric motors

MA BS Series		MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 80 BS	MA 150 BS	MA 200 BS	MA 350 BS
63	B5	F	F	F					
	B14	F	F						
71	B5	B	B	F	F	F			
	B14	B	B	F					
80	B5			B	F	F	F		
	B14			B					
90	B5			B	B	B	F	F	
	B14			B	B	B			
100 - 112	B5				B	B	B	F	
	B14				B	B	B		
132	B5							B	B
160	B5								B

SJ BS Series		SJ 5 BS	SJ 10 BS	SJ 25 BS	SJ 50 BS	SJ 100 BS	SJ 150 BS	SJ 200 BS	SJ 250 BS
56	B5	F							
	B14	F							
63	B5	B	F	F					
	B14		F						
71	B5		B	F	F	F			
	B14		B	F					
80	B5			B	F	F	F		
	B14			B					
90	B5			B	B	B	F		
	B14			B	B	B			
100 - 112	B5				B	B	B	F	F
	B14				B	B	B	B	B
132	B5							B	B

HS Series		HS 10	HS 25	HS 50	HS 100	HS 150	HS 200
71	B5	F					
	B14	F	F				
80	B5	F	F				
	B14	F	F				
90	B5		F	F	F		
	B14		F	F			
100 - 112	B5			F	F	F	
	B14			F	F		
132	B5					F	F
	B14					F	
160	B5						F

F - IEC flange with hollow shaft

B - IEC bell-housing with coupling

LINEARMECH Brushless Servomotors

Ball screw jacks can be equipped with Linearmech Brushless Servomotors BM Series with metric flange dimensions, according to IEC 34-7, UNEL 05513 regulations. Possible fittings are described below:

Servomotor	Serie MA	Serie SJ	Serie HS
BM 45 L IEC	-	SJ 5 BS	
BM 63 S IEC	MA 5 BS , MA 10 BS	SJ 10 BS	
BM 63 L IEC	MA 5 BS , MA 10 BS, MA 25 BS	SJ 10 BS , SJ 25 BS	
BM 82 S IEC	MA 25 BS	SJ 25 BS	HS 10 , HS 25
BM 82 L IEC	MA 25 BS	SJ 25 BS	HS 10 , HS 25
BM 102 S IEC	MA 25 BS , MA 50 BS , MA 80 BS	SJ 25 BS , SJ 50 BS , SJ 100 BS	HS 25 , HS 50
BM 102 L6 IEC	MA 25 BS , MA 50 BS , MA 80 BS	SJ 25 BS , SJ 50 BS , SJ 100 BS	HS 25 , HS 50
BM 102 L8 IEC	MA 25 BS , MA 50 BS , MA 80 BS	SJ 25 BS , SJ 50 BS , SJ 100 BS	HS 25 , HS 50

For technical data of servomotors, please refer to ch.5 "LINEARMECH servo motors" on page 115.

Flanges and bell-housings to specific drawing for hydraulic motors or servo motors are available on request.

Screw jacks with travelling ball nut (Mod.B)

3.15 Accessories

Bellows

In applications with particular environment conditions, bellows protect the screw from contaminants.

The usually supplied bellows are circular, sewn (double seam), in NYLON with a PVC outside and inside coating. For special application requirements, different executions or materials can be supplied on request.

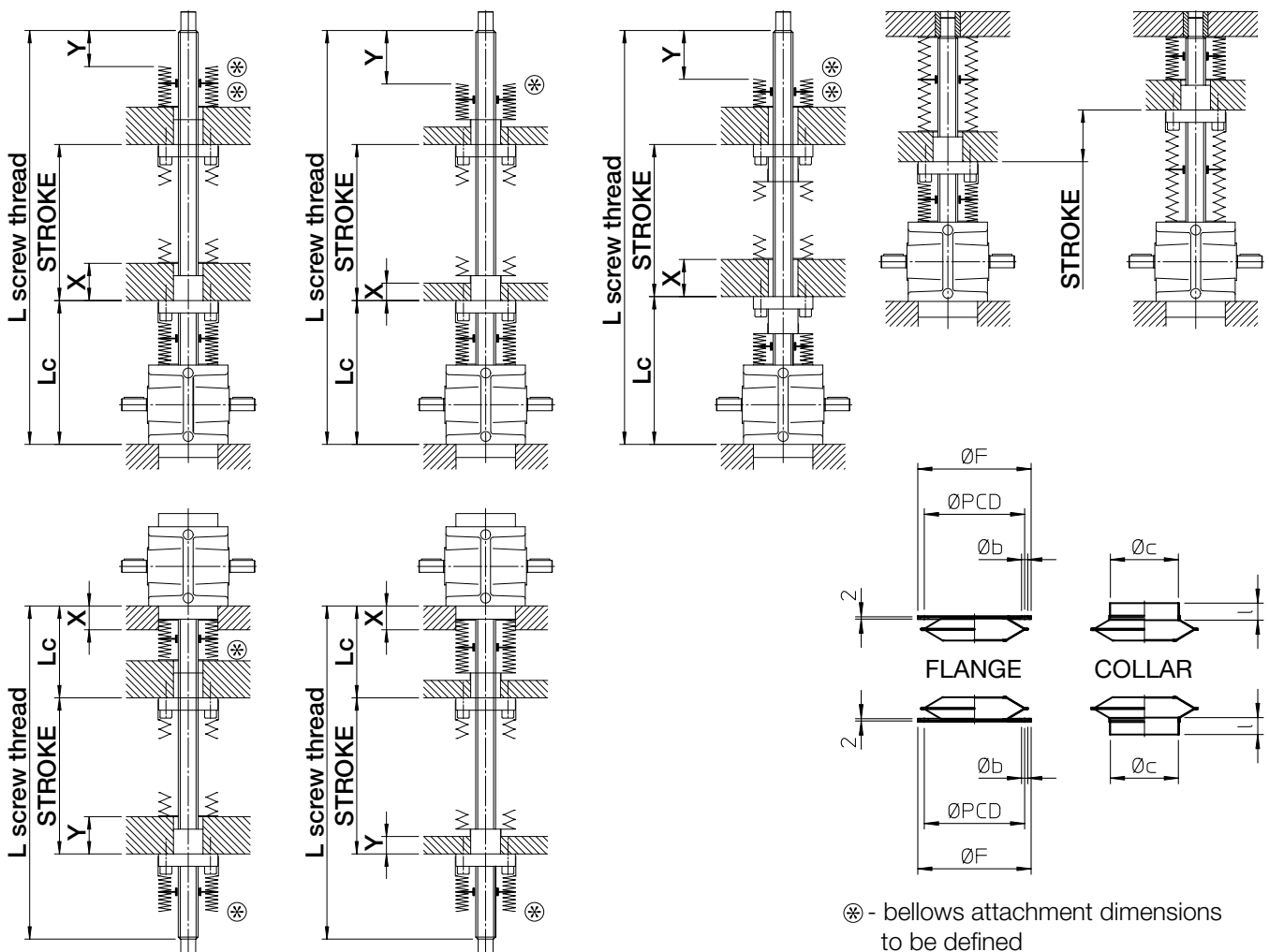
The bellows cause changes to the retracted and extended lengths and screw jack overall dimensions stated in the catalogue. On request, orders will be acknowledged with a screw jack drawing giving exact dimensions.

Usually, bellows are fitted on both sides: between the screw jack housing and the ball nut and between the nut and the ball screw end. Anyway, some applications require only one of the two bellows.

The attachments dimensions of the bellow between the screw jack housing and the nut are determined by the screw jack parts dimensions, where the bellow is fixed, while the attachments dimensions of the bellow between ball nut and screw end depend on the application, because the bellow is directly in contact with the application's structure.

The protective bellow is available for all screw jack series (MA BS, SJ BS, HS).

Ordering code: **B**



Screw jacks with travelling ball nut (Mod.B)

3.15 Accessories

Worm wheel rotation detector

Available for screw jacks MA BS and SJ BS Series only (not for HS Series).

Some applications require the possibility to verify if the worm wheel rotates while the worm shaft is moving in order to get information about the good condition and functioning of the worm wheel toothing.

A cylindrical element, machined in order to have a “crown” of empty and full spaces, is fixed to the worm wheel creating a phonic wheel that, while rotating, activates a corresponding proximity switches. As output of such proximity switch, activated and deactivated by the alternation of empty and full spaces, a “train” of impulses is generated which confirms the rotation of the worm wheel. On the contrary, the constant output signal of the proximity switch means the stop of the worm wheel.



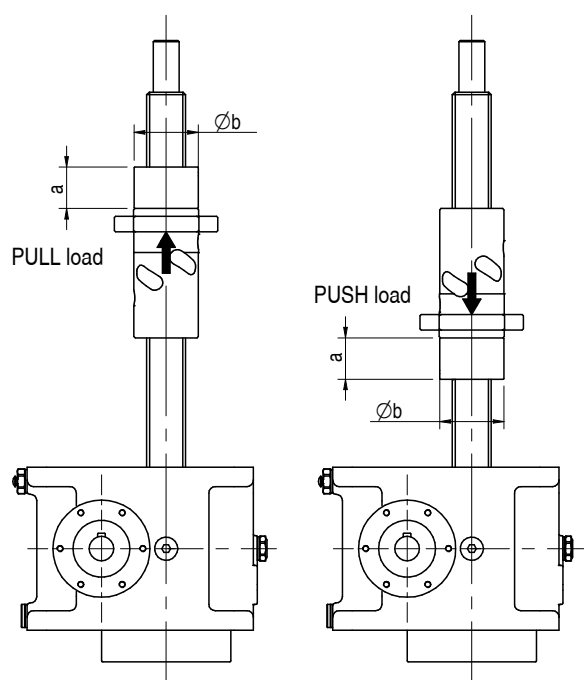
Safety nut

The safety nut is a back-up feature to prevent the load dropping in an uncontrolled manner in case of working nut balls failure. This can be caused by overload or by achieving a critical wear level.

The safety nut is an extension to the main nut and changes the screw jack overall dimensions. It works with one particular load direction only. Its position as regards the main nut is therefore conditioned by the load direction.

The safety nut does not have balls inside, but a thread helix that traces the ball truck on the screw. With a not worn out main nut, the thread of the nut does not touch the screw; in case the balls of the main nut should fail, the safety nut will touch the screw and sustain the load, causing a slithering between the screw and the safety nut threads. The safety nut is made in steel and therefore, in case it is activated, it is then necessary to replace both screw and main nut.

The safety nut is available for all screw jack series (MA BS, SJ BS, HS).



Ball screw diameter	16	20	25	32	40
a	16	20	25	32	40
Øb	28	36	40	50	63

Ball screw diameter	50	63	80	100	120
a	20	20	20	20	20
Øb	75	90	105	150	190

Ordering code: **SBC push** safety nut for PUSH load

Ordering code: **SBC pull** safety nut for PULL load

Screw jacks with travelling ball nut (Mod.B)

3.15 Accessories

ROTARY ENCODER Code ENC.4

Hall-effect encoder, incremental, bi-directional

Resolution: 4 pulses per revolution

Output: PUSH-PULL

2 channels (A and B, phase difference 90°)

Input voltage: (8 ... 32) Vdc

Max. commutable current (I_{out}): 100 mA

Max output voltage drop:

with load connected to 0 and $I_{out} = 100$ mA: 4.6 V

with load connected to + V and $I_{out} = 100$ mA: 2 V

Protection:

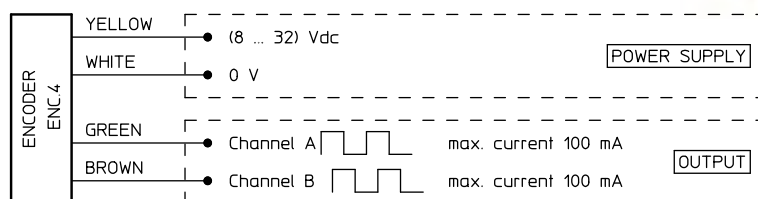
against short circuit

against input polarity inversion

against any incorrect output connection

Cable length: 1.3 m

Protection: IP 55



The encoder ENC.4 is available for all screw jack series (MA BS, SJ BS, HS).

Ordering code: **ENC.4**

ROTARY ENCODER Code EH53

Optical encoder, incremental, bi-directional

Resolution: 100 or 500 pulses per revolution

Output: PUSH-PULL

2 channels (A and B, phase difference 90°)

channel ZERO

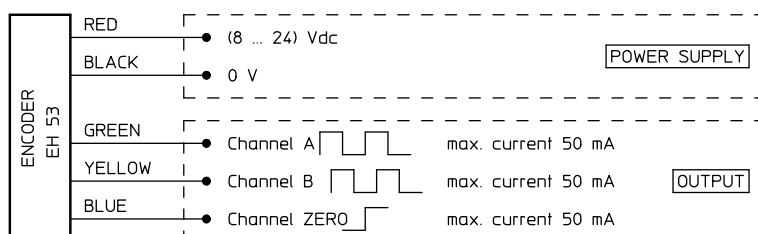
Input voltage: (8 ... 24) Vcc

No-load current: 100 mA

Max. commutable current: 50 mA

Cable length: 0.5 m

Protection: IP 54



The encoder ENC.4 is available for all screw jack series (MA BS, SJ BS, HS).

Ordering code: **EH 53**

Screw jacks with travelling ball nut (Mod.B)

3.15 Accessories - MA BS Series

Raised cover

The housing of the screw jacks MA BS Mod.B is enclosed inside two threaded covers, one on the top and one on bottom. Screw jacks Mod.B have always raised cover (CA) mounted on the screw jack housing on the opposite side of the acme screw, to protect the rotating screw threaded end. The threaded cover on the screw side is always supplied as low cover (CB) in standard execution, raised cover execution available on request. The raised cover CA with toleranced outer diameter acts as a centring diameter of the screw jack inside the machine structure.

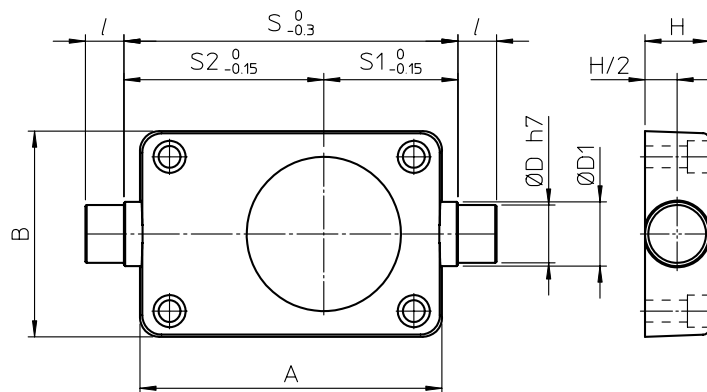
Ordering code: **CA - CA**



Trunnion mount

The trunnion mount is bolted to either the top or the bottom of the screw jack housing and allows the screw jack pivoting around the axis defined by the trunnion mount's lateral pins.

NOTE: the part of the machine where the nut is fixed must have two cylindrical pins (or holes) with axes parallel to the trunnion mount pivots axis.



	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 80 BS	MA 150 BS	MA 200 BS	MA 350 BS
A	124	140	175	235	235	276	330	415
B	80	105	130	160	160	200	230	300
ØD	15	20	25	45	45	50	70	80
ØD ₁	20	25	30	50	50	60	80	90
H	20	25	30	50	50	60	80	90
l	15	20	20	30	30	40	45	60
S	130	145	200	260	260	305	360	440
S ₁	50.5	56.5	80	104.5	104.5	119.5	132	181.5
S ₂	79.5	88.5	120	155.5	155.5	185.5	228	258.5
mass [kg]	0.8	1.6	3.2	9.8	9.8	15.8	29	52

Ordering code: **SC (screw side)**

screw jacks with SC fixed on the screw side

Ordering code: **SC (opposite screw side)**

screw jacks with SC fixed on opposite screw side

Screw jacks with travelling ball nut (Mod.B)

3.15 Accessories - SJ BS Series

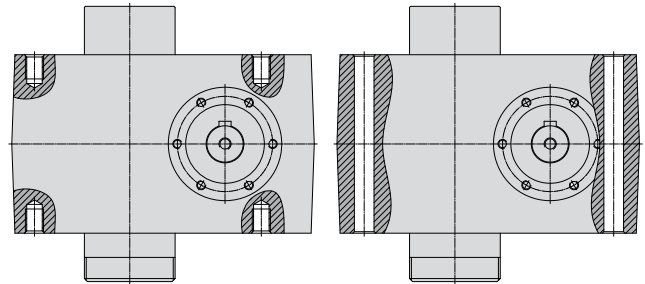
Screw jack housing fixing holes

On the gear housing of screw jack SJ Series there are fixing holes, which can be threaded tapped holes (on both housing fixing planes) or through holes.

The threaded holes position on the fixing plane can differ from the through holes position.

Ordering code: **FF** threaded holes (STANDARD)

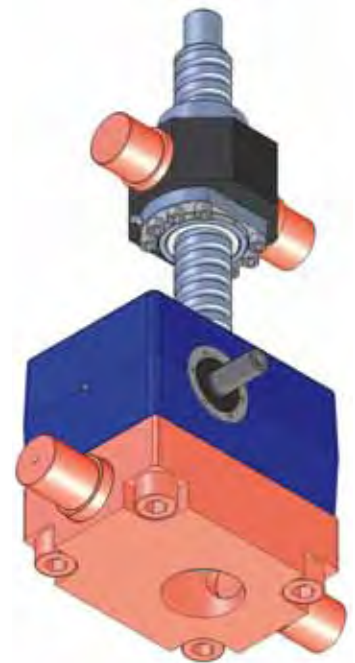
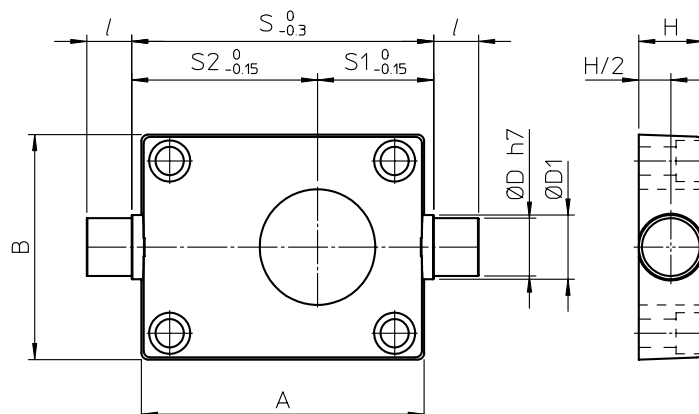
Ordering code: **FP** through holes (ON REQUEST)



Trunnion mount

The trunnion mount is bolted to either the top or the bottom of the screw jack housing and allows the screw jack pivoting around the axis defined by the trunnion mount's lateral pins.

NOTE: the part of the machine where the nut is fixed must have two cylindrical pins (or holes) with axes parallel to the trunnion mount pivots axis.



3

	SJ 5 BS	SJ 10 BS	SJ 25 BS	SJ 50 BS	SJ 100 BS	SJ 150 BS	SJ 200 BS	SJ 250 BS	SJ 300 BS
A	100	110	160	200	220	276	280	280	312
B	86	96	130	160	170	200	230	230	242
ØD	15	20	25	35	45	60	70	70	65
ØD ₁	20	25	30	40	50	70	90	90	85
H	20	25	30	40	50	100	120	120	120
l	15	20	20	30	35	65	75	75	65
S	105	115	185	215	235	305	300	300	350
S ₁	40.5	42.5	72.5	85.5	90.5	119.5	125	125	140
S ₂	64.5	72.5	112.5	129.5	144.5	185.5	175	175	210
mass [kg]	1.1	1.8	3.4	7.3	9	30	40	40	40

Ordering code: **SC (screw side)**

screw jacks with SC fixed on the screw side

Ordering code: **SC (opposite screw side)**

screw jacks with SC fixed on opposite screw side

Screw jacks with travelling ball nut (Mod.B)

3.16 Ordering code

MA BS Series Mod.B

MA	50	BS 40 × 10	Mod.B	RL	Vers. 3 (80 B5)	U-RH
1	2	3	4	5	6	7

C300	IT 5	SFN-D.40.10.5R	N B2 B1 CB / CA
8	9	10	11

...
12

...
13

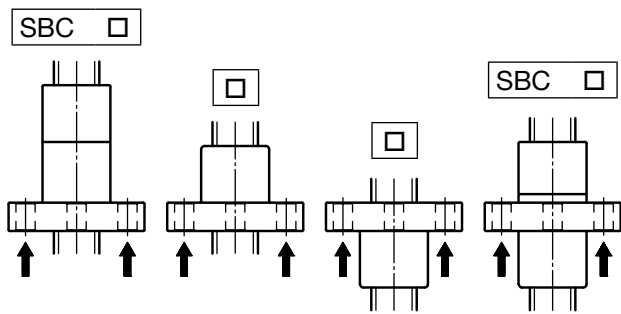
AC	3-phase	brake motor	0.75 kW	4-pole	230/400 V	50 Hz	IP 55	Ins. F
14								

1	MA (screw jack MA BS Series)	
2	Screw jack size	
5 ... 350		page 65, 66 - 67
3	Ball screw	
BS diameter × lead		page 68 - 69
4	Mod.B (Model: travelling nut)	
5	Worm gear ratio	page 66 - 67
6	Input version	
Vers. 1, Vers. 2, Vers. 3, Vers. 4, Vers. 5, Vers. 6		page 9
7	Screw jack mounting and input shaft position	
U-RH, U-LH, D-RH, D-LH, H-RH, H-LH		page 9
8	Screw jack stroke length (ex.: C300 = 300 mm stroke)	
9	Ball screw accuracy grade	
IT 3 or IT 5: whirled ball screw		page 68
IT 7: rolled ball screw		page 69
10	Ball nut	
Nut code		page 70 - 71
11	Accessories	
N	Screw end	page 82
B ₁ , B ₂	Bellows	page 91
CB, CA	Low cover, raised cover	page 94
SBC pull (push)	Safety nut for PULL (or PUSH) load	page 92
	Worm wheel rotation detector	page 92
SC	Trunnion mount	page 94
12	Other accessories	
example: encoder (with all relevant data)		page 93
13	Other specifications	
example: lubricant for low temperature		
14	Motor data	
15	Filled in selection sheet	page 97
16	Application layout	

Screw jacks with travelling ball nut (Mod.B)

UPWARD mounting ☐

☐ SBC ☐



PULL LOAD

PUSH LOAD

☐ SBC ☐

☐ SBC ☐

☐ N ☐

☐ B2 ☐

☐ B1 ☐

☐ CA ☐

☐ CB ☐

Vers. _____

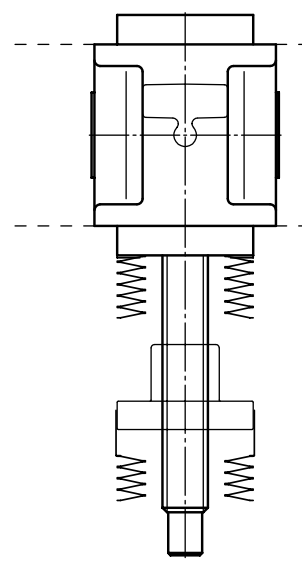
☐ CA ☐

UPWARD mounting ☐

DOWNWARD mounting ☐

☐ CA

Vers. _____



☐ CB

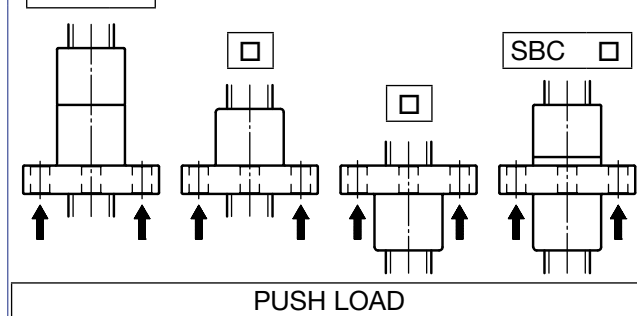
☐ CA

☐ B1

☐ B2

☐ N

☐ SBC ☐



PUSH LOAD

PULL LOAD

☐ SBC ☐

☐ SBC ☐

☐ SBC ☐

☐ SBC ☐

DOWNWARD mounting ☐

Screw jacks with travelling ball nut (Mod.B)

3.16 Ordering code

SJ BS Series Mod.B

SJ	50	BS 40 × 10	Mod.B	RL	Vers. 3 (80 B5)	U-RH	FF
1	2	3	4	5	6	7	8

C300	IT 5	SFN-D.40.10.5R	N B2 B1
9	10	11	12

Series
13

...
14

AC	3-phase	brake motor	0.75 kW	4-pole	230/400 V	50 Hz	IP 55	Ins. F
14								

1 SJ (screw jack SJ BS Series)

2 Screw jack size

5 ... 300

page 65, 66 - 67

3 Ball screw

BS diameter × lead

page 68 - 69

4 Mod.B (Model: travelling nut)

5 Worm gear ratio

page 66 - 67

6 Input version

Vers.1, Vers.2, Vers.3, Vers.4, Vers.5, Vers.6

page 9

7 Screw jack mounting and input shaft position

U-RH, U-LH, D-RH, D-LH, H-RH, H-LH

page 9

8 Gear box fixing holes

FF, FP

page 84, 86

9 Screw jack stroke length (ex.: C300 = 300 mm stroke)

10 Ball screw accuracy grade

IT 3 or 5: whirled ball screw

page 68

IT 7: rolled ball screw

page 69

11 Ball nut

Nut code

page 70 - 71

12 Accessories

N Screw end

page 84, 86

B₁, B₂ Bellows

page 91

SBC pull (push) Safety nut for PULL (or PUSH) load

page 92

SC Trunnion mount

page 95

Worm wheel rotation detector

page 92

13 Other accessories

example: encoder (with all relevant data)

page 93

14 Other specifications

example: lubricant for low temperature

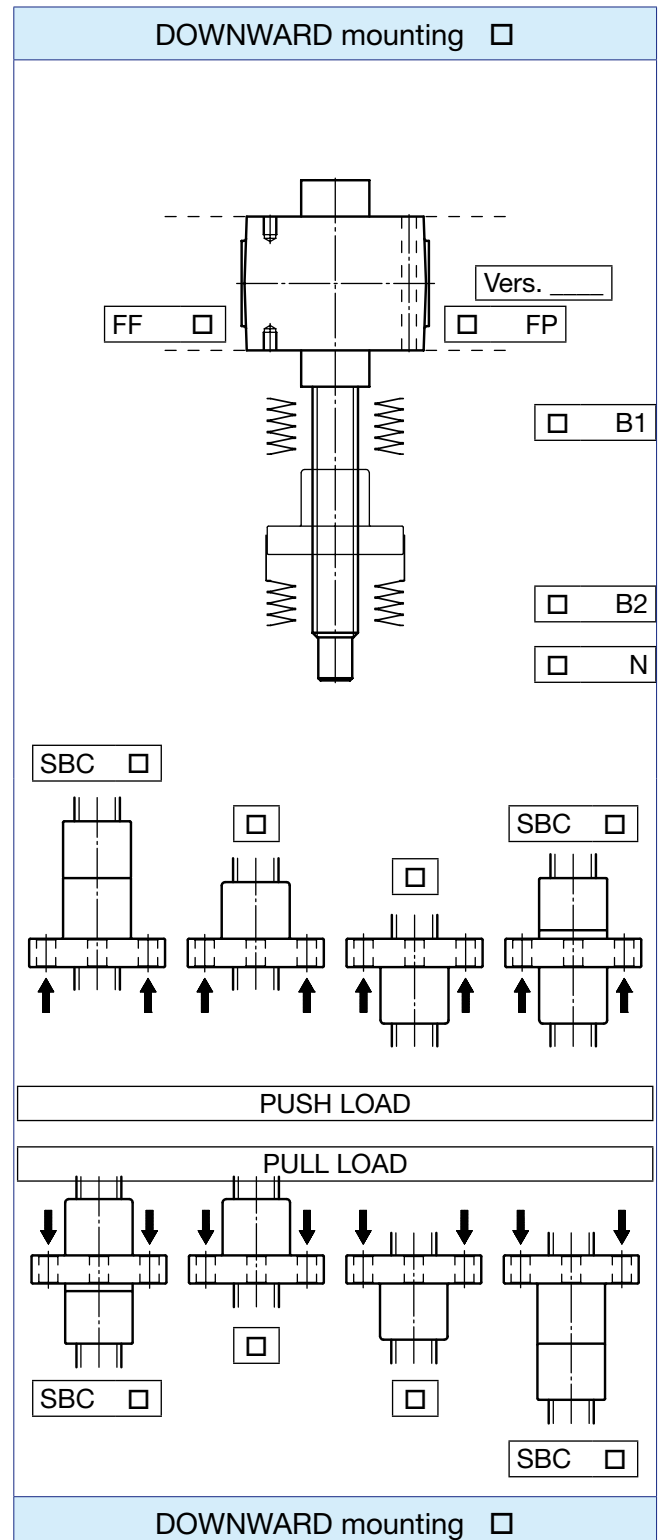
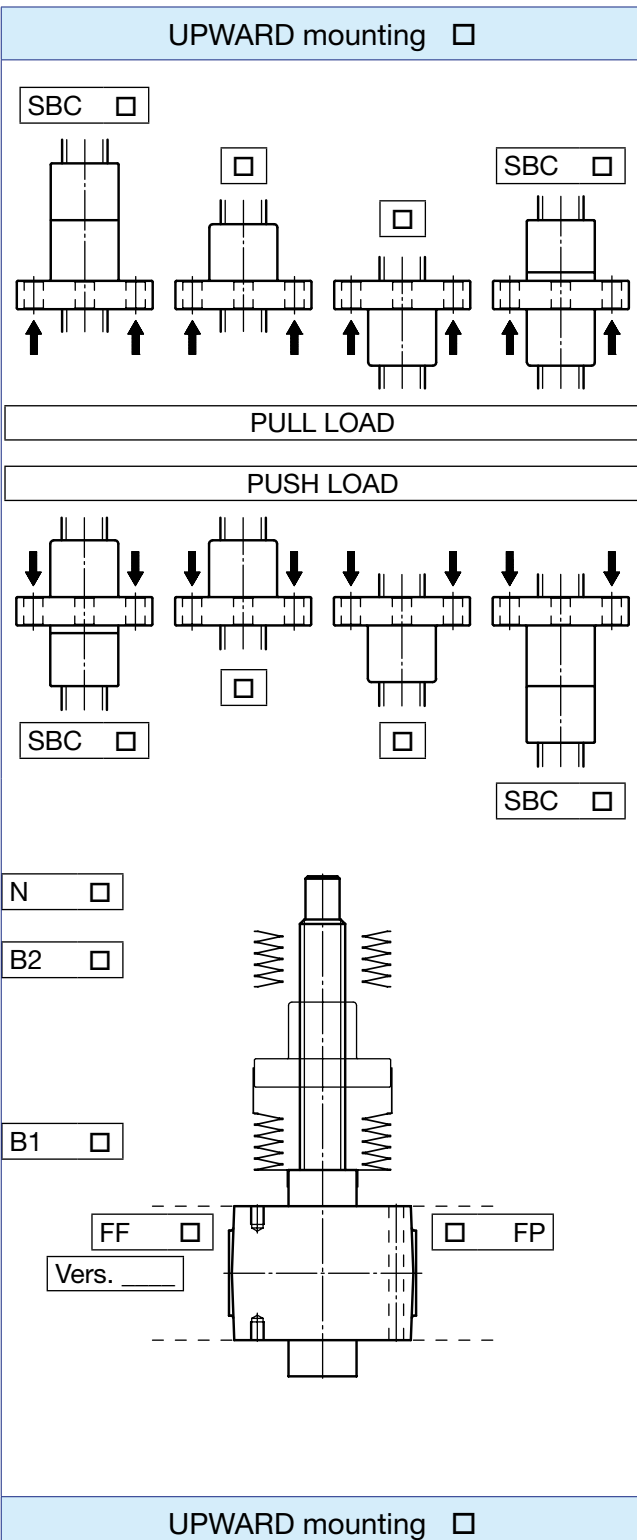
15 Motor data

16 Filled in selection sheet

page 99

17 Application layout

Screw jacks with travelling ball nut (Mod.B)



Screw jacks with travelling ball nut (Mod.B)

3.16 Ordering code

HS Series

HS	50	R2	BS 40 × 10	S	scheme 10	S 180°	U	lato B
1	2	3	4	5	6	7	8	9

C300	IT 5	SFN-D.40.10.5R	N B2 B1
10	11	12	13

...
14

...
15

AC	3-phase	brake motor	0.75 kW	4-pole	230/400 V	50 Hz	IP 55	Ins. F
16								

1 HS (screw jack HS Series)

2 Screw jack size

10 ... 200

page 65, 66 - 67

3 Worm gear ratio

R1, R1.5, R2, R3, R4

page 66 - 67

4 Ball screw

BS diameter × lead

page 68 - 69

5 Main input

S, R, MF, MA

page 10

6 Kinematics scheme

scheme 10, scheme 20

page 10

7 Additional output shaft (version and position)

S, R - 90°, 180°, 270°

page 11

8 Screw jack mounting position

U, D, H

page 11

9 Screw jack fixing side

side A - B - C - D - E - F

page 12

10 Screw jack stroke length (ex.: C300 = 300 mm stroke)

11 Ball screw accuracy grade

IT 3 or 5: whirled ball screw

IT 7: rolled ball screw

page 68

page 69

12 Ball nut

Nut code

page 70 - 71

13 Accessories

N Screw end

B₁, B₂ Bellows

SBC pull (push) Safety nut for PULL (or PUSH) load

page 88

page 91

page 92

14 Other accessories

example: encoder (with all relevant data)

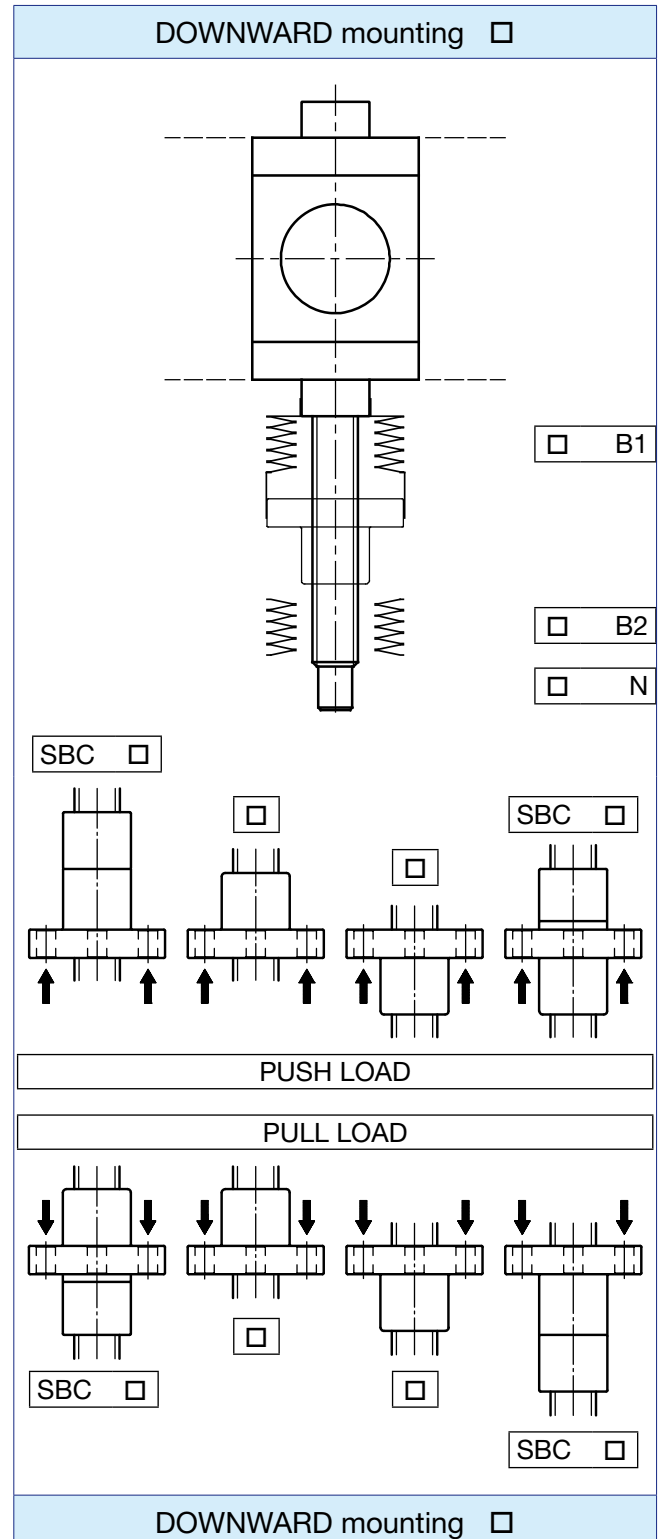
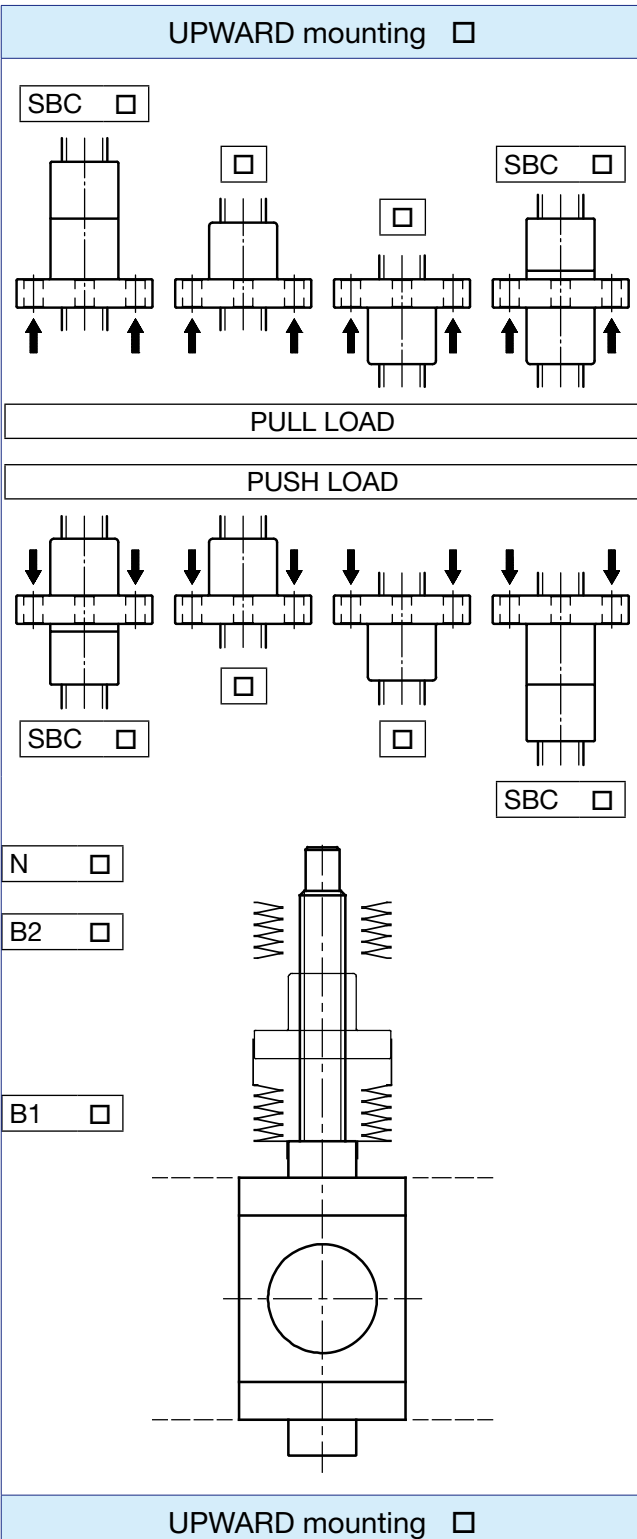
page 93

15 Other specifications

16 Motor data

17 Application layout

Screw jacks with travelling ball nut (Mod.B)



General information

4.1 Installation – Maintenance – Lubrication

Transport and handling

Screw jacks with mounted ball screw and all accessories can be often difficult to handle because of their overall dimensions. Therefore, it is recommended to handle the products with care during transport and handling to avoid damages on mechanical parts and/or fittings and also to prevent any risk for the personnel in charge of such operations. Screw jack supporting points should be previously identified and used during transport or to raise it by handling. In case of doubts, please contact SERVOMECH for support to prevent any possible damage!

Storage

During storage, screw jacks shall be protected against atmospheric agents thus to prevent dust or other contaminants to settle on ball screw and other moving parts.

In case of long storage periods, for example more than 6 months, it is necessary to move the input shafts to avoid damaging of the ring seals. Furthermore, keep all not painted parts properly lubricated to prevent oxidation.

Installation

The screw jack must be installed to work with push or pull axial load only, avoiding lateral and radial load. The correct perpendicularity between ball screw axis and screw jack fixing side shall be checked carefully. The installation of many screw jacks for synchronized lifting movement requires particular attention on two different factors:

- alignment of load support points: screw ends in case of travelling ball screw; bronze nut in case of travelling nut;
- use of connecting shafts and couplings with high torsional stiffness, to assure a perfect synchronism of all lifting points.

Commissioning and use

Before screw jack commissioning and activation, the following checks must be carried out:

- input shaft turning direction and related ball screw or nut linear motion direction;
- stroke end limit switches position cannot exceed the given limits;
- proper connection of the mechanical transmission and electric motor (rotating direction and motor supply voltage).

Lubrication and maintenance

SERVOMECH screw jacks are supplied with lubricant type and quantity as indicated in the lubricants table. For the proper lubrication of all screw jack components, please always specify in your order the screw jack mounting position.

Scheduled maintenance shall be carried out on screw jacks depending on the relevant use and environment conditions.

Ball nuts must be periodically greased every 1000 working hours, with lubricant quantity and type as stated in the table or an equivalent one. For this operation it is recommended to use the specific re-lubrication systems, consisting of grease nipples placed on the cover in case of screw jack Mod.A (travelling screw), or directly on the nut in case of Mod.B (travelling nut).

Worm gears are long-life lubricated. Additional lubrication can be done only in case of verified lubricant leakage. In such a case, use the lubricant type indicated in the table or an equivalent one.

For further information about installation and maintenance, please refer to screw jacks Use and Maintenance Manual.

General information

4.1 Installation – Maintenance – Lubrication

Lubricants for **screw jacks Model A (travelling screw)**:

SCREW JACK	GEARBOX		NUT	
MA 5 BS	grease: AGIP Grease SLL 00	0.07 kg	grease: LUBCON Thermoplex ALN 1001	10 g
MA 10 BS		0.14 kg		15 g
MA 25 BS	oil: AGIP BLASIA S 220	0.35 litre		25 g
MA 50 BS		0.75 litre		50 g
MA 100 BS		1.5 litre		200 g
MA 150 BS		1.5 litre		200 g
MA 200 BS		2.3 litre		250 g
MA 350 BS		4 litre		400 g

Lubricants for screw jacks Model B (travelling nut):

SCREW JACK	GEARBOX		NUT
MA 5 BS	grease: AGIP Grease SLL 00	0.07 kg	grease: LUBCON Thermoplex ALN 1001 ⁽¹⁾
MA 10 BS		0.14 kg	
MA 25 BS	oil: AGIP BLASIA S 220	0.35 litre	
MA 50 BS		0.75 litre	
MA 80 BS		0.75 litre	
MA 150 BS		1.5 litre	
MA 200 BS		2.3 litre	
MA 350 BS		4 litre	
SJ 5 BS	grease: AGIP Grease SM2	0.07 kg	
SJ 10 BS		0.14 kg	
SJ 25 BS		0.23 kg	
SJ 50 BS	grease: AGIP Grease SLL 00	0.6 kg	
SJ 100 BS		0.5 kg	
SJ 150 BS		1.5 kg	
SJ 200 BS		2 kg	
SJ 250 BS		2 kg	
SJ 300 BS		2 kg	
SJ 400 BS		3 kg	
HS 10	oil: AGIP BLASIA S 220	0.22 litre	
HS 25		0.45 litre	
HS 50		0.55 litre	
HS 100		1.1 litre	
HS 150		2.8 litre	
HS 200		5.5 litre	

⁽¹⁾ - for the lubricant quantity necessary for each type of nut, please refer to the table on page 104

General information

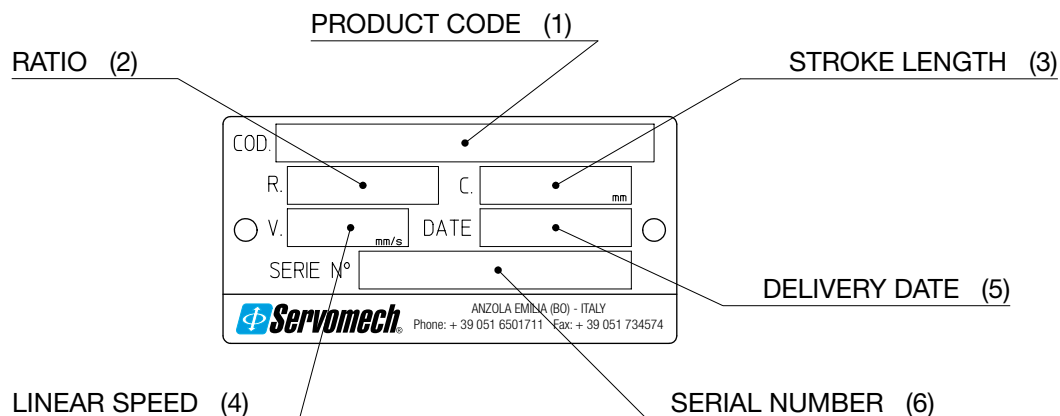
4.1 Installation – Maintenance – Lubrication

Lubricants for **nuts of screw jacks Model B (travelling nut)**:

Ball screw $BS\ d_o \times P_h$	Nut code	number of circuits i	Lubricant quantity	
			mass [g]	volume [cm ³]
BS 16 × 5	SFN-_.16.05.3R	3	2	
BS 16 × 10	SFN-_.16.10.3R	3	2	
BS 16 × 16	SFN-_.16.16.2R-2	2	1	
BS 20 × 5	SFN-_.20.05.3R	3	2	
	SFN-_.20.05.5R	5	3	
BS 20 × 10	SFN-_.20.10.3R	3	3	
BS 20 × 20	SFN-_.20.20.2R-2	2	2	
BS 25 × 5	SFN-_.25.05.3R	3	3	
BS 25 × 10	SFN-_.25.10.3R	3	4	
BS 25 × 25	SFN-_.25.25.2R-2	2	2	
BS 32 × 5	SFN-_.32.05.4R	4	4	
BS 32 × 10	SFN-_.32.10.3R	3	11	
	SFN-_.32.10.4R	4	12	
	SFN-_.32.10.5R	5	13	
BS 32 × 20	SFN-_.32.20.3R	3	12	
BS 32 × 32	SFN-_.32.32.2R-2	2	6	
BS 40 × 10	SFN-_.40.10.5R	5	17	
BS 40 × 20	SFN-_.40.20.3R	3	16	
BS 40 × 40	SFN-_.40.40.2R-2	2	9	
BS 50 × 10	SFN-_.50.10.5R	5	26	
BS 50 × 20	SFN-_.50.20.4R	4	27	
BS 63 × 10	SFN-_.63.10.5R	5	34	
BS 63 × 20	SFN-_.63.20.4R	4	60	
BS 80 × 10	SFN-_.80.10.6R	6	48	
BS 80 × 16	SFN-_.80.16.5R	5	81	
BS 80 × 20	SFN-_.80.20.5R-F	5	56	
BS 80 × 20	SFN-_.80.20.4R	4	115	
BS 100 × 16	SFN-_.100.16.5R	5	110	
BS 100 × 20	SFN-_.100.20.5R	5	170	
BS 120 × 20	SFN-_.120.20.7R	7	370	

4.2 Product label

Every SERVOMECH screw jack is provided with a nameplate, as shown below, which allows the unit identification and gives technical information about the product.



- 1) **Product code:** is an alphanumeric code stating the series, size, ratio, version and stroke limit device of the screw jack;
- 2) **Ratio:** is the ratio of the worm gear;
- 3) **Stroke length:** is the stroke length in millimetres achievable by the actuator;
- 4) **Linear speed:** is the linear speed in mm/sec for screw jacks supplied with an electric motor; if the motor is not supplied, this field is blank;
- 5) **Delivery date:** is the assembly date, expressed in week/year (ex.: 37/13 = week 37 / year 2013) which usually is also the delivery date; this date is considered as warranty reference;
- 6) **Serial number:** is the number referred to the unit and assures the exact identification of the product, even after a long time; it must be given as reference when ordering spare parts for the unit.

Company: _____

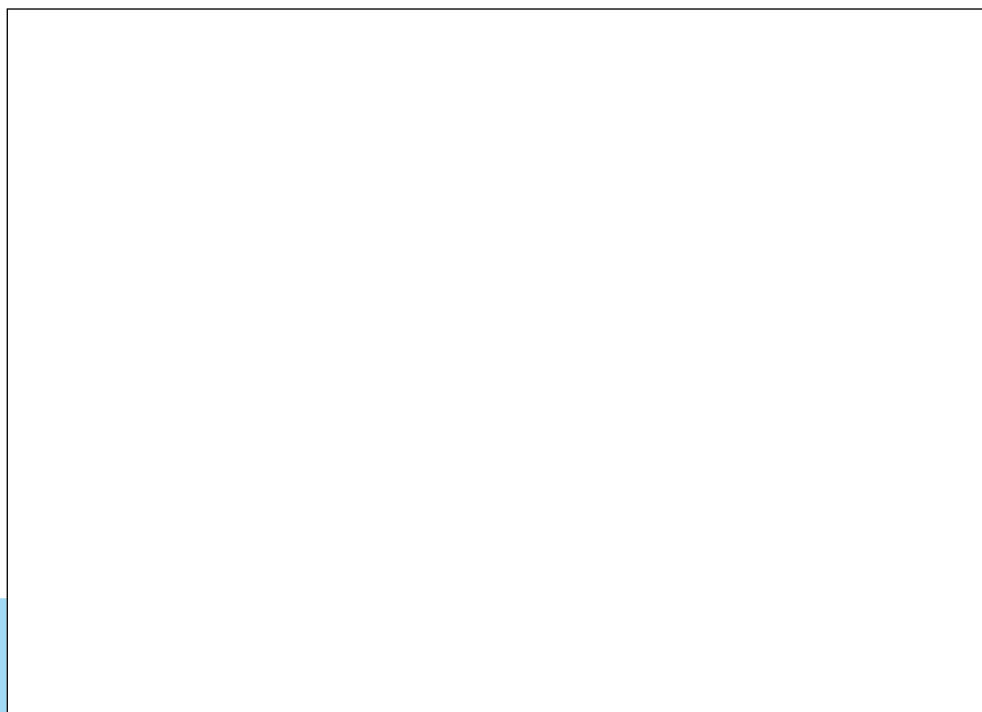
Address: _____

Contact person: _____ Position: _____

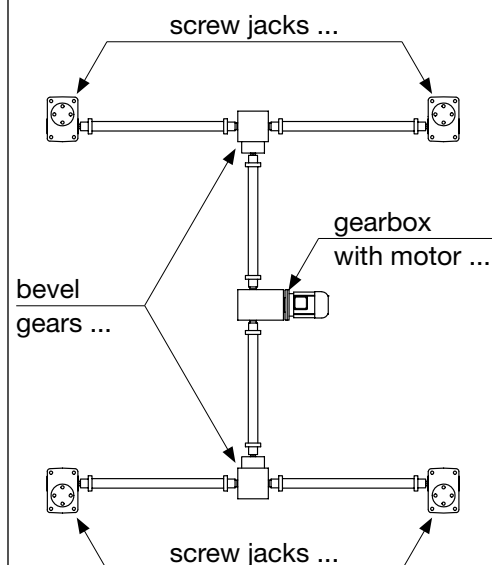
Telephone: _____ Fax: _____ E-mail: _____

APPLICATION: _____

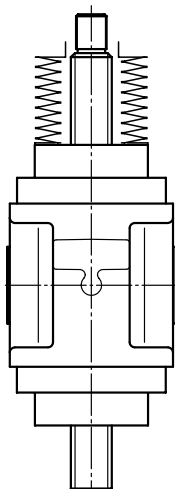
SKETCH - APPLICATION LAYOUT – plane view



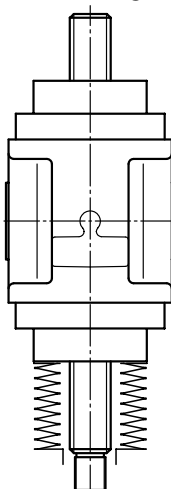
Example



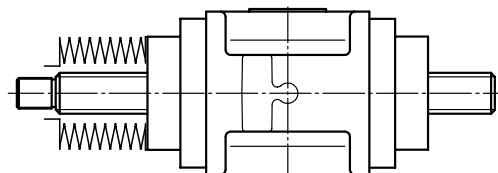
Side view of a single screw jack



□ UPWARD MOUNTING



□ DOWNWARD MOUNTING



□ HORIZONTAL MOUNTING

NUMBER OF SCREW JACKS PER APPLICATION: _____

STROKE REQUIRED: _____ mm ACME SCREW LENGTH: _____ mm

TOTAL STATIC LOAD FOR APPLICATION: PULL: _____ daN PUSH: _____ daN

MAX. STATIC LOAD FOR **SINGLE SCREW JACK**: PULL: _____ daN PUSH: _____ daN at STROKE _____ mm

SCREW JACK MOUNTING:

- ☐ Euler I (screw jack housing firmly fixed to the base – free travelling acme screw end)
- ☐ Euler II (screw jack housing and travelling acme screw end fixed to pivoting supports)
- ☐ Euler III (screw jack housing firmly fixed to the base – guided travelling acme screw end)

SCREW JACK ☐ SUBJECTED TO VIBRATIONS ☐ NOT SUBJECTED TO VIBRATIONS

TOTAL DYNAMIC LOAD FOR APPLICATION: PULL: _____ daN PUSH: _____ daN

MAX. DYNAMIC LOAD FOR **SINGLE SCREW JACK**: PULL: _____ daN PUSH: _____ daN at STROKE _____ mm

LINEAR SPEED REQUIRED: _____ mm/s _____ mm/min _____ m/min SINGLE STROKE PERFORMING TIME: ____ s

DUTY CYCLE: _____ cycles / hour _____ working hours / day Notes: _____

LIFETIME REQUIRED: _____ cycles _____ clock hours _____ calendar days Notes: _____

ENVIRONMENT: TEMPERATURE _____ °C ☐ DUST HUMIDITY ____ % POLLUTER _____

☐ Flange end

☐ Threaded end

☐ Rod end

☐ Bellows

☐ Guides

☐ Protective tube

☐ Stop nut

☐ Anti-turn device

☐ Stroke end switches

☐ Safety nut

Suggestions based on previous experiences of similar application: _____

Notes: _____

Number of screw jacks required: _____

Company: _____

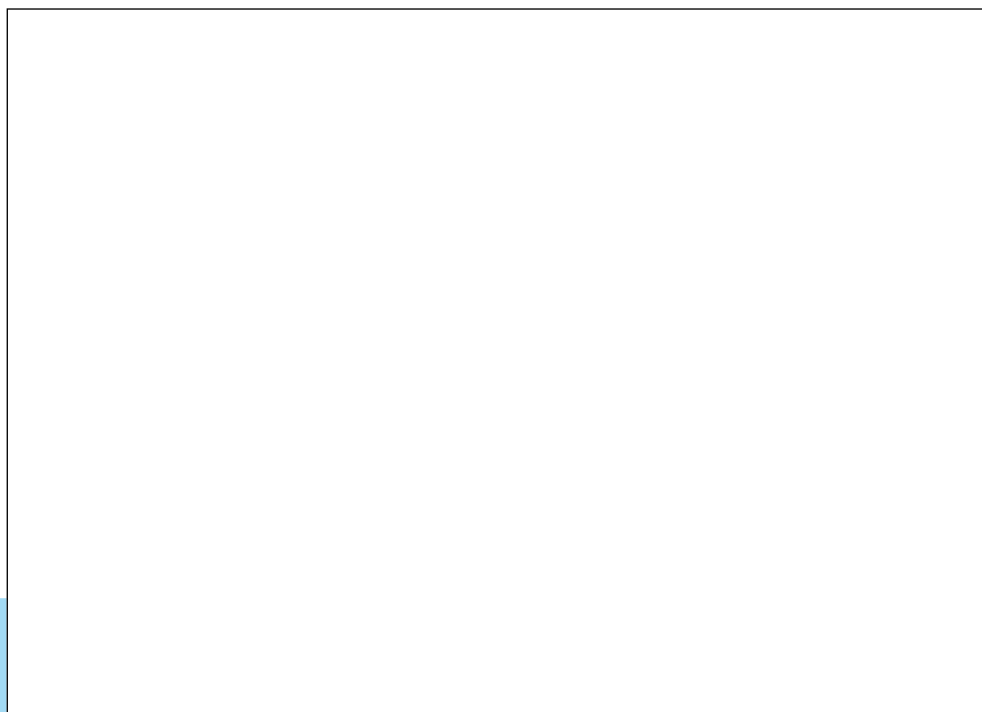
Address: _____

Contact person: _____ Position: _____

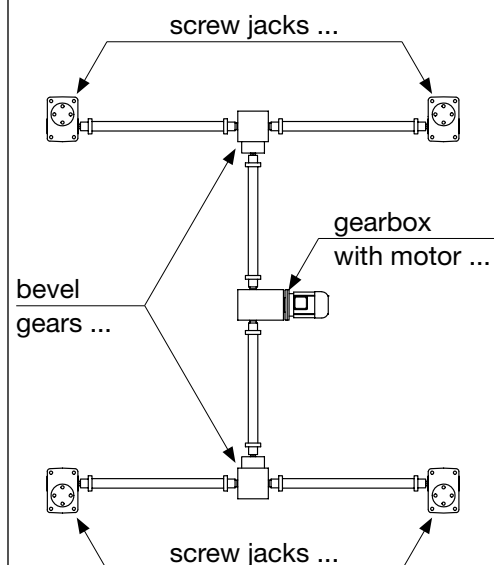
Telephone: _____ Fax: _____ E-mail: _____

APPLICATION: _____

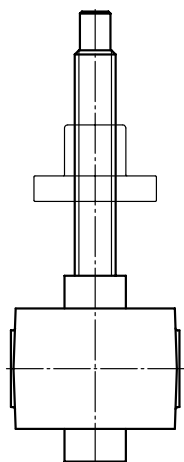
SKETCH - APPLICATION LAYOUT – plane view



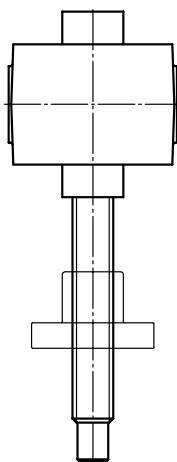
Example



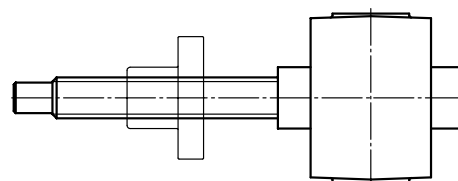
Side view of a single screw jack



☐ UPWARD MOUNTING



☐ DOWNWARD MOUNTING



☐ HORIZONTAL MOUNTING

NUMBER OF SCREW JACKS PER APPLICATION: _____

STROKE REQUIRED: _____ mm ACME SCREW LENGTH: _____ mm

TOTAL STATIC LOAD FOR APPLICATION: PULL: _____ daN PUSH: _____ daN

MAX. STATIC LOAD FOR **SINGLE SCREW JACK**: PULL: _____ daN PUSH: _____ daN at STROKE _____ mm

SCREW JACK MOUNTING:

- ☐ Euler I (screw jack housing firmly fixed to the base – free travelling nut)
- ☐ Euler II (screw jack housing and travelling nut fixed to pivoting supports)
- ☐ Euler III (screw jack housing firmly fixed to the base – guided travelling nut)

SCREW JACK ☐ SUBJECTED TO VIBRATIONS ☐ NOT SUBJECTED TO VIBRATIONS

TOTAL DYNAMIC LOAD FOR APPLICATION: PULL: _____ daN PUSH: _____ daN

MAX. DYNAMIC LOAD FOR **SINGLE SCREW JACK**: PULL: _____ daN PUSH: _____ daN at STROKE _____ mm

LINEAR SPEED REQUIRED: _____ mm/s _____ mm/min _____ m/min SINGLE STROKE PERFORMING TIME: ____ s

DUTY CYCLE: _____ cycles / hour _____ working hours / day Notes: _____

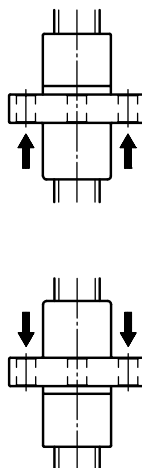
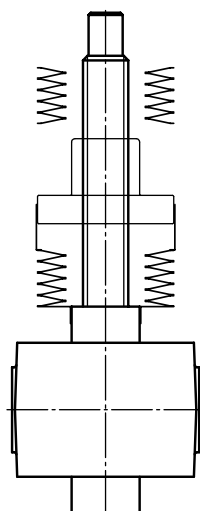
LIFETIME REQUIRED: _____ cycles _____ clock hours _____ calendar days Notes: _____

ENVIRONMENT: TEMPERATURE _____ °C ☐ DUST HUMIDITY ____ % POLLUTER _____

☐ Cylindrical end

☐ Bellows

☐ Bellows



☐ Safety nut

Suggestions based on previous experiences of similar application: _____

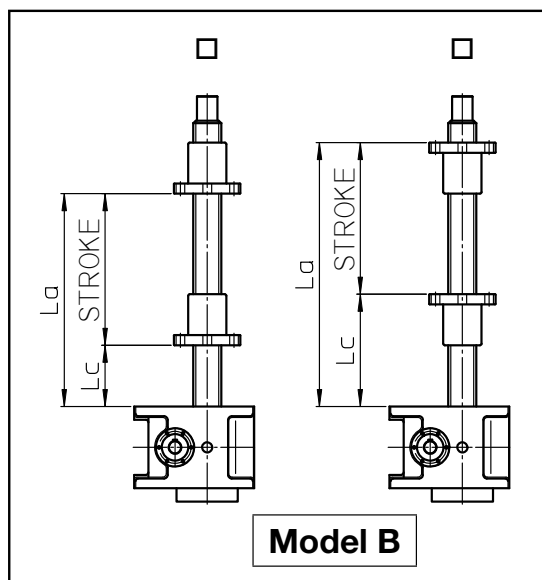
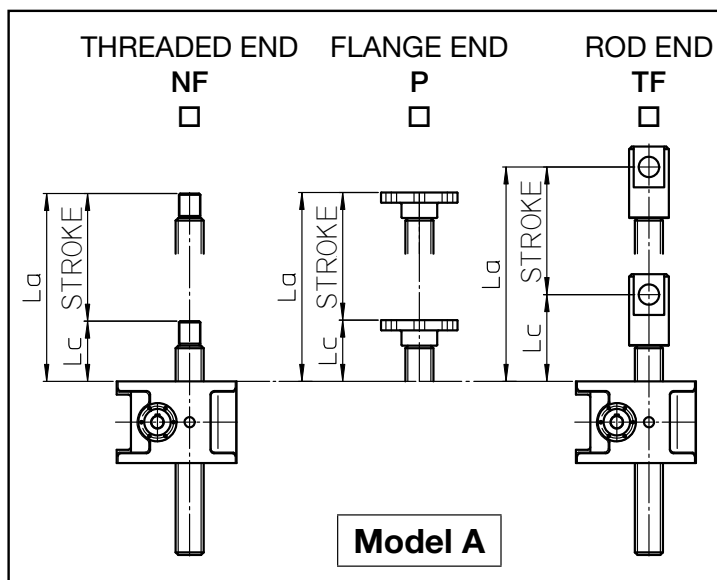
Notes: _____

Number of screw jacks required: _____

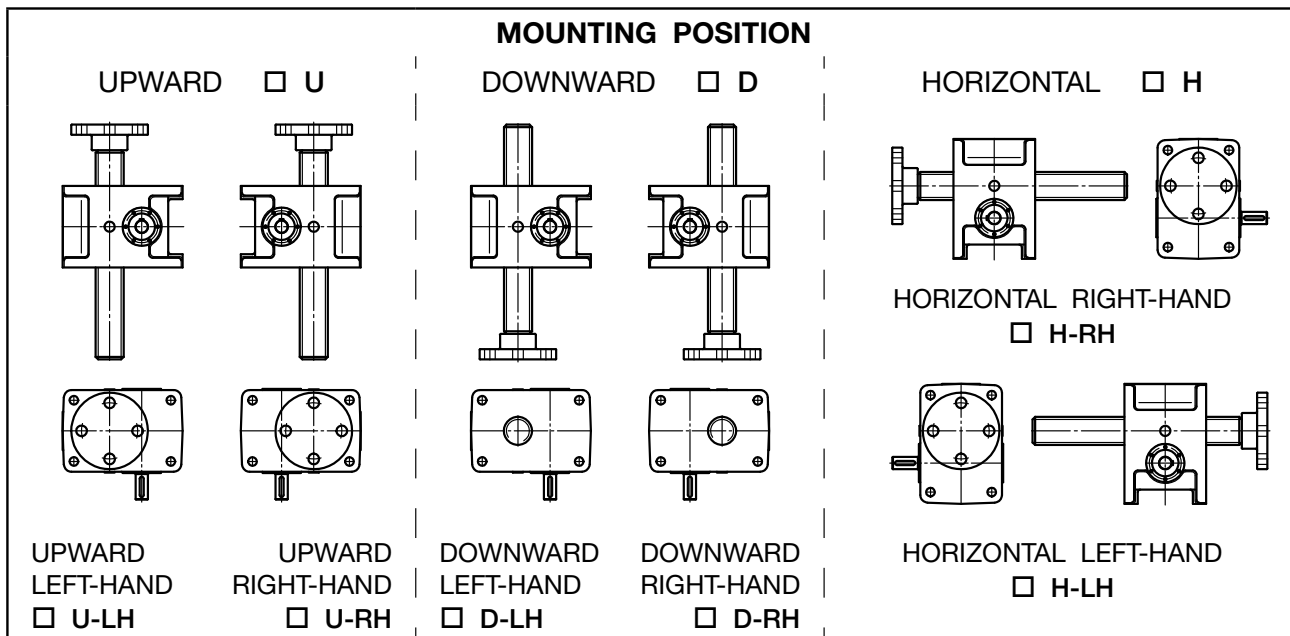
PRODUCT: _____

STROKE: _____ ACME SCREW: _____ BALL SCREW: _____

ACCESSORIES: _____


SAFETY NUT

 Model A: ☐ MSA

 Model B: ☐ SBC

SCREW JACKS MAIN DIMENSIONS

 RETRACTED JACK LENGTH: $L_c =$ _____ mm

 EXTENDED JACK LENGTH: $L_a =$ _____ mm

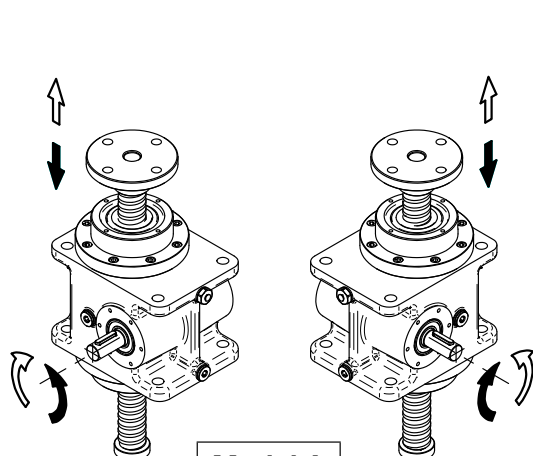
 MAX. WORKING STROKE ($L_a - L_c$): $C =$ _____ mm

PASSED

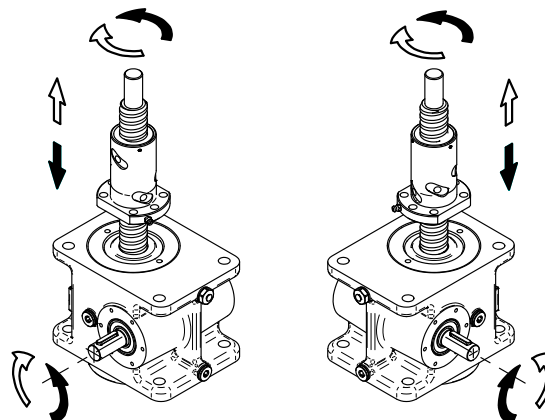
Date: _____

Signature: _____

INPUT SHAFT ROTATION - SCREW OR NUT LIFTING DIRECTION



Model A



Model B

WARNING!

1. The values L_c (retracted jack length), L_a (extended jack length) and C (max. working stroke) are the extreme permissible values.
2. For a correct installation and commissioning of the screw jack see the Installation, Use and Maintenance Manual.
3. The following operations must be done **BEFORE** commissioning:
 - ensure that the breather plug is in the highest position respect to all other plugs;
 - lubricate acme or ball screw - nut;
 - connect the stroke limit device to the electric control circuit of the screw jack or lifting system;
 - check the lifting direction of the acme or ball screw (Model A) or nut (Model B).

NOTE: _____

WORMGEAR LUBRICANT: _____

SCREW - NUT LUBRICANT: _____

SERVOMECH s.p.a.
 Via Monaldo Calari, 1 40011 Anzola Emilia (BOLOGNA) ITALY
 Phone: + 39 051 6501711 Fax: + 39 051 734574 e-mail: info@servomech.it

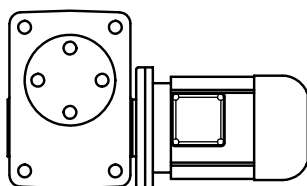
General information

4.6 Lifting systems

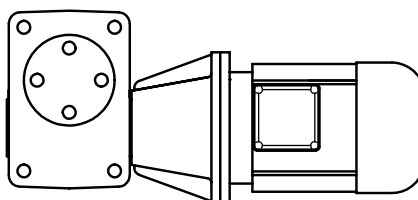
SERVOMECH can support customers by selecting the complete drive solution for screw jack systems:

- screw jack with flange for motor mounting or with input shaft
- AC 3-phase or 1-phase electric motor, DC electric motors, servomotors
- inverter drives
- screw jacks with control of axial position and linear speed
- bevel gears
- connecting transmission shafts and couplings
- general technical support for:
 - screw jack selection
 - life estimation and calculation
 - lay-out system drawings

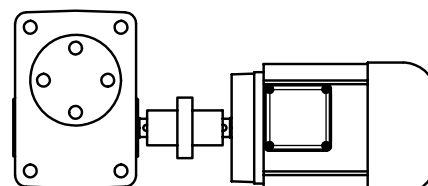
Motor-driven screw jacks (all series)



Screw jack
with plug-in
IEC flange and hollow input shaft



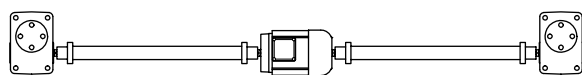
Screw jack
with IEC bell-housing and coupling



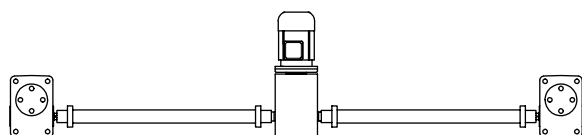
Screw jack with single input shaft
coupling
IEC B3 motor

Screw jacks MA BS Series and SJ BS Series

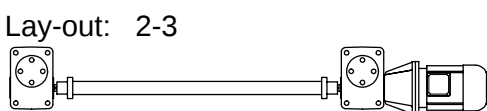
LAY-OUT: 2 points lifting system



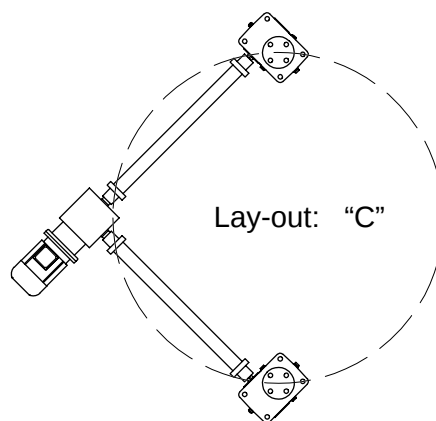
Lay-out: 2-1



Lay-out: 2-2



Lay-out: 2-3

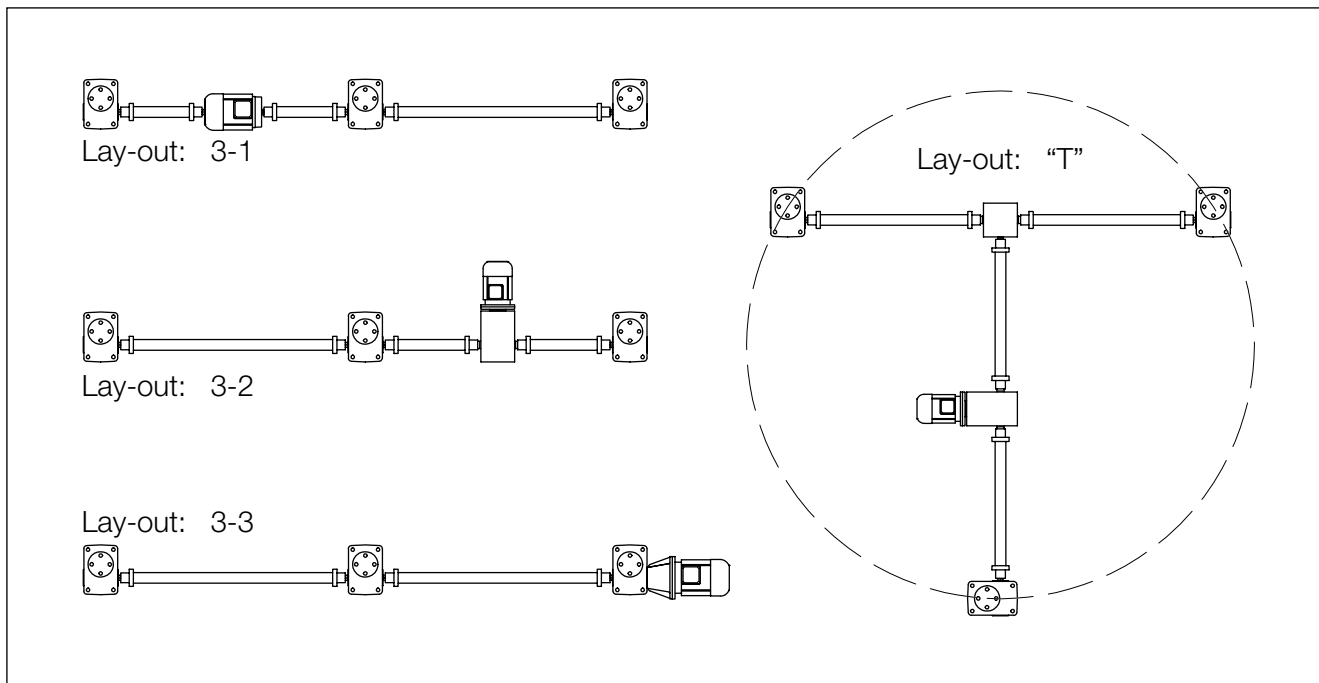


Lay-out: "C"

4.6 Lifting systems

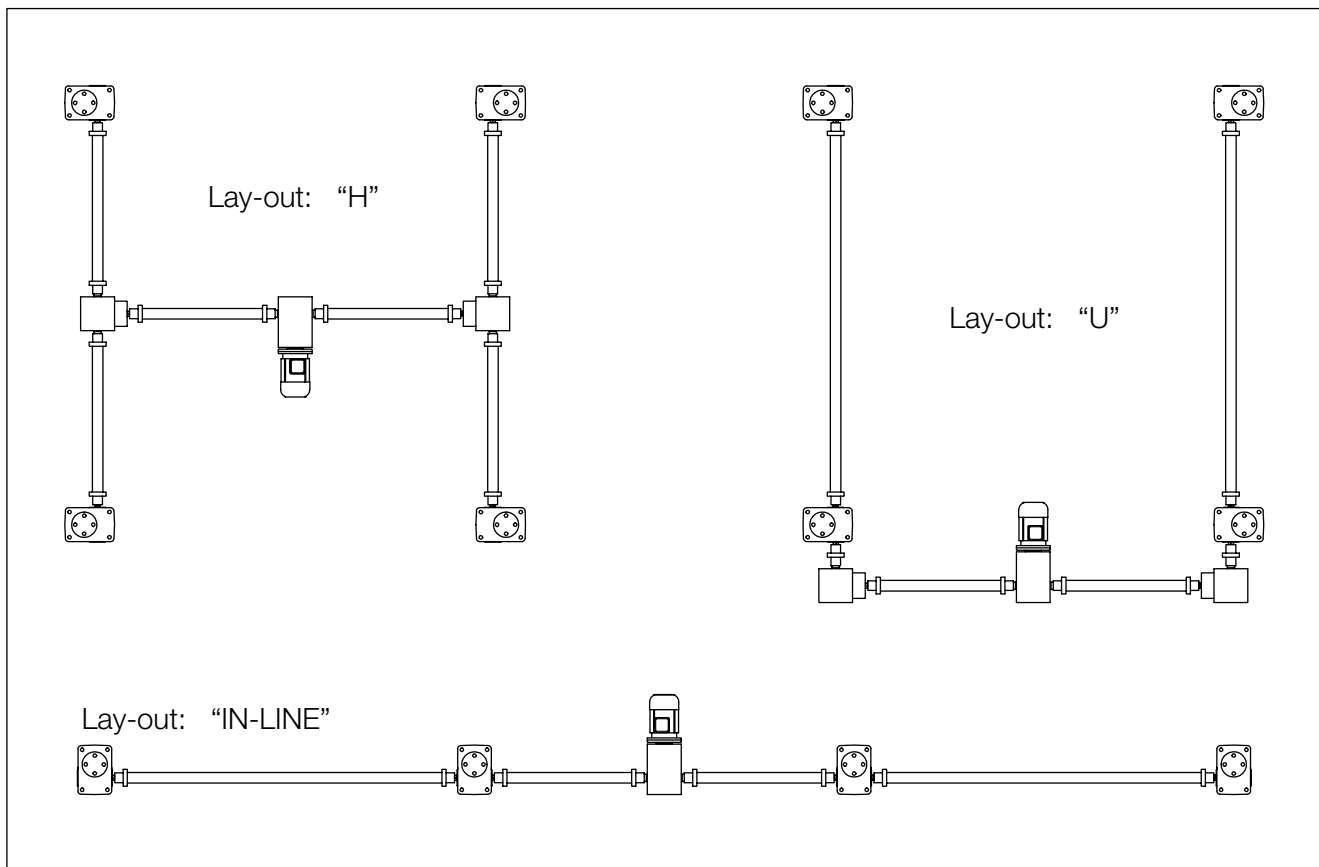
Screw jacks MA BS Series and SJ BS Series

LAY-OUT: 3 points lifting system



Screw jacks MA BS Series and SJ BS Series

LAY-OUT: 4 points lifting system

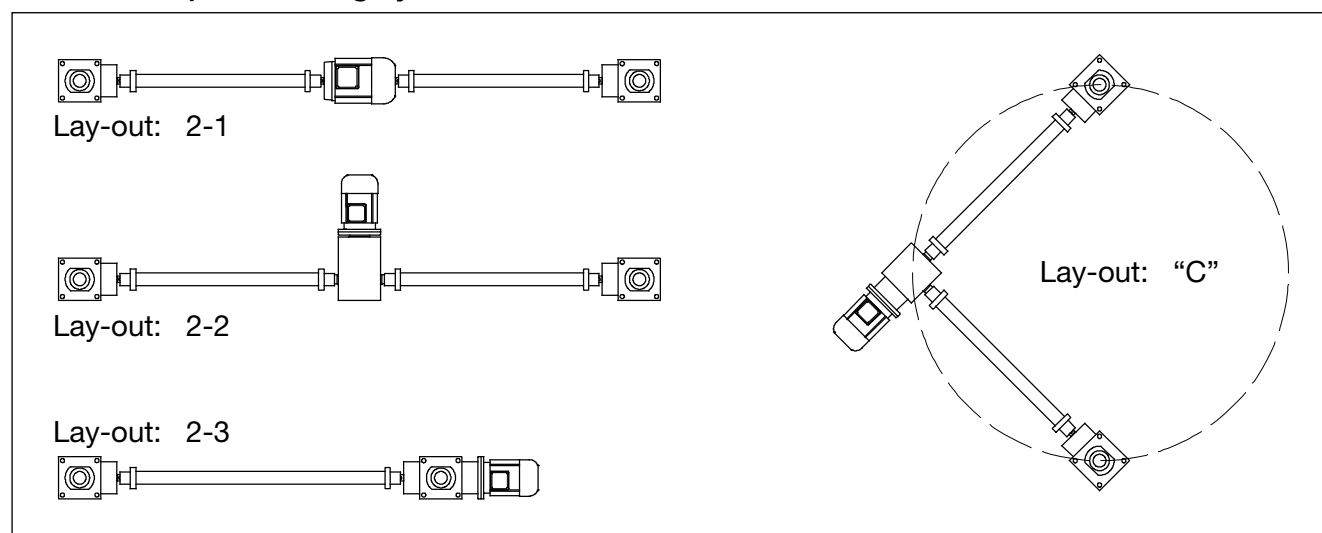


General information

4.6 Lifting systems

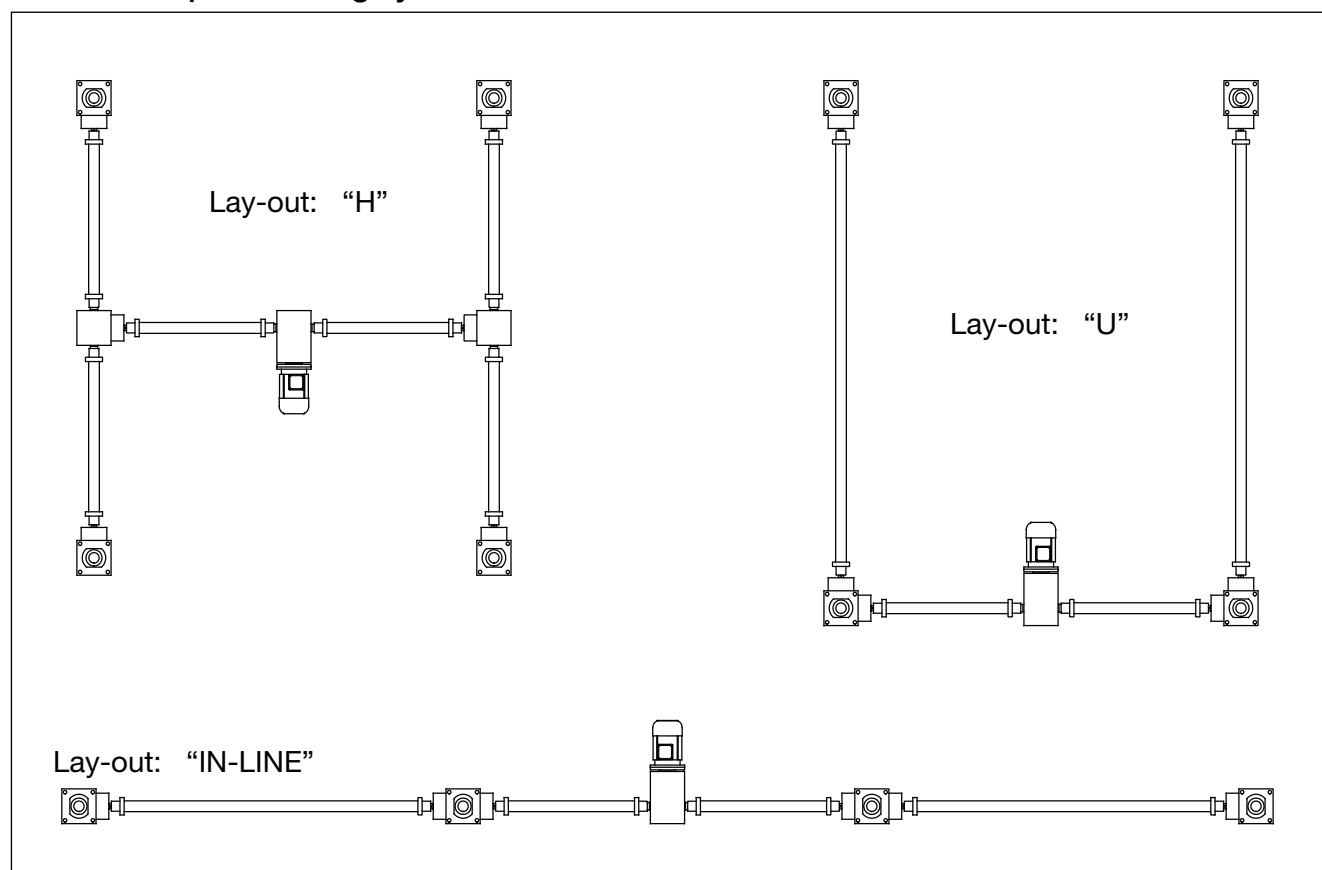
Screw jacks HS Series

LAY-OUT: 2 points lifting system



Screw jacks HS Series

LAY-OUT: 4 points lifting system



Linearmech Brushless Servomotors

Ball screw jacks can be equipped with Linearmech Brushless Servomotors BM Series. These servomotors are produced according to the latest state-of-the-art technology to improve the specific torque and its linear erogation.

The high efficiency servomotors BM Series are made using “**Segmented Lamination Stator Technology**”. This technology can pack higher torque and power density into the same-sized motor. It also allows the highest slot fill of the stator winding and the motor to run cooler, potentially extending its operational life.

Brushless servomotors BM Series have been designed for continuous working with natural convection cooling, without external cooling devices. The heat is mainly generated in the stator winding and it is dissipated through the motor external body thanks to the excellent mechanical and thermal coupling between these two parts.



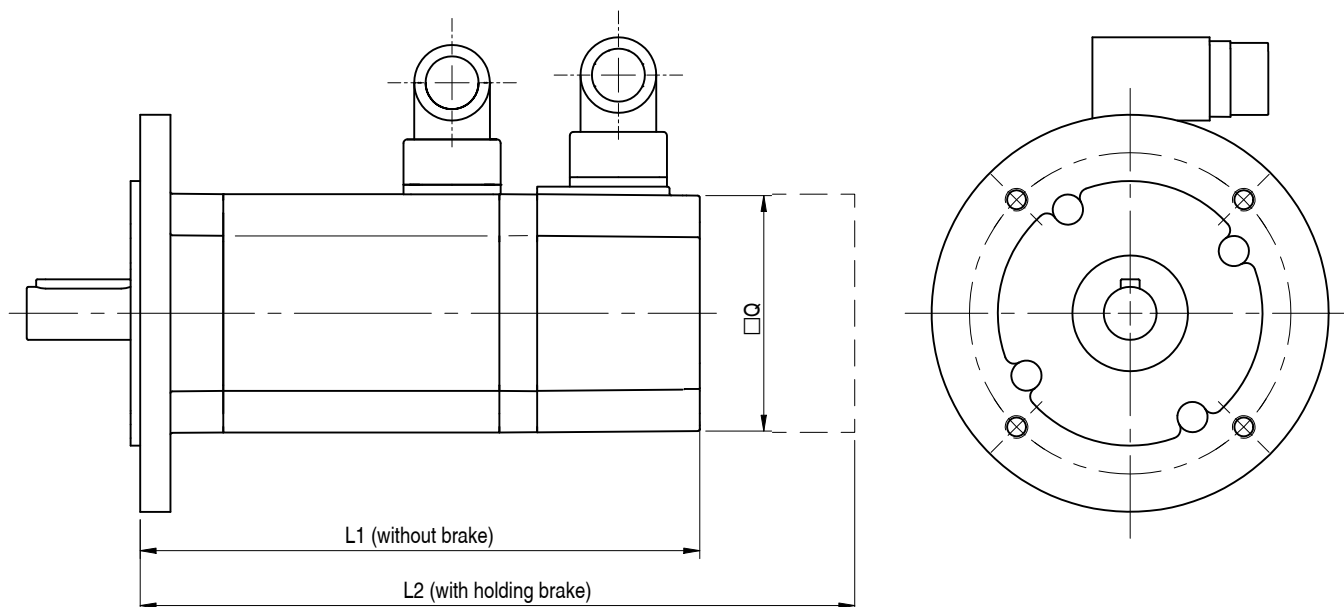
5.1 General data

Motor type:	brushless with sinusoidal back-EMF (synchronous, permanent magnets)
Cooling:	natural convection
Mounting:	IM B5
Magnets material:	NeFeB
Insulation class:	F (overheating on windings 100 K with ambient temperature 40°C and safety margin 15°C)
Protection:	motore body IP 54 motore shaft IP 44 standard, IP 54 with lubricant seal
Operating temperature:	(0 ... + 40)°C
Ambient storage temperature:	(- 10 ... + 60)°C
Humidity:	max. 85 % without condensation
Operating altitude:	< 1000 m ASL (for higher altitude a degrading factor must be applied)
Thermal protection:	optional: PTC, PTO or KTY
Motor feedback:	optical encoder, LINE-DRIVER, 2000 ppr (standard) resolver, 1 pole pairs 7 V rms, 10 kHz (optional) BISS absolute multiturn encoder (optional)
Holding brake:	optional, 24 V dc power supply
Balance quality grade:	G 2.5 (standard) according to IEC 1940-1
Reference standards:	IEC 60034-1, IEC 60034-5, IEC 60034-6, IEC 60034-7, IEC 60034-11, ISO 1940-1
Marked:	CE

Linearmech Brushless Servomotors

5.2 Dimensions

Linearmech servomotors are available with metric flange dimensions according to IEC 34-7, UNEL 05513 regulations (IEC B14 motor flange and input shaft with key).



Servomotor	IEC Interface	Continuous rated torque [Nm]	Stall torque [Nm]	Peak torque [Nm]	□ Q [mm]	L1 [mm]	L2 [mm]
BM 45 L IEC	56 B14	0.32	0.35	1.05	45	122	156
BM 63 S IEC	63 B14	0.6	0.7	2.1	63	123	164
BM 63 L IEC	71 B14	1.3	1.35	4.2	63	148	189
BM 82 S IEC	80 B14	1.3	1.5	4.5	82	134	192
BM 82 L IEC	80 B14	2.5	2.9	9	82	159	217
BM 102 S IEC	90 B14	4.1	5.2	15	102	176	230
BM 102 L6 IEC	90 B14	6.4	7.3	22	102	226	280
BM 102 L8 IEC	90 B14	6.7	9	30	102	226	280

NOTE: more informations about Servomotors and drives see “Brushless Servomotors” catalogue by Linearmech.

Linearmech Brushless Servomotors

5.3 Terms and Definitions

Term	Symbol	Unit of measure	Definition
MOTOR			
Continuous rated torque	$T_{nom, 100K}$	Nm	Torque supplied by the motor for an unlimited period of time, at nominal speed (in thermal balance condition), without exceeding the thermal limits of the relevant insulation class.
Stall torque	$T_{0, 100K}$	Nm	Torque supplied by the motor for an unlimited period of time, with blocked rotor (in thermal balance condition), without exceeding the thermal limits of the relevant insulation class.
Peak torque	T_p	Nm	Torque generated at max. current (peak). The max. torque is possible for short periods of time to have a dynamic system behaviour (abrupt variations of the operating condition). Exceeding this value causes the irreversible demagnetization of the rotor magnetic group.
Rated speed	n_{nom}	rpm	Speed performed by the motor for an unlimited period of time, without exceeding the thermal limits of the relevant insulation class, with torque as defined in the TORQUE - SPEED curve shown in the motor specific diagram.
Max. speed	n_{max}	rpm	Max. permissible rotating speed. It depends on centrifugal force of rotating masses, rotor balance grade and bearings.
Stall current	$I_{0, 100K}$	A	Current (RMS value) phase - phase supplied to the motor in order to generate the torque in conditions of blocked rotor (stall).
Peak current	I_p	A	Current (RMS value) phase - phase supplied to the motor in order to generate the max. torque (peak). This current is limited by the motor magnetic circuit: exceeding this value even for a short time causes the irreversible demagnetization of the magnets.
Voltage constant	k_E	V/1000 rpm	Voltage (RMS value) phase - phase produced by operating motor at 1 000 rpm, at 20°C ambient temperature, with average windings temperature increment of 20 K.
Torque constant	k_T	Nm/A	Ratio between torque with blocked rotor and current with blocked rotor ($T_{0, 100K} / I_{0, 100K}$), with windings temperature increment of 100 K (insulation class F).
Thermal time constant	t_{th}	min	Time necessary to heat the cold motor up to a temperature increase of 0.63×100 K, with load $I_{0, 100K}$.
Winding resistance	R_{ph}	Ω	Electric resistance of phase - phase windings connected in Y circuit, at 20°C ambient temperature.
Winding inductance	L_D	mH	Inductance of phase - phase windings connected in Y circuit.
Electric time constant	t_{el}	ms	Ratio between winding inductance and winding resistance (L_D / R_{ph}).
Moment of inertia (without brake)	J_{motor}	$kg \times m^2$	Moment of inertia of motor rotating elements.
Moment of inertia (with brake)	$J_{motor BR}$	$kg \times m^2$	Moment of inertia of motor and brake rotating elements.
Permissible radial load on motor shaft	F_R	N	Constant load radially applied on the centre of the motor shaft, at 3 000 rpm, for nominal bearing service life of 10 000 h.
Permissible axial load on motor shaft	F_N	N	Constant load axially applied on the motor shaft, at 3 000 rpm for nominal bearing service life of 10 000 h.
BRAKE			
Supply voltage	U_{BR}	V	Voltage supplied to the brake excitation coil to release the brake.
Brake power	P_{BR}	W	Power consumption of the brake excitation coil.
Rated braking torque	T_{BR}	Nm	Holding braking torque (it cannot be used to stop the motor).
Brake disengagement delay time	t_{-BR}	ms	Reacting time from the moment the rated power supply voltage is applied until the brake is completely disengaged.
Brake engagement delay time	t_{BR}	ms	Reacting time from the moment the brake power supply is interrupted until the rated braking torque T_{BR} is reached.

NOTE: more informations about Servomotors and drives see “Brushless Servomotors” catalogue by Linearmech.

Linearmech Brushless Servomotors

5.4 Technical Data

Servomotor size			BM 45 L IEC		
Drive rated voltage	U_{nom}	[V]	24 V dc	48 V dc	230 V dc
Stall torque	$T_{0, 100K}$	[Nm]	0.35		
Continuous rated torque	$T_{nom, 100K}$	[Nm]	0.32		
Peak torque	T_p	[Nm]	1.05		
Rated speed	n_{nom}	[rpm]	3000		
Max. speed	n_{max}	[rpm]	4000		
Number of poles			8		
Stall current	$I_{0, 100K}$	[A]	7.4 ⁽¹⁾	3.8 ⁽¹⁾	1.25
Peak current	I_p	[A]	24.4 ⁽¹⁾	12.5 ⁽¹⁾	3.95
Voltage constant	k_E	[V/1000 rpm]	5 ⁽¹⁾	8.9 ⁽¹⁾	17.2
Torque constant	k_T	[Nm/A]	0.047 ⁽¹⁾	0.09 ⁽¹⁾	0.28
Thermal time constant	t_{th}	[min]	12		
Winding resistance	R_{ph}	[Ω]	0.38	1.4	9.7
Winding inductance	L_D	[mH]	0.69	2.4	16.7
Electric time constant	t_{el}	[ms]	1.8	1.7	1.7
Moment of inertia (without brake)	J_{motor}	[kg × m ²]	0.091×10^{-4}		
Moment of inertia (with brake)	$J_{motor BR}$	[kg × m ²]	0.092×10^{-4}		
Rated braking torque	T_{BR}	[Nm]	0.8		
Brake supply voltage	U_{BR}	[V]	$24^{+5\%}_{-10\%}$ V dc		
Brake power	P_{BR}	[W]	12.8		
Brake engagement delay time	t_{BR}	[ms]	40		
Brake disengagement delay time	t_{-BR}	[ms]	7		
Permissible radial load on motor shaft	F_R	[N]	150		
Permissible axial load on motor shaft	F_N	[N]	50		
Mass without brake / with brake	m	[kg]	0.9 / 1.2		

⁽¹⁾ - DC values refer to trapezoidal commutation

NOTE: more informations about Servomotors and drives see “Brushless Servomotors” catalogue by Linearmech.

Linearmech Brushless Servomotors

5.4 Technical data

BM 63 S IEC			BM 63 L IEC			Servomotor size	
24 V dc	48 V dc	230 V ac	24 V dc ⁽²⁾	48 V dc	230 V ac	[V] U_{nom}	Drive rated voltage
0.7			1.35			[Nm] $T_{0, 100K}$	Stall torque
0.6			1.3			[Nm] $T_{nom, 100K}$	Continuous rated torque
2.1			4.2			[Nm] T_p	Peak torque
3000			3000			[rpm] n_{nom}	Rated speed
4000			4000			[rpm] n_{max}	Max. speed
8			8				Number of poles
15.9 ⁽¹⁾	7.7 ⁽¹⁾	0.98	35 ⁽¹⁾	15.7 ⁽¹⁾	2.1	[A] $I_{0, 100K}$	Stall current
50.8 ⁽¹⁾	25.8 ⁽¹⁾	3.7	115 ⁽¹⁾	53 ⁽¹⁾	7.1	[A] I_p	Peak current
4.7 ⁽¹⁾	9.7 ⁽¹⁾	41	4.3 ⁽¹⁾	9.4 ⁽¹⁾	43	[V/1000 rpm] k_E	Voltage constant
0.044 ⁽¹⁾	0.09 ⁽¹⁾	0.67	0.04 ⁽¹⁾	0.089 ⁽¹⁾	0.71	[Nm/A] k_T	Torque constant
15			15			[min] t_{th}	Thermal time constant
0.13	0.5	17.4	0.09	0.2	7.1	[Ω] R_{ph}	Winding resistance
0.39	1.5	53	0.17	0.8	30	[mH] L_D	Winding inductance
3	3	3	1.9	4.2	4.2	[ms] t_{el}	Electric time constant
0.156×10^{-4}			0.272×10^{-4}			[kg × m ²] J_{motor}	Moment of inertia (without brake)
0.174×10^{-4}			0.290×10^{-4}			[kg × m ²] $J_{motor BR}$	Moment of inertia (with brake)
2.5			2.5			[Nm] T_{BR}	Rated braking torque
$24^{+5\%}_{-10\%}$ V dc			$24^{+5\%}_{-10\%}$ V dc			[V] U_{BR}	Brake supply voltage
13.3			13.3			[W] P_{BR}	Brake power
40			40			[ms] t_{BR}	Brake engagement delay time
7			7			[ms] t_{-BR}	Brake disengagement delay time
230			230			[N] F_R	Permissible radial load on motor shaft
70			70			[N] F_N	Permissible axial load on motor shaft
1.25 / 1.90			1.85 / 2.50			[kg] m	Mass without brake / with brake

⁽¹⁾ - DC values refer to trapezoidal commutation

⁽²⁾ - only intermittent service S3 25 % over 10 min

NOTE: more informations about Servomotors and drives see “Brushless Servomotors” catalogue by Linearmech.

Linearmech Brushless Servomotors

5.4 Technical Data

Servomotor size			BM 82 S - 30		BM 82 L - 30	
Drive rated voltage	U_{nom}	[V]	230 V ac	400 V ac	230 V ac	400 V ac
Stall torque	$T_{0, 100K}$	[Nm]	1.5		2.9	
Continuous rated torque	$T_{nom, 100K}$	[Nm]	1.3		2.5	
Peak torque	T_p	[Nm]	4.5		9.0	
Rated speed	n_{nom}	[rpm]	3000		3000	
Max. speed	n_{max}	[rpm]	4000		4000	
Number of poles			8		8	
Stall current	$I_{0, 100K}$	[A]	2.6	1.2	4.6	2.3
Peak current	I_p	[A]	7.2	3.7	14.7	7.4
Voltage constant	k_E	[V/1000 rpm]	39.0	76.5	39.5	78.0
Torque constant	k_T	[Nm/A]	0.64	1.26	0.64	1.28
Thermal time constant	t_{th}	[min]	16		16	
Winding resistance	R_{ph}	[Ω]	3.9	14.8	1.5	6.2
Winding inductance	L_D	[mH]	28	105	13.8	56
Electric time constant	t_{el}	[ms]	7.1	7.1	8.9	9
Moment of inertia (without brake)	J_{motor}	[kg × m ²]	0.638×10^{-4}		1.030×10^{-4}	
Moment of inertia (with brake)	$J_{motor BR}$	[kg × m ²]	0.768×10^{-4}		1.160×10^{-4}	
Rated braking torque	T_{BR}	[Nm]	6.5		6.5	
Brake supply voltage	U_{BR}	[V]	$24^{+5\%}_{-10\%}$ V dc		$24^{+5\%}_{-10\%}$ V dc	
Brake power	P_{BR}	[W]	23.8		23.8	
Brake engagement delay time	t_{BR}	[ms]	45		45	
Brake disengagement delay time	t_{-BR}	[ms]	10		10	
Permissible radial load on motor shaft	F_R	[N]	400		400	
Permissible axial load on motor shaft	F_N	[N]	130		130	
Mass without brake / with brake	m	[kg]	2.0 / 3.7		3.3 / 5.0	

NOTE: more informations about Servomotors and drives see “Brushless Servomotors” catalogue by Linearmech.

Linearmech Brushless Servomotors

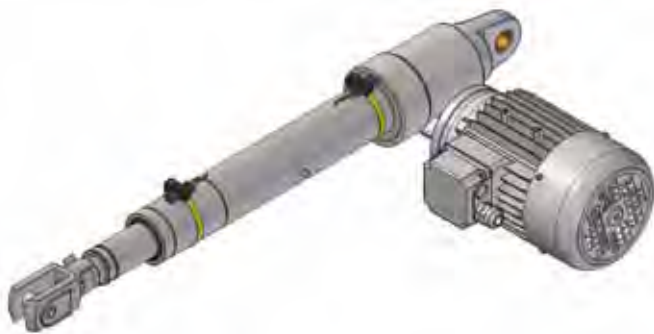
5.4 Technical Data

BM 102 S - 30		BM 102 L6 - 30		BM 102 L8 - 30		Servomotor size	
230 V ac	400 V ac	230 V ac	400 V ac	230 V ac	400 V ac	[V] U_{nom}	Drive rated voltage
5.2		7.3		9.0		[Nm] $T_{0, 100K}$	Stall torque
4.1		6.4		6.7		[Nm] $T_{nom, 100K}$	Continuous rated torque
15.0		22.0		30.0		[Nm] T_p	Peak torque
3000		3000		3000		[rpm] n_{nom}	Rated speed
4000		4000		4000		[rpm] n_{max}	Max. speed
8		6		8			Number of poles
6.5	3.5	9.8	6.1	11.5	5.8	[A] $I_{0, 100K}$	Stall current
26.0	14.0	35.5	22.0	47.0	25.5	[A] I_p	Peak current
48.6	90.0	47.7	77.0	47.7	94.0	[V/1000 rpm] k_E	Voltage constant
0.8	1.48	0.8	1.2	0.8	1.55	[Nm/A] k_T	Torque constant
35		45		45		[min] t_{th}	Thermal time constant
0.9	3.5	0.56	1.6	0.4	1.6	[Ω] R_{ph}	Winding resistance
14.0	54.0	8.2	23.0	6.0	27.6	[mH] L_D	Winding inductance
15.5	15.4	14.6	14.3	15.0	17.2	[ms] t_{el}	Electric time constant
2.88×10^{-4}		4.950×10^{-4}		4.950×10^{-4}		[kg × m ²] J_{motor}	Moment of inertia (without brake)
3.34×10^{-4}		5.410×10^{-4}		5.410×10^{-4}		[kg × m ²] $J_{motor BR}$	Moment of inertia (with brake)
14		14		14		[Nm] T_{BR}	Rated braking torque
$24^{+5\%}_{-10\%}$ V dc		$24^{+5\%}_{-10\%}$ V dc		$24^{+5\%}_{-10\%}$ V dc		[V] U_{BR}	Brake supply voltage
35.2		35.2		35.2		[W] P_{BR}	Brake power
50		50		50		[ms] t_{BR}	Brake engagement delay time
15		15		15		[ms] t_{-BR}	Brake disengagement delay time
500		500		500		[N] F_R	Permissible radial load on motor shaft
150		150		150		[N] F_N	Permissible axial load on motor shaft
5.2 / 7.4		7.8 / 10.0		7.8 / 10.0		[kg] m	Mass without brake / with brake

NOTE: more informations about Servomotors and drives see “Brushless Servomotors” catalogue by Linearmech.

SERVOMECH product range includes also:

Linear actuators



ATL Series with acme screw

- 7 sizes available
- load capacity from 4 kN to 80 kN
- linear speed from 1.5 mm/s to 150 mm/s

BSA Series with ball screw

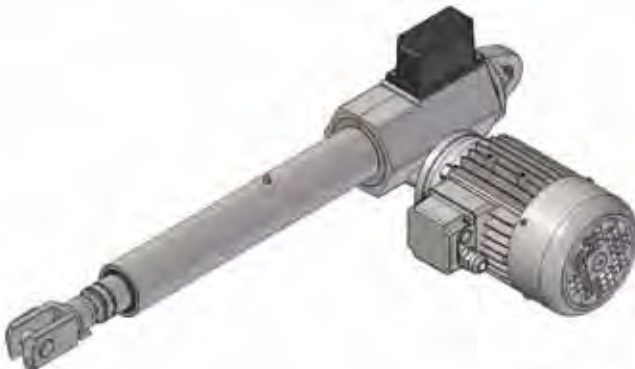
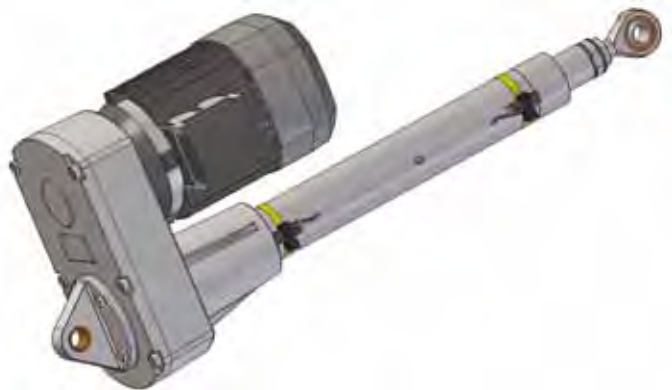
- 7 sizes available
- load capacity from 4 kN to 60 kN
- linear speed from 1.5 mm/s to 120 mm/s

UAL Series with acme screw

- 5 sizes available
- load capacity from 2 kN to 15 kN
- linear speed from 20 mm/s to 500 mm/s

UBA Series with ball screw

- 5 sizes available
- load capacity from 2 kN to 15 kN
- linear speed from 40 mm/s to 500 mm/s



CLA Series with acme screw

- 3 sizes available
- load capacity from 8 kN to 25 kN
- linear speed from 4 mm/s to 56 mm/s

CLB Series with ball screw

- 3 sizes available
- load capacity from 6 kN to 25 kN
- linear speed from 5 mm/s to 80 mm/s

TMA Series with acme screw

- 5 sizes available
- load capacity from 15 kN to 200 kN
- linear speed from 2 mm/s to 70 mm/s



SERVOMECH product range includes also:

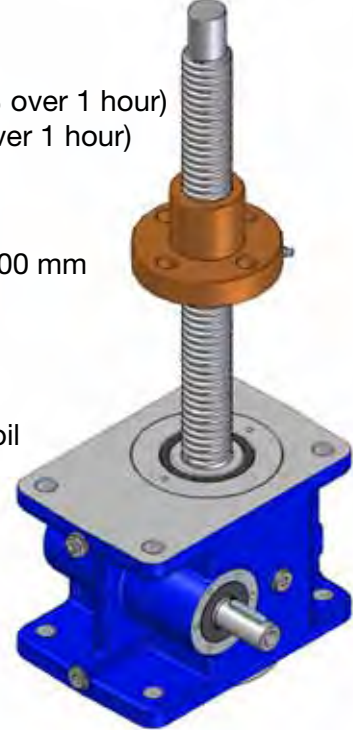
Acme screw jacks

**MA Series
travelling screw (Mod.A)**



- max. duty cycle:
travelling screw: 40 % over 10 min (30 % over 1 hour)
travelling nut: 30 % over 10 min (20 % over 1 hour)
- load capacity from 5 kN to 350 kN
- 8 sizes
- acme screw diameter from 18 mm to 100 mm
- 1-, 2-, 3- or 4-start acme screw
- input speed up to 3 000 rpm
- linear speed up to 300 mm/s
- worm gearbox lubricated with synthetic oil

**MA Series
travelling nut (Mod.B)**

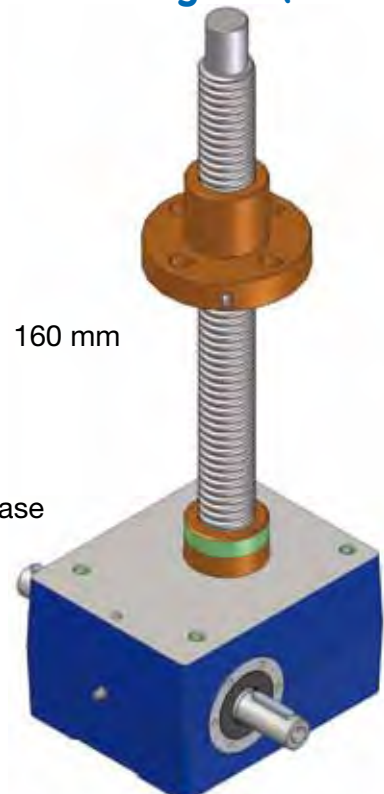


**SJ Series
travelling screw (Mod.A)**



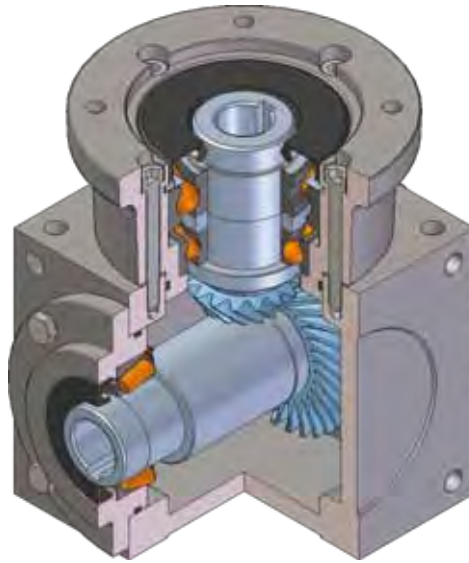
- max. duty cycle:
30 % over 10 min (20 % over 1 hour)
- load capacity from 5 kN to 1 000 kN
- 14 sizes
- acme screw diameter from 18 mm to 160 mm
- 1- or 2-start acme screw
- input speed up to 1 500 rpm
- linear speed up to 80 mm/s
- gearbox lubrication with synthetic grease

**SJ Series
travelling nut (Mod.B)**

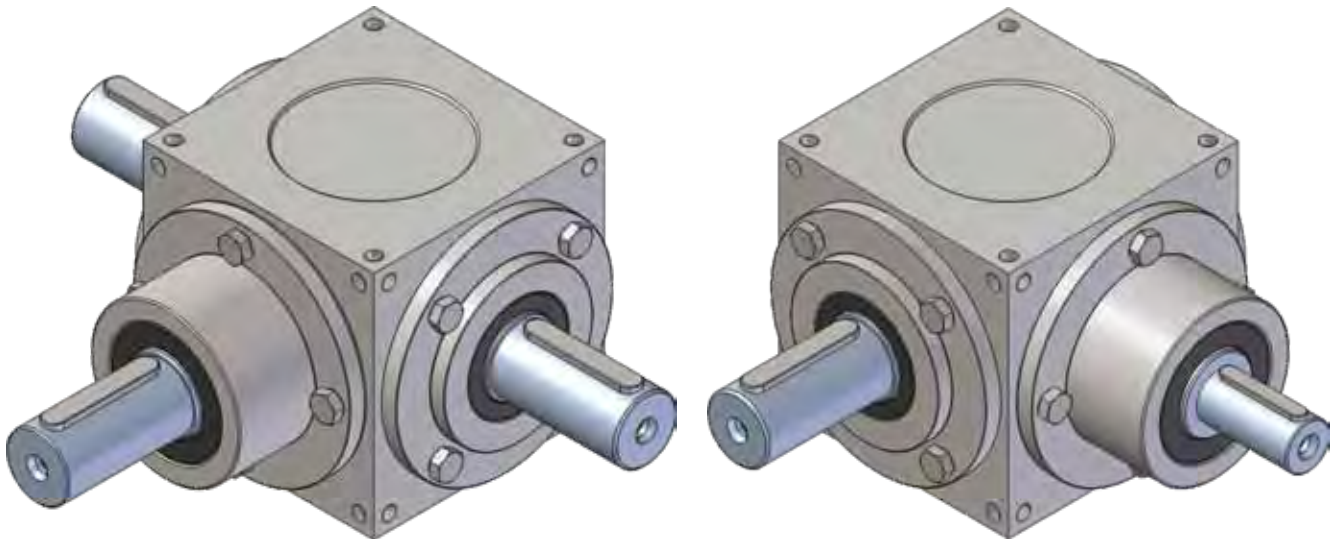


SERVOMECH product range includes also:

Bevel gearboxes



- Cubic form housing with 6 machined sides
- Bevel gears made in alloy steel, GLEASON spiral tooth profile
- 6 sizes
- Ratio: 1 : 1, 1 : 1.5, 1 : 2, 1 : 3, 1 : 4
- Max. input speed: 3 000 rpm
- Standard lubrication: grease



SERVOMECH product range includes also:

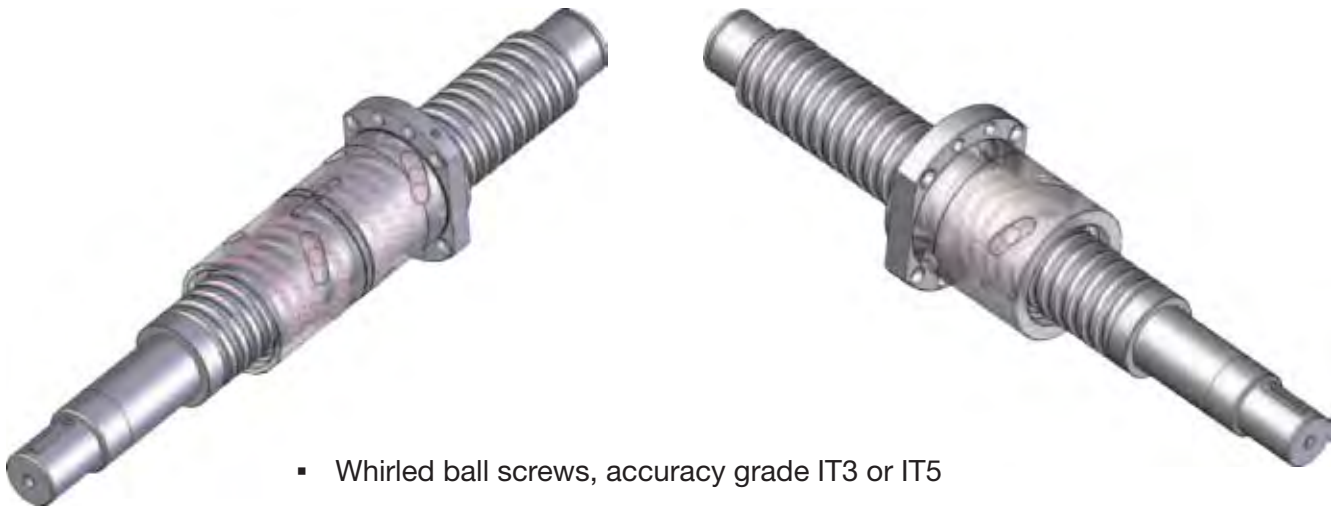
Linear actuators ILA Series



Acme screw or Ball screw linear actuators

- 6 sizes available
- load capacity from 15 kN to 200 kN
- input drive with direct coupling of motor or geared motor

Ball screws and nuts



- Whirled ball screws, accuracy grade IT3 or IT5
- Rolled ball screws, accuracy grade IT7
- Ball nuts with DIN 69051 flange or cylindrical flange
- Backlash-free or preloaded ball nuts

Italian technology

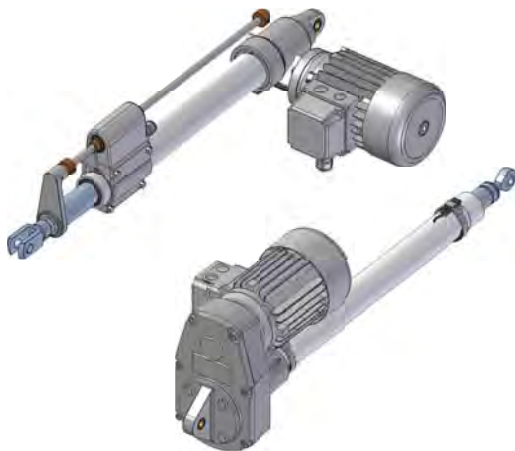
own production

entire in-house manufacturing

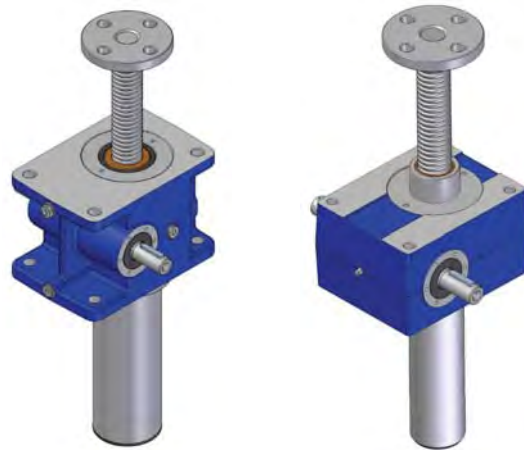
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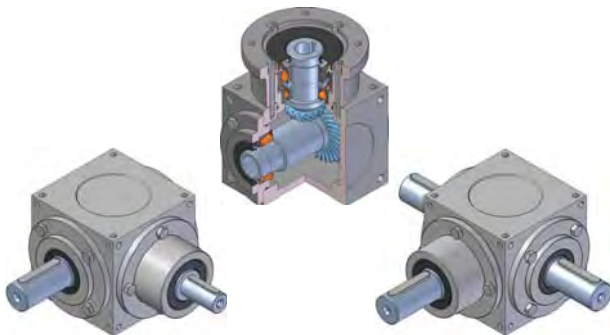
Linear actuators



Acme screw jacks



Bevel gearboxes



Ball screws and nuts



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