Ball screw drives KGT
General technical data

Manufacturing process
The thread profile is produced by cold rolling in the thread rolling method. Both screw and nut have a gothic thread profile. The load angle is 45°.

Linear speeds
At present, the permissible rotation limit is in the region of 3000 rpm. This limit defines the maximum rotation, which must be run only under ideal operating conditions.

Installed position
The position in which the screw drive is installed can always be freely chosen. Please consider that all radial forces that occur need to be absorbed by external guides.

Accuracy
The standard programme has a precision of 50 µm per 300 mm, screws from the ***MICRON*** *Line*®, series, which are available on request, achieve an accuracy of 23 µm per 300 mm.

Safety advice
Ball screw drives are generally not self-locking due to the low friction. It is therefore advisable to install suitable motors with holding brake, particularly when the ball screw drive is installed vertically.

Duty cycle
The ball screw drive permits a duty cycle of up to 100%. Extremely high charges in combination with high duty cycles can reduce the life time.

Temperatures
All screw drives are designed for continuous operation at ambient temperatures of -30° up to 80° C. Temperatures of up to 110° C are also permitted for brief periods. Ball screw drives are only in exeptional cases suitable for operation at subzero temperatures.

Repeatability
The repeatability is defined as the capability of a screw drive to reach an actual position that has once been reached again under the same conditions. It refers to the average position variation according to VDI/DGQ 3441. The repeatability is influenced amongst others by:
- Load
- Speed
- Deceleration
- Direction of travel
- Temperature

Aggressive ambient working conditions
In cases of heavy dirt and dust particles, an additional bellow or a spiral spring cover is recommended.

Installation and maintenance
See page 60

Technical Data	Ball screw drive KGS
Thread	Gothic profile (pointed profile)
Diameter	Standard: 12 – 63 mm ***MICRON*** *Line*®: 12 – 40 mm
Lead	Standard: 5 – 50 mm ***MICRON*** *Line*®: 5 – 40 mm
Number of starts	1 – 5
Thread direction	Right hand thread, KGS 2005 also left hand thread
Length	Standard: 5600 mm KGS 1205: 1300 mm
Material	1.1213 (Cf 53) Ball track inductively hardened and polished, soft-annealed screw end and core
Lead accuracy	Standard: 50 µm/300 mm ***MICRON*** *Line*®: 23 µm/300 mm
Straightness	L < 500 mm: 0.05 mm/m L = 500 – 1000 mm: 0.08 mm/m L > 1000 mm: 0.1 mm/m
Left and right hand screw	KGS 2005 only
End machining	To customer specs

Ball screw drives
Ball nuts

NEFF ball screw nuts are made as flanged nuts (KGF) and cylindrical nuts (KGM). They can be combined with all screws with any kind of end machining. Single nuts are also available on assembly sleeves.

Flanged ball screw nuts are made with attachment holes; cylindrical ball screw nuts have a spline.

NEFF manufactures ball screw nuts with three different ball return systems, depending on the diameter and the lead of the screw used. Profiled wipers reduce the seepage of lubricant, and help to repel dirt.

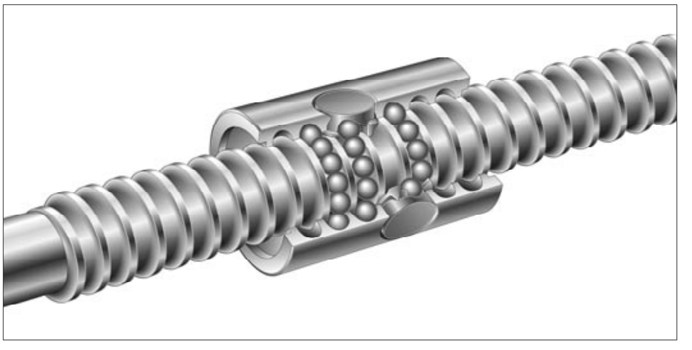
Material:
Steel 1.7131 (ESP65) / 1.3505 (100 Cr 6)

NEFF ball return systems

Single return duct

For single-start screw drives.

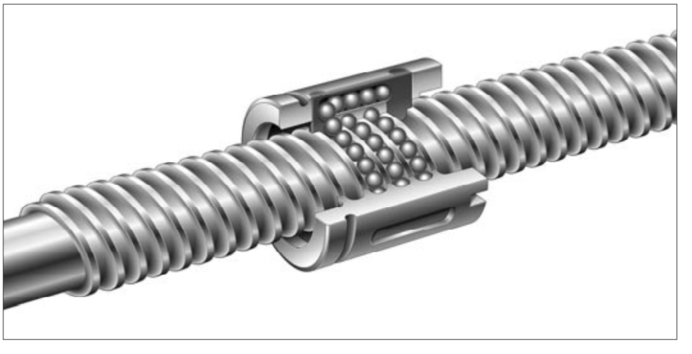
The balls are lifted out of the track after every turn of the screw and are moved back one thread lead. The NEFF guide piece, made of fibre glass re-inforced plastic, ensures perfect guidance and low ball wear.
Available for our thread leads 5 and 10 mm.



Return duct

For single- and multi-start screw drives.

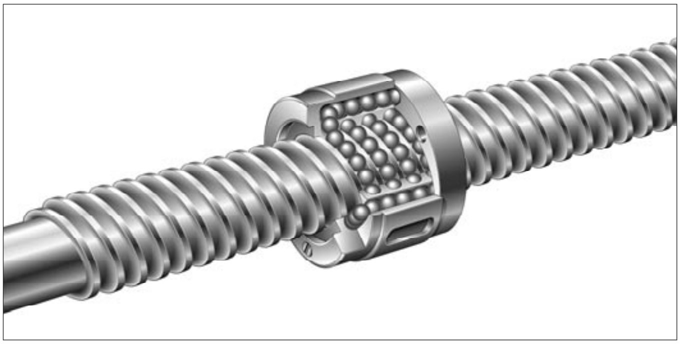
After several revolutions, the balls are returned through a patented reverse and return system that is integrated in the nut.
Available for our thread leads 5, 10 and 20 mm.



Multi-turn return duct

For multi-start screw drives.

The balls are returned via two special recirculading lids and the return duct is integrated in the nut.
Available for our thread leads 20, 25, 40 and 50 mm.



Ball screw drives
Ball nuts

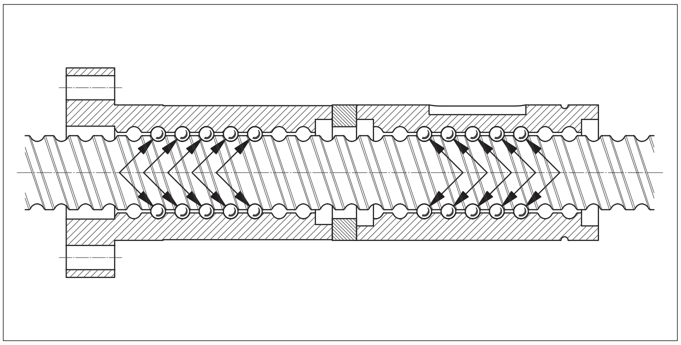
Ball nut units – pre-loaded

As a rule all nuts can be combined to form backlash-free, pre-loaded nut units except when the lead is equal to or greater than the diameter of the screw. NEFF supplies ready-to-install units with "O" pre-loading.

O pre-loading:
With this type of pre-loading the lines of forces run in a rhomboidal pattern (O-shaped), i.e. the nuts are pressed apart by the pre-loading force. This configuration offers particularly high rigidity against tilting. The standard pre-loading is equal to 10% of the dynamic load rating C.

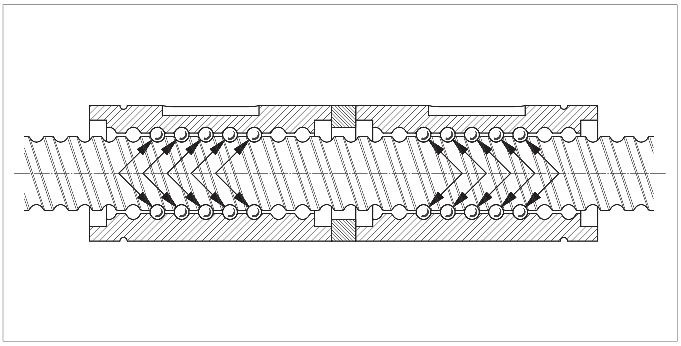
Pre-loading variants
KGT-FM

Ball screw drive with one KGF flanged nut and one KGM cylindrical nut with O-pre-loading.



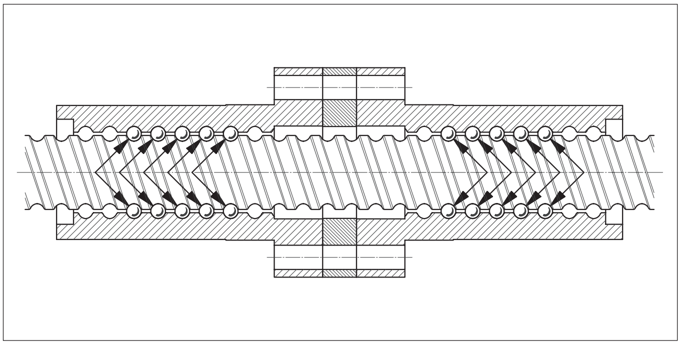
KGM-MM

Ball screw drive with two KGM cylindrical nuts and O-pre-loading. Only one of the two feather keys transmits the drive torque.



KGT-FF

Ball screw drive with two KGF flanged nuts with O-pre-loading.



STANDARD PRODUCT

Metric/Inch

Available in accuracy Grades 1 - 10

Dia-Ø	Nominal Lead P_{ho} (mm)																Nominal Lead P_{ho} (inches)				
d_o (mm)	1	2	2.5	4	5	6	8	10	12	15	16	20	25	30	40	45	0.125	0.200	0.250	0.500	1.000
6	R																				
8	R	R	R														G				
10		R	R	G	G												G	G			
12		R	R	R	R												G	G			
14		R		R																	
16		R	[R]	R	[R/Y]	R	G	[R]										R	G	G	
20		R		G	[R/Y]	G	G	G										R	G	G	
25				R/Y	[R/Y]	G	R	[R]	G	R	R						R	R/Y	R	Y	
28				G	G	R	G	G	G	G								G	G	G	
32		R		R	[R/Y]	R	R	[R]	R	R		R						R/Y	R	R	
40				R	[R/Y]	R	R	[R/Y]	R	R	R	[R]						R	R	G	G
45					G	R	R	G	R	G		G						G	R	G	G
50					[R/Y]	R	R	[R/Y]	R	R		[R]	R	R				R	R	G	G
57							R				R		R						G	R	
63					R	G	G	[R/Y]	R	R	R	[R]	G	R	[R]	Y			R	R	G
80								[R/Y]	Y	G	R	[R]	G	R	[R]				G	G	G
100								[R]	G	G		[R/Y]	G		[R]					R	G
125								[G]	G	G		[R]	G	R	[G]					G	G

R — Tooling available for these sizes in right hand leads

Y — Tooling available for these sizes in left hand leads

G — Available on request

[ ] — Nominal Ø and Lead to DIN69051/2

These size ranges are continually being up-dated.
Please call our Sales department for up-dated information.

NUT RIGIDITY

The calculations necessary to determine the rigidity of the ball zone are very involved. However the following approximation will give a value that is sufficiently accurate for most purposes.

For double ball nut assemblies, preloaded to one tenth of the Dynamic Capacity, the rigidity can be approximated by using the equation:

$$R_z \simeq 10 \cdot d_o \cdot i$$

where
R_z = rigidity of ballzone (N/µm)
d_o = nominal diameter of ballscrew (mm)
i = number of rows of balls in one nut
For single ball nuts the rigidity may be approximated by:
$R_z \simeq 5 \cdot d_o \cdot i$

OVERALL SYSTEM RIGIDITY

The overall rigidity is calculated by the following formula:

$$\frac{1}{R} = \frac{1}{Rs} + \frac{1}{Rn} + \frac{1}{Rb} + \frac{1}{Rh}$$

where
R = overall rigidity (N/µm)
Rs = rigidity of screw shaft (N/µm)
Rn = rigidity of nut (N/µm) which normally $\simeq 0.8 \cdot R_z$
Rb = rigidity of bearings (N/µm)
Rh = rigidity of nut mounting and bearing housings (N/µm)
Exact calculation to DIN 69051 (Part 6)

MATERIALS

JENA-TEC use high quality steels, specially processed to ensure high performance product.

Ballshafts: Inductively hardened tempered steel Cf 53 balltrack hardened to 60± 2 HRC. Core and spindle ends non-hardened.

Ballnuts: Case hardened steel 16MnCr5 or roller-bearing steel 100Cr6.

Note: Special materials and stainless steels can be supplied as required. Please discuss your requirements with JENA-TEC Engineers.

STATIC LOAD RATING

Static load rating Co: is the centred axial load under which the permanent combined deformation of balls and tracks at the most heavily loaded point on the ballscrew drive is 1/10000 of the ball diameter.

Note: The figure for maximum static load, beyond which brinelling of the balltrack will occur, is given in the ballscrew data sheets.

DRIVING TORQUE REQUIREMENTS

The torque which must be applied to a ballscrew in order to produce an axial thrust is given by:

$$T = \frac{F \cdot Ph_o}{2 \cdot 10^3 \cdot \pi \cdot \eta}$$

which $= \frac{F \cdot Ph_o}{5655}$ when $\eta = 0.9$

where
T = torque (Nm)
F = axial thrust load (N)
Ph_o = lead (mm)
η = efficiency of the ballscrew

To this the torque due to drag from preloading, wiper seals, and inertia of the ballscrew shaft should be added.

The preload drag torque may be calculated from the following:

$$\max Tp = \frac{0.004 \cdot d_o \cdot Fp}{1000}$$

where
Tp = dynamic preload drag torque (Nm)
Fp = preload (N)
d_o = nominal diameter of ballscrew (mm)

The preload drag torque will decrease as the external load is applied and can be ignored if the applied load is three times that of the preload.

The torque required to overcome the inertia of the ballscrew shaft, assuming constant acceleration, is given by the following formula:

$$T_1 = \frac{0.08 \cdot 10^{-12} \cdot d^4 \cdot L \cdot n}{t}$$

where
T_1 = torque to overcome inertia (Nm)
d = average dia. of ballscrew shaft (mm)
(shaft outside dia + root dia) · 0.5
L = length of ballscrew (mm)
n = maximum rotational speed (min^{-1})
t = time taken to start or stop (sec)

Note: When a mass is being moved, it is important that acceleration and deceleration forces are taken into account in calculating the axial load on the ballscrew.

SERVICE LIFE / LIFE EXPECTANCY

The use of correctly treated high grade steels and attention to detail mean that long life and trouble free operation can be expected from JENA-TEC ballscrews. It is important that the design, application, installation and maintenance procedures are correctly followed to achieve maximum service life. Assuming the above criteria are met the calculations are as follows:

The estimated service life of a ballscrew can be calculated as follows:

$$L = \left(\frac{Ca}{Fm}\right)^3 \cdot 10^6$$

where

L = the estimated life in revolutions achieved or exceeded by 90% of an appropriately large number of identical ballscrew drives before the first signs of material fatigue.

Ca = the dynamic load rating (N)

Fm = the equivalent applied load (N). Loads can act on a ballscrew drive in two directions. Fm should be determined for each of the load directions; the larger value should then be used in the calculation of L.
It is useful to draw a schematic diagram as (Fig 11), it should be noted that any preloading represents a continuous load.

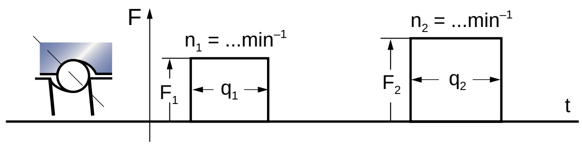


FIG. 11

From Fig 11

n_m = Mean speed

$$n_m = \frac{n_1 \cdot q_1 + n_2 \cdot q_2 + n_n \cdot q_n}{100}$$

$$Fm = \left(\frac{F_1^3 \; n_1 \cdot q_1}{n_m \cdot 100} + \frac{F_2^3 \cdot n_2 \cdot q_2}{n_m \cdot 100} + \ldots\ldots\right)^{1/3} \cdot f_a$$

where

q1, q2 = the components of the duration of a load in one direction in %. ($q_1+q_2+q_n$ = 100%)

n_1, n_2 = the speeds during q_1, q_2 (rpm)

F_1, F_2 = the axial load in N in one load direction during q_1, q_2

fa = the machine specific allowance.

fa = 1 for low acceleration values and no vibration

fa = 1.5 for higher acceleration and with vibration and medium impact loads

Please consult JENA-TEC in the case of impact loads exceeding 0.5 · Ca.

Ballscrew drive with preloaded nut system:

In cases where preloaded nut systems are used, the above calculations are used to determine the service life of each individual nut in both load directions. The overall service life is then calculated as follows:

$$L = (Fm1^{10/3} + Fm2^{10/3})^{-0.9} \cdot Ca^3 \cdot 10^6$$

where

L = the overall service life (as above)

Fm1 or Fm2 = the load of the nut 1 or 2 in the relevant load direction

Ca = the dynamic load rating (N)

Important Note: The calculations above are valid only with correct lubrication. The presence of dirt, or lubrication starvation may reduce service life to a fraction of the calculated value. Reduced service life must also be expected with very short strokes.

Ballscrew nuts cannot absorb radial forces or tilting moments.

LEAD ACCURACY

JENA-TEC precision ballscrews are manufactured to an international grading system as shown below or to customers' own specific requirements.

	Permissible deviation Grade (IT)					
	1	3	4	5	7	10
Lead Accuracy						
per 300 mm	0.006	0.012	0.016	0.023	0.052	0.210
per foot	0.0002	0.0005	0.0006	0.0009	0.002	0.008
Total travel deviation						
length ≤ 1000	0.011	0.021	0.029	0.040	0.090	-
›1000 ≤ 2000	0.018	0.035	0.048	0.065	0.150	-
›2000 ≤ 3000	0.026	0.050	0.069	0.093	0.210	-

Note: Grade 1 is offered only by special arrangement.
Grade 3-5 are normally acceptable for machine tool applications.
Transport screws are generally not preloaded.

Specified Lead: Nominal leads may be modified to accommodate specific requirements. A minus compensation will, for example, accommodate for temperature or pre-tensioning in the shaft.

Ground screws: are available in Grade 1 to Grade 7
Rolled screws: are available in Grade 5 to Grade 10
Cut screws: are available in Grade 7 to Grade 10

FEATURES OF JENA-TEC PRECISION LEADSCREWS

ACCURACY, QUALITY & RELIABILITY: JENA-TEC continue to service customers who prefer to use traditional leadscrews. The JTPL and JTRL range of leadscrews are manufactured with the same precision, experience and standards of release applied to ballscrew products.

AVAILABILITY: A range of precision leadscrews in metric and inch sizes in single and multi-start, standard leads, with nuts in various materials, to suit application, are available either directly from inventory or on a short delivery from our manufacturing base.

LEADSCREW DRIVE OPTIONS:

- Single start threads
- Steel, Grey Iron & Phosphor bronze nuts
- Multi start threads
- Gunmetal & plastic nuts for high speed low noise operation
- Trapezoidal & acme threads
- Special threadforms by request

Note: Trapezoidal thread spindles with pitch angles of less than 2.5˚ can be considered self locking.

JENA-TEC LEADSCREW RANGE DETAILS:

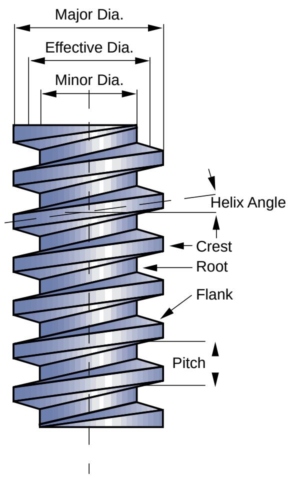
JTpL Range: A range of high precision ground and whirled leadscrews and nuts manufactured in a range of threadforms to customer requirements.

JTrL Range: A range of precision rolled trapezoidal screws in single and multi-start configurations with optional nut materials.

A selection of some of the many thread forms available in rolled, milled, whirled and ground formats in both metric and inch sizes.

END FEATURES AND NUTS

End features and nuts are produced to meet customer requirements. Splines, keyways, fine threads, trunnions, gear forms and ground diameters are a few of the features regularly supplied.



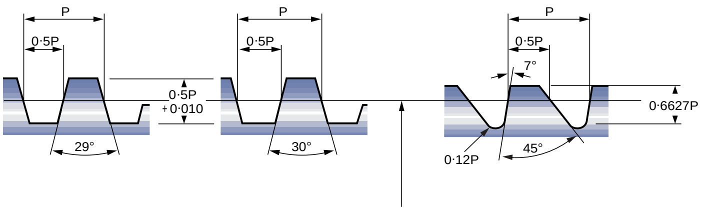


FIG. 12

DESIGN CONSIDERATIONS LEADSCREWS:

LOAD RATING: The load rating of leadscrews is dependent, as a general principle, on the material used, surface quality, state of wear, surface pressure, lubrication conditions, running speed and temperature, and thus on the duty cycle and provision for heat dissipation.

The permissible surface pressure is dependent on the running speed of the screw drive.

With motion drives the surface pressure should not exceed 10 - 15N/mm².

The pv values specified for the nut material and the bearing surface provide a simple method of calculating the permissible running speed.

Example:

Load = 10000N

Required bearing surface $= \dfrac{10000N}{10N/mm^2} = 1000\ mm^2$

pv value of Gunmetal $= 300N/mm^2 \cdot m/min$

Permissible surface running speed $= \dfrac{300N/mm^2 \cdot m/min}{10N/mm^2} = 30m/min$

If this speed is too low, a larger spindle must be selected to obtain a larger bearing surface.
The permissible running speed can now be used to calculate the spindle speed; which in turn can be used together with the spindle pitch to calculate the feed speed.

Feed speed = Speed x lead

CRITICAL SPEED OF LEADSCREW SPINDLES:
The comments and calculations for establishing the maximum permissible spindle speed are the same as for ballscrews (see page 28/29). The theoretical critical speed can be taken from Fig 8 page 28/29.

BUCKLING FORCE LEADSCREW SPINDLES:
The comments and method of calculation for establishing the buckling force are the same as those used for ballscrews (see page 31). The theoretical critical buckling force can be taken from Fig 9 page 30.

DRIVING TORQUE REQUIREMENTS/ INSTALLATION AND MAINTENANCE:

The required torque for a leadscrew drive (T) is governed by the load, the spindle pitch and the efficiency of the screw drive and bearings. With short run up times and high speeds, the acceleration torque should be checked and additionally, in the case of leadscrew drives, the breakaway torque
The same calculation (page 33) as for ballscrew drives can be made to establish drive torque. In the case of leadscrew drives the efficiency (η) is much lower than for ballscrew drives.

Calculations:

$$T = \frac{F \cdot Pho}{2 \cdot 10^3 \cdot \pi \cdot \eta}$$

$$\eta = \frac{\tan \alpha}{\tan (\alpha + \beta)}$$

$$\eta^1 = \frac{\tan (\alpha - \beta)}{\tan \alpha}$$

where
η = the efficiency of conversion of rotary motion into linear motion.
η^1 = the efficiency of conversion of linear motion into rotary motion.
α = lead angle of the thread.
β = coefficient of friction
$\tan \beta = \mu$ = coefficient of friction.

In general terms the efficiency of leadscrew (η) are based on a coefficient of friction of $\mu = 0.1$

	μ during start up dry	μ during start up lubricated	μ in motion dry	μ in motion lubricated
Metal nuts	~0.3	~0.1	~0.1	~0.04
Plastic nuts	~0.1	~0.04	~0.1	~0.03

Note: For efficiency values of Leadscrews please contact JENA-TEC Engineers.

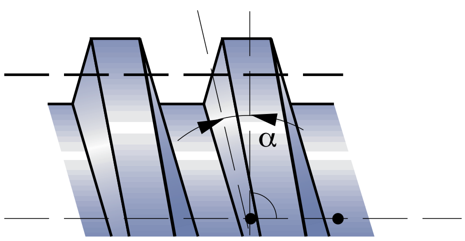


Fig 13

LEADSCREW INSTALLATION AND MAINTENANCE

INSTALLATION:
JENA-TEC leadscrew drives must be aligned carefully during installation. In the absence of suitable measuring equipment the drive should be turned through its entire length by hand before the drive unit is attached.
Variations in the force required and/or marks on the spindle indicate alignment errors between the spindle and guide.
In the case of mis-alignment the relevant mounting bolts should be loosened and the drive rotated through its entire length by hand. When a constant force is produced over the entire screwed length, alignment has been achieved.

PROTECTION:
Covers: by virtue of their design JENA-TEC leadscrew drives are less sensitive to dirt than ballscrew drives, particularly at low speeds (manual operation).
Leadscrew drives, especially with plastic nuts nonetheless, for long service life, require protection against dirt in the same way as ballscrew drives.

LUBRICATION:
Oil lubrication: this is used only in special cases for leadscrew drives.
Grease lubrication: This is the normal method of lubrication for leadscrew drives. Lubrication intervals are governed by operating condition; it is always advisable to thoroughly clean the spindle before greasing. The use of a high quality spindle spray, particularly before greasing, will increase service life.

OPERATING TEMPERATURES:
Depends primarily on the type of nut used, the condition of lubrication, and the environment. Please consult JENA-TEC Engineers in the case of temperatures above 100°C (70°C plastic nuts).

WEAR:
Can be checked manually; if the axial backlash with a single start leadscrew drive is more than 1/8 of the pitch, the nut should be replaced.

SELECTION OF A SCREW DRIVE

The selection of a ballscrew drive or leadscrew drive is governed by the following:

AXIAL FORCE: The actual force acting on the spindle, generally comprising components which are constant with respect to time (eg. an applied load) and components which vary with respect to time (impact loads, acceleration forces etc).

The axial force is limited by the following:

- The permissible axial force for the spindle bearings.
- The required service life.
- The critical buckling force of the spindle, which is subject to compressive loads.
- The permissible axial force for the nut, in the case of leadscrew drives.

General principle: Motion drives, particularly those operating at high speed, usually require ballscrews, while leadscrews are advantageous for low speeds and for clamping motions; Used with axial sliding bearings they are suited to systems with extremely high static load capacities where there is limited impact (e.g. presses, locking devices, vices etc.).

FEED SPEED: The product of spindle speed and pitch.

The spindle speed is limited by the following:

- The critical speed of the screw drive.
- The load dependent maximum speed in the case of leadscrew drives.
- The efficiency and the facilities for heat dissipation, in the case of high duty cycles.

General principle: Medium feed speeds with a low duty cycle can be handled with multi-start leadscrew drives. Higher speeds and duty cycles require single start or multi-start ballscrew drives.

ACCELERATION: Dependent not only on the spindle pitch but also on the mass moments of inertia and external forces of the overall system and the characteristic data of the motor and control card.

ACCURACY: The accuracy which a screw drive can achieve (positioning spread) is dependent on the spindle pitch deviation *and also on:*
The backlash between nuts and spindle. This can be eliminated with a ballscrew drive by means of preloading, possible, only to a limited degree, with leadscrew drives.
Frictional conditions with leadscrew drives, *the high coefficient of static friction*, leads to the “stick slip” effect. With ballscrew drives the coefficient of friction is virtually constant in the relevant speed range.

General principle: High accuracy positioning usually requires ballscrew drives.

SELF LOCKING: Leadscrew drives with a Helix angle of <2.5˚ can be considered self locking. Other screw drives may over-haul depending on operating conditions, and may require suitable design measures incorporating (brake motors with 3-phase drives and suitable control cards with DC drives).

DUTY CYCLE: Limited by the temperature rise and the provisions for the dissipation of heat. Large leadscrew drives in particular convert approx. 65% of the power applied into heat, due to their poor efficiency.

General principle: Medium duty cycles can be handled with multi-start leadscrew drives. Above this, ballscrew drives are required.

GENERAL OPERATING CONDITIONS: Ballscrew drives are sensitive to dirt, impact loads and rough handling. Leadscrew drives are more robust, particularly when used with metal nuts.

SERVICE LIFE: The service life of ballscrew drives can be calculated in the same way as with a roller bearing.
With leadscrew drives the service life is dependent mainly on the lubrication between nut and spindle and thus cannot be calculated in general terms.

General principle: Ballscrew drives will generally be selected when high load capacity and service life are required; it is, however, possible to achieve comparable service life with carefully dimensioned leadscrew drives.

PRICE: Ballscrew drives are more expensive than leadscrew drives and require more elaborate measures for protection against dirt. However, due to their greater efficiency, ballscrew drives can be operated with smaller, more cost effective, drive units.

DESIGN CONSIDERATION BALLSCREWS

PRELOAD (BACKLASH ELIMINATION): Backlash;
Single nut ballscrews are designed with specific axial and radial clearances in order to ensure that the balls achieve a 45° contact angle. This axial clearance plus the elastic deflection of the balls and ball tracks provides a total deflection known as ‘backlash’. *The following considers the factors which influence backlash and its elimination:*

Balltracks;
Semi Circular Forms (Fig 1, see page 25): Close conformity ball tracks are used where high load carrying capacity is required.

Gothic Arch Form (Fig 2, see page 25): Has the advantage over the semi circular form with regard to maintaining the contact angle, minimising radial-play, and axial backlash.

Backlash Elimination: Backlash may be minimised by the use of Gothic Arch Form and the accurate selection of ball size.

Preloading: Ballscrews applied to CNC machine tools require the elimination of backlash and the minimisation of elastic deflection in order to achieve high system rigidity and repeatability of positioning.

Preloading with a single nut: This can be achieved in two ways; by using a Gothic Arch Form and the selection of ball size or by off-setting the pitch of one circuit within the ball nut. This method is often referred to as ‘internal preload’ (see Fig 3 & Fig 4, see page 25).

Preloading using two ball nuts: Preload using two nuts is obtained by loading two nuts together (compressive) or forcing them apart (tensile).

Compressive preload (Fig 6, below): This is achieved by bolting two nuts together through the flanges with a spacer between them the size of which is adjusted to give the required preload.

Tensile preload (Fig 5, below): This is the most common method of preloading and is usually achieved by rotating one nut in relationship to the other; the preload is adjusted/fixed using a ground and keyed spacer between the nuts.

Preload considerations: The preload applied to a ballscrew must be carefully considered as heavy preloads (giving high system rigidity) reduce life and increase the power requirements. Optimum preload is generally set at one third of the average work load; some variations from this may be required for specific applications.

BACK DRIVING: Due to the inherent high efficiency of ballscrews back-driving under load can occur. Where this is unacceptable it may be prevented by incorporating a suitable device in the drive system. In cases where it is intended to produce a rotation from an axial thrust it is recommended that the lead of the ballscrew be at least one third of the shaft diameter.

BALLSCREW INSTALLATION AND MAINTENANCE

INSTALLATION: JENA-TEC Ballscrew drives are precision components; their installation requires specialist knowledge and suitable measuring facilities. Alignment errors can generally not be felt when the screw drive is rotated by hand due to the low friction of ballscrew assemblies.

PROTECTION: Covers: JENA-TEC Ballscrew drives must be protected from dust, chips and corrosive surroundings even if equipped with wipers. Protective measures include:
Bellows: Suitable only for vertical installation without additional guides.
Spiral cover springs.
Telescopic tubes or sleeves: These take up a lot of axial space.

LUBRICATION:

Oil-mist lubrication: Central lubrication by oil mist is the best method.

Oil lubrication: the oil supply should not exceed the volume lost by the wipers; otherwise use recirculating oil lubrication. Oil types: viscosity 3 up to 13°E or 25 to 100 cSt at 40°C

Grease lubrication: Add grease as appropriate to the volume lost via the wipers (under normal operating conditions it is sufficient to add grease every 200 to 300 hours).
Note: Excessive grease will cause friction and thus temperature rise.
A slight escape of grease from the lips of seals is the sign that sufficient grease is present.

OPERATING TEMPERATURES: The permissible operating temperature for JENA-TEC ballscrew drives is between -30 and +80° C, up to 110°C is permissible for brief periods. A precondition for this is correct lubrication.
Note: The torque may increase by a factor of up to 5 at temperatures below -20°C.

TRAVEL STOPS: To prevent damage to the ballscrew due to overtravelling it is advised that limit switches or mechanical stops are fitted to the machine structure. Generally it is recommended that overtravelling stops are not fitted to the ballscrew shaft.

BACKDRIVING: To prevent back driving under load when the drive is released systems need to incorporate safety devices i.e. brakes or clamps.

BALLTRACKS

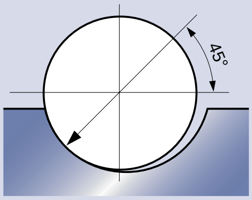


FIG 1 – Semi Circular Form

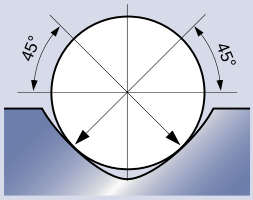


FIG 2 – Gothic Arch Form

PRELOAD METHOD

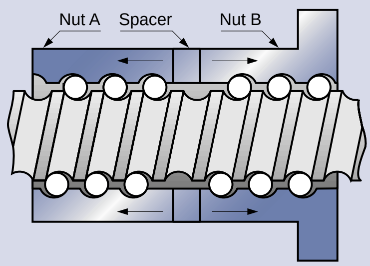


FIG 5 – Tensile Preload

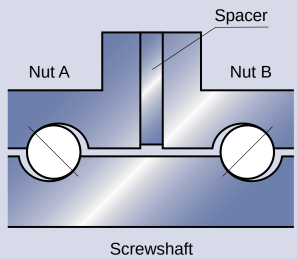


FIG 6 – Compressive Period

PRELOAD WITH SINGLE NUT

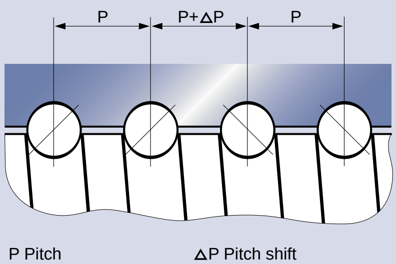


FIG 3 – Off-Set Pitch

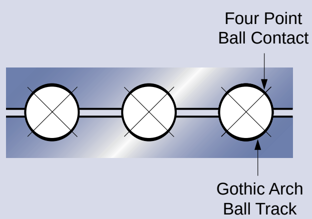


FIG 4 – Gothic Arch Form

BALLSCREW SELECTION

BALLSCREW SELECTION GUIDE:

The following steps(and considerations) will assist in selecting the JENA-TEC ballscrew to suit your specific requirements.

1. The screw should preferably be loaded in tension.

2. In the case of compressive loading; establish the minimum screw diameter necessary to resist buckling.

3. Determine the minimum diameter and lead necessary for the assembly to work below Critical Speed.

4. Establish the Load/Life required. For most applications Life Expectancy is considered as:

$0.25 \cdot 10^6$ metres of travel.

5. Dynamic capacity is based on a 90% probability of achieving a life of 1 million revs. under this loading.

$$\text{Dynamic Capacity Required} = \text{Actual load} \cdot \left(\frac{\text{Required Life}}{10^6}\right)^{1/3}$$

6. By taking the larger of the diameters given by calculations 2 and 3 above, determine the minimum PCD. of the screw required.

7. Check installation for radial or non-axial loading as these can seriously affect life expectancy.

8. Determine lead accuracy necessary for application.

9. Determine if backlash is permissible. Where loading is mono-directional or positioning accuracy is unimportant backlash may not be detrimental. Backlash can be reduced, or eliminated, if required.

10. Preloading of the nut/nuts may be required to increase the rigidity of the ball zone.

11. Ballscrew assemblies can be manufactured in Stainless Steels. However, load carrying capacities can be seriously reduced.

12. It is recommended that ballscrew assemblies are totally enclosed. Where this is impractical, wiper seals can be fitted at both ends of the nut. This may increase the nut length and reduce the operating stroke.

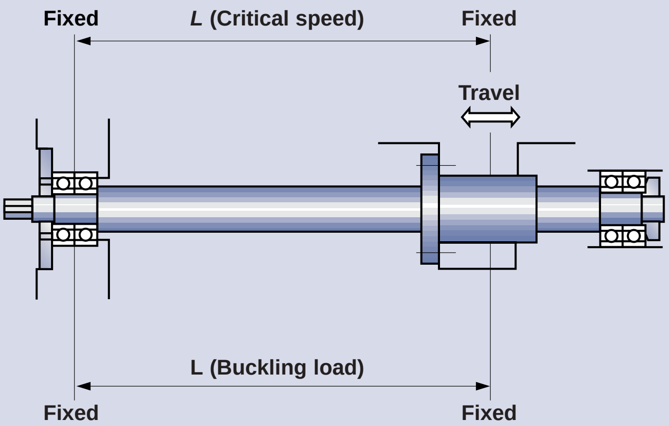
13. Ballscrew assemblies are high efficiency and not self locking; consequently a locking device, brake or worm gear may be necessary to sustain the load.

14. Lubrication with a good quality oil or grease should be maintained on the balltrack

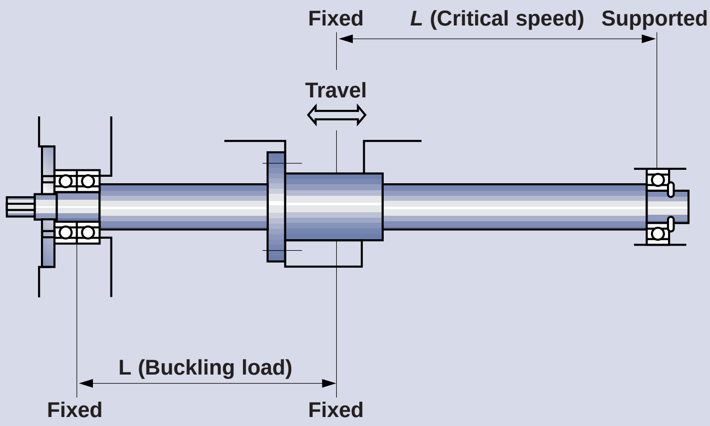
MOUNTING METHODS

Critical speed and column buckling load are dependent on the mounting method and unsupported length of the shaft. The most common mounting methods are shown opposite. The critical speed can be determined from fig 8. and the buckling load from fig 9. by reading the scales which correspond to the mounting method used.

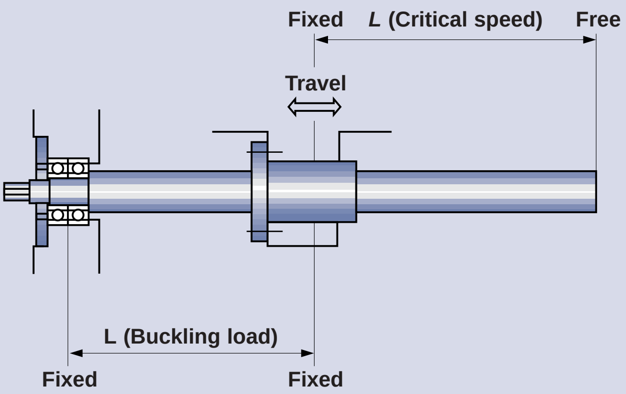
Buckling load: Fixed - Fixed **scale C**
Critical speed: Fixed - Fixed **scale G**



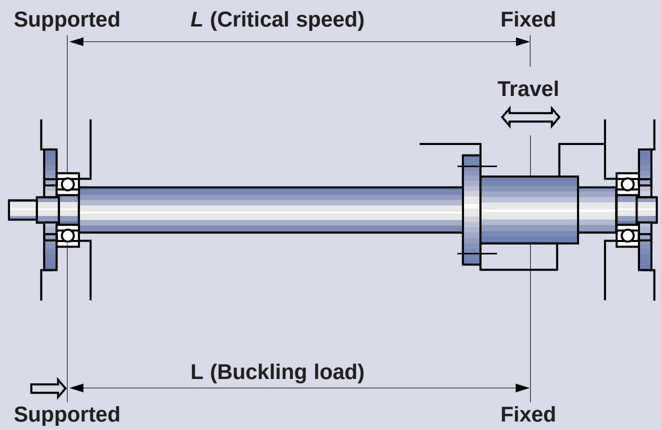
Buckling load: Fixed - Fixed **scale C**
Critical speed: Fixed - Supported **scale F**



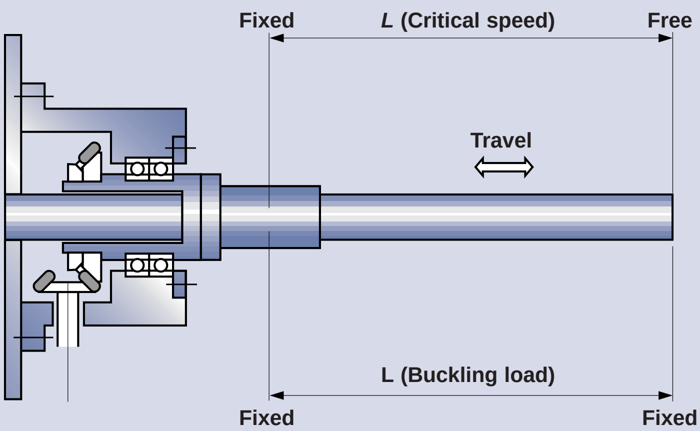
Buckling load: Fixed - Fixed **scale C**
Critical speed: Fixed - Free **scale H**



Buckling load: Fixed - Supported **scale B**
Critical speed: Fixed - Supported **scale F**



Buckling load: Fixed - Free **scale D**
Critical speed: Fixed - Free **scale H**



Buckling load: Supported - Supported **scale A**
Critical speed: Fixed - Free **scale H**

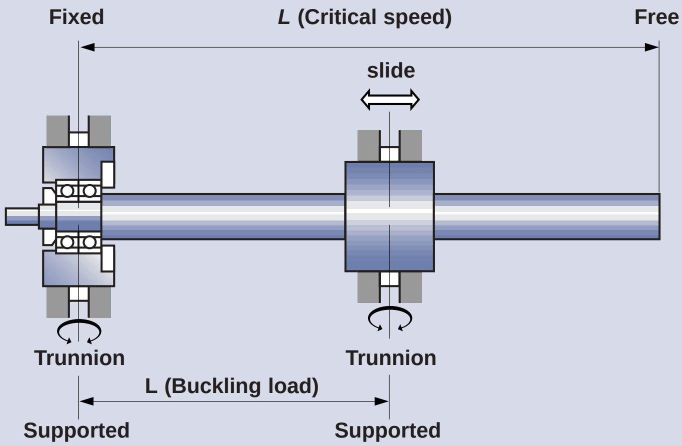
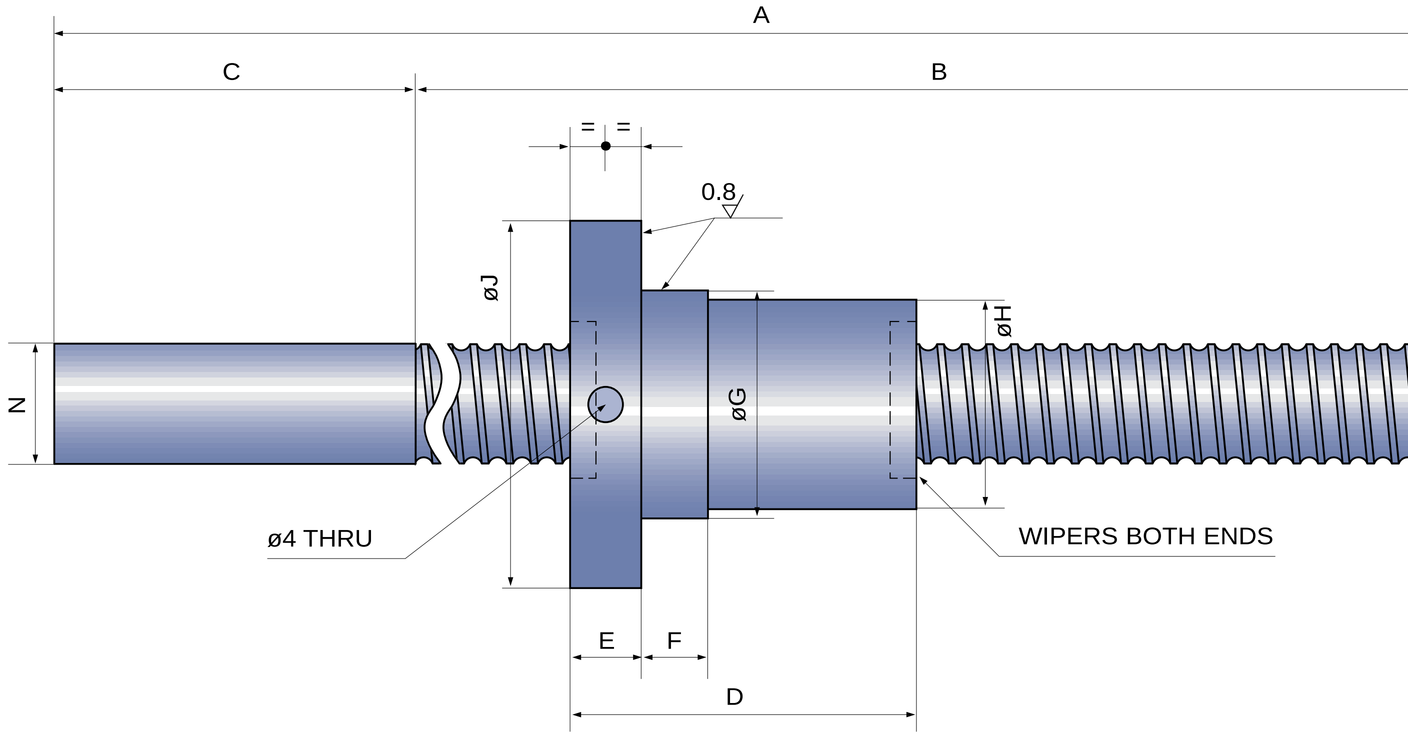


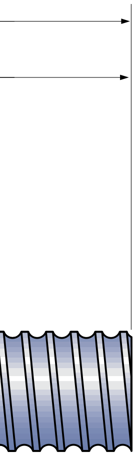
Fig. 7

PRECISION GRADE 3 METRIC LEAD BALLSCREWS
SOFT FLANGED – SINGLE NUT – PRE-LOADED

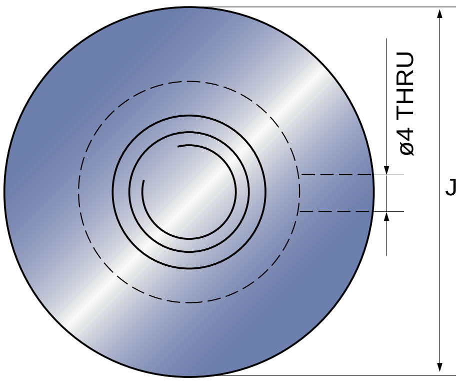


JTe3 SERIES - INSERT TRANSFER NUT PART NO	PCD	LEAD	A	B (Max)	C	D	E	F	G
JTe3-3210**	32	10	1700	1500	200	109	12	16	49,991 49,975
JTe3-3212*	32	12	1700	1500	200	92	12	16	49,991 49,975
JTe3-4006**	40	6	2200	2000	200	92	14	10	55,990 55,971
JTe3-4008**	40	8	2200	2000	200	98	14	12	55,990 55,971
JTe3-5010**	50	10	2700	2500	200	142	16	16	71,990 71,971
JTe3-6305**	63	5	3200	3000	200	81	18	10	78,990 78,971
JTe3-6310**	63	10	3500	3300	200	156	18	16	84,988 84,966
JTe3-6312**	63	12	3500	3300	200	145	20	16	89,988 89,966

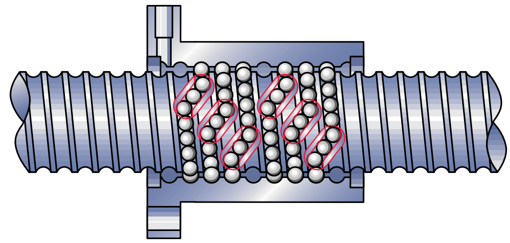
* BALL SELECTION
** PITCH SHIFT



SOFT FLANGE – max 41HRC

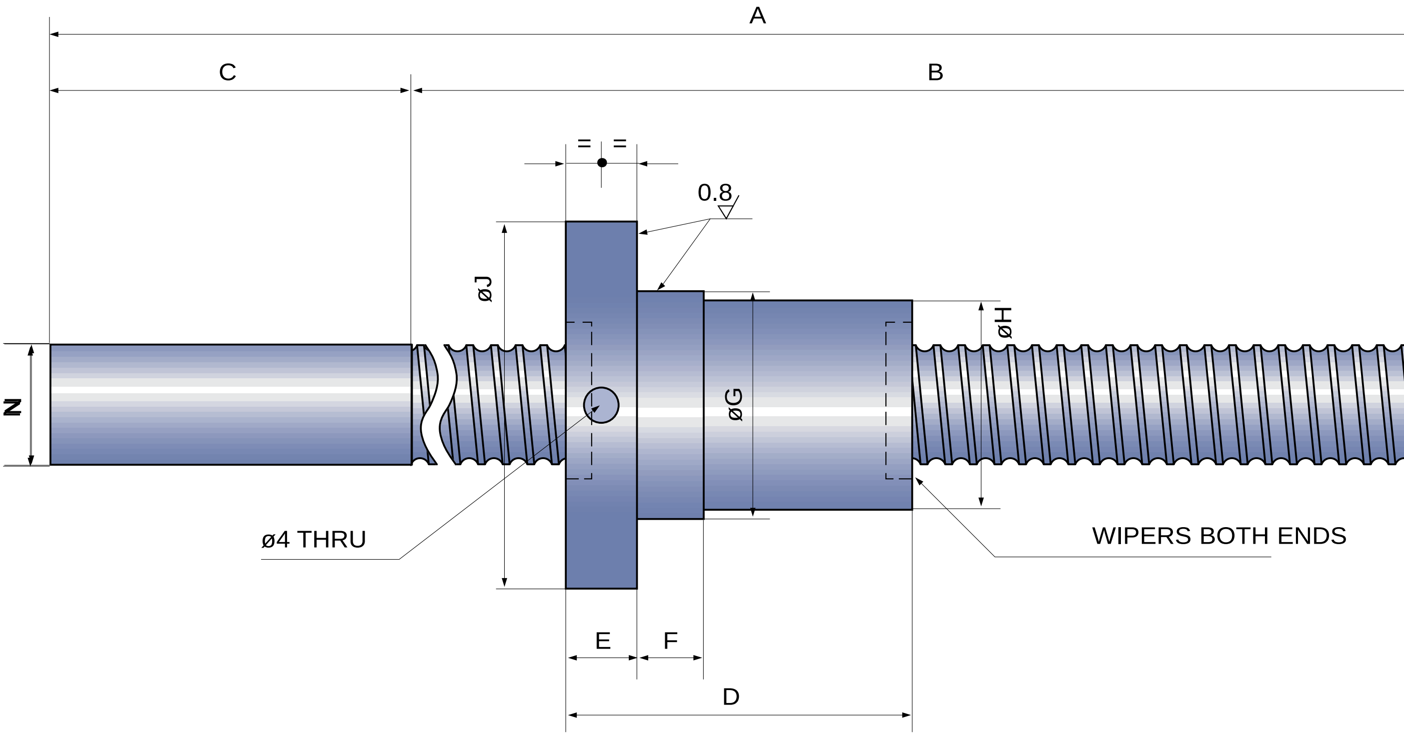


TRANSFER SYSTEM



H	J (min)	N	BALL DIA	NUMBER OF TURNS	PRELOAD daN	PRELOAD TORQUE daNcm	DYNAMIC RATING 1x10^{6}Revs daN	DYNAMIC RATING 2.5x10^{6}Revs daN	STATIC RATING daN	RIGIDITY daN/µm
$50^{-0,2}_{-0,3}$	80	30	6,000	3+3	350	4,5	3550	2620	6500	65
$50^{-0,2}_{-0,3}$	90	31	4,500	4	127	1,6	2550	1880	5200	58
$56^{-0,2}_{-0,3}$	93	39	4,500	4+4	350	5,6	3500	2580	8550	92
$56^{-0,2}_{-0,3}$	93	39	4,500	3+3	275	4,4	2750	2030	6400	73
$72^{-0,2}_{-0,3}$	115	48	7,144	4+4	740	14,8	7400	5450	17400	124
$79^{-0,2}_{-0,3}$	130	62	3,500	4+4	300	7,6	3000	2210	11000	110
$85^{-0,2}_{-0,3}$	139	61	7,144	5+5	980	24,7	9800	7220	27000	174
$90^{-0,2}_{-0,3}$	144	61	9,000	3+3	870	22,0	8700	6410	20600	116

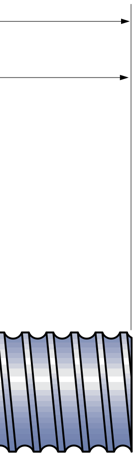
PRECISION GRADE 3 INCH LEAD BALLSCREWS
SOFT FLANGED – SINGLE NUT – PRE-LOADED



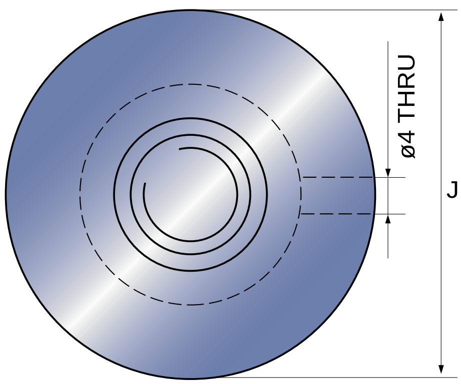
JTi3 SERIES-SINGLE NUT

PART NO.	PCD	LEAD	A mm	B	C	D	E	F	G
JTi3 - 0,625x0,200 *	0,625"	0,200"	700	600	100	40	10	10	27,993 27,980
JTi3 - 0,750x0,200 *	0,750"	0,200"	850	750	100	42	10	10	35,991 35,975
JTi3 - 1,000x0,200 *	1,000"	0,200"	1350	1200	150	42	10	10	39,991 39,975
JTi3 - 1,000x0,250 *	1,000"	0,250"	1350	1200	150	46	10	10	39,991 39,975
JTi3 - 1,250x0,200 **	1,250"	0,200"	2000	1850	150	73	12	10	49,991 49,975
JTi3 - 1,250x0,250 **	1,250"	0,250"	2000	1850	150	81	14	16	49,991 49,975
JTi3 - 1,500x0,200 **	1,500"	0,200"	2000	1850	150	86	14	10	55,990 55,971
JTi3 - 1,500x0,250 **	1,500"	0,250"	2000	1850	150	95	14	16	62,990 62,971
JTi3 - 2,000x0,200 **	2,000"	0,200"	2650	2450	200	88	16	16	74,990 74,971
JTi3 - 2,000x0,250 **	2,000"	0,250"	2650	2450	200	97	16	16	74,990 74,971
JTi3 - 2,250x0,500 **	2,250"	0,500"	3200	3000	200	173	18	16	91,988 91,966

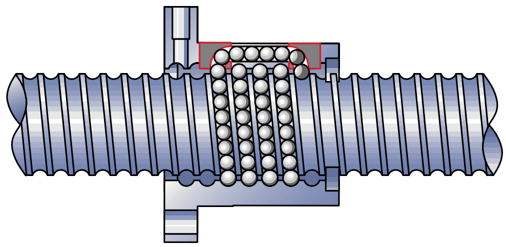
* BALL SELECTION
** PITCH SHIFT



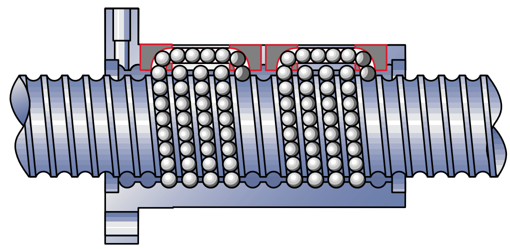
SOFT FLANGE – max 41HRC



TRANSFER SYSTEM



* Preload by Ball selection



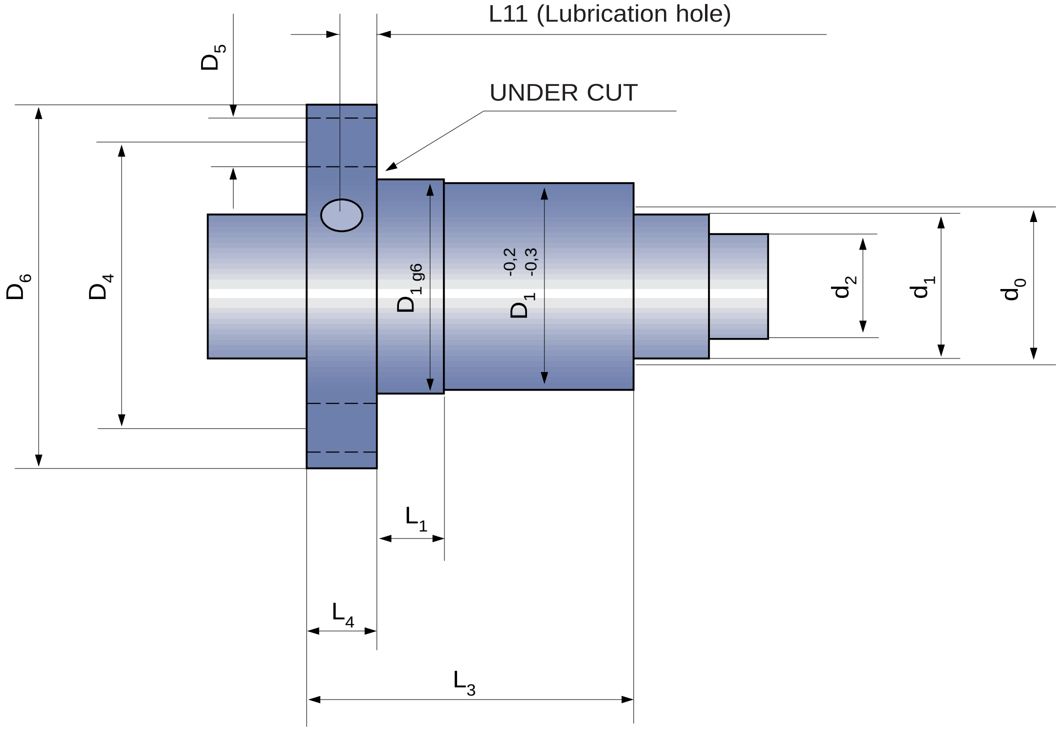
** Preload by pitch shift

H	J (min)	N	BALL DIA.	NUMBER OF TURNS	PRELOAD daN	PRELOAD TORQUE daNcm	DYNAMIC RATING $1x10^6$Revs daN	DYNAMIC RATING $2.5x10^6$Revs daN	STATIC RATING daN	RIGIDITY daN/µm
$28^{-0,2}_{-0,3}$	54	15	3,000	3	42	0,3	840	620	1290	20
$36^{-0,2}_{-0,3}$	60	19	3,500	3	60	0,5	1200	880	1990	23
$40^{-0,2}_{-0,3}$	73	24	3,500	3	65	0,6	1310	970	2470	38
$40^{-0,2}_{-0,3}$	73	24	3,500	3	65	0,6	1310	970	2470	38
$50^{-0,2}_{-0,3}$	80	31	3,500	3+3	177	2,3	1770	1300	4030	59
$50^{-0,2}_{-0,3}$	80	31	4,500	3+3	250	3,2	2500	1840	5170	63
$56^{-0,2}_{-0,3}$	87	39	3,500	4+4	249	4,0	2490	1830	6770	92
$63^{-0,2}_{-0,3}$	87	39	4,500	4+4	350	5,5	3500	2580	8550	96
$75^{-0,2}_{-0,3}$	106	49	3,500	4+4	273	5,5	2730	2010	8570	106
$75^{-0,2}_{-0,3}$	110	49	4,500	4+4	386	7,7	3860	2850	10870	112
$92^{-0,2}_{-0,3}$	132	55	9,000	4+4	1032	23,5	10320	76040	23620	141

PRECISION GROUND BALLSCREWS
FLANGED – SINGLE NUT

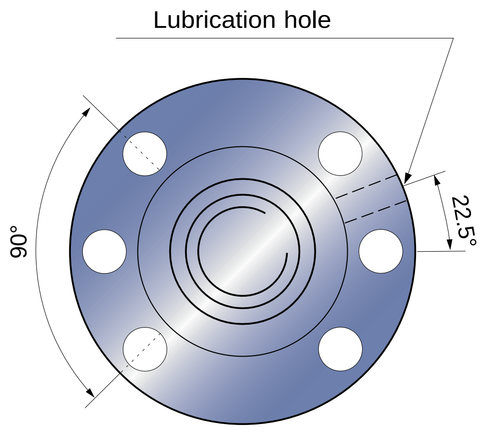
NUT DESIGN TO DIN69051 PART 5

WIPERS BOTH ENDS

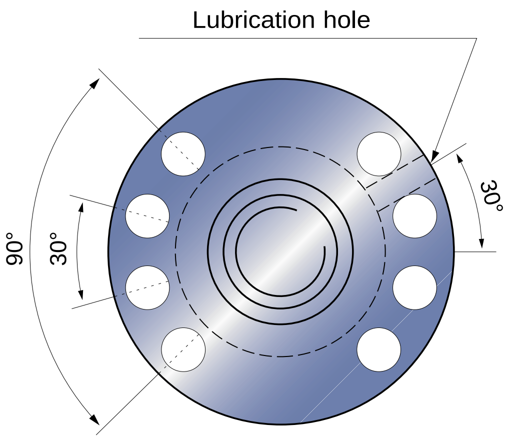


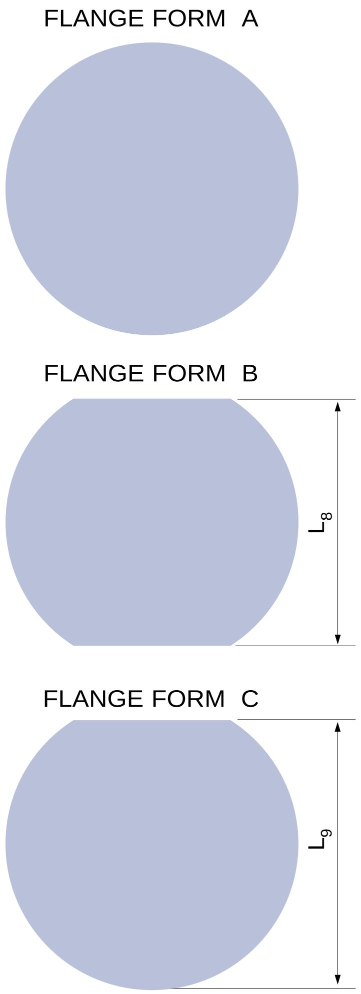
Size $d_0 x P_{ho}$	d1	Root Diameter d2	$D1_{g6}$	D4	$D5_{H13}$	D6	L1	L3 Number of turns per nut i = 2	i = 3	i = 4	i = 5	i = 6	L4
16x 5	15	12,9	28	38	5,5	48	10	35	40	45	50	55	10
20x 5	19	15,6	36	47	6,6	58	10	35	40	45	50	55	10
25x 5	24	20,6	40	51	6,6	62	10	36	41	46	51	56	10
25x10	24	20,6	40	51	6,6	62	16	49	59	69	79	89	10
32x 5	31	27,6	50	65	9	80	10	38	43	48	53	58	12
32x10	31	27,0	50	65	9	80	16	51	61	71	81	91	12
40x 5	39	35,6	63	78	9	93	10	40	45	50	55	60	14
40x10	38	33,1	63	78	9	93	16	61	71	81	91	101	14
50x 5	49	45,6	75	93	11	110	10	42	47	52	57	62	16
50x10	48	42	75	93	11	110	16	63	73	83	93	103	16
50x20	48	42	75	93	11	110	25	83	103	123	143	163	16
63x 5	62	59,6	90	108	11	125	10	44	49	54	59	64	18
63x10	61	55,1	90	108	11	125	16	65	75	85	95	105	18
63x20	61	53,2	95	115	13,5	135	25	88	108	128	148	168	20
80x10	76	70,1	105	125	13,5	145	16	67	77	87	97	107	20
80x20	76	66,4	125	145	13,5	165	25	105	125	145	165	185	25
100x10	96	90,1	125	145	13,5	165	16	69	79	89	99	109	22
100x20	96	86,4	150	176	17,5	202	25	110	130	150	170	190	30
125x10	123	117,1	150	176	17,5	202	16	72	82	92	102	112	25
125x20	121	111,4	170	196	17,5	222	25	110	130	150	170	190	30

HOLE PATTERN 1



HOLE PATTERN 2



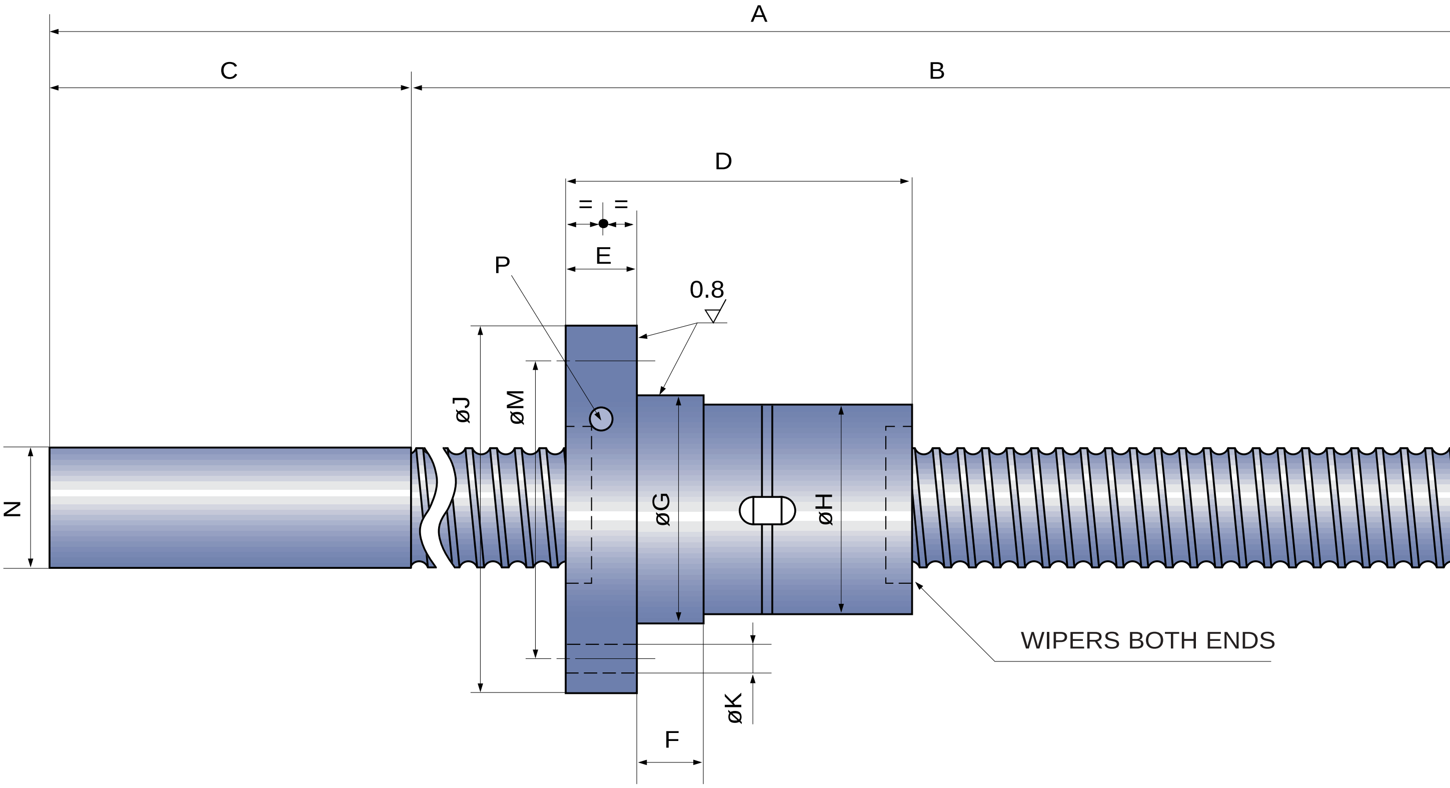


Lubrication hole M6x8 deep up to 32Ø
M8 x1x10 deep over 40Ø

L8	L9	L11	Hole Pattern	Capacity for number of turns per nut for 10⁶ Revolutions (KN) i = 2 stat.	i = 2 dynam.	i = 3 stat.	i = 3 dynam.	i = 4 stat.	i = 4 dynam.	i = 5 stat.	i = 5 dynam.	i = 6 stat.	i = 6 dynam.	Backlash Single Nut (mm)
40	44	5	1	10,9	7,2	16,3	10,2	21,8	13,0	27,2	15,8	32,7	18,5	0,05
44	51	5	1	15,9	9,8	23,8	13,9	31,7	17,8	39,7	21,6	47,6	25,2	0,06
48	55	5	1	20,9	11,2	31,3	15,9	41,7	20,3	52,1	24,6	62,5	28,8	0,06
48	55	5	1	20,9	11,2	31,3	15,9	41,7	20,3	52,1	24,6	62,5	28,8	0,06
62	71	6	1	26,9	12,5	40,3	17,7	53,7	22,6	67,1	27,4	80,6	32,1	0,06
62	71	6	1	34,3	17,5	51,5	24,9	68,7	31,9	85,8	38,6	103,0	45,2	0,06
70	81,5	7	2	33,9	13,7	50,8	19,4	67,7	24,9	84,7	30,1	101,6	35,2	0,06
70	81,5	7	2	55,4	28,1	83,1	39,8	110,8	50,9	138,5	61,7	166,2	72,2	0,08
85	97,5	8	2	42,9	15,0	64,3	21,3	85,7	27,3	107,2	33,1	128,6	38,7	0,06
85	97,5	8	2	82,8	39,4	124,2	55,9	165,7	71,5	207,1	86,7	248,5	101,4	0,10
85	97,5	8	2	82,8	39,4	124,2	55,9	165,7	71,5	207,1	86,7	248,5	101,4	0,10
95	110	9	2	58,9	16,6	82,3	23,5	109,7	30,1	137,2	36,4	164,6	42,8	0,06
95	110	9	2	107,8	44,4	161,7	62,9	215,6	80,5	269,5	97,3	323,4	114,2	0,10
100	117,5	10	2	137,2	61,4	205,8	86,9	274,4	111,1	343,0	134,9	441,6	157,8	0,13
110	127,5	10	2	174,7	49,8	221,6	70,5	282,2	90,3	352,7	109,5	423,3	128,0	0,10
130	147,5	12,5	2	234,9	105,7	352,4	149,8	469,8	191,9	587,3	232,4	704,7	272,0	0,19
130	147,5	11	2	174,5	53,8	261,8	76,3	349,1	97,7	436,4	118,4	523,6	138,5	0,10
155	178,5	15	2	330,8	118,4	451,2	167,8	601,6	214,8	752,0	260,3	902,4	304,5	0,19
155	178,5	12,5	2	220,4	58,9	330,6	83,5	440,8	106,9	551,0	129,5	661,2	151,5	0,10
175	198,5	15	2	378,0	130,5	570,0	185,0	759,9	236,9	949,9	287,0	1139,9	335,8	0,19

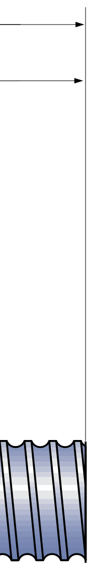
PRECISION GRADE 3 METRIC LEAD BALLSCREWS
FLANGED – DOUBLE NUT

NUT DESIGN TO DIN69051

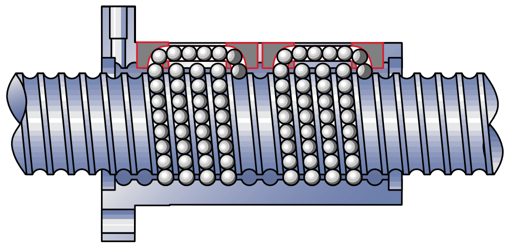


JTd3 SERIES-DOUBLE NUT

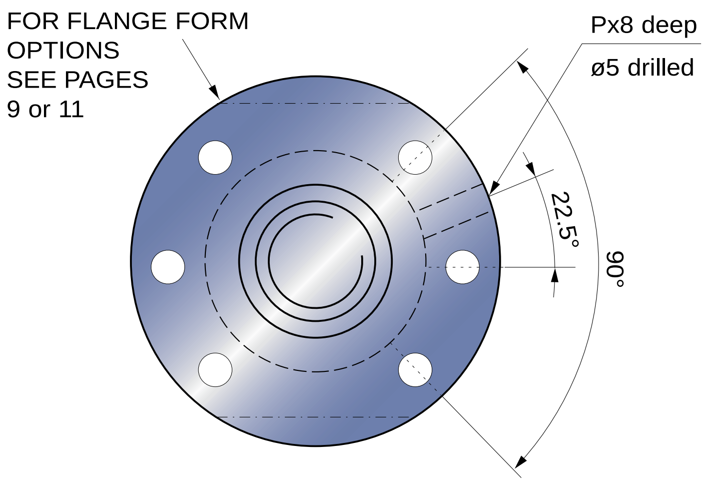
PART NO	PCD	LEAD	A	B	C	D	E	F	G	H	J	K
JTd3-1605	16	5	600	500	100	83	10	10	27,993 27,980	$28^{-0,2}_{-0,3}$	48	5,5
JTd3-2005	20	5	1000	800	200	84	10	10	35,991 35,975	$36^{-0,2}_{-0,3}$	58	6,6
JTd3-2505	25	5	1200	1000	200	84	10	10	39,991 39,975	$40^{-0,2}_{-0,3}$	62	6,6
JTd3-3205	32	5	1700	1500	200	87	12	10	49,991 49,975	$50^{-0,2}_{-0,3}$	80	9,0
JTd3-3210	32	10	1700	1500	200	131	12	16	49,991 49,975	$50^{-0,2}_{-0,3}$	80	9,0
JTd3-4005	40	5	2200	2000	200	89	14	10	62,990 62,971	$63^{-0,2}_{-0,3}$	93	9,0
JTd3-4010	40	10	2200	2000	200	145	14	18	62,990 62,971	$63^{-0,2}_{-0,3}$	93	9,0
JTd3-5005	50	5	2700	2500	200	88	16	10	74,990 74,971	$75^{-0,2}_{-0,3}$	110	11,0
JTd3-5010	50	10	2700	2500	200	148	16	16	74,990 74,971	$75^{-0,2}_{-0,3}$	110	11,0
JTd3-6310	63	10	3500	3300	200	148	18	16	89,988 89,966	$90^{-0,2}_{-0,3}$	125	11,0



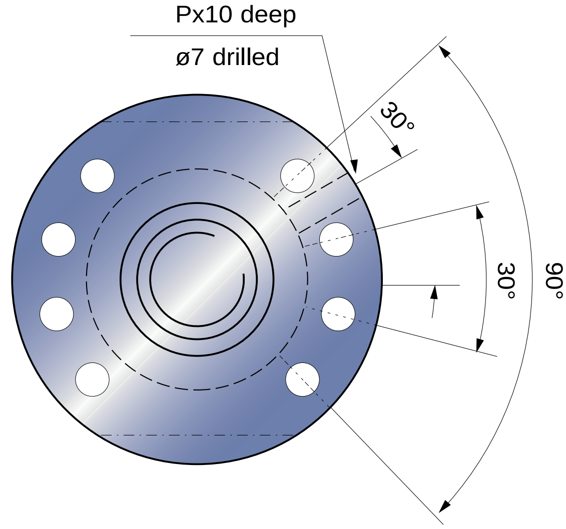
TRANSFER SYSTEM



HOLE PATTERN 1



HOLE PATTERN 2

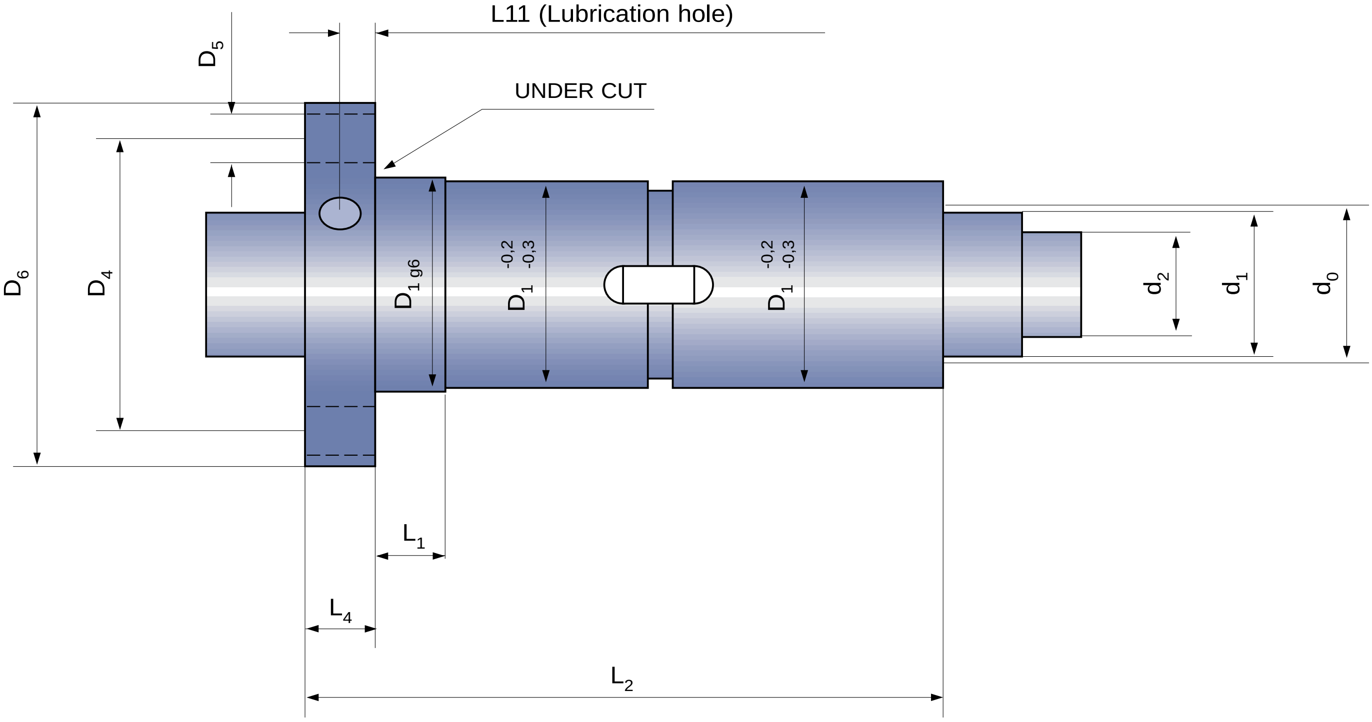


M	N	P	Hole Pattern	BALL DIA.	NUMBER OF TURNS	PRELOAD daN	PRELOAD TORQUE daNcm	DYNAMIC RATING 1x10^{6}Revs daN	DYNAMIC RATING 2.5x10^{6}Revs daN	STATIC RATING daN	RIGIDITY daN/µm
38	15	M6	1	3,000	2x4	130	0,8	1300	960	2180	45
47	19	M6	1	3,500	2x4	185	1,5	1780	1310	3170	57
51	24	M6	1	3,500	2x4	203	2,0	2030	1500	4170	65
65	31	M6	1	3,500	2x4	227	2,9	2260	1665	5370	78
65	31	M6	1	4,500	2x4	319	4,1	3190	2350	6870	85
78	39	M8x1	2	3,500	2x4	249	4,0	2490	1840	6770	92
78	38	M8x1	2	6,000	2x4	527	8,4	5090	3750	11080	106
93	49	M8x1	2	3,500	2x4	273	5,5	2730	2010	8570	106
93	48	M8x1	2	7,144	2x4	738	14,3	7150	5270	16570	126
108	61	M8x1	2	7,144	2x4	806	20,3	8050	5930	21560	144

PRECISION GROUND BALLSCREWS
FLANGED – DOUBLE NUT

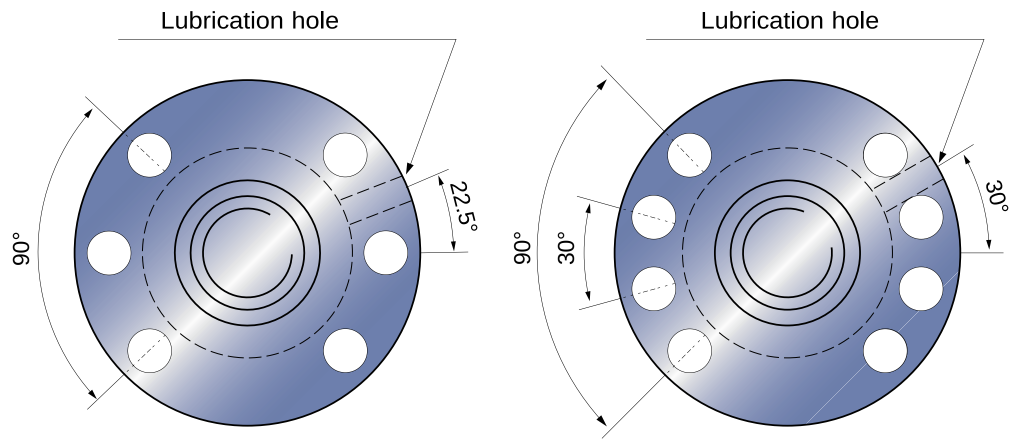
NUT DESIGN TO DIN69051 PART 5

WIPERS BOTH ENDS

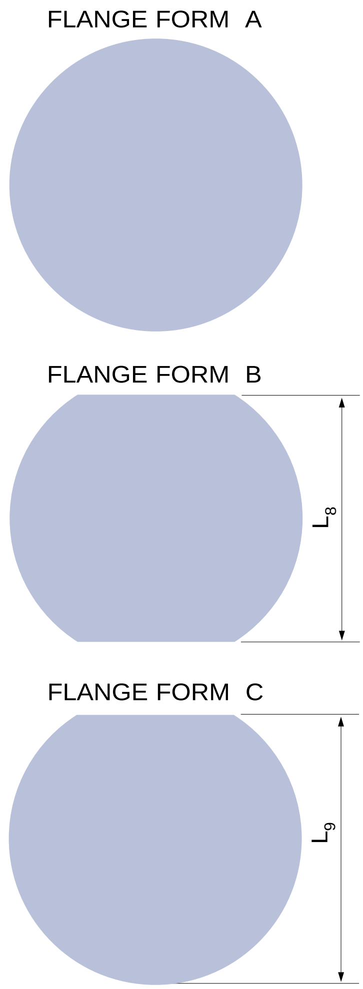


Size $d_0 x P_{ho}$	d1	Root Diameter d2	$D1_{g6}$	D4	$D5_{H13}$	D6	L1	L2 Number of turns per nut i =					L4
								i = 2	i = 3	i = 4	i = 5	i = 6	
16x 5	15	12,9	28	38	5,5	48	10	63	73	83	93	103	10
20x 5	19	15,6	36	47	6,6	58	10	64	74	84	94	104	10
25x 5	24	20,6	40	51	6,6	62	10	65	75	85	95	105	10
25x10	24	20,6	40	51	6,6	62	16	82	102	122	142	162	10
32x 5	31	27,6	50	65	9	80	10	67	77	87	97	107	12
32x10	31	27,0	50	65	9	80	16	91	111	131	151	171	12
40x 5	39	35,6	63	78	9	93	10	69	79	89	99	109	14
40x10	38	33,1	63	78	9	93	16	105	125	145	165	185	14
50x 5	49	45,6	75	93	11	110	10	70	80	90	100	110	16
50x10	48	42	75	93	11	110	16	106	126	146	166	186	16
50x20	48	42	75	93	11	110	25	147	187	227	267	307	16
63x 5	62	59,6	90	108	11	125	10	73	83	93	103	113	18
63x10	61	55,1	90	108	11	125	16	108	128	148	168	188	18
63x20	61	53,2	95	115	13,5	135	25	149	189	229	269	309	20
80x10	76	70,1	105	125	13,5	145	16	111	131	151	171	191	20
80x20	76	66,4	125	145	13,5	165	25	180	220	260	300	340	25
100x10	96	90,1	125	145	13,5	165	16	114	134	154	174	194	22
100x20	96	86,4	150	176	17,5	202	25	177	217	257	297	337	30
125x10	123	117,1	150	176	17,5	202	16	116	136	156	176	196	25
125x20	121	111,4	170	196	17,5	222	25	185	225	265	305	345	30

HOLE PATTERN 1 HOLE PATTERN 2



Lubrication hole M6x8 deep up to 32Ø
M8 x1x10 deep over 40Ø

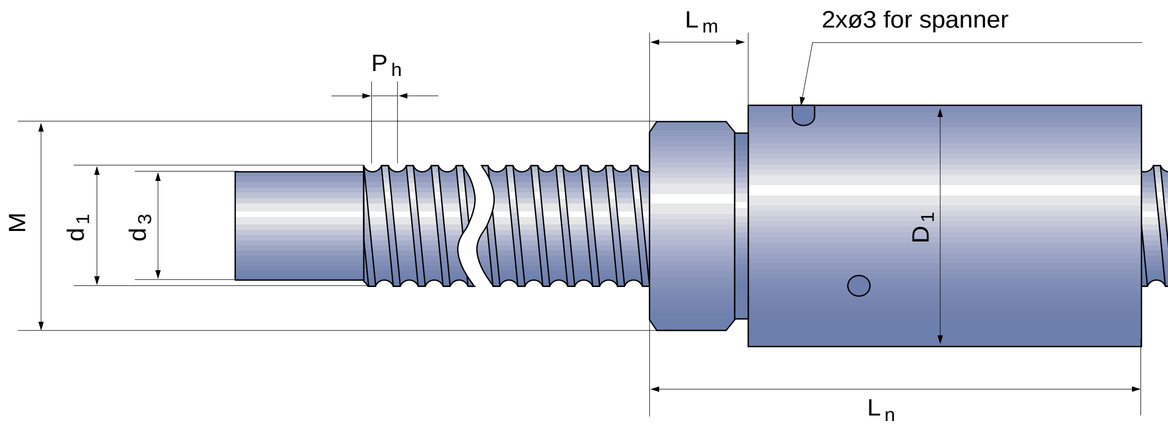


L8	L9	L11	Hole Pattern	Capacity for number of turns per nut for 10^6 Revolutions (KN) i = 2 stat.	i = 2 dynam.	i = 3 stat.	i = 3 dynam.	i = 4 stat.	i = 4 dynam.	i = 5 stat.	i = 5 dynam.	i = 6 stat.	i = 6 dynam.
40	44	5	1	10,9	7,2	16,3	10,2	21,8	13,0	27,2	15,8	32,7	18,5
44	51	5	1	15,9	9,8	23,8	13,9	31,7	17,8	39,7	21,6	47,6	25,2
48	55	5	1	20,9	11,2	31,3	15,9	41,7	20,3	52,1	24,6	62,5	28,8
48	55	5	1	20,9	11,2	31,3	15,9	41,7	20,3	52,1	24,6	62,5	28,8
62	71	6	1	26,9	12,5	40,3	17,7	53,7	22,6	67,1	27,4	80,6	32,1
62	71	6	1	34,3	17,5	51,5	24,9	68,7	31,9	85,8	38,6	103,0	45,02
70	81,5	7	2	33,9	13,7	50,8	19,4	67,7	24,9	84,7	30,1	101,6	35,2
70	81,5	7	2	55,4	28,1	83,1	39,8	110,8	50,9	138,5	61,7	166,2	72,2
85	97,5	8	2	42,9	15,0	64,3	21,3	85,7	27,3	107,2	33,1	128,6	38,7
85	97,5	8	2	82,8	39,4	124,2	55,9	165,7	71,5	207,1	86,7	248,5	101,4
85	97,5	8	2	82,8	39,4	124,2	55,9	165,7	71,5	207,1	86,7	248,5	101,4
95	110	9	2	58,9	16,6	82,3	23,5	109,7	30,1	137,2	36,4	164,6	42,8
95	110	9	2	107,8	44,4	161,7	62,9	215,6	80,5	269,5	97,3	323,4	114,2
100	117,5	10	2	137,2	61,4	205,8	86,9	274,4	111,1	343,0	134,9	441,6	157,8
110	127,5	10	2	174,7	49,8	221,6	70,5	282,2	90,3	352,7	109,5	423,3	128,0
130	147,5	12,5	2	234,9	105,7	352,4	149,8	469,8	191,9	587,3	232,4	704,7	272,0
130	147,5	11	2	174,5	53,8	261,8	76,3	349,1	97,7	436,4	118,4	523,6	138,5
155	178,5	15	2	330,8	118,4	451,2	167,8	601,6	214,8	752,0	260,3	902,4	304,5
155	178,5	12,5	2	220,4	58,9	330,6	83,5	440,8	106,9	551,0	129,5	661,2	151,5
175	198,5	15	2	378,0	130,5	570,0	185,0	759,9	236,9	949,9	287,0	1139,9	335,8

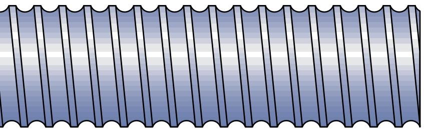
PRECISION GRADE 7 METRIC LEAD BALLSCREWS

SINGLE NUT- 3 TURNS RH

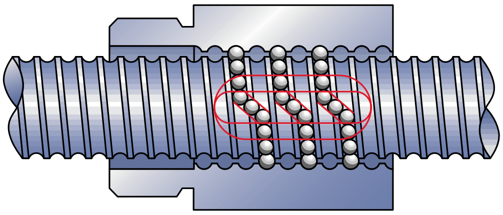
MINIMAL BACKLASH

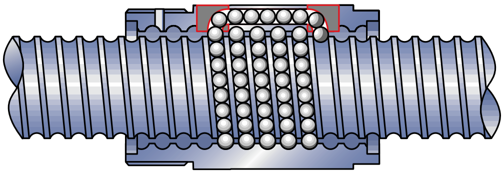


JTm7 SERIES-SINGLE NUT PART-NO		NOM. DIA. d_o	LEAD P_h	L_n	L_m	D_1
JTm7-08020	●	8	2,0	27	8	16,5
JTm7-08025	●	8	2,5	31,5	8	16,5
JTm7-10020	●	10	2,0	27	8	20,5
JTm7-10025	●	10	2,5	31,5	8	20,5
JTm7-12020	●	12	2,0	29	10	22
JTm7-12025	●	12	2,5	36	10	26
JTm7-12040	■	12	4,0	36	10	26
JTm7-12050	■	12	5,0	40	10	26
JTm7-14020	●	14	2,0	32	10	24
JTm7-14040	■	14	4,0	36	10	26
JTm7-16020	●	16	2,0	29	10	26
JTm7-16025	●	16	2,5	36	10	26
JTm7-16040	■	16	4,0	36	10	28



TRANSFER SYSTEM

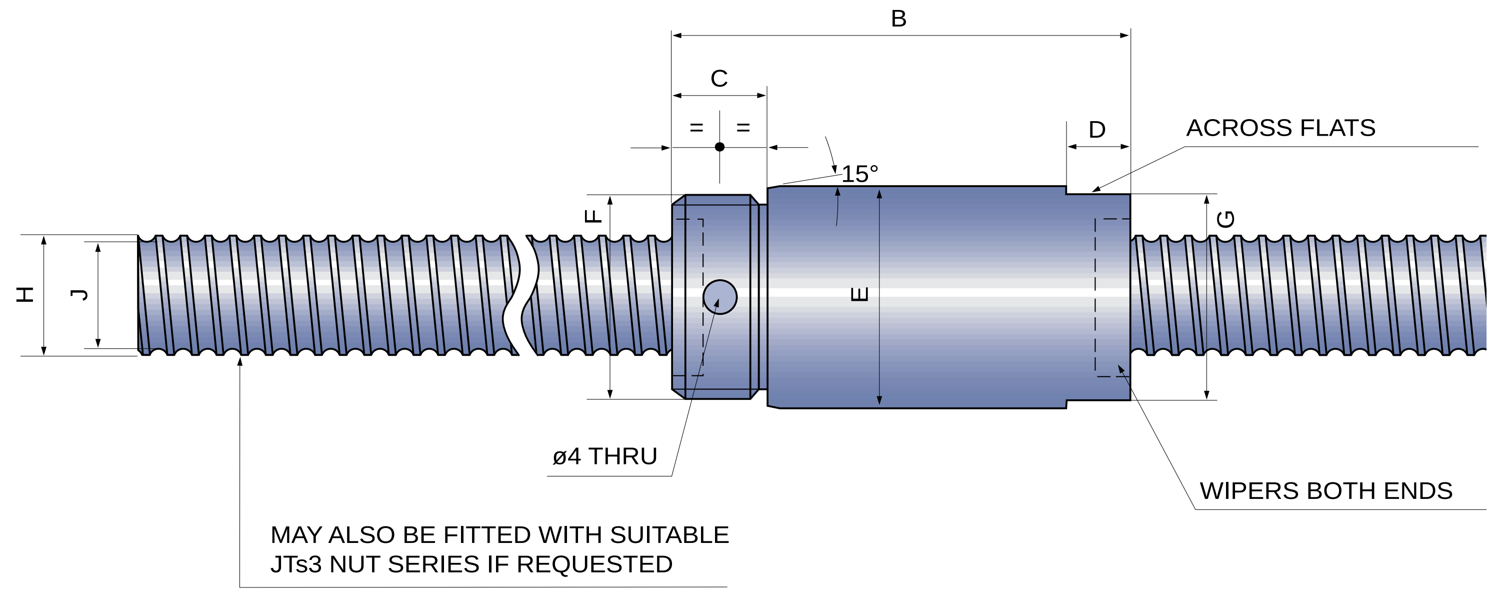




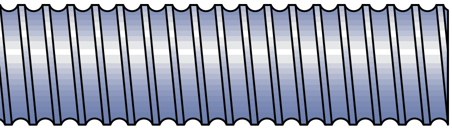
d_1	d_3	M	WIPERS	DYNAMIC RATING $1x10^6$Revs daN	STATIC RATING daN	AXIAL PLAY MAX
8,0	6,9	M14x1	-	170	220	0,01
8,0	6,9	M14x1	-	170	220	0,01
9,8	8,7	M17x1	-	190	270	0,01
9,8	8,2	M17x1	-	280	360	0,01
11,8	10,7	M18x1	-	220	340	0,01
11,8	10,2	M22x1	x	320	480	0,01
11,8	10,2	M22x1	x	320	480	0,01
11,5	9,8	M22x1	x	340	500	0,01
13,8	12,6	M22x1	x	230	410	0,01
13,8	12,1	M22x1	x	360	590	0,01
15,6	14,5	M22x1	-	240	460	0,01
15,6	14,0	M22x1	x	390	680	0,01
15,4	13,4	M25x1,5	x	610	1030	0,01

PRECISION GRADE 7 METRIC LEAD BALLSCREW
SINGLE NUT WITH AXIAL PLAY

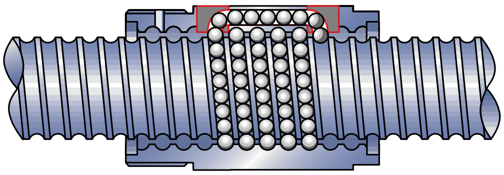
Please enquire regarding available lengths.



JTs7 SERIES-SINGLE NUT PART NO	PCD	LEAD	B	C	D	E	F
JTs7-1605	16	5	44	12	8	30	M26x1,5
JTs7-1605-LH	16	5	44	12	8	30	M26x1,5
JTs7-1610	16	10	47	12	8	30	M26x1,5
JTs7-2005	20	5	52	14	8	40	M35x1,5
JTs7-2505	25	5	57	19	8	45	M40x1,5
JTs7-2505-LH	25	5	57	19	8	45	M40x1,5
JTs7-2510	25	10	79	19	8	45	M40x1,5
JTs7-3205	32	5	57	19	8	55	M48x1,5
JTs7-3205-LH	32	5	57	19	8	55	M48x1,5
JTs7-3210	32	10	85	19	8	60	M55x1,5
JTs7-4005	40	5	56	19	10	60	M55x1,5
JTs7-4010	40	10	90	24	10	65	M60x1,5
JTs7-4020	40	20	86	24	10	65	M60x1,5
JTs7-5010	50	10	110	30	12	77	M72x1,5
JTs7-5012	50	12	132	30	12	85	M72x1,5
JTs7-6310	63	10	110	30	12	90	M85x2
JTs7-6312	63	12	133	30	12	95	M85x2



TRANSFER SYSTEM



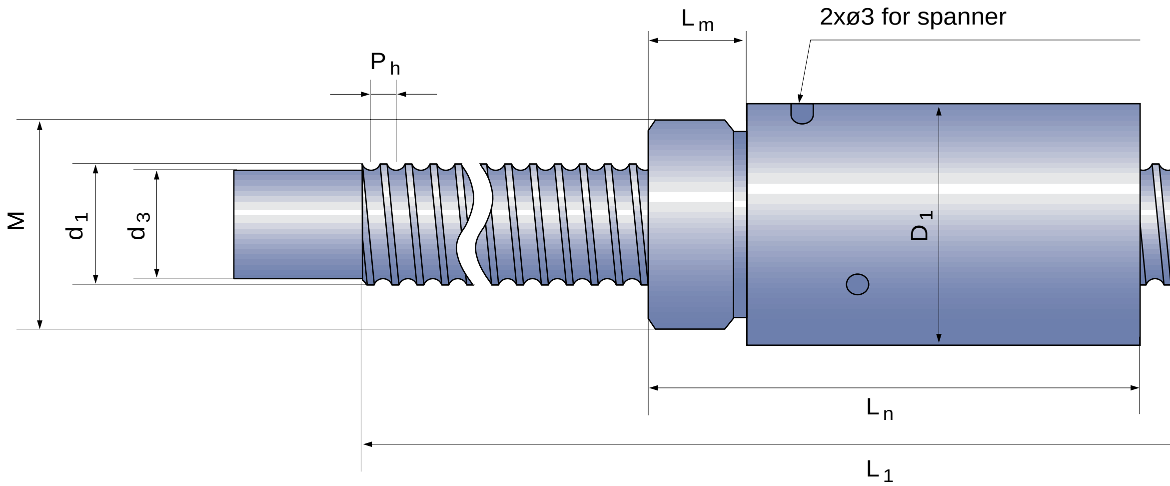
G	H	J	NUMBER OF TURNS	DYNAMIC RATING 1x10^6 Revs daN	2.5x10^6 Revs daN	AXIAL PLAY MAX
28	15	12,9	3	760	560	0,05
28	15	12,9	3	760	560	0,05
28	15	12,9	2	540	400	0,05
36	19	16,4	4	1370	1000	0,06
40	24	21,4	4	1510	1100	0,06
40	24	21,4	4	1510	1100	0,06
40	24	21,4	4	1500	1100	0,06
50	31	28,4	4	1680	1240	0,06
50	31	28,4	4	1680	1240	0,06
56	30	25,1	4	3370	2480	0,08
56	39	36,4	4	2230	1640	0,06
60	38	33,8	4	3900	2870	0,08
60	38	33,8	4	3860	2850	0,08
72	48	42,6	5	6625	4880	0,10
80	48	40,6	6	10300	7590	0,13
84	61	55,6	5	7230	5330	0,10
90	61	53,7	6	11700	8620	0,13

PRECISION GRADE 3 METRIC LEAD BALLSCREWS

MAX. THREAD LENGTH=L1

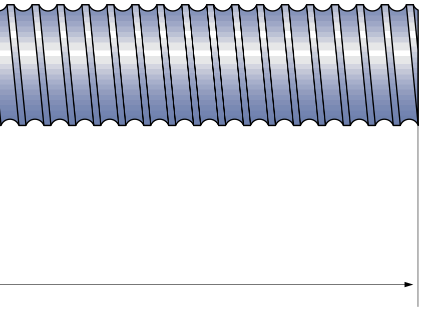
SINGLE NUT- 3 TURNS RH

MINIMAL BACKLASH OR PRE-LOADED

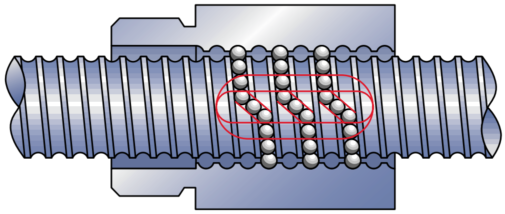


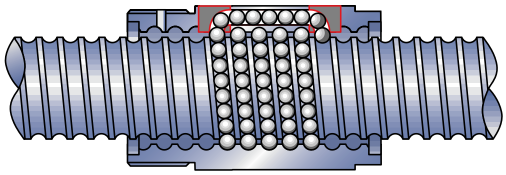
JTm3 SERIES-SINGLE NUT PART-NO		NOM. DIA. d_o	LEAD P_h	L_1	L_n	L_m
JTm3-06010	●	6	1,0	200	21	6
JTm3-08010	●	8	1,0	300	26	8
JTm3-08020	●	8	2,0	300	27	8
JTm3-08025	●	8	2,5	300	31,5	8
JTm3-10020	●	10	2,0	375	27	8
JTm3-10025	●	10	2,5	375	31,5	8
JTm3-12020	●	12	2,0	375	29	10
JTm3-12025	■	12	2,5	500	36	10
JTm3-12040	■	12	4,0	500	36	10
JTm3-12050	●	12	5,0	500	40	10
JTm3-14020	●	14	2,0	750	32	10
JTm3-14040	■	14	4,0	750	36	10
JTm3-16020	●	16	2,0	1000	29	10
JTm3-16025	●	16	2,5	1000	36	10
JTm3-16040	■	16	4,0	1000	36	10

JTm3 SERIES SINGLE NUT



TRANSFER SYSTEM





D_1	d_1	d_3	M	WIPERS	DYNAMIC RATING $1x10^6$ Revs daN	STATIC RATING daN
14,5	5,9	5,3	M12x1	-	70	100
16,5	8,0	7,4	M14x1	-	120	200
16,5	8,0	6,9	M14x1	-	190	240
16,5	8,0	6,9	M14x1	-	190	240
20,5	9,8	8,7	M17x1	-	210	300
20,5	9,8	8,2	M17x1	-	310	400
22	11,8	10,7	M18x1	-	240	380
26	11,8	10,2	M22x1	x	360	530
26	11,8	10,2	M22x1	x	360	530
26	11,5	9,8	M22x1	x	380	560
24	13,8	12,6	M22x1	x	250	450
26	13,8	12,1	M22x1	x	400	650
26	15,6	14,5	M22x1	-	270	510
26	15,6	14,0	M22x1	x	430	750
28	15,4	13,4	M25x1,5	x	680	1140

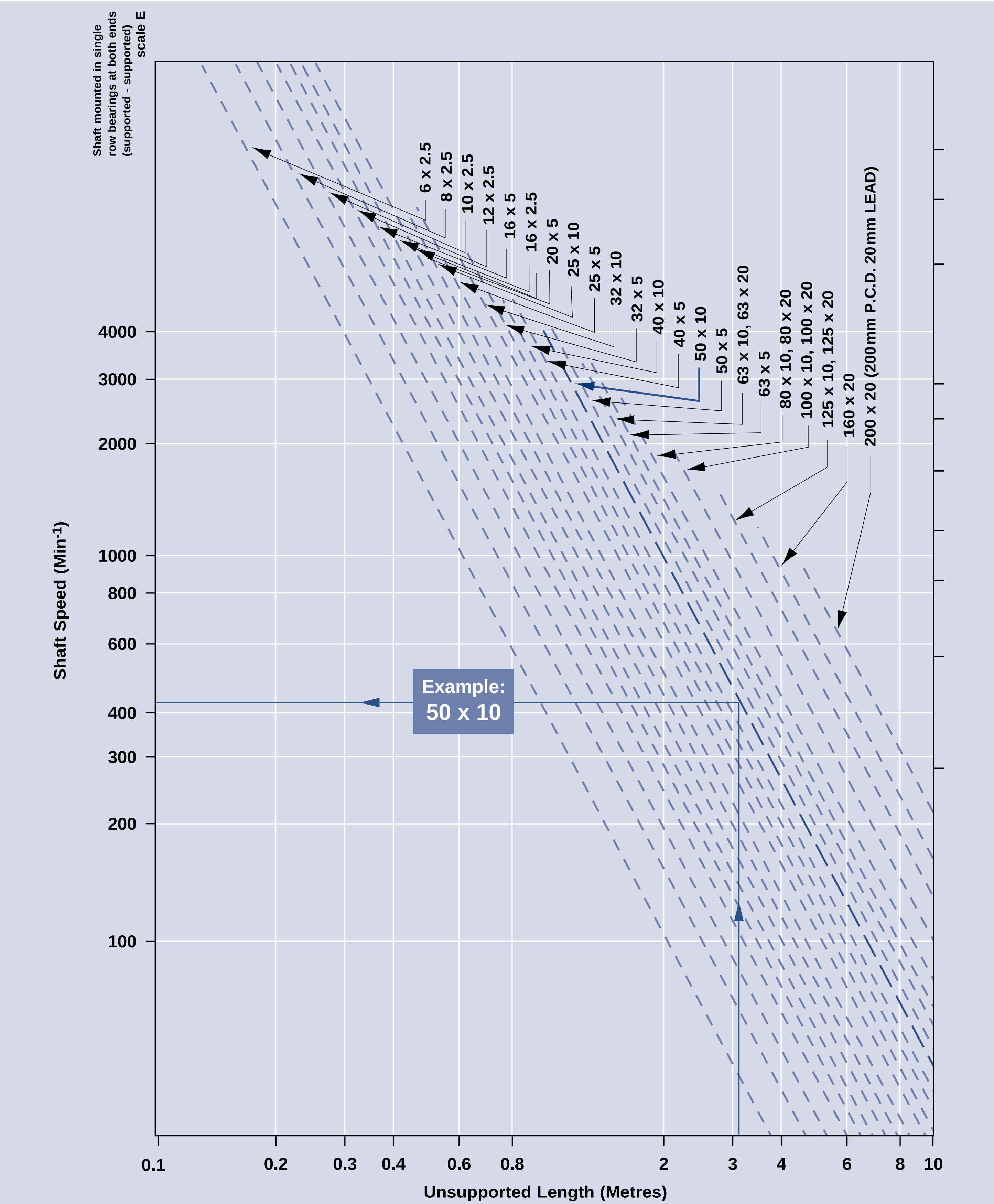
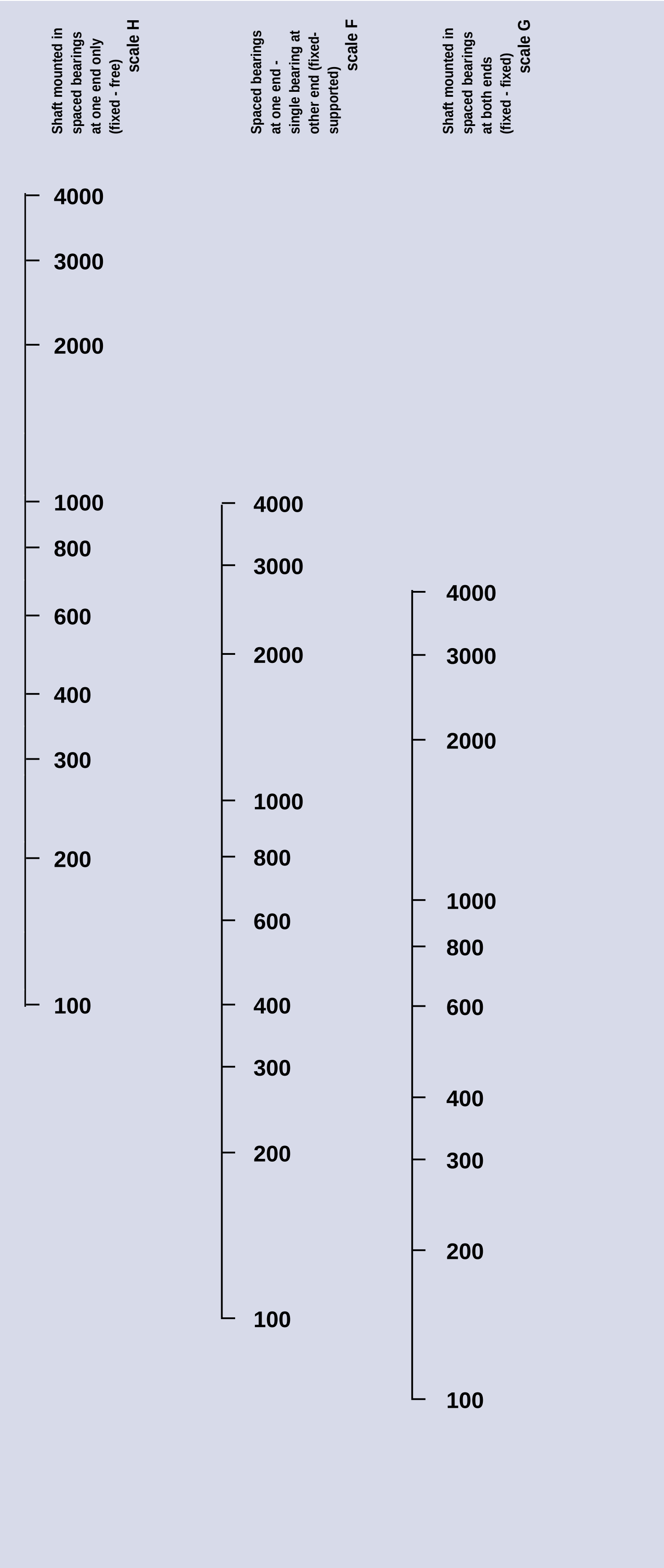

Shaft mounted in single row bearings at both ends (supported - supported) scale E
6 x 2.5
8 x 2.5
10 x 2.5
12 x 2.5
16 x 5
16 x 2.5
20 x 5
25 x 10
25 x 5
32 x 10
32 x 5
40 x 10
40 x 5
50 x 10
50 x 5
63 x 10, 63 x 20
63 x 5
80 x 10, 80 x 20
100 x 10, 100 x 20
125 x 10, 125 x 20
160 x 20
200 x 20 (200mm P.C.D. 20mm LEAD)
Example:
50 x 10
Shaft Speed (Min-1)
4000
3000
2000
1000
800
600
400
300
200
100
0.1
0.2
0.3
0.4
0.6
0.8
2
3
4
6
8
10
Unsupported Length (Metres)

Fig. 8



CRITICAL SPEEDS

As the speed of a rotating shaft is increased, at certain speeds the shaft will commence to vibrate. If the speed is then allowed to remain constant the vibrations may build-up until damage results.
However, if the speed is further increased the shaft will again run smoothly. Similar conditions are produced when a nut is rotated on a stationary shaft. The speeds at which resonant vibrations occur are known as the critical speeds.
Critical speeds are influenced by the diameter and unsupported length of the shaft and by the type and method of mounting of the supporting bearings (see Figure 7, see page 26/27).
The torque applied to the shaft may also reduce the critical speeds.
It is normal for ballscrews to operate below the first critical speed and a safety margin of 20% below this speed is generally adequate to avoid vibration problems.
Ballscrew speeds are also limited by the resultant velocity of the balls within the nut. This ball speed is for convenience, indicated by a Dwn value
(Ball P.C.D. x rotational speed). (Dwn value = 120,000).

Figure 8 (page 28/29) shows the maximum safe speeds for JENA-TEC ballscrew sizes relative to unsupported length and bearing mounting. The horizontal portions of the lines indicate, on the L.H. scale, the maximum speed of the ballscrew which will not exceed the recommended Dwn value.

COLUMN LOADING

When a ballscrew shaft is subjected to an axially compressive load, the ability to resist buckling must be ascertained.

Figure 9. provides the values of the maximum safe load a ballscrew will sustain for various unsupported lengths and different types of bearing support. The upper horizontal portion of each line shows the maximum working compressive load the screw will carry. This value is also the maximum working tensile load. For other than optimum conditions an appropriate additional safety factor should be allowed.

Note: The maximum static load limitation, beyond which brinelling of the balltrack in the screw and nut will occur must not be exceeded. this value is given in the Ballscrew Data Sheets.

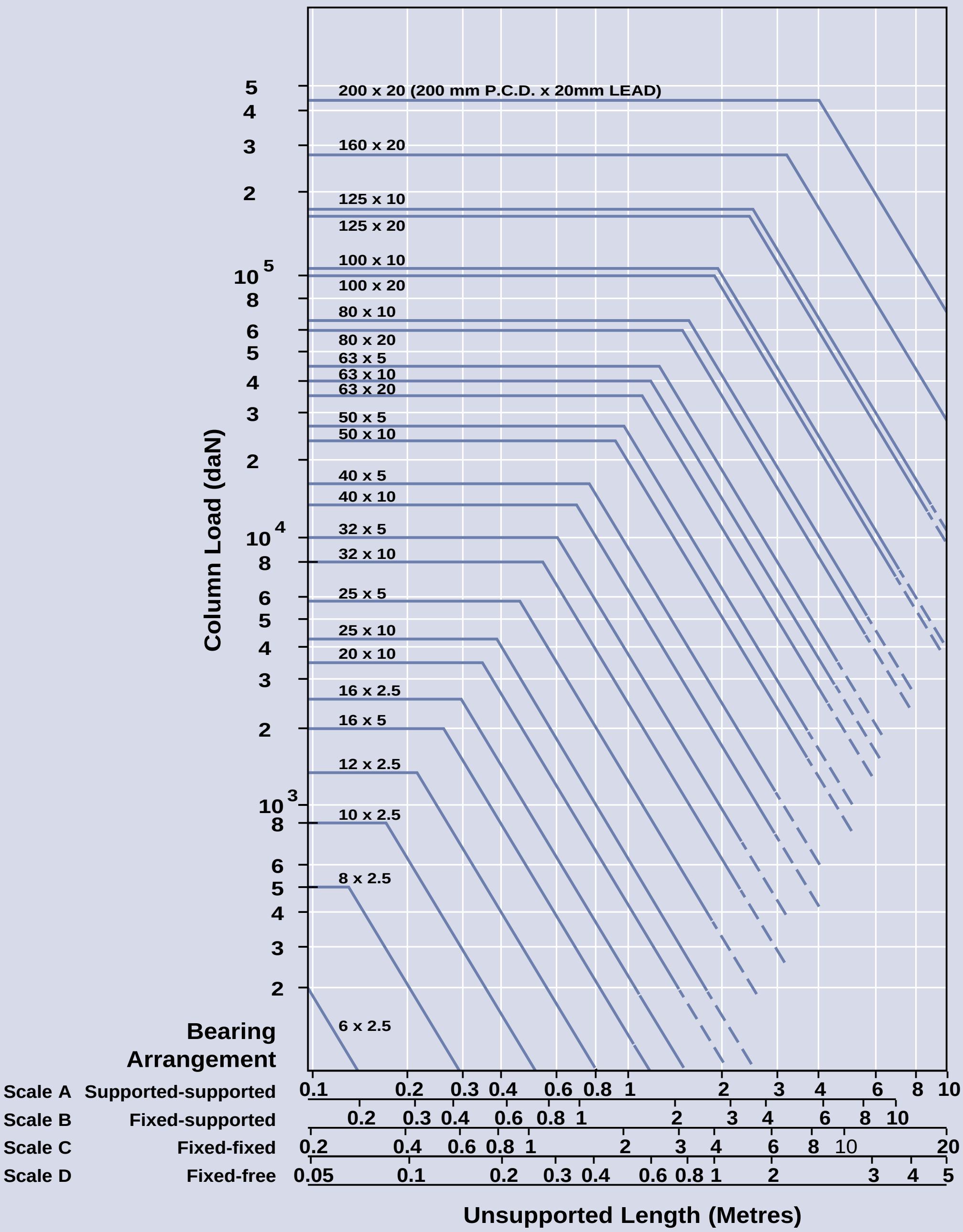


Fig. 9