Gradel GB Baudin

Threads for transmission systems

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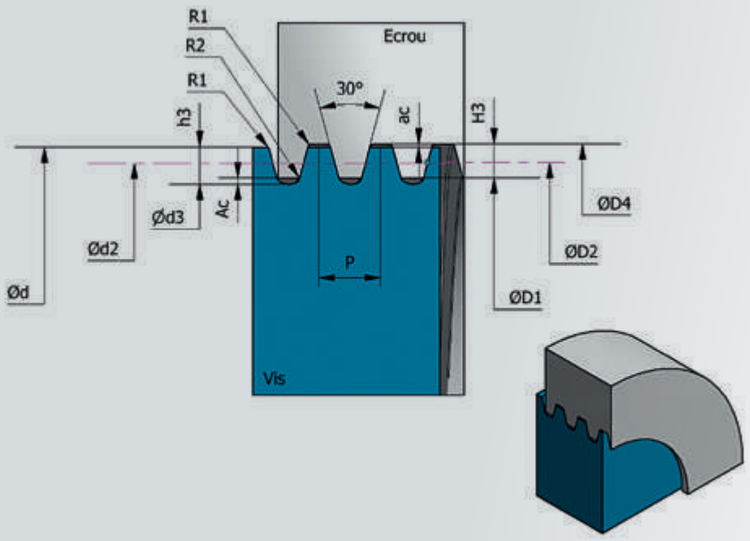
ELEMENTS OF THE BALL SCREW RANGE

TRAPEZOIDAL NUTS AND SCREWS

Our threaded rods with trapezoidal threads are manufactured using a cold working (rolling) process, in accordance with ISO 2901/2902 and DIN103 with 7e tolerance.
The nut threads are created by chip removal. Thanks to our extensive range, we offer high-performance and reliable products that are perfectly suited to meet market demand.

DEFINITION OF THE TRAPEZOIDAL PROFILE



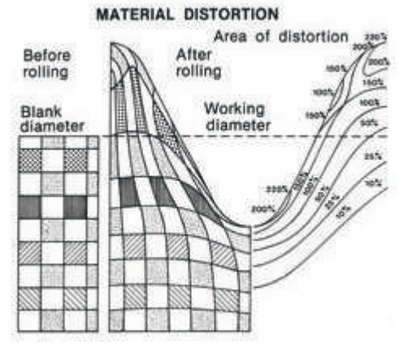
Ød = nominal diameter of the thread
P = threading pitch
Ød2 = d - 0.5P
Ød3 = d - 2h3 = d - p - 2Ac
ac = thread root clearance values
Ac = ac + 0.075P
(in the case of a rolled thread)

h3 = 0.5P + Ac = 0.5P + ac + 0.075P
H3 = 0.5P + ac
ØD1 = d – P
ØD2 = d – 0.5P
ØD4 = d + 2ac
R1 max = 0.5ac
R2max = ac

SCREWS

The roller burnished sides create an excellent surface that:
- increases the lifespan of the nuts by reducing abrasion.
- increases efficiency by reducing friction.
- improves movement fluidity by reducing vibrations.

The process allows also a high production rate and significant savings in terms of material used.



Our offer includes three product ranges:

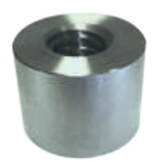
- **RPTS a precision range in C35 (1.0501) or C45 (1.0503).**
  Appreciated for its excellent rectitude and pitch precision features, and for its high resistance. We keep single left and right threads and double right threads in lengths of 3 meters up to and including Ø28, and in lengths of 6 meters for larger diameters.
- **RTS a standard range in C15 (1.0401).**
  For simple and cost effective applications. This range is available exclusively in single right thread, in a length of 3 meters.
- **RATS a stainless steel range in 316L (1.4404).**
  We keep single left and right threads and double right threads in lengths of 3 meters up to and including Ø28, and in lengths of 6 meters for larger diameters. This range features improved corrosion resistance compared with common stainless steels, such as 1.4301, 1.4305, etc.

NUTS

Our offer includes three material ranges:

- **Nuts made of CuSn7ZnPb bronze.**
  Used for manual or motorised drives with low to medium speeds and for use under heavy loads. Combination with steel or stainless steel screws provides good results, especially with adequate lubrication.

- **Nuts made of PA6.6 plastic.**
  Used for manual or motorised drives with low to medium speeds and for use under moderate loads. Combination with steel or stainless steel screws provides good results, and reduced noise. These nuts can be used without lubrication, although this will shorten their lifespan.



- **Nuts made of stainless steel 11SMnPb37 (1.0737) or 11SMn37 (1.0736).**
  Used for manual or motorised drives with low speeds, for tightening or blocking functions, or for static loads. Use with stainless steel screws is not advised.

PITCH PRECISION

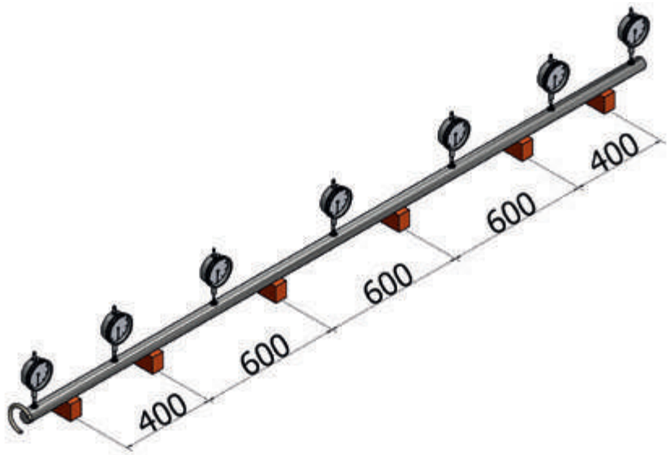
The precision of our screws is measured in microns for 300 mm of thread. This value is applicable as ± in relation to the theoretical value.

Example : for a class 50 screw, the actual measured value of the pitch is included between 299.95 and 300.05

STRAIGHTNESS

Our screws are produced with straightness controls. This feature is measured according to the protocol given below. For one bar revolution, the maximum deviation is equal to ± the declared rectitude value. Effective straightness features remove vibrations and permit use at higher speeds.

Example: for a given reference with a rectitude of 0.5, the value measured on each comparator, spaced as shown in the figure, must be less than 1mm for a full revolution of the bar.



LUBRICATION

The screw and nut system must be lubricated as often as possible. In principle, the system must be lubricated every 500 cycles. Obviously, this interval and the quality of lubricant must adjusted to suit the application and the system's working environment.

We recommend you clean and grease the screw to ensure optimum lubrication:

- When it is dirty.
- Yearly, under normal operating conditions.
- Every 2 years, if used in a clean environment.

For standard use in a normal environment, use KP2K-30-type grease in accordance with DIN 51502.

This quality must be checked for each application.

Quantity of grease required for initial lubrication or after the screw has been thoroughly cleaned. Provided for information only.

Ø	10	12	14	16	18	20	22	24	26	28	30	32	36	40	44	50	60	70	80	100	120	140	160
Quantity (ml/m)	15	18	21	24	27	30	33	36	39	42	45	48	54	60	66	75	90	105	120	150	180	210	240

Less grease required for maintenance lubrication.

ORDER

All of our screws can be delivered, cut to a specified length. Unless specifically requested, the bars are delivered rough-cut with standard rectitude. We can deliver chamfered and/or straightened bars on request.

For all requests outside reference lengths and outside standard manufacturing characteristics, a preliminary costing is required.

According to your needs, we can also machine the ends of the screws or perform additional operations on our standard nuts.

SIZING THE SCREW/NUT SET

The load applied to the nut/screw set depends on the materials used, surface states, lubrication, frequency of use, speed, etc.

Force is transferred from the screw to the nut through sliding friction, and a proportion of this force is transformed into heat. It is therefore important to size the system properly to reduce these losses. Contact pressure on the thread must be as low as possible to ensure the screw and nut function efficiently, while preventing premature wear and overheating (long-lasting lubrication).

The following calculations are used to correctly define the diameter of the screw and nut based on axial loads, speeds and assembly types.

CALCULATIONS

SLIDING SPEED

$$Vg = \frac{N.D2.\pi}{60000}$$

Vg = sliding speed in **m/s**
N = screw speed in **rpm**
D2 = diameter on side of the screw in **mm**

NUT SPEED

$$V = \frac{N.P}{60}$$

V = linear nut speed in **m/s**
N = screw speed in **rpm**
P = pitch of the system in **mm**

NUT LENGTH

$$L1 = \frac{F.P}{Pz.D2.\pi.H1.n}$$

L1 = nut length in **mm**
F = total axial load in **N**
P = pitch of the system in **mm**
Pz = contact pressure in **N/mm²** (see table)
H1 = contact height on the side in **mm** (≈ 0.5.P)
n = number of threads

CONTACT PRESSURE ACCORDING TO THE LENGTH OF THE NUT

$$Pz = \frac{F.P}{L1.D2.\pi.H1.n}$$

Pz = contact pressure in **N/mm²**
F = total axial load in **N**
P = pitch of the system in **mm**
L1 = nut height in **mm**
D2 = diameter on the side of the screw in **mm**
H1 = contact height on the side in **mm** (= 0.5.P)
n = number of threads

HELIX ANGLE

$$\text{Tan } \alpha = \frac{P}{D2.\pi}$$

α = helix angle of the thread in °
P = pitch in **mm**
D2 = diameter on the side of the screw in **mm**

The acceptable contact pressure depends on the sliding speed and the material of the nut. The table shown below lists standard values for our nuts. For other materials, use 10 N/mm² as the standard value.

Material	Sliding speed (m/s)	Pz (N/mm²)
Steel	1.5	10
Bronze	1.5	10
Polyamide	0.6	1

FRICTION ANGLE

$$\text{Tan } \rho = \mu G$$

ρ = friction angle in °
μG = see table below

REVERSIBILITY

Nut material	μG	
	dry	lubricated
Steel	0.15	0.10
Bronze	0.10	0.05
Polyamide	0.10	0.05

The system cannot be inverted if $\alpha < \rho$

The values can be changed lubrication, contact surface states, etc.

EFFICIENCY

$$\eta = \frac{\text{Tan } \alpha}{\text{Tan } (\alpha+\rho)}$$

η = efficiency of a translational rotational motion
α = helix angle
ρ = friction angle

$$\eta' = \frac{\text{Tan } (\alpha-\rho)}{\text{Tan } \alpha}$$

η′ = efficiency of a translational rotational motion
α = helix angle
ρ = friction angle

DRIVE TORQUE

$$Ma = \frac{F.P}{2000.\pi.\eta}$$

Ma = drive torque (converted from translational rotation) in Nm
F = total axial load in N
P = pitch of the system in mm
η = efficiency of a translational rotational motion

$$Me = \frac{F.P.\eta'}{2000.\pi}$$

Me = drive torque (converted from translational rotation) in Nm
F = total axial load in N
P = pitch of the system in mm
η′ = efficiency of a translational rotational motion

CRITICAL SPEED

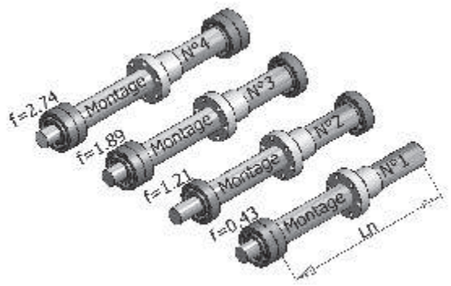
When rotating, the screws are subjected to axial loads and vibration. These depend on the free length of the screw, the assembly direction and the direction of the force (traction or compression). In the later case, a buckling calculation verification is required.

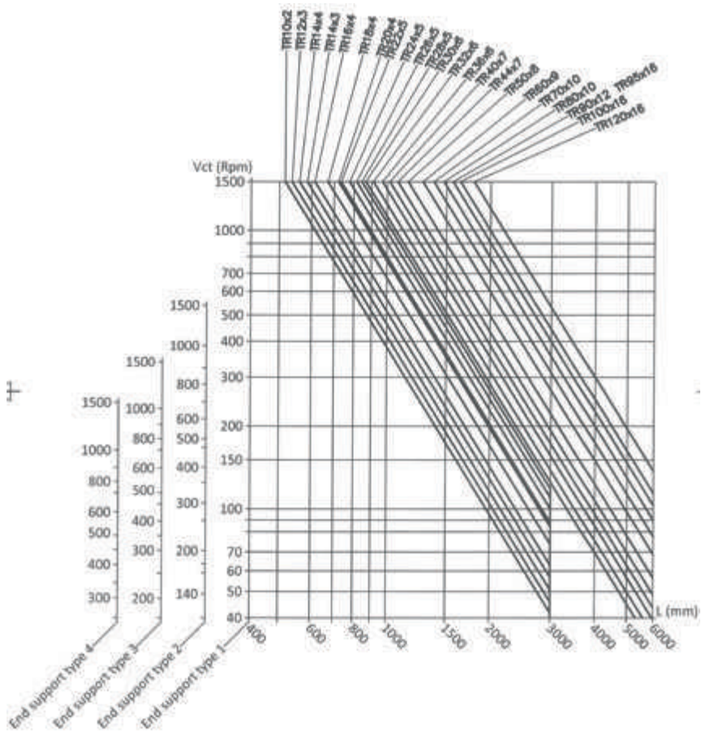
$$Vct = \frac{D_3}{L^2}\ 1{,}1.10^8$$

Vct = critical speed in **rpm**
D_3 = diameter of the screw core in **mm**
L = screw length in **mm**

$$Vadm = Vct.0{,}8.f$$

Vadm = corrected acceptable speed in **rpm**
Vct = critical speed in **rpm**
f = correction factor due to the nature of the supports



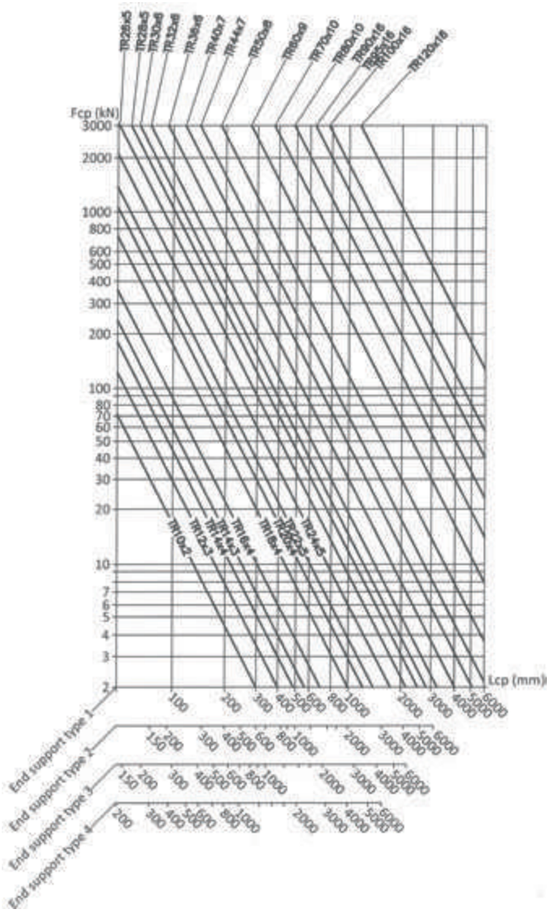


BUCKLING

When a screw is working under compression, the effect of buckling increases in proportion to the screw length/Ø ratio. It is therefore important to determine the diameter of the screw correctly, depending on load.

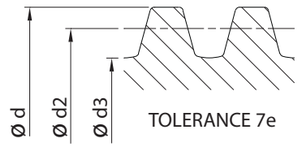
$$Fcp = \frac{21.10^4.D_3^4.\pi^3.f}{64.Lcp^2}$$

Fcp = maximum acceptable axial compression force on the nut in **N**
D_3 = thread root diameter of the screw in **mm**
f = bucking correction factor due to the nature of the supports
Lcp = length of the screw subject to compression in **mm**



TRAPEZOIDAL SCREW — RPTS

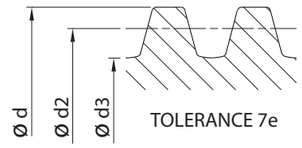
Material:	C35 (1.0501) or C45 (1.0503)
Type of thread:	Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7e tolerance
Length kept in stock:	3 meters up to and including Ø 28/6 for larger diameters



Dimension			7e tolerance thread						Precision of the pitch	Rectitude	Helix angle	Weight / m
			d max	d min	d2 max	d2 min	d3 max	d3 min				
Profile	Right	Left	mm	mm	mm	mm	mm	mm	µ/300mm	mm/300mm	α	(Kg)
8X1.5	*		8	8.85	8.183	8.013	7.2	6.763	150	0.4	3°50'	0.311
10X2	*	*	10	9.82	8.929	8.739	7.5	6.962	150	0.4	4°07'	0.482
10X3	*		10	9.764	8.415	8.191	6.5	5.770	200	0.5	6°33'	0.424
12X3	*	*	12	11.764	10.415	10.191	8.5	7.770	150	0.4	5°17'	0.653
14X3	*	*	14	13.764	12.415	12.191	10.5	9.770	100	0.4	4°26'	0.932
14X4	*		14	13.7	11.905	11.640	9.5	8.569	150	0.5	6°11'	0.879
16X4	*	*	16	15.7	13.905	13.640	11.5	10.569	50	0.5	5°16'	1.173
18X4	*	*	18	17.7	15.905	15.640	13.5	12.569	50	0.5	4°36'	1.528
20X4	*	*	20	19.7	17.905	17.640	15.5	14.569	50	0.5	4°05'	1.94
22X5	*	*	22	21.665	19.394	19.114	16.5	15.400	50	0.2	4°43'	2.294
24X5	*	*	24	23.665	21.394	21.094	18.5	17.375	50	0.2	4°17'	2.781
26X5	*		26	25.665	23.394	23.094	20.5	19.375	50	0.2	3°55'	3.329
28X5	*	*	28	27.665	25.394	25.094	22.5	21.375	50	0.2	3°36'	3.905
30X6	*	*	30	29.625	26.882	26.547	23	21.681	70	0.2	4°05'	4.358
32X6	*		32	31.625	28.882	28.547	25	23.681	70	0.2	3°48'	5.038
36X6	*	*	36	35.625	32.882	32.547	29	27.681	70	0.2	3°20'	6.546
40X7	*	*	40	39.575	36.375	36.020	32	30.506	80	0.2	3°31'	7.983
44X7	*	*	44	43.575	40.375	40.020	36	34.506	80	0.2	3°10'	9.856
50X8	*	*	50	49.55	45.868	45.468	41	39.300	100	0.2	3°11'	12.696
55X9	*		55	54.5	50.360	49.935	45	43.119	100	0.2	3°16'	15.4
60X9	*	*	60	59.47	55.360	54.935	50	48.119	100	0.2	2°58'	18.498
70X10	*	*	70	69.47	64.850	64.425	59	56.969	100	0.4	2°49'	25.627
80X10	*	*	80	79.47	74.850	74.425	69	66.969	100	0.4	2°27'	34.189
90X12	*		90	89.4	83.840	83.365	77	74.606	200	0.5	2°36'	43
95X16	*		95	94.29	86.810	86.250	77	73.900	200	1	3°22'	45.6
100X16	*		100	99.29	91.810	91.250	82	78.900	200	1	3°11'	51
120X16	*		120	119.29	111.810	111.250	102	98.900	200	1	2°36'	76
Double threads												
10X4P2	*		10	9.82	8.929	8.716	7.5	6.962	200	0.4	8°12'	0.482
12X6P3	*		12	11.764	10.415	10.164	8.5	7.770	150	0.4	10°30'	0.653
14X6P3	*		14	13.764	12.415	12.164	10.5	9.770	100	0.4	8°49'	0.932
16X8P4	*		16	15.7	13.905	13.608	11.5	10.569	100	0.5	10°29'	1.173
18X8P4	*		18	17.7	15.905	15.608	13.5	12.569	100	0.5	9°20'	1.528
20X8P4	*		20	19.7	17.905	17.608	15.5	14.569	100	0.5	8°09'	1.94
22X10P5	*		22	21.665	19.394	19.058	16.5	15.400	200	0.3	9°23'	2.294
24X10P5	*		24	23.665	21.394	21.058	18.5	17.375	200	0.3	8°31'	2.781
28X10P5	*		28	27.665	25.394	25.058	22.5	21.375	200	0.3	7°12'	3.905
30X12P6	*		30	29.625	26.882	26.507	23	21.681	200	0.3	8°08'	4.358
32X12P6	*		32	31.625	28.882	28.507	25	23.681	200	0.3	7°34'	5.038
36X12P6	*		36	35.625	32.882	32.507	29	27.681	200	0.3	6°39'	6.546
40X14P7	*		40	39.575	36.375	35.977	32	30.506	200	0.3	7°01'	7.983
44X14P7	*		44	43.575	40.375	39.977	36	34.506	200	0.3	6°20'	9.856

TRAPEZOIDAL SCREW — RTS

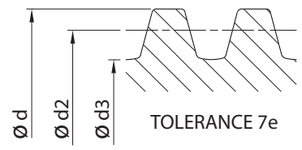
Material:	C15 (1.0401)
Type of thread:	Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7e tolerance
Length kept in stock:	3 meters



Dimension			7e tolerance thread						Precision of the pitch	Rectitude	Helix angle	Weight / m
			d max	d min	d2 max	d2 min	d3 max	d3 min				
Profile	Right	Left	mm	mm	mm	mm	mm	mm	µ/300mm	mm/300mm	α	(Kg)
10X2	*		10	9.82	8.929	8.739	7.5	6.962	200	0.7	4°07'	0.482
12X3	*		12	11.764	10.415	10.191	8.5	7.770	200	0.7	5°17'	0.653
14X3	*		14	13.764	12.415	12.191	10.5	9.770	200	0.7	4°26'	0.932
16X4	*		16	15.7	13.905	13.640	11.5	10.569	100	0.7	5°16'	1.173
18X4	*		18	17.7	15.905	15.640	13.5	12.569	100	0.7	4°36'	1.528
20X4	*		20	19.7	17.905	17.640	15.5	14.569	100	0.7	4°05'	1.94
22X5	*		22	21.665	19.394	19.114	16.5	15.400	100	0.7	4°43'	2.294
24X5	*		24	23.665	21.394	21.094	18.5	17.375	100	0.7	4°17'	2.781
26X5	*		26	25.665	23.394	23.094	20.5	19.375	100	0.7	3°55'	3.329
28X5	*		28	27.665	25.394	25.094	22.5	21.375	100	0.7	3°36'	3.905
30X6	*		30	29.625	26.882	26.547	23	21.681	100	0.7	4°05'	4.358
32X6	*		32	31.625	28.882	28.547	25	23.681	100	0.7	3°48'	5.038
36X6	*		36	35.625	32.882	32.547	29	27.681	100	0.7	3°20'	6.546
40X7	*		40	39.575	36.375	36.020	32	30.506	100	0.7	3°31'	7.983
44X7	*		44	43.575	40.375	40.020	36	34.506	100	0.7	3°10'	9.856
50X8	*		50	49.55	45.868	45.468	41	39.300	100	0.7	3°11'	12.696

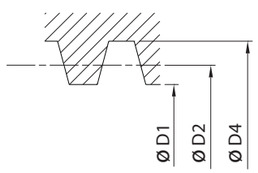
TRAPEZOIDAL SCREW — RATS

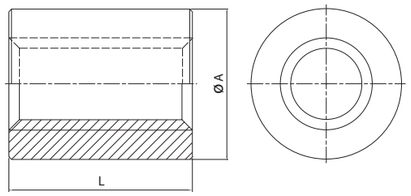
Material:	Stainless steel 316L (1.4404)
Type of thread:	Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7e tolerance
Length kept in stock:	3 meters up to and including Ø 28/6 for larger diameters



Dimension			7e tolerance thread						Precision of the pitch	Rectitude	Helix angle	Weight / m
			d max	d min	d2 max	d2 min	d3 max	d3 min				
Profile	Right	Left	mm	mm	mm	mm	mm	mm	µ/300mm	mm/300mm	α	(Kg)
10X2	*	*	10	9.82	8.929	8.739	7.5	6.962	200	0.8	4°07'	0.482
12X3	*	*	12	11.764	10.415	10.191	8.5	7.770	200	0.8	5°17'	0.653
14X3	*	*	14	13.764	12.415	12.191	10.5	9.770	200	0.8	4°26'	0.932
16X4	*	*	16	15.7	13.905	13.640	11.5	10.569	100	0.8	5°16'	1.173
18X4	*	*	18	17.7	15.905	15.640	13.5	12.569	100	0.8	4°36'	1.528
20X4	*	*	20	19.7	17.905	17.640	15.5	14.569	100	0.8	4°05'	1.94
22X5	*	*	22	21.665	19.394	19.114	16.5	15.400	100	0.8	4°43'	2.294
24X5	*	*	24	23.665	21.394	21.094	18.5	17.375	100	0.8	4°17'	2.781
26X5	*	*	26	25.665	23.394	23.094	20.5	19.375	100	0.8	3°55'	3.329
28X5	*	*	28	27.665	25.394	25.094	22.5	21.375	100	0.8	3°36'	3.905
30X6	*	*	30	29.625	26.882	26.547	23	21.681	100	0.8	4°05'	4.358
32X6	*	*	32	31.625	28.882	28.547	25	23.681	100	0.8	3°48'	5.038
36X6	*	*	36	35.625	32.882	32.547	29	27.681	100	0.8	3°20'	6.546
40X7	*	*	40	39.575	36.375	36.020	32	30.506	100	0.8	3°31'	7.983
50X8	*	*	50	49.55	45.868	45.468	41	39.300	100	0.8	3°11'	12.696

CYLINDRICAL TRAPEZOIDAL NUTS — LRM



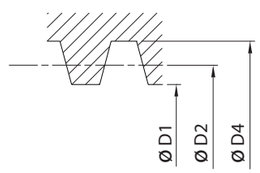


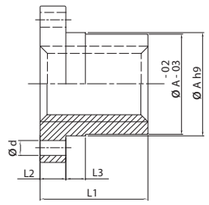
Material: CuSn7ZnPb bronze

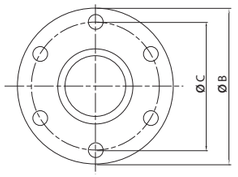
Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

Dimension			A	L	7H tolerance thread					Contact surface	Weight
					D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
8X1.5	*		18	16	6.690	6.500	7.474	7.250	8.300	150	0.029
10X2	*	*	22	20	8.236	8.000	9.250	9.000	10.500	225	0.053
10X3	*	*	22	20	7.315	7.000	8.800	8.500	10.500	219	0.053
12X3	*	*	26	24	9.315	9.000	10.800	10.500	12.500	325	0.083
14X3	*	*	30	28	11.315	11.000	12.800	12.500	14.500	451	0.135
14X4	*	*	30	28	10.375	10.000	12.355	12.000	14.500	441	0.135
16X4	*	*	36	32	12.375	12.000	14.355	14.000	16.500	587	0.232
18X4	*	*	40	36	14.375	14.000	16.355	16.000	18.500	755	0.320
20X4	*	*	45	40	16.375	16.000	18.355	18.000	20.500	943	0.455
22X5	*	*	45	44	17.450	17.000	19.900	19.500	22.500	1139	0.480
24X5	*	*	50	48	19.450	19.000	21.900	21.500	24.500	1370	0.656
26X5	*	*	50	52	21.450	21.000	23.900	23.500	26.500	1622	0.670
28X5	*	*	60	56	23.450	23.000	25.900	25.500	28.500	1895	1.150
30X6	*	*	60	60	24.500	24.000	27.450	27.000	31.000	2178	1.140
32X6	*	*	60	64	26.500	26.000	29.450	29.000	33.000	2495	1.177
36X6	*	*	75	72	30.500	30.000	33.450	33.000	37.000	3194	2.189
40X7	*	*	80	80	33.700	33.000	36.950	36.500	41.000	3984	2.725
44X7	*	*	80	88	37.700	37.000	40.950	40.500	45.000	4862	2.815
50X8	*	*	90	100	42.630	42.000	46.530	46.000	51.000	6262	4.014
60X9	*	*	100	120	51.630	51.000	56.030	55.500	61.000	9120	5.150
70X10	*	*	110	140	60.710	60.000	65.560	65.000	71.000	12537	7.805
80X10	*	*	120	160	70.710	70.000	75.560	75.000	81.000	16530	9.800
Double threads											
10X4P2	*		22	20	8.236	8.000	9.280	9.000	10.500	225	0.053
12X6P3	*		26	24	9.315	9.000	10.836	10.500	12.500	325	0.083
14X6P3	*		30	28	11.315	11.000	12.836	12.500	14.500	451	0.135
16X8P4	*		36	32	12.375	12.000	14.398	14.000	14.500	587	0.232
18X8P4	*		40	36	14.375	14.000	16.398	16.000	18.500	755	0.320
20X8P4	*		45	40	16.375	16.000	18.398	18.000	20.500	943	0.455
22X10P5	*		45	44	17.450	17.000	19.948	19.500	22.500	1139	0.480
24X10P5	*		50	48	19.450	19.000	21.948	21.500	24.500	1370	0.656
28X10P5	*		60	56	23.450	23.000	25.948	25.500	28.500	1895	1.150
30X12P6	*		60	60	24.500	24.000	27.504	27.000	31.000	2178	1.140
32X12P6	*		60	64	26.500	26.000	29.504	29.000	33.000	2495	1.177
36X12P6	*		75	72	30.500	30.000	33.504	33.000	37.000	3194	2.189
40X14P7	*		80	80	33.700	33.000	37.004	36.500	41.000	3984	2.725

FLANGED TRAPEZOIDAL NUTS — BFM





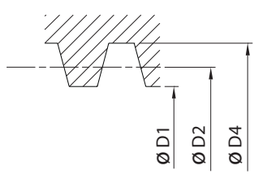


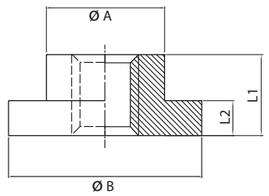
Material: CuSn7ZnPb bronze

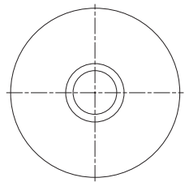
Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

Dimension			ØA	ØB	ØC	d (x6)	L1	L2	L3	7H tolerance thread					Contact surface	Weight
										D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
8X1.5	*		18	35	26	3.5	20	7	6	6.69	6.5	7.474	7.25	8.3	170	0.135
10X2	*	*	25	42	34	5	25	10	6	8.236	8	9.25	9	10.5	282	0.162
12X3	*	*	28	48	38	6	35	12	8	9.315	9	10.8	10.5	12.5	474	0.266
14X3	*	*	28	48	38	6	35	12	8	11.315	11	12.8	12.5	14.5	564	0.258
14X4	*	*	28	48	38	6	35	12	8	10.375	10	12.355	12	14.5	551	0.258
16X4	*	*	28	48	38	6	35	12	8	12.375	12	14.355	14	16.5	642	0.244
18X4	*	*	28	48	38	6	35	12	8	14.375	14	16.355	16	18.5	734	0.228
20X4	*	*	32	55	45	7	44	12	8	16.375	16	18.355	18	20.5	1038	0.346
22X5	*	*	32	55	45	7	44	12	8	17.45	17	19.9	19.5	22.5	1139	0.322
24X5	*	*	32	55	45	7	44	12	8	19.45	19	21.9	21.5	24.5	1256	0.304
26X5	*	*	38	62	50	7	46	14	8	21.45	21	23.9	23.5	26.5	1435	0.474
28X5	*	*	38	62	50	7	46	14	8	23.45	23	25.9	25.5	28.5	1557	0.442
30X6	*	*	38	62	50	7	46	14	8	24.5	24	27.45	27	31	1670	0.408
32X6	*	*	45	70	58	7	54	16	10	26.5	26	29.45	29	33	2105	0.706
36X6	*	*	45	70	58	7	54	16	10	30.5	30	33.45	33	37	2395	0.606
40X7	*	*	63	95	78	9	66	16	12	33.7	33	36.95	36.5	41	3287	1.700
44X7	*	*	63	95	78	9	66	16	12	37.7	37	40.95	40.5	45	3647	1.524
50X8	*	*	72	110	90	11	75	18	14	42.63	42	46.53	46	51	4696	2.324
60X9	*	*	88	130	110	13	90	20	16	51.63	51	56.03	55.5	61	6840	3.980
70X10	*	*	95	140	120	13	105	22	18	60.71	60	65.56	65	71	9403	4.465
80X10	*	*	105	150	130	13	120	24	20	70.71	70	75.56	75	81	12397	6.150
Double threads																
10X4P2	*		25	42	34	5	25	10	6	8.236	8	9.28	9	10.5	282	0.162
12X6P3	*		28	48	38	6	35	12	8	9.315	9	10.836	10.5	12.5	474	0.266
14X6P3	*		28	48	38	6	35	12	8	11.315	11	12.836	12.5	14.5	564	0.258
16X8P4	*		28	48	38	6	35	12	8	12.375	12	14.3976	14	14.5	642	0.244
18X8P4	*		28	48	38	6	35	12	8	14.375	14	16.3976	16	18.5	734	0.228
20X8P4	*		32	55	45	7	44	12	8	16.375	16	18.3976	18	20.5	1038	0.346
22X10P5	*		32	55	45	7	44	12	8	17.45	17	19.948	19.5	22.5	1139	0.322
24X10P5	*		32	55	45	7	44	12	8	19.45	19	21.948	21.5	24.5	1256	0.304
28X10P5	*		38	62	50	7	46	14	8	23.45	23	25.948	25.5	28.5	1557	0.442
30X12P6	*		38	62	50	7	46	14	8	24.5	24	27.504	27	31	1670	0.408
32X12P6	*		45	70	58	7	54	16	10	26.5	26	29.504	29	33	2105	0.706
36X12P6	*		45	70	58	7	54	16	10	30.5	30	33.504	33	37	2395	0.606
40X14P7	*		63	95	78	9	66	16	12	33.7	33	37.004	36.5	41	3287	1.700

FLANGED TRAPEZOIDAL NUTS — FMR



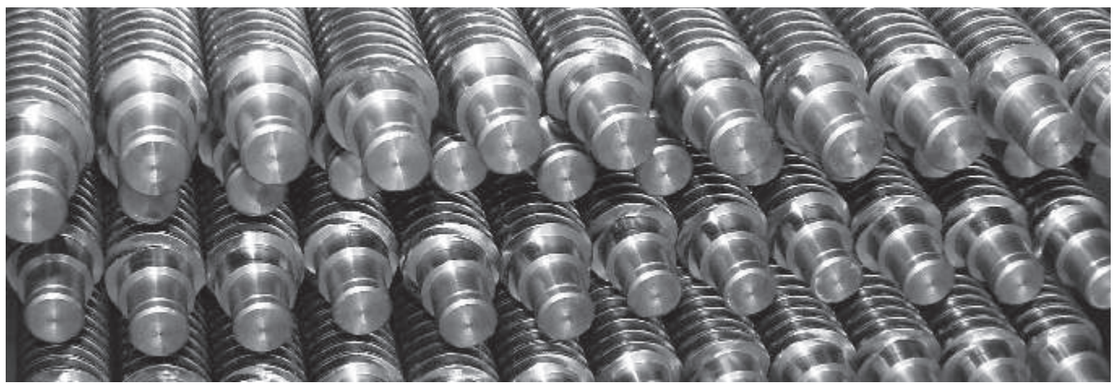




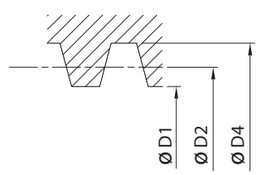
Material: CuSn7ZnPb bronze

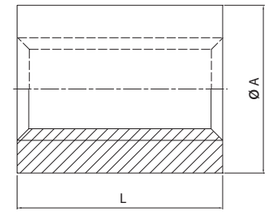
Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

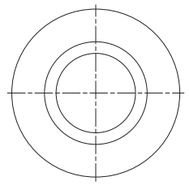
Designation			ØA	ØB	L1	L2	7H tolerance thread					Contact surface	Weight
							D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
10X2	*	*	20	35	15	6	8.236	8	9.25	9	10.5	169	0.068
12X3	*	*	24	42	20	7	9.315	9	10.8	10.5	12.5	271	0.120
14X3	*	*	30	52	24	10	11.315	11	12.8	12.5	14.5	387	0.260
16X4	*	*	30	52	24	10	12.375	12	14.355	14	16.5	440	0.250
20X4	*	*	38	62	26	11	16.375	16	18.355	18	20.5	613	0.400
24X5	*	*	50	77	33	13	19.45	19	21.9	21.5	24.5	942	0.750
30X6	*	*	58	90	48	15	24.5	24	27.45	27	31	1743	1.400
36X6	*	*	80	115	60	20	30.5	30	33.45	33	37	2661	3.200
40X7	*	*	80	140	65	20	33.7	33	36.95	36.5	41	3237	4.100
50X8	*	*	90	170	70	20	42.63	42	46.53	46	51	4383	5.900
Double threads													
10X4P2	*		20	35	15	6	8.236	8	9.28	9	10.5	169	0.068
12X6P3	*		24	42	20	7	9.315	9	10.836	10.5	12.5	271	0.120
16X8P4	*		30	52	24	10	12.375	12	14.3976	14	14.5	440	0.250
20X8P4	*		38	62	26	11	16.375	16	18.3976	18	20.5	613	0.400
24X10P5	*		50	77	33	13	19.45	19	21.948	21.5	24.5	942	0.750
30X12P6	*		58	90	48	15	24.5	24	27.504	27	31	1743	1.400
36X12P6	*		80	115	60	20	30.5	30	33.504	33	37	2661	3.200
40X14P7	*		80	140	65	20	33.7	33	37.004	36.5	41	3237	4.100



CYLINDRICAL TRAPEZOIDAL NUTS — LKM





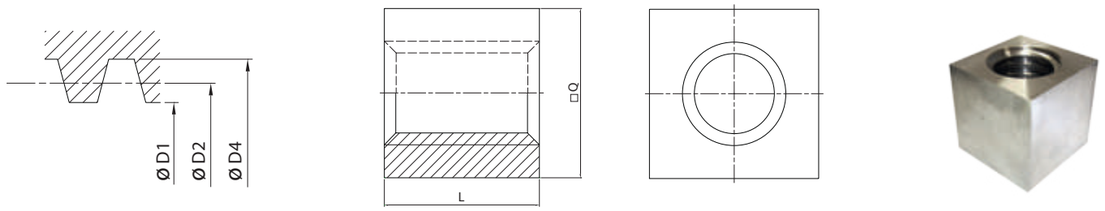


Material: Nylon PA 6.6 black

Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

Designation			ØA	L	7H tolerance thread					Contact surface	Weight
					D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
8X1.5	*		18	16	6.69	6.5	7.474	7.25	8.3	150	0.005
10X2	*	*	22	20	8.236	8	9.25	9	10.5	225	0.009
12X3	*	*	26	24	9.315	9	10.8	10.5	12.5	325	0.012
16X4	*	*	36	32	12.375	12	14.355	14	16.5	587	0.032
20X4	*	*	45	40	16.375	16	18.355	18	20.5	943	0.060
24X5	*	*	50	48	19.45	19	21.9	21.5	24.5	1370	0.088
30X6	*	*	60	60	24.5	24	27.45	27	31	2178	0.150
36X6	*	*	75	72	30.5	30	33.45	33	37	3194	0.300
40X7	*	*	80	80	33.7	33	36.95	36.5	41	3984	0.370
Double threads											
10X4P2	*		22	20	8.236	8	9.28	9	10.5	225	0.009
12X6P3	*		26	24	9.315	9	10.836	10.5	12.5	325	0.012
16X8P4	*		36	32	12.375	12	14.3976	14	14.5	587	0.032
20X8P4	*		45	40	16.375	16	18.3976	18	20.5	943	0.060
24X10P5	*		50	48	19.45	19	21.948	21.5	24.5	1370	0.088
30X12P6	*		60	60	24.5	24	27.504	27	31	2178	0.150
36X12P6	*		75	72	30.5	30	33.504	33	37	3194	0.300
40X14P7	*		80	80	33.7	33	37.004	36.5	41	3984	0.370

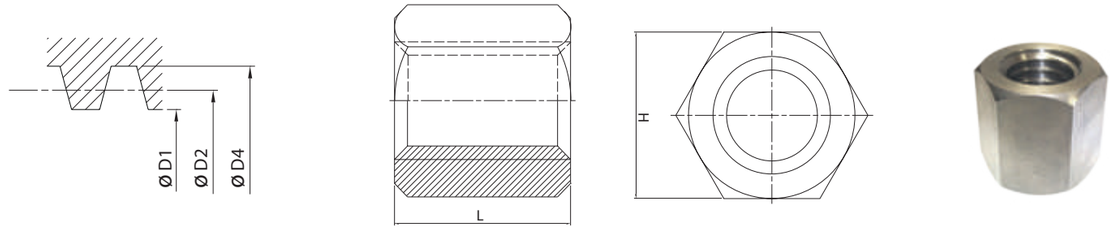
SQUARE TRAPEZOIDAL NUTS — VKM



Material: 11SMnPb37 (1.0737) / 11SMn37 (1.0736) Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

Designation			Q on flat	L	7H tolerance thread					Contact surface	Weight
					D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
10X2	*	*	17	15	8.236	8	9.25	9	10.5	169	0.027
10X3	*	*	17	15	7.315	7	8.8	8.5	10.5	165	0.027
12X3	*	*	25	18	9.315	9	10.8	10.5	12.5	244	0.076
14X3	*	*	25	20	11.315	11	12.8	12.5	14.5	322	0.079
14X4	*	*	25	20	10.375	10	12.355	12	14.5	315	0.079
16X4	*	*	28	24	12.375	12	14.355	14	16.5	440	0.119
18X4	*	*	30	28	14.375	14	16.355	16	18.5	587	0.154
20X4	*	*	35	30	16.375	16	18.355	18	20.5	707	0.259
22X5	*	*	35	33	17.45	17	19.9	19.5	22.5	855	0.240
24X5	*	*	40	36	19.45	19	21.9	21.5	24.5	1028	0.354
26X5	*	*	40	39	21.45	21	23.9	23.5	26.5	1216	0.363
28X5	*	*	45	42	23.45	23	25.9	25.5	28.5	1421	0.506
30X6	*	*	45	45	24.5	24	27.45	27	31	1634	0.513
32X6	*	*	55	48	26.5	26	29.45	29	33	1871	0.891
36X6	*	*	60	54	30.5	30	33.45	33	37	2395	1.163
40X7	*	*	60	60	33.7	33	36.95	36.5	41	2988	1.216
44X7	*	*	65	66	37.7	37	40.95	40.5	45	3647	1.538
Double threads											
10X4P2	*		17	15	8.236	8	9.28	9	10.5	169	0.027
12X6P3	*		25	18	9.315	9	10.836	10.5	12.5	244	0.076
14X6P3	*		25	20	11.315	11	12.836	12.5	14.5	322	0.079
16X8P4	*		28	24	12.375	12	14.3976	14	14.5	440	0.119
18X8P4	*		30	28	14.375	14	16.3976	16	18.5	587	0.154
20X8P4	*		35	30	16.375	16	18.3976	18	20.5	707	0.259
22X10P5	*		35	33	17.45	17	19.948	19.5	22.5	855	0.240
24X10P5	*		40	36	19.45	19	21.948	21.5	24.5	1028	0.354
28X10P5	*		45	42	23.45	23	25.948	25.5	28.5	1421	0.506
30X12P6	*		45	45	24.5	24	27.504	27	31	1634	0.513
32X12P6	*		55	48	26.5	26	29.504	29	33	1871	0.891
36X12P6	*		60	54	30.5	30	33.504	33	37	2395	1.163
40X14P7	*		60	60	33.7	33	37.004	36.5	41	2988	1.216

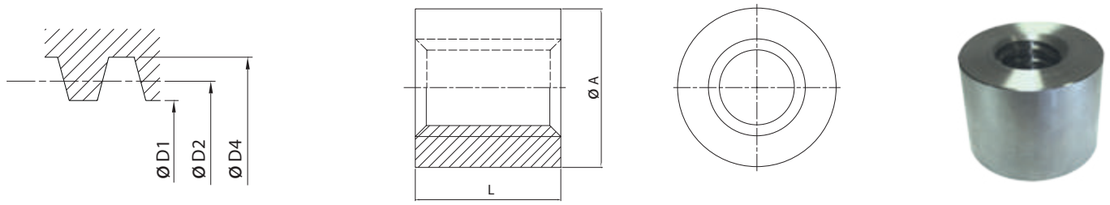
HEXAGONAL TRAPEZOIDAL NUTS — SKM



Material: 11SMnPb37 (1.0737) / 11SMn37 (1.0736) Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

Designation			H on flat	L	7H tolerance thread					Contact surface	Weight
					D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
8X1.5	*		15	12	6.69	6.5	7.474	7.25	8.3	100	0.014
10X2	*	*	17	15	8.236	8	9.25	9	10.5	169	0.022
10X3	*	*	17	15	7.315	7	8.8	8.5	10.5	165	0.022
12X3	*	*	19	18	9.315	9	10.8	10.5	12.5	244	0.032
14X3	*	*	22	21	11.315	11	12.8	12.5	14.5	338	0.049
14X4	*	*	22	21	10.375	10	12.355	12	14.5	330	0.046
16X4	*	*	24	24	12.375	12	14.355	14	16.5	440	0.065
18X4	*	*	27	27	14.375	14	16.355	16	18.5	566	0.091
20X4	*	*	30	30	16.375	16	18.355	18	20.5	707	0.124
22X5	*	*	30	33	17.45	17	19.9	19.5	22.5	855	0.125
24X5	*	*	36	36	19.45	19	21.9	21.5	24.5	1028	0.219
26X5	*	*	36	39	21.45	21	23.9	23.5	26.5	1216	0.216
28X5	*	*	41	42	23.45	23	25.9	25.5	28.5	1421	0.318
30X6	*	*	46	45	24.5	24	27.45	27	31	1634	0.445
32X6	*	*	50	48	26.5	26	29.45	29	33	1871	0.567
36X6	*	*	55	54	30.5	30	33.45	33	37	2395	0.708
40X7	*	*	60	60	33.7	33	36.95	36.5	41	2988	0.893
44X7	*	*	65	66	37.7	37	40.95	40.5	45	3647	1.538
50X8	*	*	75	75	42.63	42	46.53	46	51	4696	1.889
60X9	*	*	90	90	51.63	51	56.03	55.5	61	6840	3.277
Double threads											
10X4P2	*		17	15	8.236	8	9.28	9	10.5	169	0.022
12X6P3	*		19	18	9.315	9	10.836	10.5	12.5	244	0.032
14X6P3	*		22	21	11.315	11	12.836	12.5	14.5	338	0.049
16X8P4	*		24	24	12.375	12	14.3976	14	14.5	338	0.049
18X8P4	*		27	27	14.375	14	16.3976	16	18.5	338	0.049
20X8P4	*		30	30	16.375	16	18.3976	18	20.5	338	0.049
22X10P5	*		30	33	17.45	17	19.948	19.5	22.5	338	0.049
24X10P5	*		36	36	19.45	19	21.948	21.5	24.5	338	0.049
28X10P5	*		41	42	23.45	23	25.948	25.5	28.5	338	0.049
30X12P6	*		46	45	24.5	24	27.504	27	31	338	0.049
32X12P6	*		50	48	26.5	26	29.504	29	33	338	0.049
36X12P6	*		55	54	30.5	30	33.504	33	37	338	0.049
40X14P7	*		60	60	33.7	33	37.004	36.5	41	2988	0.893

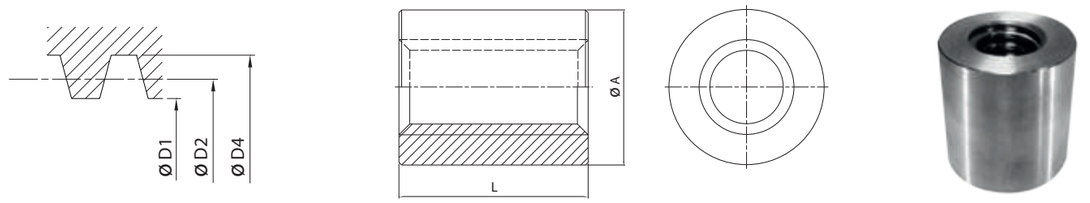
SHORT CYLINDRICAL TRAPEZOIDAL NUTS — KSM



Material: 11SMnPb37 (1.0737) / 11SMn37 (1.0736) Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

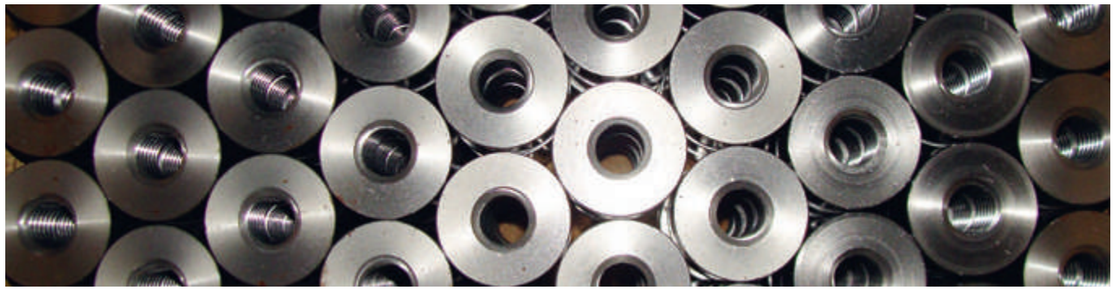
Designation			ØA	L	7H tolerance thread					Contact surface	Weight
					D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
8X1.5	*		18	12	6.69	6.5	7.474	7.25	8.3	100	0.016
10X2	*	*	22	15	8.236	8	9.25	9	10.5	169	0.035
10X3	*	*	22	15	7.315	7	8.8	8.5	10.5	165	0.035
12X3	*	*	26	18	9.315	9	10.8	10.5	12.5	244	0.055
14X3	*	*	30	21	11.315	11	12.8	12.5	14.5	338	0.090
14X4	*	*	30	21	10.375	10	12.355	12	14.5	330	0.090
16X4	*	*	36	24	12.375	12	14.355	14	16.5	440	0.155
18X4	*	*	40	27	14.375	14	16.355	16	18.5	566	0.215
20X4	*	*	45	30	16.375	16	18.355	18	20.5	707	0.305
22X5	*	*	45	33	17.45	17	19.9	19.5	22.5	855	0.322
24X5	*	*	50	36	19.45	19	21.9	21.5	24.5	1028	0.440
26X5	*	*	50	39	21.45	21	23.9	23.5	26.5	1216	0.450
28X5	*	*	60	42	23.45	23	25.9	25.5	28.5	1421	0.740
30X6	*	*	60	45	24.5	24	27.45	27	31	1634	0.765
32X6	*	*	60	48	26.5	26	29.45	29	33	1871	0.790
36X6	*	*	75	54	30.5	30	33.45	33	37	2395	1.470
40X7	*	*	80	60	33.7	33	36.95	36.5	41	2988	1.830
44X7	*	*	80	66	37.7	37	40.95	40.5	45	3647	1.890
50X8	*	*	90	75	42.63	42	46.53	46	51	4696	2.695
60X9	*	*	100	90	51.63	51	56.03	55.5	61	6840	3.865
70X10	*	*	110	100	60.71	60	65.56	65	71	8955	5.115
80X10	*	*	120	110	70.71	70	75.56	75	81	11364	6.000
Double threads											
10X4P2	*		22	15	8.236	8	9.28	9	10.5	169	0.035
12X6P3	*		26	18	9.315	9	10.836	10.5	12.5	244	0.055
14X6P3	*		30	21	11.315	11	12.836	12.5	14.5	338	0.090
16X8P4	*		36	24	12.375	12	14.3976	14	14.5	440	0.155
18X8P4	*		40	27	14.375	14	16.3976	16	18.5	566	0.215
20X8P4	*		45	30	16.375	16	18.3976	18	20.5	707	0.305
22X10P5	*		45	33	17.45	17	19.948	19.5	22.5	855	0.322
24X10P5	*		50	36	19.45	19	21.948	21.5	24.5	1028	0.440
28X10P5	*		60	42	23.45	23	25.948	25.5	28.5	1421	0.740
30X12P6	*		60	45	24.5	24	27.504	27	31	1634	0.765
32X12P6	*		60	48	26.5	26	29.504	29	33	1871	0.790
36X12P6	*		75	54	30.5	30	33.504	33	37	2395	1.470
40X14P7	*		80	60	33.7	33	37.004	36.5	41	2988	1.830

LONG CYLINDRICAL TRAPEZOIDAL NUTS — LSM



Material: 11SMnPb37 (1.0737) / 11SMn37 (1.0736) Trapezoidal in accordance with ISO 2901/2903 and DIN103, 7H tolerance

Designation			ØA	L	7H tolerance thread					Contact surface	Weight
					D1 max	D1 min	D2 max	D2 min	D4 min		
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm²	Kg
10X2	*		22	20	8.236	8	9.25	9	10.5	225	0.047
12X3	*	*	26	24	9.315	9	10.8	10.5	12.5	325	0.073
14X3	*	*	30	28	11.315	11	12.8	12.5	14.5	451	0.120
16X4	*	*	36	32	12.375	12	14.355	14	16.5	587	0.206
18X4	*	*	40	36	14.375	14	16.355	16	18.5	755	0.286
20X4	*	*	45	40	16.375	16	18.355	18	20.5	943	0.406
22X5	*	*	45	44	17.45	17	19.9	19.5	22.5	1139	0.428
24X5	*	*	50	48	19.45	19	21.9	21.5	24.5	1370	0.585
26X5	*	*	50	52	21.45	21	23.9	23.5	26.5	1622	0.599
28X5	*	*	60	56	23.45	23	25.9	25.5	28.5	1895	0.984
30X6	*	*	60	60	24.5	24	27.45	27	31	2178	1.017
32X6	*	*	60	64	26.5	26	29.45	29	33	2495	1.051
36X6	*	*	75	72	30.5	30	33.45	33	37	3194	1.955
40X7	*	*	80	80	33.7	33	36.95	36.5	41	3984	2.434
44X7	*	*	80	88	37.7	37	40.95	40.5	45	4862	2.514
Double threads											
10X4P2	*		22	20	8.236	8	9.28	9	10.5	225	0.047
12X6P3	*		26	24	9.315	9	10.836	10.5	12.5	325	0.073
14X6P3	*		30	28	11.315	11	12.836	12.5	14.5	451	0.120
16X8P4	*		36	32	12.375	12	14.3976	14	14.5	587	0.206
18X8P4	*		40	36	14.375	14	16.3976	16	18.5	755	0.286
20X8P4	*		45	40	16.375	16	18.3976	18	20.5	943	0.406
22X10P5	*		45	44	17.45	17	19.948	19.5	22.5	1139	0.428
24X10P5	*		50	48	19.45	19	21.948	21.5	24.5	1370	0.585
28X10P5	*		60	56	23.45	23	25.948	25.5	28.5	1895	0.984
30X12P6	*		60	60	24.5	24	27.504	27	31	2178	1.017
32X12P6	*		60	64	26.5	26	29.504	29	33	2495	1.051
36X12P6	*		75	72	30.5	30	33.504	33	37	3194	1.955
40X14P7	*		80	80	33.7	33	37.004	36.5	41	3984	2.434



BALL SCREWS AND NUTS

Ball screws include a threaded rod featuring a Gothic profile and a nut that contains moving balls.

TECHNICAL ADVANTAGES

The balls transform the friction of a screw/nut system into a rolling motion. This reduces heating and therefore wear. The purpose of the system is to achieve smooth and quick motions, for more accurate positioning.

The mechanical efficiency and the lifespan are thereby greatly increased.

There is no "stick slip" effect (= jerking).

The required torque is also reduced.

Ball screws can be reversed.

The ball screw/nut system is especially quiet.

FIELDS OF APPLICATION

The ball screw/nut system transforms rotational motion into linear motion, and vice versa.

It is generally used in high-precision machines (machining centre, machine featuring high forward and rotational speeds, driving systems, etc.), medical equipment, presses, cutting machines.

MANUFACTURING PROCESS

Gradel Baudin ball screws are created using a cold working manufacturing technique. The process involves working a smooth metal bar by rotating and pressing it with rollers to create the thread.

We use carbon alloy steels, known for their high quality: **C55R (1.1209)** or **CF53 (1.1213)**.

After rolling, the bars undergo a superficial induction hardening process. This thermal treatment hardens the surface of the screw while maintaining its core mechanical features, thereby ensuring excellent resistance to wear and improved resistance to fatigue.

Finally, the screws are cleaned and polished, before being individually checked.

The nuts are made of **100Cr6 (1.3505)** or **16MnCr5 (1.7131)** steel and the balls are made of **100Cr6 (1.3505)** steel.

USE AND OPERATIONAL TEMPERATURE

The ball screws are designed to be used in a temperature range from -20°C to + 80°C.

NON-REVERSIBILITY

Owing to their excellent efficiency, over 90% of ball screws are reversible systems. In order to ensure that they remain in position, a stopping system must be included in the system.

LUBRICATION

The recommendations regarding the lubrication of ball screws are the same as for ball bearings; they can be lubricated with oil or with grease.

The screw/nut sets are supplied with a thick layer of anti-oxidation protection. During assembly, the sets must be lubricated according to planned use. The lubricant's behaviour must be verified during initial operations. If the lubricant is expelled by the rotational effect, a higher viscosity lubricant is required.

Please note, in most cases, additional lubrication will be required. Apply extra lubricant after a number of cycles and determine the required doses and application schedule. Always use the same type of lubricant.

Regular, targeted lubrication protects against corrosion and reduces wear.

- For lubrication with grease, use a KPE2R-20-type grease as specified in DIN 51502
- For lubrication with oil, mineral oils are adapted to all usual temperature ranges.
- For high-temperature operations, use synthetic oil.

REDUCED AXIAL CLEARANCE

All our nuts are delivered, as a standard, with operating clearance values specified for each model.

We can use an ogive "gothic" thread and select the diameter of the balls to reduce this clearance, on request.

TRANSFER SYSTEMS FROM THE BALLS INSIDE THE NUTS

As the ball rotates, it moves along the ball track and attempts to exit the nut. It must therefore be returned to its starting point so it can start the cycle again. Two solutions have been implemented, depending on the type of nut:

For single threaded nuts, the solution is a recycling pin. After rotating around the screw, the ball is returned to its starting point by the pin.

For nuts with several threads, the solution is a tubular duct in the periphery of the nut. The system enables the transfer of balls from one end of the nut to the other.

ASSEMBLY AND DISASSEMBLY OF THE NUTS

The nuts are delivered with a tube that holds the balls inside their housings.

The nut must be assembled on the screw in the following order:

1. Cut the retaining collar or remove the rubber washer.

2. Bring the tube into contact with the end of the ball screw.

3. Turn the nut while applying light pressure in the direction of the screw.

4. Screw the nut fully onto the screw and remove the tube.

To disassemble, reverse the order of operations.

ASSEMBLY PRECAUTIONS, PROTECTION

A ball screw set is a precision system designed to transfer exclusively axial loads. The displacement axis of the nut must be completely parallel to the screw's rotational axis, to prevent the application of radial or eccentric forces. If issues arise, use self-alignment systems.

A ball screw set must be handled with care to prevent shocks. The nut must be stored in its original packaging to prevent contamination.

The ball nut includes 2 sealing rings that protect it from foreign objects and prevent lubricant leakage.

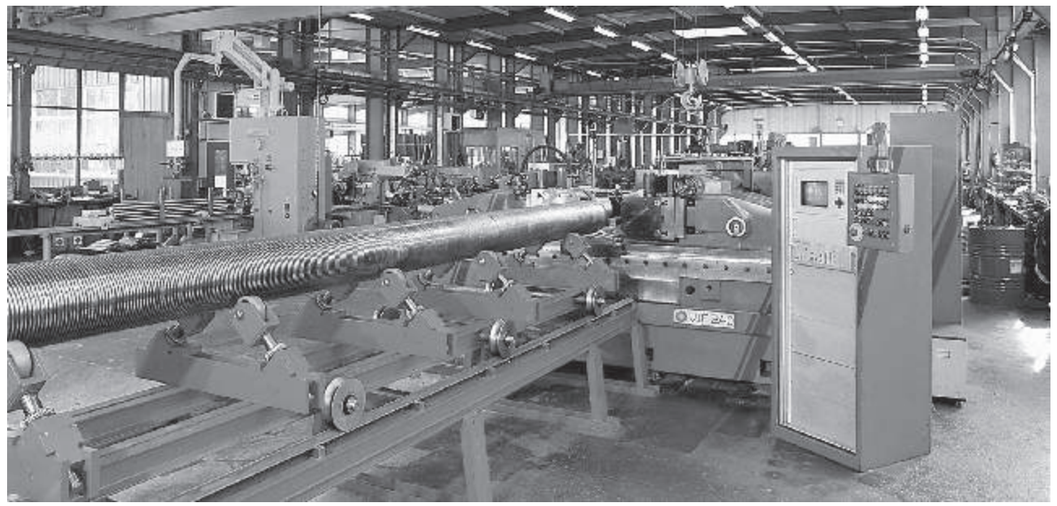
If the ball screw set is used in a harsh or dusty environment, we recommend bellows or a helical spring type protection is used.

ORDER

Our ball screws are manufactured in lengths of 6 meters, except for Ø≤20, which are in lengths of 4 meters. Other lengths can be provided upon request.

Unless otherwise specified, the screws are delivered with rough-rolled ends when supplied in their manufacturing length, or with sawn ends when they are cut to length.

Upon request and subject to studies by our commercial department, we can offer straightened screws, with one or two ends reheated after machining operations, machined according to plan or any other diameter, and with a pitch not listed in our catalogue.



CALCULATIONS

NOMINAL LIFESPAN L_{10} (IN REVOLUTIONS) OR L_h (IN HOURS) IS THE SERVICE LIFE ACHIEVED AT 90% BY A BALL SCREW

$$L_{10} = \left[\frac{C}{Fm}\right]^3 10^6$$

$$Lh = \frac{L_{10}}{Nm.60}$$

L_{10} = minimum lifespan in **number of revolutions**
Lh = minimum lifespan in **hours**
C = dynamic load capacity in **N**
Fm = average axial load during a cycle in **N**
Nm = average speed during a cycle in **rpm**

LIFESPAN WITH RELIABILITY COEFFICIENT $f$ar

Lar = L10.$f$ar
Lhar = Lh.$f$ar

Reliability in %	$f$ar
90	1
95	0.62
96	0.53
97	0.44
98	0.33
99	0.21

IF THE LIFESPAN IS IMPOSED, THE DYNAMIC LOAD CAPACITY IS CALCULATED AS FOLLOWS

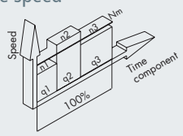
$$C = Fm \sqrt[3]{\frac{L_{10}}{10^6}}$$

L_{10} = minimum lifespan in **number of revolutions**
C = dynamic load capacity in **N**
Fm = average axial load in **N**

AVERAGE SPEED UNDER CONSTANT LOAD

$$Nm = \frac{q_1}{100} N_1 + \frac{q_2}{100} N_2 + \frac{q_3}{100} N_3 \ldots$$

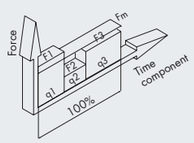
Nm = average speed in **rpm**



AVERAGE FORCE UNDER CONSTANT SPEED

$$Fm = \sqrt[3]{\frac{q_1}{100} F_1^3 + \frac{q_2}{100} F_2^3 + \frac{q_3}{100} F_3^3 \ldots}$$

Fm = average axial load in N



AVERAGE FORCE UNDER VARIABLE SPEED

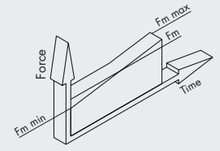
$$Fm = \sqrt[3]{\frac{q_1.N_1}{100.Nm} F_1^3 + \frac{q_2.N_2}{100.Nm} F_2^3 + \frac{q_3.N_3}{100.Nm} F_3^3 \ldots}$$

Fm = average axial load in **N**

AVERAGE SPEED LINEAR VARIATION WITH CONSTANT SPEED

$$Fm = \frac{Fmin + 2Fmax}{3}$$

Fm = average axial load in **N**



DRIVE TORQUE

$$Ma = \frac{F.P}{2000.\pi.\eta}$$

Ma = drive torque (converted from translational rotation) in **Nm**
F = total axial load in **N**
P = pitch of the system in **mm**
η = direct efficiency for transformation of rotational motion to translational motion (≈0.9)

$$Me = \frac{F.P.\ \eta'}{2000.\pi}$$

Me = drive torque (converted from translational rotation) in **Nm**
F = total axial load in **N**
P = system pitch in **mm**
η' = indirect efficiency for transformation of rotational motion to translational motion (≈0.8)

POWER AT STABILISED SPEED

$$P = \frac{Ma.N}{9550}$$

P = driving power in **Kw**
Ma = driving torque in **Nm**
N = speed in **rpm**

CRITICAL SPEED

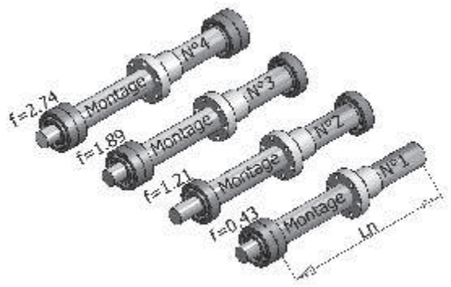
The design of the nuts and nature of the bearings mean that ball screws have a critical rotational speed.

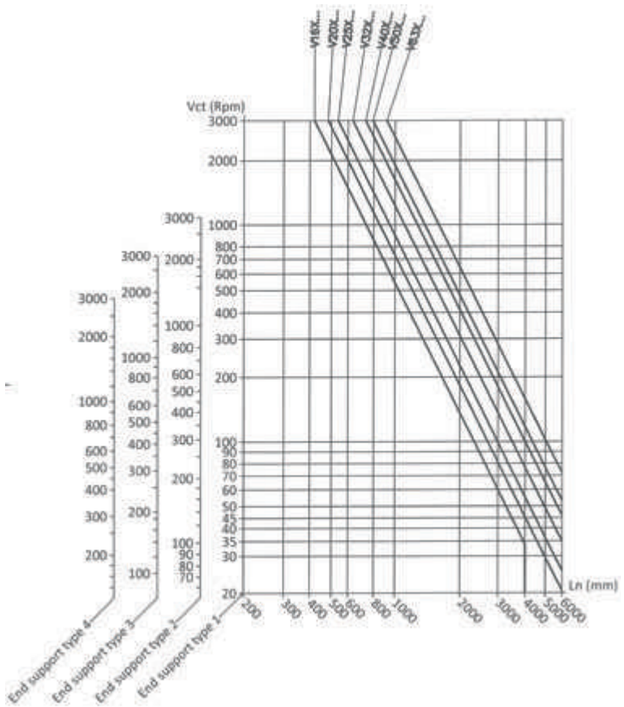
$$Vct = f\frac{D_2}{Ln^2}.10^8$$

Vct = critical rotational speed in **rpm**
f = correction factor due to the nature of the bearings
D = screw core diameter in **mm**
Ln = length in **mm**

$$Vadm = 0{,}8.Vct$$

Vadm= corrected acceptable speed in **rpm**
Vct = critical rotational speed in **rpm**
0.8 = safety factor





We recommend regular checks are performed to ensure that the acceptable maximum speed is compatible with the nut's recycling system:

Composite pins: $Vadm.D_0 < 55000$
Metal pins: $Vadm.D_0 < 85000$
End flanges $Vadm.D_0 < 80000$

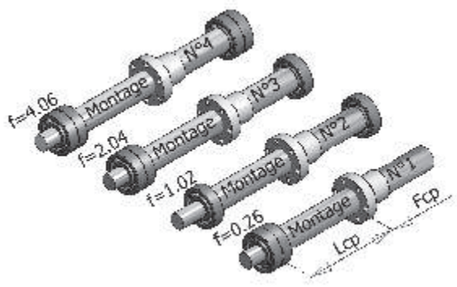
Vadm= corrected acceptable speed in **rpm**
D_0 = nominal diameter of the screw in **mm**

BUCKLING

When a screw is working under compression, the effect of buckling increases in proportion to the screw length/Ø ratio. It is therefore important to determine the diameter of the screw correctly, depending on load.

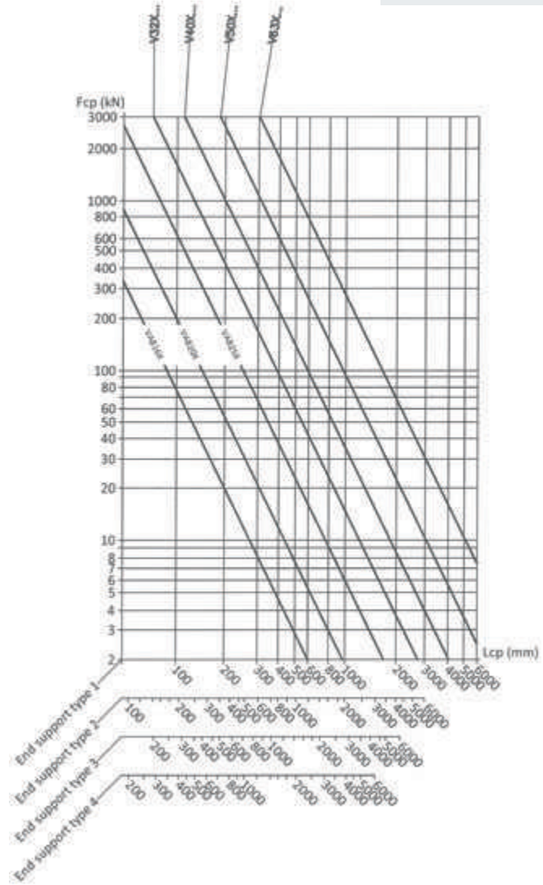
$$Fcp = \frac{f.D_2^4}{Lcp^2}.10^5$$

Fcp= critical force in **N**
f = correction factor due to the nature of the bearings
D2 = Ø of the screw core in **mm**
Lcp = length of the screw subject to compression in **mm**



$$fadm = 0.8Fcp$$

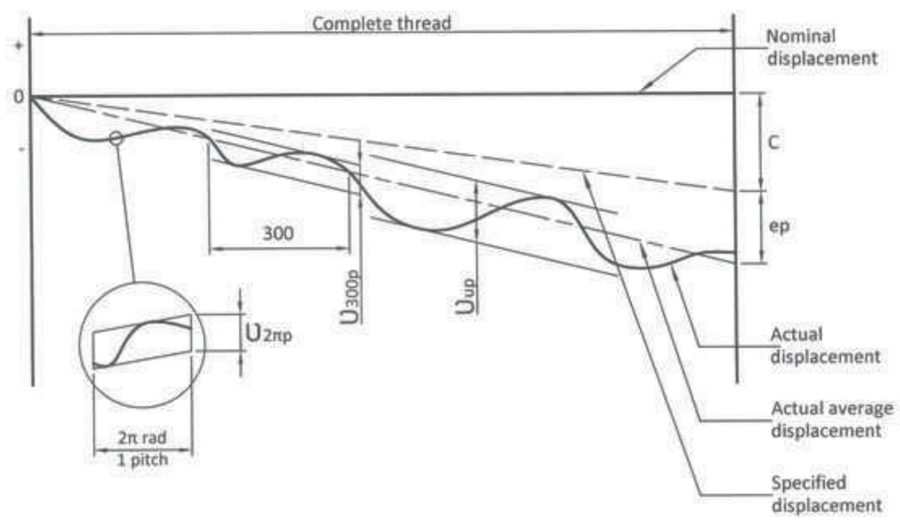
fadm = acceptable force in **N**
Fcp = critical force in **N**
0.8 = safety factor



DISPLACEMENT ACCURACY

The precision of the pitch is measured on the length of the screw reduced at either end by a length equal to its nominal value.

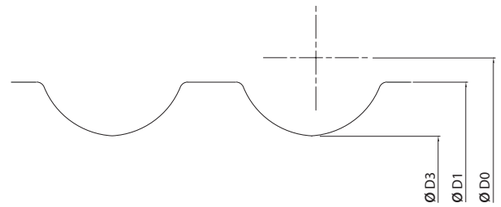
	T5	T7	T9
Measured length	±ep (µm)		
0 - 315	23	52	130
(315) - 400	25	57	140
(400) - 500	27	63	155
(500) - 630	32	70	175
(630) - 800	36	80	200
(800) - 1000	40	90	230
(1000) - 1250	47	105	260
(1250) - 1600	55	125	310
(1600) - 2000	65	150	370
(2000) - 2500	78	175	440
(2500) - 3150	95	210	530
(3150) - 4000	115	260	640
(4000) - 5000	140	320	790
(5000) - 6300	170	390	960



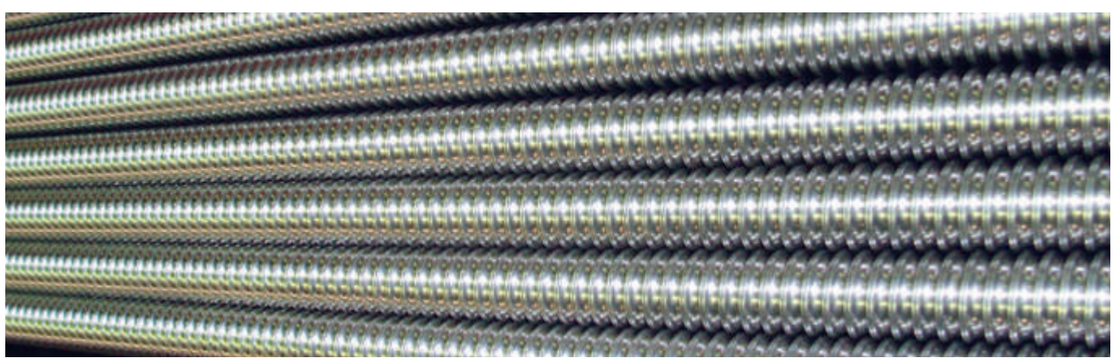
- **Nominal displacement:** product of the nominal helical pitch and the number of rotations.
- **Actual displacement:** actual displacement of the ball nut in relation to the screw, or inversely, for a given number of rotations.
- **Actual average displacement:** obtained on the basis of the actual displacement with a linear approximation using the least squares method
- **Specified displacement:** product of the nominal helical pitch and the number of rotations, to which a displacement compensation value is added.
- **C:** displacement compensation. Difference between the nominal displacement and the displacement required by the client in the order (for instance, to compensate for dilation effects).
- e_p : specified displacement tolerance
- U_{up} : maximum variation of the actual displacement
- U_{300p} : variation of the actual displacement on 300 mm selected on the length of actual displacement
- $U_{2\pi p}$: variation of the actual displacement on 1 rotation selected on the length of actual displacement

ROLLED BALL SCREWS KGS

Profile:	Gothic profile with pitch of 5 or 10 mm
Material:	Treated C55R (1.1209) or CF53 (1.1213).
Rolling route:	Induction hardened at 700±50 HV and polished
Precision:	The screws are supplied in T7 quality. We can provide T5, T9 or T10 quality on request



Designation			Moment of quadratic inertia	Moment of inertia	Moment of mass inertia	Dimensions				Ø balls	Weight
						D0	D1	D2	Lmax		
Profile	Right	Left	[10^4 mm^4]	[10^3mm^3]	[kg*m^2/m]	mm	mm	mm	mm	mm	Kg
16x5	*		0.136	0.211	3.14*10^{-5}	16	15.5	12.9	4000	3.5	1.26
20x5	*	*	0.4	0.474	8.28*10^{-5}	20	19.5	16.9	6000	3.5	1.26
25x5	*		1.13	1.03	2.23*10^{-4}	25	24.5	21.9	6000	3.5	3.33
32x5	*	*	3.42	2.37	6.39*10^{-4}	32	31.5	28.9	6000	3.5	5.61
32x10	*		2.8	2.04	6.09*10^{-4}	32	32.1	27.5	6000	6.35	5.61
40x5	*		9.1	4.93	1.64*10^{-3}	40	39.5	36.9	6000	3.5	9.03
40x10	*		6.64	3.89	1.52*10^{-3}	40	39.5	34.1	6000	7.14	8.33
50x10	*		18.4	8.36	3.69*10^{-3}	50	49.2	44	6000	7.14	13.48
63x10	*		51.8	18.2	9.9*10^{-3}	63	62.2	57	6000	7.14	22.04
80x10	*		148	39.95	2.69*10^{-2}	80	79.5	74.1	6000	7.14	36.41
Multiple threads											
16X10P5	*		0.136	0.211	3.14*10-5	16	15.5	12.9	4000	3.5	1.26
20x20P5	*		0.4	0.474	8.28*10-5	20	19.5	16.9	6000	3.5	2.04
20x50P10	*		0.364	0.441	7.92*10-5	20	19.1	16.5	6000	3.5	2.07
25x10P5	*		1.13	1.03	2.23*10-4	25	24.5	21.9	6000	3.5	3.33
25x25P5	*		1.15	1.05	2.25*10-4	25	24.5	22	6000	3.5	3.33
32x20P5	*		3.33	2.32	6.3*10-4	32	31.4	28.7	6000	3.5	5.61
32x40P5	*		3.42	2.37	6.89*10-4	32	32.6	28.9	6000	3.5	5.61
50x20P10	*		18.4	8.36	3.71*10^{-3}	50	49.4	44	6000	7.14	13.48



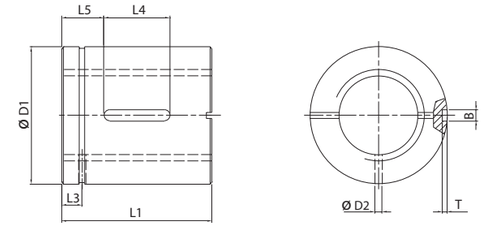
DIN-TYPE CYLINDRICAL BALL NUTS — KGMDZ

Cylindrical ball nuts with lubrication hole and key groove.	
Material:	100Cr6 (1.1505) or 16MnCr5 (1.7131)
Ball transfer for single thread nut:	Recycling pins.
Ball transfer for multiple thread nut:	2 deflectors and tubular duct located in periphery of the nut.
Seal rings	
Axial clearance:	0.05 mm for pitches of 5 0.1 mm for pitches of 10 0.15 mm for multiple pitches

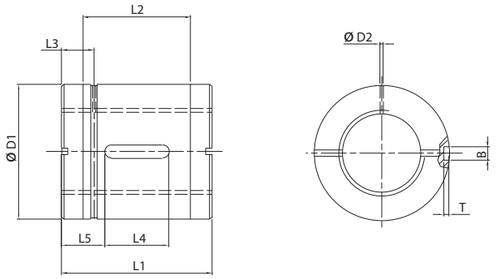
Designation			Type	Number of tracks	Acceptable load		Ø balls	Unit weight
					C dynamic	C_0 static		
Profile	Right	Left			[KN]	[KN]	mm	Kg
16X5	*		DIN S	3	10.5	15.8	3.50	0.2
20X5	*	*	DIN S	3	14.3	21.5	3.50	0.18
25X5	*		DIN S	3	15.9	27.2	3.50	0.2
32X5	*	*	DIN S	5	22.3	51.9	3.50	0.3
32X10	*		DIN S	3	31.4	56.1	6.35	0.6
40X5	*		DIN S	5	29.1	64.1	3.50	0.5
40X10	*		DIN S	3	40.1	75.7	7.14	0.9
50X10	*		DIN S	5	64.5	142.2	7.14	1.1
63X10	*		DIN S	5	77.1	201.8	7.14	1.5
Multiple threads								
16X10P5	*		DIN S	4	17.7	25.8	3.50	0.25
25X10P5	*		DIN M	2	22.0	43.6	3.50	0.25
25X25P5	*		DIN M	5	17.2	33.0	3.50	0.2
40X20P10	*		DIN M	2	42.1	94.1	5.00	1.2

DIN-TYPE CYLINDRICAL BALL NUTS — KGMDZ

DIN S



DIN M



Designation			Dimensions							
			D1 g6	D2	L1	L2	L3	L4	L5	BxT
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	
16X5	*		28	3	34	-	6.75	20	7	5x2
20X5	*	*	36	3	34	-	6.75	20	7	5x2
25X5	*		40	3	34	-	6.75	20	7	5x2
32X5	*	*	50	3	45	-	7.25	30	7.5	6x2,5
32X10	*		50	3	60	-	10	30	15	6x2,5
40X5	*		63	3	45	-	7.25	30	7.5	6x2,5
40X10	*		63	4	60	-	10	30	15	6x2,5
50X10	*		75	4	82	-	11	36	23	6x2.5
63X10	*		90	4	82	-	11	36	23	6x2.5
Multiple threads										
16X10P5	*		28	2.5	42	-	7	20	15	5x2
25X10P5	*		40	1.5	45	25	13.5	20	12.5	5x2
25X25P5	*		40	1.5	35	19	11.5	13	11	5x3
40X20P10	*		63	1.5	70	50	15	30	20	6x2,5

GB-TYPE CYLINDRICAL BALL NUTS

KGMGZ

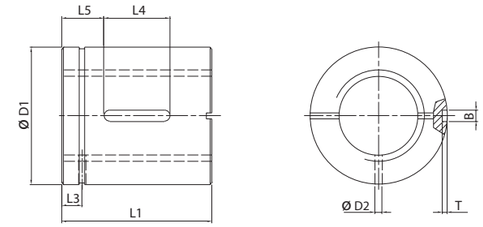
Cylindrical ball nuts with lubrication hole and key groove.	
Material:	100Cr6 (1.1505) or 16MnCr5 (1.7131)
Ball transfer for single thread nut:	Recycling pins.
Ball transfer for multiple thread nut:	2 deflectors and tubular duct located in periphery of the nut.
Seal rings	
Axial clearance:	0.05 mm for pitches of 5 0.1 mm for pitches of 10 0.15 mm for multiple pitches

Designation			Type	Number of tracks	Acceptable load		Ø balls	Unit weight
					C dynamic	C_0 static		
Profile	Right	Left			[KN]	[KN]	mm	Kg
20X5	*		GBS	3	14.3	21.5	3.50	0.15
25X5	*		GBS	3	15.9	27.2	3.50	0.2
32X5	*		GBS	5	22.3	51.9	3.50	0.3
32X10	*		GBS	3	31.4	56.1	6.35	0.6
40X5	*		GBS	5	29.1	64.1	3.50	0.5
Multiple threads								
20X20P5	*		GBM	4	12.4	19.9	3.50	0.15
20X50P10	*		GBM	5	13.9	26.6	3.50	0.25
32X20P5	*		GBM	4	30.2	71.0	3.50	0.5
32X40P5	*		GBM	4	15.5	33.6	3.50	0.45
50X20P10	*		GBM	2	79.9	181.6	7.14	1.4

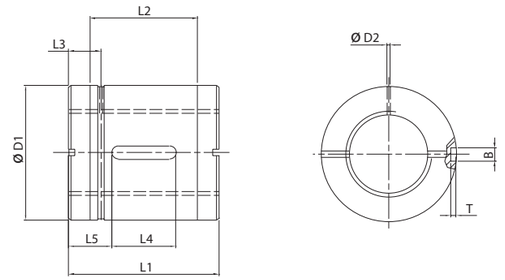
GB-TYPE CYLINDRICAL BALL NUTS

KGMGZ

GBS



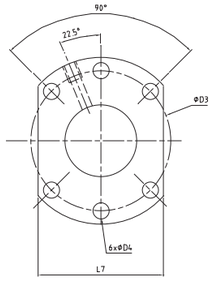
GBM



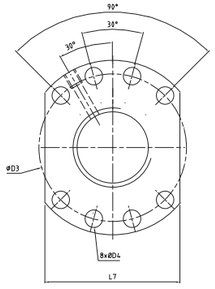
Designation			Dimensions							
			D1 g6	D2	L1	L2	L3	L4	L5	BxT
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	
20X5	*		32	3	34	-	6.75	20	7	5x2
25X5	*		38	3	34	-	6.75	20	7	5x2
32X5	*		45	3	45	-	7.25	30	7.5	6x2,5
32X10	*		53	3	60	-	10	30	15	6x2,5
40X5	*		53	3	45	-	7.25	30	7.5	6x2,5
Multiple threads										
20X20P5	*		35	1.5	30	14	11.5	12	9	5x3
20X50P10	*		35	1.5	56	40	14	20	18	5x2
32X20P5	*		53	1.5	55	35	16	25	12.5	6x4
32X40P5	*		53	1.5	50	30	16	25	12.5	6x4
50X20P10	*		85	1.5	73.5	50	16.75	30	22	6x2,5

DIN-TYPE FLANGE BALL NUTS — KGMDF

Flange ball nuts with lubrication and fixation hole.	
Material:	100Cr6 (1.1505) or 16MnCr5 (1.7131)
Ball transfer for single thread nut:	Recycling pins.
Ball transfer for multiple thread nut:	2 deflectors and tubular duct located in periphery of the nut.
Seal rings	
Axial clearance:	0.05 mm for pitches of 5 0.1 mm for pitches of 10 0.15 mm for multiple pitches



Attachment 1

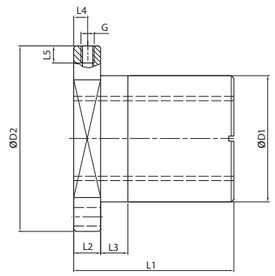


Attachment 2

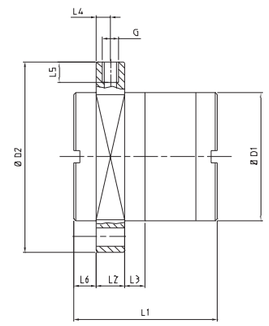
Designation			Type	Attachment	Number of tracks	Acceptable load		Ø balls	Unit weight
Profile	Right	Left				C dynamic	C0 static		
						[KN]	[KN]	mm	Kg
16X5	*		DIN S	1	3	10.5	15.8	3.5	0.20
20X5	*	*	DIN S	1	3	14.3	21.5	3.5	0.25
25X5	*		DIN S	1	3	15.9	27.2	3.5	0.35
32X5	*	*	DIN S	1	5	22.3	51.9	3.5	0.55
32X10	*		DIN S	1	3	31.4	56.1	6.35	0.90
40X5	*		DIN S	2	5	29.1	64.1	3.5	0.80
40X10	*		DIN S	2	3	40.1	75.7	7.14	1.20
50X10	*		DIN S	2	5	64.5	142.2	7.14	2.00
63X10	*		DIN S	2	5	77.1	201.8	7.14	2.60
Multiple threads									
16X10P5	*		DIN S	1	4	17.7	25.8	3.5	0.25
25X10P5	*		DIN M	1	2	22.0	43.6	3.5	0.40
25X25P5	*		DIN M	1	4	17.2	33.0	3.5	0.40
40X20P10	*		DIN M	2	2	42.1	94.1	5	1.35

DIN-TYPE FLANGE BALL NUTS — KGMDF

DIN S

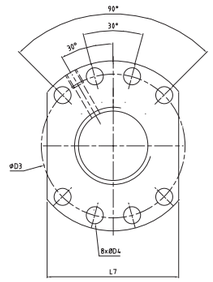


DIN M

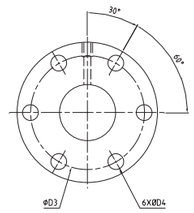


Designation			Dimensions											
Profile	Right	Left	D1g6	D2h13	D3	D4	L1	L2	L3	L4	L5	L6	L7	G
			mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
16X5	*		28	48	38	5.5	42	10	10	5	8	-	40	M6
20X5	*	*	36	58	47	6.6	42	10	10	5	8	-	44	M6
25X5	*		40	62	51	6.6	42	10	10	5	8	-	48	M6
32X5	*	*	50	80	65	9	55	12	10	6	8	-	62	M6
32X10	*		50	80	65	9	69	12	16	6	8	-	62	M6
40X5	*		63	93	78	9	57	14	10	7	10	-	70	M8x1
40X10	*		63	93	78	9	71	14	10	7	10	-	70	M8x1
50X10	*		75	110	93	11	95	16	16	8	10	-	85	M8x1
63X10	*		90	125	108	11	97	18	16	9	10	-	95	M8x1
Multiple threads														
16X10P5	*		28	48	38	5.5	48	10	10	5	8		40	M6
25X10P5	*		40	62	51	6.6	45	10	15	5	10	10	48	M6
25X25P5	*		40	62	51	6.6	35	10	9	5	10	8	48	M6
40X20P10	*		63	93	78	9	70	14	40.25	7	10	5.75	70	M8x1

Flange ball nuts with lubrication and fixation hole.	
Material:	100Cr6 (1.1505) or 16MnCr5 (1.7131)
Ball transfer for single thread nut:	Recycling pins.
Ball transfer for multiple thread nut:	2 deflectors and tubular duct located in periphery of the nut.
Seal rings	
Axial clearance:	0.05 mm for pitches of 5 0.1 mm for pitches of 10 0.15 mm for multiple pitches



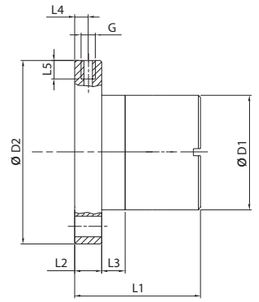
Attachment 2



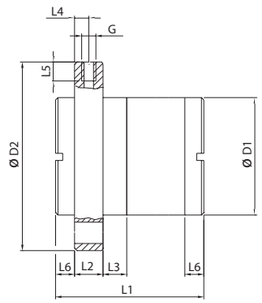
Attachment 3

Designation	Type	Attachment	Number of tracks	Acceptable load		Ø balls	Unit weight
				C dynamic	C0 static		
Profile	Right	Left				[KN]	[KN]	mm	Kg
16X5	*		GBS	3	3	10.5	15.8	3.5	0.20
20X5	*		GBS	3	3	14.3	21.5	3.5	0.25
25X5	*		GBS	3	3	15.9	27.2	3.5	0.35
32X5	*		GBS	3	5	22.3	51.9	3.5	0.55
32X10	*		GBS	3	3	31.4	56.1	6.35	0.90
40X5	*		GBS	3	5	29.1	64.1	3.5	0.80
40X10	*		GBS	3	3	40.1	75.7	7.14	1.20
50X10	*		GBS	3	5	64.5	142.2	7.14	2.00
63X10	*		GBS	3	5	77.1	201.8	7.14	2.60
Multiple threads									
20X20P5	*		GBM	3	4	12.4	19.9	3.5	0.25
20X50P10	*		GBM	3	5	13.9	26.6	3.5	0.40
32X20P5	*		GBM	3	4	30.2	71.0	3.5	0.50
32X40P5	*		GBM	3	4	15.5	33.6	3.5	0.50
50X20P10	*		GBM	2	2	79.9	181.6	7.14	2.00

GBS



GBM



Designation			Dimensions											
			D1g6	D2h13	D3	D4	L1	L2	L3	L4	L5	L6	L7	G
Profile	Right	Left	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
16X5	*		28	48	38	5.5	44	12	8	6	8	-	-	M6
20X5	*		32	55	45	7	44	12	8	6	8	-	-	M6
25X5	*		38	62	50	7	46	14	8	7	8	-	-	M6
32X5	*		45	70	58	7	59	16	10	8	8	-	-	M6
32X10	*		53	80	68	7	73	16	10	8	8	-	-	M8x1
40X5	*		53	80	68	7	59	16	10	8	8	-	-	M6
40X10	*		63	95	78	9	73	16	10	8	8	-	-	M8x1
50X10	*		72	110	90	11	97	18	10	9	8	-	-	M8x1
63X10	*		85	125	105	11	99	20	10	10	8	-	-	M8x1
Multiple threads														
20X20P5	*		35	62	50	7	30	10	4	5	8	8	-	M6
20X50P10	*		35	62	50	7	56	10	30	5	8	8	-	M6
32X20P5	*		53	80	68	7	55	16	19	8	10	10		M6
32X40P5	*		53	80	68	7	50	16	14	8	10	10	-	M6
50X20P10	*		85	125	103	11	80	18	38.75	9	10	5	95	M8x1

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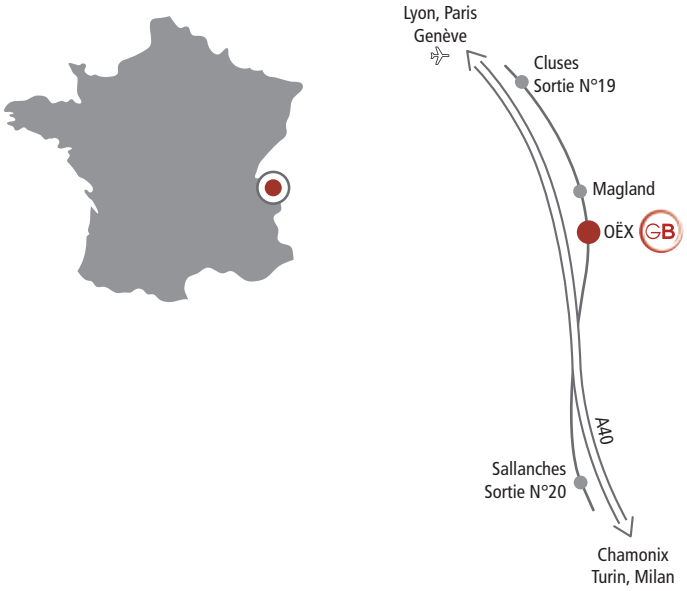

Gradel GB Baudin

Threads for transmission systems

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