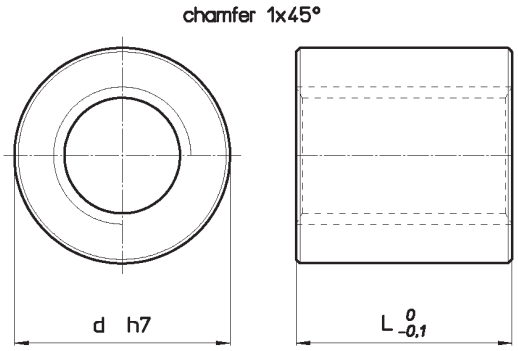
Trapezoidal nut type HSN - Cylindrical bronze

Material: EN 1982 Cu Sn5 Zn5 Pb5-C – CC491K

Cylindrical bronze nut for movement with modest loads compared with FXN. HDL and HAL.
Good lubrication is recommended.

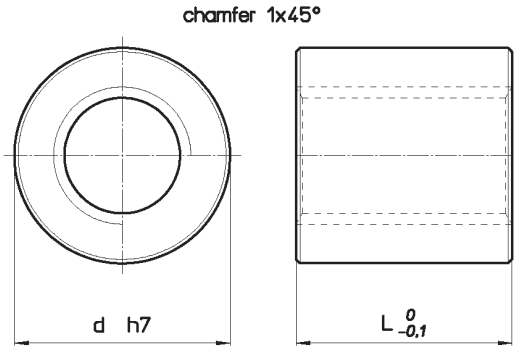


Nut Stock no. **RIGHT**	Nut Stock no. **LEFT**	**Diameter x lead**	Thread starts	**d** mm	**L** mm	**Wt.** kg/each	**At** mm^2 (1)
HSN 12 A R	HSN 12 A L	**Tr 12x3**	1	36	36	0.302	594
HSN 14 A R	HSN 14 A L	**Tr 14x4**	1	36	36	0.290	677
HSN 16 A R	HSN 16 A L	**Tr 16x4**	1	36	36	0.276	792
HSN 16 B R	--	**Tr 16x8 (P4)**	2	36	36	0.276	792
HSN 18 A R	HSN 18 A L	**Tr 18x4**	1	36	36	0.259	905
HSN 20 A R	HSN 20 A L	**Tr 20x4**	1	40	40	0.354	1130
HSN 20 B R	--	**Tr 20x8 (P4)**	2	40	40	0.354	1130
HSN 22 A R	HSN 22 A L	**Tr 22x5**	1	40	40	0.33	1225
HSN 25 A R	HSN 25 A L	**Tr 25x5**	1	45	45	0.47	1590
HSN 25 B R	--	**Tr 25x10 (P5)**	2	45	45	0.47	1590
HSN 28 A R	HSN 28 A L	**Tr 28x5**	1	45	45	0.42	1800
HSN 28 B R	--	**Tr 28x10 (P5)**	2	45	45	0.42	1800
HSN 30 A R	HSN 30 A L	**Tr 30x6**	1	50	50	0.60	2120
HSN 30 B R	--	**Tr 30x12 (P6)**	2	50	50	0.60	2120
HSN 35 A R	HSN 35 A L	**Tr 35x6**	1	55	55	0.75	2764
HSN 40 A R	HSN 40 A L	**Tr 40x7**	1	60	60	0.92	3440
HSN 40 B R	--	**Tr 40x14 (P7)**	2	60	60	0.92	3440
HSN 45 A R	HSN 45 A L	**Tr 45x8**	1	65	65	1.10	4186
HSN 50 A R	HSN 50 A L	**Tr 50x8**	1	70	70	1.30	5057
HSN 55 A R	--	**Tr 55x9**	1	80	80	2.07	6345
HSN 60 A R	HSN 60 A L	**Tr 60x9**	1	80	80	1.75	6975

Trapezoidal nut type HBD - Cylindrical bronze

Material: EN 1982 Cu Sn7 Zn4 Pb7-C – CC493K

Cylindrical bronze nut for movement with modest loads compared with FXN, HDL and HAL. Good lubrication is recommended.



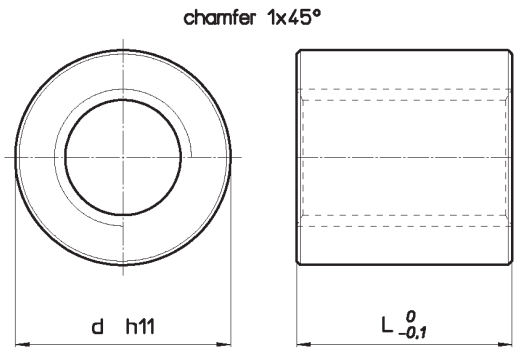
Nut Stock no. **RIGHT**	Nut Stock no. **LEFT**	**Diameter x lead**	Thread starts	**d** mm	**L** mm	**Wt.** kg/each	**At** mm^2 (1)
HBD 10 T R	HBD 10 T L	**Tr 10x2**	1	22	20	0.058	282
HBD 10 A R	HBD 10 A L	**Tr 10x3**	1	22	20	0.057	267
HBD 12 A R	HBD 12 A L	**Tr 12x3**	1	26	24	0.094	396
HBD 12 B R	--	**Tr 12x6 (P3)**	2	26	24	0.094	396
HBD 14 R R	HBD 14 R L	**Tr 14x3**	1	30	28	0.146	550
HBD 14 A R	HBD 14 A L	**Tr 14x4**	1	30	28	0.146	526
HBD 14 B R	--	**Tr 14x6 (P3)**	2	30	28	0.146	550
HBD 16 A R	HBD 16 A L	**Tr 16x4**	1	36	32	0.245	704
HBD 16 B R	--	**Tr 16x8 (P4)**	2	36	32	0.245	704
HBD 18 A R	HBD 18 A L	**Tr 18x4**	1	40	36	0.337	905
HBD 20 A R	HBD 20 A L	**Tr 20x4**	1	45	40	0.476	1130
HBD 22 A R	HBD 22 A L	**Tr 22x5**	1	45	40	0.456	1225
HBD 24 A R	HBD 24 A L	**Tr 24x5**	1	50	48	0.680	1620
HBD 26 A R	HBD 26 A L	**Tr 26x5**	1	50	48	0.648	1770
HBD 28 A R	HBD 28 A L	**Tr 28x5**	1	60	60	1.237	2400
HBD 30 A R	HBD 30 A L	**Tr 30x6**	1	60	60	1.195	2544
HBD 30 B R	--	**Tr 30x12 (P6)**	2	60	60	1.195	2544
HBD 32 A R	HBD 32 A L	**Tr 32x6**	1	60	60	1.145	2733
HBD 36 A R	HBD 36 A L	**Tr 36x6**	1	75	72	2.232	3732
HBD 40 A R	HBD 40 A L	**Tr 40x7**	1	80	80	2.823	4587
HBD 40 B R	--	**Tr 40x14 (P7)**	2	80	80	2.823	4587
HBD 44 A R	HBD 44 A L	**Tr 44x7**	1	80	80	2.639	5090
HBD 50 A R	HBD 50 A L	**Tr 50x8**	1	90	100	4.142	7224
HBD 60 A R	HBD 60 A L	**Tr 60x9**	1	100	120	5.716	10462
HBD 70 A R	HBD 70 A L	**Tr 70x10**	1	110	140	7.548	14294
HBD 80 A R	HBD 80 A L	**Tr 80x10**	1	120	160	9.60	18850

(1) Total bearing surface between screw and nut teeth on plane perpendicular to axis.

Trapezoidal nut type HDA - Cylindrical stainless steel

Material: INOX A1 - AISI 303 – 1.4305

Nut of AISI 303 stainless steel especially suitable to withstand corrosive chemical agents

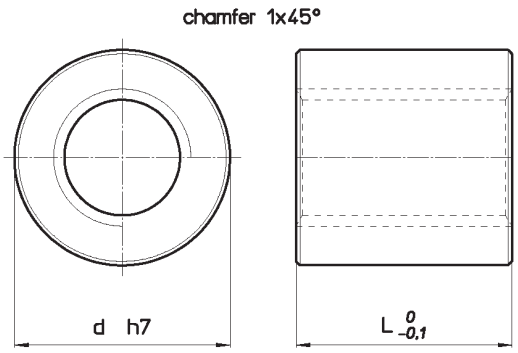


Nut Stock no. **RIGHT**	Nut Stock no. **LEFT**	**Diameter x lead**	Thread starts	**d** mm	**L** mm	**Wt.** kg/each	**At** mm^2 (1)
HDA 12 A R	HDA 12 A L	**Tr 12x3**	1	26	18	0.060	297
HDA 14 A R	HDA 14 A L	**Tr 14x4**	1	30	21	0.095	395
HDA 16 A R	HDA 16 A L	**Tr 16x4**	1	36	24	0.157	528
HDA 20 A R	HDA 20 A L	**Tr 20x4**	1	45	30	0.305	847
HDA 24 A R	HDA 24 A L	**Tr 24x5**	1	50	36	0.436	1215
HDA 30 A R	HDA 30 A L	**Tr 30x6**	1	60	45	0.766	1908
HDA 36 A R	HDA 36 A L	**Tr 36x6**	1	75	54	1.462	2799
HDA 40 A R	HDA 40 A L	**Tr 40x7**	1	80	60	1.808	3440
HDA 50 A R	HDA 50 A L	**Tr 50x8**	1	90	75	2.653	5418

Trapezoidal nut type HBM - Cylindrical bronze

Material: EN 1982 Cu Sn12-C – CC483K

Cylindrical bronze nut for movement with modest loads compared with HDL and HAL.
Good lubrication is recommended.



Nut Stock no. **RIGHT**	Nut Stock no. **LEFT**	**Diameter x lead**	Thread starts	**d** mm	**L** mm	**Wt.** kg/each	**At** mm^2 (1)
HBM 10 A R	HBM 10 A L	**Tr 10x3**	1	20	20	0.044	267
HBM 12 A R	HBM 12 A L	**Tr 12x3**	1	24	25	0.078	412
HBM 14 A R	HBM 14 A L	**Tr 14x4**	1	24	25	0.071	470
HBM 16 A R	HBM 16 A L	**Tr 16x4**	1	28	30	0.118	660
HBM 18 A R	HBM 18 A L	**Tr 18x4**	1	34	35	0.214	880
HBM 20 A R	HBM 20 A L	**Tr 20x4**	1	38	40	0.304	1130
HBM 25 A R	HBM 25 A L	**Tr 25x5**	1	44	45	0.438	1590
HBM 30 A R	HBM 30 A L	**Tr 30x6**	1	48	50	0.532	2120
HBM 35 A R	HBM 35 A L	**Tr 35x6**	1	58	60	0.959	3015
HBM 36 A R	HBM 36 A L	**Tr 36x6**	1	58	60	0.923	3110
HBM 40 A R	HBM 40 A L	**Tr 40x7**	1	64	65	1.222	3727
HBM 45 A R	HBM 45 A L	**Tr 45x8**	1	68	80	1.579	5152
HBM 50 A R	HBM 50 A L	**Tr 50x8**	1	74	80	1.808	5780
HBM 55 A R	--	**Tr 55x9**	1	78	95	2.242	7535
HBM 60 A R	HBM 60 A L	**Tr 60x9**	1	84	95	2.536	8282
HBM 70 A R	HBM 70 A L	**Tr 70x10**	1	98	120	4.354	12252
HBM 80 A R	HBM 80 A L	**Tr 80x10**	1	108	120	4.892	14137

(1) Total bearing surface between screw and nut teeth on plane perpendicular to axis.

TRAPEZOIDAL NUTS

Multiple start	**MLF** page 33 Steel 11SMnPb37		**MZP** page 33 Steel 11SMnPb37		**HSN** page 34 Bronze CuSn5Zn5Pb5-C		**HBD** page 34 Bronze CuSn7Zn4Pb7-C	
								
THREAD	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**
Tr 10 x 4 (P2)								
Tr 12 x 6 (P3)	■		■				■	
Tr 14 x 6 (P3)							■	
Tr 16 x 8 (P4)	■				■		■	
Tr 18 x 8 (P4)								
Tr 20 x 8 (P4)	■				■			
Tr 20 x 20 (P4)								
Tr 20 x 20 (P5)								
Tr 22 x 10 (P5)								
Tr 24 x 10 (P5)								
Tr 25 x 10 (P5)	■				■			
Tr 25 x 25 (P5)								
Tr 26 x 10 (P5)								
Tr 28 x 10 (P5)	■				■			
Tr 30 x 12 (P6)	■				■		■	
Tr 30 x 30 (P5)								
Tr 32 x 12 (P6)								
Tr 36 x 12 (P6)								
Tr 40 x 14 (P7)	■				■		■	
Tr 40 x 40 (P8)								

■ = Goods in stock

Multiple start	**QOB** page 37 Brass CW614N-M		**FXN** page 41 Bronze CuSn12-C		**FMT** page 42 Bronze CuSn12-C		**HDL** page 43 Bronze CuSn12-C	
								
THREAD	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**
Tr 10 x 4 (P2)								
Tr 12 x 6 (P3)	■		■		■			
Tr 14 x 6 (P3)								
Tr 16 x 8 (P4)			■		■		■	
Tr 18 x 8 (P4)								
Tr 20 x 8 (P4)			■		■		■	
Tr 20 x 20 (P4)			■					
Tr 20 x 20 (P5)			■					
Tr 22 x 10 (P5)								
Tr 24 x 10 (P5)								
Tr 25 x 10 (P5)			■		■		■	
Tr 25 x 25 (P5)			■				■	
Tr 26 x 10 (P5)								
Tr 28 x 10 (P5)			■				■	
Tr 30 x 12 (P6)			■		■		■	
Tr 30 x 30 (P5)			■					
Tr 32 x 12 (P6)								
Tr 36 x 12 (P6)								
Tr 40 x 14 (P7)			■		■		■	
Tr 40 x 40 (P8)			■					

TRAPEZOIDAL NUTS

Single start	**MLF** page 33 Steel 11SMnPb37		**MZP** page 33 Steel 11SMnPb37		**HDA** page 35 Stainless Steel Aisi 303 1.4305		**HSN** page 34 Bronze CuSn5Zn5Pb5-C		**HBD** page 34 Bronze CuSn7Zn4Pb7-C		**HBM** page 35 Bronze CuSn12-C	
												
THREAD	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**	**RH**	**LH**
Tr 8 x 1,5												
Tr 10 x 2			■	■					■	■		
Tr 10 x 3			■	■					■	■	■	■
Tr 12 x 3	■	■	■	■	■	■	■	■	■	■	■	■
Tr 14 x 3			■	■					■	■		
Tr 14 x 4	■	■	■	■	■	■	■	■	■	■	■	■
Tr 16 x 4	■	■	■	■	■	■	■	■	■	■	■	■
Tr 18 x 4	■	■	■	■			■	■	■	■	■	■
Tr 20 x 4	■	■	■	■	■	■	■	■	■	■	■	■
Tr 22 x 5	■	■	■	■			■	■	■	■		
Tr 24 x 5			■	■	■	■			■	■		
Tr 25 x 3												
Tr 25 x 5	■	■					■	■			■	■
Tr 26 x 5			■	■					■	■		
Tr 28 x 5	■	■	■	■			■	■	■	■		
Tr 30 x 3												
Tr 30 x 4												
Tr 30 x 5												
Tr 30 x 6	■	■	■	■	■	■	■	■	■	■	■	■
Tr 32 x 6			■	■					■	■		
Tr 35 x 3												
Tr 35 x 4												
Tr 35 x 5												
Tr 35 x 6	■	■					■	■			■	■
Tr 35 x 8												
Tr 36 x 6			■	■	■	■			■	■	■	■
Tr 40 x 3												
Tr 40 x 4												
Tr 40 x 5												
Tr 40 x 6												
Tr 40 x 7	■	■	■	■	■	■	■	■	■	■	■	■
Tr 40 x 8												
Tr 40 x 10												
Tr 44 x 7			■	■					■	■		
Tr 45 x 8	■	■					■	■			■	■
Tr 50 x 3												
Tr 50 x 4												
Tr 50 x 5												
Tr 50 x 6												
Tr 50 x 8	■	■	■	■	■	■	■	■	■	■	■	■
Tr 50 x 10												
Tr 55 x 9	■						■				■	
Tr 60 x 6												
Tr 60 x 7												
Tr 60 x 9	■	■	■	■			■	■	■	■	■	■
Tr 70 x 10			■	■					■	■	■	■
Tr 80 x 10			■	■					■	■	■	■
Tr 90 x 12												
Tr 95 x 16												
Tr 100 x 12												
Tr 100 x 16												
Tr 120 x 14												
Tr 140 x 14												

■ = Goods in stock

We riserve the right to change sizes and features without notice.

Trapezoidal nut specifications (also see pages for each nut type)

Diameter x lead	D 4 Major diameter tolerance H min. mm	D 4 Major diameter tolerance H max. mm	D 2 Effective or pitch dia. tolerance 7 H min. mm	D 2 Effective or pitch dia. tolerance 7 H max. mm	D 1 Minor diameter tolerance 4 H min. mm	D 1 Minor diameter tolerance 4 H max. mm	Thread starts	Radial play between screw & nut min.	Radial play between screw & nut max.	Axial play between screw & nut min.	Axial play between screw & nut max.
Tr 8 x 1,5	8,300		7,250	7,474	6,500	6,690	1	0,067	0,461	0,018	0,124
Tr 10 x 2	10.500		9.000	9.250	8.000	8.236	1	0.071	0.511	0.019	0.137
Tr 10 x 3	10.500		8.500	8.780	7.000	7.315	1	0.085	0.577	0.023	0.155
Tr 10 x 4 (P2)	10.500		9.000	9.250	8.000	8.236	2	0.071	0.511	0.019	0.137
Tr 12 x 3	12.500		10.500	10.800	9.000	9.315	1	0.085	0.609	0.023	0.163
Tr 12 x 6 (P3)	12.500		10.500	10.800	9.000	9.315	2	0.085	0.609	0.023	0.163
Tr 14 x 3	14.500		12.500	12.800	11.000	11.315	1	0.085	0.609	0.023	0.163
Tr 14 x 4	14.500		12.000	12.355	10.000	10.375	1	0.095	0.715	0.025	0.192
Tr 14 x 6 (P3)	14.500		12.500	12.800	11.000	11.315	2	0.085	0.609	0.023	0.163
Tr 16 x 4	16.500		14.000	14.355	12.000	12.375	1	0.095	0.715	0.025	0.192
Tr 16 x 8 (P4)	16.500		14.000	14.355	12.000	12.375	2	0.095	0.715	0.025	0.192
Tr 18 x 4	18.500		16.000	16.355	14.000	14.375	1	0.095	0.715	0.025	0.192
Tr 18 x 8 (P4)	18.500		16.000	16.355	14.000	14.375	2	0.095	0.715	0.025	0.192
Tr 20 x 4	20.500		18.000	18.355	16.000	16.375	1	0.095	0.715	0.025	0.192
Tr 20 x 8 (P4)	20.500		18.000	18.355	16.000	16.375	2	0.095	0.715	0.025	0.192
Tr 20 x 20 (P4)	20.500		17.500	17.875	15.000	15.450	5	0.106	0.761	0.028	0.204
Tr 20 x 20 (P5)	20.500		17.500	17.875	15.000	15.450	4	0.106	0.761	0.028	0.204
Tr 22 x 5	22.500		19.500	19.875	17.000	17.450	1	0.106	0.761	0.028	0.204
Tr 22 x 10 (P5)	22.500		19.500	19.875	17.000	17.450	2	0.106	0.761	0.028	0.204
Tr 24 x 5	24.500		21.500	21.900	19.000	19.450	1	0.106	0.806	0.028	0.216
Tr 24 x 10 (P5)	24.500		21.500	21.900	19.000	19.450	2	0.106	0.806	0.028	0.216
Tr 25 x 3	25.500		23.500	23.835	22.000	22.315	1	0.085	0.670	0.023	0.180
Tr 25 x 5	25.500		22.500	22.900	20.000	20.450	1	0.106	0.806	0.028	0.216
Tr 25 x 10 (P5)	25.500		22.500	22.900	20.000	20.450	2	0.106	0.806	0.028	0.216
Tr 25 x 25 (P5)	25.500		22.500	22.900	20.000	20.450	5	0.106	0.806	0.028	0.216
Tr 26 x 5	26.500		23.500	23.900	21.000	21.450	1	0.106	0.806	0.028	0.216
Tr 26 x 10 (P5)	26.500		23.500	23.900	21.000	21.450	2	0.106	0.806	0.028	0.216
Tr 28 x 5	28.500		25.500	25.900	23.000	23.450	1	0.106	0.806	0.028	0.216
Tr 28 x 10 (P5)	28.500		25.500	25.900	23.000	23.450	2	0.106	0.806	0.028	0.216
Tr 30 x 3	30.500		28.500	28.835	27.000	27.315	1	0.085	0.670	0.023	0.180
Tr 30 x 4	30.500		28.000	28.855	26.000	26.375	1	0.095	1.215	0.025	0.326
Tr 30 x 5	30.500		27.500	27.900	25.000	25.450	1	0.106	0.806	0.028	0.216
Tr 30 x 6	31.000		27.000	27.450	24.000	24.500	1	0.118	0.903	0.032	0.242
Tr 30 x 12 (P6)	31.000		27.000	27.450	24.000	24.500	2	0.118	0.903	0.032	0.242
Tr 30 x 30 (P5)	30.500		27.500	27.900	25.000	25.450	6	0.106	0.806	0.028	0.216
Tr 32 x 6	33.000		29.000	29.450	26.000	26.500	1	0.118	0.903	0.032	0.242
Tr 32 x 12 (P6)	33.000		29.000	29.450	26.000	26.500	2	0.118	0.903	0.032	0.242
Tr 35 x 3	35.500		33.500	33.835	32.000	32.315	1	0.085	0.670	0.023	0.180
Tr 35 x 4	35.500		33.000	33.355	31.000	31.375	1	0.095	0.715	0.025	0.192
Tr 35 x 5	35.500		32.500	32.900	30.000	30.450	1	0.106	0.806	0.028	0.216
Tr 35 x 6	36.000		32.000	32.450	29.000	29.500	1	0.118	0.903	0.032	0.242
Tr 35 x 8	36.000		31.000	31.500	27.000	27.630	1	0.132	1.007	0.035	0.270
Tr 36 x 6	37.000		33.000	33.450	30.000	30.500	1	0.118	0.903	0.032	0.242
Tr 36 x 12 (P6)	37.000		33.000	33.450	30.000	30.500	2	0.118	0.903	0.032	0.242

Trapezoidal nut specifications (also see pages for each nut type)

Diameter x lead	D 4 Major diameter tolerance H min.	D 4 max.	D 2 Effective or pitch dia. tolerance 7 H min.	D 2 max.	D 1 Minor diameter tolerance 4 H min.	D 1 max.	Thread starts	Radial play between screw & nut min.	Radial play max.	Axial play between screw & nut min.	Axial play max.
	mm		mm		mm						
Tr 40 x 3	40.500		38.500	38.835	37.000	37.315	1	0.085	0.670	0.023	0.180
Tr 40 x 4	40.500		38.000	38.355	36.000	36.375	1	0.095	0.715	0.025	0.192
Tr 40 x 5	40.500		37.500	37.900	35.000	35.450	1	0.106	0.806	0.028	0.216
Tr 40 x 6	41.000		37.000	37.450	34.000	34.500	1	0.118	0.903	0.032	0.242
Tr 40 x 7	41.000		36.500	36.975	33.000	33.560	1	0.125	0.955	0.033	0.256
Tr 40 x 8	41.000		36.000	36.500	32.000	32.630	1	0.132	1.007	0.035	0.270
Tr 40 x 10	41.000		35.000	35.530	30.000	30.710	1	0.150	1.080	0.040	0.289
Tr 40 x 14 (P7)	41.000		36.500	36.975	33.000	33.560	2	0.125	0.955	0.033	0.256
Tr 40 x 40 (P8)	41.000		36.000	36.500	32.000	32.630	5	0.132	1.007	0.035	0.270
Tr 44 x 7	45.000		40.500	40.975	37.000	37.560	1	0.125	0.955	0.033	0.256
Tr 45 x 8	46.000		41.000	41.500	37.000	37.630	1	0.132	1.007	0.035	0.270
Tr 50 x 3	50.500		48.500	48.855	47.000	47.315	1	0.085	0.705	0.023	0.189
Tr 50 x 4	50.500		48.000	48.400	46.000	46.375	1	0.095	0.795	0.025	0.213
Tr 50 x 5	50.500		47.500	47.900	45.000	45.450	1	0.106	0.806	0.028	0.216
Tr 50 x 6	51.000		47.000	47.450	44.000	44.500	1	0.118	0.903	0.032	0.242
Tr 50 x 8	51.000		46.000	46.530	42.000	42.630	1	0.132	1.062	0.035	0.285
Tr 50 x 10	51.000		45.000	45.560	40.000	40.710	1	0.150	1.135	0.040	0.304
Tr 55 x 9	56.000		50.500	51.060	46.000	46.670	1	0.140	1.125	0.038	0.301
Tr 60 x 6	61.000		57.000	57.450	54.000	54.500	1	0.118	0.903	0.032	0.242
Tr 60 x 7	61.000		56.500	56.975	53.000	53.560	1	0.125	0.955	0.033	0.256
Tr 60 x 9	61.000		55.500	56.060	51.000	51.670	1	0.140	1.125	0.038	0.301
Tr 70 x 10	71.000		65.000	65.560	60.000	60.710	1	0.150	1.135	0.040	0.304
Tr 80 x 10	81.000		75.000	75.560	70.000	70.710	1	0.150	1.135	0.040	0.304
Tr 90 x 12	91.000		84.000	84.630	78.000	78.800	1	0.170	1.295	0.046	0.347
Tr 95 x 16	97.000		87.000	87.750	79.000	80.000	1	0.190	1.500	0.051	0.402
Tr 100 x 12	101.000		94.000	94.670	88.000	88.800	1	0.170	1.340	0.046	0.359
Tr 100 x 16	102.000		92.000	92.750	84.000	85.000	1	0.190	1.500	0.051	0.402
Tr 120 x 14	122.000		113.000	113.710	106.00	106.900	1	0.180	1.420	0.048	0.380
Tr 120 x 16	122.000		112.000	112.750	104.00	105.000	1	0.190	1.500	0.051	0.402
Tr 140 x 14	142.000		133.000	133.710	126.00	126.900	1	0.180	1.420	0.048	0.380
Tr 160 x 16	162.000		152.000	152.750	144.00	145.000	1	0.190	1.500	0.051	0.402

General choice criteria

The choice between different types of available screws and nuts is generally made considering the following:

Choice of the screw

Working environment

For work environments where there are no particular corrosive or oxidizing agents C45 screws can be used. Where these conditions are not met, we recommend using stainless steel screws A2 or A4 which are particularly suitable in the following cases:

- With relative humidity of 70/80% and above.
- Immersed in water, even in sea water.
- In presence of particular corrosive agents such as chlorides. In case of highly corrosive agents please contact our Technical Department.
- Where, due to special construction requirements, components must not oxidise, for example in the food industry, where they are coupled with nuts HDA.
- Where the screws cannot be reached for lubrication. For "maintenance free" constructions they are mainly coupled with self-lubricating plastic nuts.
- Where working temperature is relatively high because the stainless steel A2 and A4 feature a relatively high slag temperature due to the austenitic structure of the material.

Positioning accuracy

For positioning screws it is necessary to have the control of the error of the thread pitch. We provide customer screws with accuracy class 50 (50 µm/300 mm), 100 (100 µm/300 mm) and screws with class 200 (200 µm/300 mm) both in C45 and stainless steel A2. For standard carriage lead screws class 200 ones can be used.

Irreversibility

The complete irreversibility occurs with trapezoidal screw with helix angle < 2° 30'.
In all other cases, torque may be transmitted to the drive gear in a still screw condition subject to a load on the nut (especially under vibration). However, a good irreversibility is present up to 5 or 6 degrees.

Choice of the nut

Working environment

The available materials used for the production of nuts, both in bronze and stainless steel 303, are resistant to most of the oxidizing agents that occur in various applications of the trapezoidal screw/nut system. In presence of corrosive agents please contact our Technical Department.
In applications where the presence of added lubricants (grease or oil) is not allowed, we recommend to use self lubricating plastic nuts.

The use of plastics is restrained by the actual working conditions, therefore you may need to study the solution together with our technical department, and not rely on a choice based on intuition only. This because plastics have sometimes excellent self-lubrication features, but have, at the same time, restrictions on the working temperature or humidity absorption problems, as well as some mechanical properties that may not be suitable for the intended use. The preliminary study of the application, in such cases, is therefore required to achieve positive and satisfying results.

General sizing criteria

The actual sizing of a trapezoidal screw/nut system has to be done considering the following three points:

1. sizing to wear
2. sizing the critical bending load
3. sizing to the critical speed

In order to obtain a good working condition of a screw/nut system, all three above mentioned points must be respected when sizing.

Sizing to wear

The coupling screw/nut system has been used for a long time in a lot of applications to convert rotary motion into linear motion. The total power applied to the screw (Pt) is transformed into usable power (Pu) on the nut. The ratio Pu / Pt = η defines the efficiency of the system, which basically depends on the friction coefficient between the contacting surfaces of the screw and the nut, as well as on the lead angle. Because of the presence of sliding friction, part of the power is converted into heat. Just looking into this sliding friction, parameters can be given to evaluate the functioning of the system. The criterion is to limit the contact surface pressure on the side of the thread to allow a smooth glide between the two surfaces to avoid therefore heavy friction that erodes the nut. The product p ● Vst must be also limited (p = contact surface pressure and Vst = sliding speed on the effective diameter of the thread) in order to reduce the power that is dissipated into heat. This helps to reduce the temperature of the surfaces in contact. This limitation is important to avoid lubricant damages if bronze nuts are used. In case of use of self-lubricating plastic nuts, without the addition of further oil or grease, temperature should be checked as at higher temperatures the values of the product p ● Vst must be kept at low values.

Calculation of the contact surface pressure "p"

The contact surface pressure "p" is calculated using the following formula:

(1) $p = \frac{F}{At}$

F = Axial Force [N]
At = Total bearing surface between the teeth of the nut and the screw in the plane perpendicular to the axis. [mm^2]

(2) $At = \pi \bullet dm \bullet Z \bullet H1$

dm = mean diameter of the thread [mm]
H1 = support radial size between the teeth of the screw and the nut [mm]
Z = n° of gripping teeth

$$Z = \frac{h\ nut\ [mm]}{\left(\frac{real\text{ - }pitch\ [mm]}{n°\ starts}\right)}$$

For standard nuts each At value has been reported into the tables.

Calculation of the sliding speed "Vst"

The sliding speed is calculated using one of the following formulas:

- if round speed of the screw has already been defined:

(3) $Vst = \frac{n \bullet P}{1000 \bullet \text{sen}\ \alpha}$

n = RPM $\left[\frac{round}{min.}\right]$
P = thread pitch [mm]
α = thread helix angle

- if we have already established at which speed the nut must move:

(4) $Vst = \frac{Vtr}{\text{sen}\alpha}$

Vst = sliding speed on mean diametre. [m/min]
Vtr = motion speed [m/min]
α = thread helix angle

Please note that the screw RPM and the motion speed are bound as follows:

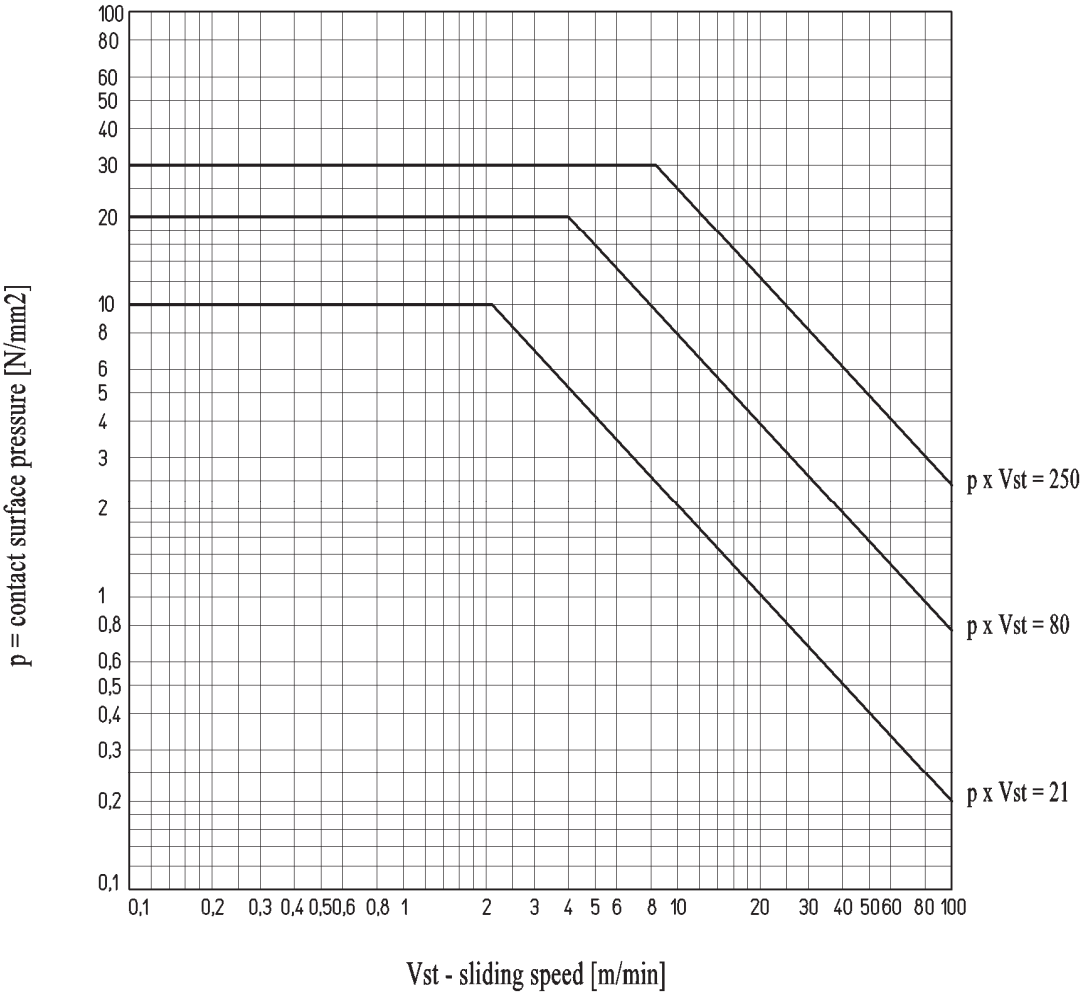
(5) $n = \frac{1000 \bullet Vtr}{P}$

n = RPM
Vtr = motion speed [m/min]
P = thread pitch [mm]

Bronze nut sizing

As per the bronze nut, the study of the product p•Vst allows you to plot the graph N.1 where three areas are highlighted, each of which is characterized by certain working conditions that in terms of smoothness of the surfaces in contact allow us to make evaluations based on experimental results previously obtained. A good lubrication is always necessary, possibly with oil. With little or no lubrication working condition may vary greatly.

Graph N° 1 – Sliding condition for Bronze



Area A : area A is enclosed by the limit p•Vst = 21 [N/mm^2 • m/min]
In this area, the operation is in the best conditions.
"Continuous service" is possible as the amount of heat produced within these limits p ● Vst is pretty low. Therefore the life of the nut is very good.

Area B : area B is enclosed by the limit p•Vst = 80 [N/mm^2 • m/min]
In this area, the operation is in more severe conditions.
In such conditions a steady lubrication is required to contain the erosion of the bronze nut in order to still have a good lifetime. “Continuous service” is possible for limited periods only, as the amount of heat that is produced may lead to the overheating of the nut. It also depends on the real amount of oil used because, beside the lubrication, it helps reducing the heat. The life of the nut is however limited.

Area C : area C is enclosed by the limit p•Vst = 250 [N/mm^2 • m/min]
In this area, the operation is in very heavy conditions.
With these values of p•Vst “continuous service” is certainly not possible. Even with good lubrication we face a great overheating and a very quick nut wear off, because the fiction between the surfaces in contact causes a rapid erosion of the nut.

We riserve the right to change sizes and features without notice.

General considerations for bronze nuts

In all three working conditions described, the bronze nut wear off is greatly affected by the real lubricating condition during operation. Giving acceptable reference values is therefore impossible during the project of the life of the nut. Pay particular attention to those applications where working room temperature is above l40/150°C, as such temperatures may damage the lubricant with consequent deterioration of operating conditions and lifetime. In such cases we recommend the use of lubricants designed to withstand high temperatures.

Safety factor for the forces of inertia "*f i*"

During the sizing process we must also check that the inertia forces present during acceleration and deceleration are relatively low so that the value of p●Vst remains within the controlled limits. Whereas this calculation is difficult, in the presence of a non-uniform movement or under great variations, safety factors reported in Chart. N°1 must be considered.

Chart. N° 1: Safety factors with respect to the forces of inertia

Load Type	*f i*
Constant loads and controlled acceleration / deceleration.	from l to 0,5
Constant loads and violent start and stop	from 0,5 to 0,33
Loads and speed greatly variable	from 0,33 to 0,25
Loads in presence of shocks and vibrations	from 0,25 to 0,17

The coefficient *"f i"* is used to correct the value of the product " $(p \bullet Vst)_{max}$" derived from the graph N° 1, considering the maximum admissible sliding speed to the value of the contact surface pressure related to the real case in exam. Working "area" limits (A, B or C) must be considered.
To calculate p•Vst related to the case in exam admissible the following **(6)** must be used

(6) $p \bullet Vst\ am = (p \bullet Vst)_{max} \bullet f i$

Example of calculation with bronze nut

Size to wear a bronze nut which must operate in continuous service remaining within the maximum limit value of p•Vst = 21 (Area A), with good lubrication.
Constant axial load without relevant variations, with forces of inertia limited by controlled ramps of acceleration/deceleration.

Axial load F = 1200 N (1 Kg *f* = 9,81N)
Constant motion speed Vtr = 2, 8 m/min
Evaluation of the product p•Vst using a nut FTN 30 AR (bronze flanged nut with thread Tr 30x6 1 start, right)

Contact surface pressure is calculated with **(1)** (see page 57)

$$p = \frac{F}{At} = \frac{1200\,[N]}{2120\,[mm^2]} = 0{,}57\left[\frac{N}{mm^2}\right]$$

F = Axial Force [N]
At = Total bearing surface between the teeth of the screws and the nuts in the plane perpendicular to the axis[mm^2]

The sliding speed is calculated with **(4)** (see page 57)

$$Vst = \frac{Vtr}{\text{sen }\alpha} = \frac{2{,}8\left[\frac{m}{min}\right]}{\text{sen } 4°03'} \qquad Vst \cong 39{,}6\left[\frac{m}{min}\right]$$

Vtr = motion speed $\left[\frac{m}{min}\right]$
α = thread helix angle

The value of the product p • Vst is:

$$p \bullet Vst = 0{,}57\,[N/mm^2] \bullet 39{,}6\left[\frac{m}{min}\right] \cong 22{,}57\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

In order to remain within the continuous working conditions, corrected by the safety factor *fi* from table N° 1, in this case =0,77, the maximum admissible value of p•Vst is **(6)** (see page 59)

$$p \bullet Vst\ am = (p \bullet Vst)_{max} \bullet fi = 21 \bullet 0{,}77\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right] \qquad p \bullet Vst\ am = 16{,}15\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

As the maximum admissible value of the product p•Vst is lower than the value obtained with a nut FTN 30 AR, we shall try using a nut HDL 30 AR (bronze flanged nut with 3xTr length, Tr 30x6 thread, right)

The contact surface pressure is **(1)** (see page 57)

$$p = \frac{F}{At} = \frac{1200\,[N]}{2120\,[mm^2]} = 0{,}57\left[\frac{N}{mm^2}\right]$$

F = Axial Force [N]
At = Total bearing surface between the teeth of the screws and the nuts in the plane perpendicular to the axis[mm^2]

The sliding speed remains the same as the previous calculation

$$Vst = 39{,}6\left[\frac{m}{min}\right]$$

The value of p • Vst is now:

$$p \bullet Vst = 0{,}31\left[\frac{N}{mm^2}\right] \bullet 39{,}6\left[\frac{m}{min}\right] \cong 12{,}28\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

The value obtained is now lower than the admissible one, therefore the HDL 30 AR is chosen.

 We riserve the right to change sizes and features without notice.

Plastic Nuts sizing

In applications where silence is important or where lubrication is not allowed (grease or oil), self lubricating plastic nuts are recommended. The use of plastics is very constrained by the actual working conditions, therefore we do suggest studying the solution together with our technical office and not relying on a choice based only on intuition. This is because plastic materials have sometimes great features such as low friction and self-lubrication, but at the same time limitations caused by operating temperatures, hygroscopic problems, or some mechanical features that may not be suitable for the intended use. An advanced study of the application in this case is therefore required in order to obtain positive and satisfying results.

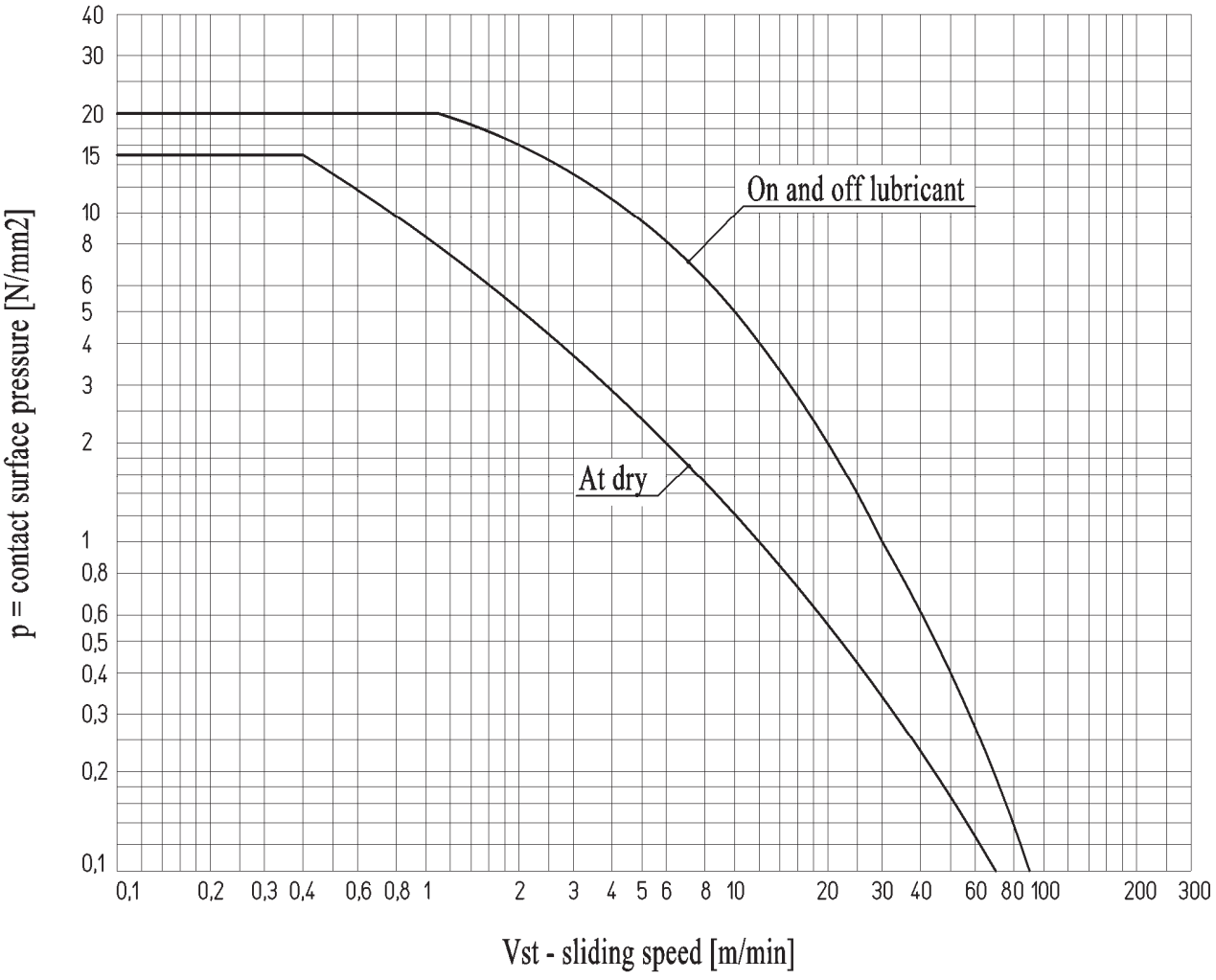
Regarding the plastic nuts, the study of the product p•Vst allows you to draw a chart which describes a curve that limits the values of p•Vst within which we have a gentle flow of the surfaces in contact with limited wearing of the nut and constant in time. Operating outside the limit drawn on the chart is not possible as in this case we would have a quick wearing of the nut due to the surface erosion caused by the contact with the screw.

Cylindrical nut MPH

Graph N° 2 shows the limit of the product p•Vst of the cylindrical nut MPH. As this plastic is resistant to wear but not self-lubricant, it's necessary to draw the limit curve relating to material used in dry conditions and intermittently lubricated material.

Graph N° 2 – Sliding condition for nuts MPH

Test condition: - continuous operation - temperature 23°C – relative humidity approx 50%



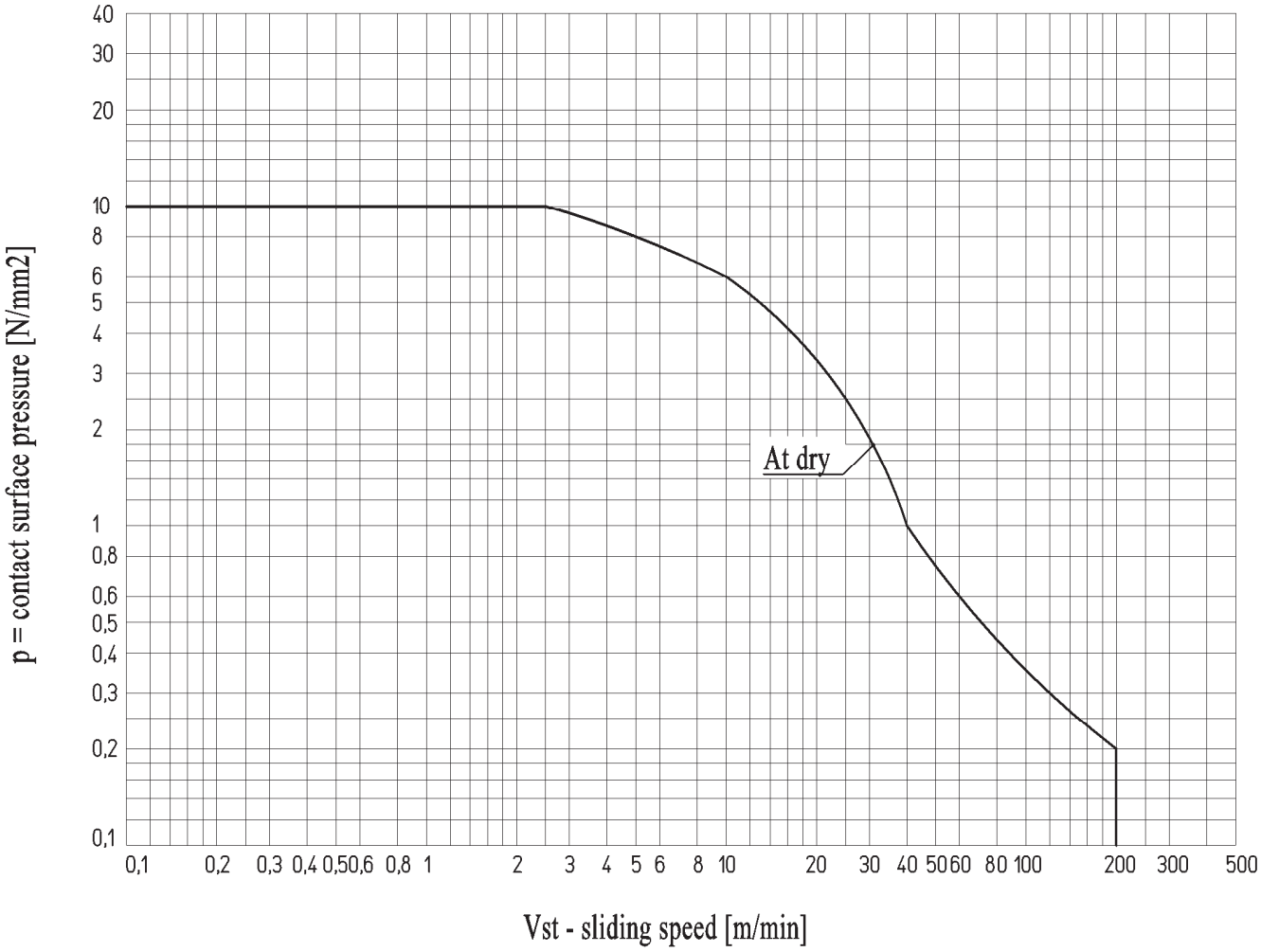
Self-lubricating plastic flanged nut with 3xTr length FCS

Graph N° 3 shows the limit of the product p•Vst of the nut FCS. The plastic used for the FCS features a strong resistance to wear and a complete self-lubricating property.

Before using the FCS, please read what stated on page 52.

Graph N° 3
Sliding conditions for nuts in self-lubricating plastic FCS

Test conditions: - continuous operation - temperature 23°C – relative humidity approx 50% with no lubrication



General considerations for plastic nuts

The use of plastics is very constrained by the actual working conditions, therefore you may need to study the solution together with our technical department, and not rely on a choice based on intuition only. This is because plastics have sometimes excellent self-lubrication features, but have, at the same time, restrictions on the working temperature or humidity absorption problems as well as some mechanical properties that may not be suitable for the intended use. The preliminary study of the application, in such cases, is therefore required to achieve positive and satisfying results.

Safety factor for the forces of inertia "*f i*"

During the sizing process we must also check that the inertia forces present during acceleration and deceleration are relatively low so that the value of p●Vst remains within the controlled limits. Whereas this calculation is difficult, in the presence of a non-uniform movement or under great variations, safety factors reported in Chart. N°2 must be considered.

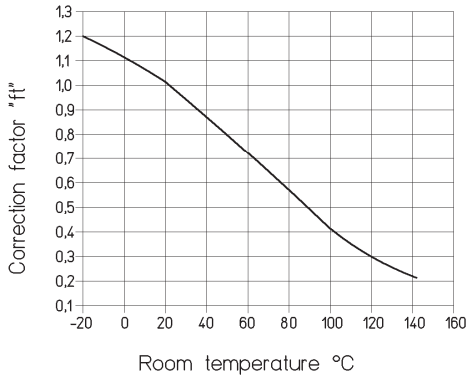
Chart. n° 2 : Safety factors with respect to the forces of inertia

Load type	*f i*
Constant loads and controlled acceleration / deceleration.	from 1 to 0,5
Constant loads and violent start and stop	from 0,5 to 0,33
Loads and speed greatly variable	from 0,33 to 0,25
Loads in presence of shocks and vibrations	from 0,25 to 0,17

Correction factor for working environment temperature

Using plastic nuts MPH o FCS, the value of p●Vst admissible must be corrected in function of the working environment temperature. Plastic becomes softer at higher temperature and withstands minor load. At lower temperatures, it becomes harder and bears heavier loads. Correction factor "*f* t" is shown in graph n° 4.

Graph N°4 - Correction factor "ft"
for nuts MPH and FCS



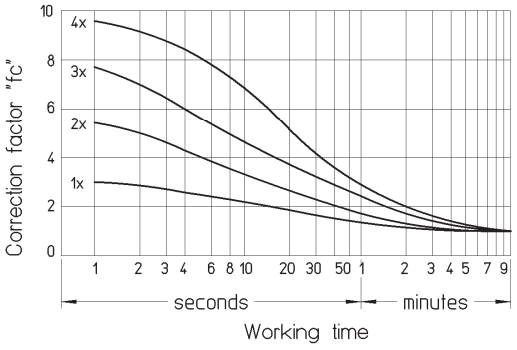
Correction factor dependent on intermittent use

Plastic nuts operating in on and off cycles for relatively short periods of time do not reach the limit of the maximum permissible temperature of the surface in contact with the screw. This temperature is a constraint that mainly contributes to limit the values of the product p●Vst in graphs N° 2 and N° 3 for the nuts MPH e FCS in continuous operation. The value of p●Vst admissible when operating in on and off cycles is higher than the value in continuous cycles. Deduce from graph N° 5 the value of the factor "*f* c". The curves of "x" represent the relationship between the downtime and the working time of the nut.

- 1 x represents downtime same as working time.
- 2 x represents downtime twice as much of the working time.
- 3 x represents downtime three times the working time.
- 4 x represents downtime four times the working time.

Find the working time value on the horizontal axis the working time value for the case in exam, climb vertically until intersecting the line of the relationship between the downtime and work time, then move horizontally and read the value of "*f* c".

Graph N°5 - Correction factor "fc"
for nuts MPH and FCS



The values of the three coefficients *"fi", "ft", "fc"* are used to correct the value of the product "(p●Vst)" max read from graph N° 2 (for nut MPH) or graph N° 3 (for nut FCS), considering the maximum admissible sliding speed in "test conditions" relating to the contact surface pressure value of the real case in exam.
To calculate the admissible p●Vst of the case in exam we shall use **(7) :** $p \bullet Vst\ am = (p \bullet Vst)_{max} \bullet fi \bullet ft \bullet fc$

Example of calculation with self-lubricating plastic nut

Size to wear a nut FCS flanged in self-lubricating plastic with 3xTr length which operate in the following conditions:
- Constant axial load with forces of inertia limited by controlled ramps of acceleration/deceleration of F = 1750 N
- Moving speed = 10 m / min
- Working time = 20 sec. With downtime = 60 sec.
- Working environment temperature = 50°C
- No lubricant

The nut FCS is perfectly self-lubricating and therefore suitable to operate in the considered conditions.
We choose a nut which is available among those that may be compatible with the dimensions of the motion system to be realized. Then we verify that the value of the product p•Vst is lower than the admissible value of p•Vst as per the graph N° 3 and then correct it with the coefficients "*fi*", "*ft*" and "*fc*" from the chart N° 2 and graphs N° 4 and 5.

We choose the FCS40AR (flanged nut in self-lubricating plastic with 3xTr length, Tr 40x7 right threaded)
We calculate the contact surface pressure with **(1)**

$$p = \frac{F}{At} = \frac{1750\,[N]}{6880\,[mm^2]}$$

F = Axial Force [N]
At = Total bearing surface between the teeth of the screws and the nuts in the plane perpendicular to the axis [mm^2]

$$p = 0{,}25\left[\frac{N}{mm^2}\right]$$

The sliding speed is calculated with **(4)**

$$Vst = \frac{Vtr}{\text{sen }\alpha} = \frac{10\left[\frac{m}{min}\right]}{\text{sen } 3°30'}$$

Vtr = Motion Speed $\left[\frac{m}{min}\right]$
α = thread helix angle

$$Vst \cong 164\left[\frac{m}{min}\right]$$

The value of the product p•Vst is:

$$p \bullet Vst = 0{,}25\left[N/mm^2\right] \bullet 164\left[\frac{m}{min}\right] \cong 41\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

Now we calculate the admissible value of the product p•Vst in the conditions in exam.
From the graph N° 3 we see that in continuous working conditions at 23°C with p = 0,25 [N/mm^2] the admissible value of Vst is ≅ 140 [m/min]

$$\text{i.e. } (p \bullet Vst)_{max} = 0{,}25 \bullet 140 = 35\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

- From graph N° 2 we read the value of the coefficient "*fi*". In our case "*fi*" may be = 0,75.
- From graph N° 4 we read the value of the coefficient "*ft*". In our case, in the working environment temperature of 50°C we may assume "*ft*" = 0,8
- From graph N° 5 we read the value of the coefficient "*fc*". In our case with working time of 20 sec. and downtime of 60 sec., therefore

$$\frac{\text{downtime}}{\text{working time}} = 3\,(\text{curve } 3x)$$ we assume "*fc*" = 3,7

The maximum admissible value of the product p•Vst in our case is **(7):**

$$p \bullet Vst\ am = (p \bullet Vst)_{max} \bullet fi \bullet ft \bullet fc = 35\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right] \bullet 0{,}75 \bullet 0{,}8 \bullet 3{,}7 = 77{,}7\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

As the value of the product p•Vst in this case is lower than the admissible value, the nut FCS 40 AR may be used for this motion.

Lifetime of the plastic nut

Using the experimental values it is possible to give an indication of the lifetime a plastic nut may have. The parameters that affect the life of a plastic nut are as follows:

- Value of the contact surface pressure p [N/mm^2]
- Value of the sliding speed Vst [m/min]
- Constant of the resistance to the wear of the plastic in exam derived from experimental tests k $\left[\frac{mm3 \bullet min}{N \bullet m \bullet hrs}\right]$
- Correction factor *fc* of the on and off cycle.

All data shown below are for coupling of plastic nuts with our precision rolled screws as we guarantee a surface roughness less than 1 µm Ra.

Coupling plastic nuts with lathed screws is not possible.

The following calculations and considerations are for screws working at a temperature of approx 20/25°C with relative humidity from 30% to 70%.

For working environment at a different temperature and humidity, you should contact our Technical Office directly.

To calculate the lifetime we use the following formula:

$$(8)\quad t = \frac{m \bullet fc}{p \bullet Vst \bullet k}$$

m = increase in the axial play between screw and nut in respect of the initial value [mm]
fc = correction factor from graph N° 5
p = contact surface pressure (see page 53 onward) [N/mm^2]
Vst = sliding speed (see page 53 onward) [m/min]
k = constant of resistance to wear $\left[\frac{mm3 \bullet min}{N \bullet m \bullet hrs}\right]$

Value of the constant k for plastic nuts.

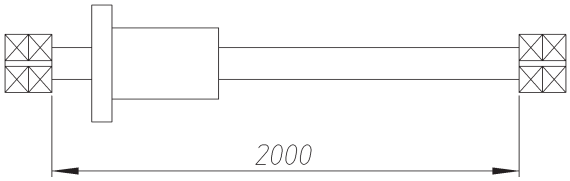
nuts MPH	$k = 10{,}5 \bullet 10^{-5}$
nuts FCS	$k = 2{,}5 \bullet 10^{-5}$

Example of lifetime calculation of a plastic nut

Size to wear and calculate the lifetime of the nut FCS operating in the following conditions:

- Constant axial load forces of inertia limited by controlled ramps of acceleration/deceleration of F = 450 N
- Motion speed = 10 m/min
- Working time = 12 sec. with downtime = 12 sec.
- Distance covered in 12 sec. at 10 m/min ≅ 2000 mm
- Working environment temperature ≅ 22°C
- Working environment mean relative humidity ≅ 40% : 60%
- No lubrication
- Minimum lifetime requested: the coupling screw/nut must work for 200.000 cycles (i.e. approx 1.330 hrs at the above conditions) increasing the axial play in respect of the initial value of 0,1 mm.

V motion =10 m/min



Nuts type FCS are perfectly self-lubricant and therefore suitable to work in the considered conditions.
Seen the good motion speed requested (10 m/min) we verify to wear the nut FCS 28 BR, with pitch 10 (2 starts at pitch 5).
To verify the product p•Vst see example on page 60.

Contact surface pressure is calculated with **(1)**.

$$p = \frac{F}{At} = \frac{450\,[N]}{3600\,[mm^2]} = 0{,}125\left[\frac{N}{mm^2}\right]$$

The sliding speed is calculated with **(4)**.

$$Vst = \frac{Vtr}{\text{sen }\alpha} = \frac{10\left[\frac{m}{min}\right]}{\text{sen } 7°07'} = 80{,}7\left[\frac{m}{min}\right]$$

The value p•Vst is:

$$p \bullet Vst = 0{,}125\,[N/mm^2] \bullet 80{,}7\left[\frac{m}{min}\right] \cong 10\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

Now we calculate the admissible value of the product p•Vst at the considered conditions.
From graph N° 3 we see that in continuous working conditions at 23°C with p = 0,125 [N/mm^2] the admissible value of Vst is ≅ 180 [m/min]

$$\text{i.e. } (p \bullet Vst)\ max = 0{,}125 \bullet 180 = 22{,}5\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

- from chart N° 2 *"fi"* = 0,75
- form graph N° 4 " *ft"* = 1
- from graph N° 5 *"fc"* = 3

- the maximum admissible value of p•Vst, in this case, with **(7) :**

$$p \bullet Vst\ amm = p \bullet Vst \bullet fi \bullet ft \bullet fc = 22{,}5\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right] \bullet 0{,}75 \bullet 1 \bullet 2 = 33{,}75\left[\frac{N}{mm^2} \bullet \frac{m}{min}\right]$$

As the value of p•Vst is here less than the admissible one, the nut FCS 28 BR may be use for this motion.

Verify to wear:
Now we calculate in how long we would face wear in continuous working conditions and therefore an increase of the axial play of 0,2 mm with **(8)**

$$t = \frac{m \bullet fc}{p \bullet Vst \bullet k} = \frac{0{,}1 \bullet 2}{10 \bullet 2{,}5 \bullet 10^{-5}} = 800 \text{ hrs}$$

Therefore 800 working hrs, at the speed of 10 m/min, correspond to the following distance:

$800 \bullet 60 \bullet 10 = 480.000$ m

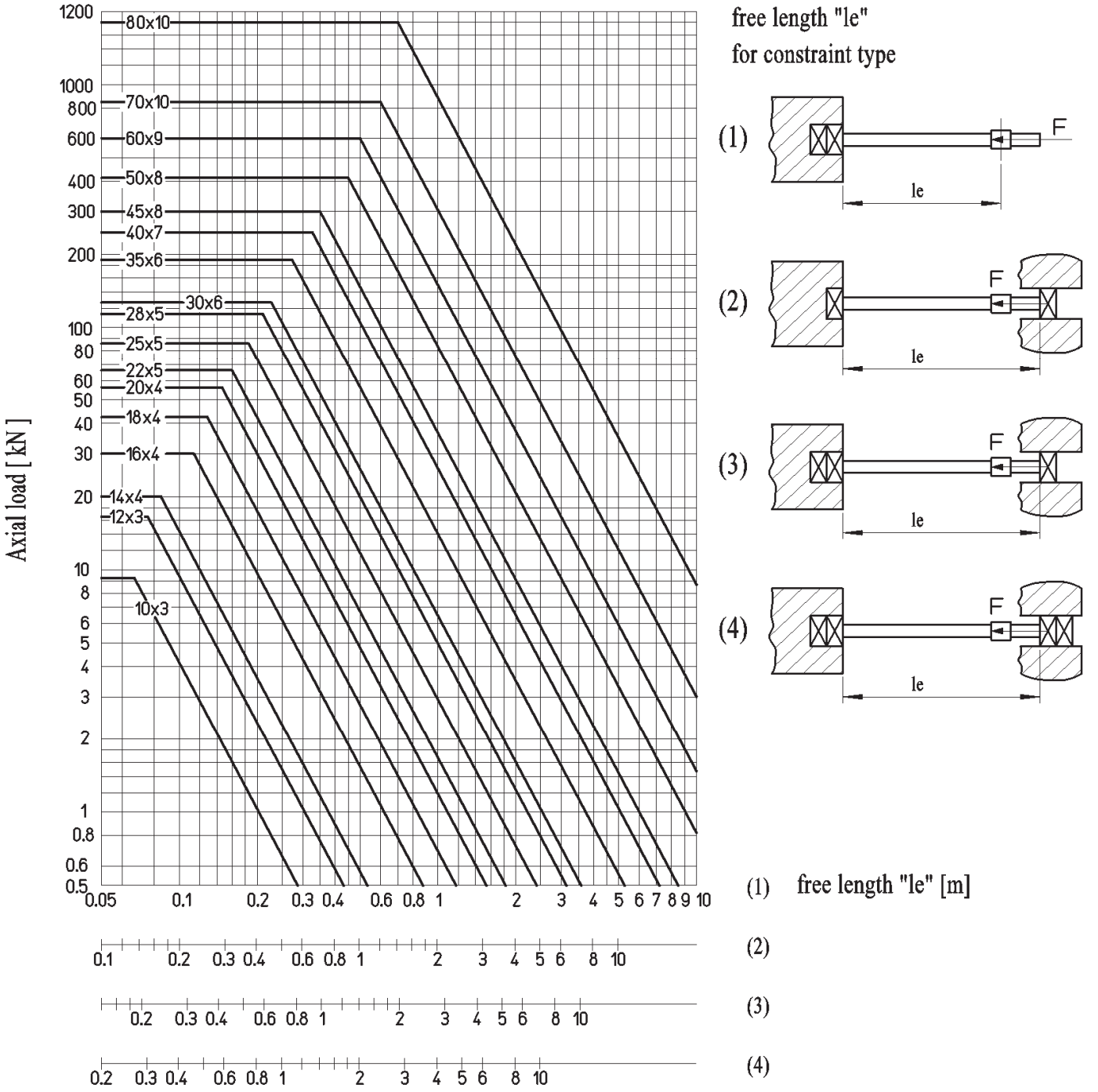
Number of cycles: $\frac{480.000}{2} = 240.000$ cycles

We have a lifetime of 1.600 hrs. at the considered conditions.

Critical Axial Load (Peak Load)

When there are compression loaded screws allowance must be made for limitations due to peak load to avoid screw bending due to excessive axial compression load. Admissible axial load depends on the core diameter (d3) of the screw, end constraints (bearings) and free length 'le'.
Regarding the values given in graph no. 6, allow a minimum safety factor ≥ 2.

Graph no. 6 - Peak Load



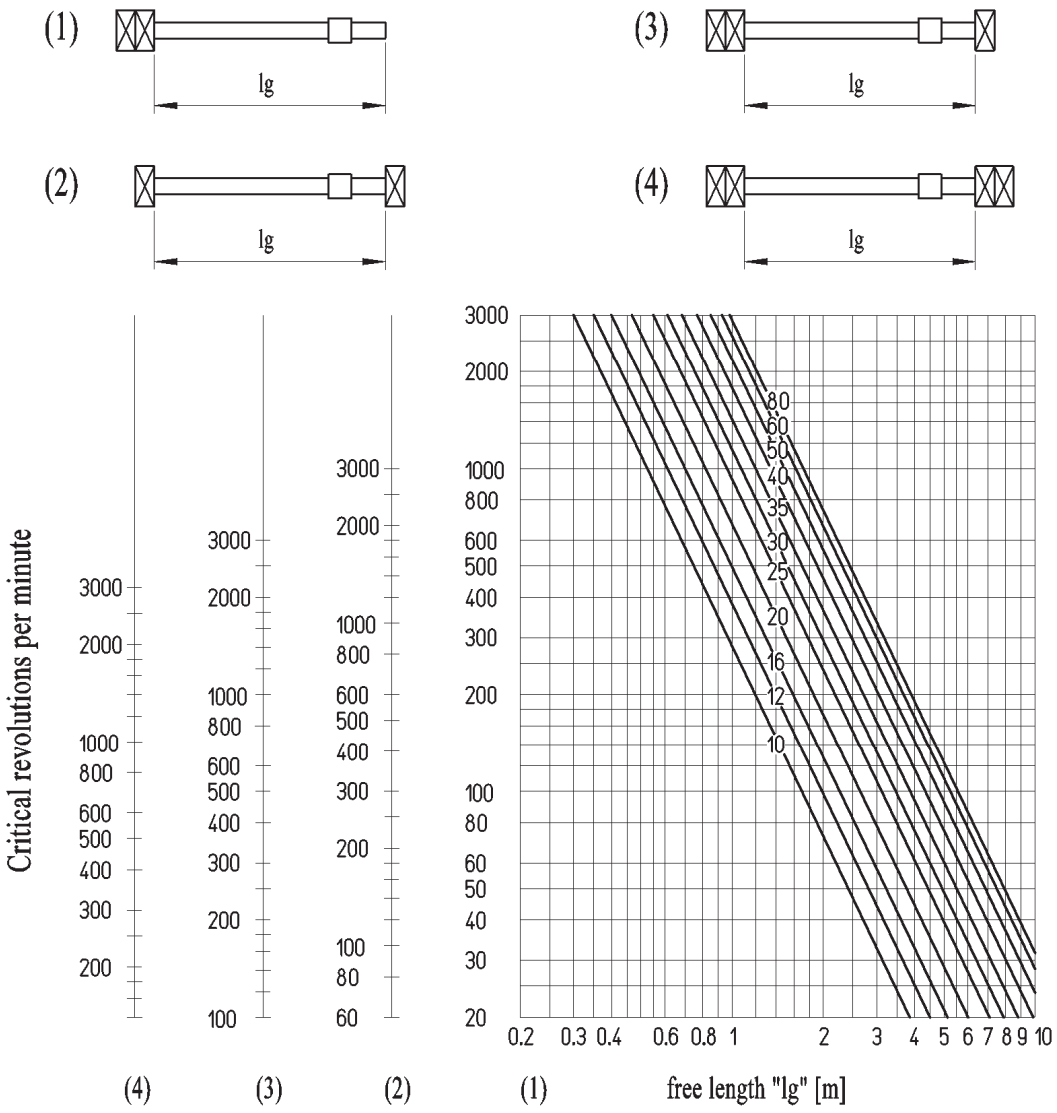
Example: find the admissible axial load of a Tr 30x6 screw 3000 mm long with constraint conditions as in drawing 4.
From graph 6 Take Fmax = 11 kN with safety factor of 2 and assume Fadm = 11/2 = 5.5 kN.

Critical revolutions per minute

The critical revolutions per minute is the rotating speed at which screw vibrations appear. This rotation speed must never be reached because the vibrations cause serious operating irregularities. Critical rpm depend on screw diameter, end constraints (bearings), free length "lg" and from the assembly accuracy.
For values shown in Graph 7 assume a minimum safety factor related to the assembly accuracy as per the following chart:

Chart n°3 Assembly accuracy coefficient:		
Assembly accuracy	**Conditions**	**Safety coefficient**
Good assembly accuracy: - Nut alignment to screw within 0.05mm	Bearing and nut seats obtained from CNC lathe onto an already finished structure.	1.3 – 1.6
Medium assembly accuracy: - Nut alignment to screw within 0.10mm	Bearing and nut seats processed on parts which are then assembled together. Alignments are checked by comparators with estreme care after mounting.	1.7 – 2.5
Low assembly accuracy: - Nut alignment to screw within 0.25mm	Bearing and nut seats processed on parts which are then assembled or welded together. Alignments are checked by comparators after mounting.	2.6 – 4.5

Graph no. 7 – Critical rpm



Example: find the critical rpm of a screw Tr 40x7 length 3000 mm with constraint conditions as in drawing 3 with average assembly accuracy. Graph 7 gives critical rotation speed ≅ 1000 rpm
From chart n°3 we calcolate the Safety coefficient = 2.2.
We can reach the working speed at a maximum round speed of: n. max = 1000/2.2 = 454 rpm.

Efficiency

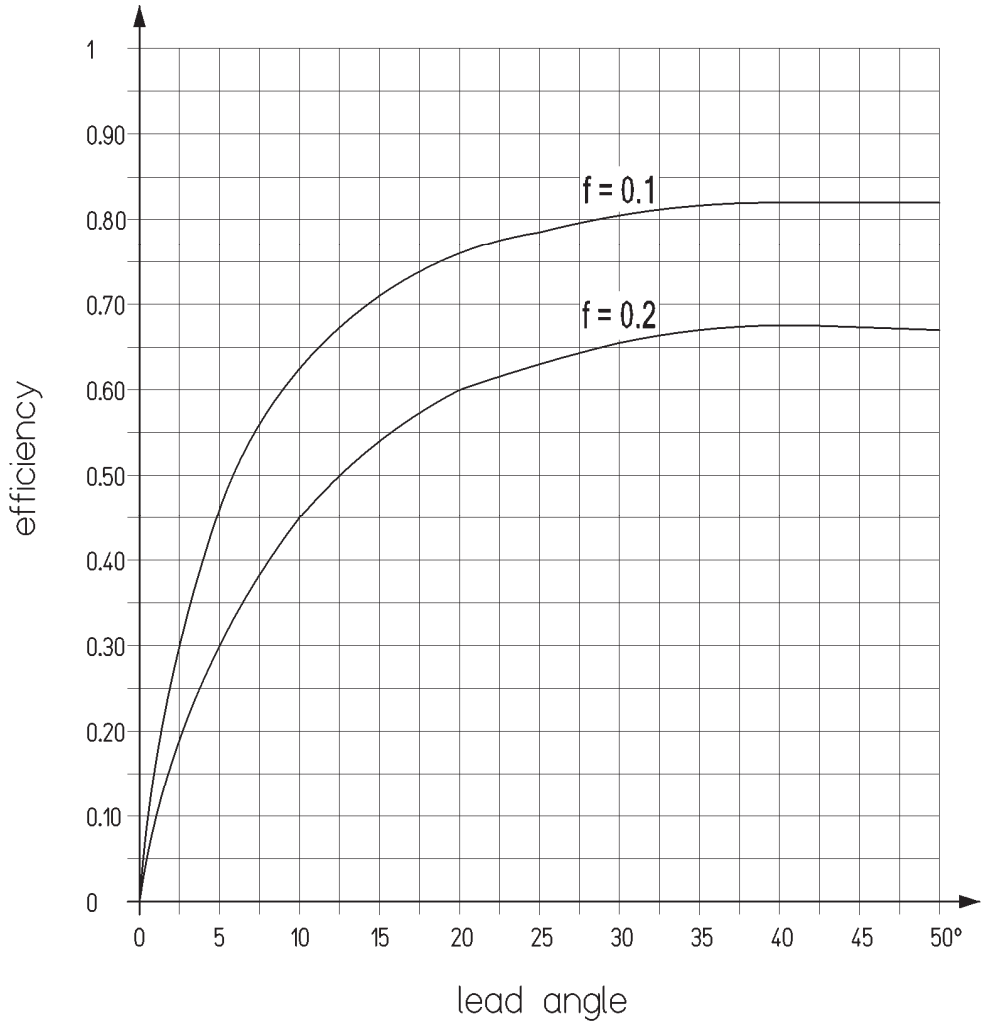
By efficiency is meant the ability of a screw & nut system to convert rotary motion into linear motion. This parameter allows appraisal of how much rotation energy is converted into useful energy for linear movement, hence how much energy is dissipated as heat.
The following formula can be used for calculation.

$$(9)\quad \eta = \frac{1 - f \bullet \mathrm{tg}\alpha}{1 + \frac{f}{\mathrm{tg}\alpha}}$$

η = efficiency
f = dynamic friction factor between scew and nut materials
α = lead angle of threads

The numerical efficiency values of each limit are shown in the table 'Screw Specifications' on page 54.

Graph no. 8 – Efficiency



Graph no. 8 shows that efficiency is greater if the lead angle of the screw thread is greater, hence to dissipate less energy as heat, it is recommended to use screws with lead angle as high as possible for the type of work (Pay attention if the system must be self-locking). Efficiency is inversely proportionate to the dynamic friction factor, i.e. using material with a lower friction factor there is less waste of energy. For this reason we make precision rolled trapezoidal screws with minimal roughness on the side of the tooth and always less than 1 µm Ra (usually 0.2 to 0.7 µm). We also make wear-resistant self-lubricating plastic flanged nuts which ensure very low friction factors with no need for lubrication. Dynamic friction factor $f \cong 0.1$, stiction factor $\cong 0.15$.

Torque

The Torque necessary for moving a screw & nut system is calculated by the following equation.

$$(10)\quad C = \frac{F \bullet P}{2\,\pi\,\eta\,1000}$$

C = torque (input) [N•m]
F = axial force on nut [N]
P = true lead of screw [mm]
η = efficiency (assume efficiency with stiction factor f= 0.2, Table on page 52)

Example of calculation :

Find torque necessary for movement of a screw Tr 30x6 coupled with a nut HCL Tr 30x6.

Resistant axial force = 10.000 N
Screw lead = 6 mm
η = 0.26

$$\text{Torque} = \frac{F \bullet P}{2 \bullet \pi \bullet \eta \bullet 1000} = \frac{10.000\,[\text{N}] \bullet 6\,[\text{mm}]}{2 \bullet \pi \bullet 0.26 \bullet 1000} = 36.7\ \text{N} \bullet \text{m}$$

The torque value does not consider the efficiency of mechanical parts moving together with the screw system, such as bearings, belts or other transmission components. In project phase, an increase between the 20 and 30% of the theoretical value is recommended. If electric motors with low static torque are used assume another increase of 50% to find nominal torque.

C = 36.7 [N • m] • 1.3 • 1.5 ≅ 71.6 [N • m]

Power

The power necessary for moving a trapezoidal screw & nut system is calculated with the following equation.

$$(11)\quad P = \frac{C \bullet n}{9550}$$

P = power [kW]
C = torque [N•m]
n = rpm

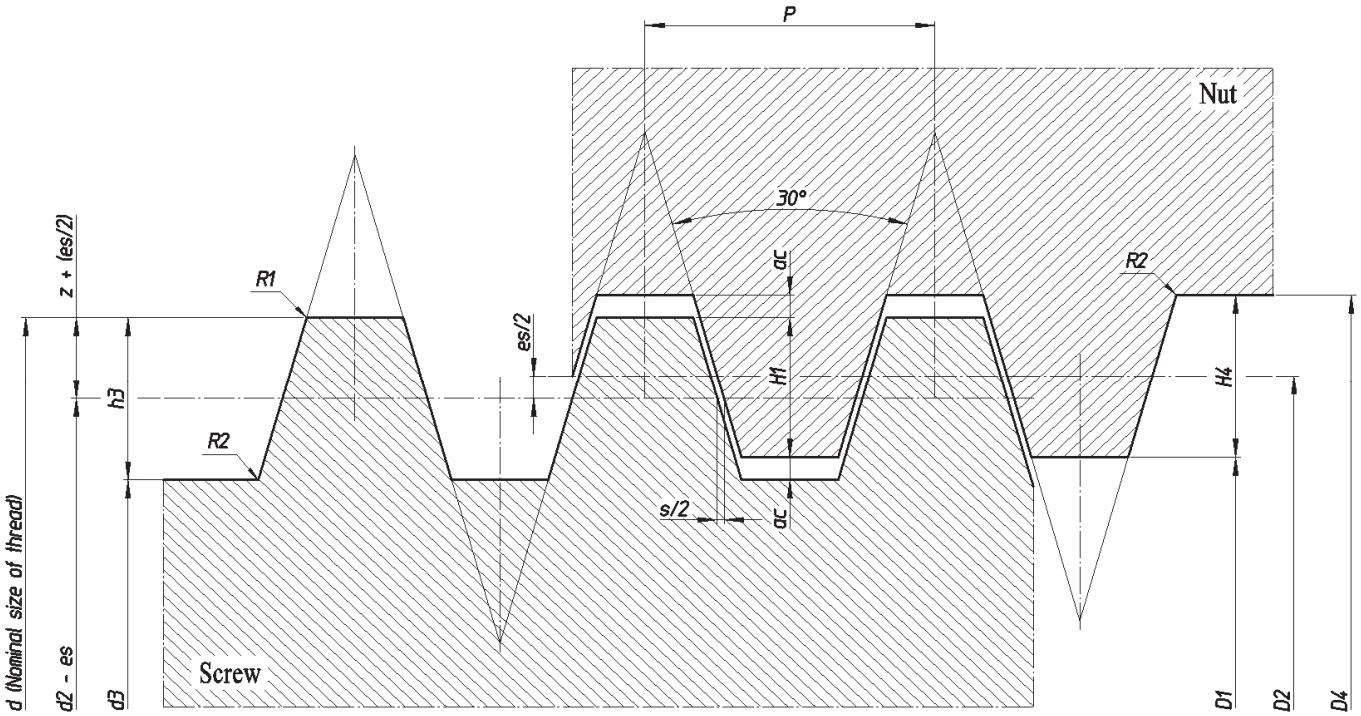
Example of calculation :

Calculate the power necessary for moving the screw Tr 30x6 of the above example at 600 rpm.

$$P = \frac{C \bullet n}{9550} = \frac{71.6\,[\text{N} \bullet \text{m}] \bullet 600\,[\text{round/min}]}{9550} \cong 4.5\ \text{kW}$$

This is the minimum useful power necessary.

PROFILE FOR METRIC TRAPEZOIDAL THREADS TO ISO STANDARD 2901 – 2902 – 2903 – 2904



$H_1 = 0{,}5\ P$
$h_3 = H_4 = H_1 + a_c = 0.5\ P + ac$
$z = 0{,}25\ P = H_1/2$
$d_3 = d - 2\ h_3$
$d_2 = D_2 = d - 2\ z = d - 0.5\ P$
$D_2 = d + 2\ a_c$
a_c = bottom play
es = top deviation for screw
$s = 0{,}26795$ es
R_1 max. $= 0.5\ a_c$
R_2 max. $= a_c$

Sizes stocked. Ready reference:

Screws…… page 6
Nuts…… page 10

Generale features and materials used in "Conti" precision
Rolled trapezoidal screws and nuts…… page 16

Screw	Lead Accuracy	Material		
KTS	100	carbon steel	EN 10083-2 C45 – 1.0503……	page 18
KUE	100	carbon steel	EN 10083-2 C45 – 1.0503……	page 19
KKA	50	carbon steel	EN 10083-2 C45 – 1.0503……	page 20
KSR	500	carbon steel	EN 10083-2 C45 – 1.0503……	page 21
KQX	200	carbon steel	EN 10084 C15E – 1.1141……	page 22
KEQ	200	carbon steel	EN 10084 C15E – 1.1141……	page 23
KRP	200	stainless steel	INOX A2 - AISI 304 – 1.4301……	page 24
KRE	200	stainless steel	INOX A2 - AISI 304 – 1.4301……	page 25
KAM	200	stainless steel	INOX A4 - AISI 316 – 1.4401……	page 26
KAF	200	stainless steel	INOX A4 - AISI 316 – 1.4401……	page 27

Nut	Shape	Material		
MLF	cylindrical	steel	EN 10277-3 11SMnPb37 – 1.0737……	page 33
MZP	cylindrical	steel	EN 10277-3 11SMnPb37 – 1.0737……	page 33
HSN	cylindrical	bronze	EN 1982 CuSn5Zn5Pb5-C – CC491K……..	page 34
HBD	cylindrical	bronze	EN 1982 CuSn7Zn4Pb7-C – CC493K……..	page 34
HDA	cylindrical	stainless steel	INOX A1- AISI 303 – 1.4305……	page 35
HBM	cylindrical	bronze	EN 1982 CuSn12-C – CC483K……	page 35
BIG	cylindrical big	bronze	EN 1982 CuSn12-C – CC483K……	page 36
CQA	square	steel	EN 10277-3 11SMnPb37 – 1.0737……	page 37
QOB	square	brass	EN 12164 CW614N-M (ex OT58)……	page 37
CQF	square holes	steel	EN 10277-3 11SMnPb37 – 1.0737……	page 38
QBF	square holes	bronze	EN 1982 CuSn12-C – CC483K……	page 39
FTN	flanged	bronze	EN 1982 CuSn5Zn5Pb5-C – CC491K…….	page 40
FXN	flanged	bronze	EN 1982 CuSn12-C – CC483K……	page 41
FMT	flanged	bronze	EN 1982 CuSn12-C – CC483K……	page 42
HDL	flanged	bronze	EN 1982 CuSn12-C – CC483K……	page 43
CBC	flanged	bronze	EN 1982 CuSn12-C – CC483K……	page 44
FFR	flanged	bronze	EN 1982 CuSn5Zn5Pb5-C – CC491K ……	page 45
FHD	flanged	bronze	EN 1982 CuSn12-C – CC483K……	page 46
FEU	flanged	bronze	EN 1982 CuSn7Zn4Pb7-C – CC493K …….	page 47
FSF	flanged	bronze	EN 1982 CuSn7Zn4Pb7-C – CC493K …….	page 48
CDF	2-flanged	bronze	EN 1982 CuSn12-C – CC483K……	page 49
HAL	flanged	Alu. bronze	EN 1982 CuAl11Fe6Ni6-C – CC333G……	page 50
MES	exagonal	steel	EN 10277-3 11SMnPb37 – 1.0737……	page 51
FCS	flanged	plastic	PA 6 + Mo S2 DIN 7728 + self lubrificating….	page 52
MPH	cylindrical	plastic	PA 6 + Mo S2 DIN 7728……	page 53

Features of CONTI Trapezoidal Screws and Nuts

CONTI trapezoidal screws are precision rolled. Continuous search for improvement and many years of CONTI experience in the development of the cold plastic deformation process which characterizes rolling allow us to offer our customers trapezoidal screws with excellent features.

Materials

Steel used in trapezoidal screws:		**Surface hardness after rolling**
EN 10084 C15E - 1.1141	carbon steel	App. 160/180 HB
EN 10083-2 1C45 - 1.0503	carbon steel	App. 250 HB
Inox A2 - AISI 304 -1.4301	stainless steel	App. 260 HB
Inox A4 - AISI 316 - 1.4401	stainless steel	App. 280 HB

C45 and A2 stainless steel were chosen because in addition to their natural qualities as good construction materials, after rolling they give very good surface hardness and finish on the thread sides. A4 stainless steel also has excellent corrosion resistance. C15 is an excellent quality-price compromise.
Roughness is less than 1 μm Ra for all.
These two features are decisive factors for qualitative appraisal of trapezoidal screws because they give very small friction coefficients, much lower than those obtainable with machined screws where other conditions such as speed, load and lubrication are equal.
Our trapezoidal screws coupled with bronze nuts give the opportunity to realize translation systems whose efficiency, flowability and quietness are much lower comparing to a coupling with machined screws.
Because of the low friction coefficient the amount of heat generated during movement is limited with resulting smaller nut heating. Nut life is also increased. We make nuts with 10 kinds of material to better meet the various requirements.

Steel used in nuts:		
EN 10277-3 11SMnPb37 – 1.0737	steel with sulphur, manganese and lead	
INOX A1- AISI 303 – 1.4305	stainless steel	
Brass used in nuts:		
EN 12164 CW614N-M	brass	
Bronze used in nuts:		
EN 1982 CuSn5Zn5Pb5-C – CC491K	tin bronze with zinc and lead	60-70 HB
EN 1982 CuSn7Zn4Pb7-C – CC493K	tin bronze with zinc and lead	65-75 HB
EN 1982 CuSn12-C – CC483K	tin bronze	80-100 HB
EN 1982 CuAl11Fe6Ni6-C – CC483K	aluminium bronze	160-220 HB
Plastic used in nuts:		
PA 6 + Mo S2 DIN 7728	plastic	
PA 6 + Mo S2 DIN 7728 + additives	self-lubricating plastic	

The nuts we make with length 3xTr: HDL, BIG and HAL deserve special attention.
These bronze nuts, thanks to their considerable length, distribute the load over a larger number of holding threads and this limit surface contact pressure between screw and nut. This is decisive for long nut life.
By using the 3xTr long nuts compared with bronze nuts with conventional length (approximately 1.5xTr or 2xTr), very high loads can be withstood for equal traversing speed.
In particular, with HAL aluminium bronze nuts very high loads can be born and it is recommended to apply continuous steady lubrication. HAL nuts have to be coupled with screws in C45 or in stainless steel A2 or A4; C15 screws are not recommended.
Where it is not desired to lubricate trapezoidal screws, self-lubricating plastic nuts are recommended.
It is not possible to couple plastic nuts with screws made by machining.