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Locking screw calculation Locking screw table

The torque transmission capacity of a RINGFEDER® Locking Element connection is directly proportional to the effective clamping force F_A . As clamping elements normally locking screws are used which act on the Locking Elements via a thrust flange.

Regular thread ¹⁾ , metric						
d_G	8.8		10.9		12.9	
	T_A	F_V	T_A	F_V	T_A	F_V
M 4	2.9	3 900	4.1	5 450	4.9	6 550
M 5	6.0	6 350	8.5	8 950	10	10 700
M 6	10	9 000	14	12 600	17	15 100
M 8	25	16 500	35	23 200	41	27 900
M10	49	26 200	69	36 900	83	44 300
M12	86	38 300	120	54 000	145	64 500
M14	135	52 500	190	74 000	230	88 500
M16	210	73 000	295	102 000	355	123 000
M18	290	88 000	405	124 000	485	148 000
M20	410	114 000	580	160 000	690	192 000
M22	550	141 000	780	199 000	930	239 000
M24	710	164 000	1000	230 000	1200	276 000
M27	1050	215 000	1500	302 000	1800	363 000
M30	1450	262 000	2000	368 000	2400	442 000

1 Nm = 0.738 lb-ft
1 N = 0.225 lb

Regular thread , Inch							
BOLT SIZE	BOLT DIA.	F_V	T_A	BOLT SIZE	BOLT DIA.	F_V	T_A
Inch	Inch	lbs	lb-in	Inch	Inch	lbs	lb-ft
4-40	0.112	540	12	1/4"-20	0.25	2850	12
4-48	0.112	600	13	1/4"-28	0.25	3250	14
6-32	0.138	820	23	5/16"-18	0.3125	4700	25
6-40	0.138	920	25	5/16"-24	0.3125	5200	25
8-32	0.164	1260	41	3/8"-16	0.375	6950	45
8-36	0.164	1320	43	3/8"-24	0.375	7900	50
10-24	0.19	1580	60	7/16"-14	0.4375	9600	70
10-32	0.19	1800	68	7/16"-20	0.4375	10700	80
				1/2"-13	0.5	12800	110
				1/2"-20	0.5	14400	120
				9/16"-12	0.5625	16400	150
				9/16"-18	0.5625	18300	170

1) T_A = tightening torque (Nm)
 F_V = initial clamping force (N)
 (screws oiled, $\mu_{total} = 0.14$)

Solid

Slit

Locking Assembly dimensions											Transmissible torques or axial forces						Weight			
d x D	d	C ₁	C _b	D	C ₂	L	I	A _t	F ₀	FA'	T	F _{ax}	X				WT	d ₁	D ₁	T _{max}
mm	Inch								psi	lb-ft	lbs	Inch				lbs 10 ⁻³	Inch			
260 x 290	10.236			11.417		1.890	1.732	55.955	40917	438399	41676	97797	0.276	0.394	0.512	0.630	10584	10.268	11.386	87249
270 x 300	10.630			11.811	-0	1.890	1.732	58.125	39793	456385	44996	101169	0.276	0.394	0.512	0.630	10805	10.661	11.780	94157
280 x 313	11.024	+0	-0	12.323	+0.0032	2.087	1.929	66.805	46313	523831	53479	116906	0.276	0.433	0.551	0.669	13892	11.055	12.291	111663
290 x 323	11.417			12.717		2.087	1.929	69.130	49910	541817	57167	120279	0.276	0.433	0.551	0.669	14333	11.449	12.685	119337
300 x 333	11.811			13.110		2.087	1.929	71.610	48112	559802	61224	124775	0.276	0.433	0.551	0.669	14774	11.843	13.079	127854
320 x 360	12.598			14.173	-0	2.559	2.323	91.915	65647	719424	84090	159622	0.394	0.591	0.787	0.984	24035	12.638	14.134	177231
340 x 380	13.386			14.961	+0.0035	2.559	2.323	97.650	61151	764388	94786	169739	0.394	0.591	0.787	0.984	25358	13.425	14.921	200420
360 x 400	14.173	+0	-0	15.748	+0.0035	2.559	2.323	103.385	58004	809353	106219	179856	0.394	0.591	0.787	0.984	26901	14.213	15.709	224858
380 x 420	14.961	-0.0035	+0.0035	16.535		2.559	2.323	109.120	60477	854317	118390	189973	0.394	0.591	0.787	0.984	28224	15.000	16.496	249923
400 x 440	15.748			17.323	-0	2.559	2.323	115.010	57554	899281	131299	200090	0.394	0.591	0.787	0.984	29768	15.787	17.283	277097
420 x 460	16.535	+0	-0	18.110	+0.0038	2.559	2.323	120.590	54856	944245	144576	210207	0.394	0.591	0.787	0.984	31091	16.575	18.071	305640
440 x 480	17.323	-0.0038	+0.0038	18.898		2.559	2.323	126.325	52608	989209	158592	220324	0.394	0.591	0.787	0.984	32414	17.362	18.858	335509

More sizes on request

■ Mounting of Locking Element

The values for T, F_{ax}, P_W and P_N apply to Locking Elements installed in oiled condition.

■ Surface finishes

For shafts and hub bores

R_a ≤ 63 RMS

Required screw tension force

for Locking Elements solid: $F_A = F_{A'} + F_0$

for Locking Elements slit: $F_A = F_{A'}$

Where n-Locking Elements are used one behind the other (series), the following applies to the increase in T and F_{ax}:

$$T_n = T_1 \cdot m \quad \text{and} \quad F_{axn} = F_{ax1} \cdot m$$

Retaining the values for T and F_{ax} it is possible to reduce F_{A'} and p where:

$$F_{A'n} = F_{A'}/m \quad \text{and} \quad p_n = p/m$$

With 2 / 3 / 4 Locking Elements, m = 1.555 / 1.86 / 2.03

For tolerances see table on 39/41.

The fits specified have given excellent service in practical operations. Naturally, the shafts and the bores can feature other clearances. Please contact our Technical Department.

1) approx. values

■ Undercut, clearance cut

The relatively narrow RINGFEDER® RfN 8006 Locking Elements mainly serve the purpose of transmitting large torques and axial forces. They are not self-centering. The concentricity accuracy of the clamped hub therefore depends on the centering and care with which installation is carried out. Locking Elements RfN 8006 can center themselves within the framework of their production accuracy if they are absolutely plane-parallel when pressed together.

Explanations to tables

d, D, L, l = Basic dimensions, Locking Elements not tightened

C_1 = shaft tolerances

C_b = hub bore tolerances

C_2 = bore tolerances

A_t = effective bearing surface $A_t = \pi \cdot d \cdot l$

X = travel distance for 1,2,3 or 4 Locking Elements. This value includes a safety allowance to ensure that the thrust flange will not contact the face of the hub or shaft. Any reduction of this value could cause a block and the transmission values of the connection would not be achieved.

T = transmissible torque

F_{ax} = axial forces

T and F_{ax} refer to a pressure between the Locking Element and shaft of 14500 psi .

When solid Locking Elements the required total clamping force F_A is obtained by:

$$F_A = F_{A'} + F_O$$

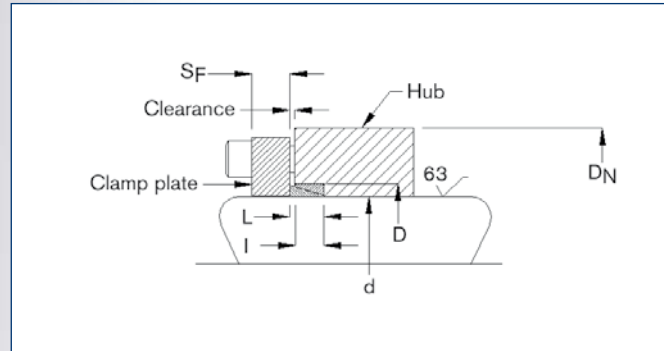
$F_{A'}$ = Screw number x Fv, see screw table page 40

F_O = approximate clamping force required to bridge the clearances where the tolerances given in the table are fully exploited during manufacture, not applicable if slit Locking Elements are used.

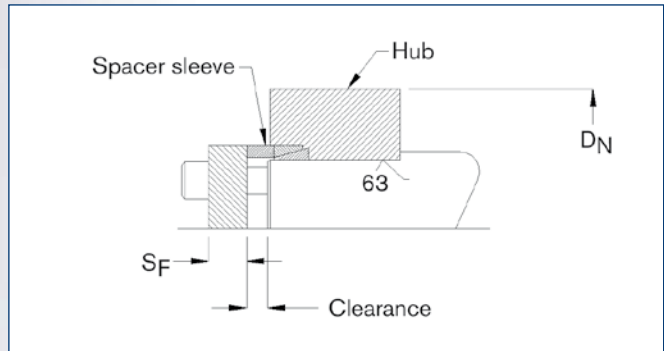
d_1 = clamp plate bore

D_1 = spacer sleeve OD

T_{max} = transmissible torque by one Locking Element at a shaft contact pressure of = 47850 psi



Hub bolted Clamp Plate (hub axially adjustable)



Shaft bolted Clamp Plate (hub axially fixed)

Explanations

- d = shaft diameter
- C_1 = machining tolerances for shaft (d)
- D = counter bore diameter
- C_2 = machining tolerances for counter bore (D)
- L, I = width dimensions, relaxed condition
- R = radius in hub bore
- F_O = preload to bridge specified fit clearances
- F_A = actual locking force to generate T
- T = transmissible torque for one Locking Element
based on coefficient of friction of $\mu = 0.15$ and
10,000 psi contact pressure
(torque can be increased by up to 50%)
- F_{ax} = axial load (thrust capacity)
- D_N = Hub outer diameter
- S_F = Clamp plate thickness

Size	GSA dimensions						F _o	F _A '	Transmissible torques or axial forces		Weight WT
	d	C ₁	D	C ₂	L	I			T	F _{ax}	
	Inch								psi	lb-in	
GSA-250	0.2500		0.3750		0.126	0.094	580	450	14	112	0.76
GSA-312	0.3125	+0	0.4375	-0	0.143	0.112	686	670	26	166	1.04
GSA-375	0.3750	-0.0005	0.5000	+0.0005	0.160	0.128	673	920	43	229	1.35
GSA-437	0.4375		0.5937		0.176	0.143	796	1196	65	297	2.20
GSA-500	0.5000		0.6562		0.193	0.158	944	1512	94	376	2.69
GSA-562	0.5625		0.7500	-0	0.210	0.174	1259	1872	132	469	3.97
GSA-625	0.6250		0.8125	+0.001	0.226	0.187	1231	2237	175	560	4.69
GSA-687	0.6875		0.8750		0.243	0.203	1414	2670	230	669	5.47
GSA-750	0.7500	+0	0.9375		0.260	0.219	1413	3145	295	787	6.33
GSA-812	0.8125	-0.001	1.0312		0.276	0.234	1617	3637	370	911	8.56
GSA-875	0.8750		1.0937	-0	0.293	0.250	1611	4188	458	1047	10.14
GSA-937	0.9375		1.1875	+0.0015	0.310	0.267	2087	4790	561	1197	12.36
GSA-1000	1.0000		1.2500		0.326	0.284	2090	5437	680	1360	14.05
GSA-1125	1.1250	+0	1.4060		0.359	0.312	2220	6620	840	1493	19.55
GSA-1250	1.2500	-0.0015	1.5310		0.393	0.344	2240	8105	1140	1824	23.54
GSA-1375	1.3750		1.6870		0.426	0.376	2745	9750	1510	2196	31.22
GSA-1500	1.5000		1.8120	-0	0.459	0.407	3030	11510	1940	2587	36.38
GSA-1625	1.6250	+0	1.9680	+0.002	0.492	0.437	3295	13390	2450	3015	46.43
GSA-1750	1.7500	-0.002	2.1250		0.526	0.469	3585	15475	3045	3480	58.53
GSA-1875	1.8750		2.2500		0.559	0.500	3595	17675	3730	3979	66.22
GSA-2000	2.0000		2.4060		0.592	0.528	5365	19910	4480	4480	81.09
GSA-2250	2.2500		2.6560		0.592	0.528	4795	22400	5670	5040	90.30
GSA-2437	2.4375		2.8430		0.592	0.528	4430	24260	6655	5461	97.07
GSA-2500	2.5000	+0	2.9060	-0	0.592	0.528	4330	24885	7000	5600	99.50
GSA-2687	2.6875	-0.003	3.0930	+0.003	0.592	0.528	4035	26750	8090	6020	106.26
GSA-2750	2.7500		3.1560		0.592	0.528	3950	27370	8470	6160	108.70
GSA-3000	3.0000		3.4060		0.592	0.528	3890	29860	10080	6720	117.90

* Stainless steel available upon request.

* Delivery on request; other sizes stocked. Contact Ringfeder Corporation for additional sizes and information.

■ Selection Guide

1. Determine the shaft diameter to be used and the maximum torque (T) to be transmitted.

$$T = \frac{63,000 \text{ (lb-in) x HP}}{\text{RPM}}$$

2. Select a locking element from the specification table for the shaft diameter. Verify that the transmissible torque (T) for the element meets the torque requirement.

Note: Required peak torque should never exceed specified transmissible torque (T). Higher torque capacities can be obtained by increasing the locking force.

3. Determine the required locking force (F_A'). A pre-load (F_O) is required to bridge the clearance for the specified fits. The total required locking force is F_A=F_O+ F_A'. The locking force is normally obtained by using one or more screws and a clamp plate.

4. Refer to screw tables on page 40 to determine the number, size and grade of screws needed for the required locking force and individual screw clamp load.

$$\text{Clamp load/screw} = \frac{\text{required locking force (F}_A\text{') or F}_A\text{'}}{\text{number of screws (z)}}$$

Explanations to tables

d, D, L, l = Basic dimensions, Locking Elements not tightened

C_1 = shaft tolerances

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C_2 = bore tolerances

A_t = effective bearing surface $A_t = \pi \cdot d \cdot l$

X = travel distance for 1,2,3 or 4 Locking Elements. This value includes a safety allowance to ensure that the thrust flange will not contact the face of the hub or shaft. Any reduction of this value could cause a block and the transmission values of the connection would not be achieved.

T = transmissible torque

F_{ax} = axial forces

T and F_{ax} refer to a pressure between the Locking Element and shaft of 14500 psi .

When solid Locking Elements the required total clamping force F_A is obtained by:

$$F_A = F_{A'} + F_O$$

$F_{A'}$ = Screw number x Fv, see screw table page 40

F_O = approximate clamping force required to bridge the clearances where the tolerances given in the table are fully exploited during manufacture, not applicable if slit Locking Elements are used.

d_1 = clamp plate bore

D_1 = spacer sleeve OD

T_{max} = transmissible torque by one Locking Element at a shaft contact pressure of = 47850 psi



Weitere technische Hinweise befinden sich im jeweiligen Katalog.

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