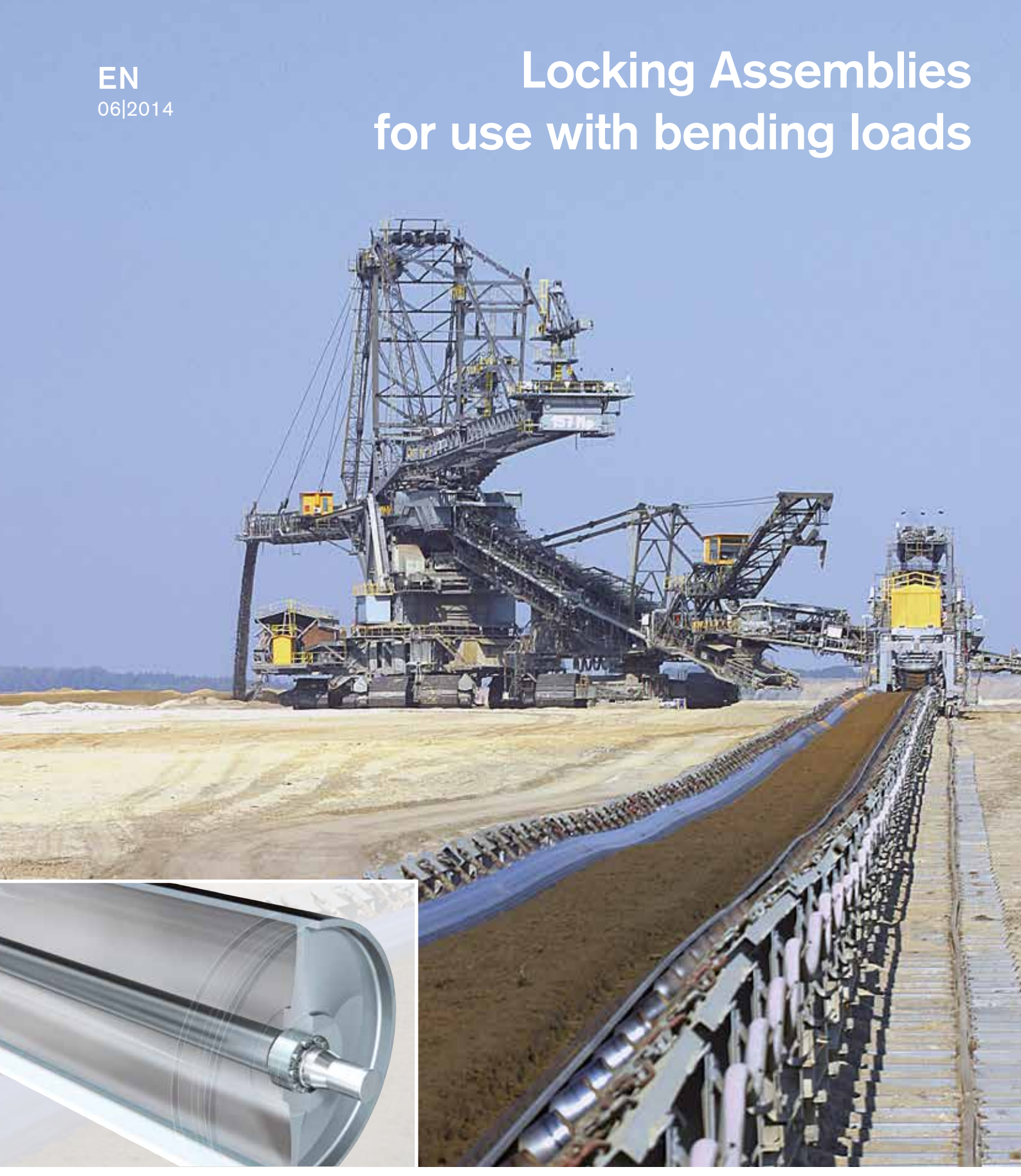
EN
06|2014

Locking Assemblies for use with bending loads



Partner for performance
www.ringfeder.com

RINGFEDER

A Global Presence For You

The RINGFEDER POWER TRANSMISSION GMBH was founded in 1922 in Krefeld, Germany to fabricate and promote Friction Spring technology. Today we have expanded our offerings to top power transmission and damping products. Innovative thinking sets us apart and allows us to develop progressive and economical solutions to support our customers.

Special applications require special solutions

Our extensive range of RINGFEDER POWER TRANSMISSION products can be applied to solve most applications. We don´t just sell, but by understanding the individual requirements of our customers (e.g. loads on the components, easy installation/removal capability and reduction of production costs) assist you in every step with innovative engineering to plan efficient and technically mature solutions.

Locking Assemblies for use with bending loads

One of the most demanding challenges on our promise of performance is the belt drum application field. The extreme loads which such components are subject to, especially the high bending moment, coupled with the simultaneous indispensable reliability and longest-possible service life require the highest in engineering know-how. Our international development team, which has already set benchmarks in quality Locking Assemblies for the RfN 7012, RfN 7012.2, RfN 7015.0 and RfN 7015.1 products, is now setting a further milestone.

The new development of the RfN 7515 Locking Assemblies has set a new benchmark in this segment with its quality, performance and price range.

Quality means: high-quality materials and material services, and the most precise workmanship, guarantee sustainable product usage.

Performance means: reliability and long service life.

Price means: not just the newest, but also most inexpensive RINGFEDER Locking Assemblies product for bending loads at the high level of performance you are used to.

Belt drum with Locking Assemblies and a shrink disc on the drive side

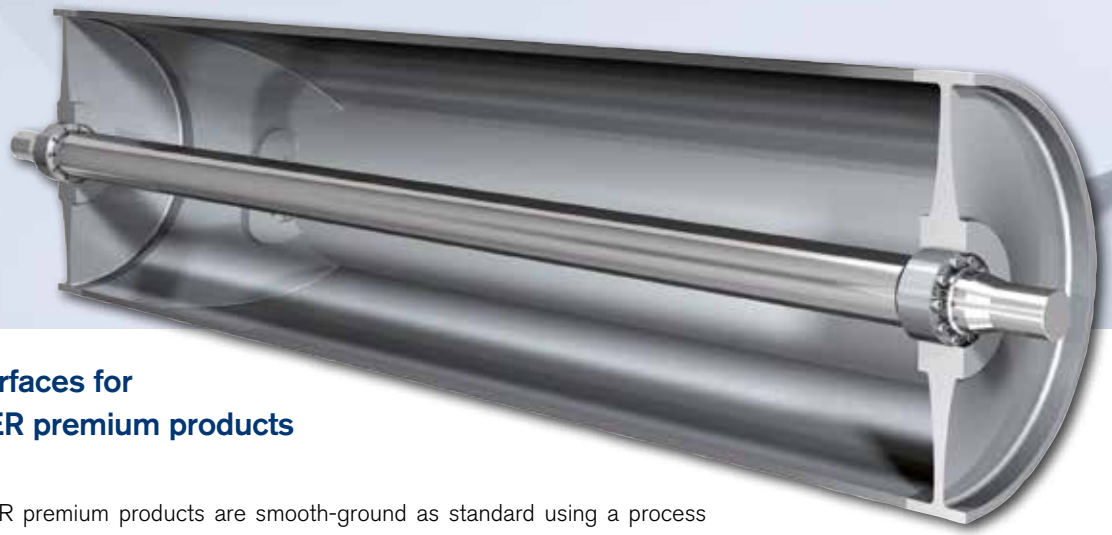
Ready-for-shipping belt drum with Locking Assemblies

Locking Assemblies for use with bending loads

Surface roughness measurement


Hardness measurement


3-D measurement



Special surfaces for RINGFEDER premium products

All RINGFEDER premium products are smooth-ground as standard using a process specially developed for us. Account to this special quality feature, a consistent reproducible coefficient of friction is achieved for all Locking Assembly contact surfaces.

This exceptionally important reproducibility guarantees the consistent of defined pressure on which all Locking Assembly technical values are based.

Merely turned surfaces, even those which are precision-turned, have slip-stick effects if the cone is displaced. A type of indenting also takes place. The considerable coefficient of friction deviations which occur due to this affect the pressure, the torque transfer and the stresses in all components. Removal of the Locking Assembly is also made considerably more difficult.

RfN 7012

RfN 7012.2

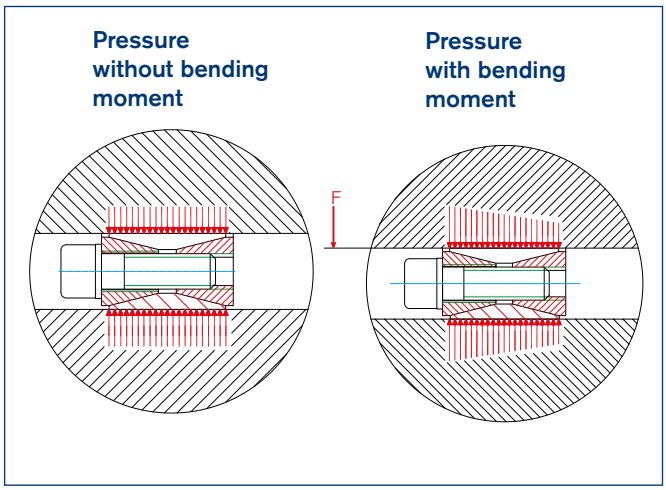
RfN 7015.0

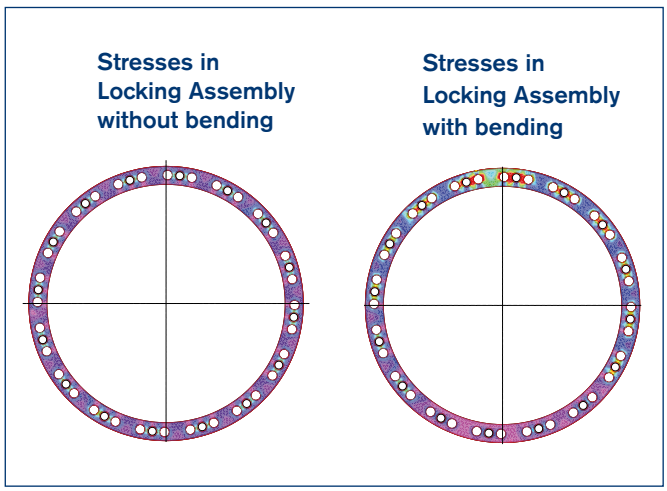
RfN 7015.1

RfN 7515

Pressures and stresses in Locking Assembly taking bending moment into consideration

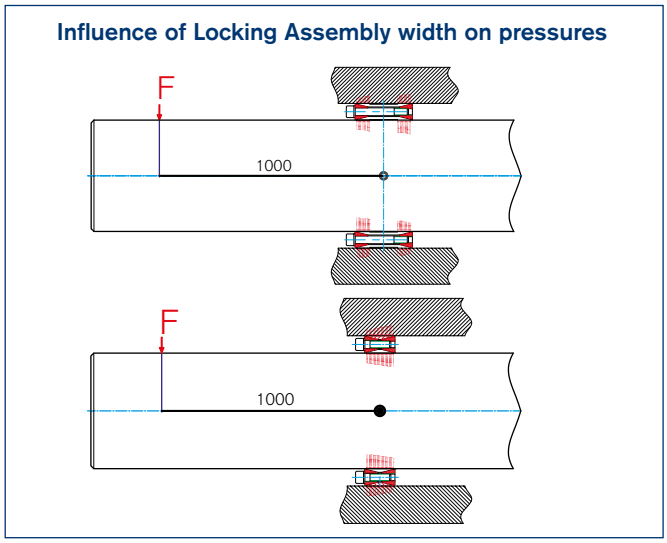
Without bending moment loading, pressure on the contact areas of the Locking Assembly between the shaft and drum end disc are evenly distributed. Under bending moment, the pressure increases on one side and decreases rotary on the opposing side during each drum rotation. In this case, the stresses in the Locking Assembly between the bores on the side with higher pressure are subject to extreme increases, and these can destroy Locking Assemblies made of too soft or low-quality materials very quickly.





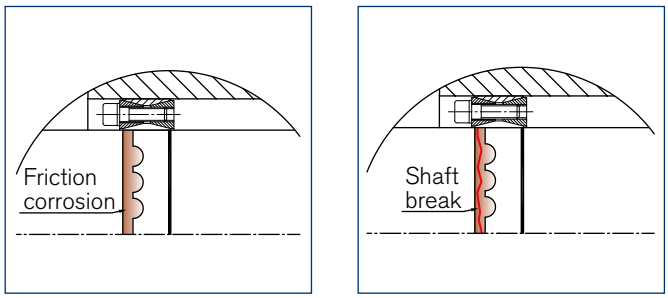
Influence of Locking Assembly width on pressure under bending moment loading

Ever wider the Locking Assembly, so much larger the leverage. In other words, larger Locking Assembly widths produce larger leverage. This means that pressure changes under bending loads are lower for wider Locking Assemblies, which in turn means that their behaviour under bending moment loads are more advantageous.



Shaft breakage due to friction corrosion

The Locking Assembly can be subject to localised lifting on the side with lower pressure. Micro-movements between the Locking Assembly and the adjacent components occur. The fretting corrosion which results from this causes surface damage, which can lead to cracks or even shaft breakage in worst cases.



Hub loads due to pressure increases

The hub (drum end disc) is loaded over its whole circumference by the increased pressures. This means it is imperative that the drum end disc is designed to meet the maximum occurring pressure. Drum end disc which have been designed too weakly deform in a plastic manner and lead to connection failures. Drive pulleys slip if the drum end disc deforms in a plastic manner and tail pulleys start to „move“ axially.

Influence of material strength on transmissible bending moment

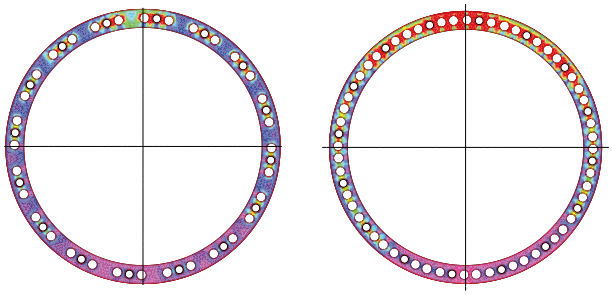
The loading limits can be considerably increased for applications which fall below the stated web stresses for the standard RfN 7012 Locking Assembly through the use of Locking Assemblies made of high-quality materials, e.g.: RfN 7012.2 (here, the material yield strength is around 40% greater than that of the standard Locking Assembly). This results in a tripling of the transmissible bending moment.

Influence of number of bores on stresses in Locking Assemblies

The number of bores made, which weaken the pressure ring, significantly influences the stresses in the Locking Assembly. Stresses can be considerably reduced through the use of lower number of bores, and the reserves made available by this can be used for additional bending moment loads.

Lower number of bores - lower stress at bending moment

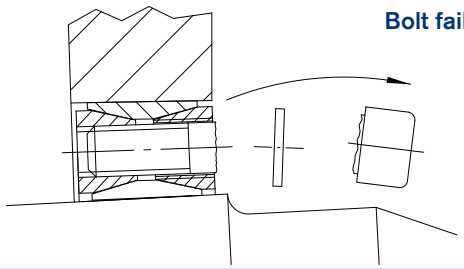
High number of bores - higher stress at bending moment



Bolt failure under excessive bending moment

The shaft deflection caused by the circumferential belt tension applies load to the clamping bolts every drum rotation. This additional axial loading leads to fatigue failures and bolt head breakage if the bolts are fully tightened. For this reason, the bolt tightening torques must be reduced depending on the series if Locking Assembly applications are subject to bending loads.

Bolt failure



Shaft torsion and therefore no torque division on both drum ends

The shaft is torsionally softer than the drum body. For this reason, the entire torque must be transferred to the drive side. Torque division on both Locking Assemblies results in the destruction of the Locking Assembly on the drive side. (See drawing)

Shaft torsion

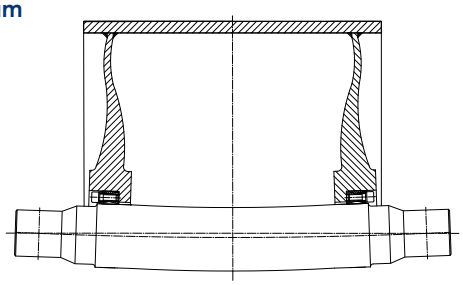
Start-up factor for belt drives

When belt equipment starts up, the electric motor briefly applies around 2.5 times the nominal torque. The drum fixing therefore needs to be designed to accept the start-up torque loading. If not, the connection slips or the Locking Assembly is destroyed after a short time.

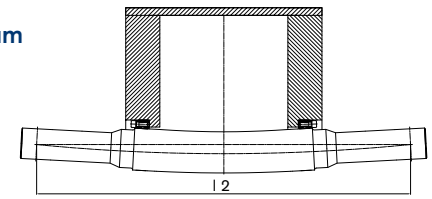
Bending moment division between shaft and drum end disc

The Locking Assembly must transfer the entire bending moment if the end disc is very stiff. If the drum end disc is flexible, the bending moment to be transferred is divided between the end disc and drum shaft - the stresses from the bending moment are reduced and the Locking Assembly is protected.

Soft drum



Stiff drum



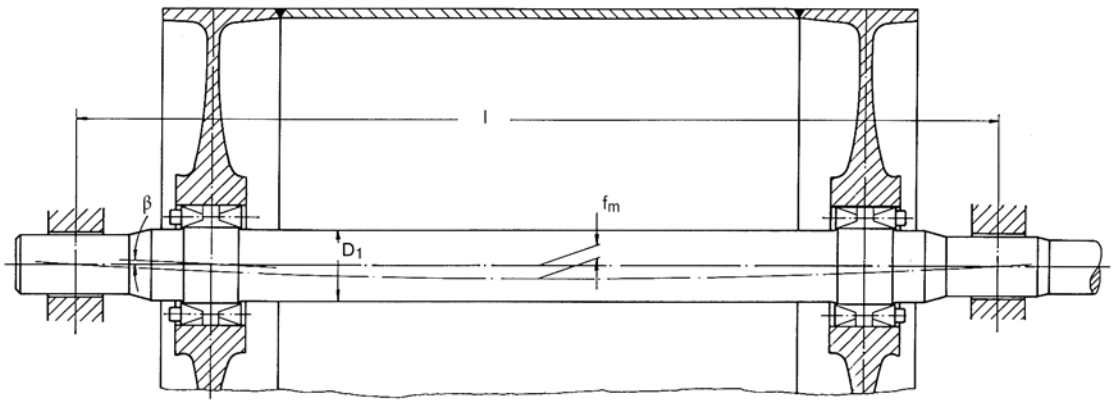
Function between bending moment, torque, pressure and bolt tightening torque

Sample values from calculation for 400 x 495 RfN 7012				
T_a	M_b	pw	pn	$T_{res.}$
Nm	Nm	N/mm²	N/mm²	Nm
780	0	123	99	311700
780	73400	169	137	302900
468	0	74	60	187000
468	73400	120	97	172000
780	**146800**	**215**	**174**	**275000**
Sample values from calculation for 400 x 495 RfN 7012.2				
780	**146800**	**228**	**184**	**311200**
780	200000	261	211	280000

● *This Locking Assembly was destroyed by overloading*

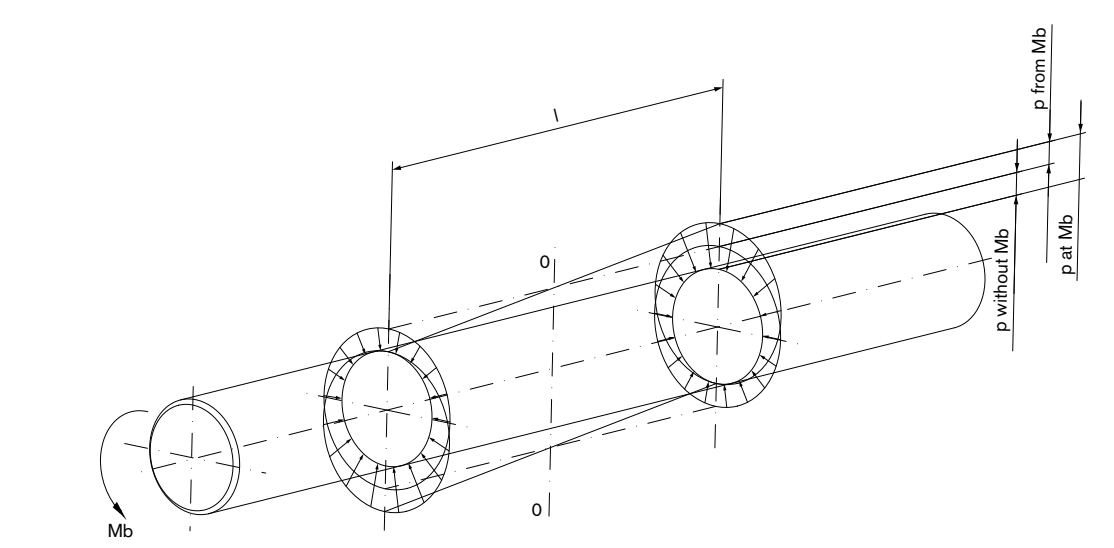
● *This Locking Assembly is able to transfer the required loads*

Construction hints



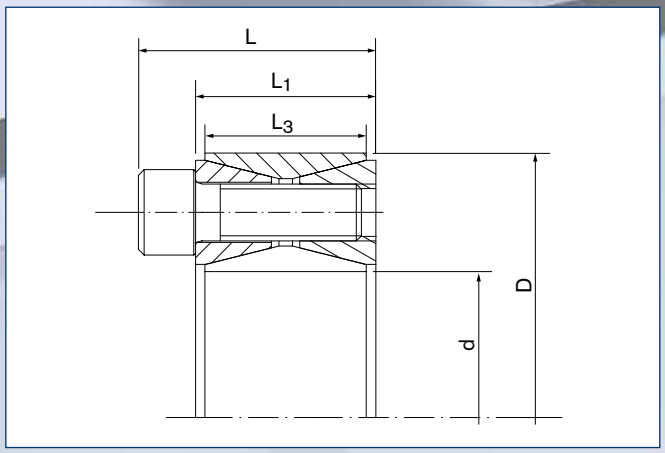
Belt drum mounted using Locking Assemblies RfN 7015

With this and similar constructions the main criterion is to be found in the admissible bending load. For limitation of this load we have on condition of elastic drum bottoms up to now determined a certain shaft deflection as related to the bearing distance and thus as corresponding angle of deflection at the fitting point of the Locking Assembly. Thus, an angle deflection < 5,4' or the maximum shaft deflection fm as related to the bearing distance l were permitted at 1/2000. Constructions based on these experimental values can, however, be optimized by designing in accordance with the permissible bending moment of the Locking Assembly used.



Distribution of surface pressures

The chosen diagram shows the correlation between the surface pressures derived from the clamping and the bending moment. Basic limitations for the superposition of those surface pressures are additionally shown.



Locking Assembly RfN 7012 · Dimensions

Explanations to tables

Basic dimensions when screws are not tightened

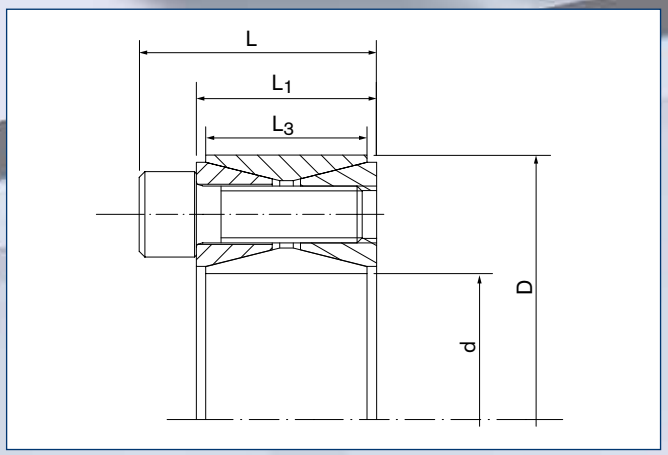
d	=	**Inner diameter**
D	=	**Outer diameter**
L	=	**Overall length**
L_1	=	**Overall length without screws**
L_3	=	**Width of inner ring**
n_{Sc}	=	**Quantity of locking srews**
D_G	=	**Thread**
$T_{Ared.}$	=	**Reduced tightened torque of the screws under bending load**
T	=	**Transmissible torque at given T_A**
p_W	=	**Surface pressure on shaft at given T_A**
p_N	=	**Surface pressure on hub at given T_A**
$M_b$max.	=	**Max. bending moment under the specified T_A**
$T_{res.}$ at $M_b$max.	=	**Remaining transmissible torque at indicated M_b and T_{Ared}**
$p_W$max. at $M_b$max.	=	**Max. surface pressure on shaft at max. bending moment**
$p_N$max. at $M_b$max.	=	**Max. surface pressure on hub at max. bending moment**
$p_W$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
$p_N$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
F_{ax} at $M_b$max.	=	**Transmissible axial force at max. bending moment**
G_W	=	**Weight**

Locking Assemblies for bending moments **RfN 7012**

Locking Assembly dimensions						Locking screws ISO 4762-12.9															
d	x	D	L	L_1	L_3	n_{Sc}	D_G		$T_{Ared.}$	T	p_W	p_N	$M_b$max.	$T_{res.}$ at $M_b$max.	p_{Wmax} p_{Nmax} at $M_b$max.		p_{Wmin} p_{Nmin} at $M_b$max.		F_{ax} at $M_b$max.	Gw
mm			mm						Nm	Nm	N/mm²		Nm		N/mm²				kN	kg
100	x	145	47	33	26	14	M12	x 30	125	9591	196	135	7210	6325	331	228	60	41	126	2,01
110	x	155	47	33	26	14	M12	x 30	125	10488	177	126	7840	6966	311	221	43	30	127	2,15
120	x	165	47	33	26	16	M12	x 30	125	13004	184	134	8960	9425	325	236	44	32	157	2,35
130	x	180	52	38	34	20	M12	x 35	125	17522	162	117	11310	13383	285	206	38	28	206	3,51
140	x	190	52	38	34	22	M12	x 35	125	20661	164	121	10160	17991	268	197	61	45	257	3,85
150	x	200	52	38	34	24	M12	x 35	125	24046	167	125	9020	22290	252	189	81	61	297	4,07
160	x	210	52	38	34	26	M12	x 35	125	27674	169	129	7870	26532	239	182	99	75	332	4,3
170	x	225	60	44	38	22	M14	x 40	190	32486	157	119	21570	24292	291	220	22	17	286	5,78
180	x	235	60	44	38	24	M14	x 40	190	37391	161	123	18960	32227	273	209	49	38	358	6,05
190	x	250	68	52	46	28	M14	x 45	190	45890	147	111	24070	39071	242	184	51	39	411	8,25
200	x	260	68	52	46	30	M14	x 45	190	51590	149	114	21150	47056	228	176	69	53	471	8,65
220	x	285	74	56	50	26	M16	x 50	295	66374	146	112	32670	57777	242	187	49	38	525	11,22
240	x	305	74	56	50	30	M16	x 50	295	83094	153	120	20330	80569	208	164	98	77	671	12,2
260	x	325	74	56	50	34	M16	x 50	295	101512	159	127	16810	100111	201	161	117	94	770	13,2
280	x	355	86,5	66	60	32	M18	x 60	405	124233	140	111	38440	118136	204	161	76	60	844	19,2
300	x	375	86,5	66	60	36	M18	x 60	405	149101	146	117	24820	147020	185	148	108	86	980	20,5
320	x	405	100,5	78	72	36	M20	x 70	580	207104	149	118	37220	203732	188	148	110	87	1273	29,6
340	x	425	100,5	78	72	36	M20	x 70	580	219216	140	112	57920	211426	196	157	83	66	1244	31,1
360	x	455	116	90	84	36	M22	x 80	780	282418	138	109	74630	272379	189	150	86	68	1513	42,2
380	x	475	116	90	84	36	M22	x 80	780	297102	130	104	87000	284078	187	150	73	58	1495	44
400	x	495	116	90	84	36	M22	x 80	780	311738	123	99	150460	273024	217	175	29	23	1365	46
420	x	515	116	90	84	40	M22	x 80	780	362587	130	106	93580	350303	186	151	74	60	1668	50
440	x	545	130	102	96	40	M24	x 90	1000	442836	126	102	113140	428139	176	142	76	62	1946	64,6
460	x	565	130	102	96	40	M24	x 90	1000	461680	121	98	177330	426266	195	159	46	37	1853	67,4
480	x	585	130	102	96	42	M24	x 90	1000	504497	121	99	168140	475653	189	155	53	43	1982	71
500	x	605	130	102	96	44	M24	x 90	1000	549139	121	100	158960	525629	183	151	60	49	2103	72,6
520	x	630	130	102	96	45	M24	x 90	1000	582655	119	98	194480	549239	192	158	46	38	2112	80
540	x	650	130	102	96	45	M24	x 90	1000	603639	114	95	258670	545408	207	172	21	18	2020	82
560	x	670	130	102	96	48	M24	x 90	1000	666213	117	98	212800	631313	191	160	44	36	2255	85
580	x	690	130	102	96	50	M24	x 90	1000	717182	118	99	203610	687672	186	156	50	42	2371	88
600	x	710	130	102	96	50	M24	x 90	1000	740342	114	96	267800	690210	200	169	27	23	2301	91
620	x	730	130	102	96	52	M24	x 90	1000	793992	114	97	258610	750696	195	166	33	28	2422	93
640	x	750	130	102	96	54	M24	x 90	1000	849441	115	98	249429	811994	190	162	39	33	2537	96
660	x	770	130	102	96	56	M24	x 90	1000	906684	115	99	240240	874277	186	159	44	38	2649	99
680	x	790	130	102	96	56	M24	x 90	1000	932418	111	96	304420	881324	198	171	25	21	2592	102

To continue see next page

Remark! The values of the shaft- and hub pressures have been calculated with the screw tightening shown in the tables. Reduction of the screw tightening torque results in different calculation values! The specified pressures at $M_{bmax.}$ are sometimes very low. An operation near these limit values may therefore lead to increased fretting corrosion!



Locking Assembly RfN 7012 · Dimensions

Explanations to tables

Basic dimensions when screws are not tightened

d	=	**Inner diameter**
D	=	**Outer diameter**
L	=	**Overall length**
L_1	=	**Overall length without screws**
L_3	=	**Width of inner ring**
n_{Sc}	=	**Quantity of locking srews**
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$p_N$max. at $M_b$max.	=	**Max. surface pressure on hub at max. bending moment**
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$p_N$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
F_{ax} at $M_b$max.	=	**Transmissible axial force at max. bending moment**
G_W	=	**Weight**

Locking Assemblies for bending moments **RfN 7012**

Locking Assembly dimensions						Locking screws ISO 4762-12.9															
d	x	D	L	L_1	L_3	n_{Sc}		D_G	$T_{Ared.}$	T	p_W	p_N	$M_b$max.	$T_{res.}$ at $M_b$max.	p_{Wmax} p_{Nmax} at $M_b$max.		p_{Wmin} p_{Nmin} at $M_b$max.		F_{ax} at $M_b$max.	Gw
mm			mm						Nm	Nm	N/mm²		Nm		N/mm²				kN	kg
700	x	810	130	102	96	60	M24	x 90	1000	1026541	116	100	221870	1002277	177	153	54	47	2864	104
720	x	830	130	102	96	60	M24	x 90	1000	1054013	112	97	286050	1014455	189	164	35	31	2818	107
740	x	850	130	102	96	62	M24	x 90	1000	1117486	113	98	276870	1082644	185	161	40	35	2926	110
760	x	870	130	102	96	64	M24	x 90	1000	1182737	113	99	267680	1152048	182	159	45	39	3032	113
780	x	890	130	102	96	65	M24	x 90	1000	1230829	112	98	295180	1194909	185	162	38	34	3064	116
800	x	910	130	102	96	66	M24	x 90	1000	1279783	111	97	322680	1238436	189	166	32	28	3096	118
820	x	930	130	102	96	68	M24	x 90	1000	1349444	111	98	313500	1312524	185	163	37	32	3201	121
840	x	950	130	102	96	70	M24	x 90	1000	1420874	111	98	304310	1387904	182	161	41	36	3305	124
860	x	970	130	102	96	72	M24	x 90	1000	1494068	112	99	295130	1464629	178	158	45	40	3406	127
880	x	990	130	102	96	74	M24	x 90	1000	1569025	112	100	285940	1542750	175	156	49	43	3506	129
900	x	1010	130	102	96	75	M24	x 90	1000	1624087	111	99	313440	1593554	178	159	43	38	3541	132
920	x	1030	130	102	96	76	M24	x 90	1000	1680004	110	98	340940	1645045	182	162	38	34	3576	135
940	x	1050	130	102	96	78	M24	x 90	1000	1759331	110	99	331750	1727770	179	160	42	37	3676	138
960	x	1070	130	102	96	80	M24	x 90	1000	1840411	110	99	322570	1811922	176	158	45	40	3775	140
980	x	1090	130	102	96	81	M24	x 90	1000	1899788	109	98	350070	1867256	179	161	40	36	3811	143
1000	x	1110	130	102	96	82	M24	x 90	1000	1960015	108	98	377570	1923305	182	164	35	32	3847	146

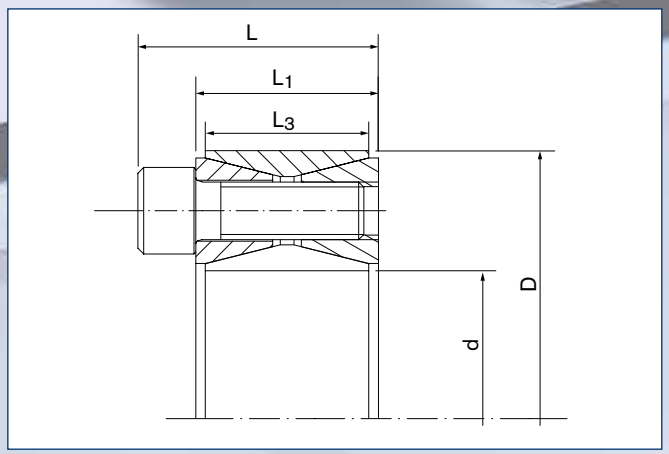
Ordering example: RfN 7012

Series	d	D
RfN 7012	160	210

- **Surface finishes**
  For shaft and hub bores
  $R_a \leq 3{,}2$ µm
- **Tolerances**
  We recommend the following mounting tolerances
  For shaft h9 · Hub H9

Remark! The values of the shaft- and hub pressures have been calculated with the screw tightening shown in the tables. Reduction of the screw tightening torque results in different calculation values! The specified pressures at $M_{bmax.}$ are sometimes very low. An operation near these limit values may therefore lead to increased fretting corrosion!

Locking Assemblies for bending moments **RfN 7012.2**



Locking Assembly RfN 7012.2 · Dimensions

A special bolt for type **RfN 7012.2** has been developed by RINGFEDER for the increased requirements occurring when subject to loading by bending moment.

These special bolts guarantee loadings above strength class 12.9 at simultaneous higher expansion with regard to tensile strength and yield strength.

These bolts were manufactured specially for RINGFEDER with qualified steel analysis.

Every bolt is labelled with RPT-B and the batch number. This allows every bolt to be traced back to manufacture.

The benefit of this bolt is the considerably increased fracture resistance under additional bending stress.

Explanations to tables

Basic dimensions when screws are not tightened

d	=	**Inner diameter**
D	=	**Outer diameter**
L	=	**Overall length**
L_1	=	**Overall length without screws**
L_3	=	**Width of inner ring**
n_{Sc}	=	**Quantity of locking srews**
D_G	=	**Thread**
$T_{Ared.}$	=	**Reduced tightened torque of the screws under bending load**
T	=	**Transmissible torque at given T_A**
p_W	=	**Surface pressure on shaft at given T_A**
p_N	=	**Surface pressure on hub at given T_A**
$M_b$max.	=	**Max. bending moment under the specified T_A**
$T_{res.}$ at $M_b$max.	=	**Remaining transmissible torque at indicated M_b and T_{Ared}**
$p_W$max. at $M_b$max.	=	**Max. surface pressure on shaft at max. bending moment**
$p_N$max. at $M_b$max.	=	**Max. surface pressure on hub at max. bending moment**
$p_W$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
$p_N$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
F_{ax} at $M_b$max.	=	**Transmissible axial force at max. bending moment**
G_W	=	**Weight**

Locking Assemblies for bending moments **RfN 7012.2**

Locking Assembly dimensions						Locking screws ISO 4762-12.9 Thread															
d	x	D	L	L_1	L_3	n_{Sc}		D_G	$T_{Ared.}$	T	p_W	p_N	$M_b$max.	$T_{res.}$ at $M_b$max.	p_{Wmax} p_{Nmax} at $M_b$max.		p_{Wmin} p_{Nmin} at $M_b$max.		F_{ax} at $M_b$max.	Gw
mm			mm						Nm	Nm	N/mm²		Nm		N/mm²				kN	kg
100	x	145	47	33	26	13	M12	x 30	125	10409	212	146	10300	1502	406	280	19	13	30	2,01
110	x	155	47	33	26	13	M12	x 30	125	11382	192	136	11200	2027	383	272	1	0	37	2,15
120	x	165	47	33	26	15	M12	x 30	125	14249	202	147	12880	6095	404	294	0	0	102	2,35
130	x	180	52	38	34	19	M12	x 35	125	19455	180	130	16400	10467	359	259	0	0	161	3,51
140	x	190	52	38	34	23	M12	x 35	125	25246	201	148	9700	23308	299	221	103	76	333	3,85
150	x	200	52	38	34	23	M12	x 35	125	26933	187	140	14690	22574	326	244	48	36	301	4,07
160	x	210	52	38	34	25	M12	x 35	125	31101	190	144	13380	28075	308	235	71	54	351	4,3
170	x	225	60	44	38	21	M14	x 40	190	36243	175	132	28080	22914	350	265	0	0	270	5,78
180	x	235	60	44	38	23	M14	x 40	190	41880	180	138	28860	30348	350	268	11	8	337	6,05
190	x	250	68	52	46	27	M14	x 45	190	51719	165	126	37000	36137	312	237	19	14	380	8,25
200	x	260	68	52	46	28	M14	x 45	190	56277	162	125	40180	39404	314	241	11	8	394	8,65
220	x	285	74	56	50	25	M16	x 50	295	74592	164	126	50440	54952	313	241	14	11	500	11,22
240	x	305	74	56	50	26	M16	x 50	295	84169	155	122	57100	61838	310	244	0	0	515	12,2
260	x	325	74	56	50	30	M16	x 50	295	104686	164	131	48910	92558	287	229	42	33	712	13,2
280	x	355	86,5	66	60	29	M18	x 60	405	131586	148	117	89170	96766	297	234	0	0	691	19,2
300	x	375	86,5	66	60	30	M18	x 60	405	145219	143	114	91850	112482	285	228	0	0	750	20,5
320	x	405	100,5	78	72	30	M20	x 70	580	201713	145	115	139400	145793	290	229	0	0	911	29,6
340	x	425	100,5	78	72	31	M20	x 70	580	220626	141	113	143500	167582	281	225	0	0	986	31,1
360	x	455	116	90	84	32	M22	x 80	780	293404	143	113	178400	232936	267	211	19	15	1294	42,2
380	x	475	116	90	84	33	M22	x 80	780	318305	139	111	204700	243754	274	219	5	4	1283	44
400	x	495	116	90	84	34	M22	x 80	780	344106	136	110	217320	266798	272	220	0	0	1334	46
420	x	515	116	90	84	37	M22	x 80	780	391995	140	114	195820	339580	257	210	24	19	1617	50
440	x	545	130	102	96	37	M24	x 90	1000	478752	137	110	251950	407093	248	200	26	21	1850	64,6
460	x	565	130	102	96	38	M24	x 90	1000	512615	134	109	283500	427085	254	206	14	12	1857	67,4
480	x	585	130	102	96	39	M24	x 90	1000	547520	131	108	315100	447762	259	212	4	3	1866	71
500	x	605	130	102	96	41	M24	x 90	1000	598054	132	109	304200	514908	250	207	14	12	2060	72,6
520	x	630	130	102	96	42	M24	x 90	1000	635586	130	107	345050	533770	259	214	1	1	2053	80
540	x	650	130	102	96	43	M24	x 90	1000	674155	128	106	355400	572866	256	212	0	0	2122	82
560	x	670	130	102	96	45	M24	x 90	1000	729980	129	108	365700	631770	255	213	2	2	2256	85
580	x	690	130	102	96	47	M24	x 90	1000	787923	129	109	354800	703519	248	209	11	9	2426	88
600	x	710	130	102	96	48	M24	x 90	1000	830673	128	108	386400	735331	253	213	3	2	2451	91
620	x	730	130	102	96	49	M24	x 90	1000	874450	126	107	401500	776828	251	214	0	0	2506	93
640	x	750	130	102	96	52	M24	x 90	1000	956024	129	110	364600	883770	240	204	18	16	2762	96
660	x	770	130	102	96	54	M24	x 90	1000	1021852	130	111	353700	958686	234	200	26	22	2905	99
680	x	790	130	102	96	54	M24	x 90	1000	1050855	126	108	357760	988081	228	196	23	20	2906	102
700	x	810	130	102	96	54	M24	x 90	1000	1079804	122	105	357770	1018812	221	191	23	20	2911	104
720	x	830	130	102	96	54	M24	x 90	1000	1108702	118	103	354670	1050443	214	185	23	20	2918	107
740	x	850	130	102	96	56	M24	x 90	1000	1179681	119	104	367670	1120922	215	188	23	20	3030	110
760	x	870	130	102	96	58	M24	x 90	1000	1252745	120	105	379250	1193960	217	189	23	20	3142	113
780	x	890	130	102	96	59	M24	x 90	1000	1305758	119	104	385650	1247509	215	188	23	20	3199	116
800	x	910	130	102	96	60	M24	x 90	1000	1359784	117	103	392150	1302011	213	187	22	20	3255	118

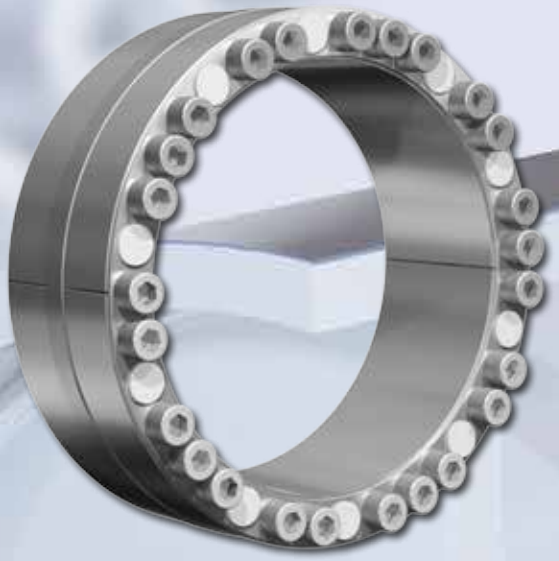
Ordering example: RfN 7012.2

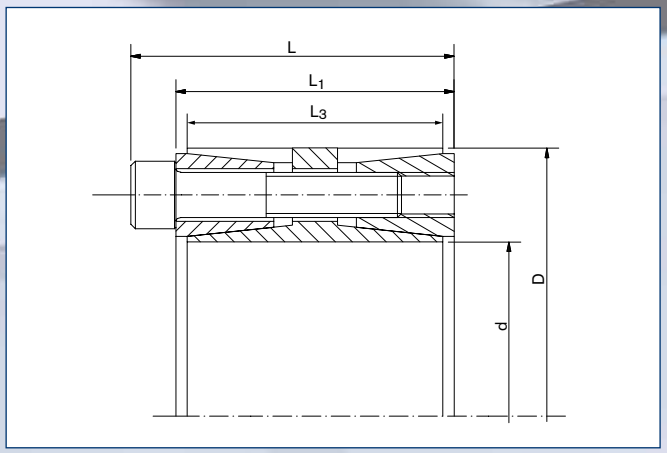
Series	d	D
RfN 7012.2	200	260

Surface finishes
For shaft and hub bores
$R_a \leq 3{,}2$ µm

Tolerances
We recommend the following mounting tolerances
For shaft h9 · Hub H9

Remark! The values of the shaft- and hub pressures have been calculated with the screw tightening shown in the tables. Reduction of the screw tightening torque results in different calculation values! The specified pressures at $M_{bmax.}$ are sometimes very low. An operation near these limit values may therefore lead to increased fretting corrosion!





Locking Assembly RfN 7015.0 · Dimensions

Explanations to tables

Basic dimensions when screws are not tightened

d	=	**Inner diameter**
D	=	**Outer diameter**
L	=	**Overall length**
L_1	=	**Overall length without screws**
L_3	=	**Width of inner ring**
n_{Sc}	=	**Quantity of locking srews**
D_G	=	**Thread**
$T_{Ared.}$	=	**Reduced tightened torque of the screws under bending load**
T	=	**Transmissible torque at given T_A**
p_W	=	**Surface pressure on shaft at given T_A**
p_N	=	**Surface pressure on hub at given T_A**
$M_b$max.	=	**Max. bending moment under the specified T_A**
$T_{res.}$ at $M_b$max.	=	**Remaining transmissible torque at indicated M_b and T_{Ared}**
$p_W$max. at $M_b$max.	=	**Max. surface pressure on shaft at max. bending moment**
$p_N$max. at $M_b$max.	=	**Max. surface pressure on hub at max. bending moment**
$p_W$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
$p_N$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
F_{ax} at $M_b$max.	=	**Transmissible axial force at max. bending moment**
G_W	=	**Weight**

Locking Assemblies for bending moments **RfN 7015.0**

Locking Assembly dimensions						Locking screws ISO 4762-12.9 Thread															
d	x	D	L	L_1	L_3	n_{Sc}	D_G		$T_{Ared.}$	T	p_W	p_N	$M_b$max.	$T_{res.}$ at $M_b$max.	p_{Wmax} p_{Nmax} at $M_b$max.				p_{Wmin} p_{Nmin} at $M_b$max.		F_{ax} at $M_b$max.	Gw
mm			mm						Nm	Nm	N/mm²		Nm		N/mm²						kg	kg
100	x	145	77	65	60	10	M12	x 55	115	11297	157	108	11200	1474	215	148	98	68	29	4,1
110	x	155	77	65	60	10	M12	x 55	115	12426	142	101	12300	1767	201	143	84	60	32	4,4
120	x	165	77	65	60	12	M12	x 55	115	16267	157	114	16100	2326	227	165	87	63	39	4,8
130	x	180	86	74	68	15	M12	x 60	115	22028	156	113	21900	2375	224	162	89	64	37	6,5
140	x	190	86	74	68	18	M12	x 60	115	28468	174	128	21600	18543	236	174	113	83	265	7
150	x	200	86	74	68	18	M12	x 60	115	30501	163	122	30300	3495	224	183	82	61	47	7,4
160	x	210	86	74	68	21	M12	x 60	115	37957	178	136	22500	30569	234	179	122	93	382	7,8
170	x	225	95	81	75	18	M14	x 65	185	47955	179	135	33300	34508	244	184	114	86	406	10
180	x	235	95	81	75	18	M14	x 65	185	50776	169	129	49800	9909	260	199	77	59	110	10,6
190	x	250	108	94	88	20	M14	x 75	185	59552	149	113	58300	12149	224	170	74	57	128	14,3
200	x	260	108	94	88	24	M14	x 75	185	75224	170	131	30900	68585	208	160	132	102	686	15
220	x	285	120	104	98	18	M16	x 90	285	84791	152	117	84300	9107	230	178	74	57	83	19,8
240	x	305	120	104	98	24	M16	x 90	285	123332	186	146	52500	111599	230	181	141	111	930	21,4
260	x	325	120	104	98	25	M16	x 90	285	139176	178	143	51900	129137	219	175	138	110	993	23
280	x	355	144	126	120	24	M18	x 110	390	174092	161	127	124600	121585	223	176	99	78	868	35,2
300	x	375	144	126	120	25	M18	x 110	390	194299	157	125	139200	135556	222	177	92	73	904	37,4
320	x	405	162	142	135	25	M20	x 120	550	265703	159	125	171300	203112	216	171	101	80	1269	51,3
340	x	425	162	142	135	25	M20	x 120	550	282310	149	120	229800	163984	222	178	77	61	965	54,1
360	x	455	187	165	158	25	M22	x 130	745	371148	149	118	295300	224830	214	169	84	66	1249	75,4
380	x	475	187	165	158	25	M22	x 130	745	391767	141	113	389800	39211	223	178	60	48	206	79
400	x	495	187	165	158	25	M22	x 130	745	412387	134	108	410300	41431	215	174	53	43	207	82,8
420	x	515	187	165	158	30	M22	x 130	745	519607	153	125	311300	416033	212	173	94	77	1981	86,5
440	x	545	204	180	172	30	M24	x 150	960	639702	154	124	417000	485108	216	175	91	74	2205	110
460	x	565	204	180	172	30	M24	x 150	960	668779	147	120	485800	459635	217	177	77	63	1998	114
480	x	585	204	180	172	32	M24	x 150	960	744381	150	123	446100	595900	212	174	89	73	2483	119
500	x	605	204	180	172	32	M24	x 150	960	775396	144	119	474800	613029	207	171	82	68	2452	123
520	x	630	227	200	190	30	M27	x 160	1440	1014357	156	129	613500	807798	219	181	93	77	3107	148
540	x	650	227	200	190	30	M27	x 160	1440	1053370	150	125	674900	808764	217	180	84	69	2995	154
560	x	670	227	200	190	30	M27	x 160	1440	1092384	145	121	684200	851571	210	176	80	67	3041	160
580	x	690	227	200	190	30	M27	x 160	1440	1131398	140	118	890500	697904	222	186	58	49	2407	165
600	x	710	227	200	190	32	M27	x 160	1440	1248439	144	122	798300	959853	215	182	73	62	3200	170
620	x	730	227	200	190	32	M27	x 160	1440	1290054	140	119	1004600	809331	226	192	53	45	2611	177
640	x	750	227	200	190	35	M27	x 160	1440	1456512	148	126	651400	1302730	202	173	94	80	4071	182
660	x	770	227	200	190	35	M27	x 160	1440	1502028	143	123	772500	1288151	206	176	81	69	3903	187
680	x	790	227	200	190	36	M27	x 160	1440	1591760	143	123	435600	1530997	177	153	109	94	4503	193
700	x	810	227	200	190	36	M27	x 160	1440	1638576	139	120	641900	1507613	188	163	90	78	4307	198
720	x	830	227	200	190	40	M27	x 160	1440	1872658	150	130	645200	1758001	198	172	103	89	4883	204
740	x	850	227	200	190	40	M27	x 160	1440	1924677	146	127	654500	1809975	193	168	99	86	4892	209
760	x	870	227	200	190	40	M27	x 160	1440	1976695	142	124	663800	1861906	189	165	96	84	4900	215
780	x	890	227	200	190	40	M27	x 160	1440	2028713	139	122	673100	1913796	185	162	93	81	4907	220
800	x	910	227	200	190	42	M27	x 160	1440	2184768	142	125	777900	2041588	194	170	90	79	5104	225

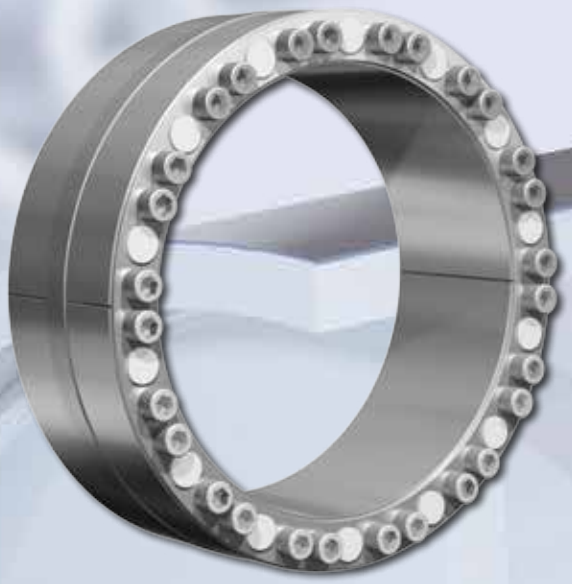
Ordering example: RfN 7015.0

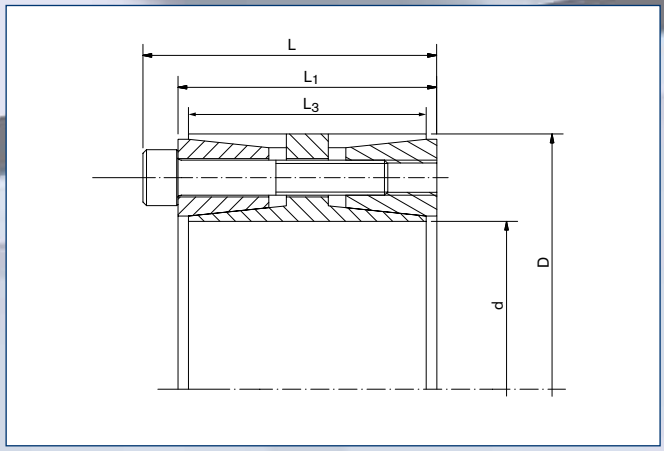
Series	d	D
RfN 7015.0	240	305

Surface finishes
For shaft and hub bores
$R_a \leq 3{,}2$ µm

Tolerances
We recommend the following mounting tolerances
For shaft h8 · Hub H8

Remark! The values of the shaft- and hub pressures have been calculated with the screw tightening shown in the tables. Reduction of the screw tightening torque results in different calculation values! The specified pressures at $M_{bmax.}$ are sometimes very low. An operation near these limit values may therefore lead to increased fretting corrosion!





Locking Assembly RfN 7015.1 · Dimensions

Explanations to tables

Basic dimensions when screws are not tightened

d	=	**Inner diameter**
D	=	**Outer diameter**
L	=	**Overall length**
L_1	=	**Overall length without screws**
L_3	=	**Width of inner ring**
n_{Sc}	=	**Quantity of locking srews**
D_G	=	**Thread**
T_A	=	**Max. tightened torque of the locking screws**
T	=	**Transmissible torque at given T_A**
p_W	=	**Surface pressure on shaft at given T_A**
p_N	=	**Surface pressure on hub at given T_A**
$M_b$max.	=	**Max. bending moment under the specified T_A**
$T_{res.}$ at $M_b$max.	=	**Remaining transmissible torque at indicated M_b and T_{Ared}**
$p_W$max. at $M_b$max.	=	**Max. surface pressure on shaft at max. bending moment**
$p_N$max. at $M_b$max.	=	**Max. surface pressure on hub at max. bending moment**
$p_W$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
$p_N$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
F_{ax} at $M_b$max.	=	**Transmissible axial force at max. bending moment**
G_W	=	**Weight**

Locking Assemblies for bending moments **RfN 7015.1**

Locking Assembly dimensions						Locking screws ISO 4762-12.9 Thread															
d	x	D	L	L_1	L_3	n_{Sc}		D_G	T_A	T	p_W	p_N	$M_b$max.	$T_{res.}$ at $M_b$max.	p_{Wmax} p_{Nmax} at $M_b$max.		p_{Wmin} p_{Nmin} at $M_b$max.		F_{ax} at $M_b$max.	Gw
mm			mm						Nm	Nm	N/mm²		Nm		N/mm²				kN	kg
100	x	145	75	65	60	9	M10	x 55	83	6575	91	63	6540	681	125	86	57	39	14	4,1
110	x	155	75	65	60	10	M10	x 55	83	8037	92	65	7900	1475	130	92	55	39	27	4,4
120	x	165	75	65	60	12	M10	x 55	83	10521	101	74	10460	1128	147	107	56	41	19	4,8
130	x	180	84	74	68	15	M10	x 60	83	14247	101	73	14170	1476	145	105	58	42	23	6,5
140	x	190	84	74	68	15	M10	x 60	83	15343	94	69	15260	1589	138	101	50	37	23	7
150	x	200	84	74	68	16	M10	x 60	83	17534	94	70	17440	1816	140	105	47	35	24	7,4
160	x	210	84	74	68	18	M10	x 60	83	21041	99	75	20930	2160	151	115	46	35	27	7,8
170	x	225	93	81	75	15	M12	x 65	145	27352	105	80	27210	2788	159	120	52	39	33	10
180	x	235	93	81	75	16	M12	x 65	145	30892	106	81	30730	3161	164	125	49	37	35	10,6
190	x	250	106	94	88	18	M12	x 75	145	36684	96	73	36500	3674	144	109	48	37	39	14,3
200	x	260	106	94	88	20	M12	x 75	145	42906	101	78	42690	4298	154	119	48	37	43	15
220	x	285	116	104	98	21	M12	x 80	145	49556	89	69	49300	5033	135	104	43	33	46	19,8
240	x	305	116	104	98	24	M12	x 80	145	61784	93	73	61470	6225	145	114	41	32	52	21,4
260	x	325	116	104	98	27	M12	x 80	145	75300	97	77	74920	7552	155	124	38	30	58	23
280	x	355	140	126	120	28	M14	x 100	230	115034	106	84	114450	11574	164	129	49	39	83	35,2
300	x	375	140	126	120	28	M14	x 100	230	123250	99	80	122630	12351	157	125	42	34	82	37,4
320	x	405	158	142	135	28	M16	x 110	355	179962	110	87	179050	18093	171	135	49	39	113	51,3
340	x	425	158	142	135	28	M16	x 110	355	191209	103	83	190250	19131	164	131	42	34	113	54,1
360	x	455	183	165	158	24	M18	x 140	485	209622	84	67	208570	20978	130	103	38	30	117	75,4
380	x	475	183	165	158	27	M18	x 140	485	248927	90	72	247670	24980	141	113	38	30	131	79
400	x	495	183	165	158	32	M18	x 140	485	310552	101	82	308990	31104	162	131	40	32	156	82,8
420	x	515	183	165	158	32	M18	x 140	485	326079	96	78	324440	32655	157	128	35	28	155	86,5
440	x	545	200	180	172	27	M20	x 140	690	372775	91	74	370900	37338	147	119	35	28	170	110
460	x	565	200	180	172	27	M20	x 140	690	389719	87	71	387760	39026	143	117	31	25	170	114
480	x	585	200	180	172	30	M20	x 140	690	451848	93	76	449500	46004	155	127	30	25	192	119
500	x	605	200	180	172	30	M20	x 140	690	470675	89	74	468300	47224	151	125	27	22	189	123
520	x	630	220	200	190	32	M20	x 150	690	522135	80	66	519500	52395	134	110	27	22	202	148
540	x	650	220	200	190	32	M20	x 150	690	542218	77	64	539400	55205	131	109	24	20	204	154
560	x	670	220	200	190	36	M20	x 150	690	632587	84	70	629400	63421	144	120	24	20	227	160
580	x	690	220	200	190	36	M20	x 150	690	655180	81	68	651890	65573	141	119	21	18	226	165
600	x	710	220	200	190	36	M20	x 150	690	677772	78	66	674370	67823	138	117	18	16	226	170
620	x	730	220	200	190	36	M20	x 150	690	700364	76	64	696850	70074	136	115	16	13	226	175
640	x	750	220	200	190	36	M20	x 150	690	722957	73	63	705037	159967	132	113	15	13	500	180
660	x	770	220	200	190	40	M20	x 150	690	828388	79	68	783300	269570	142	122	16	14	817	194
680	x	790	220	200	190	40	M20	x 150	690	853491	77	66	783300	338951	138	119	15	13	997	199
700	x	810	220	200	190	40	M20	x 150	690	878593	75	64	783300	397954	134	116	15	13	1137	205
720	x	830	220	200	190	40	M20	x 150	690	903696	73	63	783300	450675	131	113	15	13	1252	210
740	x	850	220	200	190	42	M20	x 150	690	975239	74	65	822500	524008	133	116	15	13	1416	216
760	x	870	220	200	190	42	M20	x 150	690	1001596	72	63	822500	571567	130	113	14	13	1504	221
780	x	890	220	200	190	42	M20	x 150	690	1027954	70	62	822500	616590	127	111	14	12	1581	227
800	x	910	220	200	190	42	M20	x 150	690	1054312	69	60	822500	659597	123	108	14	12	1649	232

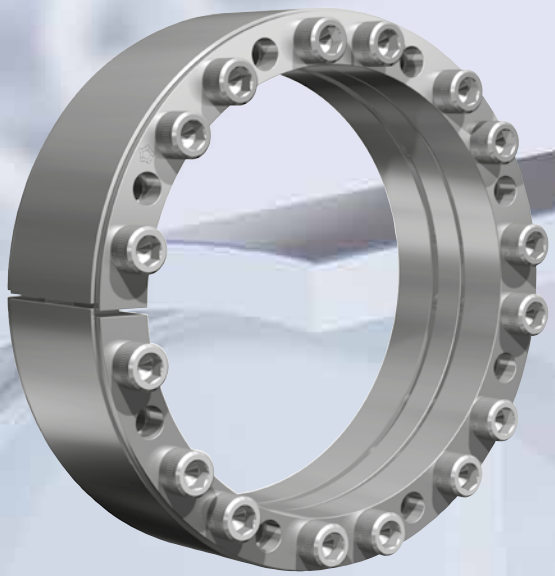
Ordering example: RfN 7015.1

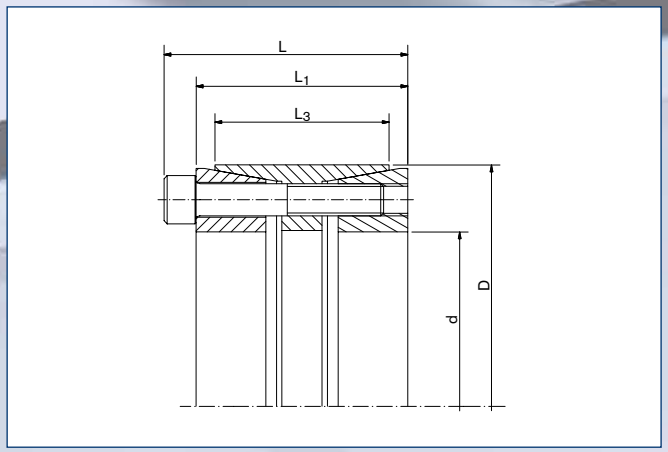
Series	d	D
RfN 7015.1	620	730

- **Surface finishes**
  For shaft and hub bores
  $R_a \leq 3{,}2$ µm
- **Tolerances**
  We recommend the following mounting tolerances
  For shaft h8 · Hub H8

Remark! The values of the shaft- and hub pressures have been calculated with the screw tightening shown in the tables. Reduction of the screw tightening torque results in different calculation values! The specified pressures at $M_{bmax.}$ are sometimes very low. An operation near these limit values may therefore lead to increased fretting corrosion!

Locking Assemblies for bending moments **RfN 7515**





Locking Assembly RfN 7515 · Dimensions

Explanations to tables

Basic dimensions when screws are not tightened

d	=	**Inner diameter**
D	=	**Outer diameter**
L	=	**Overall length**
L_1	=	**Overall length without screws**
L_3	=	**Width of inner ring**
n_{Sc}	=	**Quantity of locking srews**
D_G	=	**Thread**
T_A	=	**Max. tightened torque of the locking screws**
T	=	**Transmissible torque at given T_A**
p_W	=	**Surface pressure on shaft at given T_A**
p_N	=	**Surface pressure on hub at given T_A**
$M_b$max.	=	**Max. bending moment under the specified T_A**
$T_{res.}$ at $M_b$max.	=	**Remaining transmissible torque at indicated M_b and T_{Ared}**
$p_W$max. at $M_b$max.	=	**Max. surface pressure on shaft at max. bending moment**
$p_N$max. at $M_b$max.	=	**Max. surface pressure on hub at max. bending moment**
$p_W$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
$p_N$min. at $M_b$max.	=	**Min. surface pressure on hub at max. bending moment.**
F_{ax} at $M_b$max.	=	**Transmissible axial force at max. bending moment**
G_W	=	**Weight**

Locking Assemblies for bending moments **RfN 7515**

Locking Assembly dimensions						Locking screws ISO 4762-12.9 Thread													
d	x	D	L	L_1	L_3	n_{Sc}	D_G	T_A	T	p_W	p_N	$M_b$max.	$T_{res.}$ at $M_b$max.	p_{Wmax} p_{Nmax} at $M_b$max.		p_{Wmin} p_{Nmin} at $M_b$max.		F_{ax} at $M_b$max.	Gw
mm			mm					Nm	Nm	N/mm²		Nm		N/mm²				kN	kg
60	x	95	58	50	42	8	M8 x 40	41	4299	186	118	2800	3262	228	144	145	91	109	1,48
70	x	110	70	60	50	8	M10 x 50	83	7280	197	125	5040	5253	242	154	152	97	150	2,7
80	x	120	70	60	50	10	M10 x 50	83	10399	216	144	7210	7494	272	181	159	106	187	2,7
90	x	130	70	60	50	11	M10 x 50	83	12869	211	146	8890	9305	272	189	149	103	207	2,9
100	x	145	82	70	60	10	M12 x 60	145	18881	209	144	10080	15965	254	175	163	112	319	4,3
110	x	155	82	70	60	10	M12 x 60	145	20769	190	135	11070	17573	235	167	144	102	320	4,5
120	x	165	82	70	60	11	M12 x 60	145	24923	191	139	14490	20278	246	179	137	99	338	5
130	x	180	91	79	65	14	M12 x 70	145	34364	207	150	19710	28150	262	190	152	110	433	6,6
140	x	190	91	79	65	15	M12 x 70	145	39651	206	152	19440	34558	257	189	156	115	494	7
150	x	200	91	79	65	15	M12 x 70	145	42483	193	144	27270	32575	259	194	127	95	434	7,5
160	x	210	91	79	65	16	M12 x 70	145	48336	193	147	22050	43014	243	185	143	109	538	7,9
170	x	225	106	92	78	15	M14 x 80	230	65790	195	147	30900	58082	243	183	147	111	683	10,9
180	x	235	106	92	78	15	M14 x 80	230	69660	184	141	44820	53327	250	191	118	90	593	11,4
190	x	250	116	102	88	16	M14 x 80	230	78432	165	125	54460	56442	226	172	104	79	614	14,6
200	x	260	116	102	88	18	M14 x 80	230	92880	176	135	40470	83600	219	169	133	102	836	14,8
220	x	285	126	110	96	15	M16 x 90	355	116459	173	133	75870	88353	236	182	109	84	803	19,9
240	x	305	124	108	96	20	M16 x 90	355	169394	211	166	43460	163724	245	193	176	139	1364	21,5
260	x	325	127	111	96	20	M16 x 90	355	183510	176	141	67410	170681	221	177	130	104	1313	22,9
280	x	355	131	111	96	15	M20 x 90	690	230199	205	162	112140	201038	277	219	133	105	1436	33,1
300	x	375	131	111	96	16	M20 x 90	690	263085	204	163	125280	231341	279	223	129	103	1542	30,6
320	x	405	156	136	124	20	M20 x 110	690	350780	189	150	170050	306805	252	199	126	100	1918	46,3
340	x	425	156	136	124	20	M20 x 110	690	372704	178	143	206820	310054	250	200	106	85	1824	48,9
360	x	455	175	155	140	20	M22 x 130	930	487557	174	137	265770	408752	239	189	108	85	2271	66,2
380	x	475	175	155	140	20	M22 x 130	930	514644	164	132	350820	376541	247	197	82	66	1982	69,5
400	x	495	175	155	140	22	M22 x 130	930	595903	172	139	369270	467697	254	205	89	72	2338	73,4
420	x	515	175	155	140	24	M22 x 130	930	682580	179	146	286396	619591	239	195	118	96	2950	76,5
440	x	535	175	155	140	24	M22 x 130	930	715084	170	140	387810	600790	249	205	92	75	2731	80
460	x	555	175	155	140	24	M22 x 130	930	747588	163	135	463939	586215	253	210	73	61	2549	83
480	x	575	175	155	140	25	M22 x 130	930	812595	163	136	437178	684972	244	204	81	68	2854	86
500	x	595	175	155	140	25	M22 x 130	930	846453	156	131	436816	725034	234	197	78	66	2900	90
520	x	615	175	155	140	28	M22 x 130	930	985949	168	142	506360	845987	255	216	81	69	3254	93
540	x	635	175	155	140	28	M22 x 130	930	1023870	162	138	629600	807412	266	226	58	49	2990	96
560	x	655	175	155	140	30	M22 x 130	930	1137633	167	143	541600	1000439	254	217	81	69	3573	101
580	x	675	175	155	140	30	M22 x 130	930	1178263	162	139	664900	972734	264	227	59	51	3354	104
600	x	695	175	155	140	30	M22 x 130	930	1218893	156	135	782334	934694	272	235	40	34	3116	108
620	x	715	175	155	140	30	M22 x 130	930	1259522	151	131	909163	871676	282	244	20	18	2812	112
640	x	735	175	155	140	30	M22 x 130	930	1300152	146	128	631858	1136288	234	204	58	51	3551	116

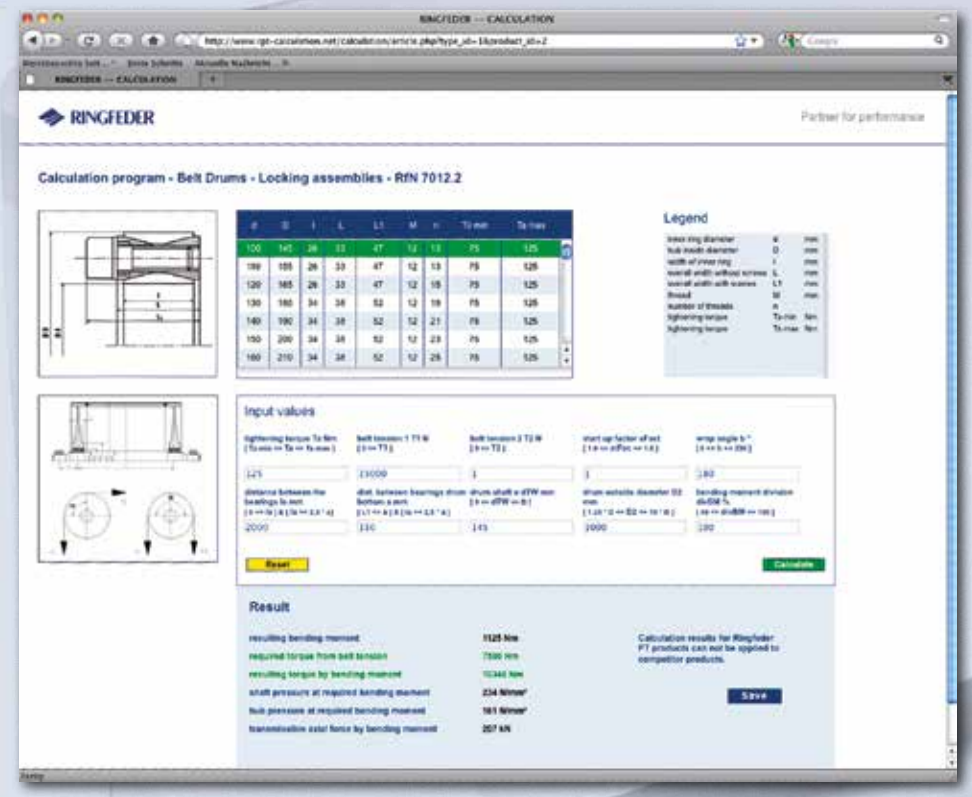
Ordering example: RfN 7515

Series	d	D
RfN 7515	300	375

- **Surface finishes**
  For shaft bores $R_a \leq 1{,}6$ µm
  For hub bores $R_a \leq 3{,}2$ µm
- **Tolerances**
  We recommend the following mounting tolerances
  For shaft h8 · Hub H8

Remark! The values of the shaft- and hub pressures have been calculated with the screw tightening shown in the tables. Reduction of the screw tightening torque results in different calculation values! The specified pressures at $M_{bmax.}$ are sometimes very low. An operation near these limit values may therefore lead to increased fretting corrosion!

Calculation program



In order to meet the complex requirements on the correct design and selection of RINGFEDER products under bending moment loading, RINGFEDER POWER TRANSMISSION GMBH has developed a calculation program.

This calculation program offers the engineer a valuable aid in the calculation of forces and loads occurring in materials subject to bending moment.

After the product has been selected, e.g. RfN 7012, RfN 7012.2, RfN 7015.0, RfN 7015.1 or RfN 7515, the engineer first selects the required diameter of the Locking Assembly. After this, the engineer can make his input and start the calculation.

The results field shows immediately whether the torque resulting from the belt tensions is above the required torque, in addition to the output of further calculation results, and whether the product complies with the loads under bending moment loading at the selected size.

Interested? Visit our website **www.ringfeder.com!**

Fax Inquiry

+49 (0) 6078 9385-100

For a design proposal using RINGFEDER® Locking Assemblies in belt drums

To: RINGFEDER POWER TRANSMISSION GMBH / sales.international@ringfeder.com

From:

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Contact: .....

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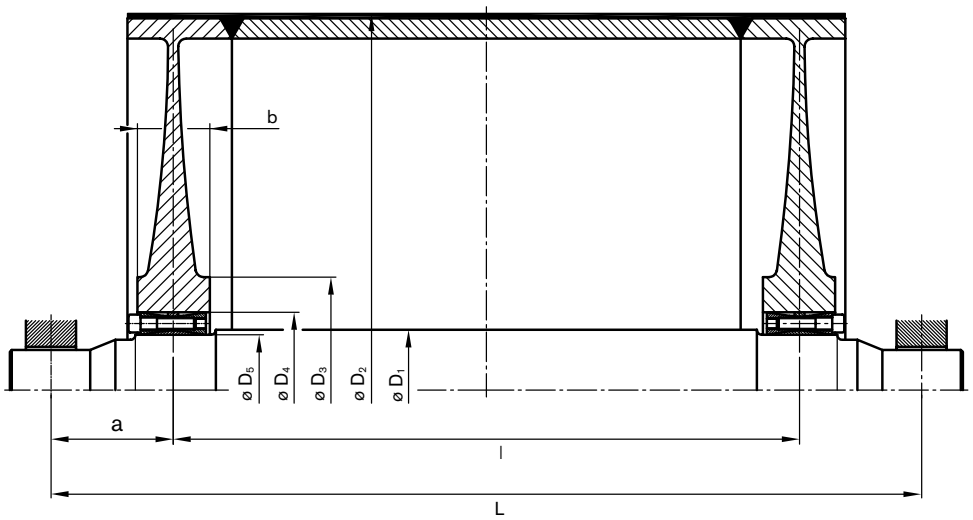
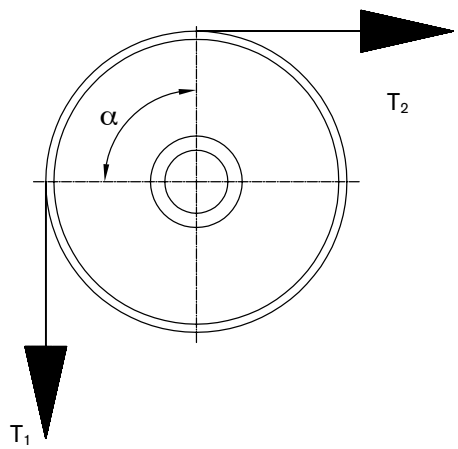
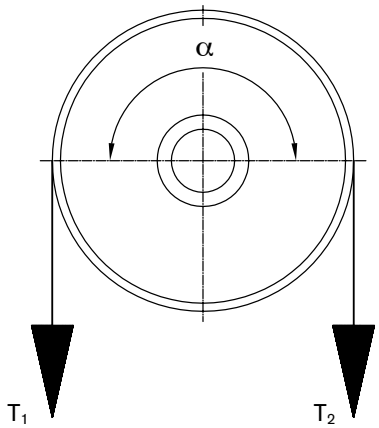






Dimensions:

D_1	=	_____	mm
D_2	=	_____	mm
D_3	=	_____	mm
D_4	=	_____	mm
D_5	=	_____	mm
L	=	_____	mm
l	=	_____	mm
a	=	_____	mm
b	=	_____	mm

Hub material/yield point:

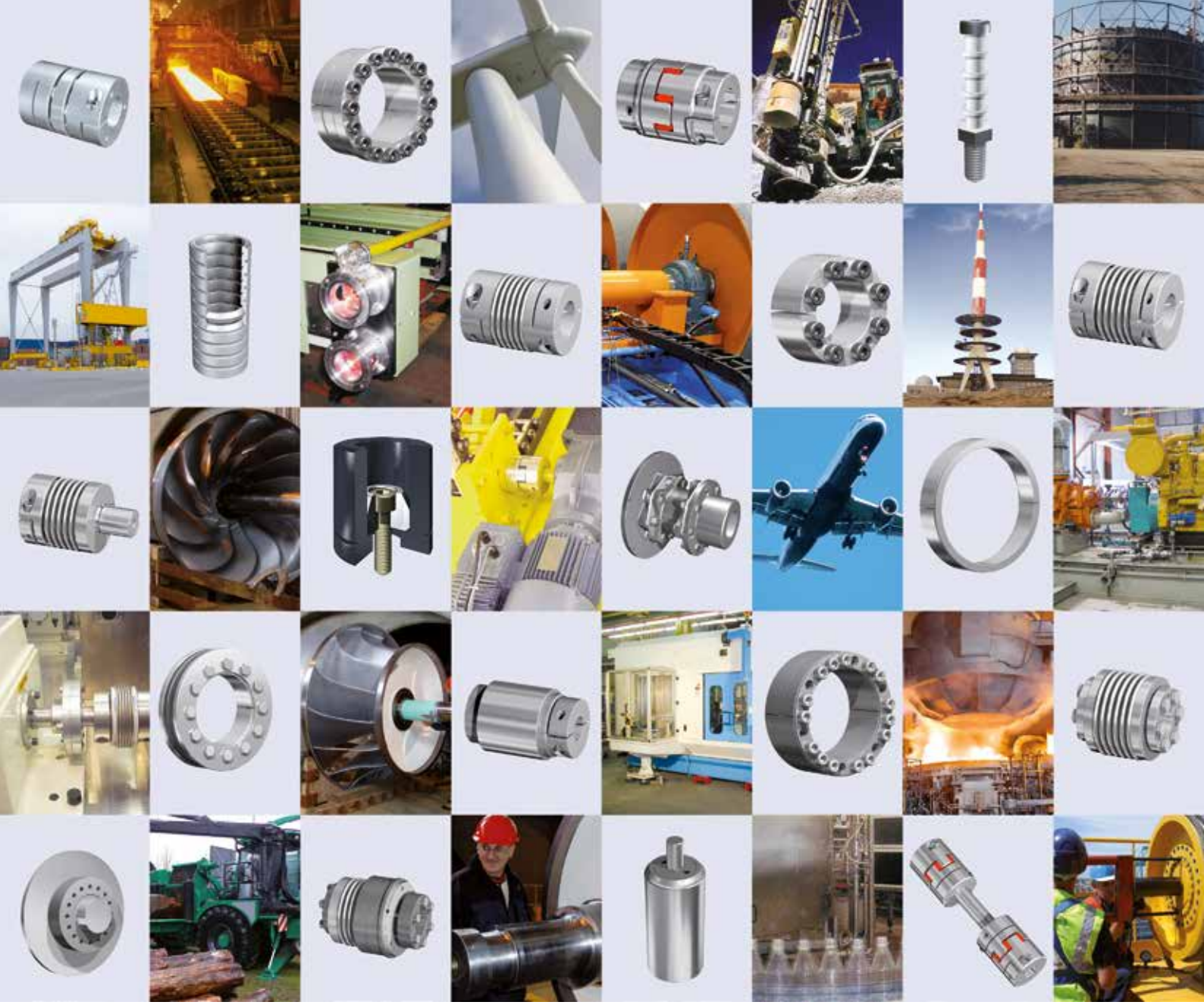
Rp0,2N	=	_____	N/mm^2

Shaft material/yield point:

Rp0,2W	=	_____	N/mm^2

Loads:

T_1	=	_____	N
a	=	_____	°
T_2	=	_____	N



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