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Locking Elements



RfN 8006 solid



RfN 8006 slit

EN 01.2023

Product Paper & Tech Paper



100 YEARS EMPOWERING TOMORROW SINCE 1922



Machine Building



Aviation & Aerospace



Process Technology

Welcome

Your System Partner for Drive and Damping Technology

We say what we mean and mean what we say.

We see things from our customers' perspective.

We are considerate of our employees and their families as well as of our environment and society.



Movement



Energy



Extraction

RINGFEDER POWER TRANSMISSION is the international market leader in niche markets for drive and damping technology. We develop, manufacture and supply superior Shaft-Hub Connections, Damping Components, Couplings, Brake Systems and Bearing Housings for highest functionality and durability requirements in a wide range of technology sectors worldwide. Not only do we always provide our ambitious customers with competent advice based on over 100 years of experience and expertise, but also realize need-based, application-oriented solutions together with them that guarantee safe, failure-free and economic machine and plant operation – with our aspiration to be **Partner for Performance**.

Our customer promise for your specific use case:

- Excellent know-how for maximum performance and reliability
- Best cost-benefit ratio
- Short reaction times and high product availability



Quality & Expertise

One century of competence and experience

As pioneer and market leader for premium systems and components of drive and damping technology, we stand for outstanding professional competence, superior product and service quality as well as excellent customer focus. For your advantage, we consistently combine highest quality standards, continuous optimization and profound consulting – no matter how, where and when forces must be transmitted or damped.

Reliability & Trust

From the requirement to the optimum result

Whether customized special design or proven standard type, highly specific individual or holistic system solution: As a competent, professional and service-oriented partner, we support and accompany you from the initial clarification of your requirements to the successful completion of your purpose – and, of course, also beyond.



Your Projects, Our Drive

Anytime & Anywhere

Locally on-site for you worldwide

Thanks to national and international development, manufacturing and sales locations as well as a worldwide service and partner network, we are at your side around the globe directly and locally with qualified technical support and fast product availability – around the clock, seven days a week, of course also and particularly in urgent maintenance and repair cases.

Digital & Online

Always find the right information instantly

Discover the latest company and product information, download CAD models, brochures and data sheets, use our calculation and selection program for shaft-hub connections, arrange a video consultation appointment with one of our specialists and much more – quickly, easily, with no obligation and at any time. Convince yourself on our website at www.ringfeder.com.

RINGFEDER®
Locking Elements

Introduction

For over 90 years, our product offering of RINGFEDER® Locking Elements has been unparalleled in the industry. Products that offer you the highest level of quality and precision. RINGFEDER® Locking Elements are wear- and maintenance-free.

Characteristics

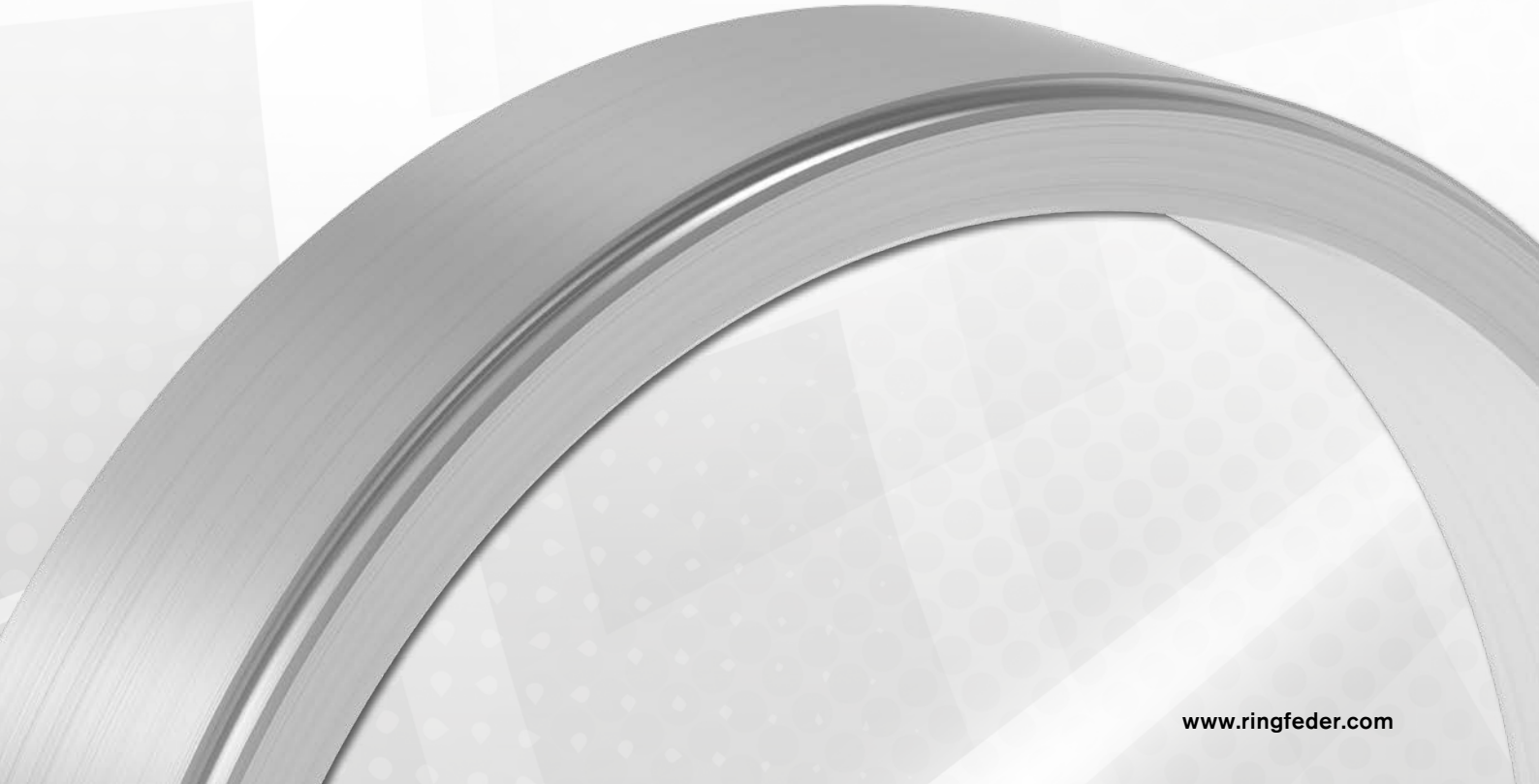
- **Customized application** – by varying the number of Locking Elements, size and quantity of clamping screws, the connection can be adapted to fit most applications concerning surface pressures, materials, hub/shaft dimensions and available mounting space.
- **Transmission of high loads** – to increase the transmissible torque and axial forces up to 4 Locking Elements can be used in series.
- **Maximum reliability** – no matter whether the connection is subjected to static, pulsating, dynamic or intermittent loads.
- **Simple manufacture** – shaft and hub are designed without keyway. Apart from this, relatively large tolerances are admissible.
- **Easy adjustability** – Locking Elements work without positive connection. So they can be adjusted at any place to any position by following the simple installation and removal instructions.
- **Backlash-free** – no risk of swinging out.
- **High fatigue strength under alternating torsional stresses** – as neither the shaft nor the hub have grooves the notch effect is minimized and a higher polar section modulus is given, enabling the use of smaller diameters.
- **Simple installation** – in comparison to cross-press fits temperature treatments and fitting are eliminated. Screws have to be tightened with standard tools.
- **Easy removal** – The clamping elements RfN 8006 are loosened after releasing the clamping screws. Shaft and hub are fully mobile.
- **Wear and maintenance-free** – unlimited lifetime if designed and used correctly.



RINGFEDER®
RfN 8006 solid



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RfN 8006 slit



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 srews are used which act on the Locking Elements via a thrust flange. According to the required tension force, the selection according to screw quality, size and quantity can be done according to the chart below.

	Regular thread [1], metric					
	8.8		10.9		12.9	
d_G	T_A	F_V	T_A	F_V	T_A	F_V
M4	2,9	3 900	4,1	5 450	4,9	6 550
M5	6,0	6 350	8,5	8 950	10,0	10 700
M6	10,0	9 000	14,0	12 600	17,0	15 100
M8	25,0	16 500	35,0	23 200	41,0	27 900
M10	49,0	26 200	69,0	36 900	83,0	44 300
M12	86,0	38 300	120,0	54 000	145,0	64 500
M14	135,0	52 500	190,0	74 000	230,0	88 500
M16	210,0	73 000	295,0	102 000	355,0	123 000
M18	290,0	88 000	405,0	124 000	485,0	148 000
M20	410,0	114 000	580,0	160 000	690,0	192 000
M22	550,0	141 000	780,0	199 000	930,0	239 000
M24	710,0	164 000	1000,0	230 000	1200,0	276 000
M27	1050,0	215 000	1500,0	302 000	1800,0	363 000
M30	1450,0	262 000	2050,0	368 000	2400,0	442 000

1) T_A = tightening torque [Nm]
F_V = initial clamping force [N] (screws oiled, μ_{ges} = 0,14)

Mounting of Locking Element

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

Surface finishes

For shaft and hub bore:

$$R_a \leq 1\ \mu m$$

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 when using elements in series:

Applicable here:

$$F_{A'n} = \frac{F_{A'}}{m} \quad \text{and} \quad P_N = \frac{p}{m}$$

With 2 / 3 / 4 Locking Elements, **m = 1,555 / 1,86 / 2,03**

Recommended fits for customer shaft and hub. Please contact our technical department.

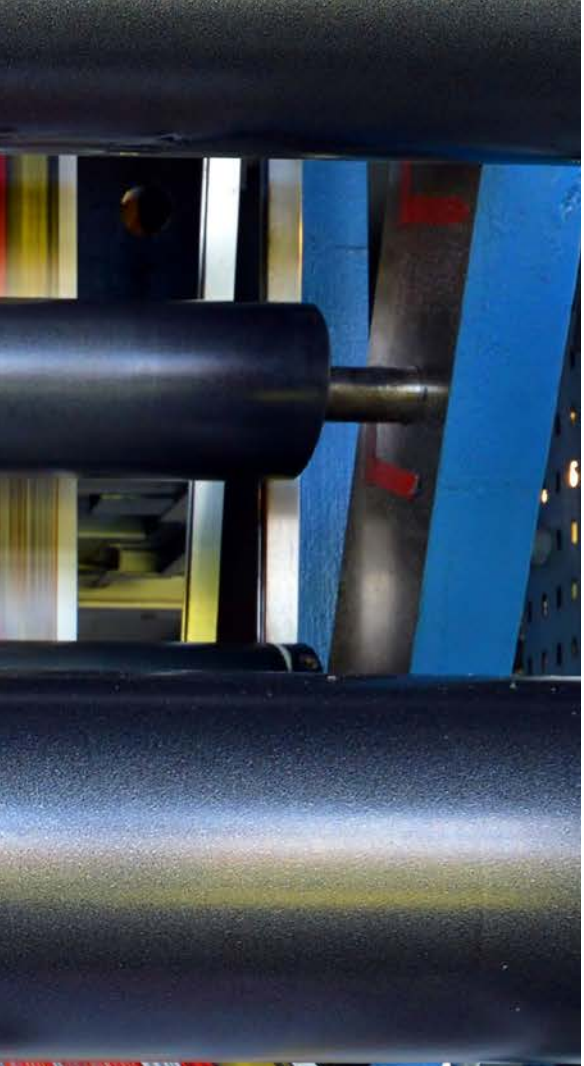
Disclaimer of liability
All technical details and notes are non-binding and cannot be used as a basis for legal claims. The user is obligated to determine whether the represented products meet his requirements. We reserve the right carry out modifications at any time in the interests of technical progress.

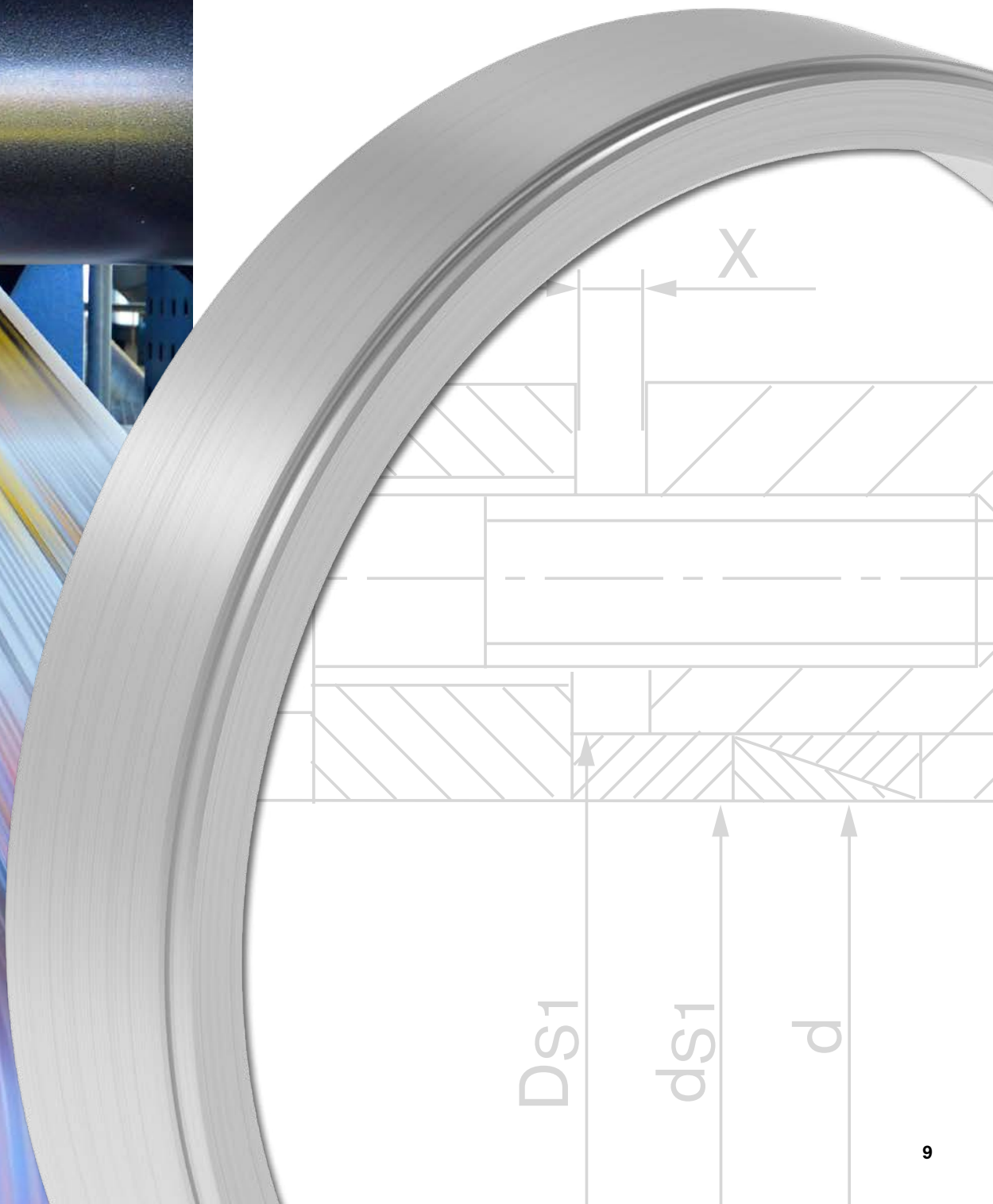


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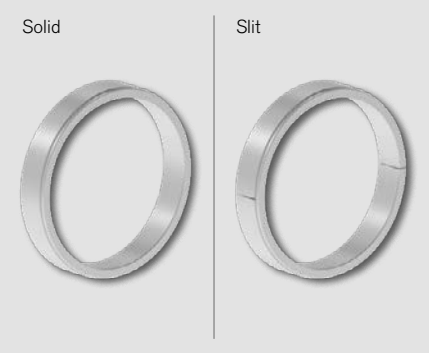
Locking Elements
RINGFEDER®

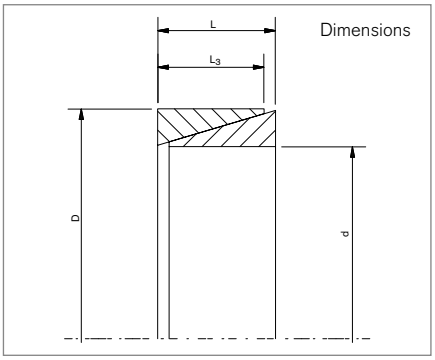
Tables & Values

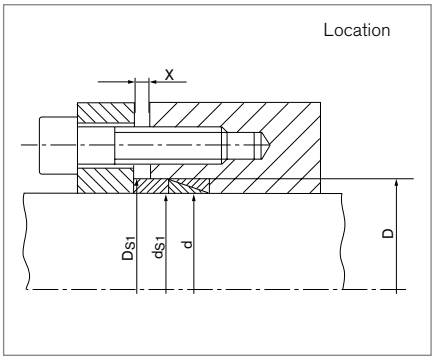




Locking Elements
RINGFEDER® RfN 8006







Locking Element dimensions						Clamping force		Transmissible torques or axial forces		Locking Elements					Diameter spacer sleeve		
										1 | 2 | 3 | 4					inside | outside		
d	x	D	L	L_3	A_t	F_0	$F_{A'}$	T_{100}	F_{ax100}	x				Gw	d_{S1}	D_{S1}	T_{max}
mm			mm		mm^2	kN	kN	Nm	N	mm				kg	mm		Nm
*6	x	9	4,5	3,7	69	-	3,7	2,5	830	2	2	3	3	0,0015	6,1	8,9	7,8
*7	x	10	4,5	3,7	80	-	4,4	3,4	970	2	2	3	3	0,0014	7,1	9,9	10
*8	x	11	4,5	3,7	90	-	5	4,4	1100	2	2	3	3	0,0015	8,1	10,9	13
9	x	12	4,5	3,7	105	7,6	5,7	5,7	1270	2	2	3	3	0,0017	9,1	11,9	8,7
10	x	13	4,5	3,7	116	6,95	6,3	7	1400	2	2	3	3	0,0018	10,1	12,9	12
11	x	14	4,5	3,7	128	7,5	6,9	8	1500	2	2	3	3	0,002	11,1	13,9	15
12	x	15	4,5	3,7	139	6,9	7,5	10	1670	2	2	3	3	0,0022	12,1	14,9	19
13	x	16	4,5	3,7	151	6,4	8,2	12	1810	2	2	3	3	0,0023	13,1	15,9	23
14	x	18	6,3	5,3	233	11,2	12,6	20	2800	3	3	4	5	0,0049	14,1	17,9	34
15	x	19	6,3	5,3	250	10,7	13,5	23	3000	3	3	4	5	0,0053	15,1	18,9	41
16	x	20	6,3	5,3	266	10,1	14,4	26	3190	3	3	4	5	0,0055	16,1	19,9	48
17	x	21	6,3	5,3	283	9,5	15,3	29	3400	3	3	4	5	0,0058	17,1	20,9	56
18	x	22	6,3	5,3	300	9,1	16,2	33	3600	3	3	4	5	0,0061	18,1	21,9	65
19	x	24	6,3	5,3	316	12,6	17,1	36	3790	3	3	4	5	0,0078	19,2	23,8	91
20	x	25	6,3	5,3	333	12,0	18	40	4000	3	3	4	5	0,0082	20,2	24,8	103
22	x	26	6,3	5,3	366	9,0	19,8	48	4400	3	3	4	5	0,0072	22,2	25,8	100
24	x	28	6,3	5,3	400	8,3	21,6	58	4800	3	3	4	5	0,0079	24,2	27,8	122
25	x	30	6,3	5,3	416	9,9	22,5	62	5000	3	3	4	5	0,01	25,2	29,8	171
28	x	32	6,3	5,3	466	7,4	25,2	78	5600	3	3	4	5	0,009	28,2	31,8	171
30	x	35	6,3	5,3	499	8,5	27	90	6000	3	3	4	5	0,012	30,2	34,8	252
32	x	36	6,3	5,3	533	7,8	28,8	102	6400	3	3	4	5	0,01	32,2	35,8	223
35	x	40	7	6	659	10,1	35,6	138	7900	3	3	4	5	0,02	35,2	39,8	339
36	x	42	7	6	678	11,6	36,6	147	8200	3	3	4	5	0,02	36,2	41,8	439
38	x	44	7	6	716	11,0	38,7	163	8600	3	3	4	5	0,02	38,2	43,8	492
40	x	45	8	6,6	829	13,8	45	199	9950	3	4	5	6	0,02	40,2	44,8	428
42	x	48	8	6,6	870	15,6	47	219	10400	3	4	5	6	0,03	42,2	47,8	580
45	x	52	10	8,6	1215	26,1	66	328	14600	3	4	5	6	0,05	45,2	51,8	750
48	x	55	10	8,6	1296	24,6	70	373	15600	3	4	5	6	0,05	48,2	54,8	865
50	x	57	10	8,6	1350	23,5	73	405	16200	3	4	5	6	0,05	50,2	56,8	948
55	x	62	10	8,6	1485	21,8	80	490	17800	3	4	5	6	0,05	55,2	61,8	1160

To continue see next page

Locking Elements RINGFEDER® RfN 8006

Locking Element dimensions						Clamping force		Transmissible torques or axial forces		Locking Elements					Diameter spacer sleeve		
										1	2	3	4		inside	outside	
d	x	D	L	L_3	A_t	F_0	$F_{A'}$	T_{100}	F_{ax100}	x				Gw	d_{S1}	D_{S1}	T_{max}
mm			mm		mm^2	kN	kN	Nm	N	mm				kg	mm		Nm
56	x	64	12	10,4	1829	29,4	99	615	22000	3	4	5	7	0,07	56,2	63,8	1370
60	x	68	12	10,4	1959	27,4	106	705	23500	3	4	5	7	0,07	60,2	67,8	1590
63	x	71	12	10,4	2057	26,3	111	780	24800	3	4	5	7	0,08	63,2	70,8	1760
65	x	73	12	10,4	2123	25,4	115	830	25600	3	4	5	7	0,08	65,2	72,8	1880
70	x	79	14	12,2	2682	31,0	145	1120	32000	3	5	6	7	0,11	70,3	78,7	2460
71	x	80	14	12,2	2720	31,0	147	1160	32600	3	5	6	7	0,11	71,3	79,7	2530
75	x	84	14	12,2	2873	34,6	155	1290	34400	3	5	6	7	0,12	75,3	83,7	2800
80	x	91	17	15	3768	48,0	203	1810	45000	4	5	6	8	0,12	80,3	90,7	3910
85	x	96	17	15	4004	45,6	216	2040	48000	4	5	6	8	0,2	85,3	95,7	4440
90	x	101	17	15	4239	43,4	229	2290	51000	4	5	6	8	0,2	90,3	100,7	5010
95	x	106	17	15	4475	41,2	242	2550	54000	4	5	6	8	0,22	95,3	105,7	5610
100	x	114	21	18,7	5872	60,7	317	3520	70000	4	6	7	9	0,4	100,3	113,7	7950
110	x	124	21	18,7	6459	66,0	349	4250	77000	4	6	7	9	0,4	110,3	123,7	9570
120	x	134	21	18,7	7046	60,2	380	5050	84000	4	6	7	9	0,5	120,3	133,7	11500
130	x	148	28	25,3	10328	96,2	558	8050	124000	5	7	9	11	0,85	130,4	147,6	17300
140	x	158	28	25,3	11122	89,0	600	9350	134000	5	7	9	11	0,91	140,4	157,6	20200
150	x	168	28	25,3	11916	84,5	643	10700	143000	5	7	9	11	0,97	150,4	167,6	23300
160	x	178	28	25,3	12711	78,5	686	12200	152500	5	7	9	11	1,02	160,4	177,6	26600
170	x	191	33	30	16014	117,5	865	16300	192000	6	8	10	12	1,5	170,5	190,5	34900
180	x	201	33	30	16956	111,2	916	18300	204000	6	8	10	12	1,6	180,5	200,5	26681
190	x	211	33	30	17898	105,0	966	20400	214000	6	8	10	12	1,7	190,5	210,5	29896
200	x	224	38	34,8	21854	134,0	1180	26200	262000	6	8	11	13	2,3	200,6	223,4	37870
210	x	234	38	34,8	22947	127,0	1239	28900	275000	6	8	11	13	2,5	210,6	233,4	41950
220	x	244	38	34,8	24040	122,0	1298	31700	288000	6	8	11	13	2,5	220,6	243,4	46189
230	x	257	43	39,5	28527	165,0	1540	39400	342000	6	9	12	14	3,4	230,6	256,4	56482
240	x	267	43	39,5	29767	157,5	1610	43000	358000	6	9	12	14	3,5	240,6	266,4	61739
250	x	280	48	44	34700	190,0	1870	52000	415000	7	10	13	16	4,7	250,8	279,2	74503
260	x	290	48	44	36100	182	1950	56500	435000	7	10	13	16	4,8	260,8	289,2	80845
270	x	300	48	44	37500	177	2030	61000	450000	7	10	13	16	4,9	270,8	299,2	87356
280	x	313	53	49	43100	206	2330	72500	520000	7	11	14	17	6,3	280,8	312,2	103565
290	x	323	53	49	44600	222	2410	77500	535000	7	11	14	17	6,5	290,8	322,2	110590
300	x	333	53	49	46200	214	2490	83000	555000	7	11	14	17	6,7	300,8	332,2	118644
320	x	360	65	59	59300	292	3200	114000	710000	10	15	20	25	10,9	321	359	164313
340	x	380	65	59	63000	272	3400	128500	755000	10	15	20	25	11,5	341	379	186257
360	x	400	65	59	66700	258	3600	144000	800000	10	15	20	25	12,2	361	399	209334
380	x	420	65	59	70400	269	3800	160500	845000	10	15	20	25	12,8	381	419	232702
400	x	440	65	59	74200	256	4000	178000	890000	10	15	20	25	13,5	401	439	258373
420	x	460	65	59	77800	244	4200	196000	935000	10	15	20	25	14,1	421	459	285339
440	x	480	65	59	81500	234	4400	215000	980000	10	15	20	25	14,7	441	479	313545
460	x	500	65	59	85300	224	5000	256000	1111000	10	15	20	25	16,6	501	539	354518
480	x	520	65	59	89000	239	5000	344000	1430000	10	15	20	25	16,6	501	539	385345
500	x	540	65	59	92600	229	5000	278000	1111000	10	15	20	25	16,6	501	539	417458
520	x	570	80	73	119000	338	6450	373000	1433000	12	18	24	30	26,9	521	569	568785
540	x	590	80	73	124000	326	6700	402000	7026000	12	18	24	30	27,9	541	589	612339
560	x	610	80	73	128000	314	6950	432000	1544000	12	18	24	30	28,8	561	609	657498
580	x	630	80	73	133000	304	7200	464000	1599000	12	18	24	30	29,8	581	629	704263
600	x	650	80	73	138000	331	7450	497000	1656000	12	18	24	30	30,8	601	649	752631
620	x	670	80	73	142000	321	7700	530430	1711000	12	18	24	30	31,8	621	669	802607

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Locking Elements RINGFEDER® RfN 8006

Locking Element dimensions						Clamping force		Transmissible torques or axial forces		Locking Elements					Diameter spacer sleeve		
										1	2	3	4		inside	outside	
d	x	D	L	L_3	A_t	F_0	$F_{A'}$	T_{100}	F_{ax100}	x				Gw	d_{S1}	D_{S1}	T_{max}
mm			mm		mm^2	kN	kN	Nm	N	mm				kg	mm		Nm
640	x	690	80	73	147000	311	7950	565000	1767000	12	18	24	30	32,8	641	689	854189
660	x	710	80	73	151000	302	8200	601000	1822000	12	18	24	30	33,8	661	709	907376
680	x	730	80	73	156000	294	8450	638000	1878000	12	18	24	30	34,7	681	729	962169
700	x	750	80	73	160000	286	8700	676649	1933282	12	18	24	30	35,8	701	749	1018568
720	x	770	80	73	165000	278	8950	715981	1988836	12	18	24	30	36,7	721	769	1076572
740	x	790	80	73	170000	271	9200	756424	2044390	12	18	24	30	37,7	741	789	1136182
760	x	810	80	73	174000	296	9450	797979	2099944	12	18	24	30	38,7	761	809	1197396
780	x	830	80	73	179000	289	9700	840644	2155498	12	18	24	30	39,9	781	829	1260217
800	x	850	80	73	183000	281	9900	879977	2199941	12	18	24	30	40,7	801	849	1324644
820	x	870	80	73	188000	275	10150	924753	2255496	12	18	24	30	41,7	821	869	1390677
840	x	890	80	73	193000	268	10400	970641	2311050	12	18	24	30	42,6	841	889	1458315
860	x	910	80	73	197000	263	10650	1017640	2366604	12	18	24	30	43,6	861	909	1527559
880	x	930	80	73	202000	256	10900	1065749	2422158	12	18	24	30	44,7	881	929	1598409
900	x	950	80	73	206000	250	11150	1114970	2477712	12	18	24	30	45,6	901	949	1670865
920	x	970	80	73	211000	246	11400	1165302	2533266	12	18	24	30	46,6	921	969	1744926
940	x	990	80	73	216000	240	11650	1216745	2588820	12	18	24	30	47,6	941	989	1820592
960	x	1010	80	73	220000	270	11900	1269300	2644374	12	18	24	30	48,6	961	1009	1897861
980	x	1030	80	73	225000	264	12150	1322965	2699928	12	18	24	30	49,5	981	1029	1976739
1000	x	1050	80	73	229000	259	12400	1377741	2755482	12	18	24	30	50,6	1001	1049	2057223

More sizes on request

To continue see next page

Locking Elements RINGFEDER® RfN 8006

Explanation

d = Inner diameter
D = Outer diameter
L = Overall length
L_3 = Width of ring
A_t = Bearing surface = PI*d*L3
F_0 = Clamping force for gap filling when manufacturing tolerances are exploited. Not applicable for slit versions.

$F_{A'}$ = Needed clamping force to get a shaft pressure of 100 N/mm²
T_{100} = Transmissible torque based on p = 100 N/mm²
F_{ax100} = Transmissible axial force based on p = 100 N/mm²
X (n) = Min. distance to thrust flange for n Locking Elements. Any reduction of this values could cause that the required transmission value is not achieved.

Gw = Weight
d_{S1} = Diameter spacer sleeve inside
D_{S1} = Diameter spacer sleeve outside
T_{max} = Max. transmissible torque

* Generally slit. At Locking Elements in slit version F_0 is eliminated in the calculation.

Technical information

- Mounting of Locking Element: The values for T and F_{ax}, apply to Locking Elements installed in oiled condition.
- Surface finishes: Shaft and hub bore $R_a \leq 1$ µm
- 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} : $T_n = T_1 \cdot m$ and $F_{axn} = F_{ax1} \cdot m$
- Retaining the values for T and Fax it is possible to reduce FA´ and p when using elements in series: $F_{A'n} = F_{A'}/m$ and $P_N = p/m$
- With 2 / 3 / 4 Locking Elements, m = 1,555 / 1,86 / 2,03
-

	d	Shaft	Bore
up to	38	h6	H7
above	38	h8	H8

- Recommended fits for customer shaft and hub. Please contact our technical department.
- Concentricity: 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 of the installation. Locking Elements RfN 8006 can centre themselves within the framework of their production accuracy if they are absolutely plane-parallel when pressed together.

Ordering example RfN 8006 solid

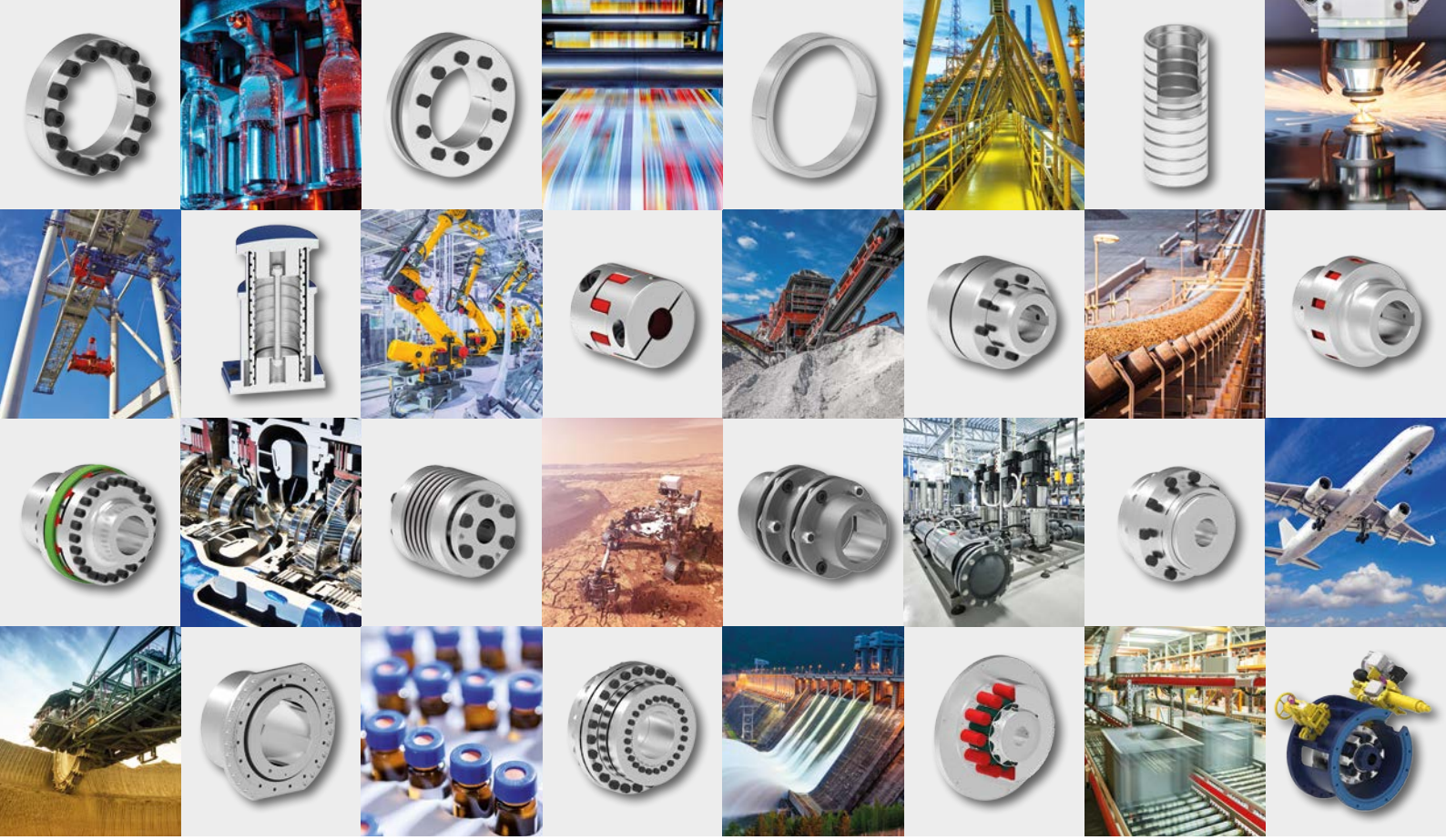
Series	d	D
RfN 8006	18	22

Ordering example RfN 8006 slit

Series	d	D	Further details
RfN 8006	18	22	G (=slit)

Further information on
RINGFEDER® RfN 8006
on **www.ringfeder.com**

Disclaimer of liability
All technical details and notes are non-binding and cannot be used as a basis for legal claims. The user is obligated to determine whether the represented products meet his requirements. We reserve the right carry out modifications at any time in the interests of technical progress.



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