



# Steel laminae couplings

Types and operating description 186

## RADEX®-N

General information and hub types 188

Types and applications 189

**Technical data 190**

Standard types 192

Customised types 194

Corrosion-resistant type for

large shaft distances 195

Standard series NANA 3 for 196

Pump drives in accordance with API 610



## RIGIFLEX®-N

General information and hub types 198

Technical data 199

Type A 201

Type A-J 202

Type A-H 203

## RIGIFLEX®-HP

Type C 204

Type L 205

### Please note: torque increase



Years of experience with applications at customer sites and additional test series in the KTR test field in Rheine enabled us to determine potentials allowing for an increase of rated and maximum torques with some sizes of this series:

RADEX®-N



RIGIFLEX®-N



RIGIFLEX®-HP



# STEEL LAMINAE COUPLINGS

## TYPES AND OPERATING DESCRIPTION

### Properties of laminae couplings





Product	RADEX <sup>®</sup> -N	RIGIFLEX <sup>®</sup> -N	RIGIFLEX <sup>®</sup> -HP
Type	Steel laminae coupling		High-performance steel laminae coupling
<b>Properties</b>			
Torsionally rigid	●	●	●
Backlash-free	●	●	●
Maintenance-free	●	●	●
Compensating for misalignment	●	●	●
<b>Special features</b>			
Stock programme	Basic programme available from stock, customised solutions available	Basic programme available from stock, customised solutions available	For customised solutions, applications in high performance ranges and on high-speed drives
Applications / core industries	Pumps, compressors, fans	Pumps, compressors, fans	Pumps, turbo compressors, turbines
API	610	610 & 671	610 & 671
<b>Performance data</b>			
Max. rated torque T <sub>KN</sub> [Nm]	280,000	280,000	330,000
Max. speed n [rpm]	20,000	23,000	17,300
Max. operating temperature T [°C]	280	280	280
<b>Standard materials</b>			
<b>Hubs</b>			
Steel (S355J2)	●	●	
Q & T steel (C45N)	●	●	
Q & T steel (42CrMo4V)			●
Q & T steel (30CrNiMo8)			●
<b>Spacers</b>			
Steel (S355J2)	●	●	
Q & T steel (C45N)	●	●	
Q & T steel (42CrMo4V)	with torsion shafts		●
Q & T steel (30CrNiMo8)	with torsion shafts		●
<b>Special materials (corrosion-resistant)</b>			
<b>Hubs</b>			
Steel (1.4305)	●		○
Steel (1.4404)	●		○
<b>Spacers</b>			
Steel (1.4305)	●		
Steel (1.4404)	●		
Spacer made of Composite GRP (fibre glass)	●	○	○
Spacer made of Composite CFRP (carbon fibre)	●		
Surface coating	Painting, phosphating, zinc-coating and passivating, Geomet, Tenifer Q	Painting, phosphating, zinc-coating and passivating, Geomet, Tenifer Q	Painting, phosphating, zinc-coating and passivating, Geomet, Tenifer Q

● ≈ Standard  
○ ≈ On request

# STEEL LAMINAE COUPLINGS

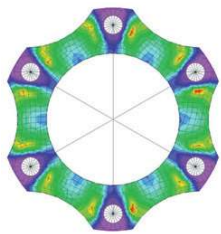
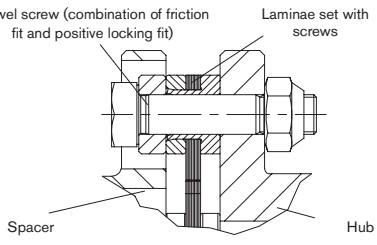
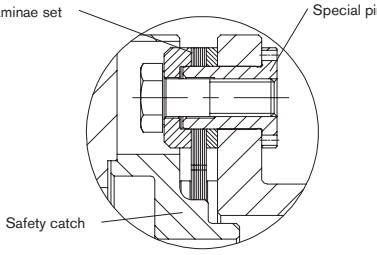
## TYPES AND OPERATING DESCRIPTION

### Product finder of laminae couplings

Product	RADEX <sup>®</sup> -N	RIGIFLEX <sup>®</sup> -N	RIGIFLEX <sup>®</sup> -HP
Type	Steel laminae coupling		High-performance steel laminae coupling
<b>Geometries</b>			
Design	Single- and double-cardanic	Double-cardanic	Double-cardanic
Max. shaft diameter [mm]	330	400	380
Radial assembly	●	●	●
<b>Certifications/type examinations</b>			
ATEX 	●	●	-
GOST R/ GOST TR 	●	●	●
DNV GL 	●	●	●
ABS 	●	●	-

● ≈ Standard

### Details on laminae couplings

<p><b>Laminas - laminae shape optimized by FEM</b></p> <p>The steel laminae sets made of high-strength, stainless spring steel were developed based on FEM calculations. Considering the necessary options of displacement of the coupling, the optimum shape with regard to torque transmission and torsional stiffness was aimed at. The waisted shape of the steel laminas on the outside diameter resulted from this optimization calculation.</p>	
<p><b>RADEX<sup>®</sup>-N - laminae sets with dowel screws</b></p> <p>The heart of the steel laminae coupling are the laminae sets and their connection to hubs and spacers. High-strength special dowel screws that are alternately screwed to hubs and spacer allow for a combination of friction fit and positive locking fit. Thus a high power density with simultaneous ease of displacement and low restoring forces is ensured.</p>	
<p><b>RIGIFLEX<sup>®</sup>-N - protecting the spacer</b></p> <p>Since our main idea with the development of RIGIFLEX<sup>®</sup>-N was to comply with the standards of API 610 and API 671, the spacer is secured by a safety catch, too. In case if the laminas break the spacer remains inside the coupling. In general the spacer is supplied along with laminae sets pre-assembled by the manufacturer. These are connected with the spacers resp. flanges fully free from backlash via positive-locking special pins.</p>	

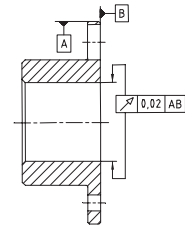
# RADEX®-N

## Steel laminae couplings

### General advice

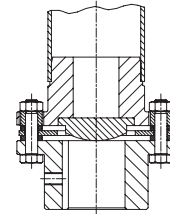
#### Advice on assembly and operation

See our mounting instructions KTR standard 47110 at [www.ktr.com](http://www.ktr.com). With the assembly it is important to make sure that the laminae sets are assembled free from distortion in axial direction. If the finish bore is machined by the customer, the concentricity and axial running tolerances have to be adhered to (see sketch).



#### Installation

RADEX®-N couplings are designed for horizontal installation. With vertical installation the spacer might have to be supported (see sketch). Please consult with us.



Typ

#### Delivery condition

RADEX®-N couplings are delivered as individual components (can be delivered assembled on request). The hubs can be supplied unbored or with finish bore and feather keyway or with a frictionally engaged shaft-hub-connection. The shaft-hub-connection needs to be inspected by the customer (consult with KTR, if necessary).



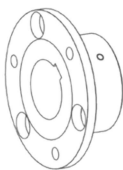
#### Balancing

On request of the customer the RADEX®-N couplings can be balanced. For standard applications this is not necessary due to accurate machining of the coupling. Please consult with us, if necessary.

#### Safety regulations

The coupling has to be dimensioned in that the permissible coupling load is not exceeded during any operating condition. For this purpose the actual loads have to be compared to the permissible parameters of the coupling. The customer has to protect rotating parts from accidental contact (Safety of Machinery DIN EN 292 part 2). Take precautions to make sure there is sufficient coupling protection in case of fracture of the coupling caused by overload.

### Types of hubs



#### Type 1.0 hub with feather keyway and setscrew

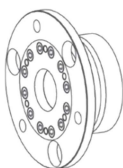
Positive locking torque transmission, permissible torque depending on the permissible surface pressure. Not suitable for backlash-free torque transmission with heavily reversing operation.

#### Type 1.1 hub without feather keyway, with setscrew

Non-positive torque transmission for crimp connections and adhesive bonds. (No ATEX approval)

#### Type 1.2 hub without feather keyway, without setscrew

Non-positive torque transmission for crimp connections and adhesive bonds. (No ATEX approval)



#### Type 6.0 clamping ring hub

Integrated frictionally engaged shaft-hub-connection for the transmission of higher torques. Clamping screws on laminae side. Transmittable torques depending on bore diameter. Suitable for high speeds.

#### Type 6.5 clamping ring hub

Integrated frictionally engaged shaft-hub-connection for the transmission of higher torques. Clamping screws from outside. Transmittable torques depending on bore diameter. Suitable for high speeds.



#### Type 2.5 clamping hub double slotted, without feather keyway

Frictionally engaged, backlash-free shaft-hub-connection. Transmittable torques depending on bore diameter. For ATEX category 3 only.

#### Type 2.6 clamping hub double slotted, with feather keyway

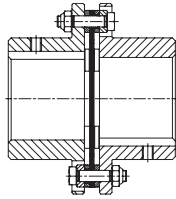
Positive shaft-hub connection with additional friction fit. The friction fit prevents respectively reduces reverse backlash.

# RADEX®-N

## Steel laminae couplings

### Types and applications

Type NN (see page 192)



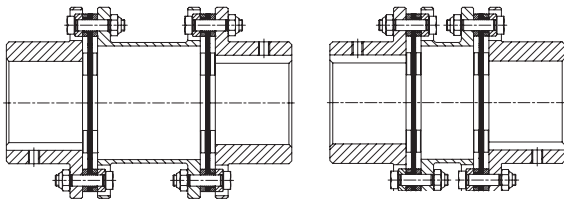
#### Properties

- Single-cardanic type
- Only angular and axial displacement permissible
- High torsional rigidity
- Compact dimensions

#### Applications

- Mixers
- Agitators
- Immersion pumps
- Fans
- Applications with high radial load

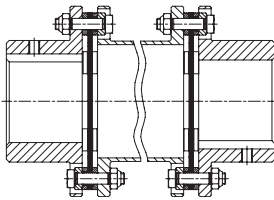
Type NANA 1/NANA 2 (see page 192)



- Double-cardanic type
- Compensating for high misalignment with low restoring forces
- Standard spacers available from stock

- Paper machines
- Printing and processing machines
- Materials handling
- Steel mills
- Generators
- Mill drives

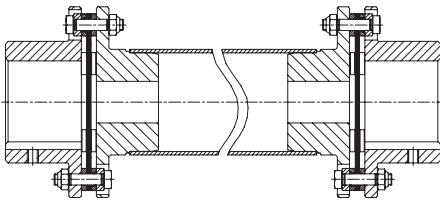
Type NANA 3 (see page 196)



- Double-cardanic type
- Spacers adapted to standard dimensions of pumps
- Radial assembly, no shifting of the machine required
- Available according to API 610

- Process pumps
- Water pumps
- Pumps according to API standard
- Turbines
- Compressors

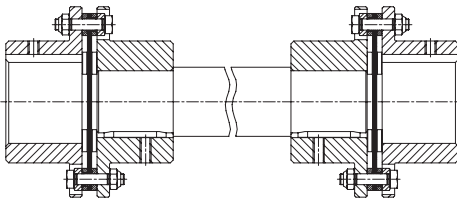
Type NANA 4 (see page 194)



- Customised spacers
- Max. shaft distance dimension up to approx. 6 m
- Welded intermediate pipes for high torsional rigidity

- Foil and paper machines
- Pallet and conveyor systems
- Robotic palletizers
- Test benches
- Cooling towers/blowers

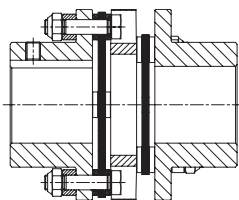
Type NNW (see page 194)



- Customised spacers
- Coupling consisting of 2-off type NN with intermediate shaft
- For drives with relatively low speeds

- Low-speed drives with large shaft distance dimensions
- Agitators
- Crushers
- Presses
- Packaging machinery

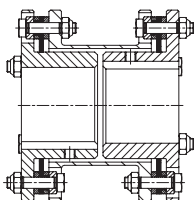
Type NNZ (see page 193)



- Compact double-cardanic coupling
- Cannot be radially assembled
- With intermediate disk
- Ideal for replacing curved-tooth gear couplings made of steel
- Standard type up to size 70

- Robotics
- Paper machines and inserters
- Machine tools
- Packaging machinery
- Test benches

Type NENE (see page 193)



- With reduced hubs
- Compact double-cardanic design
- Spacer cannot be radially assembled
- Variable spacer length

- Applications with short shaft distance dimensions
- Replacement of curved-tooth gear couplings made of steel

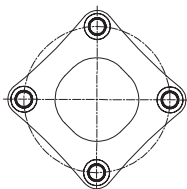
# RADEX®-N

## Steel laminae couplings

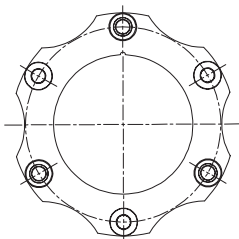
### Technical data

The following laminae types are to be distinguished with RADEX®-N:

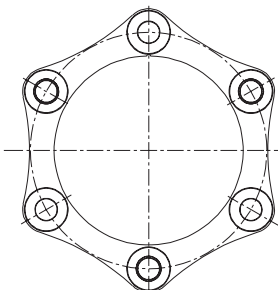
Size 20 – 50  
(laminae with 4 holes)



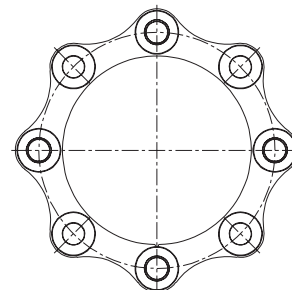
Size 60 – 135  
(laminae with 6 holes)



Size 136 – 336  
(laminae with 6 holes)



Size 138 – 338  
(laminae with 8 holes)



Torques and displacements										
Size	Laminae type	Torques [Nm] <sup>1)</sup>			Angular [°] each laminae	Perm. displacements <sup>2)</sup>				
		T <sub>KN</sub>	T <sub>K</sub> max	T <sub>KW</sub>		Axial [mm]			Radial [mm]	
						NN	NANA 1/ NANA2/ NNZ	NANA 1	NANA 2	
20		30	60	15	1.0	0.60	1.2	1.0	0.2	
25		60	120	30	1.0	0.80	1.6	1.0	0.2	
35	laminae with 4 holes	120	240	60	1.0	1.00	2.0	1.1	0.3	
38		240	480	120	1.0	1.20	2.4	1.2	0.3	
42		320	640	160	1.0	1.40	2.8	1.2	0.4	
50		470	940	235	1.0	1.60	3.2	1.5	0.4	
60		900	1800	450	1.0	1.00	2.0	1.5	0.8	
70		1300	2600	650	1.0	1.10	2.2	1.8	1.0	
80		1800	3600	900	1.0	1.30	2.6	2.1	1.2	
85		2600	5200	1300	1.0	1.30	2.6	2.2	1.2	
90		4600	9200	2300	1.0	1.00	2.0	2.2	1.1	
105		5600	11200	2800	1.0	1.20	2.4	2.4	1.4	
115		9900	19800	4950	1.0	1.40	2.8	2.5	1.5	
135	laminae with 6 holes	13500	27000	6750	1.0	1.75	3.5	3.8	–	
136		17500	35000	8750	0.7	1.85	3.7			
156		25000	50000	12500	0.7	2.10	4.2			
166		35000	70000	17500	0.7	2.25	4.5			
186		42000	84000	21000	0.7	2.40	4.8			
206		52500	105000	26250	0.7	2.60	5.2			
246		90000	180000	45000	0.7	3.00	6.0			
286		150000	300000	75000	0.7	3.35	6.7			
336		210000	420000	105000	0.7	3.75	7.5			
138		23000	46000	11500	0.5	1.30	2.6		Depending on drop-out center dimension E	
158		33000	66000	16500	0.5	1.40	2.8			
168	laminae with 8 holes	45000	90000	22500	0.5	1.50	3.0			
188		56000	112000	28000	0.5	1.60	3.2			
208		70000	140000	35000	0.5	1.75	3.5			
248		120000	240000	60000	0.5	2.00	4.0			
288		200000	400000	100000	0.5	2.40	4.5			
338		280000	560000	140000	0.5	2.50	5.0			

= Years of experience with applications at customer sites and additional test series in the KTR test field in Rheine enabled us to determine potentials allowing for an increase of the rated and maximum torques with some sizes of this series.

Permissible speeds and torsional stiffness figures					
Size	Max. speed [rpm] (higher speeds on request)	Torsion spring stiffness x 10 <sup>6</sup> [Nm/ rad] per laminae set	Size	Max. speed [rpm] (higher speeds on request)	Torsion spring stiffness x 10 <sup>6</sup> [Nm/ rad] per laminae set
20	20400	0.02	156	3500	17.00
25	16800	0.03	166	3300	19.00
35	13900	0.11	186	3000	25.00
38	12000	0.20	206	2800	31.00
42	11000	0.28	246	2300	55.00
50	9000	0.50	286	2000	79.00
60	8200	0.56	336	1800	125.00
70	7300	0.90	138	3800	20.00
80	6300	1.10	158	3500	26.00
85	5900	1.50	168	3300	30.00
90	5400	2.00	188	3000	39.00
105	5000	2.50	208	2800	49.00
115	4300	3.50	248	2300	83.00
135	3700	6.90	288	2000	125.00
136	3800	13.00	338	1800	200.00

<sup>1)</sup> For selection of coupling see page 18 et seqq.

<sup>2)</sup> The permissible displacement figures specified are maximum figures which must not arise simultaneously. If axial, radial and angular displacement arises at the same time, these values must be reduced.

# RADEX®-N

## Steel laminae couplings

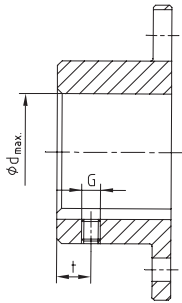
### Technical data

Weights and mass moments of inertia						
Size	Hub <sup>1)</sup> [kg] / [kgm <sup>2</sup> ]	Laminae set [kg] / [kgm <sup>2</sup> ]	NN <sup>1)</sup> complete [kg] / [kgm <sup>2</sup> ]	NANA 1 <sup>1)</sup> complete [kg] / [kgm <sup>2</sup> ]	NANA 2 <sup>1)</sup> complete [kg] / [kgm <sup>2</sup> ]	NNZ <sup>1)</sup> complete [kg] / [kgm <sup>2</sup> ]
20	0.13 / 0.00043	0.04 / 0.00002	0.3 / 0.00011	0.6 / 0.000204	-	0.4 / 0.000166
25	0.2 / 0.000116	0.08 / 0.00005	0.56 / 0.00028	0.9 / 0.000522	-	0.8 / 0.000414
35	0.6 / 0.00042	0.10 / 0.00010	1.2 / 0.00094	1.9 / 0.00158	-	1.6 / 0.00129
38	0.8 / 0.00073	0.20 / 0.00026	1.8 / 0.0017	2.8 / 0.00303	-	2.4 / 0.00247
42	1.1 / 0.00123	0.25 / 0.00040	2.4 / 0.0029	3.6 / 0.00482	-	3.1 / 0.00409
50	1.7 / 0.00291	0.46 / 0.0010	4.0 / 0.0068	6.2 / 0.0118	-	5.1 / 0.00932
60	1.9 / 0.00378	0.40 / 0.0012	4.2 / 0.0087	6.0 / 0.0141	5.8 / 0.0138	5.3 / 0.0120
70	2.8 / 0.00714	0.42 / 0.0016	6.0 / 0.016	8.6 / 0.0253	8.2 / 0.0242	7.5 / 0.0214
80	4.1 / 0.0134	0.72 / 0.0037	9.0 / 0.031	12.6 / 0.0476	12.0 / 0.0458	11.1 / 0.0410
85	5.1 / 0.0195	1.0 / 0.0065	11.2 / 0.046	16.2 / 0.0734	15.5 / 0.0711	14.8 / 0.0650
90	6.2 / 0.0282	2.3 / 0.0162	14.7 / 0.073	22.0 / 0.121	21.3 / 0.119	20.1 / 0.108
105	7.6 / 0.0414	2.2 / 0.0180	17.4 / 0.101	25.8 / 0.165	24.6 / 0.159	23.1 / 0.145
115	12.0 / 0.0899	4.0 / 0.0433	27.9 / 0.223	42.8 / 0.381	41.2 / 0.372	38.3 / 0.333
135	19.0 / 0.187	7.3 / 0.105	45.1 / 0.478	71.3 / 0.835	-	-
136	16.8 / 0.153	7.9 / 0.113	41.4 / 0.419	-	-	-
156	20.2 / 0.217	11.9 / 0.200	52.2 / 0.634	-	-	-
166	30.0 / 0.373	12.3 / 0.255	72.3 / 1.001	-	-	-
186	42.0 / 0.629	12.7 / 0.318	96.7 / 1.576	-	-	-
206	55.1 / 1.004	18.2 / 0.548	128.3 / 2.556	-	-	-
246	85.9 / 2.229	31.2 / 1.304	203.1 / 5.762	-	-	-
286	145.1 / 4.977	44.4 / 2.495	334.4 / 12.449	-	-	-
336	223.9 / 10.486	64.2 / 4.74	512.0 / 25.712	Depending on	Depending on	-
138	16.2 / 0.145	9.9 / 0.143	42.3 / 0.433	drop-out center dimension	Edrop-out center dimension E	-
158	19.5 / 0.205	14.9 / 0.252	54.0 / 0.662	-	-	-
168	29.4 / 0.360	15.2 / 0.318	74.0 / 1.038	-	-	-
188	41.7 / 0.611	15.6 / 0.396	99.0 / 1.618	-	-	-
208	54.1 / 0.971	22.4 / 0.680	130.5 / 2.622	-	-	-
248	84.0 / 2.144	38.2 / 1.605	206.2 / 5.893	-	-	-
288	142.5 / 4.823	53.8 / 3.056	338.8 / 12.702	-	-	-
338	220.1 / 10.18	78.0 / 5.817	518.2 / 26.177	-	-	-

<sup>1)</sup> Hubs with max. bore

### Cylindrical bores

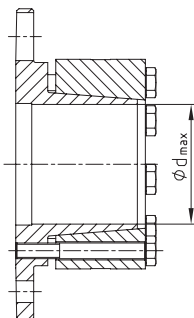
Standard hub 1.0 with feather keyway according to DIN 6885 sheet 1									
Size	d <sub>max.</sub>	G	t	T <sub>A</sub> [Nm]	Size	d <sub>max.</sub>	G	t	T <sub>A</sub> [Nm]
20	20	M5	6	2.0	105	110	M12	30	40.0
25	25	M5	8	2.0	115	120	M12	30	40.0
35	38	M6	15	4.8	135	135			
38	42	M6	15	4.8	136 / 138	135			
42	50	M8	20	10.0	156 / 158	150			
50	55	M8	20	10.0	166 / 168	170			
60	65	M8	20	10.0	186 / 188	190			
70	75	M10	20	17.0	206 / 208	210			
80	85	M10	20	17.0	246 / 248	245			
85	90	M10	25	17.0	286 / 288	290			
90	100	M12	25	40.0	336 / 338	340			
									According to customer specification



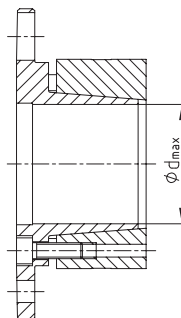
### Backlash-free shaft-hub connections without feather key

Selection: If used in potentially explosive atmospheres the clamping ring hubs must be selected in that there is a minimum safety factor of  $s = 2$  between the peak torque of the machine including all operating parameters and the nominal torque and frictional locking torque of the coupling.

Clamping ring hub type 6.5  
(clamping screws from outside)



Clamping ring hub type 6.0  
(clamping screws from inside)



Type with CLAMPEX® element type 603

