

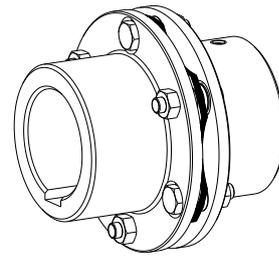


RADEX[®]-N

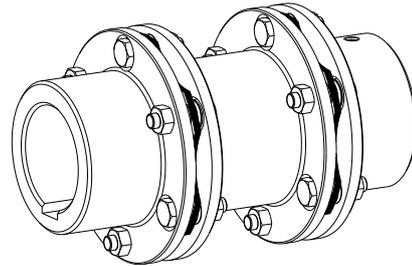
Steel lamina couplings types

NN, NANA 1 to 4,
NENA 1 and 2, NENE 1
NNZ, NNW

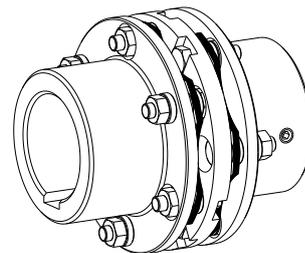
according to directive 94/9/EC
(ATEX 95) for finish bored, pilot bored
and unbored couplings



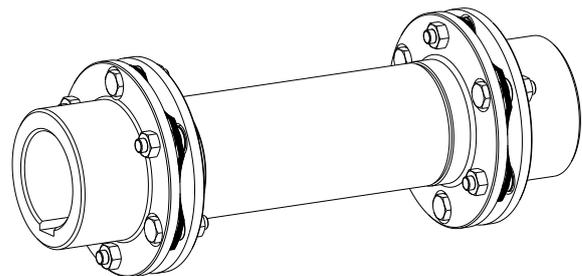
RADEX[®]-N type NN



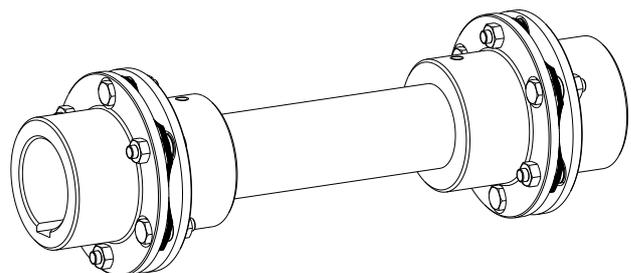
RADEX[®]-N type NANA 1



RADEX[®]-N type NNZ



RADEX[®]-N type NANA 4



RADEX[®]-N type NNW



RADEX®-N is a torsionally stiff flexible steel lamina coupling. It is able to compensate for shaft misalignment, for example caused by thermal expansion, etc.

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1 Technical data

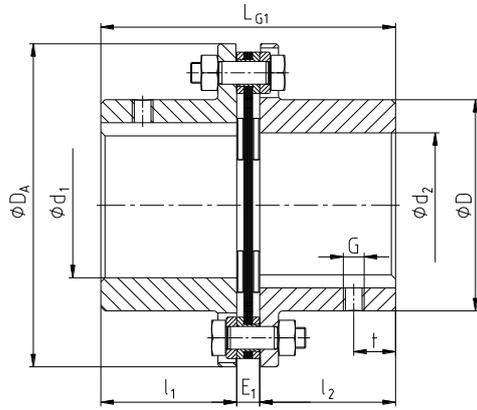


Illustration 1: RADEX®-N type NN

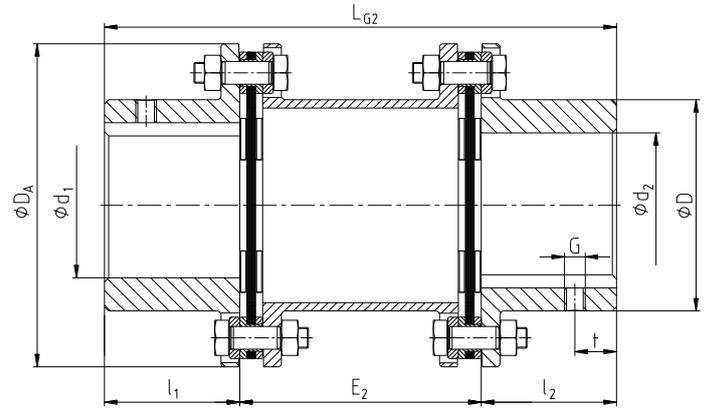


Illustration 2: RADEX®-N type NANA 1

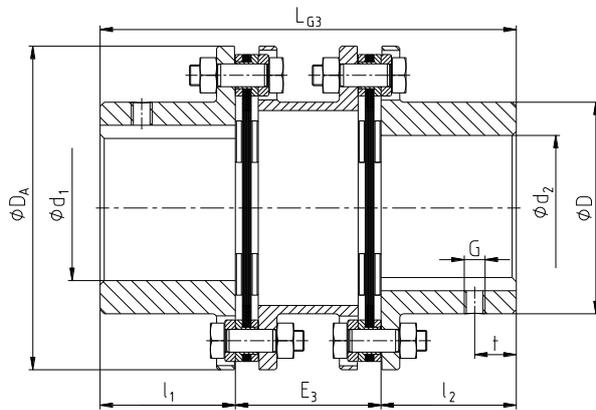


Illustration 3: RADEX®-N type NANA 2

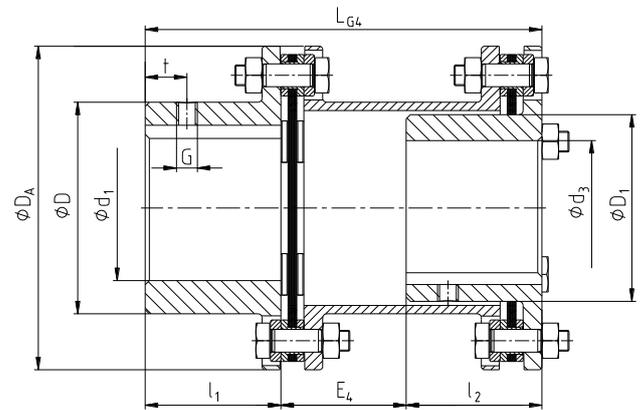


Illustration 4: RADEX®-N type NENA 1

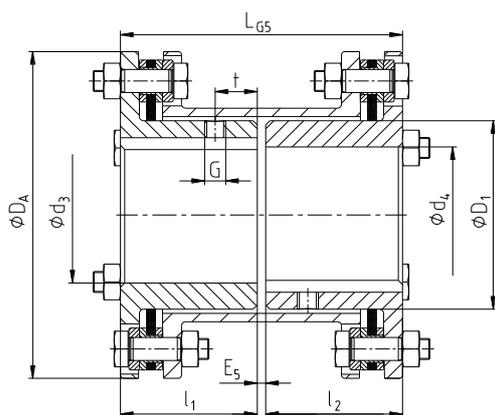


Illustration 5: RADEX®-N type NENE 1

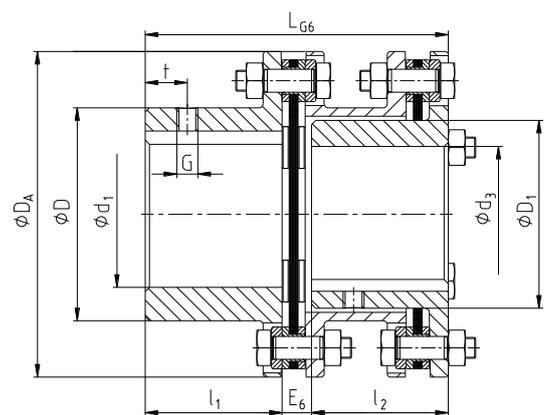


Illustration 6: RADEX®-N type NENA 2

Dimensions of the couplings see table 1, sheet 4.



1 Technical data

Table 1: Types NN - NANA 1 - NANA 2 - NENA 1 - NENE 1 - NENA 2

Size	Max. finish bore [mm]		Dimensions [mm]																
			General																
	d ₁ , d ₂	d ₃ , d ₄	D	D ₁	D _A	l ₁ , l ₂	L _{G1}	E ₁	L _{G2}	E ₂	L _{G3}	E ₃	L _{G4}	E ₄	L _{G5}	E ₅	L _{G6}	E ₆	
20	20	-	32	-	56	20	45	5	100	60	-	-	-	-	-	-	-	-	
25	25	-	40	-	68	25	56	6	110	60	-	-	-	-	-	-	-	-	
35	35	-	54	-	82	40	86	6	150	70	-	-	-	-	-	-	-	-	
38	38	-	58	-	94	45	98	8	170	80	-	-	-	-	-	-	-	-	
42	42	-	68	-	104	45	100	10	170	80	-	-	-	-	-	-	-	-	
50	50	-	78	-	126	55	121	11	206	96	-	-	-	-	-	-	-	-	
60	60	55	88	77	138	55	121	11	206	96	170	60	160	50	114	4	124	14	
70	70	65	102	90	156	65	141	11	246	116	200	70	190	60	134	4	144	14	
80	80	75	117	104	179	75	164	14	286	136	233	83	220	70	154	4	167	17	
85	85	80	123	112	191	80	175	15	300	140	246	86	232	72	164	4	178	18	
90	90	85	132	119	210	80	175	15	300	140	251	91	233	73	166	6	184	24	
105	105	90	147	128	225	90	200	20	340	160	281	101	263	83	186	6	204	24	
115	115	100	163	145	265	100	223	23	370	170	309	109	288	88	206	6	227	27	
135	135	115	184	160	305	135	297	27	520	250	-	-	-	-	-	-	-	-	
136	135	-	180	-	300	135	293	23											
156	150	-	195	-	325	150	327	27											
166	165	-	225	-	350	165	361	31											
186	180	-	250	-	380	185	401	31											
206	200	-	275	-	420	200	437	37											
246	240	-	320	-	500	240	524	44											
286	280	-	383	-	567	280	612	52											
336	330	-	445	-	660	330	718	58											
138	135	-	180	-	300	135	293	23											
158	150	-	195	-	325	150	327	27											
168	165	-	225	-	350	165	361	31											
188	180	-	250	-	380	185	401	31											
208	200	-	275	-	420	200	437	37											
248	240	-	320	-	500	240	524	44											
288	280	-	383	-	567	280	612	52											
338	330	-	445	-	660	330	718	58											

According to customer specification

Dimensions for thread for setscrew (dimension G and t) see table 4.

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1 Technical data

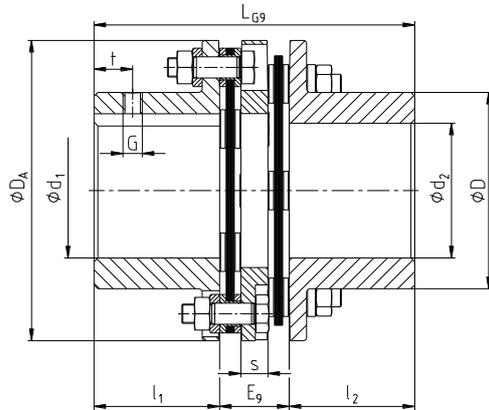


Illustration 7: RADEX®-N type NNZ

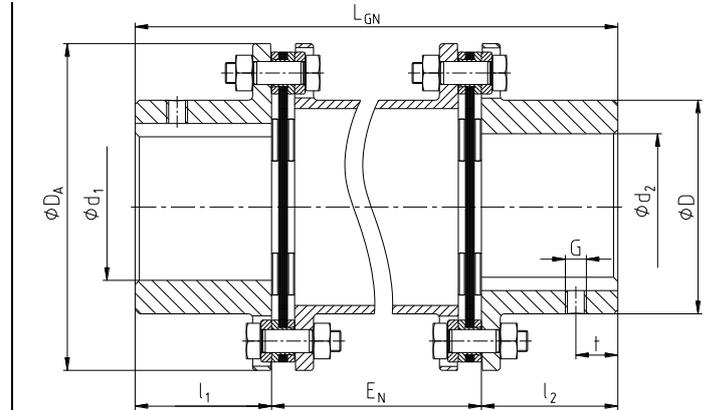


Illustration 8: RADEX®-N type NANA 3

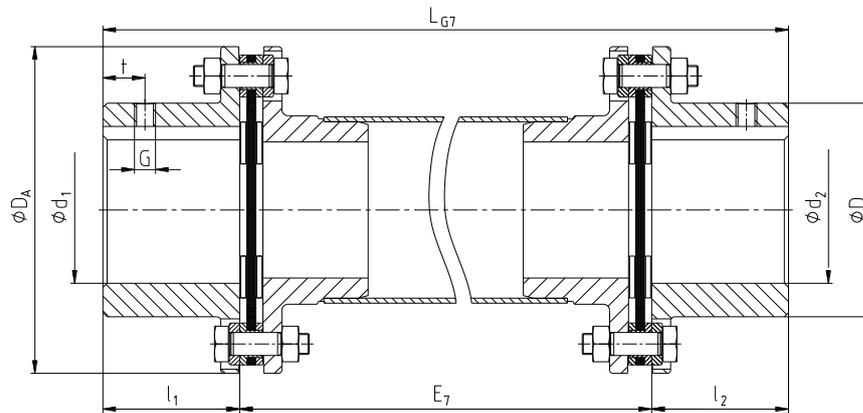


Illustration 9: RADEX®-N type NANA 4

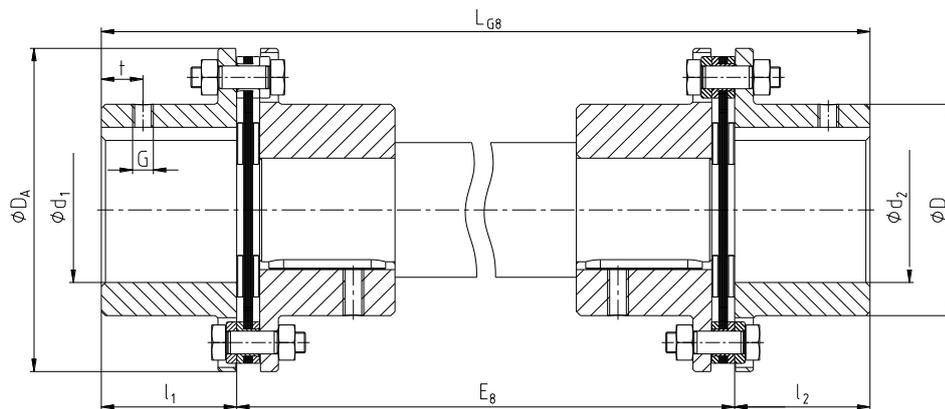


Illustration 10: RADEX®-N type NNW

Dimensions of couplings see table 2, sheet 6.



1 Technical data

Table 2: Types NNZ - NANA 3 - NANA 4 - NNW

Size	Max. finish bore [mm] d ₁ / d ₂	Dimensions [mm]									
		General									
		D	D _A	l ₁ , l ₂	L _{G7}	E ₇	L _{G8}	E ₈	L _{G9}	E ₉	s
20	20	32	56	20	L _{G7} = E ₇ + l ₁ + l ₂	Intermediate shaft dimension according to customer specification	L _{G8} = E ₈ + l ₁ + l ₂	Intermediate shaft dimension according to customer specification	58	18	8
25	25	40	68	25					70	20	8
35	35	54	82	40					102	22	10
38	38	58	94	45					118	28	12
42	42	68	104	45					124	34	14
50	50	78	126	55					144	34	12
60	60	88	138	55					144	34	12
70	70	102	156	65					166	36	14
80	80	117	179	75					-	-	-
85	85	123	191	80					-	-	-
90	90	132	210	80					-	-	-
105	105	147	225	90					-	-	-
115	115	163	265	100					-	-	-
135	135	184	305	135					-	-	-
136	135	180	300	135					-	-	-
156	150	195	325	150					-	-	-
166	165	225	350	165					-	-	-
186	180	250	380	185					-	-	-
206	200	275	420	200					-	-	-
246	240	320	500	240					-	-	-
286	280	383	567	280					-	-	-
336	330	445	660	330					-	-	-
138	135	180	300	135					-	-	-
158	150	195	325	150					-	-	-
168	165	225	350	165					-	-	-
188	180	250	380	185					-	-	-
208	200	275	420	200					-	-	-
248	240	320	500	240					-	-	-
288	280	383	567	280					-	-	-
338	330	445	660	330					-	-	-

Further dimensions of type NANA 3 (L_{GN} and E_N) see table 3.
Dimensions for thread for setscrew (dimension G and t) see table 4.

Table 3: Further dimensions of type NANA 3

Size	42		50			60			70			80			
L _{GN}	190	230	210	250	290	210	250	290	230	270	310	250	290	330	400
E _N	100	140	100	140	180	100	140	180	100	140	180	100	140	180	250

Size	85				90			105			115		135
L _{GN}	260	300	340	410	300	340	410	320	360	430	380	450	520
E _N	100	140	180	250	140	180	250	140	180	250	180	250	250

Size	136	156	166	186	208	246	286	336	138	158	168	188	208	248	288	338
L _{GN}	On request of customer															
E _N																

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1 Technical data

Table 4: Dimensions of thread for setscrews

Size	20	25	35	38	42	50	60	70	80	85	90	105	115
G	M5	M5	M6	M6	M8	M8	M8	M10	M10	M10	M12	M12	M12
t	6	8	15	15	20	20	20	20	20	25	25	30	30
Quantity z	1	1	1	1	1	1	1	1	1	1	1	1	1

Size	135	136	156	166	186	206	246	286	336	138	158	168	188	208	248	288	338
G	M20	M12	M12	M16	M16	M16	M20	M20	M24	M12	M12	M16	M16	M16	M20	M20	M24
t	On request of customer																
Quantity z	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Table 5: Torque and speed

Size	20	25	35	38	42	50	60	70	80	85
Torque [Nm]	T _{KN}	15	30	60	120	180	330	690	1100	2400
	T _{Kmax.}	30	60	120	240	360	660	1380	2200	4800
	T _{KW}	5	10	20	40	60	110	230	370	800
Max. speed n [rpm]	20000	16000	13000	12000	10000	8000	6700	5900	5100	4750

Size	90	105	115	135	136	156	166	186	206	246
Torque [Nm]	T _{KN}	4500	5100	9000	12000	17500	25000	35000	42000	90000
	T _{Kmax.}	9000	10200	18000	24000	35000	50000	70000	84000	180000
	T _{KW}	1500	1700	3000	4000	8750	12500	17500	21000	26250
Max. speed n [rpm]	4300	4000	3400	3000	3800	3500	3300	3000	2800	2300

Size	286	336	138	158	168	188	208	248	288	338
Torque [Nm]	T _{KN}	150000	210000	23000	33000	45000	56000	70000	120000	280000
	T _{Kmax.}	300000	420000	46000	66000	90000	112000	140000	240000	560000
	T _{KW}	75000	105000	11500	16500	22500	28000	35000	60000	100000
Max. speed n [rpm]	2000	1800	3800	3500	3300	3000	2800	2300	2000	1800



RADEX®-N couplings with attachments that may generate heat, sparks and static charge (e. g. combinations with brake drums, brake disks, overload systems like torque limiters, fans etc.) are not permitted for the use in hazardous locations. A separate analysis must be performed.

2 Advice

2.1 General advice

Please read through these operating/assembly instructions carefully before you start up the coupling. Please pay special attention to the safety instructions!



The **RADEX®-N** coupling is suitable and approved for the use in hazardous locations. When using the coupling in hazardous locations please observe the special advice and instructions regarding safety in enclosure A.

The operating/assembly instructions are part of your product. Please store them carefully and close to the coupling. The copyright for these assembly instructions remains with **KTR Kupplungstechnik GmbH**.

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2 Advice

2.2 Safety and advice symbols



Warning of potentially explosive atmospheres

This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death caused by explosion.



Warning of personal injury

This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death.



Warning of product damages

This symbol indicates notes which may contribute to preventing material or machine damage.



General advice

This symbol indicates notes which may contribute to preventing undesirable results or conditions.



Warning of hot surfaces

This symbol indicates notes which may contribute to preventing burns with hot surfaces resulting in light to serious bodily injuries.

2.3 General hazard warnings



With assembly, operation and maintenance of the coupling it has to be made sure that the entire drive train is secured against accidental switch-on. You may be seriously hurt by rotating parts. Please make absolutely sure to read through and observe the following safety indications.

- All operations on and with the coupling have to be performed taking into account "safety first".
- Please make sure to switch off the power pack before you perform your work on the coupling.
- Secure the power pack against accidental switch-on, e. g. by providing warning signs at the place of switch-on or removing the fuse for current supply.
- Do not reach into the operation area of the coupling as long as it is in operation.
- Please secure the coupling against accidental contact. Please provide for the necessary protection devices and covers.

2.4 Intended use

You may only assemble, operate and maintain the coupling if you

- have carefully read through the operating-/assembly instructions and understood them
- had technical training
- are authorized by your company

The coupling may only be used in accordance with the technical data (see chapter 1). Unauthorized modifications on the coupling design are not admissible. We will not assume liability for any damage that may arise. In the interest of further development we reserve the right for technical modifications.

The **RADEX®-N** described in here corresponds to the technical status at the time of printing of these assembly instructions.

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2 Advice

2.5 Coupling selection



For a long-lasting and failure-free operation of the coupling it must be selected according to the selection instructions (according to DIN 740 part 2) for the particular application (see RADEX®-N catalogue).

Please observe the critical whirling speed with types NANA 4 and NNW.

If the operating conditions (performance, speed, modifications on engine and machine) change, the coupling selection must be reviewed again.

Please note that the technical data regarding torque refer to the lamina set only. The transmittable torque of the shaft/hub connection must be reviewed by the customer and is subject to his responsibility.

For drives subject to torsional vibrations (drives with cyclic stress due to torsional vibrations) it is necessary to perform a torsional vibration calculation to ensure a reliable selection. Typical drives subject to torsional vibrations are e. g. drives with diesel engines, piston pumps, piston compressors etc. If requested, KTR will perform the coupling selection and the torsional vibration calculation.



If the coupling is used in hazardous locations, the size must be selected such that there is a minimum safety of $s = 2.0$ between the torque of the machine and the rated torque of the coupling.



Selection of clamping ring hubs

With the use in hazardous locations the clamping ring hubs have to be selected such that there is a minimum safety factor of $s = 2.0$ covering the peak torque of the machine including all operating parameters and the friction torque of the clamping ring hub.

3 Storage, transport and packaging

3.1 Storage

The couplings are supplied in preserved condition and can be stored at a dry and covered place for 6 - 9 months.



Humid storage rooms are not suitable.

Please make sure that condensation is not generated. The best relative air humidity is less than 65 %.

3.2 Transport and packaging



In order to avoid any injuries and any kind of damage please always make use of proper lifting equipment.

The couplings are packed differently each depending on size, number and kind of transport. Unless otherwise contractually agreed, packaging will follow the in-house packaging regulations of KTR Kupplungstechnik GmbH.



4 Assembly

The coupling is generally supplied in individual parts. Before assembly the coupling has to be inspected for completeness.

4.1 Components of the couplings

Components of RADEX®-N type NN

Component	Quantity	Description	Component	Quantity	Description
1	2	Flange hub ¹⁾	5	see table 6	Spacer sleeve
2	1	Lamina set	6	see table 6	Washer
3	-	Spacer	7	see table 6	Hexagon nut/Clamping nut
4	see table 6	Setscrew	8	2	Setscrew DIN EN ISO 4029

1) Design as clamping ring hub (frictionally engaged shaft-hub-connection) on request

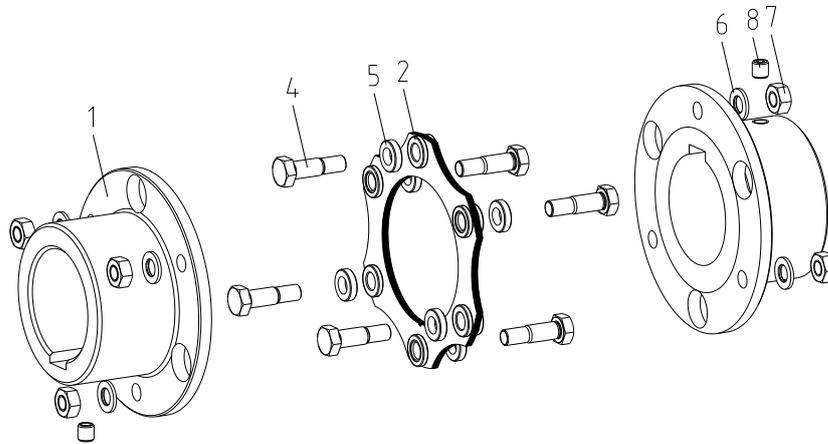


Illustration 11: RADEX®-N type NN

Components of RADEX®-N type NANA 1 to 3 - NENA 1 and 2 - NENE 1

Component	Quantity	Description	Component	Quantity	Description
1	2	Flange hub ¹⁾	5	see table 6	Spacer sleeve
2	2	Lamina set	6	see table 6	Washer
3	1	Spacer	7	see table 6	Hexagon nut/Clamping nut
4	see table 6	Setscrew	8	2	Setscrew DIN EN ISO 4029

1) Design as clamping ring hub (frictionally engaged shaft-hub-connection) on request

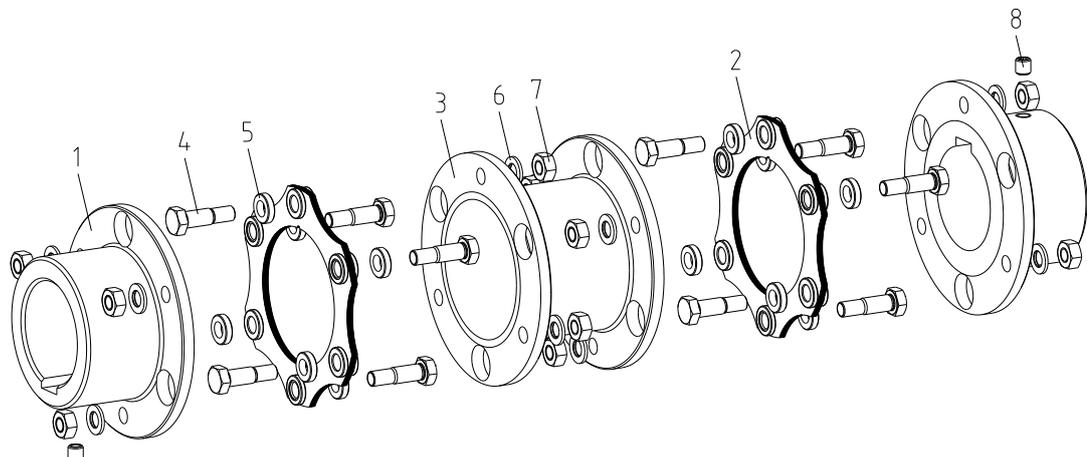


Illustration 12: RADEX®-N type NANA 1 (example)

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4 Assembly

4.1 Components of the couplings

Components of RADEX®-N type NNZ

Component	Quantity	Description	Component	Quantity	Description
1	2	Flange hub ¹⁾	5	see table 6	Spacer sleeve
2	2	Lamina set	6	see table 6	Washer
3	1	Spacer	7	see table 6	Hexagon nut/Clamping nut
4	see table 6	Setscrew	8	2	Setscrew DIN EN ISO 4029

1) Design as clamping ring hub (frictionally engaged shaft-hub-connection) on request

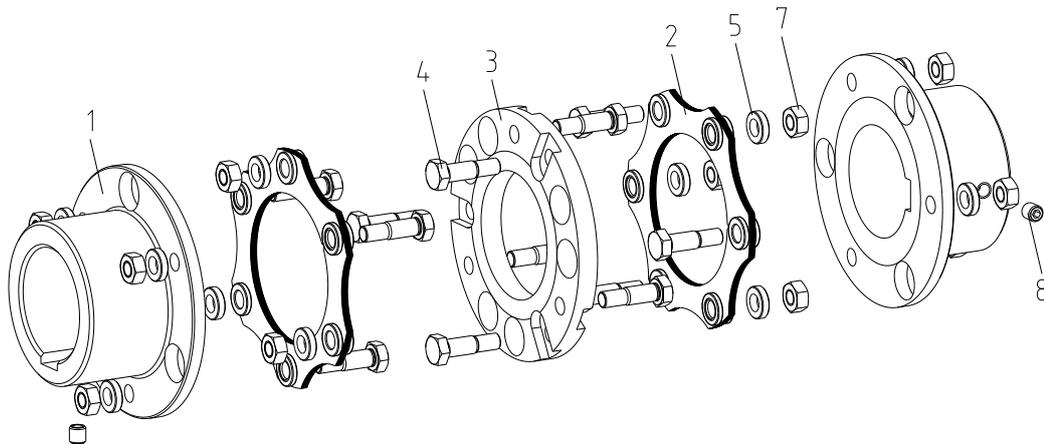


Illustration 13: RADEX®-N type NNZ

Components of RADEX®-N type NANA 4

Component	Quantity	Description	Component	Quantity	Description
1	2	Flange hub ¹⁾	4	see table 6	Setscrew
2	2	Lamina set	5	see table 6	Spacer sleeve
3	1	Intermediate pipe with 2 flange hubs spec. - welded	6	see table 6	Washer
			7	see table 6	Hexagon nut/Clamping nut
			8	2	Setscrew DIN EN ISO 4029

1) Design as clamping ring hub (frictionally engaged shaft-hub-connection) on request

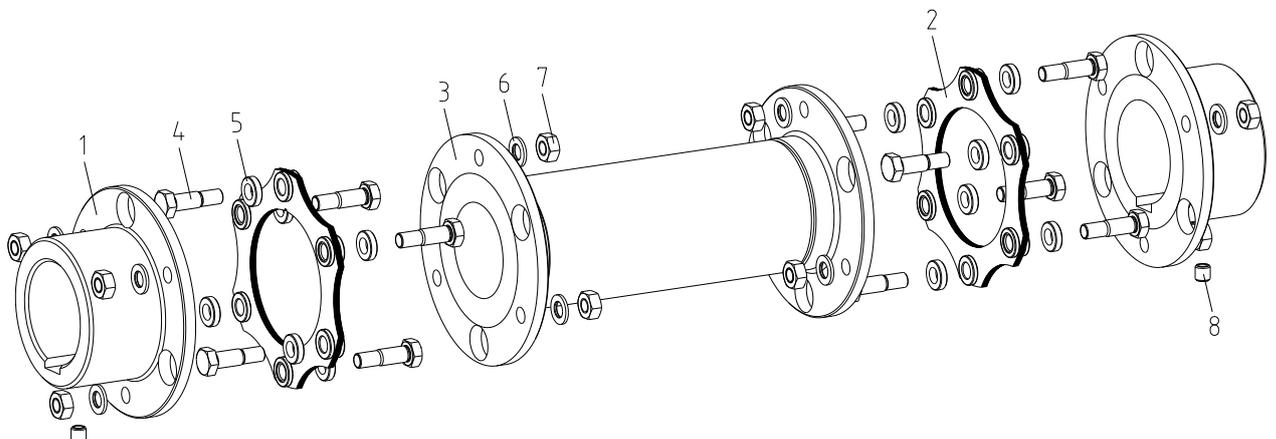


Illustration 14: RADEX®-N type NANA 4

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4 Assembly

4.1 Components of the couplings

Components of RADEX®-N type NNW

Component	Quantity	Description	Component	Quantity	Description
1	4	Flange hub ¹⁾	5	see table 6	Spacer sleeve
2	2	Lamina set	6	see table 6	Washer
3	1	Intermediate shaft with 2 feather keys	7	see table 6	Hexagon nut/Clamping nut
4	see table 6	Setscrew	8	2	Setscrew DIN EN ISO 4029

1) Design as clamping ring hub (frictionally engaged shaft-hub-connection) on request

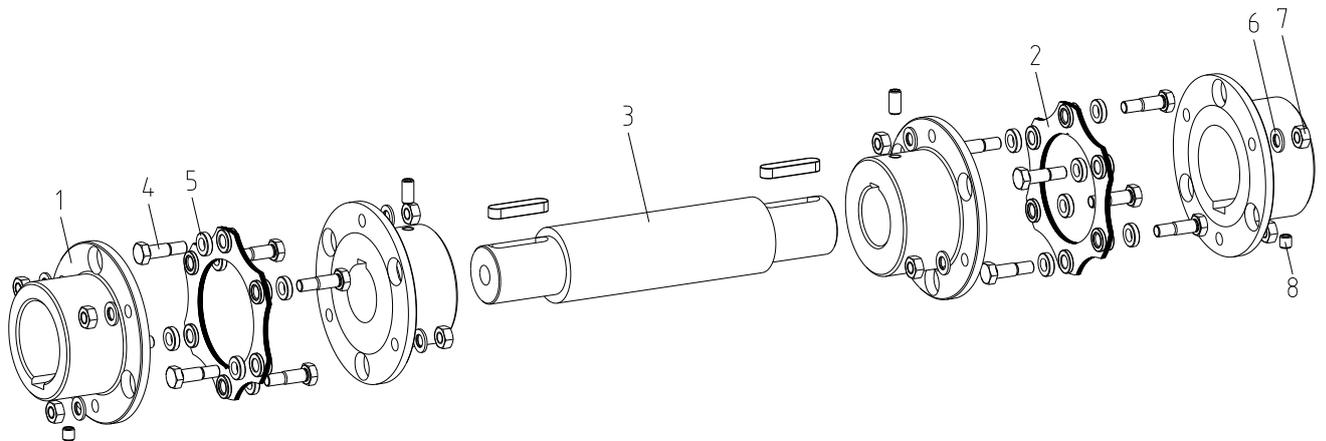


Illustration 15: RADEX®-N type NNW

Table 6: Quantity of single parts

Size	20	25	35	38	42	50	60	70	80	85
Setscrew (item 4) ¹⁾	4	4	4	4	4	4	6	6	6	6
Distance sleeve (item 5) ¹⁾	4	4	4	4	4	4	6	6	-	-
Washer (item 6) ¹⁾²⁾	-	-	-	-	-	-	-	-	6	6
Hexagon nut/Clamping nut (item 7) ¹⁾	4	4	4	4	4	4	6	6	6	6

Size	90	105	115	135	136	156	166	186	206	246
Setscrew (item 4) ¹⁾	6	6	6	6	6	6	6	6	6	6
Distance sleeve (item 5) ¹⁾	-	-	-	-	-	-	-	-	-	-
Washer (item 6) ¹⁾²⁾	6	6	6	6	-	6	-	-	-	-
Hexagon nut/Clamping nut (item 7) ¹⁾	6	6	6	6	6	6	6	6	6	6

Size	286	336	138	158	168	188	208	248	288	338
Setscrew (item 4) ¹⁾	6	6	8	8	8	8	8	8	8	8
Distance sleeve (item 5) ¹⁾	-	-	-	-	-	-	-	-	-	-
Washer (item 6) ¹⁾²⁾	-	-	-	8	-	-	-	-	-	-
Hexagon nut/Clamping nut (item 7) ¹⁾	6	6	8	8	8	8	8	8	8	8

1) Quantity each lamina set

2) With size 156 and 158 washer below the screw head

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4 Assembly

4.2 Advice for finish bore



The maximum permissible bore diameters d (see table 1 and 2 in chapter 1 - technical data) must not be exceeded. If these figures are disregarded, the coupling may tear. Rotating particles may cause danger to life.

- Bores of flange hubs machined by the customer have to observe concentricity or axial runout, respectively (see illustration 16).
- Please make absolutely sure to observe the figures for $\varnothing d_{max}$.
- Carefully align the flange hubs when the finish bores are drilled.
- Please provide for a setscrew according to DIN EN ISO 4029 with a cup point or an end plate to fasten the flange hubs axially.

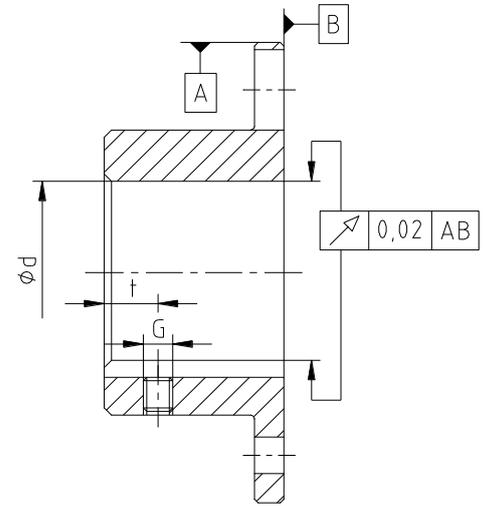


Illustration 16: Concentricity and axial runout



The customer bears the sole responsibility for all machining processes performed subsequently on unbored or pilot bored as well as finish machined coupling components and spare parts. KTR does not assume any warranty claims resulting from insufficient re-machining.



KTR supplies unbored or pilot bored coupling components and spare parts only upon explicit request of the customer. These parts are additionally labelled with the symbol Ⓢ .

Table 7: Setscrews DIN EN ISO 4029

Size	20	25	35	38	42	50	60	70	80	85	90	105	115
G	M5	M5	M6	M6	M8	M8	M8	M10	M10	M10	M12	M12	M12
t	6	8	15	15	20	20	20	20	20	25	25	30	30
Quantity z	1	1	1	1	1	1	1	1	1	1	1	1	1
Tightening torque T_A [Nm]	2	2	4.8	4.8	10	10	10	17	17	17	40	40	40

Size	135	136	156	166	186	206	246	286	336	138	158	168	188	208	248	288	338
G	M20	M12	M12	M16	M16	M16	M20	M20	M24	M12	M12	M16	M16	M16	M20	M20	M24
t	On request of customer																
Quantity z	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tightening torque T_A [Nm]	140	40	40	80	80	80	140	140	240	40	40	80	80	80	140	140	240



4 Assembly

4.3 Assembly/disassembly of flange hubs



We recommend to inspect bores, shaft, keyway and feather key for dimensional accuracy before assembly.



Heating the flange hubs lightly (approx. 80 °C) allows for an easier mounting on the shafts.



Please pay attention to the ignition risk in hazardous locations!



Touching the heated hubs causes burns.
Please wear safety gloves.



With the assembly please make sure that the distance dimension E (see table 1 and 2) is observed so that the coupling components are not in contact with each other during the operation.

Disregarding this advice may cause damage to the coupling.

For axial alignment of the coupling the distance dimension E (see table 1 and 2) is decisive. In order to adjust the right dimension E you should proceed as follows:

- Shift the flange hubs on the shafts of the driving and driven side.
- The internal sides of the flange hubs must be flush with the front sides of the shafts (see illustration 17).
- Align the power packs in axial direction until the distance dimension E is achieved (see table 1 or 2).
- Fasten the flange hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (see table 7).



If used in hazardous locations the setscrews to fasten the hubs as well as all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).

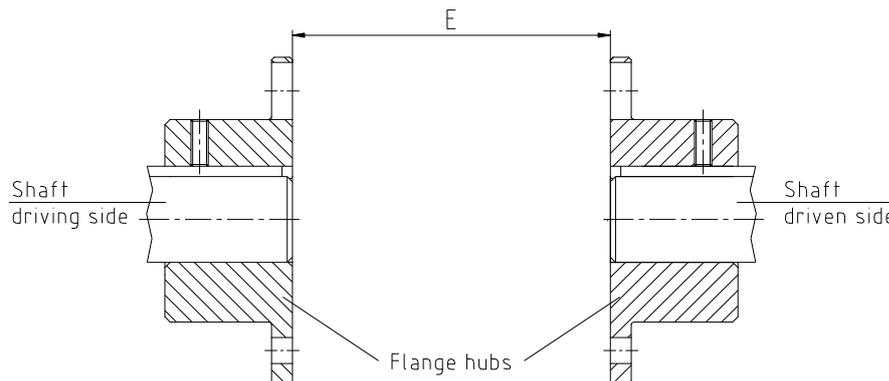


Illustration 17: Assembly of flange hubs

Disassembly:



Driving components falling down may cause injury to persons or damage on the machine.
Secure the driving components during disassembly.

- Untighten the setscrew in the hub and unscrew it by 2 - 3 pitches.
- Pull the hub from the shaft.



4 Assembly

4.4 Assembly/disassembly of clamping ring hubs



The stiffness and dimensions of the shafts (here specifically hollow shafts) have to be selected in a way that sufficient safety against plastic deformation is provided for (if necessary, consult with company KTR).



We recommend to inspect bores and shafts for dimensional accuracy before assembly.



With the assembly please make sure that the distance dimension E (see table 1 and 2) is observed so that the coupling components are not in contact with each other during the operation.

Disregarding this advice may cause damage to the coupling.

For axial alignment of the coupling the distance dimension E (see table 1 and 2) is decisive. In order to adjust the right dimension E you should proceed as follows:

- Clean and degrease the hub bores and shafts, afterwards lubricate with a thin-fluid oil (e. g. Castrol 4 in 1 or Klüber Quietsch-Ex).



Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.

- Lightly untighten the clamping screws and pull the clamping ring from the hub only marginally to make sure that the clamping ring is fitted loosely.
- Shift the clamping ring hubs on the shaft of the driving and driven side.
- The internal sides of the clamping ring hubs must be flush with the front sides of the shafts (see illustration 18).
- Align the power packs in axial direction until the distance dimension E is achieved (see table 1 or 2).
- Tighten the clamping screws evenly crosswise at first to 1/3 and afterwards 2/3 of the full tightening torque (see table 8). Afterwards tighten the clamping screws crosswise to the full tightening torque. The process needs to be repeated until the tightening torque is achieved with all screws.

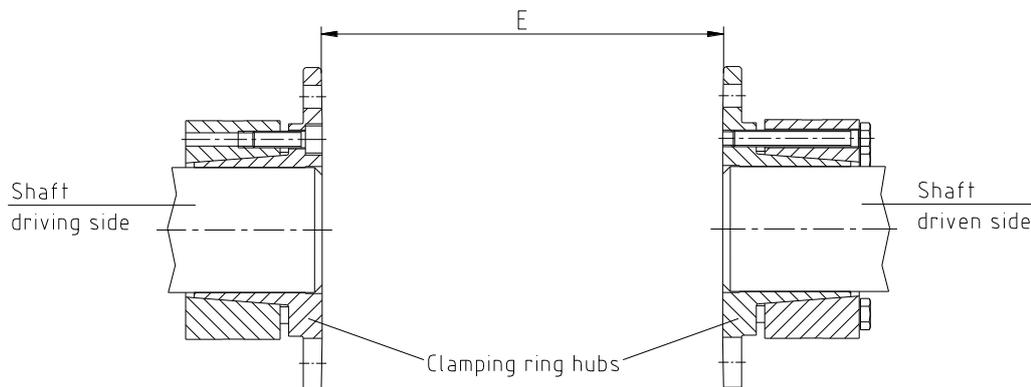


Illustration 18: Assembly of clamping ring hubs



4 Assembly

4.4 Assembly/disassembly of clamping ring hubs

Table 8: Tightening torques of clamping screws

Size	35	38	42	50	60	70	80	85	90	105	115	135
Clamping screws	M5	M6	M6	M8	M8	M8	M10	M12	M12	M12	M12	M16
Tightening torque T_A [Nm]	8.5	14	14	35	35	35	69	120	120	120	120	295



Having started up the coupling the tightening torques of the screws have to be inspected during the usual inspection intervals.



Selection of clamping ring hubs

With the use in hazardous locations the clamping ring hubs have to be selected such that there is a minimum safety factor of $s = 2.0$ covering the peak torque of the machine including all operating parameters and the friction torque of the clamping ring hub.



If used in hazardous locations the setscrews to fasten the hubs as well as all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).

Disassembly:



Driving components falling down may cause injury to persons or damage on the machine. Secure the driving components during disassembly.

- Untighten the clamping screws evenly one after the other. During each revolution every screw may only be unscrewed by half a turn. Unscrew all clamping screws by 3 - 4 pitches.
- Remove the screws located next to the pull-off threads and screw them into the respective pull-off threads until they are in contact.
- The clamping ring is untightened if the screws in the pull-off threads are tightened evenly stepwise and crosswise.

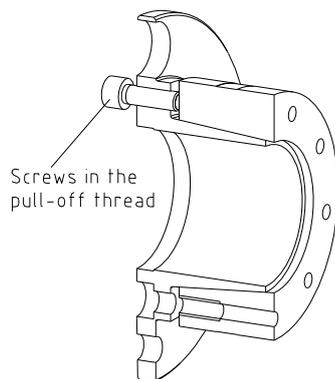


Illustration 19: Disassembly of clamping ring hub type 6.0

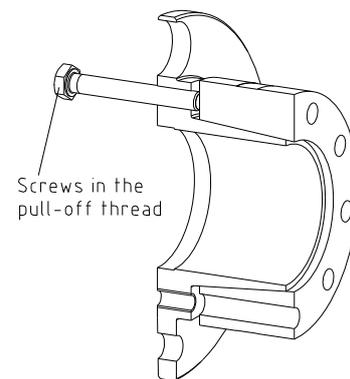


Illustration 20: Disassembly of clamping ring hub type 6.5

- In case of a repeated assembly the hub bore and shaft have to be cleaned and afterwards lubricated with a thin-fluid oil (e. g. Castrol 4 in 1 or Klüber Quitsch EX). The same applies for the taper surfaces of clamping ring hub and clamping ring.



If these hints are not observed, the operation of the clamping ring hub may be affected.

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4 Assembly

4.5 Vertical assembly/disassembly

For vertical alignment of the coupling the distance dimension E (see table 1 and 2) is decisive. In order to adjust the right dimension E you should proceed as follows:

- Shift the flange hubs on the shafts of the driving and driven side. Please make sure that the flange hub with the washer for vertical support is at the bottom (see illustration 21 and 22 as an alternative).
- The internal sides of the flange hubs or centering surface of the flange hub at the bottom must be flush with the front sides of the shafts (see illustration 21 and 22 as an alternative).
- Align the power packs in vertical direction until the distance dimension E is achieved (see table 1 or 2).
- Fasten the flange hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (see table 7).



With the assembly of a spacer please make sure that the flange hub with the washer for vertical support is at the bottom.



If used in hazardous locations the setscrews to fasten the hubs as well as all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).

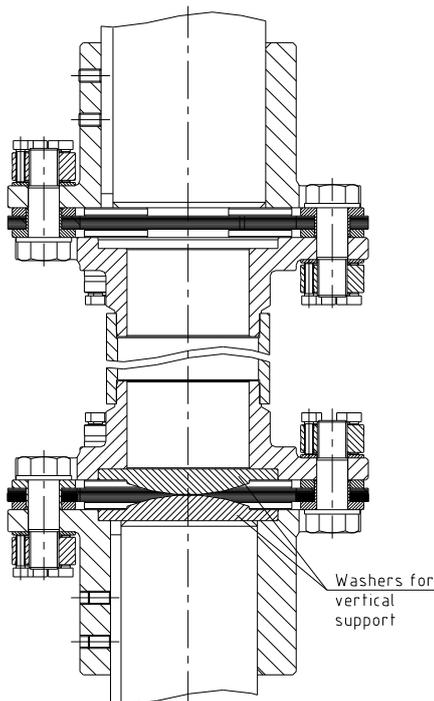


Illustration 21: Vertical assembly (preferred assembly)

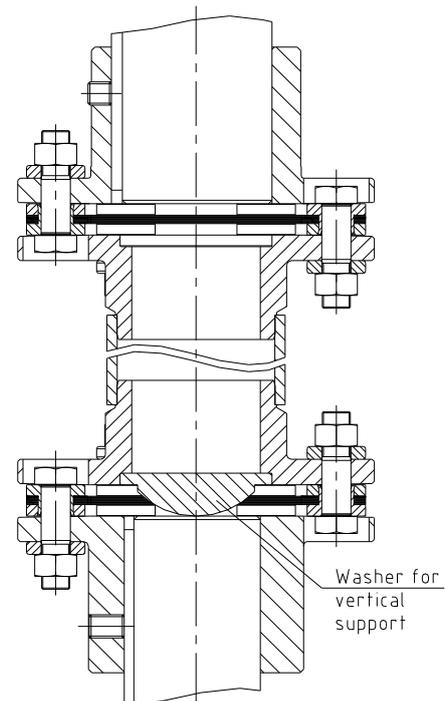


Illustration 22: Vertical assembly (as an alternative)

Disassembly:



Driving components falling down may cause injury to persons or damage on the machine. Secure the driving components during disassembly.

- Untighten the setscrew in the hub and unscrew it by 2 - 3 pitches.
- Pull the hub from the shaft.



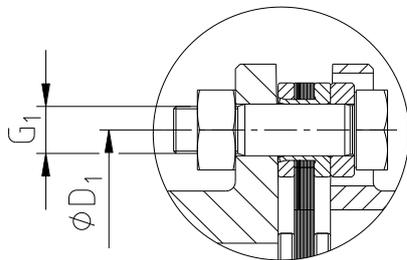
4 Assembly

4.6 Assembly/disassembly of the lamina sets, RADEX®-N size 20 - 135



With the assembly please make sure that the lamina sets are installed free from distortion in axial direction. Disregarding this advice may cause damage to the coupling.

- Clean and degrease the contact surfaces of screw connections on the flange hub, lamina set and spacer.
- Please assemble the lamina sets and the spacer (see illustration 23 and 24, respectively). With type NN only 1 lamina set is used (no spacer).
- Hand-tighten the components for the time being, the setscrews to be assembled reciprocally (see illustration 23 or 24, respectively).
- Tighten the hexagon nuts one after the other and with several revolutions to the tightening torque mentioned in table 11. Secure the setscrew against twisting.



Lamina set

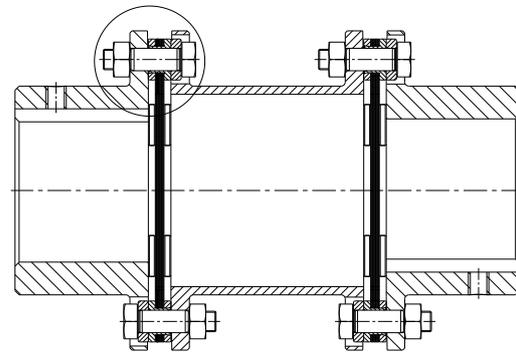
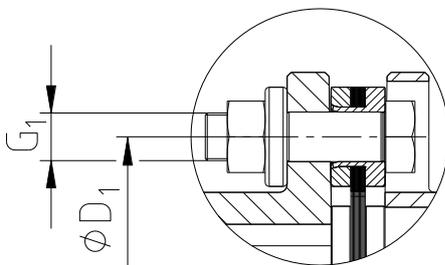


Illustration 23: Assembly of lamina sets, RADEX®-N size 20 - 70



Lamina set

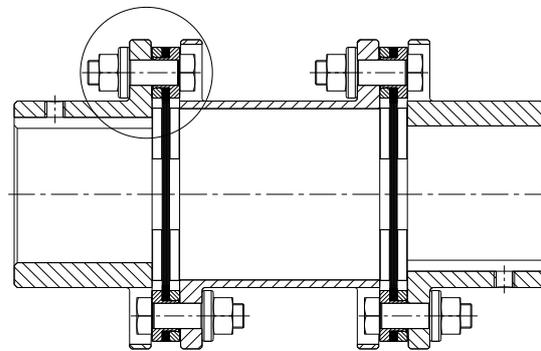


Illustration 24: Assembly of lamina sets, RADEX®-N size 80 - 135

Table 9:

Size	20	25	35	38	42	50	60	70	80	85	90	105	115	135
Pitch circle Ø D ₁	44	53	67	75	85	100	112	128	148	158	170	185	214	240

Disassembly:



Driving components falling down may cause injury to persons or damage on the machine. Secure the driving components during disassembly.

- Unscrew the hexagon nuts and remove along with the setscrews and washers.
- Take out the lamina sets.

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4 Assembly

4.7 Assembly/disassembly of the lamina sets, RADEX®-N size 136 - 336 and 138 - 338



With the assembly please make sure that the lamina sets are installed free from distortion in axial direction. Disregarding this advice may cause damage to the coupling.

- Clean and degrease the contact surfaces of screw connections on the flange hub, lamina set and spacer as well as the threads of the clamping nut and setscrew.
- Please insert the lamina sets and the spacer (see illustration 25, respectively). With type NN only 1 lamina set is used (no spacer).
- Hand-tighten the components for the time being, the setscrews to be assembled reciprocally (see illustration 25, respectively). With size 156 and 158 use a washer under the screw head.
- The pressure screws in the clamping nut must not protrude on the pressure side (see illustration 26).



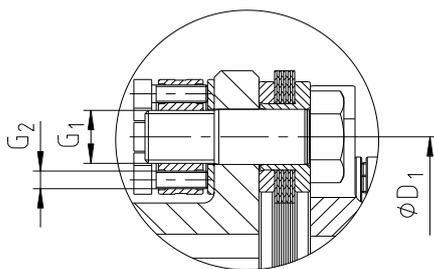
All components must be superimposed without any gap.

- Afterwards turn back the clamping nut until there is a gap of 1 - 2 mm (see illustration 26).
- Hand-tighten the pressure screws marked in illustration 28.
- Tighten these screws (see illustration 28) at half the tightening torque according to table 11 and afterwards at the full tightening torque according to table 11.
- Now tighten all pressure screws one after another and with several revolutions until all screws have achieved the full tightening torque (illustration 29).



The pressure screws must not bear on the heads after assembly (see illustration 27).

- All clamping screws have to be mounted as per the aforementioned process.



Lamina set

Illustration 25: Assembly of the lamina sets, RADEX®-N size 136 - 336 and 138 - 338

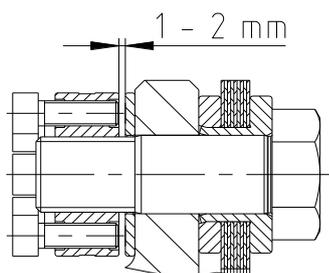
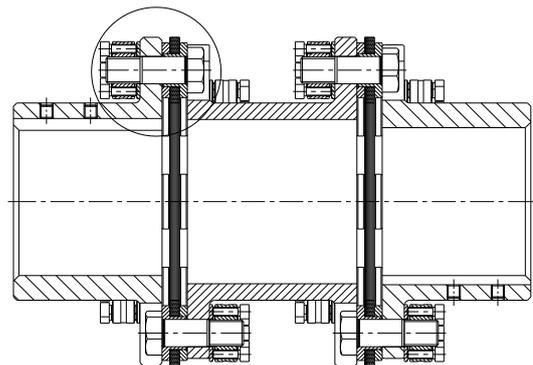


Illustration 26

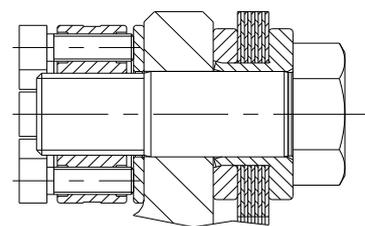


Illustration 27



4 Assembly

4.7 Assembly/disassembly of the lamina sets, RADEX®-N size 136 - 336 and 138 - 338

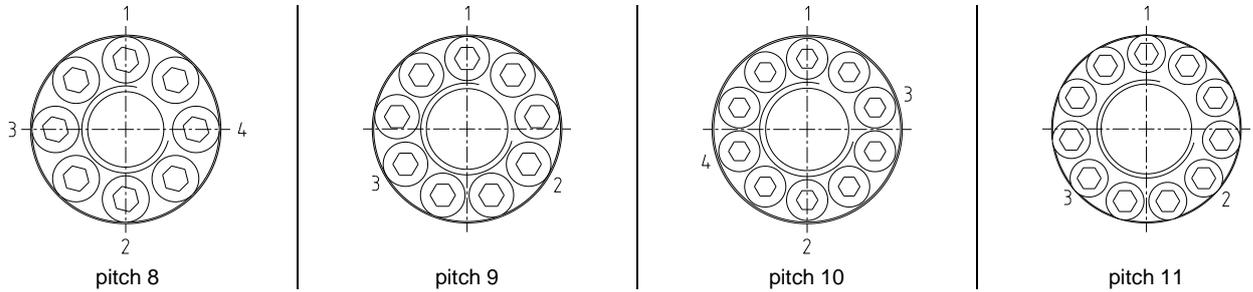


Illustration 28: Tightening of pressure screws

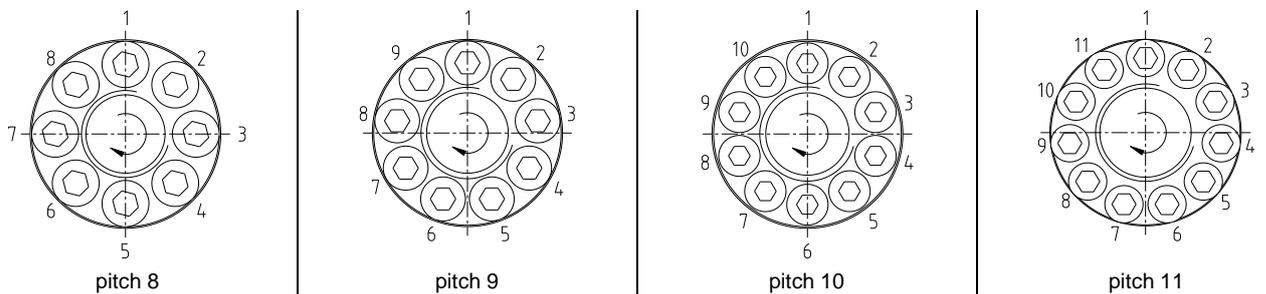


Illustration 29: Tightening of pressure screws (one after another)

Table 10:

Size	136 / 138	156 / 158	166 / 168	186 / 188	206 / 208	246 / 248	286 / 288	336 / 338
Pitch circle Ø D ₁	240	260	290	320	350	410	480	550

Disassembly:



Driving components falling down may cause injury to persons or damage on the machine. Secure the driving components during disassembly.

- Untighten the pressure screws of the clamping nut with several revolutions by a quarter revolution until all screws are released from tension.



Do not relieve and unscrew individual clamping screws completely in any case.

- Turn down the clamping nuts and remove the disks.
- Take out the lamina sets.



4 Assembly

4.8 Tightening torques of screw connections on the lamina set

Table 11: Tightening torque of screw connections on the lamina set

Size	20	25	35	38	42	50	60
Dimension G ₁ [mm]	M5	M6	M6	M8	M8	M10	M8
Tightening torque T _A [Nm]	8.5	14	14	35	35	69	33

Size	M70	80	85	90	105	115	135
Dimension G ₁ [mm]	M10	M10	M12	M16	M16	M20	M24
Tightening torque T _A [Nm]	65	65	115	280	280	550	900

Size	136 / 138	156 / 158	166 / 168	186 / 188	206 / 208	246 / 248	286 / 288	336 / 338
Dimension G ₁ [mm]	M24	M27	M27	M27	M30	M36	M42	M48
Dimension G ₂ [mm]	8 x M8	9 x M8	9 x M8	9 x M8	8 x M10	8 x M12	10 x M12	11 x M12
Pressure screw G ₂ Tightening torque T _A [Nm]	30	30	30	30	60	105	105	105



Having set the coupling into operation, the tightening torque of the screw connections has to be investigated at regular maintenance intervals.

4.9 Displacements - alignment of the coupling

The displacement figures specified in table 12 provide for sufficient safety to compensate for external influences like, for example, thermal expansion or foundation settling.



In order to ensure a long service life of the coupling and avoid dangers with the use in hazardous locations, the shaft ends must be accurately aligned.



Please absolutely observe the displacement figures specified (see table 12). If the figures are exceeded, the coupling will be damaged.

The more accurate the alignment of the coupling, the longer is its service life.

If used in hazardous locations for the explosion group IIC (marking II 2GD c IIC T X), only half of the displacement figures (see table 12) are permissible.

Please note:

- The displacement figures specified in table 12 are maximum figures which must not arise in parallel. If radial, axial and angular displacement arises at the same time, these values must be reduced (see illustration 31).
- Please inspect with a dial gauge, ruler or feeler whether the permissible displacement figures of table 12 can be observed.

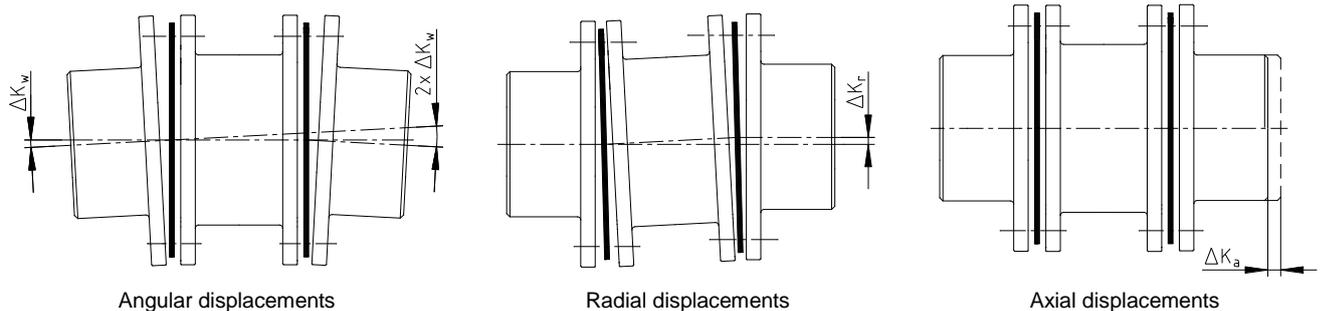


Illustration 30: Displacements

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4 Assembly

4.9 Displacements - alignment of the couplings

Examples of the displacement combinations specified in illustration 31:

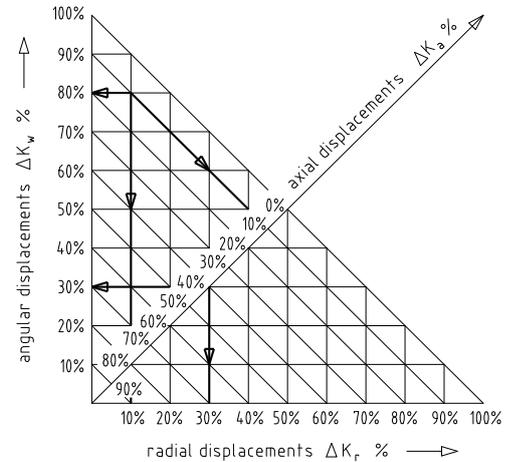
Example 1:

- $\Delta K_r = 10\%$
- $\Delta K_w = 80\%$
- $\Delta K_a = 10\%$

Example 2:

- $\Delta K_r = 30\%$
- $\Delta K_w = 30\%$
- $\Delta K_a = 40\%$

Illustration 31:
Combinations of displacement



$$\Delta K_{total} = \Delta K_a + \Delta K_r + \Delta K_w \leq 100\%$$

Table 12: Displacement figures

Size	Type NN ΔK_a [mm], (axial)	Type NA- NA1/NANA2 ΔK_a [mm], (axial)	Type NN ΔK_r [mm], (radial)	Type NANA1 ΔK_r [mm], (radial)	Type NANA2 ΔK_r [mm], (radial)	Type NN/NANA1/NANA2 ΔK_w [°], (angular) ¹⁾
20	0.60	1.2	-	0.5	0.1	1.0
25	0.80	1.6	-	0.5	0.2	1.0
35	1.00	2.0	-	0.5	0.2	1.0
38	1.20	2.4	-	0.6	0.3	1.0
42	1.40	2.8	-	0.6	0.3	1.0
50	1.60	3.2	-	0.8	0.4	1.0
60	1.00	2.0	-	1.7	1.0	1.0
70	1.10	2.2	-	2.1	1.2	1.0
80	1.30	2.6	-	2.5	1.5	1.0
85	1.30	2.6	-	2.5	1.5	1.0
90	1.00	2.0	-	2.0	1.4	1.0
105	1.20	2.4	-	2.5	1.6	1.0
115	1.40	2.8	-	2.0	1.3	1.0
135	1.75	3.5	-	4.0	-	1.0
136	1.85	3.7	-			0.7
156	2.10	4.2	-			0.7
166	2.25	4.5	-			0.7
186	2.40	4.8	-			0.7
206	2.60	5.2	-			0.7
246	3.00	6.0	-			0.7
286	3.35	6.7	-			0.7
336	3.75	7.5	-			0.7
138	1.30	2.6	-			0.5
158	1.40	2.8	-			0.5
168	1.50	3.0	-			0.5
188	1.60	3.2	-			0.5
208	1.75	3.5	-			0.5
248	2.00	4.0	-			0.5
288	2.25	4.5	-			0.5
338	2.50	5.0	-			0.5

1) each lamina set

5 Start-up

Before start-up of the coupling, please inspect the tightening of the setscrews in the flange hubs, the alignment and the distance dimension E and adjust, if necessary, and also inspect all screw connections for the tightening torques specified, dependent on the type of coupling.



If used in hazardous locations the setscrews to fasten the flange hubs as well as all screw connections must be secured against working loose additionally, e. g. conglutinating with Loctite (average strength).

Finally the coupling protection against accidental contact must be fitted.

The cover must be electrically conductive and included in the equipotential bonding. Bell housings (magnesium share below 7.5 %) made of aluminium and damping rings (NBR) can be used as connecting element between pump and electric motor. The cover may only be taken off with standstill of the unit.

During operation of the coupling, please pay attention to

- different operating noise
- vibrations occurring.



If the couplings are used in locations subject to dust explosion and in mining the user must make sure that there is no accumulation of dust in a dangerous volume between the cover and the coupling. The coupling must not operate in an accumulation of dust.

For covers with unlocked openings on the top face no light metals must be used if the couplings are used as equipment of equipment group II (*if possible, from stainless steel*).

If the couplings are used in mining (equipment group I M2), the cover must not be made of light metal. In addition, it must be resistant to higher mechanical loads than if it is used as equipment of equipment group II.

The minimum distance „Sr“ between the protective device and the rotating parts must at least correspond to the figures mentioned below.

If the protective device is used as cover, regular openings complying with the explosion protection demands can be made that must not exceed the following dimensions:

Openings	Cover [mm]		
	Top side	Lateral components	Distance „Sr“
Circular - max. diameter	4	8	≥ 10
Rectangular - max. lateral length	4	8	≥ 10
Straight or curved slot - max. lateral length/height	not permissible	8	≥ 20



If you note any irregularities with the coupling during operation, the drive unit must be switched off immediately. The cause of the breakdown must be specified by means of the table „Breakdowns“ and, if possible, be eliminated according to the proposals. The potential breakdowns mentioned can be hints only. To find out the cause all operating factors and machine components must be considered.

Coupling coating:



If coated (priming, painting etc.) couplings are used in hazardous locations, the requirements on conductivity and coating thickness must be considered. In case of paintings up to 200 µm electrostatic load does not have to be anticipated. Multiple coatings that are thicker than 200 µm are prohibited for explosion group IIC.



6 Breakdowns, causes and elimination

The below-mentioned failures can result in a use of the **RADEX[®]-N** coupling other than intended. In addition to the specifications given in these operating and assembly instructions please make sure to avoid these failures. The errors listed can only be clues to search for the failures. When searching for the failure the adjacent components must generally be included.



**If used other than intended the coupling can become a source of ignition.
EC directive 94/9/EC requires special care by the manufacturer and the user.**

General failures with use other than intended:

- Important data for the coupling selection were not forwarded.
- The calculation of the shaft-hub-connection was not considered.
- Coupling components with damage occurred during transport are assembled.
- If the heated hubs are assembled, the permissible temperature is exceeded.
- The clearance of the components to be assembled is not coordinated with one another.
- Tightening torques have been fallen below/exceeded.
- Components are mixed up by mistake/assembled incorrectly.
- A wrong or no lamina set is inserted in the coupling.
- No original KTR parts (purchased parts) are used.
- : The coupling used/the coupling protection used is not suitable for the operation in hazardous locations and does not correspond to EC directive 94/9/EC, respectively.
- Maintenance intervals are not observed.

Breakdowns	Causes	Hazard notes for hazardous locations	Elimination
Changes in operating noise and/or vibrations occurring	Misalignment	none	1) Set the unit out of operation 2) Eliminate the reason for the misalignment (e. g. loose foundation bolts, breaking of the engine mount, heat expansion of unit components, modification of the mounting dimension E of the coupling) 3) Inspection of wear see item inspection
	Setscrews working loose, low micro friction under the screw head and on the steel lamina set	Ignition risk due to sparking	1) Set the unit out of operation 2) Inspect coupling components and replace coupling components that are damaged 3) Tighten the setscrews until the permissible tightening torque is reached 4) Inspect alignment, adjust if necessary
	Screws for axial fastening of flange hubs working loose	none	1) Set the unit out of operation 2) Inspect alignment of coupling 3) Tighten the screws to fasten the flange hubs and secure against working loose 4) Inspection of wear see item inspection
Breaking of the steel lamina set	Breaking of the steel lamina set due to high impact energy/overload	Ignition risk due to sparking	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the steel lamina sets 3) Inspect coupling components and replace coupling components that are damaged 4) Insert steel lamina sets, assemble coupling components 5) Find out the reason for overload
	Operating parameters do not correspond to the performance of the coupling		1) Set the unit out of operation 2) Review the operating parameters and select a bigger coupling (consider mounting space) 3) Assemble new coupling size 4) Inspect alignment

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6 Breakdowns, causes and elimination

Breakdowns	Causes	Hazard notes for hazardous locations	Elimination
Breaking of the steel lamina set	Operating error of the unit	Ignition risk due to sparking	<ol style="list-style-type: none"> 1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the steel lamina sets 3) Inspect coupling components and replace coupling components that are damaged 4) Insert steel lamina sets, assemble coupling components 5) Instruct and train the service staff
Cracks in/fracture of the steel lamina sets/fastening screws	Vibrations of drive		<ol style="list-style-type: none"> 1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the steel lamina sets 3) Inspect coupling components and replace coupling components that are damaged 4) Insert steel lamina sets, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Find out the reason for vibrations



If you operate with a faulty lamina set (see chapter 10.1) and with the subsequent contact of metal parts a proper operation meeting the explosion protection requirements and acc. to directive 94/9/EC is not ensured.

7 Environment and disposal

7.1 Environment

In the interest of the environment our products comply with directive EC 1907/2006 (REACH). Any substances specified in the REACH SVHC list in an impermissible concentration are not used.

7.2 Disposal

In respect of environmental protection we would ask you to dispose of the packaging or products on termination of their service life in accordance with the legal regulations and standards that apply, respectively. All coupling components consist of metal. Any metal components have to be cleaned and disposed of by scrap metal.

8 Maintenance and service

RADEX®-N is a low-maintenance coupling. We recommend to perform a visual inspection on the coupling **at least once a year**. Please pay special attention to the condition of the lamina sets, the alignment and screw connection of the coupling.

- Since the flexible machine bearings of the driving and driven side settle during the course of load, please inspect the alignment of the coupling and re-align the coupling, if necessary.
- If some individual laminas are broken, the lamina sets of the coupling have to be replaced. The coupling parts have to be inspected for damages.
- The screw connections have to be inspected visually.



After start-up of the coupling the tightening torques of the screws of the lamina sets have to be inspected during the usual maintenance intervals.



With the use in hazardous locations please observe chapter 10.2 *Inspection intervals for couplings in Ex-hazardous locations.*

Please observe protection note ISO 16016.	Drawn:	12.06.14 Pz/Ba	Replaced for:	KTR-N dated 27.02.12
	Verified:	08.07.14 Pz	Replaced by:	



9 Spares inventory, customer service addresses

A basic requirement to ensure the operational readiness of the coupling is a stock of the most important spare parts on site.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage at www.ktr.com.



KTR does not assume any liability or warranty for the use of spare parts and accessories which are not provided by KTR and for the damages which may incur as a result.

10 Enclosure A

Advice and instructions regarding the use in  hazardous locations

Types NN, NANA 1 to 5, NENA 1 and 2, NENE 1, NNZ, NNW, MK with standard flange hubs as well as assembly with KTR clamping nuts.

RADEX®-N with spacer made of steel only.

10.1 Intended use in hazardous locations

Conditions of operation in hazardous locations

RADEX®-N couplings are suitable for the use according to EC directive 94/9/EC.

1. Industry (with the exception of mining)

- Equipment group II of category 2 and 3 (*coupling is not approved for equipment group 1*)
- Media class G (*gases, fogs, steams*), zone 1 and 2 (*coupling is not approved for zone 0*)
- Media class D (*dusts*), zone 21 and 22 (*coupling is not approved for zone 20*)
- Explosion group IIC (*explosion class IIA and IIB are included in IIC*)

Temperature class:

Temperature class	Ambient or operating temperature T_a	Max. surface temperature
T2, T1	- 30 °C to + 280 °C ¹⁾	+ 280 °C ²⁾
T3	- 30 °C to + 190 °C	+ 200 °C ²⁾
T4	- 30 °C to + 125 °C	+ 135 °C ²⁾
T5	- 30 °C to + 90 °C	+ 100 °C
T6	- 30 °C to + 75 °C	+ 85 °C

Explanation:

The maximum surface temperatures each result from the maximum permissible ambient or operating temperature T_a plus the maximum temperature increase ΔT of 10 K which has to be taken into account.

1) The ambient or operating temperature T_a is limited to + 280 °C due to the permissible permanent operating temperature.

2) The maximum surface temperature of + 110 °C applies for the use in locations which are potentially subject to dust explosion, too.

2. Mining

Equipment group I of category M2 (coupling is not approved for equipment group M1).
Permissible ambient temperature - 30 °C to + 140 °C.

Please observe protection note ISO 16016.	Drawn:	12.06.14 Pz/Ba	Replaced for:	KTR-N dated 27.02.12
	Verified:	08.07.14 Pz	Replaced by:	



10 Enclosure A

Advice and instructions regarding the use in  hazardous locations

10.2 Inspection intervals for couplings in  hazardous locations

Explosion group	Inspection intervals
3G 3D	For couplings which are classified in category 3G or 3D the operating and assembly instructions that are usual for standard operation apply. During the standard operation which has to be subject to the ignition risk analysis the couplings are free from any ignition source. Merely the temperature increase produced by self-heating and depending on the coupling type has to be considered: for RADEX®-N: $\Delta T = 10 \text{ K}$
II 2GD c IIB T1, T2, T3, T4, T5, T6	An inspection of torsional backlash and a visual inspection of the lamina set must be performed after 3,000 operating hours for the first time, at the latest after 6 months after start-up of the coupling. If you note insignificant or no wear on the lamina set upon this initial inspection, further inspections can each be performed after 6,000 operating hours or at the latest after 18 months, provided that the operating parameters remain the same. If you note significant wear during the initial inspection so that it would be recommendable to replace the lamina sets, please find out the cause according to the table „Breakdowns“, if possible. The maintenance intervals must be adjusted to the modified operating parameters without fail.
II 2GD c IIC T1, T2, T3, T4, T5, T6	An inspection of the torsional backlash and a visual inspection of the lamina set must be performed after 2,000 operating hours for the first time, at the latest after 3 months after start-up of the coupling. If you note insignificant or no wear on the lamina set upon this initial inspection, further inspections can each be performed after 4,000 operating hours or at the latest after 12 months, provided that the operating parameters remain the same. If you note significant wear during the initial inspection so that it would be recommendable to replace the lamina sets, please find out the cause according to the table „Breakdowns“, if possible. The maintenance intervals must be adjusted to the modified operating parameters without fail.

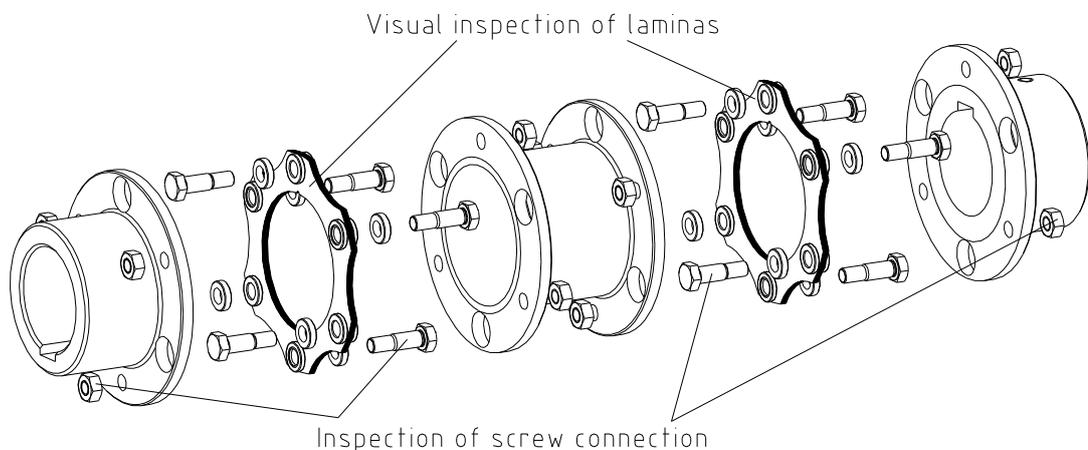


Illustration 32: RADEX®-N type NANA 1

Please observe protection note ISO 16016.	Drawn:	12.06.14 Pz/Ba	Replaced for:	KTR-N dated 27.02.12
	Verified:	08.07.14 Pz	Replaced by:	



10 Enclosure A

Advice and instructions regarding the use in  hazardous locations

10.3 Permissible coupling materials in hazardous locations

In the explosion groups IIB and IIC the following materials may be combined:

Steel
Stainless steel

Aluminium as coupling material is generally excluded for the explosion area.

10.4 marking of coupling for hazardous locations

Couplings for the use in hazardous locations are marked on at least one component completely and on the remaining components by an  label on the outside diameter of the hub or on the front side each for the operating conditions permitted. The lamina sets are not marked.

Complete labelling:



II 2G c IIC T6, T5, T4, T3 resp. T2 - $30\text{ °C} \leq T_a \leq +75\text{ °C}$, $+90\text{ °C}$, $+125\text{ °C}$,
 $+190\text{ °C}$ resp. $+280\text{ °C}$
II 2D c T 110 °C - $30\text{ °C} \leq T_a \leq +100\text{ °C}$ /I M2 c - $30\text{ °C} \leq T_a \leq +140\text{ °C}$

Short labelling:



II 2GD c IIC T X/I M2 c X

The former marking remains valid:



II 2G c IIC T4/T5/T6 - $30\text{ °C} \leq T_a \leq +80/60/45\text{ °C}$
II 2D c T 110 °C /I M2 c - $30\text{ °C} \leq T_a \leq +80\text{ °C}$

The labelling with explosion group IIC includes the explosion groups IIA and IIB.

If the symbol  was stamped in addition to , the coupling component was supplied unbored or pilot bored by KTR.



10 Enclosure A

Advice and instructions regarding the use in  hazardous locations

10.5 EC Certificate of conformity

EC Certificate of conformity

corresponding to EC directive 94/9/EC dated 23 March 1994
and to the legal regulations

The manufacturer - KTR Kupplungstechnik GmbH, D-48432 Rheine - states that the

RADEX®-N Steel Lamina Couplings

in an explosion-proof design described in these assembly instructions correspond to article 1 (3) b) of directive 94/9/EC and comply with the general safety and health requirements according to enclosure II of directive 94/9/EC.

The RADEX®-N steel lamina coupling is in accordance with the specifications of the directive 94/9/EC. One or several directives mentioned in the corresponding EC type examination certificate IBExU02ATEXB005_05 X were in part replaced by updated versions. KTR Kupplungstechnik GmbH being the manufacturer confirms that the product mentioned above is in accordance with the specifications of the new directives, too.

According to article 8 (1) of directive 94/9/EC the technical documentation is deposited with the institution:

IBExU
Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7

09599 Freiberg

Rheine,
Place

12.06.2014
Date

i. V. 
Reinhard Wibbeling
Engineering/R&D

i. V. 
Reiner Banemann
Product Manager