

Installation and Operation Manual TSCHAN®
Torsionally Rigid Coupling

POSIMIN® - NZN, NZNmin



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1 Safety Instructions

This installation and operation manual is an essential component of the coupling delivery. Always keep this manual in a readily accessible place near the coupling. The German version of this manual is the predominant and binding version.

Take care that all persons being charged with the installation, operation, maintenance and repair of the coupling have read and understood this manual and that all instructions contained therein are carefully observed in order to:

- avoid danger to life and limb of the user or third persons,
- ensure the operational safety of the coupling,
- preclude operation failures and environmental damages due to wrong handling and misuse.

The relevant instructions and regulations regarding safety at work and environmental protection have to be observed while transporting, mounting and dismounting the coupling. Make sure that suitable handling and transportation means are at disposal.

The coupling shall be operated, mounted, maintained and repaired by authorized, trained and instructed personnel only.

In the interest of further development, we reserve the right to carry out modifications serving the technical progress.

We do not assume any liability or warranty for any damages resulting from the use of accessories and parts that are not originally manufactured by TSCHAN GmbH.

2 Function

The TSCHAN®-Coupling POSIMIN® is a torsionally rigid steel disk coupling. It compensates for angular, radial and axial shaft misalignments within defined ranges. The coupling transmits torque without backlash through flexible steel disks loaded in tension.

The spacer can be radially mounted and dismounted without having to move the connected machines. The distance dimension 'E' between the flange hubs can then be used, for example, to service connected machines.

When the spacer is dismounted, a check of the rotational direction of the drive can easily be performed.

The coupling is suitable for use in every direction of rotation and installation position. For applications involving other than horizontal position, it may be necessary to support the spacer. Please consult TSCHAN GmbH, if this has not been considered when selecting the coupling.

2.1 Intended Application

- The coupling must only be operated in normal industrial atmospheres. Since aggressive media may attack the coupling components, screws and elastic buffer rings, they represent a risk for the operational safety of the coupling. Consult TSCHAN GmbH in such cases.
- In order to ensure trouble-free and reliable operation, the coupling has to be sized according to the design specifications, e.g. according to DIN, part 2, (or acc. to catalogue TSCHAN® POSIMIN®), with a service factor appropriate for the service conditions.
- Except for the production of a finish bore with keyway, no further modifications are allowed to be carried out on the coupling!
- The coupling shall only be used and operated within the frame of the conditions as defined in the performance or delivery contract.
- Any change in the operation conditions or service parameters requires the verification of the coupling design.

3 Storage

On receipt of the goods, immediately check that all parts are on hand and are as ordered. Eventual shipping damages and/or missing parts have to be reported in writing.

The coupling parts can be stored in a dry place under roof at normal ambient temperatures for a time period of 6 months. Storage for a longer period requires the application of a long-term preservation. (Please consult TSCHAN GmbH in this respect.)

The disk packs are made of stainless spring steel. They must not be exposed to any aggressive products, extreme temperatures or humidity. Do not store the disk packs along with acids, alkaline solutions or other caustic chemicals. The place of storage should be dry and free from dust. The air humidity should not exceed 65% and condensation is not permissible.

4 Construction

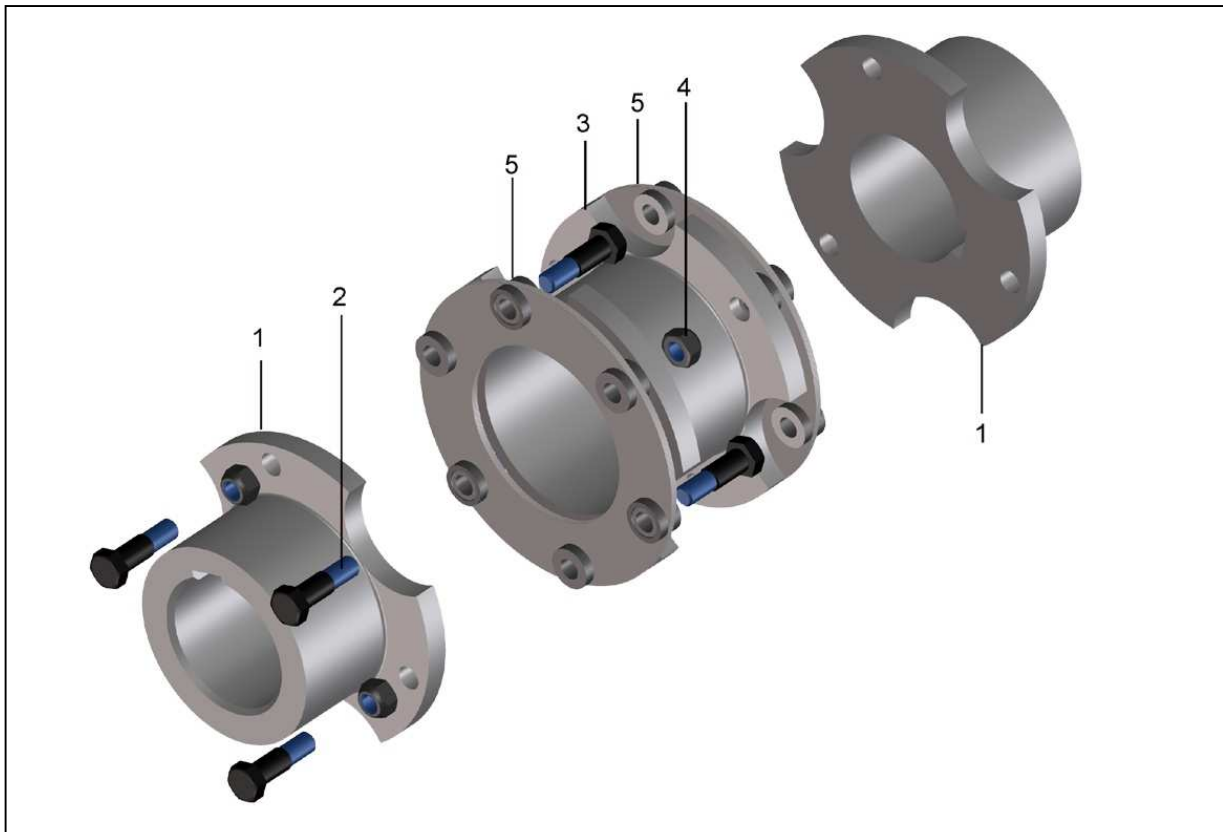
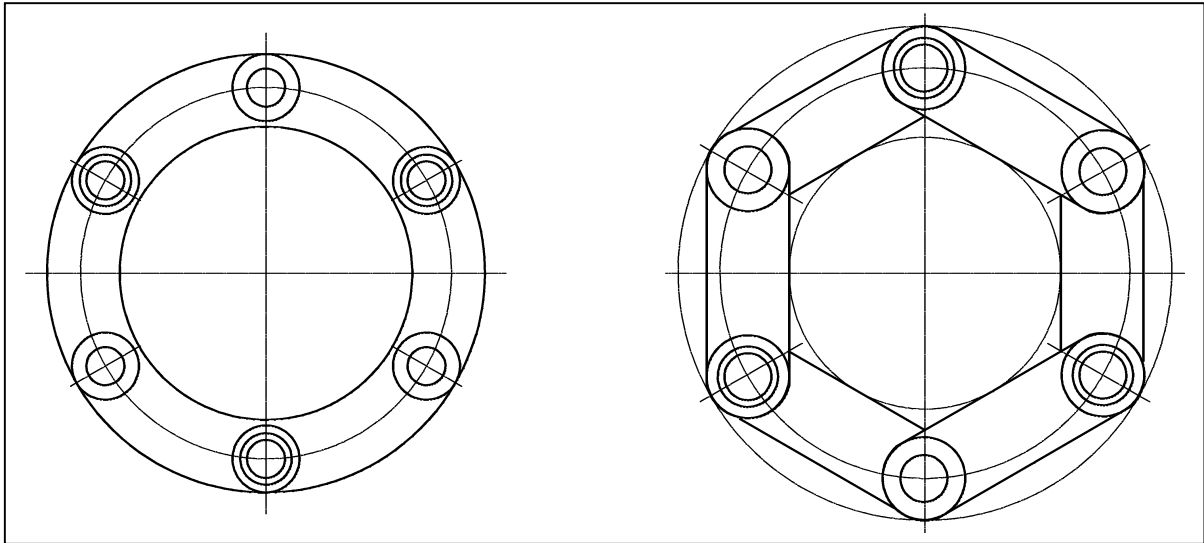


Fig. 1 Construction POSIMIN® NZN, NZNmin

- 1 N-hub, part 475
- 2 Fitted bolt
- 3 Spacer
- 4 Hexagon nut
- 5 Steel disk pack of NZN-design

Important notes:

- The spacer, part 3, is delivered with fitted disk packs, part 5, as an easy-to-mount unit.
- Balanced assemblies are match marked. For balanced couplings, the fitted bolts and nuts are weight balanced. These sets must not be mixed with bolt sets of other couplings!



Ring type disk pack
up to size 260

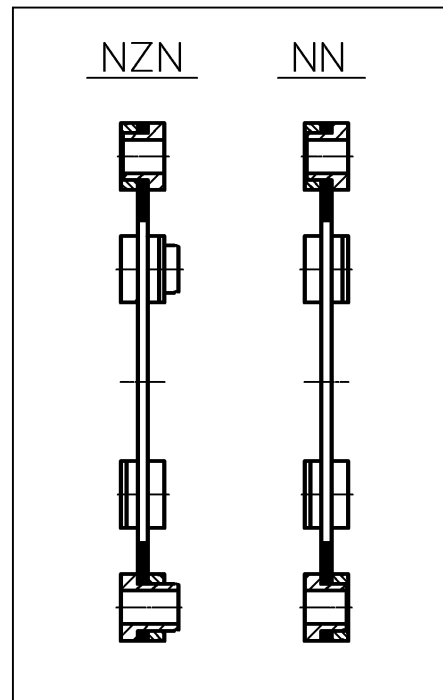
Link type disk pack
as of size 330

NZN-design:

Disk pack with alternate short and long protruding bushes used to fit the disk pack to the spacer.

NN-design:

Disk pack with short bushes.



5 Technical Data

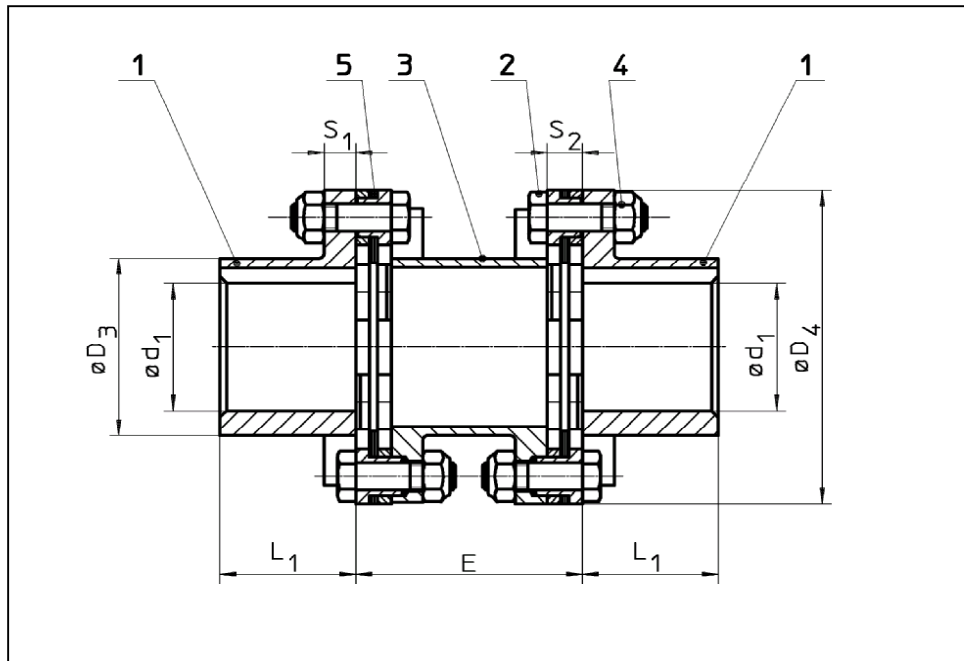


Fig. 2 Construction POSIMIN® NZN, NZNmin

Table 1 Technical Data:

Size NZN NZNmin	T _{Cnom} [Nm]	T _{Cpeak} [Nm]	n _{max} [rpm]	d _{1 max} [mm]	E Standard E _{min}	L ₁ [mm]	D ₃ [mm]	D ₄ [mm]	S ₁ [mm]	S ₂ [mm]	m [kg]
3	80	166	13900	28	50 42	30	39	69	7	7,8	1,0 1,0
5	110	200	11500	38	60 42	35	53	83	7	7,8	2,0 1,9
10	150	270	10300	45	70 42	40	63	93	7	7,8	2,9 2,7
21	360	650	8100	55	86 55	50	77	118	9	10,7	5,8 5,6
42	500	900	7200	65	106 55	60	91	133	9	10,7	9,0 8,5
66	900	1600	6100	75	126 65	70	105	156	9	11,6	14,0 13,2
105	1400	2500	5700	80	130 70	75	112	168	12	12,5	17,9 17,1
168	2400	4300	5150	85	140 80	80	118	186	13	13,4	23,0 22,0
260	2900	5200	4900	90	160 85	90	128	196	13	13,4	29,0 28,0
330	4400	8000	4300	100	170 105	100	139	222	18	22,8	41,0 40,0
520	5200	9400	4030	110	190 105	110	154	237	18	22,8	52,0 50,0
660	7700	13900	3650	115	200 120	115	158	262	20	24,4	65,0 62,0
840	8300	15000	3450	125	220 120	125	174	278	20	24,4	80,0 75,0
1200	15000	27000	2900	145	250 160	145	197	330	25	32,0	128,0 120,0
1650	18000	32400	2600	170	300 160	170	232	365	25	32,0	180,0 171,0
2500	28000	50400	2250	200	350 200	200	269	425	30	38,0	288,0 275,0
3200	32000	57600	2100	225	400 200	225	304	460	30	38,0	382,0 365,0

The torques T_{Cnom} and T_{Cpeak} are valid for:

- Ambient temperatures of -30°C up to $+150^{\circ}\text{C}$
- Operation within the range of the specified alignment values.

Weights are specified for couplings without bores in the hubs.

For determining the size of the coupling according to DIN 740, part 2, (or to catalogue POSIMIN[®]) various factors have to be taken into account:

- the temperature factor S_V in case of higher temperatures,
- the start-up factor S_z depending on the frequency of starts,
- the shock factor S_A, S_L depending on the service conditions.

For circumferential speeds above 30 m/s, referred to the outer diameter of the coupling, we recommend balancing the coupling parts.

Spacers, which are longer than the standard E-dimension, should be balanced in each case.

6 Installation

6.1 Instructions to be observed prior to Installation



- **Danger of injuries!**
- **Disconnect the drive before carrying out any work on the coupling!**
- **Secure the drive against unintentional re-start and rotation!**
- **Incorrectly tightened bolts can cause serious personal injuries and property damages.**
- **If possible, assemble the coupling outside of the danger zone. Take care that suitable transportation means are at disposal and that the transportation ways are free of obstacles.**
- **In compliance with accident prevention regulations, you are obliged to protect all freely rotating parts by means of permanently installed guards against unintentional contact and falling down objects.**
- **To avoid sparks, the covers for couplings used should be made of stainless steel!**
- **As a minimum, the covers have to fulfil the requirements of protection type IP2X.**
- **The covers have to be designed to prevent dust from depositing on the coupling.**
- **The cover must not contact the coupling or impair the proper function of the coupling.**

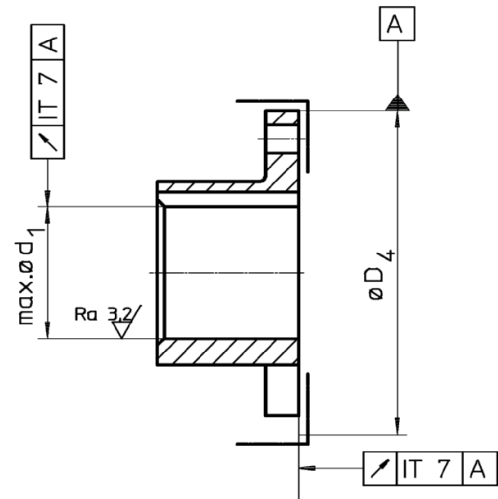
- Make sure that the speeds, torques and ambient temperatures as stated in chapter 5 'Technical Data' are not exceeded.
- The maximum permissible bore diameters must not be exceeded.
- Check whether the shaft-hub connections safely transmit the occurring operating torques.
- The standard tolerance of TSCHAN for finish bores is fit H7.
- Standard keyways comply with DIN 6885, sheet 1.
- Check the dimensions and tolerances of shafts, hub bores, keys and keyways.

- Set screws as required.

6.2 Finish Bore

The following procedure has to be followed to produce a finish bore in a coupling hub:

- Clean and remove all preservatives from the coupling hubs.
- Mount the coupling hub in between the surfaces marked with \lrcorner and carefully align the hub.
- The values for d_{1max} as listed in table 1 are valid for keyed connections according to DIN 6885/1 and must not be exceeded.
- Select the bore fit so that an interference fit such as H7/m6 results when mating it with the shaft tolerance.
- Axially lock the hub, for example by means of a setscrew on the back of the hub above the keyway.



Consult TSCHAN GmbH in case of other shaft-hub connections.



- **The stated maximum bore diameters are valid for keyed connections according to DIN 6885/1 and must not be exceeded.**
- **If these values are exceeded, the coupling can break.**
- **Flying off coupling fragments are a danger to life!**

6.3 Mounting of Coupling

- Prior to installation, carefully clean the bores of the coupling hubs and the shaft ends. The surfaces must be clean, dry and free of grease.
- For larger couplings use suitable mounting tools and hoisting devices such as cranes or pulley blocks.
- Mount the coupling hubs in the proper position on the shaft ends (Fig. 3).

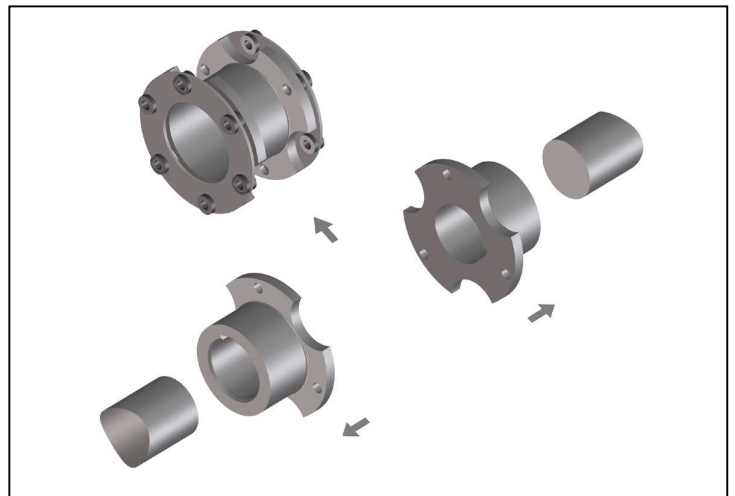


Fig. 3

Note:

To facilitate mounting, the hub can be uniformly heated to 80°C to 120°C.



Warning!

- **Always wear heat-resistant gloves to protect yourself against injuries due to hot coupling components!**

- Mount the hubs in such a manner that the shaft end is flush with the inner bore opening (Fig. 4). Projecting shaft ends prevent radial mounting and removal of the spacer. Observe deviant agreements, which may exist!
- When tightening setscrews, secure them with an adhesive, such as e.g. Loctite 222, to prevent the screws from working loose and dropping out.

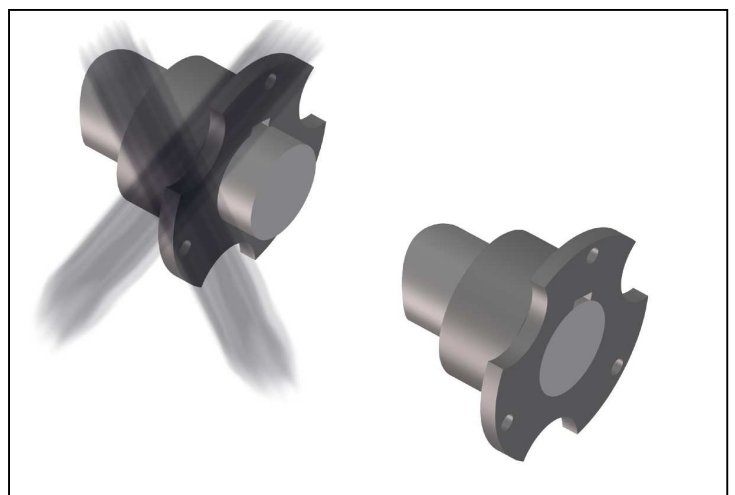


Fig. 4

- Before mounting the spacer, perform an initial alignment over the hub flanges by using an appropriate tool, e.g. a straightedge. The shaft ends should be flush with each other.
- The hub flanges must be parallel to each other. Refer to chapter 7 'Coupling Alignment'.
- Check correct distance dimension 'E'. See Fig. 5 and chapter 7 'Coupling alignment'.
- The bearing surfaces of the fastening elements on the flanges and disk packs must be clean, dry and free of grease.
- Place the spacer with the bushed disk packs between the hubs. (Fig. 6). This has to be done in such a manner that the fitted bores repose in the recesses of the mating part.
- Install the fitted bolts through the disk packs into the fitted bores. The nuts have to rest on the flange (Fig. 6).
Attention: The NZN-min design only allows to mount the fitted bolts from the hub side.

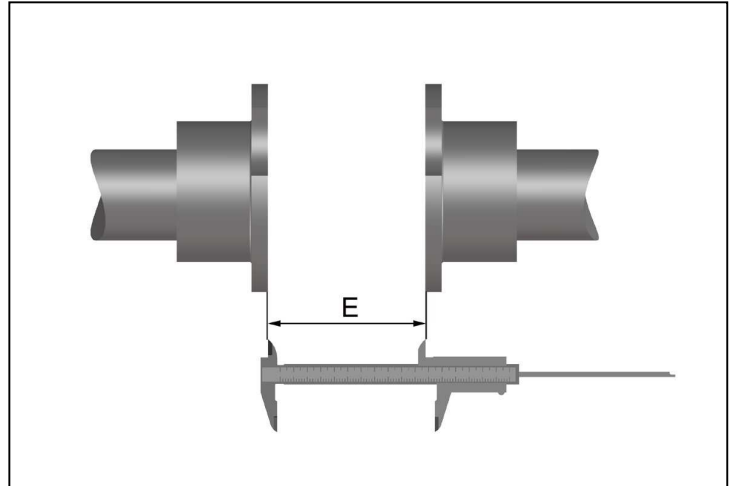


Fig. 5

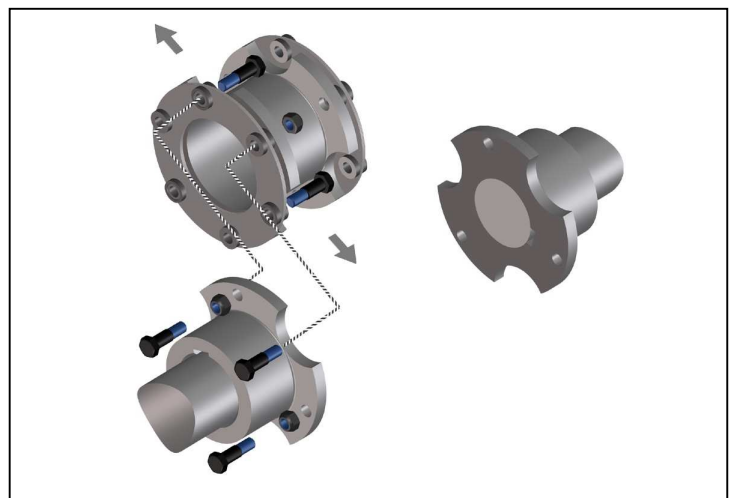


Fig. 6



- **Use the fitted bolts and nuts as they were delivered, i.e. slightly oiled. Do not clean or additionally lubricate the fastening elements !**

- Slightly tighten the nuts by hand.
- Tighten the nuts progressively one after the other in small increments until the tightening torque M_A stated in table 2 is reached. **Secure the fitted bolts against turning!**
- Align the coupling according to the instructions given in chapter 7 'Coupling Alignment'.

Table 2 Tightening torques M_A of nuts in 'slightly oiled' delivery state:

Size	3	5	10	21	42	66	105	168	260
Fitted bolt	M6x22	M6x22	M6x22	M8x30	M8x30	M10x35	M12x40	M16x46	M16x46
M_A [Nm]	14	14	14	33	33	66	115	250	250

Size	330	520	660	840	1200	1650	2500	3200
Fitted bolt	M20x65	M20x65	M24x72	M24x72	M30x92	M30x92	M36x110	M36x110
M_A [Nm]	490	490	840	840	1700	1700	2800	2800

7 Coupling Alignment



- **Danger of injuries!**
- **Disconnect the drive before carrying out any work on the coupling.**
- **Secure the drive against unintentional re-start and rotation!**
- **Note:**
- **Accurate alignment of the coupling prolongs the lifetime of the disk packs and reduces the risks when operating the coupling.**
- **It is of utmost importance to observe the recommended alignment values. Exceeding the permissible misalignment values results in coupling damages and failures!**

- When aligning the cold equipment take into account the expected thermal growth of the components, so that the permissible misalignment values for the coupling are not exceeded in operation.
- Be aware that the coupling under misalignment imposes restoring forces on the adjacent shafts and bearings. Take into account that the larger the misalignment, the greater the restoring forces will be.
- In special cases with high demand on quiet running or high rotation speeds it is possible that, in the three displacement levels, an alignment accuracy of $\leq 0,1\text{mm}$ is necessary.
- If the coupling is mounted in a closed housing / casing so that a subsequent alignment is not possible anymore, it must be guaranteed that the geometry and fit accuracy of the contact surfaces in operation aligns the shafts exactly within the mentioned tolerances.

7.1 Angular Misalignment ΔK_w

- Measure one complete rotation (360°) on the face of the outer diameter. Determine the largest deviation K_{w1} and the smallest deviation K_{w2} (Fig. 7). Calculate the angular misalignment:
 $\Delta K_w = K_{w1} - K_{w2}$.
- When aligning, observe the max. permissible angular misalignment $\Delta K_{w\text{max}}$ acc. to table 3.

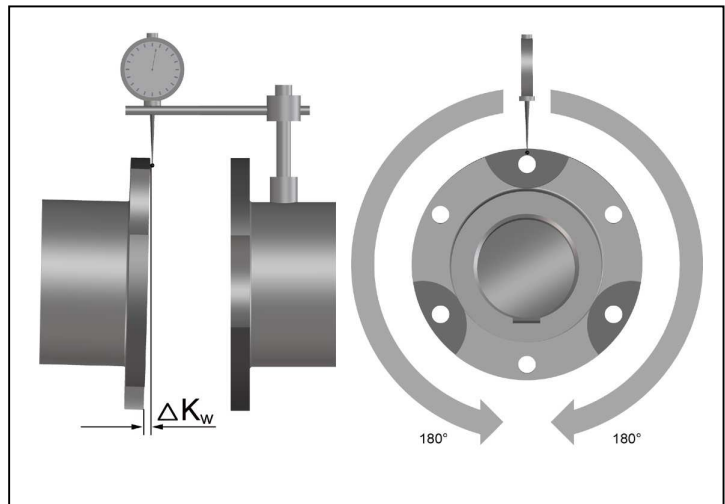


Fig. 7

Table 3 Angular Misalignment:

Size	3	5	10	21	42	66	105	168	260	330	520	660	840	1200	1650	2500	3200
$\Delta K_{w\text{max}}$ [mm]	0,12	0,14	0,15	0,2	0,2	0,25	0,3	0,3	0,3	0,35	0,4	0,4	0,45	0,6	0,6	0,7	0,8

7.2 Axial Misalignment ΔK_a

- Before installing the spacer measure the actual length dimension 'E' of the spacer over the bushes of the disk packs (Fig. 8).
- Set the distance between the flange hubs to a dimension between E and (E + Δe) acc. to table 4. Do not exceed the tolerances stated in table 4.

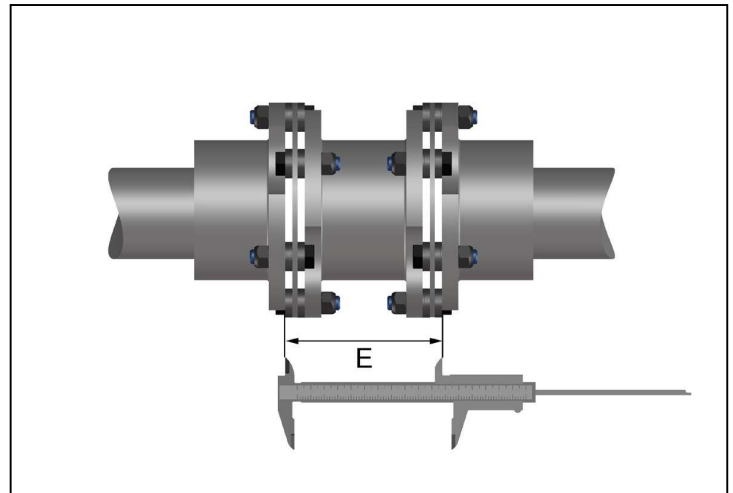


Fig. 8

Table 4 Recommended Tolerance Values Δe for Mounting Dimension 'E':

Size	3	5	10	21	42	66	105	168	260	330	520	660	840	1200	1650	2500	3200
Δe [mm]	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,25	0,25	0,25	0,3	0,35	0,4	0,4	0,5	0,55

ATTENTION!

Make sure not to fall below the dimension 'E', as otherwise it is not possible to mount the spacer radially!

If larger axial displacements are to be anticipated during operation, e.g. due to thermal growth, the coupling can be mounted with axial pre-stretch to account for the expected growth. This item has to be discussed with TSCHAN GmbH, if it has not been considered when designing the coupling. In service, the coupling shall run in unconstrained manner with dimension 'E'.

7.3 Radial Misalignment ΔK_r

- Measure one complete rotation (360°). Determine the largest deviation K_{r1} and the smallest deviation K_{r2} (Fig. 9). Calculate the radial misalignment $\Delta K_r = 0,5 \times (K_{r1} - K_{r2})$. Observe the preceding sign of the measured values.
- When aligning, observe the maximum permissible radial misalignment in dependence of the mounting dimension 'E' $\Delta K_{rmax} = E/1000$ [mm].
- For verification purposes, this measurement should also be performed on the second coupling half.
- The alignment must be corrected in case of any deviations.

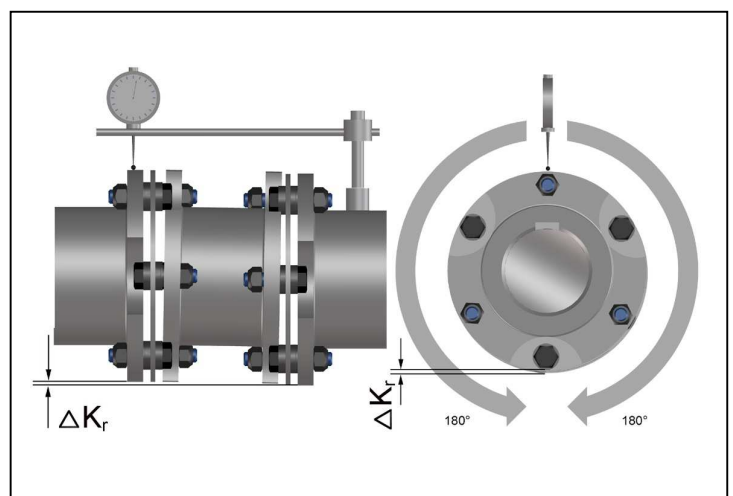


Fig. 9

8 Operation

When operating the coupling, its specific technical data have to be carefully observed (see chapter 5 'Technical Data'). These values must never be exceeded without the prior written approval by TSCHAN GmbH.

In order to ensure trouble-free and reliable performance of the coupling, the coupling has to be designed according to the selection specifications, e.g. according to DIN 740, part 2, (or acc. to catalogue POSIMIN[®]), with a service factor appropriate to the service conditions. Any change in the service conditions or service parameters always necessitates the verification of the coupling design!



- **Danger of injuries!**
- **Disconnect the drive before carrying out any work on the coupling!**
- **Secure the drive against unintentional re-start and rotation!**
- **Improperly tightened screws may cause parts to fly off what leads to most serious personal injuries and property damages!**
- **Before putting the coupling into operation, check the alignment and all screwed connections for correct tightening torque and firm fit!**

- **Before starting up the equipment, install all protective guards in order to avoid unintentional contact with freely moving or rotating parts.**
- **To avoid sparks, the covers for couplings used should be made of stainless steel!**
- **The covers have to comply with protection type IP2X as a minimum.**
- **The cover shall be designed to prevent dust from depositing on the coupling parts.**
- **The cover must not touch the coupling and must not impair the proper function of the coupling.**

While operating the coupling, pay attention to:

- Changes in operating noises
- Vibrations

Attention!

- **Disconnect the drive immediately, if any irregularities are observed while operating the coupling!**
- Identify the cause for the problem using table 5 "Operation Faults and Possible Causes" and correct the fault.
The listed problems are some examples to assist you in troubleshooting.
- **All the machinery components and operation modes have to be considered for the determination and correction of faults!**

Table 5 Operation Faults and Possible Causes:

Trouble	Cause	Risk Warning	Correction
Running noises/ vibrations	Alignment fault	Increased restoring forces on shafts and bearings of the connected machines.	<ul style="list-style-type: none"> - Disconnect drive - Remove cause for alignment fault - Re-align coupling - Check disk packs for damages such as cracks, dents or similar damages, and replace them, if necessary
	Damaged disk packs	Disk breakage, spacer can fly out	<ul style="list-style-type: none"> - Disconnect drive - Check coupling components for damages and replace parts, if necessary - Check alignment - Verify coupling design - Replace disk packs - Verify balance state of plant components and correct it, if necessary
	Unbalance	Vibrations, disk breakage	<ul style="list-style-type: none"> - Disconnect drive - Check disk packs for damages, such as cracks, dents or similar damages, and replace them, if necessary - Verify balance state of plant components and correct it, if necessary
	Loose screw connections	Spacer can fly out	<ul style="list-style-type: none"> - Disconnect drive - Check coupling parts for damages, replace parts, if necessary - Verify alignment of coupling - Tighten nuts with the specified tightening torque
Disk pack damages	Alignment faults	Increased restoring forces on shafts and bearings of the connected machines	<ul style="list-style-type: none"> - Disconnect drive - Remove cause for alignment fault - Re-align coupling - Replace disk packs - Verify balance state of plant components and correct it, if necessary
	Overloading due to very high torque	Disk breakage, spacer can fly out	<ul style="list-style-type: none"> - Disconnect drive - Verify coupling design in cooperation with TSCHAN GmbH - Replace coupling - Install larger coupling, if necessary
	Contact with aggressive products	Disk breakage, spacer can fly out	<ul style="list-style-type: none"> - Disconnect drive - Check coupling parts for damages and replace parts, if necessary - Replace disk packs - Verify balance state of plant components and correct it, if necessary - Verify alignment of coupling - Prevent contact with aggressive products

Trouble	Cause	Risk Warning	Correction
	Torsional vibrations in the drive line	Disk breakage, spacer can fly out	<ul style="list-style-type: none">- Disconnect drive- Analyse and eliminate cause for torsional vibrations- Check coupling parts for damages and replace parts, if necessary- Verify coupling alignment

9 Maintenance

The torsionally rigid disk coupling POSIMIN® only requires little maintenance during operation.

On the occasion of routine inspections or maintenance of the equipment, check:

- alignment of coupling,
- state of disk packs,
- firm fit of all fastening elements at the disk packs.
- Remove dust deposits from coupling parts and disk packs.

9.1 Disk Pack Inspection



- **Danger of injuries!**
- **Disconnect the drive before carrying out any work on the coupling!**
- **Secure the drive against unintentional re-start and rotation!**

Visually inspect the disk packs after 2000 hours, however after 3 months at latest, after the first start-up. If this first inspection does not reveal any damages such as cracks or dents on the disks, further inspections may be conducted at regular intervals of 4000 hours, however, at least once a year, provided that the operation modes and service conditions of the equipment are not altered.

If damages of the disk packs are already detected on the occasion of this first inspection, verify whether the cause for the problem is listed in table 5 "Operation faults". It is essential to adapt the inspection intervals to the prevailing operation conditions.

Under special operation conditions it may be necessary to perform inspections and maintenance operations at shorter intervals than stated.

9.2 Replacement of Disk Packs



- **Danger of injuries!**
- **Disconnect the drive before carrying out any work on the coupling!**
- **Secure the drive against unintentional re-start and rotation!**

- Secure the spacer against falling down.
- Remove the fastening elements from the disk packs.
- Radially lift out the spacer along with the disk packs of the hub flanges. For larger couplings use appropriate tools and lifting devices such as cranes or blocks and tackles (Figure 10).
- Carefully remove the damaged disk packs making sure not to damage the fitted bores in the flanges.
- Check the coupling parts for damages.
- Install the new disk packs of NZN-design with the protruding bushes to the spacer. Take care that the bushes do not get canted, and press the bushes into the flange of the spacer in a simultaneous and uniform manner.
- For further way of proceeding, see chapter 6 'Coupling Installation'.
- Verify the alignment of the coupling according to chapter 7 'Coupling Alignment'.

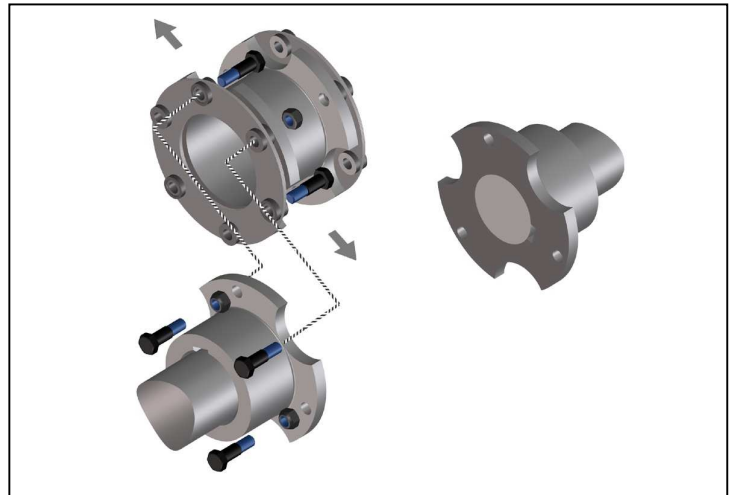


Fig. 10



Warning!

- Before putting the equipment into service, all safety guards must be installed to prevent unintentional contact with freely rotating parts.
- To avoid sparks, the covers for couplings used should be made of stainless steel.
- The covers have to fulfil the requirements of protection type IP2X as a minimum.
- The covers have to be designed to prevent dust from depositing on the coupling parts.
- The cover must not touch the coupling and impair the proper operation of the coupling.

We do not assume any responsibility or warranty for any damages resulting from the use of accessories or spare parts, which have not originally been manufactured by TSCHAN GmbH.

10 Disposal

Disposal of the parts must be arranged in accordance with the regulations and laws of the country where the equipment is installed.