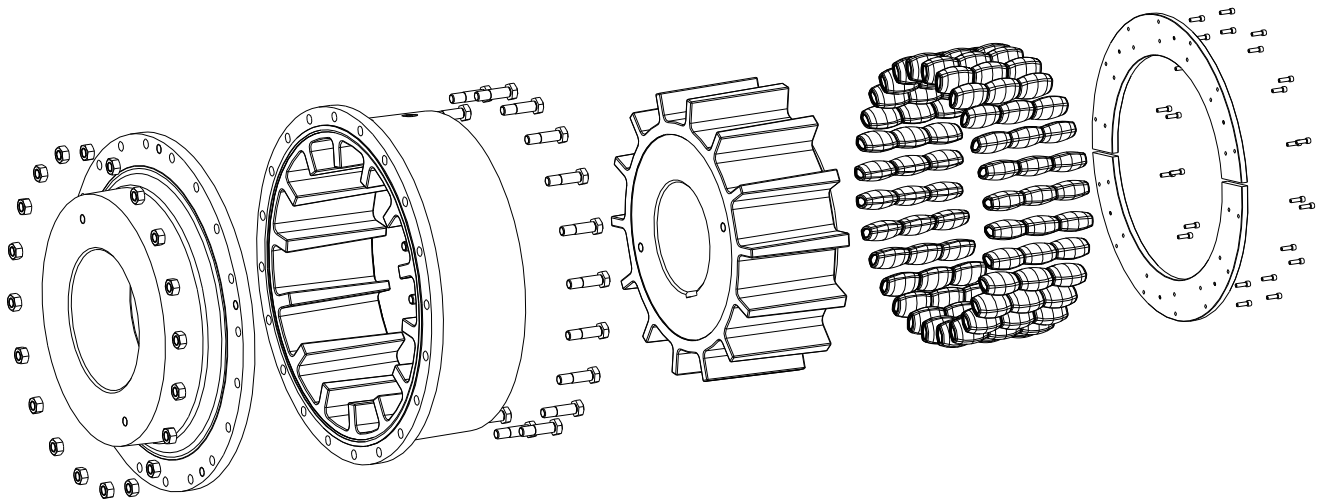




# POLY-NORM<sup>®</sup>-M

Flexible jaw coupling type AFN

for finish bored, pilot bored and unbored couplings



**Type AFN**



**POLY-NORM®-M** is a torsionally flexible jaw coupling. It is able to compensate for shaft misalignment, for example caused by manufacturing inaccuracies, thermal expansion, etc.

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**1 Technical data**

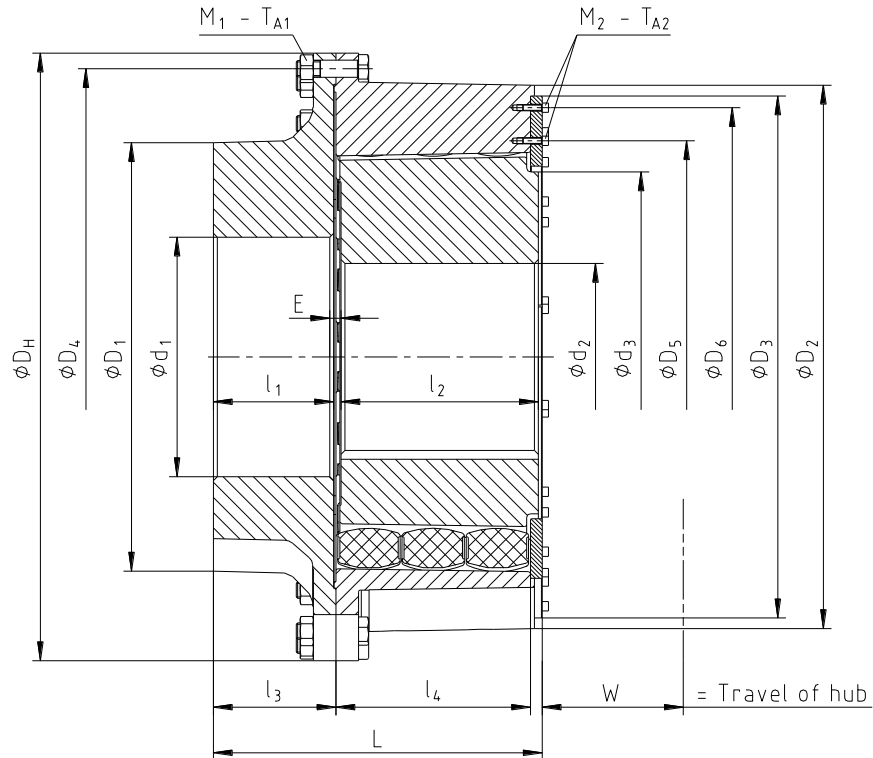


Illustration 1: POLY-NORM®-M, type AFN

**Table 1: Dimensions**

Size	Dimensions [mm]																
	Max. finish bore		General														
	d <sub>1</sub>	d <sub>2</sub>	L	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	D <sub>H</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	d <sub>3</sub>	E	W
202	350	200	425	195	215	200	218	640	500	552	530	600	360	480	300	12	150
252	355	250	438	208	215	213	218	720	550	635	610	680	460	570	360	12	150
302	380	300	464	203	247	209	255	770	600	682	660	730	510	625	430	13	175
402	480	400	580	224	335	230	350	1000	760	885	860	945	650	800	530	14	250
502	650	500	654	228	407	234	360	1200	1000	1080	1050	1140	830	990	700	19	250
703	700	700	845	309	507	315	500	1560	1100	1395	1340	1480	1110	1280	950	19	360
903	1000	900	982	406	541	412	550	2060	1400	1865	1800	1975	1500	1730	1300	25	390
905	1000	900	1377	406	857	417	920	2060	1650	1865	1800	1975	1500	1730	1300	114	715

**Table 2: Technical data**

Size	Torque [kNm]		Max. speed <sup>1)</sup> [rpm]	Tightening torque [Nm]				Weight <sup>2)</sup> [kg]
	T <sub>KN</sub>	T <sub>K max.</sub>		M <sub>1</sub>	T <sub>A1</sub>	M <sub>2</sub>	T <sub>A2</sub>	
202	100	200	600	M24	970	M16	290	430
252	140	280	530	M24	970	M16	290	590
302	200	400	500	M24	970	M16	290	730
402	400	800	380	M30	1950	M16	290	1750
502	650	1300	320	M30	1950	M16	290	2240
703	1200	2400	245	M42	3600	M16	290	5150
903	3300	6600	190	M48	5450	M24	970	9800
905	5500	11000	190	M48	5450	M24	970	14800

1) Maximum circumferential speed v = 20 m/s referring to the maximum outside diameter. Higher speed on request.  
2) Weights apply for max. bore diameters with feather keyway according to DIN 6885 sheet 1



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

### 2.2 Safety and advice symbols



**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 adverse 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 operating 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 **POLY-NORM®-M** described in here corresponds to the technical status at the time of printing of these operating/assembly instructions.

Please observe protection note ISO 16016.

Drawn:	2018-10-04 Pz/Kr
Verified:	2018-10-05 Pz

Replacing:	KTR-N dated 2018-07-06
Replaced by:	

**2 Advice****2.5 Coupling selection**

For a permanent 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 catalogue drive technology).

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

Please make sure that the technical data regarding torque refer to the elastomers 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.

**2.6 Reference to EC Machinery Directive 2006/42/EC**

The couplings supplied by KTR should be considered as components, not machines or partly completed machines according to EC Machinery Directive 2006/42/EC. Consequently KTR does not have to issue a declaration of incorporation. For details about safe assembly, start-up and safe operation please refer to the present operating/assembly instructions considering the warnings.

**3 Storage, transport and packaging****3.1 Storage**

The coupling hubs are supplied in preserved condition and can be stored at a dry and roofed place for 6 - 9 months. The features of the individual elastomers remain unchanged for up to 5 years with favourable stock conditions.



The storage rooms must not include any ozone-generating devices like e. g. fluorescent light sources, mercury-vapour lamps or electrical high-voltage appliances.

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 transport and 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 specifications of KTR.



**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 POLY-NORM®-M, type AFN**

Component	Quantity	Description
1	1	Flange hub
2	1	Hub
3	2 <sup>1)</sup>	Cover segment
4	1	Cam ring
5	see table 3	Individual elastomer
6	see table 3	Cap screw DIN EN ISO 4762 - 12.9
7	see table 3	Hexagon fit bolt DIN 609 - 10.9 <sup>2)</sup>
8	see table 3	Hexagon nut DIN EN ISO 4032 - 10

1) With size 903 and 905 the number is 4.

2) With size 202 and 252 - hexagon screws DIN EN ISO 4017 - 10.9

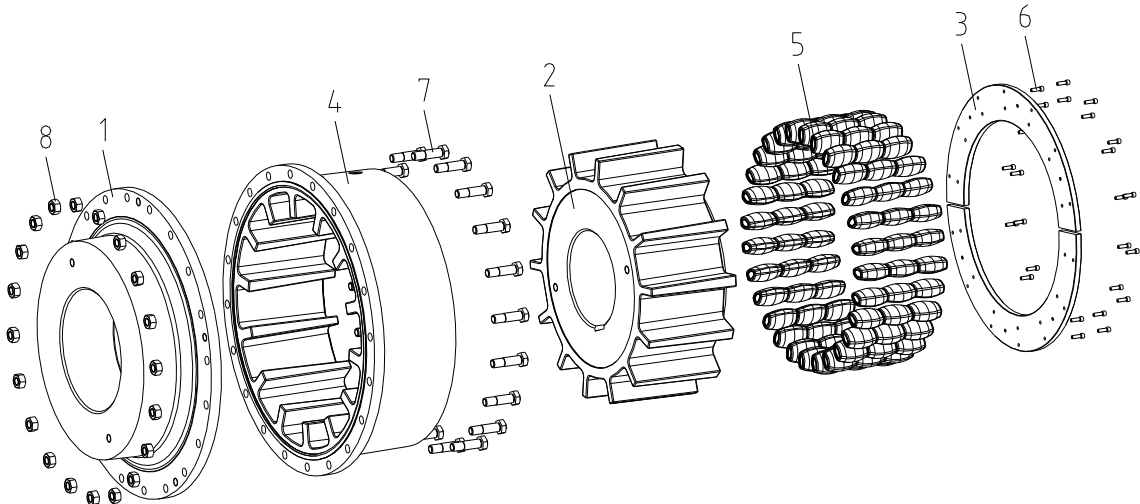


Illustration 2: POLY-NORM®-M, type AFN

Table 3:

Size	Quantity z				
	Component 5		Component 6	Component 7	Component 8
Coupling	per cavity				
202	32	2	16	24	24
252	36	2	18	30	30
302	48	2	24	20	20
402	40	2	20	18	18
502	48	2	24	24	24
703	84	3	28	20	20
903	96	3	32	40	40
905	160	5	32	40	40

**4.2 Advice on remachining**



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 remachining.

Please observe protection note ISO 16016.	Drawn:	2018-10-04 Pz/Kr	Replacing:	KTR-N dated 2018-07-06
	Verified:	2018-10-05 Pz	Replaced by:	

**4 Assembly**

**4.3 Assembly of the coupling (general)**



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



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



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



With the assembly make sure that the distance dimension E (see table 1) 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.



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

Tapped holes exist on the face and outside diameter of the coupling serving for using proper sling gears or lifting equipment, respectively. If proper sling gears are used they should be dismantled after assembly of the coupling.

**4.4 Assembly of type AFN**

- Mount the flange hub (component 1) and hub (component 2) on the shafts of driving and driven side (see illustration 3).



With assembly of the hub (component 2) it has to be made sure that the hub side with a recess (dimension  $d_3$ ) is shifted on first (see illustration 5).

- The internal sides of the hubs (component 1 and 2) must be flush with the front sides of the shafts.
- Shift the cam ring (component 4) over the hub and take it off carefully or keep the cam ring via a proper lifting device (see illustration 4).
- Shift the power pack with the flange hub in axial direction until the distance dimension E is achieved (see illustration 5, table 1).
- If the power packs are already firmly assembled, shifting the coupling hubs axially on the shafts allows for adjusting the distance dimension E (see illustration 5, table 1).



The transmittable torque of the shaft-hub-connection must be reviewed by the customer and is subject to his responsibility.

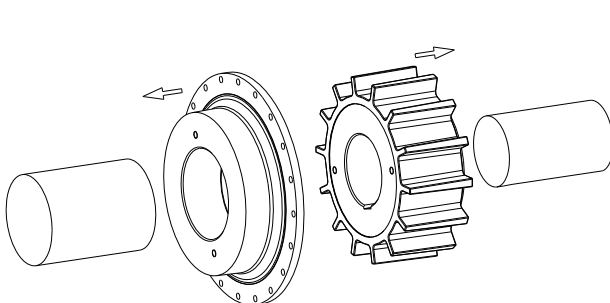


Illustration 3

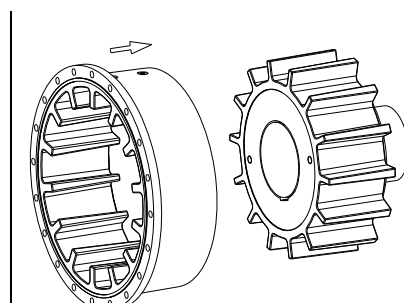


Illustration 4

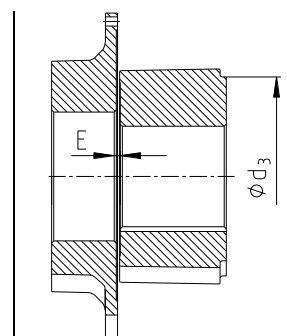


Illustration 5

**4 Assembly**

**4.4 Assembly of type AFN**

- Push the cam ring onto the hub and align the bore of the flange hub and the cam ring flush.
- Screw up the flange hub and cam ring via hexagon fit bolts (component 7) and hexagon nuts (component 8) and tighten them evenly to the tightening torques  $T_{A1}$  specified in table 2 by means of a torque key (see illustration 6).
- Align the unit screwed up versus the hub such that the cavities between hub and cam ring are evenly arranged.
- Insert the individual elastomers (component 5) in the cavities between hub and cam ring as per the order specified in illustration 7 and 8. Please make sure that the arrow on the individual elastomers points towards the direction of the shaft.



**With the assembly make sure that the individual elastomers on the cam ring do not protude since otherwise it is not possible to mount the cover segments (component 3).**



**For an easier assembly of the individual elastomers we recommend to use a fitting lubricant, e. g. REMA TIP TOP Universal mounting paste or a silicone oil having a viscosity of 1000 cSt.**



**The respective number of individual elastomers must be used in every cavity (see table 3).**

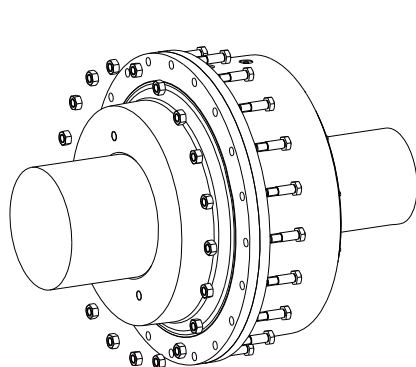


Illustration 6

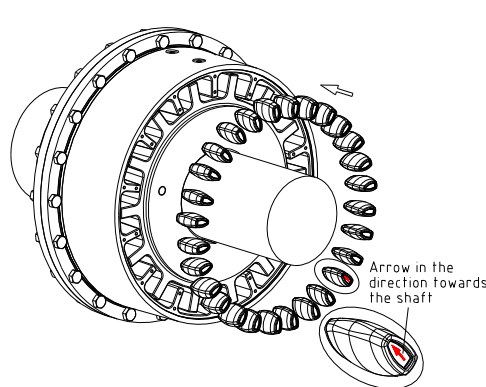


Illustration 7

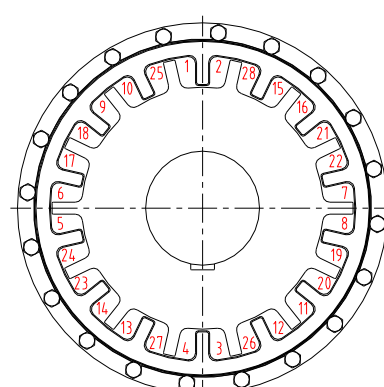


Illustration 8: Example of size 703

- Hand-tighten the cover segments (component 3) with the cap screws DIN EN ISO 4762 (component 6) for the time being (see illustration 9 and 10).



**With the assembly make sure that a gap of at least 5 mm between hub and cover segments is observed (see illustration 10).**

- Tighten the cap screws evenly to the tightening torques  $T_{A2}$  specified in table 2 by means of a suitable torque key.



**Having started up the coupling, the tightening torque of the screws and the wear of the individual elastomers have to be inspected at regular maintenance intervals.**





4 Assembly

4.4 Assembly of type AFN

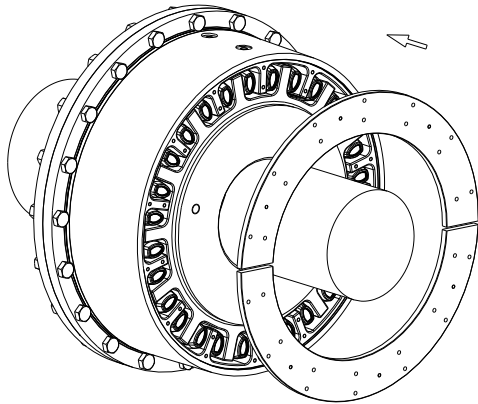


Illustration 9

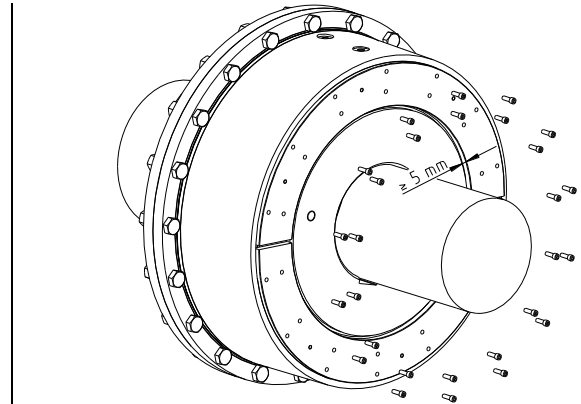


Illustration 10

4.5 Displacements - alignment of the coupling

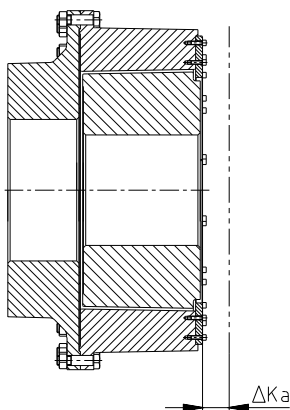
The POLY-NORM®-M compensates for displacements generated by the shafts to be combined as shown in table 4. Excessive misalignment may be generated by inaccurate alignment, production tolerances, thermal expansion, shaft deflection, twisting of machine frames, etc.



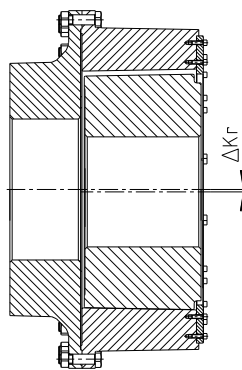
**In order to ensure a long service life of the coupling, the shaft ends have to be accurately aligned. Please absolutely observe the displacement figures specified (see table 4). If the figures are exceeded, the coupling will be damaged. The more accurate the alignment of the coupling, the longer is its service life.**

**Please note:**

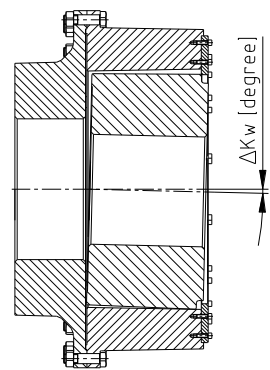
- The displacement figures specified in table 4 are maximum figures which must not arise in parallel. If radial and angular displacement occurs at the same time, the sum of the displacement figures must not exceed  $\Delta K_r$  or  $\Delta K_w$ .
- Please inspect with suitable measuring tools whether the permissible displacement figures specified in table 4 can be observed.



Axial displacements



Radial displacements



Angular displacements

$L_{adm.} = L + \Delta K_a$  [mm]

Illustration 11: Displacements

Please observe protection note ISO 16016.	Drawn:	2018-10-04 Pz/Kr	Replacing:	KTR-N dated 2018-07-06
	Verified:	2018-10-05 Pz	Replaced by:	

## 4 Assembly

### 4.5 Displacements - alignment of the coupling

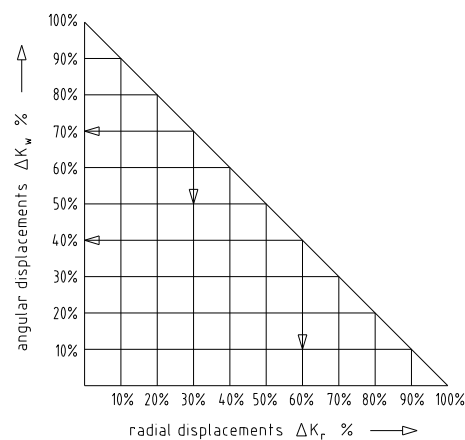
Examples of the displacement combinations specified in illustration 12:

Example 1:  
 $\Delta K_r = 30\%$   
 $\Delta K_w = 70\%$

Example 2:  
 $\Delta K_r = 60\%$   
 $\Delta K_w = 40\%$

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

Illustration 12:  
Combinations of displacement



**Table 4: Displacement figures**

Size	202	252	302	402	502	703	903	905
Max. axial displacement $\Delta K_a$ [mm]	± 3.0	± 3.0	± 3.0	± 3.0	± 3.0	± 5.0	± 6.0	± 6.0
Max. radial displacement $\Delta K_r$ [mm] with	2.0	2.0	2.5	2.5	3.0	3.0	4.0	4.0
Max. angular displacement $\Delta K_w$ [degree] with	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

## 5 Start-up

Before start-up of the coupling, please inspect the alignment and adjust, if necessary, and also inspect all screw connections for the tightening torques specified.

Finally the coupling protection against accidental contact must be fitted. It is required in accordance with DIN EN ISO 12100 (Safety of Machinery) and directive 2014/14/EU and must protect against

- access with the little finger
- falling down of solid foreign objects.

The cover may provide for openings intended for necessary heat dissipation. These openings have to comply with DIN EN ISO 13857.

The cover must be electrically conductive and included in the equipotential bonding. Bellhousings (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 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 specified can be hints only. To find out the cause all operating factors and machine components must be considered.**

**6 Breakdowns, causes and elimination**

The below-mentioned failures can lead to a use of the **POLY-NORM®-M** coupling other than intended. In addition to the specifications given in these operating and assembly instructions please make sure to avoid such failures. The errors listed can only be clues to search for the failures. When searching for the failure the adjacent components must generally be considered.

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.
- Wrong or no individual elastomers are inserted in the coupling.
- No original **KTR** components (purchased parts) are used.
- Old/already worn off individual elastomers or those which are stored for too long are used.
- Maintenance intervals are not observed.

Breakdowns	Causes	Elimination
Different operating noise and/or vibrations occurring	Misalignment	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 installation dimension E of the coupling) 3) For inspection of wear see chapter 8
	Wear of elastomers, short-term torque transmission due to metal contact	1) Set the unit out of operation 2) Disassemble the coupling, remove remainders of the elastomers 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert elastomers, assemble coupling components 5) Inspect alignment, adjust if necessary
	Axial fastening of hub working loose	1) Set the unit out of operation 2) Inspect alignment of coupling 3) Inspect axial fastening of hubs and correct, if necessary 4) For inspection of wear see chapter 8
Breaking of cams	Wear of elastomers, torque transmission by metal contact	1) Set the unit out of operation 2) Replace complete coupling 3) Inspect alignment
	Breaking of the cams due to high impact energy/overload	1) Set the unit out of operation 2) Replace complete coupling 3) Inspect alignment 4) Find out the reason for overload
	Operating parameters do not meet with 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
	Operating error of the unit	1) Set the unit out of operation 2) Replace complete coupling 3) Inspect alignment 4) Instruct and train the service staff

**6 Breakdowns, causes and elimination**

Breakdowns	Causes	Elimination
Early wear of elastomers	Alignment error (e. g. indications are large volumes of rubber dust or impressions of the cams of the hub on the cover segment)	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 installation dimension E of the coupling) 3) For inspection of wear see chapter 8
	e. g. contact with aggressive liquids/oils, ozone influence, too high/low ambient temperatures etc. causing a physical modification of the elastomers	1) Set the unit out of operation 2) Disassemble the coupling, remove remainders of the elastomers 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert elastomers, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Make sure that further physical modifications of the elastomers are excluded
	ambient/contact temperatures which are too high for the elastomers, max. permissible - 30 °C/+ 80 °C	1) Set the unit out of operation 2) Disassemble the coupling, remove remainders of the elastomers 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert elastomers, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Inspect and adjust ambient/contact temperature
Early wear of elastomer (hardening/embrittlement of elastomers)	Vibrations of drive	1) Set the unit out of operation 2) Disassemble the coupling, remove remainders of the elastomers 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert elastomers, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Find out the reason for vibrations

**7 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.

- **Metal**  
Any metal components have to be cleaned and disposed of by scrap metal.
- **Nylon materials**  
Nylon materials have to be collected and disposed of by a waste disposal company.
- **Greases/oils**  
Greases and oils have to be collected and disposed of by a waste disposal company.



**8 Maintenance and service**

**POLY-NORM®-M** 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 individual elastomer of the coupling.

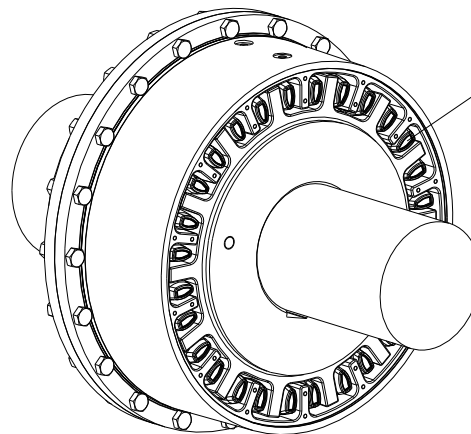
- Since the flexible machine bearings of the driving and driven side settle during the course of load, please inspect the alignment of the coupling and re-align the coupling, if necessary.
- The coupling parts have to be inspected for damages.
- Small volumes of rubber dust are normal, with bigger volumes lubrication of the individual elastomers is necessary.
- The screw connections have to be inspected visually.



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

In order to perform a visual inspection of the individual components, remove the cover segments from the coupling so that the front sides of the individual elastomers can be seen. For that purpose you do not need to take the individual elastomers out of the coupling. Anyway, the individual elastomers should be replaced if one of the following items applies:

- Having reached the limits of wear
- Material deterioration of individual elastomers
- Individual elastomers damaged or torn



Visual inspection of individual elastomers

Illustration 13

Please observe protection note ISO 16016.	Drawn:	2018-10-04 Pz/Kr	Replacing:	KTR-N dated 2018-07-06
	Verified:	2018-10-05 Pz	Replaced by:	

**8 Maintenance and service**

When reaching the limit of wear and tear  $X_{max.}$ , the individual elastomers must be replaced. Here the backlash between the cams of the coupling and the individual elastomers must be inspected by means of a feeler gauge (see illustration 14). Several individual elastomers should be inspected.

Reaching the limits for replacing depends on the operating conditions and the existing operating parameters. With wear  $\geq 20\%$  of the original elastomer thickness it is necessary to replace the individual elements.



**In order to ensure a long service life of the coupling, the shaft ends have to be accurately aligned. Please absolutely observe the displacement figures specified (see table 4). If the figures are exceeded, the coupling will be damaged. The more accurate the alignment of the coupling, the longer is its service life.**

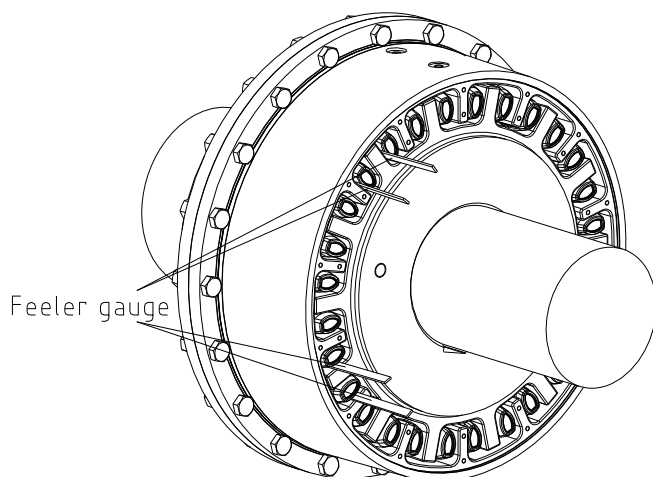


Illustration 14: Inspection of the limit of wear

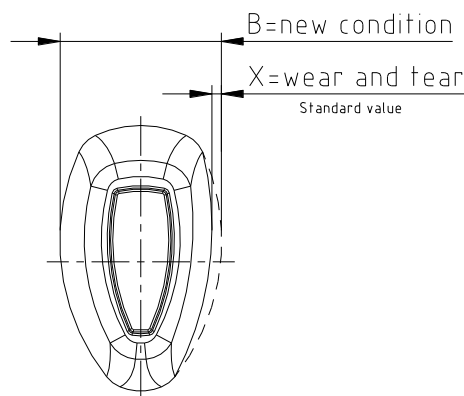


Illustration 15: Wear of elastomers

**Table 5: Limits of wear**

Size	Limits of wear [mm]	
	Thickness of elastomer B	Friction $X_{max.}$
202	46.0	9.0
252	46.0	9.0
302	39.0	7.5
402	67.0	13.5
502	67.0	13.5
703	82.5	16.5
903	91.0	18.0
905	91.0	18.0

**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](http://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.**

Please observe protection note ISO 16016.	Drawn:	2018-10-04 Pz/Kr	Replacing:	KTR-N dated 2018-07-06
	Verified:	2018-10-05 Pz	Replaced by:	