

Scientific Production Enterprise

“NASOSTECHCOMPLECT”

MKO-2 Type Coupling

MAINTENANCE GUIDENCE

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GENERAL SPESIFICATION

1.1. MKO-2 type coupling is designed to transmit torque with compensation of radial, axial and angular misalignments of shafts to be connected, from a drive to pumps, compressors and other rotating equipment.

1.2. The coupling is designed for indoor use in macroclimatic regions with temperate and cold climates.

MEMO: *In case when coupling is to be used in another climatic zone, it should be taken into account when ordering.*

1.3. The **MKO-2-XXX** coupling structure of symbols includes:

«**MKO**» – is a special designed compensating coupling (flexible coupling)

«**2**» – double row (two rows of plate packs)

«**XXX**» – is a power index = $N \times 1000$ n, where «**N**» is transmission power, Kw and «**n**» is coupling rate speed, rev/min.

TECHNICAL SPECIFICATION

2.1. Purpose indicators and constructive indicators are quoted in **Table 1**.

Table 1

Coupling size-series	Transmitted torque, N x m		Allowable speed , rpm	Allowable radial misalignment of shaft axes *, mm		Allowable inter-misalignment of hub ends, for maximum diameter*, mm		Allowable axial misalignment of shafts, mm	Overall dimensions of the coupling, mm		Mass, kg
	Nominal	Maximum short-term		When putting into operation	In continuous operation	When putting into operation	In continuous operation		Diameter, no more than	Length	
MKO2-4	38	95	22000	0,03	0,4	0,03	0,3	± 2,0	87	According to the assembly drawing	According to the assembly drawing
MKO2-8	76	190	18000	0,03	0,5	0,03	0,4	± 2,4	105		
MKO2-17	160	395	17000	0,03	0,5	0,03	0,5	± 2,8	116		
MKO2-34	315	787	14000	0,03	0,6	0,03	0,5	± 3,2	136		
MKO2-67	630	1 575	13000	0,03	0,6	0,03	0,6	± 2,3	146		
MKO2-134	1 280	3 200	11000	0,03	0,7	0,03	0,7	± 2,5	166		
MKO2-270	2 500	6 250	10000	0,04	0,9	0,04	0,8	± 2,7	185		
MKO2-540	5 150	12 890	8500	0,04	0,9	0,04	0,9	± 2,5	225		

*Parameters quoted for couplings with the minimum distance between the shaft ends

MEMO: The actual parameters of each coupling (permissible radial misalignment of the shaft axes and permissible mutual run out of the hub ends) are given in the certificate of the particular coupling.

2.2. Reliability rates.

The reliability of the coupling under the conditions and modes of operation, specified in **Table 1**, has the following rates:

- average MTBF (Mean Time Between Failures) is at least 25 000 hours
- average total lifetime is at least 5 years

MEMO: Occurrence and development of fatigue cracks in plates (flexible elements) is a criterion for failure.

DESIGN AND OPERATING PRINCIPLE

3.1. Design description.

3.1.1. The coupling is a torsional rigid all-metal device purported to compensate misalignments and axial displacements of shafts to be connected by means of elastic deformations of the special compensating elements.

3.1.2. The coupling comprises motor hub **1**, mechanism hub **2**, spacer **3**, two plate pack units **4**, close fitting bolts **5**, collar nuts **6** and bushings **7** (**Fig. 1**).

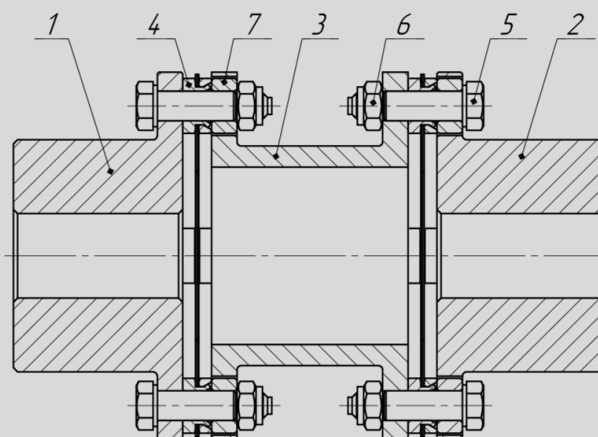


Figure 1

3.1.3. Hub **1** is fixed at the motor shaft end.

3.1.4. Hub **2** is fixed at the mechanism shaft end.

3.1.5. Plate pack units **4** are mounted into gaps between spacer **3** and hubs **1**, **2**, and joined by close fitting bolts **5**, two guard rings **7** and nuts **6**.

3.1.6. The relative position of hubs **1**, **3** and spacer **2**, after coupling mounting and balancing, is defined by marks on their surfaces.

3.1.7. Each plate pack unit (**Fig. 2**) comprises plate pack **8**, bushings **9** and washers **10**. The elements are joined by pressing. The plate pack unit is interchangeable and can be supplied as a spare part for the coupling repair.

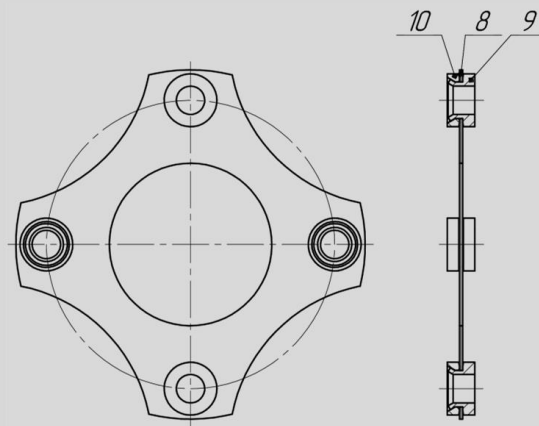


Figure 2

3.2. Operating principle.

3.2.1. Torque is usually transmitted from the motor shaft to hub **1** and from hub **2** to the mechanism shaft via key-connection (the other types of connection can also be applied).

3.2.2. Between hubs torque is transmitted via bolts **5**, plate packs **4** and spacer **3**.

3.2.3. The torque transmission by plate (flexible element) is carried out by means of the tension and compression efforts of its sections between bushings connected by bolts **5** with spacer **3** and hubs **1, 2** (**Fig. 1,2**).

3.2.4. Compensation of deviations in the relative position of the shafts is carried out due to complex deformation of each link of plates (flexible elements) in both packs.

3.2.5. In case of emergency damage to the plate pack, torque can be transmitted by bolts **5** via bushings **7** (**Fig. 1**).

SUPPLY ASSEMBLY

4.1. Standard supply assembly of MKO-2 type coupling consists of:

- Coupling
- Packing pan (box)
- Maintenance guidance – 1 copy to address
- Quality certificate – 1 copy for each coupling

MEMO: The plate pack unit in complete, shaft alignment device and hub puller can be supplied on request.

INSTALLATION OF COUPLING AND COUPLING REMOVAL

Any work performance with the coupling should be guided by an assembly drawing and given maintenance guidance.

MEMO: When exchange of plate pack unit 4 is needed, it is necessary to contact with a coupling manufacturer.

5.1. Preparation for the installation

5.1.1. Unbox, degrease and examine the coupling.

5.1.2. Unscrew nuts 6 and push out bolts 5 which are in contact with the spacer, and detach one of two hubs from spacer 3. In doing so, the hub and plate pack unit will be detached simultaneously. Push the bolts out of the hub and detach plate pack unit 4. Detach the second hub in the same order.

5.1.3. In the case when coupling with machining allowance is delivered, bore the hubs and machine the key-ways. When finalizing, the hub basing must be carried out on surfaces A and B. Accuracy of basing is 0.03 mm.

MEMO: The durability and reliability of coupling as well as dynamic loads on the machine shafts supports depend on accuracy of hubs bore.

5.1.4. The key-way in the motor hub 1, 2 must be carried out so it is located opposite the one of the hub installation holes in the hub. The relative position of parts at initial assembly is fixed by marks. In the motor hub make a threaded hole for screw 11 (Fig.3) intended to fix possible axial displacements of the motor-hub. The hole must be located opposite the hub key-way.

5.2. Installation of coupling

5.2.1. Preassemble the motor and mechanism on the machine frame. Set them into operative position.

5.2.2. Check up the side play of the driving machine and motor rotors. Set them into operative position.

5.2.3. For the motor with slider bearings only. Carry out idle start and for steady rotation check the working axial position by issued device of the motor. The circular groove (mark) at the shaft should index with the device indicator. Stop motor and, moving the rotor in axial direction, renew its position to when rotation occurs aligning a circular groove at the shaft with the device indicator.

MEMO: Exceeding of the rotor axial play of the motor in sliding bearings above allowable axial misalignment of the coupling is not an obstacle for its using, since the relative axial misalignments of shafts to be connected are limited by coupling flexible forces to the allowable values.

5.2.4. For the pumps with a hydraulic balancing device only. Slide the pump rotor to the suction side up to the end.

5.2.5. Insert bushing-key **13** into the slot and fit hub **2** onto the driving machine shaft. If necessary, heat it up to 80-90°C.

5.2.6. Insert bushing-key **13** into the motor shaft slot and fit hub **1** onto the motor shaft. If necessary, heat it up to 80-90°C. During the hub installation, it is essential to keep up size **B** between the hub flanges with an accuracy of $\pm 0.5\text{mm}$. The size value **B** of each hub is stamped on their surface and quoted in quality certificate.

MEMO: It is essential to keep up size **B** by means of moving hub **1** on the motor shaft. In aggregates with thermal axial stroke of shafts exceeded 50% of coupling allowable displacement, it is recommended to ensure size **B** at nominal operating mode by means of preloading axial state of the coupling. It is essential only in the case of rigid axial fixation of both shafts to be connected.

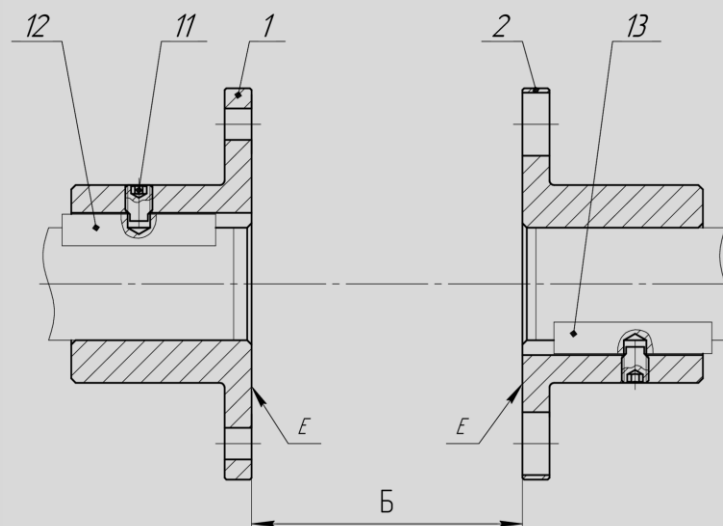


Figure 3

5.2.7. Fit the shaft alignment device onto hubs **1, 2** and make an alignment, according to the requirements set out in documentation for aggregate. Allowable shafts axial misalignments are quoted in **Table 2**.

Table 2

Parameter	MKO 2-4	MKO 2-8	MKO 2-17	MKO 2-34	MKO 2-67	MKO 2-134	MKO 2-270	MKO 2-540
Radial	0,03						0,04	
Inter-misalignment of hub ends, for maximum diameter, mm	0,03						0,04	

***MEMO:** In aggregates with radial shaft stroke exceeded 0.05 mm, it is necessary to ensure balancing with required accuracy at nominal operation mode by means of using radial misalignment.*

5.2.8. Take off the shaft alignment device, make control measurement and, if it's necessary, correct distance **B** between the hub flanges with an accuracy of $\pm 0.5\text{mm}$.

5.2.9. Fix hub **1** with screw **11** on the motor shaft in the axial direction. The end of the shaft should go beyond the end surface of hub **1** (**Fig. 3**).

5.2.10. Mount the spacer and plate pack units between the hubs in following order:

- Turn one of the shafts until marks on the hub match (**Fig. 1**). Before installation, all details must be located as given: spacer **3** – according the marks, plate pack units – so that bushing **7**, after its installation, was located on the washer side **10** (**Fig. 1, 2**). Fit bushings **7** onto bolts **5** (what is half of the total amount).
- Lead spacer **3** into the space between the hubs (marks must be in line with each other) and, keeping it in such a way, lead the plate pack unit **4** into the space between the flange and one of the hubs. The plate pack unit must be located as mentioned in the previous paragraph. Insert appropriate bolt **5** (with bushing **7** or without it) into the upper hole of the hub, according to **Fig.1**. In doing this, the bolt has to go through the appropriate holes of plate pack unit **4** and spacer **3**. Set, if it's necessary, bushing **7** on the bolt, screwing nut **6** tentatively. Set another plate pack

unit **4** in the same way. In doing this one of the shafts should be turned around until the holes of the details to be connected are fully aligned.

- Next, insert one bolt on each side in the opposite holes, as shown above. Make sure details are mounted correctly. Mount the other bolts in the same way.
- Replace nuts with nylostop nuts **6** included in complete set of delivery. First, tight the nuts tentatively, and then tight them until stop with torque quoted in **Table 3**. To avoid the package splitting, the state of plates (flexible elements) **8 (Fig. 2)** must be controlled. In case when splitting occurs it is necessary to weaken nuts tightening until the shape of the plate (element) and continuity of the package are fully restored. After that the tightening process should be started over.

Table 3

Coupling size-series							
MKO2-4	MKO2-8	MKO2-17	MKO2-34	MKO2-67	MKO2-134	MKO2-270	MKO2-540
$4,6^{+2} N \times m$	$11^{+} N \times m$	$11^{+2} N \times m$	$22^{+2} N \times m$	$22^{+2} N \times m$	$42^{+3} N \times m$	$62^{+3} N \times m$	$62^{+3} N \times m$

Requirements:

- Coupling mounting should be carried out with the switched off driving motor and closed suction and charging gate valves.
- During the mounting it is necessary to avoid big deformations of the plate pack unit and details hitting.
- When the coupling is mounted and the motor shaft and driving machine shaft are in operative position the plate pack units shouldn't have any signs of deformation.

5.3. Removal of coupling

5.3.1. The dismantling of plate pack units should be carried out in following order:

- Unscrew three of four nuts (**6**) on each side, leaving two nuts on the top.
- Push out bolts **5** carefully.
- Unscrew the rest of nuts.
- While holding spacer **3** and plate pack unit **4**, push out the rest of bolts carefully.
- Lead out details from the space between hubs.

5.3.2. Dismount hubs **1, 2** in following order:

- Remove screws **11** from motor hub **1** and pump **2**.
- Fit the puller onto hub **2**, and take the hub off the shaft end.
- Fit the puller onto hub **1**, and take the hub off the shaft end.

Requirements:

- Coupling removal should be carried out with the switched off driving motor and closed suction and charging gate valves.

- During removal, it is necessary to avoid big deformations of plate pack units and details hitting.
 - Do not remove the coupling by hammer stroke or in a similar way.
-

SAFETY INSTRUCTIONS

- 6.1. All users involved into the mounting, operation, maintains and coupling repair must read this instruction carefully and respect it strictly. Noncompliance with the instruction may cause product and material damage as well as injury to the operating personnel.
 - 6.2. All safety/environmental regulations must be met while transporting, mounting, removing, operating and maintaining.
 - 6.3. All lifting gears and load gripping units, if used, must be suitable for the coupling weight.
 - 6.4. No changes must be made to the coupling, besides the processing specified in this instruction.
 - 6.5. If there any visible damage, the coupling must not be mounted and put into operation.
 - 6.6. The coupling cannot be put into process before it's mounted in the suitable housing according to existing standards.
 - 6.7. All coupling technical inspections, its maintenance and repairs must be performed with the machine stopped and the engine turned off.
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MAINTENANCE

- 7.1. During aggregate stops, in the process of current and other repairs, it is necessary to:
 - Examine and restore the alignment of aggregate shafts to the values quoted in **Table 1**, as increased radial and angular displacements cause the most dangerous cyclic stresses of flexible elements and are the main reason of reduced reliability and coupling life;
 - Check the tightness of nuts **6**;
 - Examine the peripheral plates (flexible elements) state in packs **8 (Fig. 2)**.
- 7.2. The appearance of micro cracks and plastic deformation of plates (flexible elements) in packs **8** is a result of long-term operation of the aggregate with shaft misalignment.
- 7.3. To restore the coupling workability, it is necessary to restore the shaft alignment of the aggregate to standards quoted in **Table 1** and change plate pack units **4** which have the signs of plastic deformation or damage.

MEMO: Only spare parts made by the manufacturer must be used. The use of non-original parts can lead to unpredictable accidents.

TRANSPORTATION AND STORAGE

8.1. Transportation of couplings can be provided by all modes of the covered transport with the observance of shipping rules, which are valid on the appropriate modes of transport.

8.2. Couplings and components should be stored in a dry building away from direct heat.

8.3. For maximum protection, the coupling and components should be stored in the original packaging. If any packaging has been removed or damaged in transit, it should be restored to a secure, safely-packaged condition.

8.4. The coupling should be stored horizontally and should not be stood on end for long periods. Avoid shock during handling and protect against corrosion.

8.5. Always examine parts thoroughly when taking them from storage for signs of damage or deterioration.

MANUFACTURERS' WARRANTY

9.1. The manufacturer guarantees conformity of equipment with technical documentation subject to safety rules by the user.

9.2. The warranty period of the coupling is 12 months since the day the coupling is put into operation.

APPENDIX A

Diagram of half-coupling basing for machining of the setting bore and the key groove

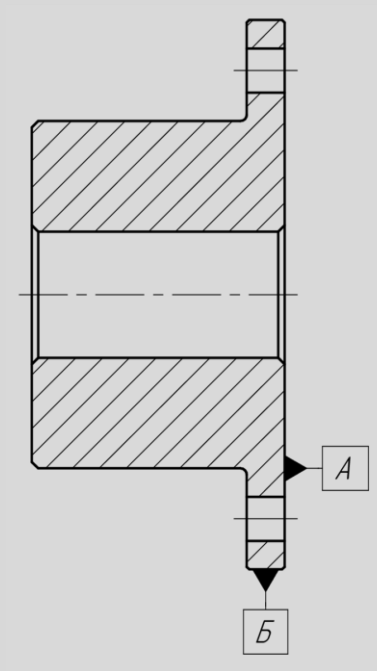


Figure A.1