Scientific Production Enterprise

“NASOSTECHCOMPLECT”

MUP-2 Type Flexible Membrane Coupling

MAINTENCE GUIDENCE

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GENERAL SPESIFICATION

1.1 Connective coupling MUP 2 type (coupling) is intended for torque transfer from drive to pumps, compressors and other rotating mechanisms with compensation of radial, angular and axial deflection of shafts connection.

1.2 УХЛ2О4 is climatic manufacturing of couplings according to ГОСТ 15150. Couplings allow using in explosive areas В-1а and В-1г classes according to “Principles of Electric Devices Structure” with IIA-T3 explosive mixture category and group according ГОСТ 12.1.011.

1.3 According to reliability indexes nomenclature by ГОСТ 27.003 coupling is:

- specified purpose item according to purpose specificity
- 1-type item according to probable state number (working capacity), i.e. it can be in workable state or non-workable state
- continuous long application item according to application modes;
- item, which failure and transfer to limiting state doesn’t lead to disastrous effects, according to failure consequences
- repairable item according to workable state regeneration after failure during maintenance process;
- serviced item according to technical service potentials during maintenance

1.4 Nomenclature structure of ***MUP 2 – XXX*** coupling consists of:

MUP flexible membrane coupling;
2 double-row (two rows of flexible element packages);
XXX power index = N × 1000 / n,

N is transmission power, kW;
n is coupling rotational speed, rev/min.

TECHNICAL SPECIFICATION

2.1 Purpose factors and constructive factors are given in the table 1.

Factor name	Coupling size-series									
	MUP2-17	**MUP2-34**	**MUP2-67**	**MUP2-105**	**MUP2-210**	**MUP2-420**	**MUP2-670**	**MUP2-850**	**MUP2-1340**	**MUP2-2100**
Transmitted torque, N×m - rated - maximum short-term	160 280	315 550	630 1 100	1 000 1 750	2 000 3 500	4 000 7 000	6 300 11 000	8 000 14 000	12 500 22 000	20 000 35 000
Allowable rotational speed (without balancing requirements), rev/s (rev/min)	250 (15 000)	225 (13 500)	200 (12 000)	175 (10 500)	150 (9 000)	125 (7 500)	110 (6 600)	110 (6 600)	100 (6 000)	80 (4 800)
Allowable radial deflection of shaft axes*, mm - when putting into operation	0,05									
- in continuous operation**	0,25	0,30	0,35	0,40	0,45	0,50	0,60	0,60	0,60	0,60
Allowable inter-misalignment of half-coupling ends, for maximum diameter*, mm - when putting into operation	0,1									
- in continuous operation**	0,50	0,50	0,50	0,60	0,60	0,80	1,0	1,0	1,1	1,2
Allowable axial deflection of shafts, mm	± 1,5	± 1,7	± 2,0	± 2,2	± 2,4	± 2,6	± 3,4	± 3,4	± 4,0	± 4,0
Coupling overall dimension, mm: - diameter, nor more than - length *	125 300	150 360	170 420	190 500	220 600	265 600	290 650	295 650	320 750	365 850
Mass, kg*	12	18	22	25	35	50	80	95	120	160

2.2 Reliability indexes

Coupling reliability in terms of operation conditions, given in the table 1, has the following indexes:

- Average error-free running time is no less than 50 000 hrs.
- Average total service life - nor less than 9 years.

Criterion of failure is appearance and development of fatigue cracks in springing elements.

DESIGN AND OPERATING PRINCIPLE

3.1 Design description

3.1.1 Coupling design is torsion-resistible all-metal unit, which can compensate misalignment and axial deflection of connectable shafts by special compensative elements elastic deformations.

3.1.2 Coupling (figure 1) consists of motor half-coupling **1**, mechanism half-coupling **2**, spacer unit **3**, screws **4**and washers **5**.

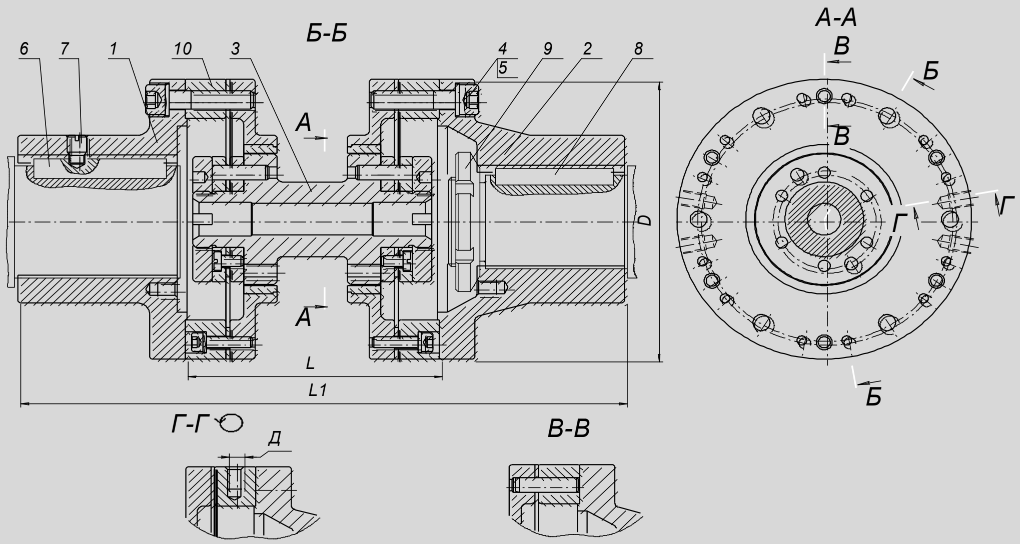


Figure 1

3.1.3 Half-coupling **1** is fixed at cylindrical motor shaft end by fit H7/k6 using feather key **6** and screw **7**.

3.1.4 Half-coupling **2** is fixed at cylindrical (conical) mechanism shaft end by feather key **8** and if provided by nut **9**.

3.1.5 Spacer unit is connected with every half-coupling by screws **4** and washers **5**.

3.1.6 Part position after coupling assembly and balancing is determined by marks (punching) along the external part boundary.

3.1.7 There are threaded openings **Д** for fixing of coupling mounting device in spacer rings **10**.

3.1.8 There are threaded openings **Е** and **Ж** (figure 6) for remover fixing in hubs of half-couplings **1** and **2**.

3.1.9 Spacer unit (figure 2) consists of two flexible elements **11** and parts: spacer **12** and nuts

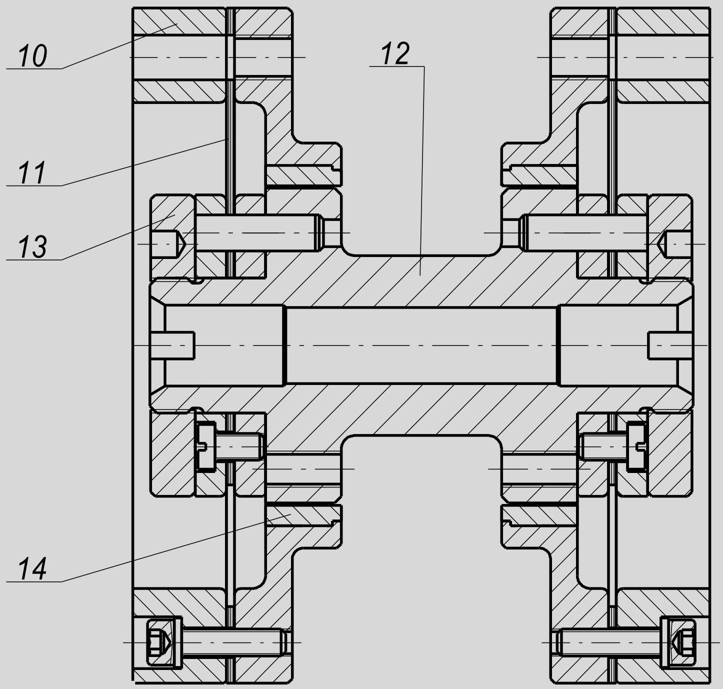


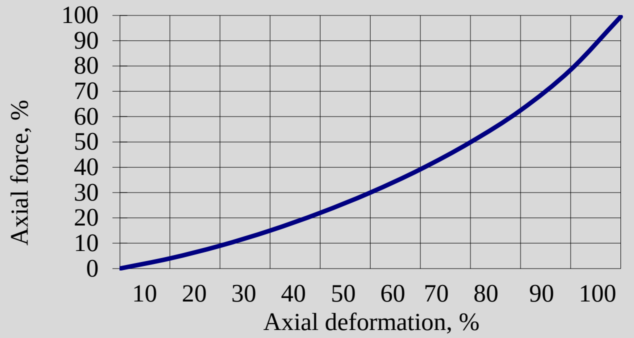
Figure 2

3.2 Operation principle

3.2.1 Torque transfer between half-couplings and spacer is realized by end surfaces friction forces, which are provided by screw **4** stretching (figure 1).
3.2.2 Spacer unit **3** centering in half-couplings **1** and **2** (figure 1) is provided by fit of centering spigot.
3.2.3 Torque transfer by springing element is realized by tension and compression forces in radial bridges, which are situated between pins of inner and outer casings.
3.2.4 Coupling compensation of shaft relative position deflection is realized by complex deformation of flexible element unit in both packages.
3.2.5 In case of emergency failure of radial bridges in flexible element package, pump and motor are disconnected and this leads to absence of accident pump destruction.

If electricity is not turned off and motor rotor continues revolving, antifriction rings **14** will keep spacer **12** in coaxial state. At the same time rings **14** will be sealing for broken parts of package bridges. Rings **14** are spark-protection element.
Flexible element packages **11** have non-linear form of rigidity characteristic (figure 3) when they are axially loaded.

Figure 3



SUPPLY ASSEMBLY

4.1 Standard supply assembly of MUP-2 type coupling consists of:

- Coupling
- Packing pan (box)
- Given maintenance guidance – 1 copy to 1 address
- Registration certificate- 1 copy for each coupling

4.2 The following can be supplied on demand:

- Ready-assembled flexible element unit
- Device for spacer unit mounting
- Device for shaft centering
- Half-coupling remover

INSTALLATION OF COUPLING AND COUPLING REMOVAL

MEMO: *It is necessary to follow the mounting drawing (figure 1) and the given guidance when carrying out any works with coupling.*

IMPORTANT

Don’t dismount the middle part of the coupling. It is necessary to address the coupling producer when flexible element package 11 should be changed.

5.1 Preparation to mounting

5.1.1 Resume and inspect the coupling.
5.1.2 Turn screws **4** with washers **5** out of spacer **3** (figure 1) and disconnect half-couplings **1** and **2** off spacer **3**.
5.1.3 If the coupling was supplied with allowance “for boring by position”, you should base half-couplings in surfaces К and Л (appendix А, figure А.1) when finishing. Basing accuracy is 0.03 mm.

MEMO: *Coupling reliability and lifetime and dynamic loads on unit shaft supports depend on half-coupling boring accuracy.*

5.1.4 Data about coupling balancing:
5.1.4.1 When supplying couplings with bores in half-couplings according to customer forms, motor half-coupling, pump half-coupling and spacer unit are balanced by manufacturer.
5.1.4.2 When supplying couplings with bores in half-couplings, which will be finished by customer, only spacer unit is balanced. Couplings should be balanced only after finishing of mounting bores in unit rotors.

5.2 Mounting

5.2.1 Check axial acceleration of motor rotors and driving machine and put them to operative location.

***5.2.1.1.1* for the motor with sliding bearings.** Carry out idle start and for steady rotation check working axial position by issued structure of motor. Circular groove (mark) at shaft should index with device indicator. Stop motor and, moving rotor in axial direction, renew its position to that one, when rotation occurs, connecting circular groove at shaft with device indicator.

Exceeding of motor shaft axial start in sliding bearings above allowable axial deflection of the coupling is not obstacle for its using, because elastic forces of coupling limit relative axial deflections of connectable shafts to allowable values.

***5.2.1.1.2* for the motor with hydraulic face.** Remove pump rotor to suction side up to the stop (closing of hydraulic face axial clearance)

5.2.2 Apply diamond polishing paste ГОСТ 14068 onto cylindrical surfaces of pump, motor and half-couplings **1** and **2** (figure 1) ends.

5.2.3 Set key **8** to groove at pump shaft. Set half-coupling 2 at pump shaft and fix it by nut 9, if it is provided.

5.2.4 Set key **6** to motor shaft groove, press half-coupling **1**. When half-coupling **1** mounting, it is necessary to keep size **L** between flanges of half-couplings **1** and **2** equal to middle part of the coupling to within ±0,5 mm. Actual value of size **L** for each pump is marked on spacer **3** housing and given in the coupling registration certificate.

IMPORTANT

Size L should be kept by moving at half-coupling 1 motor shaft.

5.2.5 Set device (figure B.2) at half-couplings **1** and **2** and carry out centering according to the rules, given in the documents for the unit. If there are no rules, carry out centering according to Appendix B of this maintenance guidance.

Allowable deflections of shaft axes for centering are given in the table 2.

Table 2

Deflection direction	Value, mm
Radial	0,05
Front (relative beating of half-coupling ends, measured for maximum diameter)	0,1

MEMO: *For units with radial shaft move, over than 0.05 mm, it is necessary to provide centering with required accuracy for typical operation by introducing given preliminary radial centering.*

5.2.6 After centering you should carry out control measurement and if necessary set the distance **Б** between flanges of half-couplings **1** and **2** to within ±0.5 mm.

5.2.7 Fix hub **1** by screw **18** at motor shaft in axial direction.

5.2.8 Fix two devices into bores **Д** of rings **10** (figure 4) and reap spacer unit at 2…2,5mm when screwing nuts **16** of device **15**. While keeping spacer unit **3** in reaped state put it to the opening **L** between hubs **1** and **2** and control reciprocal position of half-couplings and rings **10** by marks (punching). Fix coupling spacer by turning off nuts **16** of device **15**.

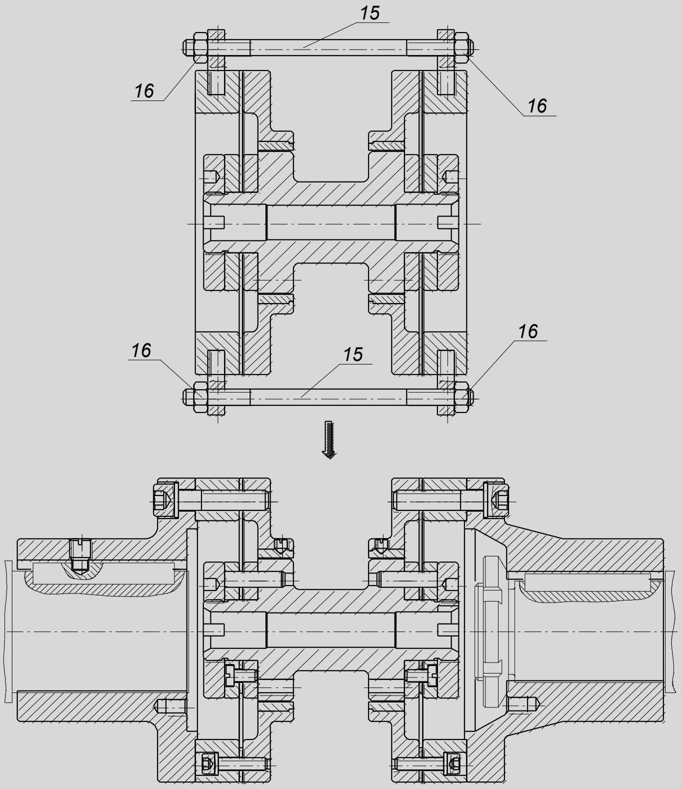


Figure 4

5.2.9 Fasten half-couplings **1** and **2** with coupling spacer **3** by screws **4** with washers **5**. Values of screw **4** tightening moments are given in the table 3.

Table 3 N×m

Coupling standard size series									
MUP2-17	MUP2-34	MUP2-67	MUP2-105	MUP2-210	MUP2-420	MUP2-670	MUP2-850	MUP2-1340	MUP2-2100
20^{+5} $(2{,}0^{+0{,}5})$	45^{+5} $(4{,}5^{+0{,}5})$	55^{+5} $(5{,}5^{+0{,}5})$	75^{+5} $(7{,}5^{+0{,}5})$	105^{+5} $(10{,}5^{+0{,}5})$	240^{+5} $(24{,}0^{+0{,}5})$	350^{+5} $(35{,}0^{+0{,}5})$	350^{+5} $(35{,}0^{+0{,}5})$	350^{+5} $(35{,}0^{+0{,}5})$	350^{+5} $(35{,}0^{+0{,}5})$

5.3 Coupling dismantling

5.3.1 Dismount spacer unit.
5.3.1.1 Partly turn screws **4**.
5.3.1.2 Screw two devices **15** into bores **Д** (figure 5) and reap spacer unit at 2…2,5mm when screwing nuts **16** of device.
5.3.1.3 Finally turn screws **4** out, keeping spacer. Take spacer out of grindings in half-couplings **1** and **2** and opening **L**.

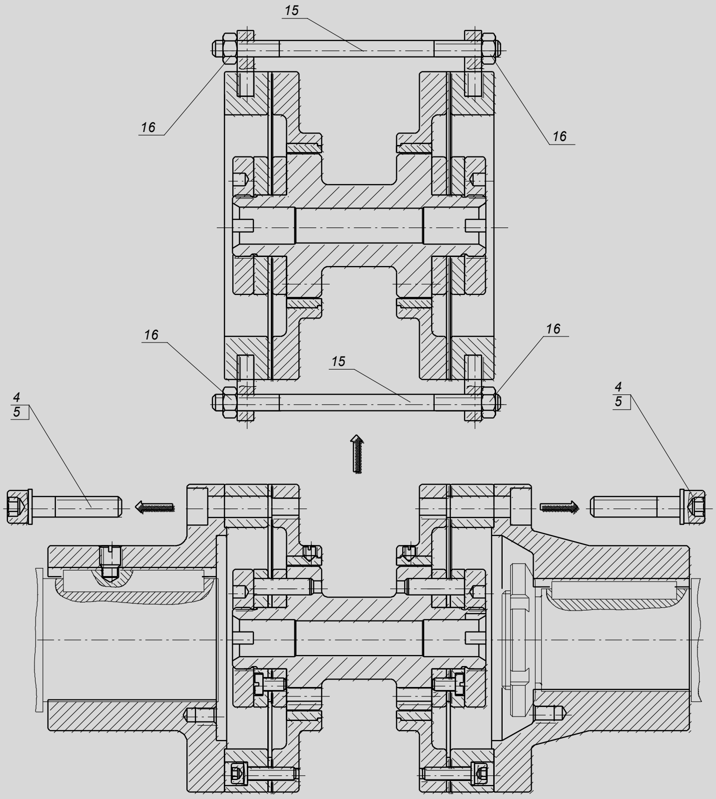


Figure 5

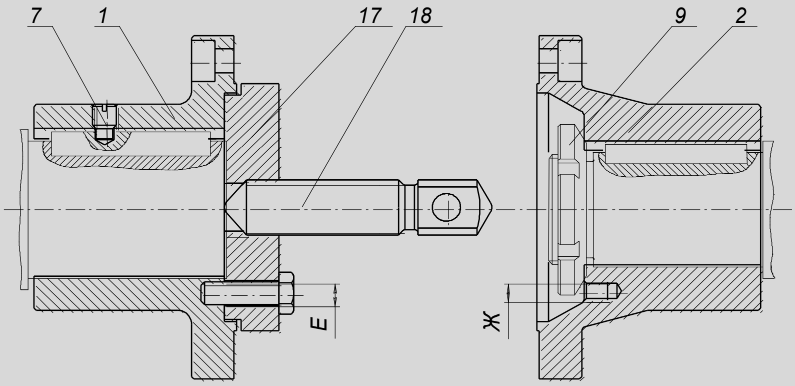


Figure 6

5.3.2 Turn screw **9** out of pump shaft end. Fix remover **17** at half-coupling **2** into bores **Ж** (figure 6), and remove half-coupling **2** using screw **18**.

5.3.3 Turn screw **7** out of half-coupling hub **1**.

5.3.4 Fix remover **17** at half-coupling **1** into bores **E** (figure 6), and remove half-coupling **1** using screw **18**.

SAFETY INSTRACTIONS

6.1 The coupling design meets the requirements of general safety measures ГОСТ 12.2.003 and ГОСТ 12.2.004.
6.2 The coupling should be protected by lagging.
6.3 Check up, servicing and repair of the coupling should be provided for stopped unit and off line motor.

MAINTANCE

7.1 In case of unit break-out, current and other repairs it is important to:

- check and renew to means, given in the table 2, unit shaft centering, as high radial and angular shaft deflections cause the most dangerous cyclical tensions in springing elements and are the main reason of coupling reliability reduction and loss of life;
- check screw **4** tightening**;**
- check state of peripheral springing elements in packages **11**

7.2 Appearance of micro cracks and plastic deformation of springing elements in packages **11** (figure 2) is a result of continuous unit operation with disturbed shaft centering.

MEMO: *For coupling efficiency renewal it is necessary to renew unit shaft centering to norms, given in the table 2, and replace flexible element packages* ***11****, which include elements with features of plastic deformation and failure.*

7.3 Replacement of flexible element packages **11** (figure 2) should be provided according to the coupling producer technology.

TRANSPORTATION AND STORAGE

8.1 Coupling transporting by any mode of transport is allowed if keeping the rules of freight transporting for a given mode of transport. Transporting conditions should conform to group 5 by ГОСТ 15150 (housing in macroclimatic areas with temperate and cold climate) with regard to climatic factors influence.

8.2 Storage conditions should conform to group 2 by ГОСТ 15150 (closed not-heated storehouse in macroclimatic areas with temperate and cold climate).

MANUFACTURE’S WARRANTY

9.1 Supplier guarantees the coupling conformity to technical documents when consumer keeps storage, mounting and maintenance rules, established by the given guidance.

9.2 Guarantee life – 12 months from the coupling setting to work day. Guarantee time calculation – in accordance to ГОСТ 22352.

APPENDIX A

The scheme of basing for half-coupling boring

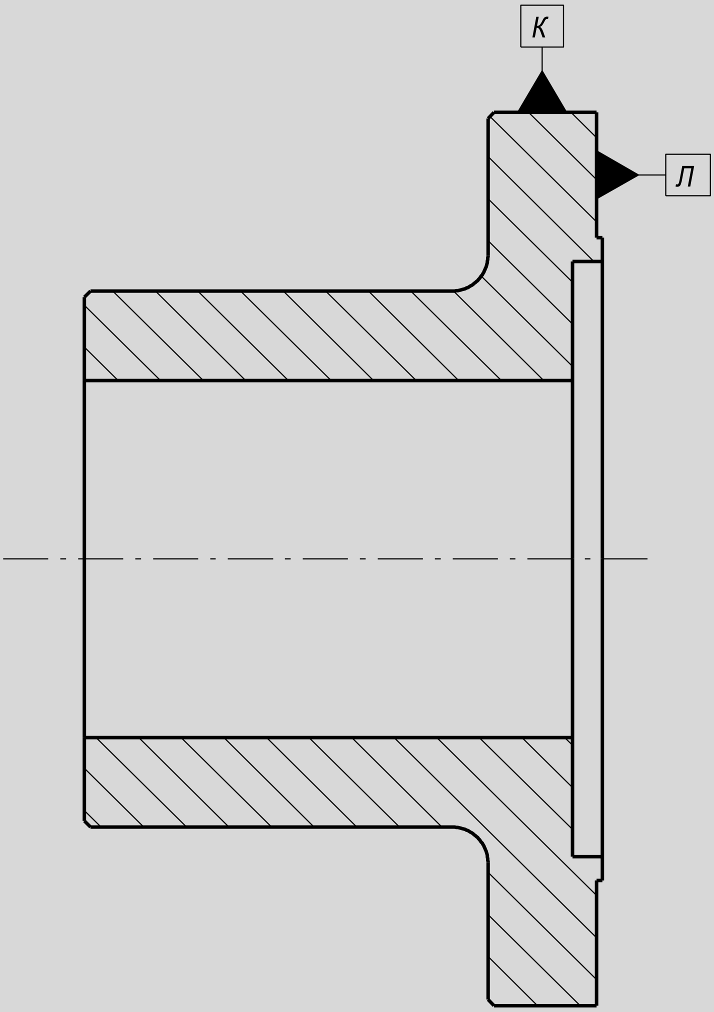


Figure A1

APPENDIX B

The order of unit shafts centering

1 Centering is carried out in two stages:

1.1 Pre-centering is carried out in the following order: put line gage to cylindrical surface along generator of cylindrical surface of half-coupling flange and control clearance ***e*** between work face of line gage and cylindrical surface of half-couplings (figure B.1).

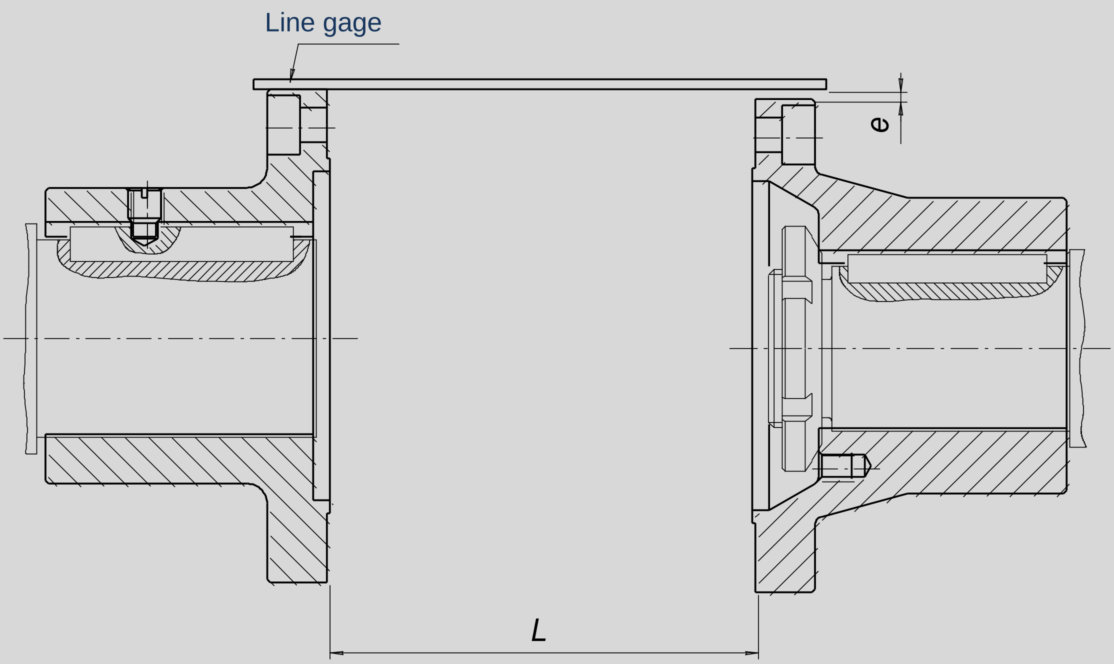


Figure B.1

MEMO: *It is necessary that clearance is the same by changing pad thickness under motor lugs. Besides, it is necessary to control distance between half-couplings **L** (figure B.1). It should be equal to actual length of coupling spacer **L**±0,5mm. For pre-centering deflection of value **e** is about 0.3 - 0.5mm.*

1.2 Final centering is carried out in the following order:

- Set and fix device and indicators at the motor half-coupling according to the drawing (figure B.2);
- it is necessary to draw diagrams according to the figure B.2 for notes;
- Measure end clearances with the help of indicators situated above and below, and radial clearance – indicators situated above at zero position. Put measurement results to the diagram: end clearances – inside circle, and radial – outside;
- Turn motor rotor and pump rotor to 90º, 180º and 270º and measure end and radial clearances for every position. Put measurement results to the diagrams 2, 3 and 4 correspondingly;
- Sum up iterated results of measurements for upper part of coupling at 0º and 180º position. Divide iterated sum by 2. Put these results to inner upper part of the diagram 5;
- Sum up iterated results of measurements for lower part of coupling at 0º and 180º position. Divide iterated sum by 2. Put these results to inner lower part of the diagram 5;

- Repeat actions described in 5) and 6) for coupling at 90º and 270º position and put these to diagram 6;
- Transfer values of radial clearances from diagrams 1 and 3 to diagram 5 (above and below correspondingly) and from diagrams 2 and 4 – to diagram 6;
- Reduce data from diagrams 5 and to zero and write them down to diagrams 7 and 8 vertically and horizontally correspondingly. Accept the least clearance as zero. Centering is satisfactory if difference of opposite measurements in diagrams 7 and 8 is less than values given at the table 2.

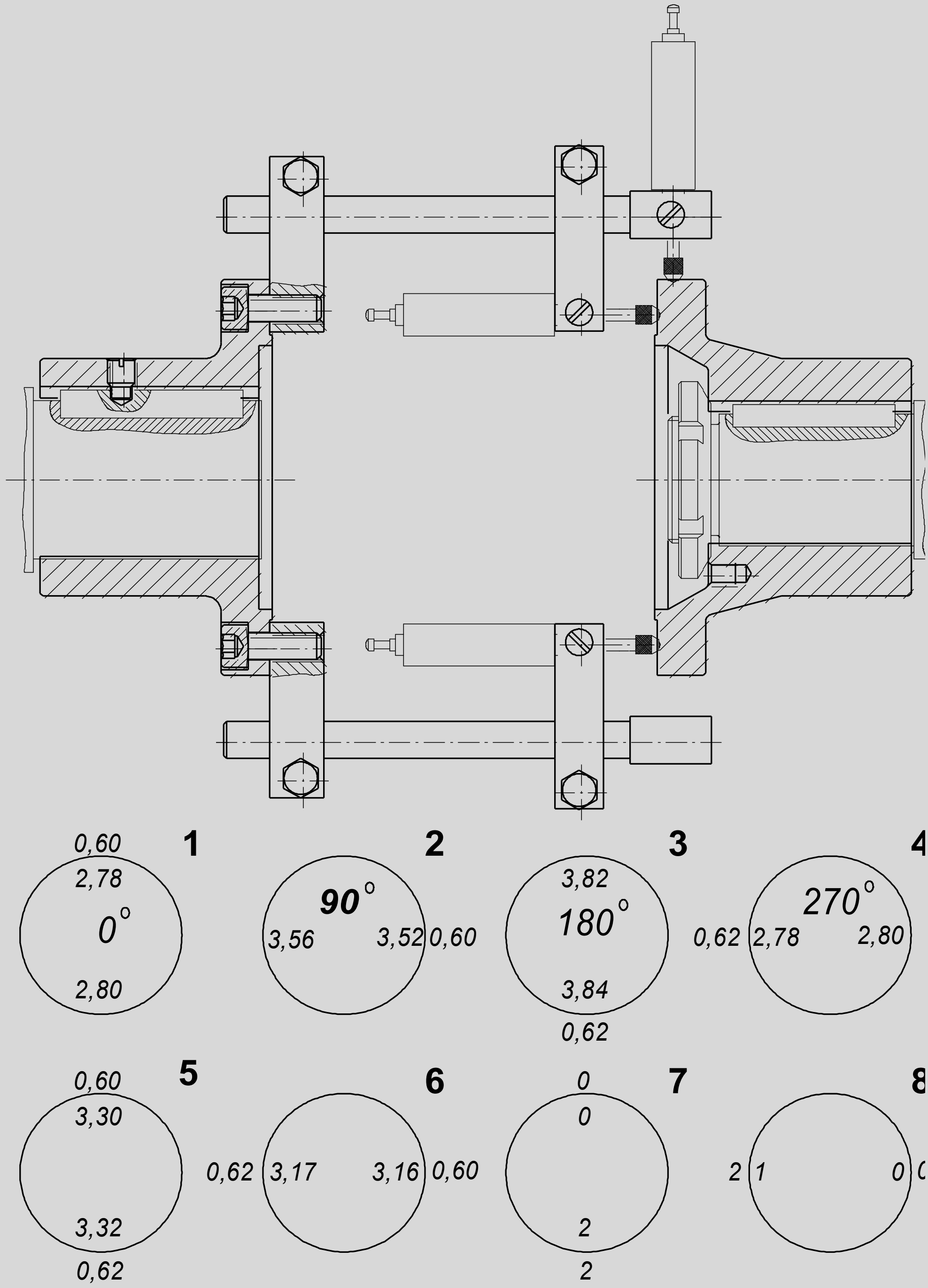


Figure B.2

APPENDIX C

Diagram of shaft tolerance displacements for МУП-2 type couplings

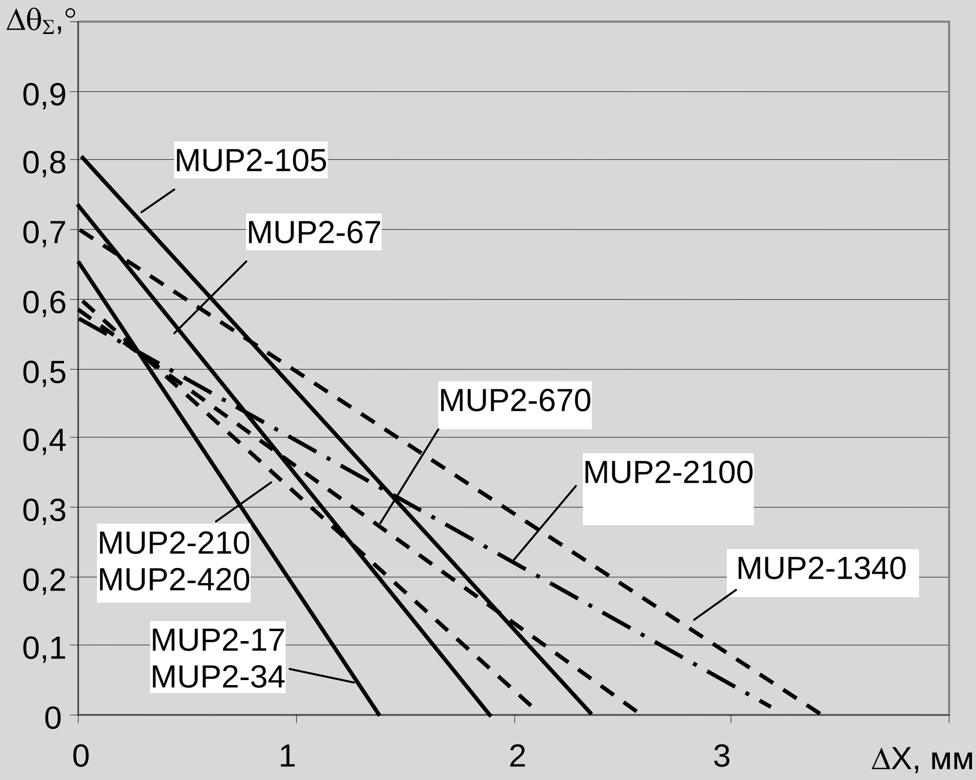


Figure C.1

$\Delta\boldsymbol{\theta}_\Sigma$ – actual spacer angular deflection, degree;
$\Delta\boldsymbol{X}$ – axial deflection of shafts, mm.

$$\Delta\theta_\Sigma = \arctan\left(\frac{\Delta Y}{L}\right) + \Delta\theta \,,$$

L – interval between springing element packages, mm;
ΔY - radial deflection of shaft axes, mm;
$\Delta\theta$ - angular deflection of shaft axes, degree.

$$\Delta\theta = \arctan\left(\frac{\Delta Z}{D}\right)$$

ΔZ - half-coupling end beating, measured for diameter D (mm), mm.

Coupling working point (ΔX; $\Delta\theta_\Sigma$) should lie in the field, limited by coordinate axes and appropriate curve.