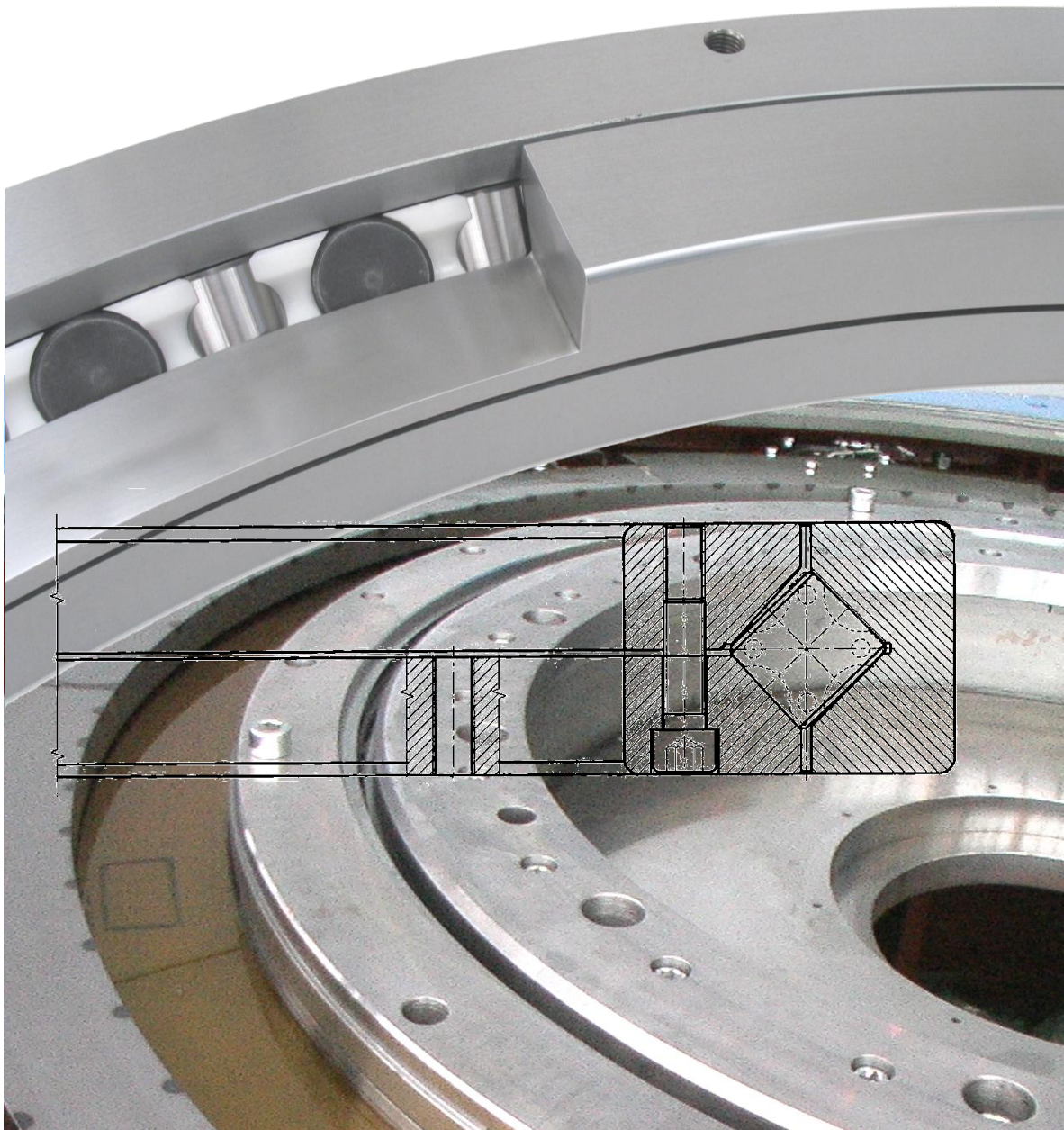




Crossed Tapered Roller Bearings

Mounting Instructions





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1. Introduction

This manual gives procedure for proper mounting of crossed tapered roller bearings of types PSL 912-3XX. Knowledge-based mounting as well as proper bearings selection and design are conditional for reliable and trouble-free operation. Wrong handling during transportation, improper storage, contamination, damage of rolling surface or others can reduce defined service life and true running of the bearing.

Crossed tapered roller bearings consist of one outer ring, two inner rings and set of tapered rollers and spacers. Faces of respective rings are marked with “A” and “C” signs (Fig.1). Rings and rollers of bearings are not interchangeable. It is not allowed to couple rings originated from various bearings.

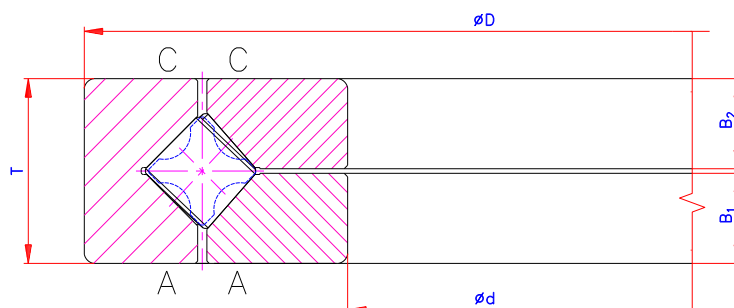


Fig.1

Principal dimensions are listed in a bearing certificate which is provided to each produced bearing. A copy of the certificate is enclosed in a bearing box. Based on this data supporting areas of bearings (Fig.2) have to be machined in housing (4) as well as in journal (5) in order to achieve values according to Table 1 and Charts 1 and 2. On demand a delivery of a bearing certificate can be provided advance a bearing shipment.

Bearings are delivered in disassembled status if not agreed differently – each ring is wrapped separately.

In order to make handling easier using manipulation equipment bearings feature handling thread holes for eyebolt (DIN 580, ISO 3266) on faces.

Adjustment of the bearing is achieved through upper inner bearing ring marked “C”, which is mounted as a loose-fitting on the journal according to Chart 1.

Overall schemes of a bearing arrangement in variants of gear ring and journal layout are shown in Fig.2a and 2b.

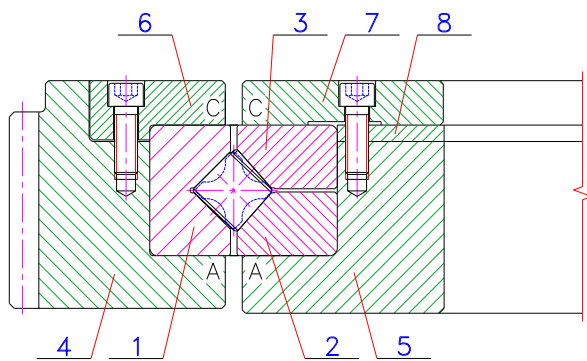


Fig.2a

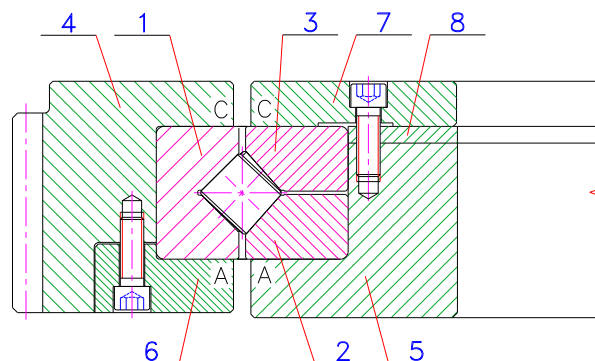


Fig.2b

Description

- 1 - Outer ring
- 2 - Inner ring „A“
- 3 - Inner ring „C“
- 4 - Gear ring
- 5 - Journal
- 6 - Gear ring flange
- 7 - Journal flange
- 8 - Distance spacer

2. Preparation of mounting

Preparation of mounting includes following operations:

- 2.1. **Workplace preparation** – cleansing and disposing all means necessary for mounting in order to make the process smooth and safe.
- 2.2. **Preparation of subassemblies** – cleansing, deburring and visual inspection of appearance, dimensions and variation of geometric characteristics of housing and journal supporting areas. It is not allowed to machine supporting areas in a shop together with unpacked part of bearing.
- 2.3. **Preparation of a bearing** – unpacking and cleansing of bearing parts from preservation oil. In order to make handling easier using manipulation equipment bearings feature handling thread holes for eyebolt on faces. Visual inspection of all bearing parts in order to detect any damage possibly caused in process of transportation.

3. Mounting procedure

3.1. General instructions

Correct and mistake-free mounting can be achieved only by meeting following instructions:

Use protective gloves during all assembly.

Mounting of bearing must be performed in its horizontal position only t. i. with vertical rotation axis. In case of horizontal working position of the bearing the mounted bearing has to be as assembled in the machine subassembly also in horizontal position and subsequently the whole assembly attached to the machine in required working position.

Before the bearing mounting it is necessary measure and record data of bearing supporting areas in housing (diameter) and journal (diameter, depth).

Since the outer ring and inner ring “A” of the bearings are mounted with interference as a tight-fitting the process can be made easier by heating of the inner ring and the gear ring.

The inner ring of the bearing should be heated at temperature $+ 80^{\circ}\text{C} \pm 5^{\circ}\text{C}$. Not respecting of these conditions could cause metallographic changes in structure of material and finally affect a proper hardness of raceways.



PSL recommends heating of the gear ring but not freezing of the outer ring of the bearing. PSL does not take responsibility and guarantee for proper operation of the bearing in case of freezing the outer ring by customer.

Provided above mentioned or other similar appropriate methods cannot be followed it is allowed to press rings into using a soft steel mandrel. In that case it is necessary to avoid a damage of rings by assuring a proper chamfering of individual parts.

3.2. Requirements for supporting surfaces

Requirements for supporting surfaces (tolerance of cylindricity, overall axial run out, roughness and class of roughness) both for gear ring and journal are given in Table 1 and in charts 1 and 2.

Table 1: Tolerances of supporting surfaces

Tolerance for journal:

Size from D (mm) to	250	250 315	315 400	400 500	500 630	630 800	800 1000	1000 1250	1250 1600	1600 2000
Cylindricity DIN EN ISO 4287	7	7	8	8	9	11	12	14	16	20
Overall axial run-out DIN EN ISO 4287	4	4	5	6	7	9	10	12	13	17
Roughness R _a DIN EN ISO 4287	0,8									
Class of Roughness DIN EN ISO 1302	N6									

Tolerance for gear ring:

Size from D (mm) to	315	315 400	400 500	500 630	630 800	800 1000	1000 1250	1250 1600	1600 2000	2000 2500
Cylindricity DIN EN ISO 4287	10	12	12	13	15	18	20	23	27	33
Overall axial run-out DIN EN ISO 4287	6	7	9	11	13	15	18	20	25	30
Roughness R _a DIN EN ISO 4287	1,6									
Class of Roughness DIN EN ISO 1302	N7									

Notes:

Cylindricity comprises circularity, straightness and parallelism.

Cylindricity refers to radius.

Tolerances of cylindricity are doubled for two-point inspection of journal or gear ring diameter.

Chart 1

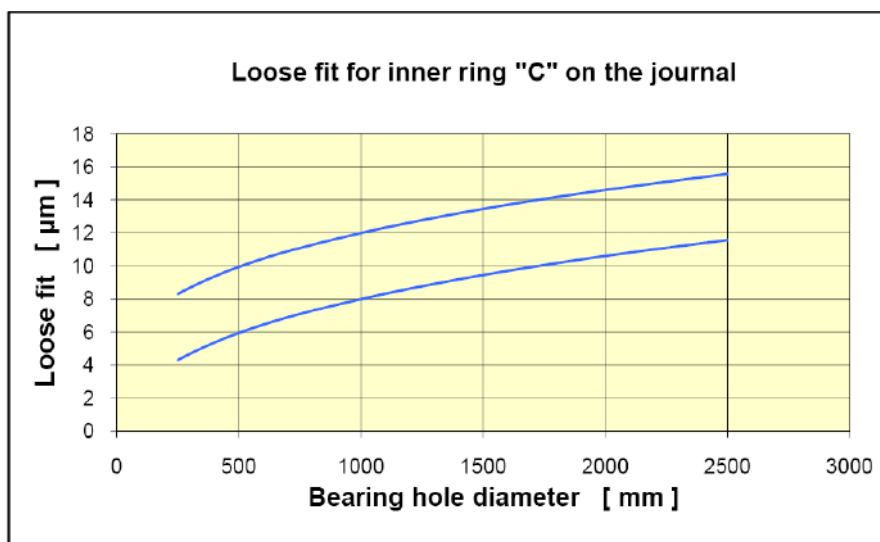
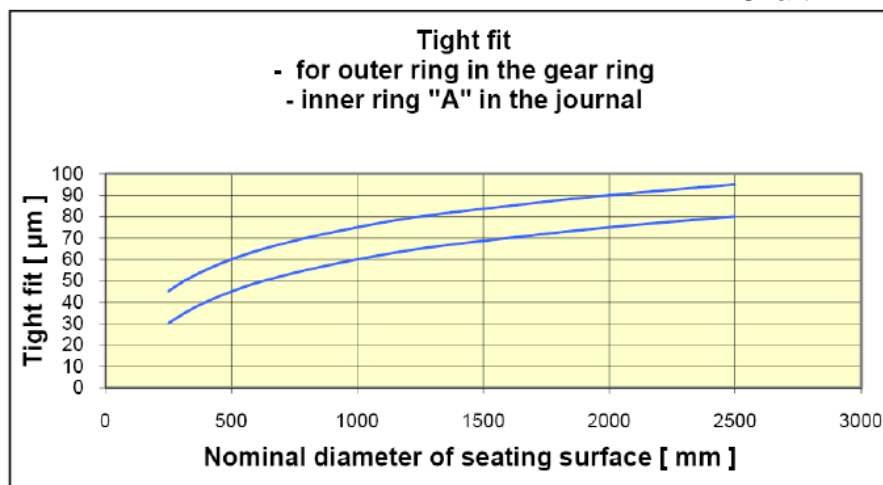


Chart 2



3.3. Mounting of a bearing

Mounting of a bearing has to be performed in accordance with following procedure:

3.3.1 Insert the outer ring (1) into gear ring (4) in the way the face marked "A" or "C" to be always located on the bottom side (Fig. 3a or 3b). Check proper seating of the face all around circumference using 0.03 mm feeler gauge. Temperature of assembly components has to be balanced with room temperature.

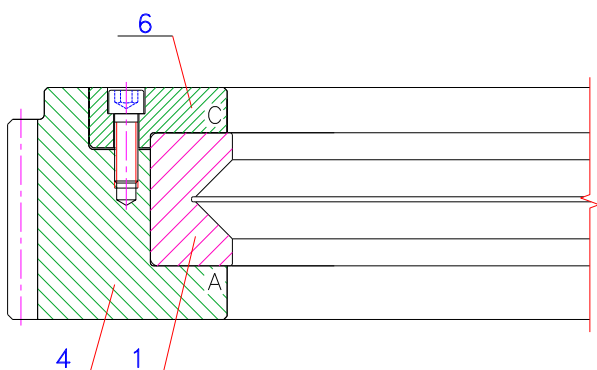


Fig.3a

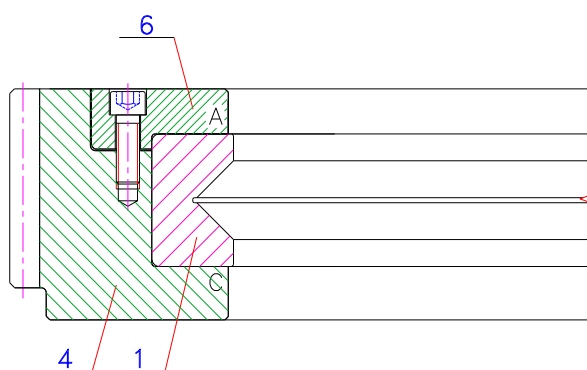
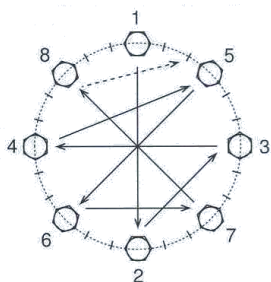


Fig.3b

3.3.2. Attach a fixing flange of the outer ring (6) and tighten bolts with a torque recommended by bolt manufacturer for corresponding bolt size in two steps (50% and 100% of recommended tightening torque for corresponding bolt size) following diagonal sequence of tightening with alternating bolts on opposite positions.



Diagonal sequence of tightening the bolts

3.3.3. Check proper seating of the flange using a feeler gauge.

3.3.4. Mount the inner ring (2) marked "A" into a journal according to Fig. 4 and check proper seating using a feeler gauge.

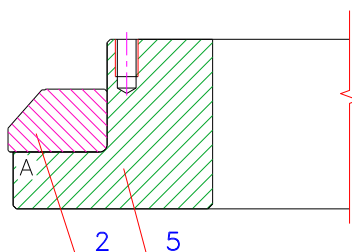


Fig.4

3.3.5. Slightly oil raceway of both rings.

3.3.6. Attach the housing with outer ring mounted on the journal with the inner ring "A" installed. Centre relative position of both arrangements. Support the gear ring so as a position of face of the "A" outer ring is higher toward face of the inner ring "A". This temporary changed position of rings enables inserting of rollers and spacers (Fig.5).

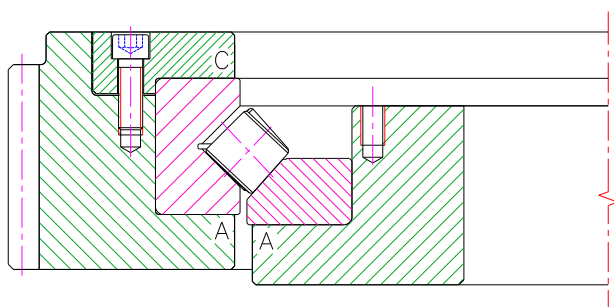


Fig.5a

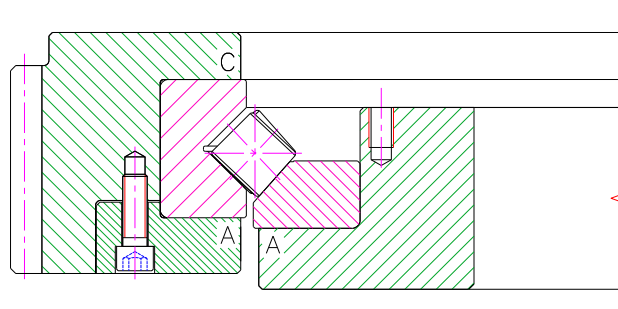


Fig.5b

- 3.3.7. Gradually insert rollers in a way the larger diameter of rollers (with curved face) is always directed to the outer ring and alternately to upper and lower raceway (Fig.5a, 5b). Spacers have to be inserted between rollers. Thicker spacers have to be inserted equally on perimeter (if two types of spacers are used at the bearing).
- 3.3.8. Remove the support of housing with outer ring after all rollers and spacers are installed.
- 3.3.9. A slow alternate slewing of the gear ring is recommended to achieve a right all around seating of all rolling elements.
- 3.3.10. Slightly oil raceways and rollers while slow slewing.
- 3.3.11. Insert the inner ring (3) into the journal with the "C" face upwards (Fig. 6a, 6b).

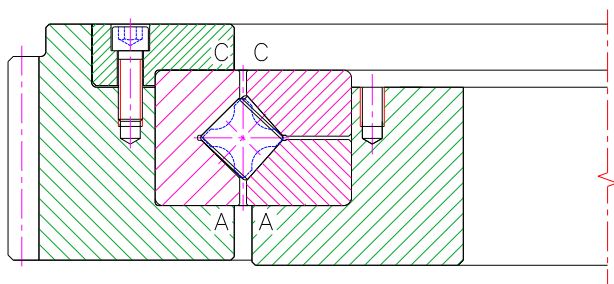


Fig.6a

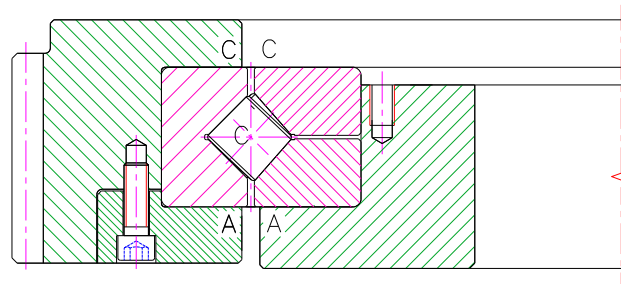


Fig.6b

- 3.3.12. Final seating of rollers and spacers is achieved by slow alternate slewing of the gear ring. Initially a tough running can occur but after several alternate slews a motion should become easy and smooth.

3.4. Adjustment of a bearing

- 3.4.1. Check parallelism and axial run-out of the outer ring to inner ring „C“. Maximal value of run-out should not exceed a value defined for respective size and precision of a mounted bearing. Measure thickness of the distance spacer (8) according to Fig.7a, 7b.

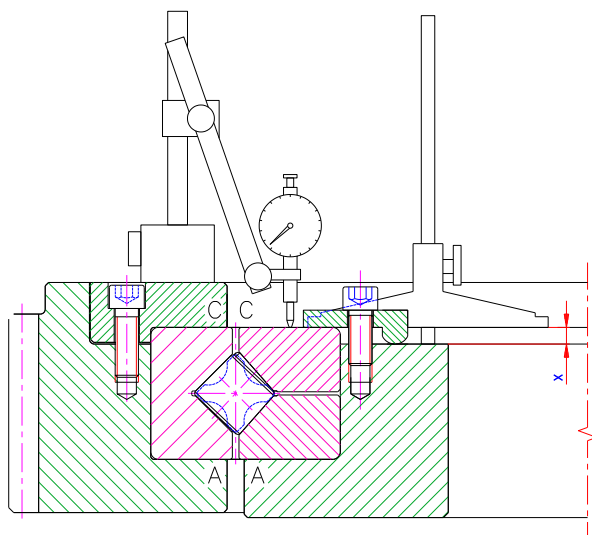


Fig.7a

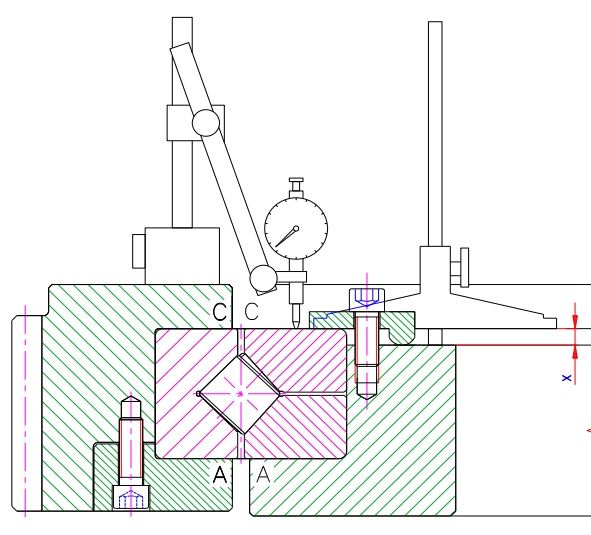


Fig.7b

- 3.4.2. Attach and fix a flange of the journal (7) (without inserting the distance spacer) and gradually tighten bolts to adjust a bearing clearance (Fig.7a, 7b).
- 3.4.3. Measure distance “X” between journal (5) and inner ring (3) at several positions all around. Calculate arithmetic mean value from all measured values. Thickness of the distance spacer then equals to calculated arithmetic mean value reduced by value of assigned preload (Fig.8).
- 3.4.4. Dismantle the fixing flange and insert the spacer (8). Check a correct seating of the distance spacer. Gradually tighten bolts in two steps (50% and 100% of recommended tightening torque for corresponding bolt size).

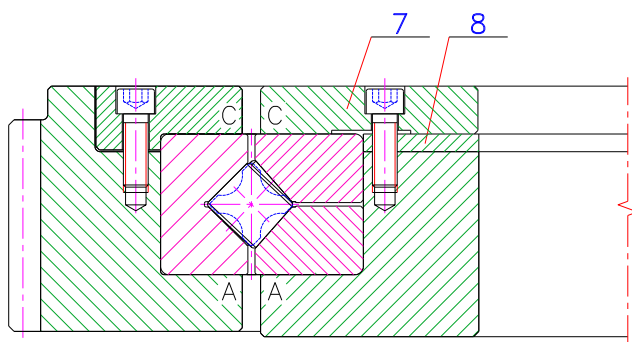


Fig.8a

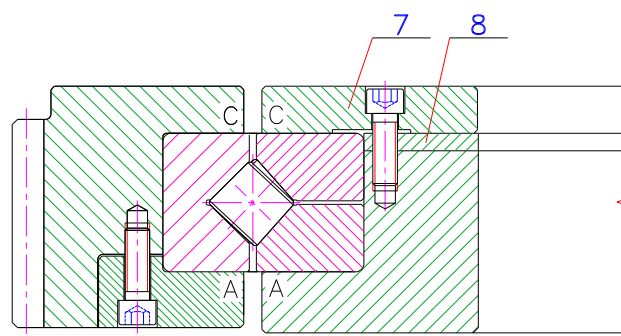


Fig.8b

- 3.4.5. It is necessary to check a final preload as well as true running by operational testing. In case a quality of machining is not suitable, it is allowed to modify preload of the bearing by appropriate modification of the distance spacer.

An increased running accuracy of a clamping table can be achieved by final machining of a table on finished machine.

4. Service inspection of a bearing

Proper performance and full service life guaranteed is conditioned especially by:

- correct mounting performed in accordance with instruction
- sufficient and appropriate lubrication in operation
- regular inspection of lubrication system
- completion of regular preventive inspections of bearing running
- keeping (not exceeding) specified operating parameters
- minimizing the risk of shock loadings, etc.

5. Documentation

PSL recommends to keep and to maintain appropriate documentation related to mounting and operation which gives basic information on operation of each bearing.

Documentation should include information on:

- bearing
 - o type, serial number, bearing parameters stated in a bearing certificate
- mounting
 - o date, working team
 - o serial number of the machine or designation of housing and journal
 - o parameters of supporting surfaces (diameter, cylindricity, run-out, roughness, etc.)
- initial parameters of
 - o bearing
 - o running accuracy of a clamping table



- maintenance inspections
 - o date
 - o parameters of running accuracy of a table

6. Accessories and measuring instruments

Measuring instruments

- a. feeler gauges
- b. depth meter
- c. micrometers

Accessories

supports
facilities for heating
gloves

7. Closing provisions

PSL does not take responsibility for any damage as well as does not guarantee specified bearing performance in case a mounting procedure and maintenance inspections have not been performed in accordance with this instruction.

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