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Replacing GB/T 894.1-1986, GB/T 894.2-1986

Retaining rings for shaft

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Standardization Administration of the PRC.

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Foreword

This Standard is one of “retaining rings” series of standards. This series include:

- GB/T 893 Retaining rings for bores;
- GB/T 894 Retaining rings for shaft;
- GB/T 896 “E” rings;
- GB/T 959.1 Specifications for retaining rings - Circlips.

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 894.1-1986 “Circlips for shaft - Type A” and GB/T 894.2-1986 “Circlips for shaft - Type B”. As compared with GB/T 894.1-1986 and GB/T 894.2-1986, the main technical changes are as follows:

- GB/T 894.1-1986 and GB/T 894.2-1986 are combined into one standard; and the standard’s name is modified;
- ADD specifications for standard type (Type A): d_1=210, 220, 230, 240, 250, 260, 270, 280, 290, and 300 mm (SEE Table 1);
- MODIFY the thickness (s), and other dimensions and tolerances of standard type (Type A) (SEE Table 1);
- SPECIFY that the bore for installation pincer (d_5) is the minimum limit dimension (SEE Table 1, Table 2);
- ADD the standard value of bearing capacity F_N of groove (SEE Table 1, Table 2, Chapter 5);
- ADD the standard value of bearing capacity F_R of rings (SEE Table 1, Table 2, Chapter 5);
- ADD the limit speed of rings (SEE Table 1, Table 2, Chapter 5);
- ADD a heavy type (Type B), d_1 = 15 mm ~ 100 mm (SEE Table 2);
- ADD installation tool standards and specifications (SEE Table 1, Table 2);
- ADD groove design and installation (SEE Chapter 6, Chapter 7);
- DELETE the previous Appendix A.

This Standard was proposed by China Machinery Industry Federation.

Retaining rings for shaft

1 Scope

This Standard specifies the retaining rings for shaft of standard type (Type A) with bore diameter d_1 = 3 mm ~ 300 mm and of heavy type (Type B) with d_1 = 15 mm ~ 100 mm; and gives the groove design data for installing the retaining rings.

This Standard applies to the retaining rings, which can withstand axial force, used for fixed parts or components (such as rolling bearings) on the shaft.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the versions with the dates indicated are applicable to this document. For the undated references, the latest version (including all the amendments) are applicable to this document.

GB/T 959.1 Specifications for retaining rings - Circlips

GB/T 1237 Designation system for fasteners

JB/T 3411.47 Pincer for assembly spring thrust collar on shaft - Dimensions

3 Symbols

The following symbols are applicable to this document.

a - Lug radial width

b - Radial width opposite the opening of retaining ring

d_1 - Shaft diameter

d_2 - Groove diameter

d_3 - Inner diameter of retaining ring in free state

d_4 - The maximum centerline diameter of the external space. The calculation equation is: $d_4 = d_1 - 2.1a$

d_5 - Installation bore diameter

F_N - The groove bearing capacity when the lower yield strength of the material R_{eL} = 200 MPa (SEE 5.2)

F_R - Bearing capacity of the retaining ring at right angle contact (SEE 5.3)

F_{Rg} - Bearing capacity of the retaining ring at chamfer contact (SEE 5.3)

g - Part chamfer dimension (SEE Figure 2)

m - Groove width (SEE Table 1, Table 2)

n - Edge distance (SEE Table 1, Table 2)

n_{abl} - Limit speed of retaining rings (SEE Table 1)

R_{eL} - Lower yield strength of material

s - Thickness of retaining rings (SEE Table 1, Table 2)

t - The groove depth when d_1 and d_2 are nominal dimensions (SEE Figure 2)

4 Dimensions and design data

The dimensions of retaining ring and groove shall be in accordance with the provisions of Table 1 and Table 2. Among them, the dimensional tolerances apply to the dimensions before coating.

Figure 1 is only an example.

The load values for groove and groove edge are determined by specifications. The groove bottom shall be in accordance with 6.3.

5 Bearing capacity

5.1 General rules

The dimensions for mounting retaining ring require the calculation of groove bearing capacity F_N and the retaining ring bearing capacity F_R, respectively. Usually, the design is mainly referred to lower limit parameters. Table 1 and Table 2 give the bearing capacities (F_N, F_R, F_{Rg}), which do not include the safety factor of the yield generated under static load or the fatigue fracture under dynamic load. Under static load, the safety level against fracture is at least 2 times.

Under high-speed rotation conditions, because the centrifugal action may lead to the retaining ring moving away from the bottom surface of groove, the limit speed is limited.

5.2 Groove bearing capacity F_N

The F_N values given in Tables 1 and 2 apply to grooves with a material lower yield strength R_{eL}=200 MPa, and with nominal groove depth t and edge distance n.

For other groove depths t′ and lower yield strengths R'_{eL}, the bearing capacity F'_N shall be calculated according to the equation (1):

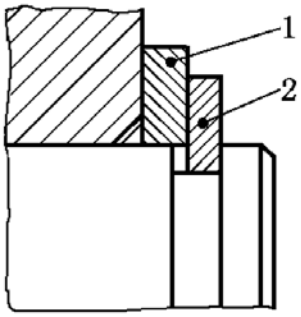
$$F'_N = F_N \cdot \frac{t'}{t} \cdot \frac{R'_{eL}}{200} \qquad \cdots\cdots (1)$$

5.3 Ring bearing capacity F_R

The F_R values given in Tables 1 and 2 apply to the retaining ring which passes through the shaft greater than the maximum diameter of $1.01 \times d_1$ (SEE Chapter 7) and conforms to n_{abl}, assembly in contact with the part at right angle (SEE Figure 3).

The F_{Rg} value applies to assemblies with a part chamfer dimension of g (SEE Figure 4).

The F_R and F_{Rg} values apply to the retaining ring material with a modulus of elasticity of 210 GPa.



Keys:

1 - Support ring;

2 - Retaining ring.

Figure 5 -- Right angle contact using a support ring

5.4 Limit speed

After the retaining ring made of C67S or C75S is installed in accordance with the method specified in Chapter 7, when the speed reaches the limit speeds given in Tables 1 and 2, the ring shall not come out of the groove.

6 Groove design

6.1 Groove dimension d_2

The groove dimension d_2 shall be selected from Tables 1 and 2, to allow the retaining ring to be prestressed after being placed in the groove.

Note: If prestressing does not need to be withstood, a smaller groove diameter can be selected. Its lower limit is: $d_{2min} = d_{3max}$.

6.2 Groove width m

The tolerance zone H13 is suitable for the groove widths specified in Tables 1 and 2. When subjected to a unidirectional force, the groove can be widened and/or chamfered to the unstressed side. The groove width does not affect the bearing capacity of retaining ring. The manufacturer can determine the shape and width of groove at its discretion.

If the retaining ring alternately transmits the force, and the groove wall is subjected to a bidirectional force, the groove width m shall be matched as much as possible to the retaining ring thickness s, such as reducing the tolerance.

The groove shape is shown in Figure 6 a)~d).

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