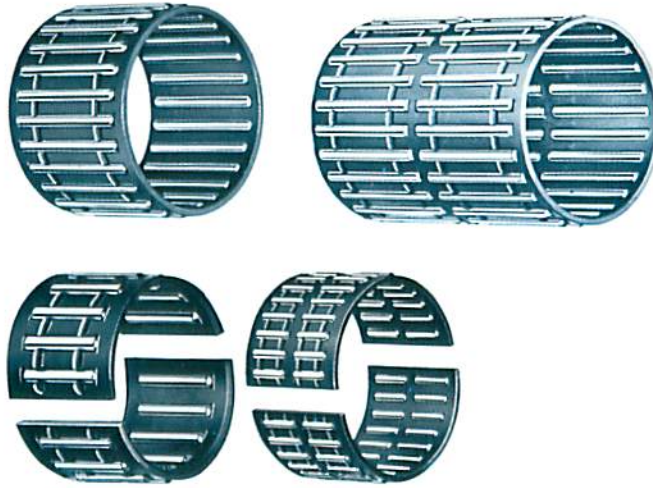


NEEDLE CAGES



Needle cages are inexpensive and very easy to install. They can be fitted by hand without the use of tools. They may be manufactured in two parts and can then be mounted on an inner raceway between two shoulders. This arrangement allows the rigidity of the shaft to be increased.

The double cage, that is one having two rows of needles, comprises two bearings side by side in one continuous unit. It allows parts such as idler pinions to be fitted easily and ensures their stability. The double cage can also be manufactured in two separate parts.

The dimensions and characteristics of split cages in two parts with one or two rows of needles can be supplied on request.

ADVANTAGES

NADELLA cages, manufactured in steel, present the following advantages:

- ▶ *Great rigidity* preventing deformation during handling
- ▶ *Good mechanical stability* that resists ageing and ensures long operational life without excessive wear whilst maintaining the geometrical shape of the cage at high temperatures
- ▶ *Excellent resistance* to synthetic additives contained in many lubricants
- ▶ *Minimal thickness* allowing maximum oil penetration thus assisting effective lubrication
- ▶ *Low weight* minimising the centrifugal effects of rapid acceleration.

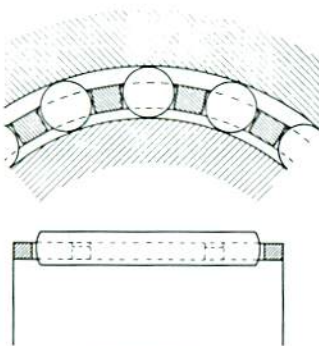
DESIGN

The convergent faces of the cage pockets form a V-shaped cradle which ensures correct retention of the needles and prevents them from falling inwards. The cage is centred by the needles and does not come into contact with the raceways, thus considerably reducing operational wear and noise.

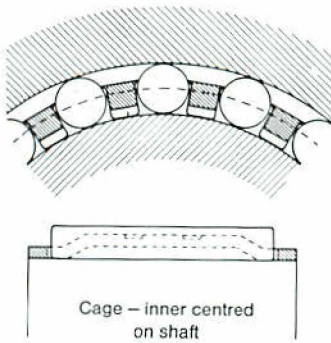
Retention of the needles to prevent them moving outwards from the cage is effected by small wedges which remain out of contact with the needles during operation. The sides of two adjacent cage pockets and the needle form a prism ensuring retention of lubricant and silent operation.

NEEDLE CAGES FOR SPECIAL APPLICATIONS

If the specification and quantities permit, needle cages may be specially manufactured in cadmium-plated steel with stainless steel needles.



Standard cage



In applications such as planet gear pinions, gudgeon pins and big ends of high-speed engines, needle cages are subjected to considerable centrifugal loads which can cause high stresses between the cage pockets and the needles if standard cages are used. For these special cases, NADELLA manufactures specially contoured cages which are "centred" in contact with the inner or outer raceway. The use of these "centred" cages is recommended where the centrifugal load applied corresponds to an acceleration of 500 m/s^2 or more.

In general, cages for the small end are centred from the inside on the gudgeon pin. The cages of the big end may be centred from the inside or from outside, though centring from the inside using the crank pin of the crankshaft is advisable only up to certain limits of centrifugal force with corresponding limits on dimensions and speed. Centring from the outside by the bore of the big end is preferred in all cases, particularly where lubrication is not totally assured, as in the case of two-stroke engines rotating at high speed.

TYPES OF CAGE

Cages with one row of needles: type **B**

Cages with two rows of needles: type **BB**

Cages in two parts, with one row of needles: type **MB** (1)

Cages in two parts, with two rows of needles: type **MBB** (1)

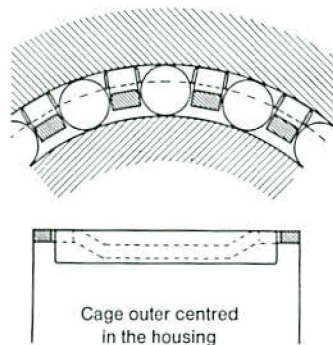
(1) Dimensions and characteristics supplied on request.

MANUFACTURING TOLERANCES

The needles of a particular cage have a diameter restricted to a tolerance of $2 \mu\text{m}$ according to one of the groups shown in the table below. Unless otherwise specified in advance, NADELLA may supply a batch of cages within several tolerance groups without distinction by colour coding.

However, if several cages are used on the same shaft, their needles should be of the same tolerance group to ensure the best possible distribution of load.

The tolerance on the width L conforms to ISO/DIS Norm 3030, or $-0.2/-0.55$.



| Tolerance Group Microns | Colour Code | Tolerance Group Microns | Colour Code |
|----------------------------|----------------|----------------------------|----------------|
| 0/-2 | red | -1/-3 | pink |
| -2/-4 | blue | -3/-5 | sky blue |
| -4/-6 | white | -5/-7 | grey |
| -6/-8 | green | -7/-9 | orange |
| -8/-10 | yellow | | |

SHAFT AND HOUSING TOLERANCES

| Functional Clearance | Shaft Dimension Ci | Housing Dimension Ce |
|-----------------------|--------------------|----------------------|
| Closer than standard | j5 h5 | G6 H6 |
| Standard | h5 g5 | G6 H6 |
| Greater than standard | g6 f6 | G6 H6 |

Cylindrical tolerance, defined as the difference in radii of two coaxial cylinders (ISO Standard 1101) must normally be less than a quarter of the manufacturing tolerance. In the case of precision applications or high speed operation it is recommended to reduce this tolerance to one eighth of the manufacturing tolerance.

The width of the housing formed by the lateral abutments must at least be equal to the nominal dimension L (recommended tolerance: H11).

LATERAL RETENTION

Needle cages must be laterally retained whether on the shaft or in the housing. The maximum bore A of the abutments integral with the housing or the minimum outer diameter E of the abutments integral with the shaft are shown in the table of dimensions.

Snap rings for shafts or for housings must not be used in direct contact with the faces of the cage, but only with a spacer interposed.