Legacy products

The following legacy series can still be supplied:
- 11AN..
- 11AW..
- ..SN
- ..SW

The legacy series listed in **table 16** are delivered and marked according to the listed cross-reference designation system (see also the relevant product tables):

Legacy standards

SKF can supply bearings compliant to the following legacy standards:

- AS 21230 to AS 21233

Customer standards

SKF can supply bearings compliant to the following customer standards:

- ASNA2121 to ASNA2124
- NSA 8134 to NSA 8137

Table 16

Cross-reference to legacy products

Variant	Cross-reference designation system	SKF Aerospace France designation system Lons-le-saunier (Formerly known as SARMA)	SKF Aeropsace U.K. Limited designation system Clevedon (Formerly known as AMPEP)
Light metric	**LEN..**	XRA..	11C..N.. (not plated) 11F..N.. (chromium plated sphere)
Narrow metric	**NEN**	XRE..	11C..W.. (Not plated) or 11F..W.. (chromium plated sphere) for bore code 5 and 22 11C..N.. (Not plated) or 11F..N.. (chromium plated sphere) for bore code 6 and 10 11C..E.. (Not plated) or 11F..E.. (Chromium plated sphere) for bore code 8 and ≥ 12 (except 22)
Wide metric	**WEN**	XRL..	11C..E.. (Not plated) or 11F..E.. (Chromium plated sphere) for bore code 5 11C..W.. (Not plated) or 11F..W.. (chromium plated sphere) for bore code ≥ 6
High misalignment metric	**HMEN**	RL..SP.. (stepped design inner ring)	11E..H (Blended design inner ring)
Narrow inch	**NAS**	XRE..	11HN.. (Inner ring sphere surface coated) 11BN..
Narrow inch lined bore	**NAS..A..**	XRE..A..	11LHN.. (Inner ring sphere surface coated) 11LBN..
Wide inch	**WAS**	XRL..	11HW.. (Inner ring sphere surface coated) 11BW..
Wide inch lined bore	**WAS..A..**	XRL..A..	11LHW.. (Inner ring sphere surface coated) 11LBW..

Bearing interfaces

Fits and tolerances

Spherical plain bearings are mounted with different fits on the shaft and in the housing:

- Shaft: Loose fit, typically 0 to +0,020 mm (*0 to +0.0008 in*)
- Housing: Depending on application requirements, **table 16**

The fit selection can affect the selection of the clearance or torque variant (**table 16**).

For example, when mounting with interference fit:

- For metal-to-metal spherical plain bearings, to avoid the removal of all the bearing clearance and risk of blocking the bearing, sufficient initial internal clearance is needed. Using a reduced clearance variant is therefore not recommended
- For self-lubricating spherical plain bearings, to avoid high torque increase and risk of blocking the bearing, reduced torque or controlled clearance variants should be used

Refer to *Friction and torque* **page 136** and *Internal clearance* **page 137** for more information.

The required bearing fits and resulting operating clearance and torque are influenced by the coefficients of thermal expansion of the housing and shaft materials if different than the bearing material. This effect must be considered when selecting fits and bearing initial internal clearance and torque.

Table 16

Housing fits for spherical plain bearings

Application conditions	Recommended fit	Recommended bearing variant		Effect on internal clearance or torque
		Metal-to-metal bearings	Self-lubricating bearings	
Risk for push-out, heavy load, matched assembly required	Interference fit –0,002 to –0,012 mm *–0.0001 to –0.0005 in*	Normal clearance	Reduced torque or controlled clearance	Moderate internal clearance reduction or torque increase
Accurate torque or clearance needed, low push-out risk, easy axial positioning needed	Loose fit with small clearance +0,025 to +0,010 mm *+0.0010 to +0.0004 in*	Normal or reduced clearance	Normal or reduced torque	Not affecting internal clearance nor torque
Accurate torque or clearance needed, low push-out risk, adhesive must be applied in the housing bore	Loose fit with large clearance +0,100 to +0,050 mm *+0.0040 to +0.0020 in*	Normal or reduced clearance	Normal or reduced torque	Not affecting internal clearance nor torque
Enable re-use of housing, matched assembly required for larger bearing outer diameters	Transition fit +0,020 to –0,005 mm *+0.0008 to –0.0002 in*	Normal or reduced clearance	Normal or reduced torque	Small internal clearance reduction or torque increase

Mounting

Mount spherical plain bearings in a clean environment and with care to achieve maximum performance and service life. Leave the bearings in their original packages until immediately before mounting so they are not exposed to any contaminants. Also, make sure mating components are clean before mounting the bearings.

Bearings should be mounted onto their shaft seats with a loose fit, refer to *Fits and tolerances* **page 142**. High interference fit could damage the inner ring and subsequently affect bearing performance.

When mounting a bearing in a housing, use an assembly tool which pushes on the outer ring whilst supporting both the outer and inner ring (**figure 28**).

When mounting a bearing on a shaft, use an assembly tool pushing on the inner ring while supporting the outer ring.

This is to ensure that the mounting force never acts on the sliding contact surfaces which could damage the bearing (**figures 29** and **30**).

It is possible to use a mechanical press to mount a bearing (**figure 31**). To avoid damage to the bearing, under no circumstances should a method involving shock load or impact be used (**figure 32**).

Bearings mounted with an interference fit should be assembled using a temperature difference between the bearing and housing (e.g. cooling the bearing with liquid nitrogen or refrigeration unit, or heating the housing) to ease assembly. The temperature used must stay between the permissible bearing temperature limits (For more information, refer to *Operating temperature* **pages 128** and **137**).

Depending on bearing mounting conditions, a retaining or a jointing compound can be used at the interface between the housing and the bearing outer ring:

- A retaining compound between the outer ring and housing can be used to maintain the bearing position. This is typically required for bearings fitted with a clearance fit in the housing. The effectiveness of the compound used should be tested to confirm its suitability for the application requirements
- To counteract fretting or galvanic corrosion between the metallic surfaces of the housing and the bearing outer ring, a jointing compound can be applied

Do not allow the retaining or jointing compound to enter the bearing or to obstruct the lubrication groove and holes in the outer ring of metal-to-metal spherical plain bearings.

Figure 28

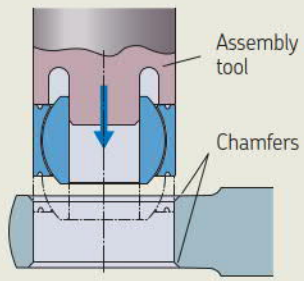


Figure 29

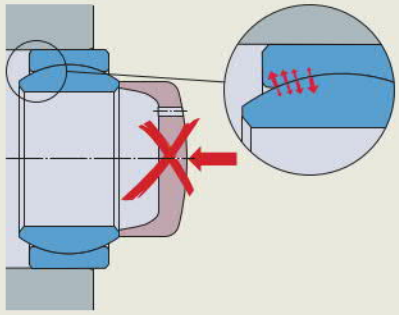


Figure 30

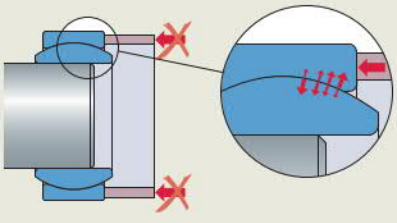


Figure 31

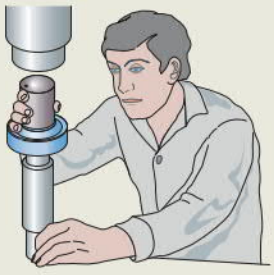
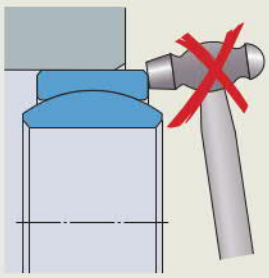


Figure 32



Bearing retention

Spherical plain bearings must be retained in the housing. Common solutions are described below.

The retention process can impact the bearing torque and/or internal clearance.

2

Anvil staking Process

1 Install bearing as detailed in *Mounting* **page 143**. Ensure the bearing is correctly axially centred in housing.
2 Determine the staking load required for bearing size and the housing material. Refer to *Staking and pushout load* **page 144**.
3 To confirm suitability of the staking loads, defined in step (2), slightly reduce the staking load and stake the first bearing from the batch using the following steps.
4 Position the bearing assembly on the location pin of the staking tool, as shown in **figure 33**. Apply the staking load and stake the first face.
5 Replace the lower anvil with a second staking head as shown in **figure 34**. Turn the bearing and housing over, locate the staked groove on the staking head and, applying the staking load, stake the second face.
6 Remove the bearing assembly, remove any surplus of retaining or jointing compound, and check rotational torque and axial retention.
7 If the staking acceptance criteria given in **page 144** are met, continue with the remaining components in the batch at the staking load established in step (3). If requirements are not met, adjust the staking load and repeat from step (4).

As an alternative to the above staking method, the staking of the two sides can be carried out in one step (omitting the staking anvil step in (4) above). This alternative should not be applied if a clearance fit is used.

Staking acceptance

After staking, the staked lip should be inspected for any damage, cracking or incomplete staking areas.

Two main criteria can be used to validate the staking:
- Check the retaining strength of the staked lip. The installed bearing can be axially proof loaded (For more information, refer to *Staking and pushout load* below). Loads must be applied through the outer ring of the bearing and not through the inner ring
- Check the gap between the lip and housing chamfer. This should be checked with a feeler gauge and should not exceed 0.127 mm (0.005 in) over 40% of the staking lip circumference. See **figure 35**.

Staking and pushout load

For additional information about staking of standard bearings, refer to the relevant standards, including TR 4541, MIL-HDBK-1599, NAS 0331, NFL 31-081 and NFL 31-083.

Figure 33

Tooling arrangement first stage stake

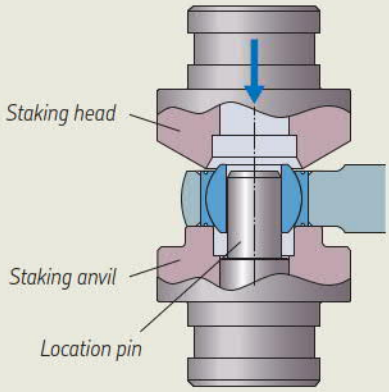


Figure 34

Tooling arrangement final stage stake

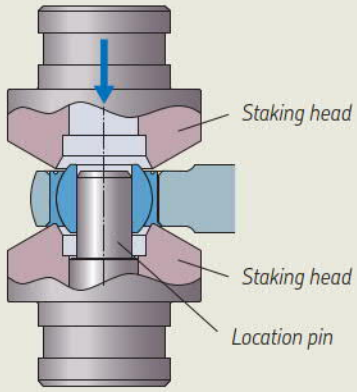
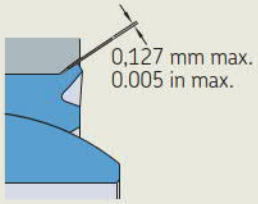


Figure 35

Staking gauge control



Roller staking

Roller staking is another lip deforming method. This is carried out using a rotating head with rotating discs or rollers running in the staking groove, which deform the outer ring lip.

Threaded or bolted retention plate

Spherical plain bearings with chamfered outer rings can be retained in the housing by using either a threaded or bolted plate (**figure 36**). This method improves axial load carrying capabilities and eases assembly and bearing replacement but increases weight and requires more space.

For mounting of customized designs, such as screwed flanges, refer to *Customized products* **page 131** and **140**.

Dismounting

Spherical plain bearings can be removed by pushing the bearing out of its housing.

The removal of bearings retained by staking can be facilitated if one retaining lip is machined away before pressing the bearing out. Care must be taken not to damage the housing.

A typical dismounting method is shown in **figure 37.**

A dismounted bearing should not be reused.

SKF supplies bearings with oversized outer diameters in a range of increments to allow bearing replacement in housings.

The housing should be thoroughly cleaned of any hardened retaining or jointing compound. The housing bore can also be re-machined and should be verified dimensionally before the new bearing is installed, especially if fretting damage is evident.

Storage

The conditions under which bearings, seals and lubricants are stored can have an adverse effect on their performance. Inventory control can also play an important role in performance, particularly for bearings having seals and lubricants. Therefore, SKF recommends a "first in, first out" inventory policy.

Storage conditions

To maintain the integrity of the product during storage, SKF recommends the following basic housekeeping practices (**table 17**):

- Store bearings in a stable, clean, vibration-free, and dry area with a cool, and steady temperature
- Control and limit relative humidity in the storage area
- Keep bearings in their original unopened packages until immediately prior to mounting to prevent risk of bearing deterioration such as the ingress of contaminants

After 5 years of storage, the grease in metal-to-metal bearings ages and must be changed by SKF.

For storage outside these conditions, the stated storage life is not guaranteed. Contact SKF for more information.

Figure 36

Threaded or bolted retention plate

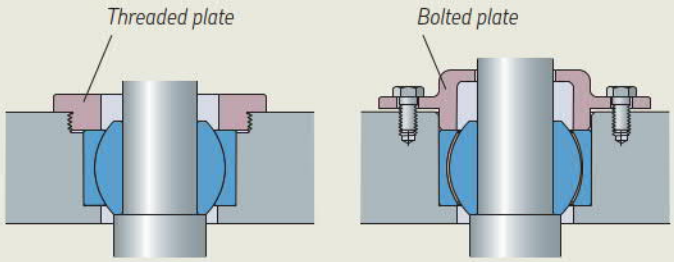


Table 17

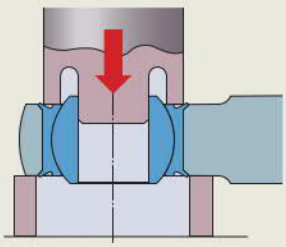
Bearing storage conditions

Standard	Metal-to-metal bearings	Self-lubricating bearings
Storage life	5 years	15 years[1)]
Storage temperature	15 to 35 °C *(55 to 95 °F)*	15 to 25 °C *(55 to 77 °F)*
Relative humidity	50 to 70%	50 to 70%

1) Can be limited by specific combinations of surface treatment and marking technology. Always refer to the dates indicated on SKF's packaging. Contact SKF for more information.

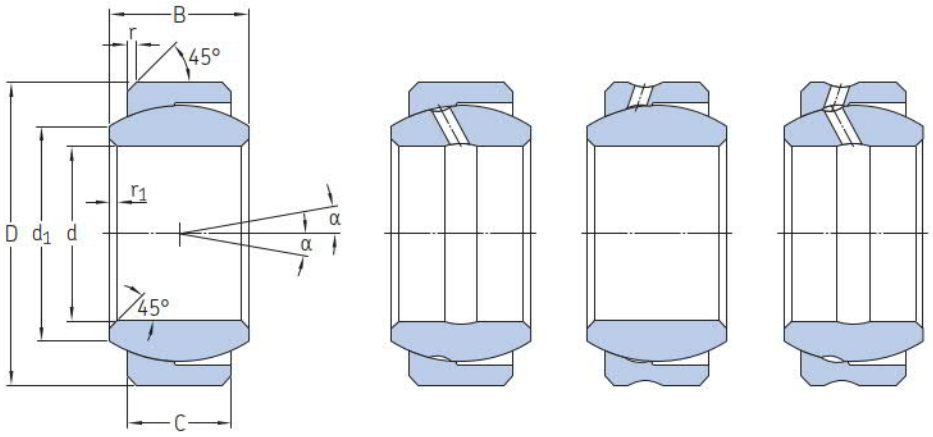
Figure 37

Bearing dismounting



2.1 Metal-to-metal loader slot (metric dimensions)

GE.. bore code **4** to **20**



GE.. GES.. GEC.. GEY..

Technical specification	EN 2337
Product standards	EN 2336 (Bearing steel) EN 2588 (Corrosion-resistant steel)
Surface treatment	One of the spherical surfaces is treated with molybdenum disulfide

Dimensions

Nominal bore code	Dimensions d	Δdmp	Δds	D	ΔDmp	ΔDs	C 0/–0,25	B 0/–0,06
–	mm	µm		mm	µm		mm	
4[1]	4	0/–8	+2/–10	12	0/–8	+5/–13	3	5
5	5	0/–8	+2/–10	14	0/–8	+5/–13	4	6
6	6	0/–8	+2/–10	14	0/–8	+5/–13	4	6
8	8	0/–8	+2/–10	16	0/–8	+5/–13	5	8
10	8	0/–8	+2/–10	19	0/–9	+6/–15	6	9
12	10	0/–8	+3/–11	22	0/–9	+6/–15	7	10
15	10	0/–8	+3/–11	26	0/–9	+6/–15	9	12
17	12	0/–8	+3/–11	30	0/–11	+8/–19	10	14
20	14	0/–10	+3/–13	35	0/–11	+8/–19	12	16

Dimensions cont., loads and clearance

Nominal bore code	Dimensions d_1 ≈	r	r_1	α	Mass ≈	Static limit load[2] Radial C_s	Axial C_a	Axial clearance Reduced	Standard	Radial clearance max Reduced	Standard
–	mm			°	g	kN		µm			
4[1]	6,2	0,4/0,7	0,3/0,6	16	3	7,7	0,45	1/30	30/60	8	15
5	8	0,4/0,7	0,3/0,6	13	4	14	0,8	1/30	30/60	8	15
6	8	0,4/0,7	0,3/0,6	13	4	17,5	1	1/30	30/60	8	15
8	10,2	0,5/0,8	0,5/0,8	15	8	27	1,8	1/30	30/60	8	15
10	13,2	0,5/0,8	0,5/0,8	12	12	44	2,5	1/30	30/60	8	15
12	16	0,6/1	0,5/0,8	11	17	57	3,5	1/30	30/60	8	15
15	18,5	0,6/1	0,5/0,8	9	32	87	5,3	1/30	30/60	8	15
17	20,7	0,9/1,3	0,7/1,1	10	54	112	6,7	1/30	30/60	8	15
20	24,1	0,9/1,3	0,7/1,1	9	65	162	9,8	1/30	30/60	8	15

[1] SKF option
[2] Loads are given in the opposite direction to the slots