

FAG



Single row deep groove ball bearings of Generation C

Technical Product Information

SCHAEFFLER GROUP
INDUSTRIAL

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FAG deep groove ball bearings of Generation C

Features

Features

Single row FAG deep groove ball bearings are versatile, self-retaining bearings with solid outer rings, inner rings and ball and cage assemblies.

These products, which are of simple design, robust in operation and easy to maintain, are available in unsealed and sealed variants. Due to the manufacturing processes used, unsealed bearings have turned recesses in the outer ring for seals or shields, Figure 1.

Due to the raceway geometry and the balls, deep groove ball bearings can support axial forces in both directions as well as radial forces.

Due to their low noise level and low frictional torque, single row deep groove ball bearings are particularly suitable for electrical machinery, ventilators, washing machines and power tools.

The new FAG deep groove ball bearings of Generation C were developed with such applications particularly in mind. Thanks to design modifications such as improved bearing kinematics, new seals and cages as well as refined manufacturing processes, deep groove ball bearings of Generation C have numerous advantages.

Advantages of FAG deep groove ball bearings of Generation C

- **Lower noise level**
due to improved quality of balls, optimised surfaces, cage with higher stability and modified osculation

- **Lower friction**
due to modified osculation and optimised surfaces, waviness and roundness
- **Improved sealing action**
due to optimised position of the HRS seal lips, a matched undercut on the inner ring and axial running contact of the seal lip on the inner ring or due to Z seals with a labyrinth function
- **Higher cost-efficiency**
lower energy costs due to lower friction; longer grease operating life due to reduced strain on lubricant; longer rating life of sealed bearings due to better protection against contamination; reduced grease loss due to better sealing function.

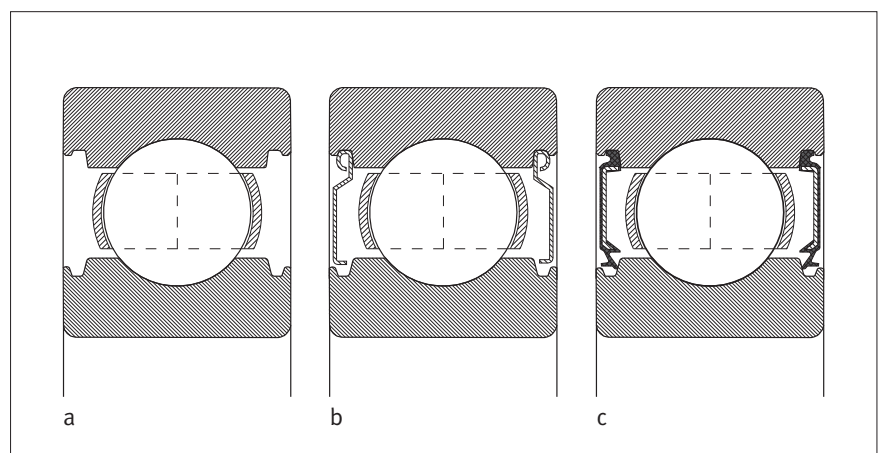
Sealing and lubrication

Unsealed bearings are suitable for high to very high speeds, Figure 1a.

Bearings with the suffix 2Z have gap seals on both sides, Figure 1b. These bearings are lubricated for life using a high quality grease and are suitable for high speeds. In bearings of Generation C, the sealing function and retention in the outer ring are improved.

Bearings with the suffix 2HRS have lip seals on both sides made from nitrile butadiene rubber, Figure 1c. These designs are lubricated for life using a high quality grease and are suitable for moderate speeds. The frictional torque and heat generation are lower than with the previous RSR seal.

By agreement, we can supply bearings with non-contact BRS seals on both sides (suffix 2BRS). The frictional behaviour of these bearings is just as favourable as that of bearings with Z seals. If the inner ring is stationary and the outer ring rotates, the lubricant loss is less than that in bearings with Z seals.



1: Available designs of FAG deep groove ball bearings of Generation C:
a: unsealed bearing,
b: bearing with gap seals (2Z);
c: bearing with lip seals (2HRS)

FAG deep groove ball bearings of Generation C

Features

Operating temperature

Unsealed deep groove ball bearings can be used up to an operating temperature of +120 °C. For applications at temperatures above +120 °C, please contact us.

Deep groove ball bearings with lip seals can be used at operating temperatures from -30 °C to +110 °C, limited by the grease and the seal material.

Bearings with gap seals can be used at temperatures from -30 °C to +120 °C.

Bearings with cages made from glass fibre reinforced polyamide are suitable for operating temperatures up to +120 °C.

Cages

Single row deep groove ball bearings without a cage suffix have a sheet steel cage. Instead of the lug cage previously used, bearings of Generation C have a more stable riveted sheet metal cage.

The suffix TVH indicates a cage made from glass fibre reinforced polyamide. The chemical resistance of polyamide to synthetic greases and lubricants with EP additives must be checked. Aged oil and additives in the oil can impair the operating life of plastic cages at high temperatures. The oil change intervals must be observed in all cases.

Suffixes

Suffixes for available designs: see table.

| Suffix | Description | Design |
|--------|---|------------------------------|
| C | Modified internal construction (Generation C) | Standard |
| 2HRS | Lip seals on both sides | Standard |
| HRS | Lip seal on one side | Special design ¹⁾ |
| 2BRS | Labyrinth seals on both sides | Special design ¹⁾ |
| BRS | Labyrinth seal on one side | Special design ¹⁾ |
| TVH | Cage made from glass fibre reinforced polyamide | Standard |
| 2Z | Gap seals on both sides | Standard |
| Z | Gap seal on one side | Special design ¹⁾ |

¹⁾ Available by agreement



Unsealed and sealed FAG deep groove ball bearings of Generation C

FAG deep groove ball bearings of Generation C

Design and safety guidelines

Design and safety guidelines

Equivalent dynamic bearing load

For bearings under dynamic loading, the following applies:

| Load ratio | Equivalent dynamic load |
|--------------------------|---------------------------------|
| $\frac{F_a}{F_r} \leq e$ | $P = F_r$ |
| $\frac{F_a}{F_r} > e$ | $P = X \cdot F_r + Y \cdot F_a$ |

P N
Equivalent dynamic bearing load for combined load
F_a N
Axial dynamic bearing load
F_r N
Radial dynamic bearing load
e, X, Y –
Factors: see table Factors e, X, Y

The values according to the table Factors e, X and Y are valid for normal fits:

- Shaft machined to j5 or k5, housing machined to J6.

Factors e, X, Y

| $\frac{f_0 \cdot F_a}{C_{0r}}$ | Factor for radial internal clearance | | | | | | | | |
|--------------------------------|--------------------------------------|------|------|------|------|------|------|------|------|
| | CN | | | C3 | | | C4 | | |
| | e | X | Y | e | X | Y | e | X | Y |
| 0,3 | 0,22 | 0,56 | 2 | 0,32 | 0,46 | 1,7 | 0,4 | 0,44 | 1,4 |
| 0,5 | 0,25 | 0,56 | 1,8 | 0,35 | 0,46 | 1,56 | 0,43 | 0,44 | 1,31 |
| 0,9 | 0,28 | 0,56 | 1,58 | 0,39 | 0,46 | 1,41 | 0,45 | 0,44 | 1,23 |
| 1,6 | 0,32 | 0,56 | 1,4 | 0,43 | 0,46 | 1,27 | 0,48 | 0,44 | 1,16 |
| 3 | 0,36 | 0,56 | 1,2 | 0,48 | 0,46 | 1,14 | 0,52 | 0,44 | 1,08 |
| 6 | 0,43 | 0,56 | 1 | 0,54 | 0,46 | 1 | 0,56 | 0,44 | 1 |

C_{0r} N
Basic static load rating according to dimension tables
f₀ –
Factor, see table f₀ for deep groove ball bearings, right
F_a N
Axial dynamic bearing load

Equivalent static bearing load

For bearings under static loading, the following applies:

| Load ratio | Equivalent static load |
|----------------------------------|---|
| $\frac{F_{0a}}{F_{0r}} \leq 0,8$ | $P_0 = F_{0r}$ |
| $\frac{F_{0a}}{F_{0r}} > 0,8$ | $P_0 = 0,6 \cdot F_{0r} + 0,5 \cdot F_{0a}$ |

P₀ N
Equivalent static bearing load for combined load
F_{0a} N
Axial static bearing load
F_{0r} N
Radial static bearing load

Axial load carrying capacity

Deep groove ball bearings are also suitable for axial loads.

If the bearing is subjected to high loads and high speeds, a reduced life as well as increased friction and bearing temperature must be taken into consideration.

Minimum radial load

In order to ensure slippage-free operation, the bearings must be subjected to a minimum radial load. This applies particularly in the case of high speeds and high accelerations. In continuous operation, ball bearings with cage must therefore be subjected to a minimum radial load of the order of $P/C_r > 0,01$.

Speed

If the limiting speed n_G is reached, we recommend checking with Schaeffler Application Engineering to determine whether the conditions – such as lubrication, internal clearance, machining of bearing seats – are being fulfilled.

Mounting dimensions

The dimension tables indicate the maximum dimension for the radius r_a and the diameters of the abutment shoulders D_a, d_a.

Factor f₀ for deep groove ball bearings

| Bore code | Factor f ₀ | |
|-----------|-----------------------|-----------|
| | Series 60 | Series 62 |
| 00 | 12,4 | 12,1 |
| 01 | 13 | 12,3 |
| 02 | 13,9 | 13,1 |
| 03 | – | 13,1 |
| 04 | 13,9 | 13,1 |
| 05 | – | 13,8 |

FAG deep groove ball bearings of Generation C

Accuracy

Accuracy

The main dimensions of FAG deep groove ball bearings of Generation C correspond to DIN 625-1.

The dimensional and running tolerances of FAG deep groove ball bearings of Generation C correspond to tolerance class P6 in accordance with DIN 620.

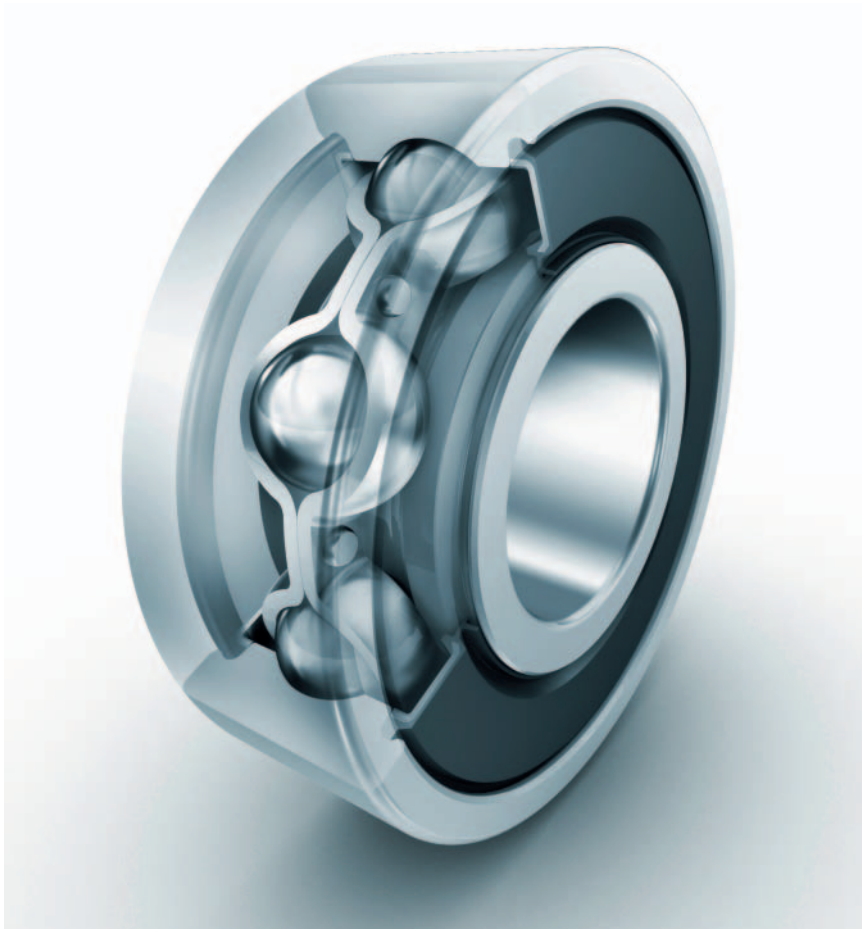
Bearings with higher accuracy are available by agreement.

Radial internal clearance

The radial internal clearance of deep groove ball bearings with cylindrical bore corresponds to

internal clearance group CN in accordance with DIN 620-4.

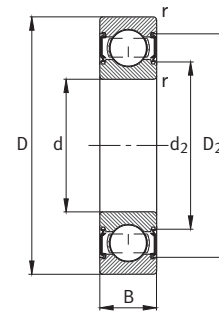
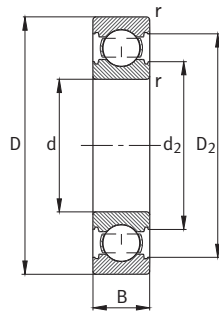
| Bore d mm | | Radial internal clearance | | | | | | | |
|-----------------|-------|---------------------------|------|----------|------|----------|------|----------|------|
| | | C2 µm | | CN µm | | C3 µm | | C4 µm | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. | max. |
| 6 | 10 | 0 | 7 | 2 | 13 | 8 | 23 | 14 | 29 |
| 10 | 18 | 0 | 9 | 3 | 18 | 11 | 25 | 18 | 33 |
| 18 | 24 | 0 | 10 | 5 | 20 | 13 | 28 | 20 | 36 |
| 24 | 30 | 1 | 11 | 5 | 20 | 13 | 28 | 23 | 41 |



FAG deep groove ball bearings of Generation C with lip seals on both sides

FAG deep groove ball bearings of Generation C

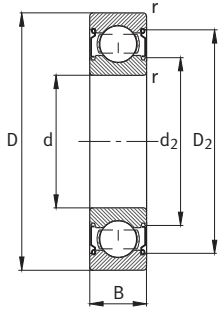
Single row
Unsealed or sealed



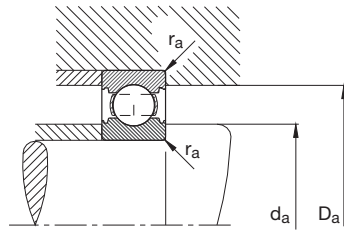
Seal 2HRS

Dimension table · Dimensions in mm

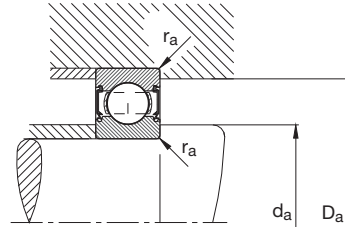
| Designation | Mass | Dimensions | | | | | | |
|-------------|-------|------------|----|----|-----|------|----------------|----------------|
| | | m | d | D | B | r | D ₂ | d ₂ |
| | | ≈kg | | | | min. | ≈ | ≈ |
| 6000-C | 0,019 | 10 | 26 | 8 | 0,3 | 23,4 | 13,4 | |
| 6000-C-2HRS | 0,02 | 10 | 26 | 8 | 0,3 | 23,4 | 13,4 | |
| 6000-C-2Z | 0,02 | 10 | 26 | 8 | 0,3 | 23,4 | 13,4 | |
| 6200-C | 0,031 | 10 | 30 | 9 | 0,6 | 26 | 14,9 | |
| 6200-C-2HRS | 0,034 | 10 | 30 | 9 | 0,6 | 26 | 14,9 | |
| 6200-C-2Z | 0,032 | 10 | 30 | 9 | 0,6 | 26 | 14,9 | |
| 6001-C | 0,02 | 12 | 28 | 8 | 0,3 | 25,4 | 15,4 | |
| 6001-C-2HRS | 0,022 | 12 | 28 | 8 | 0,3 | 25,4 | 15,4 | |
| 6001-C-2Z | 0,02 | 12 | 28 | 8 | 0,3 | 25,4 | 15,4 | |
| 6201-C | 0,037 | 12 | 32 | 10 | 0,6 | 28,2 | 17 | |
| 6201-C-2HRS | 0,039 | 12 | 32 | 10 | 0,6 | 28,2 | 17 | |
| 6201-C-2Z | 0,039 | 12 | 32 | 10 | 0,6 | 28,2 | 17 | |
| 6002-C | 0,031 | 15 | 32 | 9 | 0,3 | 29 | 18,9 | |
| 6002-C-2HRS | 0,033 | 15 | 32 | 9 | 0,3 | 29 | 18,9 | |
| 6002-C-2Z | 0,033 | 15 | 32 | 9 | 0,3 | 29 | 18,9 | |
| 6202-C | 0,043 | 15 | 35 | 11 | 0,6 | 31,2 | 19,8 | |
| 6202-C-2HRS | 0,045 | 15 | 35 | 11 | 0,6 | 31,2 | 19,8 | |
| 6202-C-2Z | 0,045 | 15 | 35 | 11 | 0,6 | 31,2 | 19,8 | |
| 6203-C | 0,065 | 17 | 40 | 12 | 0,6 | 35,2 | 22,6 | |
| 6203-C-2HRS | 0,067 | 17 | 40 | 12 | 0,6 | 35,2 | 22,6 | |
| 6203-C-2Z | 0,067 | 17 | 40 | 12 | 0,6 | 35,2 | 22,6 | |
| 6004-C | 0,069 | 20 | 42 | 12 | 0,6 | 37,7 | 25,1 | |
| 6004-C-2HRS | 0,071 | 20 | 42 | 12 | 0,6 | 37,7 | 25,1 | |
| 6004-C-2Z | 0,071 | 20 | 42 | 12 | 0,6 | 37,7 | 25,1 | |
| 6204-C | 0,106 | 20 | 47 | 14 | 1 | 41,4 | 26,5 | |
| 6204-C-2HRS | 0,11 | 20 | 47 | 14 | 1 | 41,4 | 26,5 | |
| 6204-C-2Z | 0,11 | 20 | 47 | 14 | 1 | 41,4 | 26,5 | |
| 6205-C | 0,129 | 25 | 52 | 15 | 1 | 46,4 | 31,3 | |
| 6205-C-2HRS | 0,133 | 25 | 52 | 15 | 1 | 46,4 | 31,3 | |
| 6205-C-2Z | 0,133 | 25 | 52 | 15 | 1 | 46,4 | 31,3 | |



Seal 2Z



Mounting dimensions
Unsealed design



Mounting dimensions
Sealed design

Mounting dimensions

Basic load ratings

Fatigue limit load

Limiting speed

Reference speed

| d_a | D_a | r_a | dyn. C_r N | stat. C_{0r} N | C_{ur} N | n_G min^{-1} | n_B min^{-1} |
|-------|-------|-------|--------------------|------------------------|---------------|----------------------------|----------------------------|
| min. | max. | max. | | | | | |
| 12 | 24 | 0,3 | 4 550 | 1 960 | 93 | 34 000 | 28 500 |
| 12 | 24 | 0,3 | 4 550 | 1 960 | 93 | 19 000 | – |
| 12 | 24 | 0,3 | 4 550 | 1 960 | 93 | 28 000 | 28 500 |
| 14,2 | 25,8 | 0,6 | 6 000 | 2 600 | 171 | 32 000 | 23 400 |
| 14,2 | 25,8 | 0,6 | 6 000 | 2 600 | 171 | 17 000 | – |
| 14,2 | 25,8 | 0,6 | 6 000 | 2 600 | 171 | 26 000 | 23 400 |
| 14 | 26 | 0,3 | 5 100 | 2 360 | 130 | 32 000 | 25 000 |
| 14 | 26 | 0,3 | 5 100 | 2 360 | 130 | 18 000 | – |
| 14 | 26 | 0,3 | 5 100 | 2 360 | 130 | 26 000 | 25 000 |
| 16,2 | 27,8 | 0,6 | 6 950 | 3 100 | 198 | 30 000 | 22 200 |
| 16,2 | 27,8 | 0,6 | 6 950 | 3 100 | 198 | 16 000 | – |
| 16,2 | 27,8 | 0,6 | 6 950 | 3 100 | 198 | 24 000 | 22 200 |
| 17 | 30 | 0,3 | 5 600 | 2 850 | 134 | 30 000 | 22 000 |
| 17 | 30 | 0,3 | 5 600 | 2 850 | 134 | 16 000 | – |
| 17 | 30 | 0,3 | 5 600 | 2 850 | 134 | 24 000 | 22 000 |
| 19,2 | 30,8 | 0,6 | 7 800 | 3 750 | 220 | 26 000 | 20 200 |
| 19,2 | 30,8 | 0,6 | 7 800 | 3 750 | 220 | 14 000 | – |
| 19,2 | 30,8 | 0,6 | 7 800 | 3 750 | 220 | 20 000 | 20 200 |
| 21,2 | 35,8 | 0,6 | 9 500 | 4 750 | 275 | 22 000 | 18 100 |
| 21,2 | 35,8 | 0,6 | 9 500 | 4 750 | 275 | 12 000 | – |
| 21,2 | 35,8 | 0,6 | 9 500 | 4 750 | 275 | 18 000 | 18 100 |
| 23,2 | 38,8 | 0,6 | 9 300 | 5 000 | 285 | 20 000 | 18 900 |
| 23,2 | 38,8 | 0,6 | 9 300 | 5 000 | 285 | 12 000 | – |
| 23,2 | 38,8 | 0,6 | 9 300 | 5 000 | 285 | 17 000 | 18 900 |
| 25,6 | 41,4 | 1 | 12 700 | 6 550 | 440 | 18 000 | 16 300 |
| 25,6 | 41,4 | 1 | 12 700 | 6 550 | 440 | 10 000 | – |
| 25,6 | 41,4 | 1 | 12 700 | 6 550 | 440 | 15 000 | 16 300 |
| 30,6 | 46,4 | 1 | 14 000 | 7 800 | 510 | 17 000 | 14 400 |
| 30,6 | 46,4 | 1 | 14 000 | 7 800 | 510 | 9 000 | – |
| 30,6 | 46,4 | 1 | 14 000 | 7 800 | 510 | 14 000 | 14 400 |

Notes

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