
SKF
Svenska Kullager Fabriken

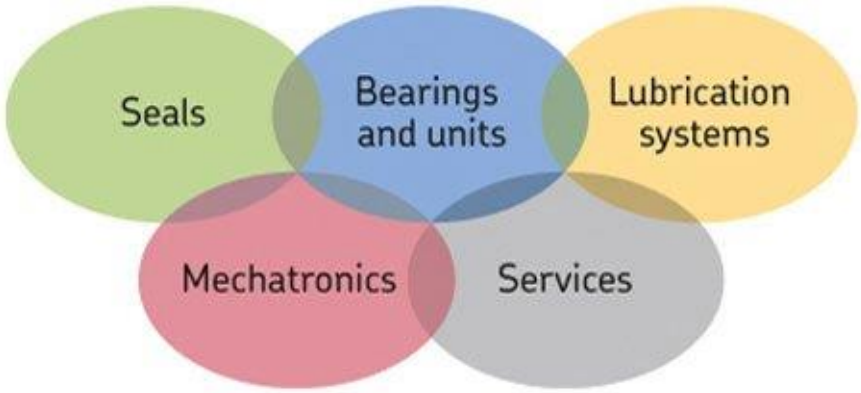
Fast Facts

Established:	1907
Employees:	46,039 More than 40 in SKF Pakistan
Production sites:	around 130 in 32 countries
SKF presence:	in over 130 countries
Distributors/dealers:	15,000 locations 5 distributors in Pakistan
Global certificates:	ISO 14001 OHSAS 18001 certification

Competence

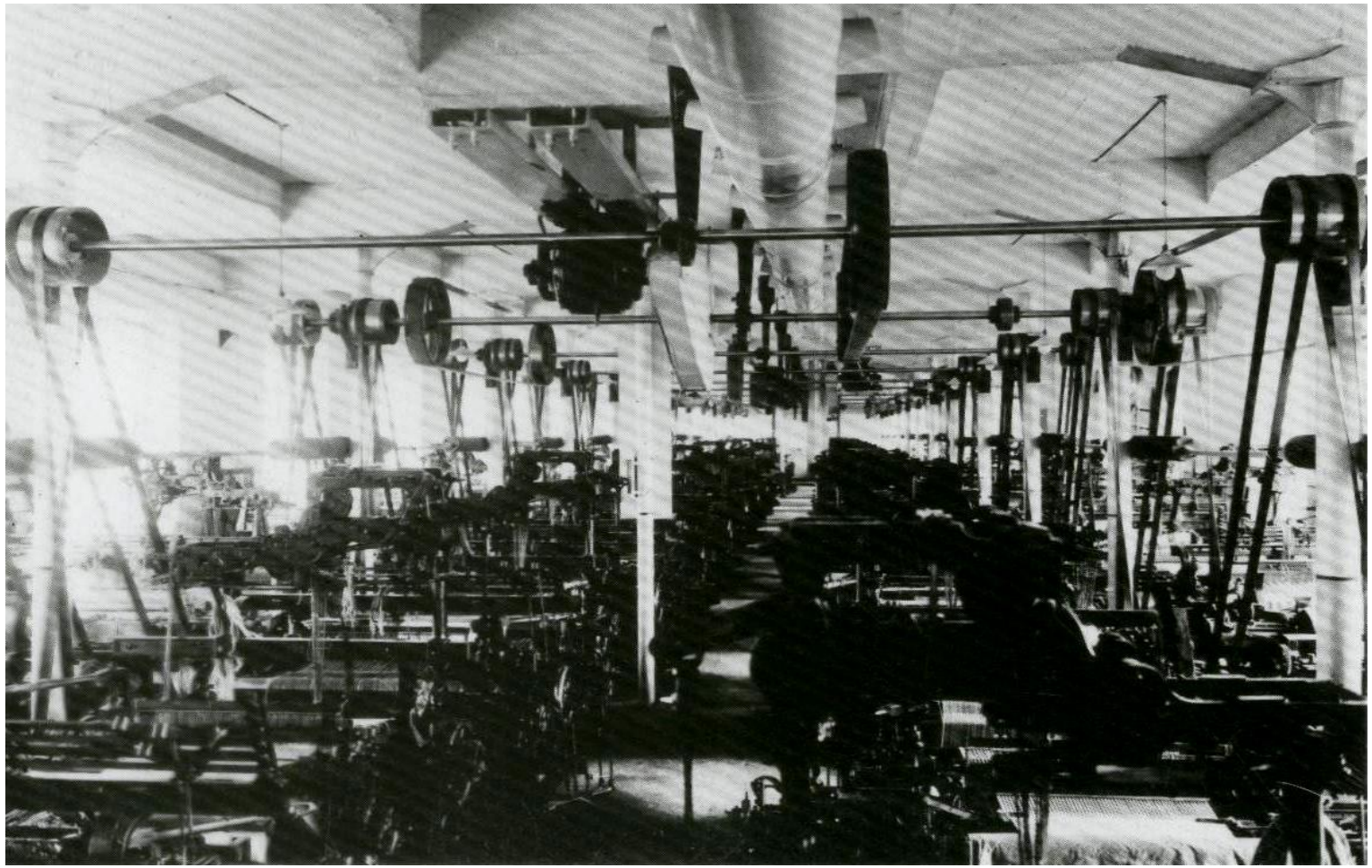
SKF´s five technology platforms are

- Bearings and Units
- Seals
- Mechatronics
- Services and
- Lubrication Systems



By utilizing these capabilities SKF develops tailor-made offers for each industry.

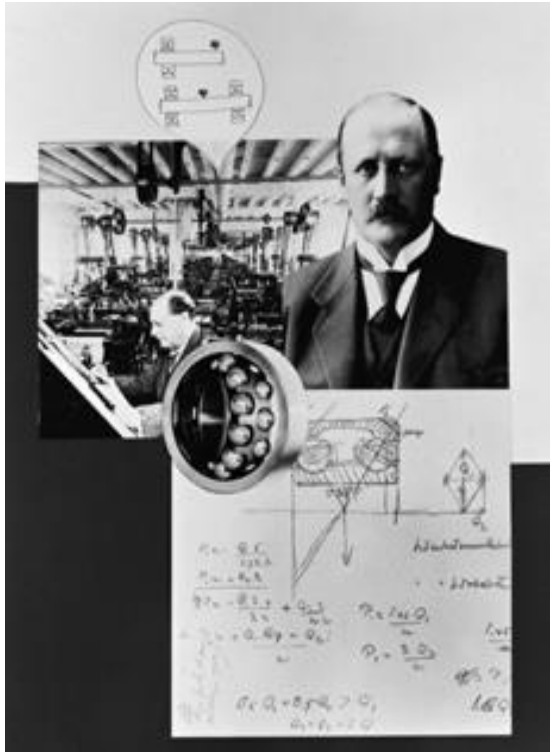
Example of shaft misalignment



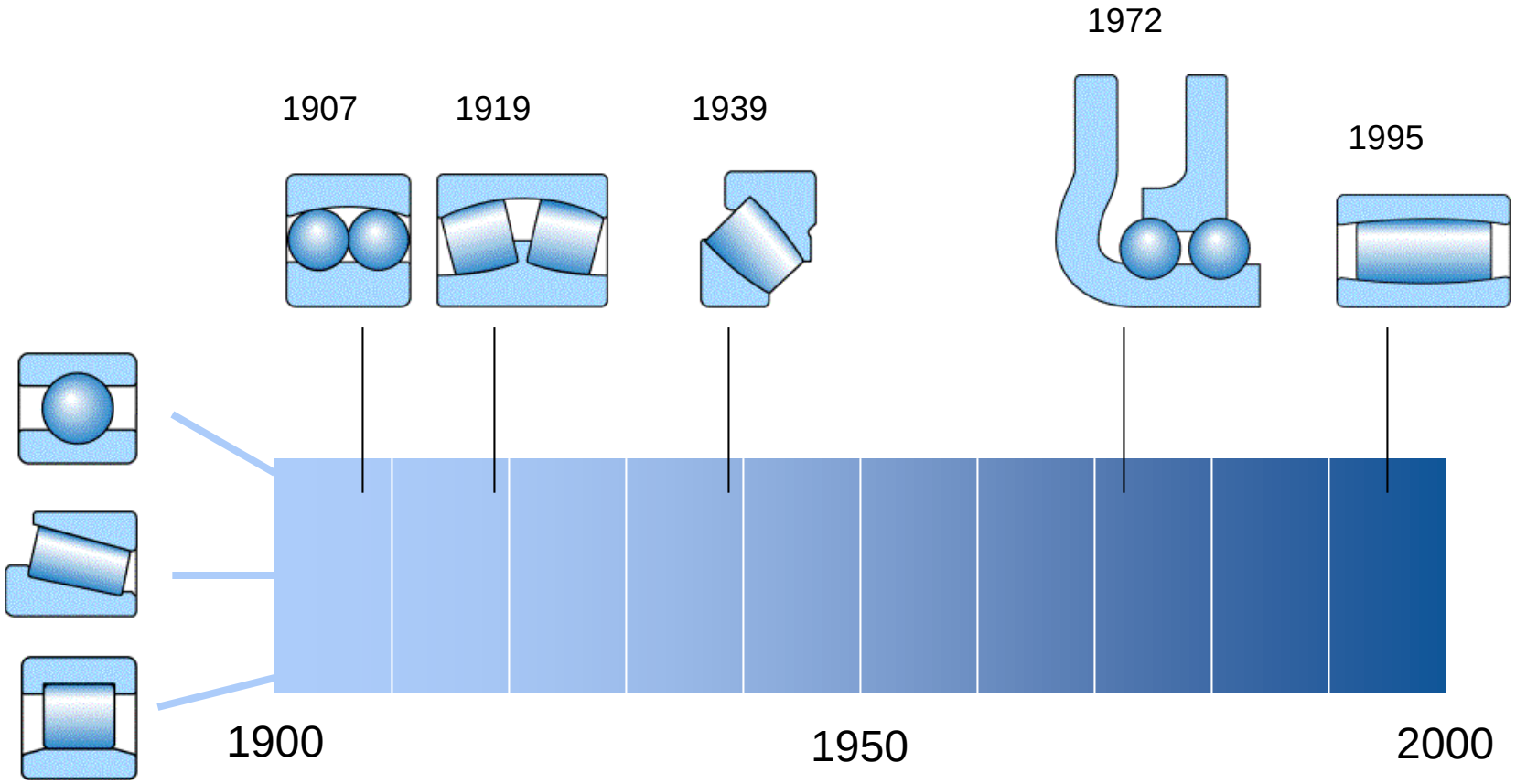
The Foundation Story 1907

A ground-breaking innovation
In 1899, the young swede Sven Wingquist (1876-1953) started work as an engineer and maintenance supervisor at a textile mill in Gothenburg. Constant machinery problems caused by fragile bearings led Wingquist to become almost obsessed with the challenging task of contracting sustainable bearing.

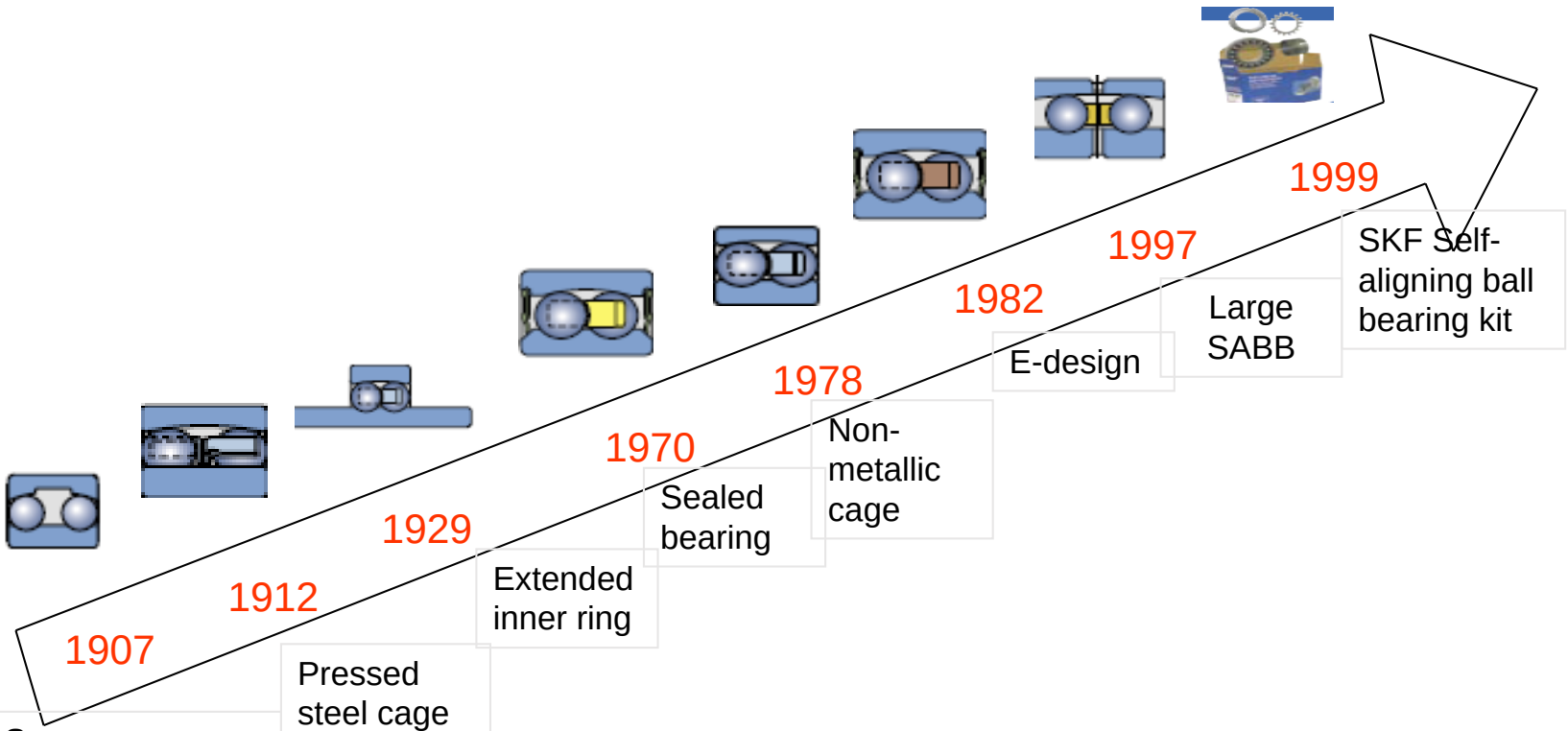
In 1907, Wingquist constructed the first self-aligning ball bearing, and SKF was founded on 16th February, 1907, with the inventor as president.



Bearing Innovations



Self-Aligning Ball Bearing

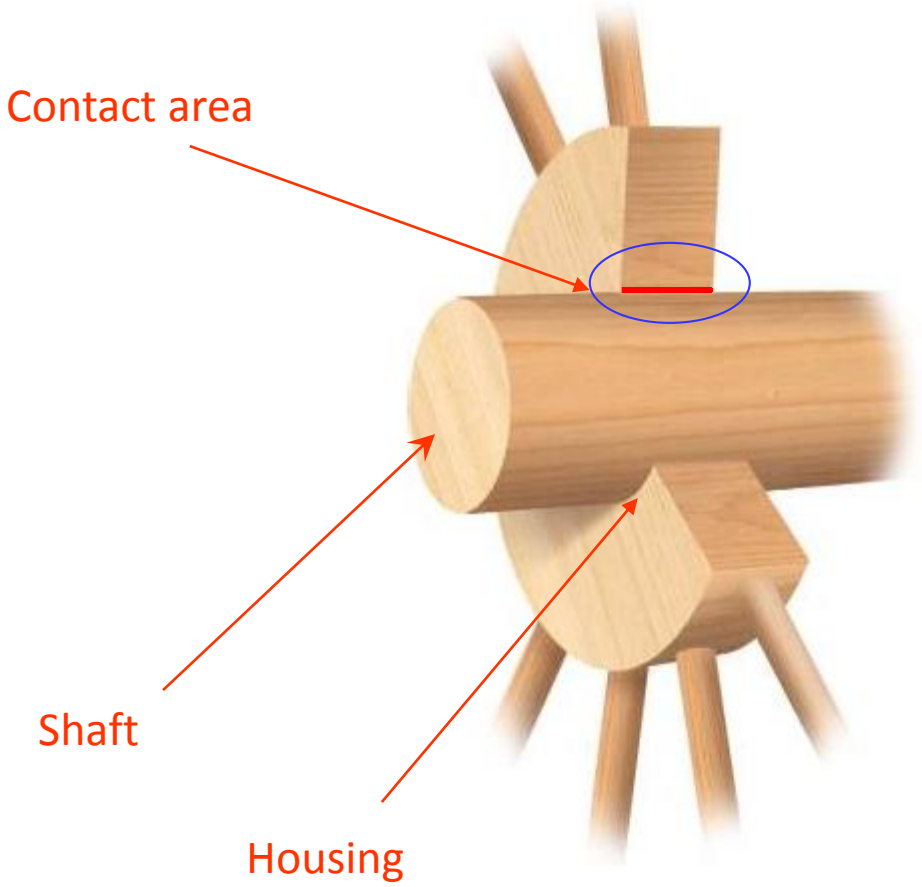


2 Bearing Basics – Why bearings?

- What is a Bearing?
- Bearing types
- Bearing parts & material

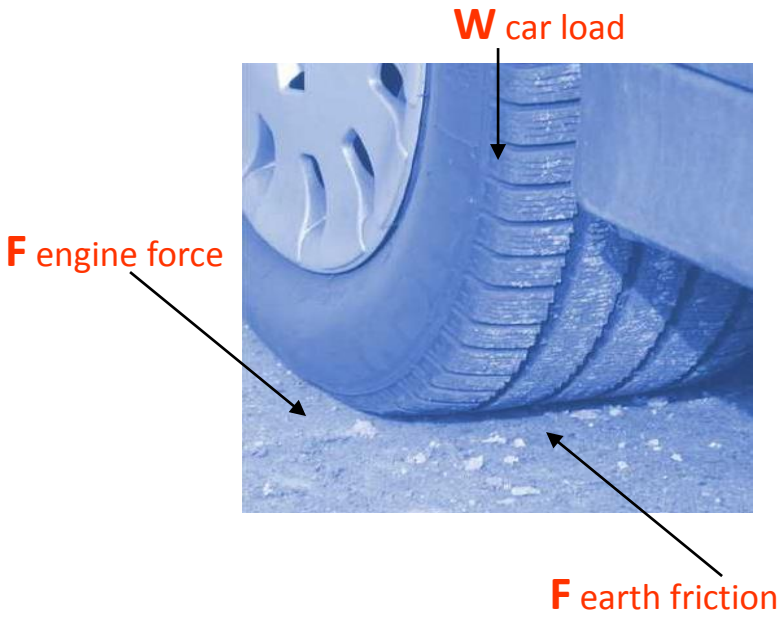
What is Bearing ?

The simple bearing consists of a rotating shaft and hole or housing, both having contact with each other



Friction

(A resistive force that prevents slippage between two bodies)

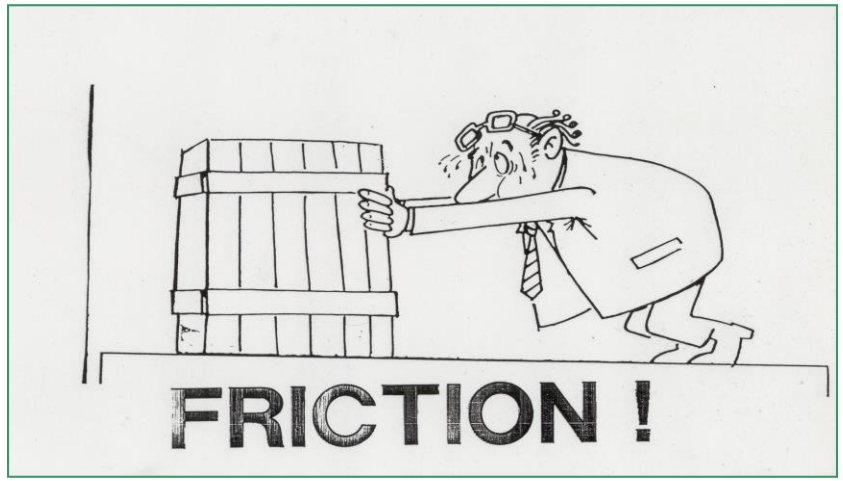


In most machines, however, friction is undesirable since it causes power loss, heat generation, wear and noise.

SKF bearings help reduce friction.

Friction

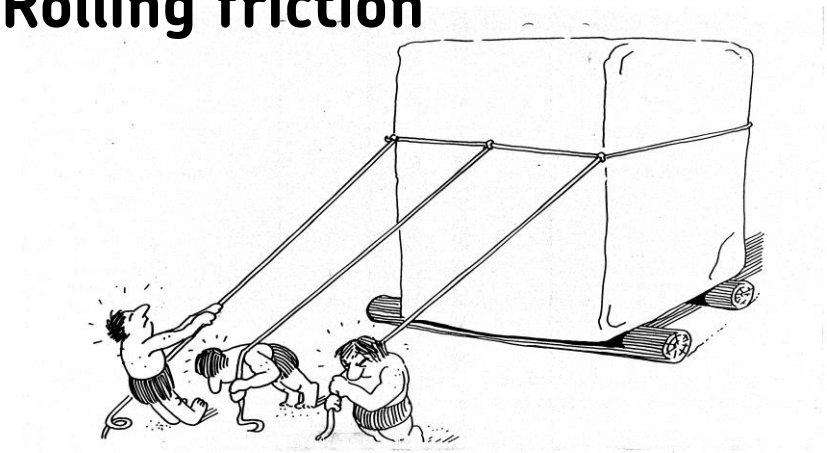
Sliding friction



✓Direct surface to surface contact takes place

✓High friction forces due to larger contact area

Rolling friction

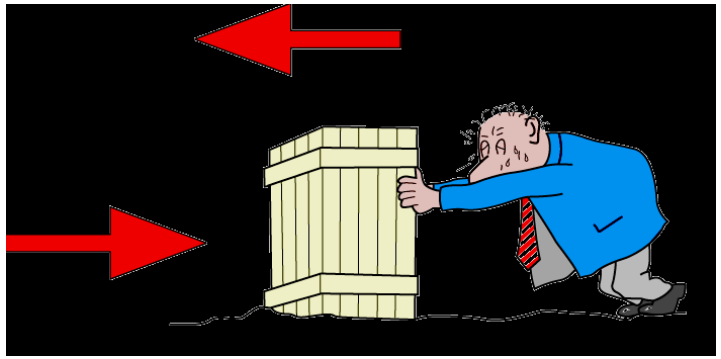


✓Rolling element is introduced between the contacting surfaces

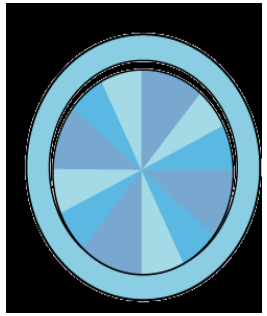
✓lower friction forces due to lesser contact area

Bearing classification w.r.t. nature of contact

Sliding friction

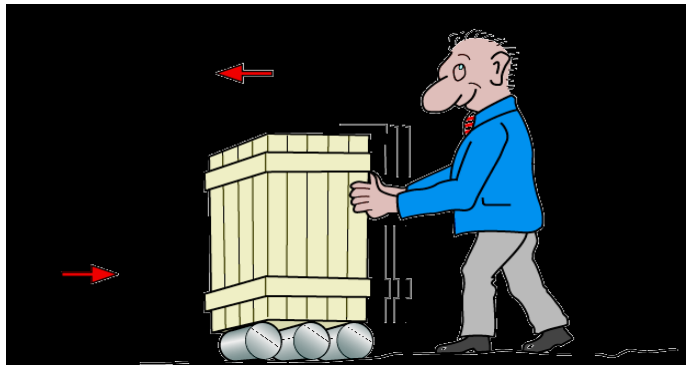


- sliding contact bearing or plain bearing

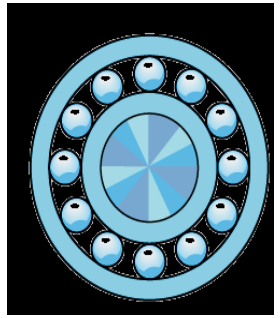


μ

Rolling friction



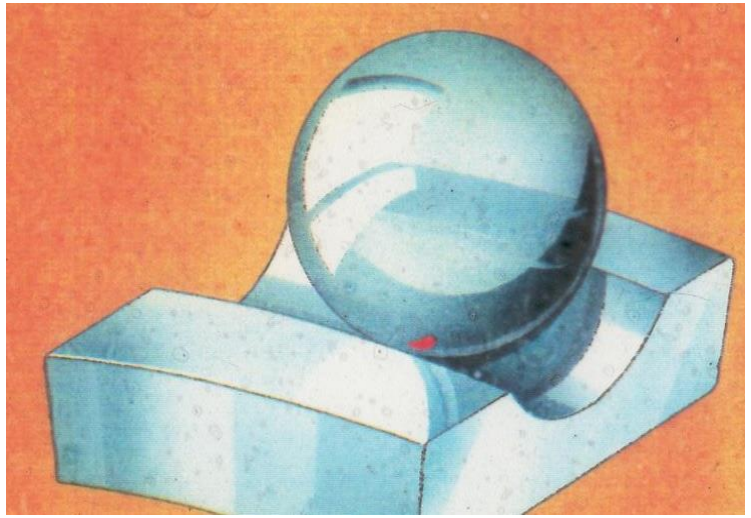
- Rolling contact bearing



μ

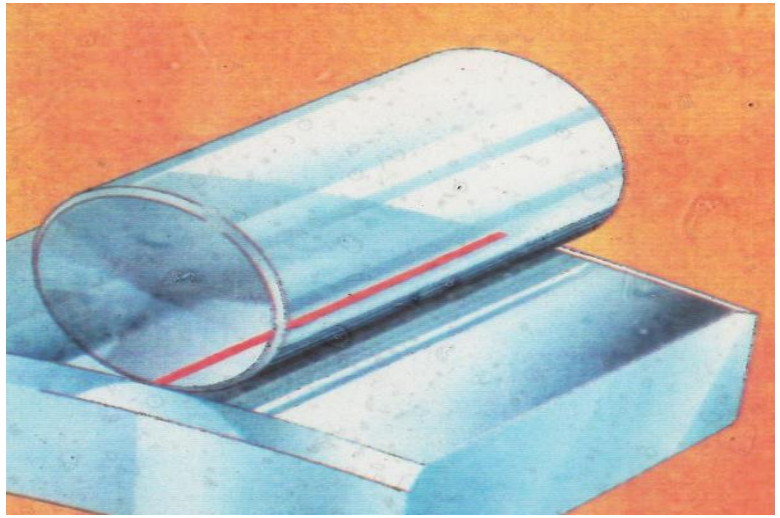
ROLLING CONTACT BEARINGS

Point Contact



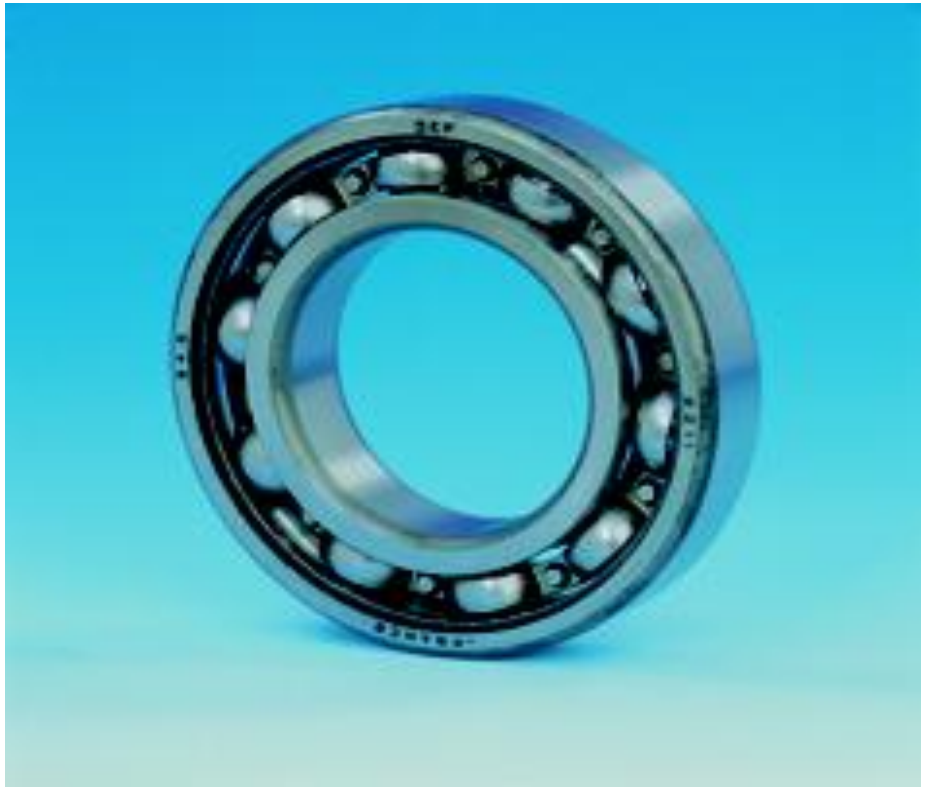
- ✓Balls have point contact
- ✓For light or moderate loads
- ✓For higher speed applications

Line Contact

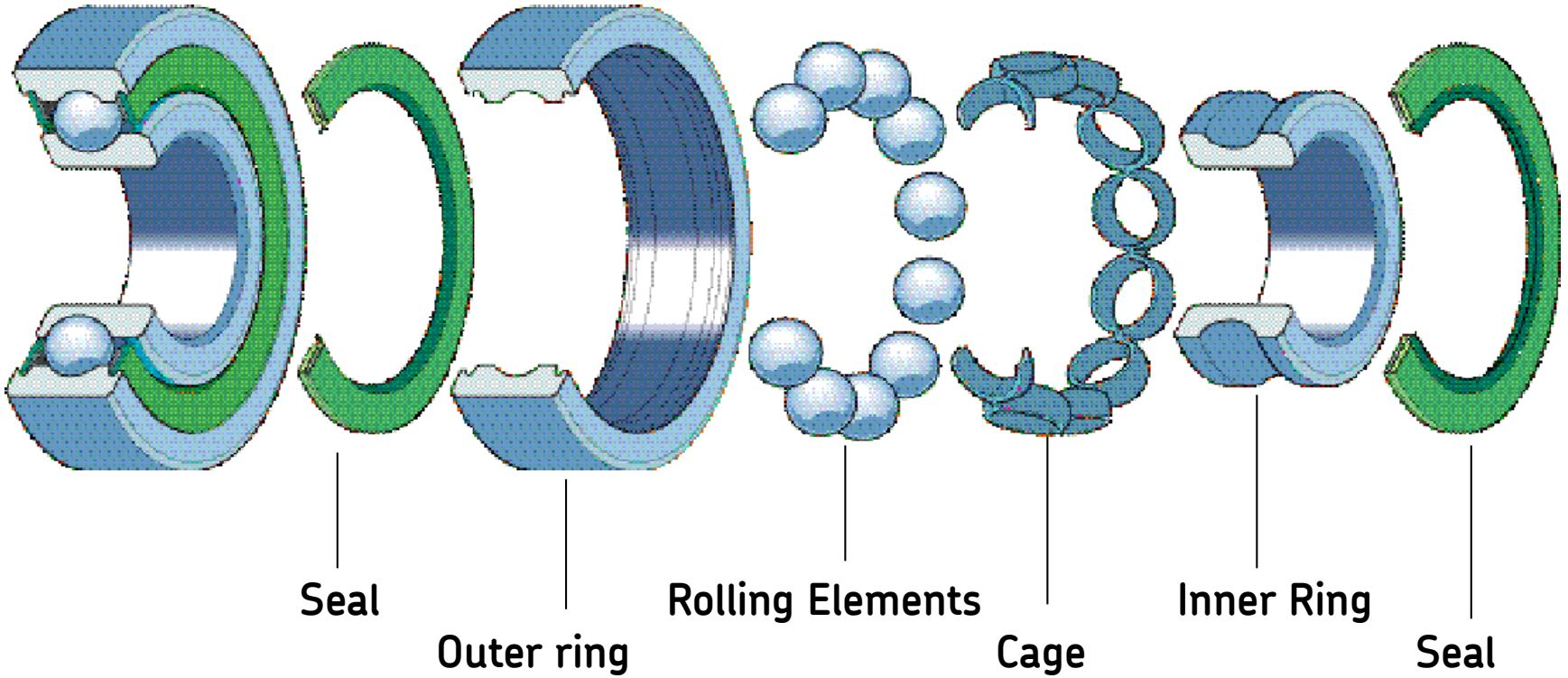


- ✓Rollers have line contact
- ✓For heavy loads
- ✓For lower speed applications

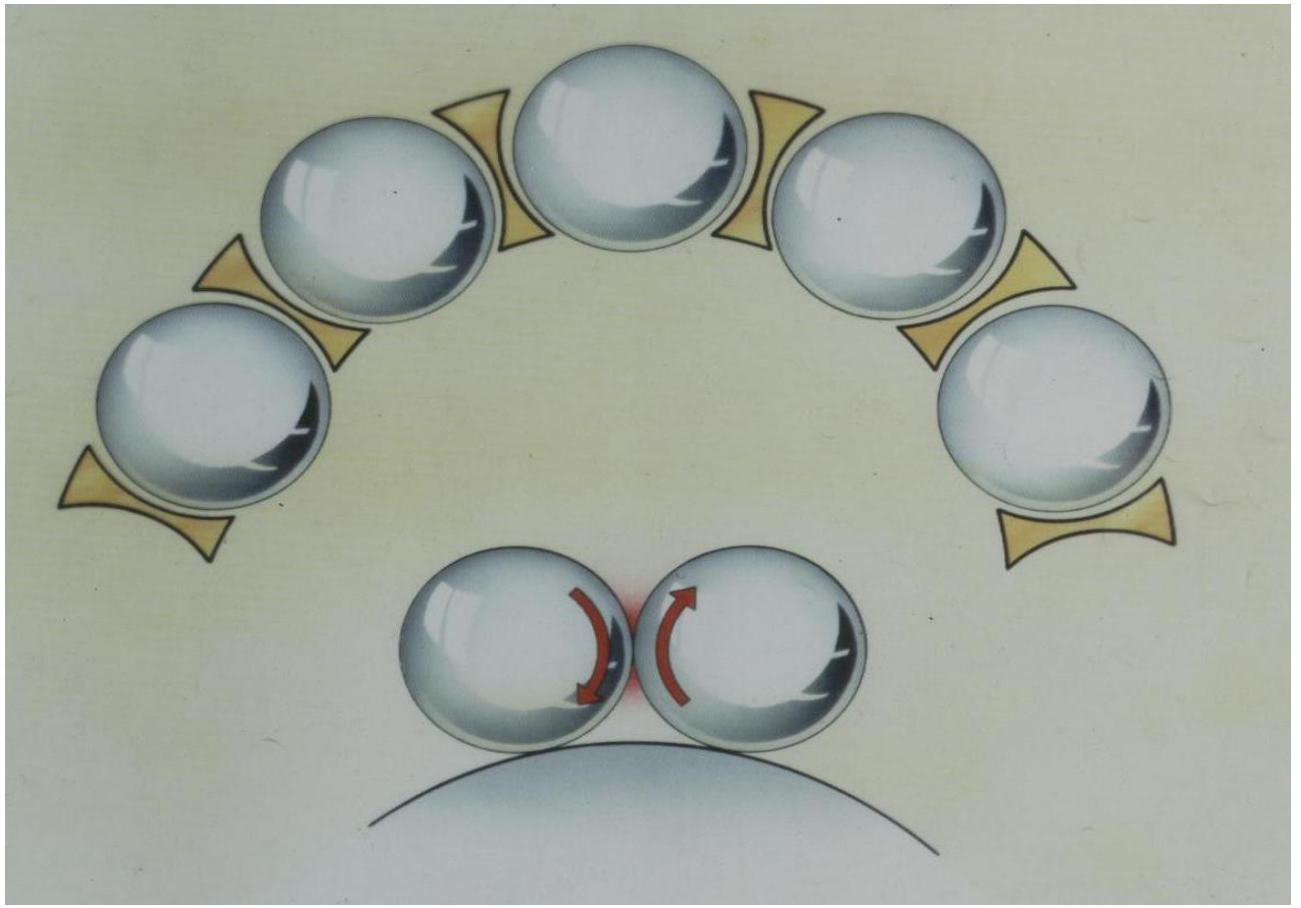
Bearing Components



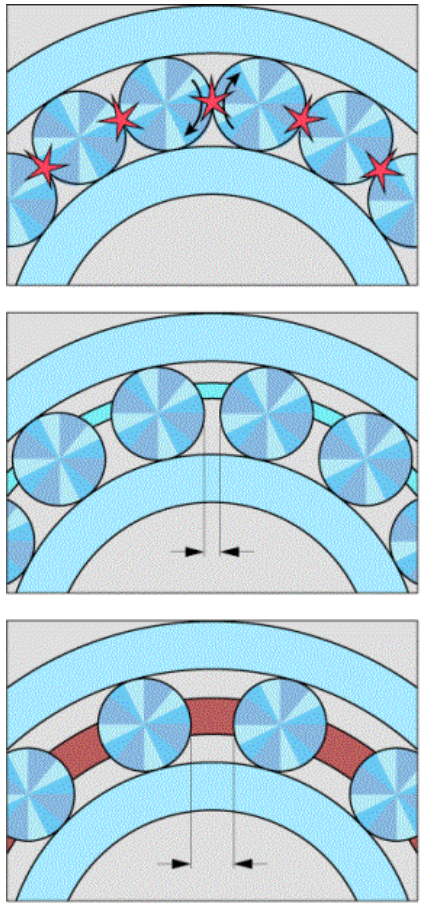
Bearing Components (Deep Groove Ball Bearing)



Cage



Cage Function



- Prevent immediate contact between rolling elements to minimize friction and heat generation
- Guide the rolling elements
- Provide space for lubricant
- Retain the rolling elements when bearings of separable design are mounted or dismounted

Cage Variants

Polyamide cage

Window-type sheet steel cage

Window-type solid brass cage

Polyamide Cages

+	Lightweight
+	High elasticity
+	Good sliding properties
+	Good marginal lubrication properties
−	-40°C< O.Temp < +120 °C

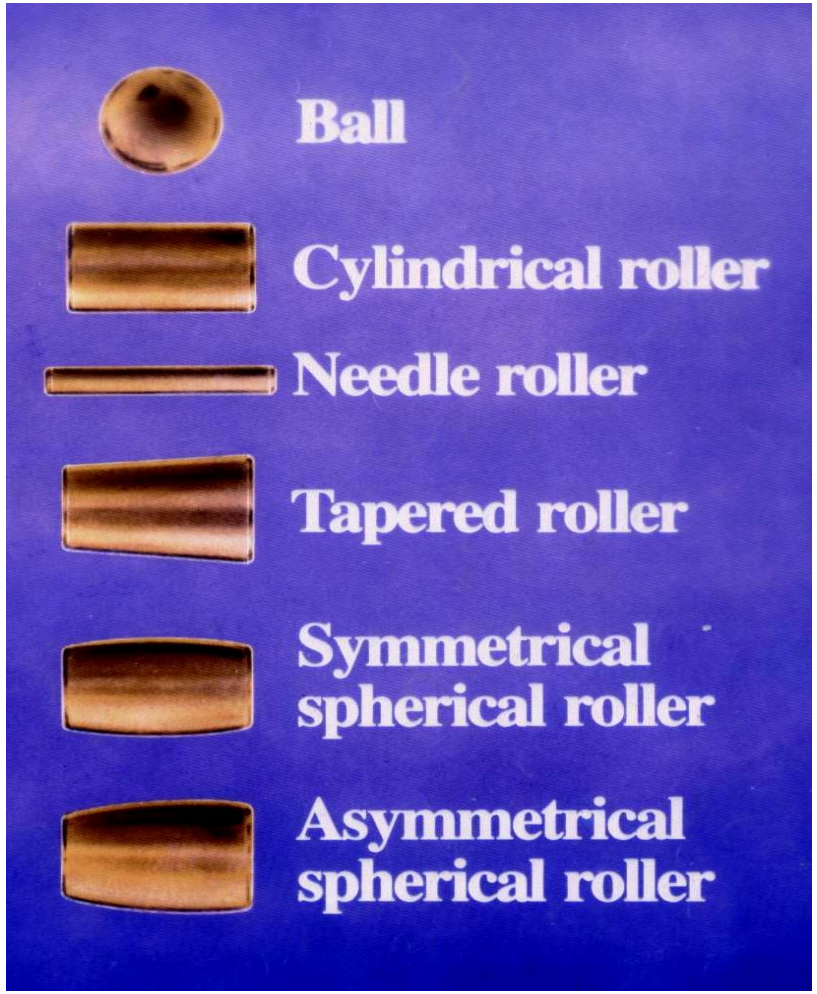
Window Type Sheet Steel Cages

+	Lightweight
+	High strength
+	Operating temperature limit up to 300 °C
+	High vibration and acceleration resistance
–	Sensitive to poor lubrication

Window Type Solid Brass Cages

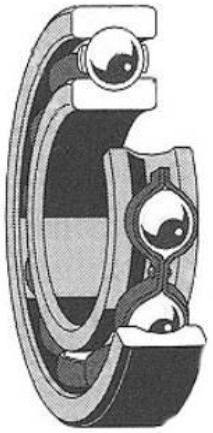
+	Very high vibration and acceleration resistance
+	Suitable for very high speed in connection with circulating oil
–	Soft (Wear & tear)
–	Highly Sensitive to Poor Lubricant

Different types of rolling elements

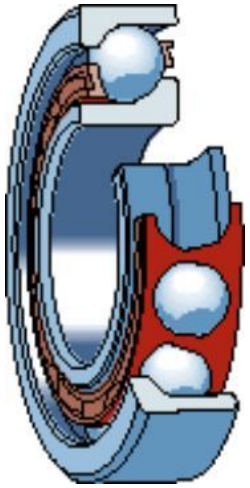


Ball Bearings

Single Row Deep Groove Ball Bearing (DGBB)



Single Row Angular Contact Ball Bearing (SRACBB)

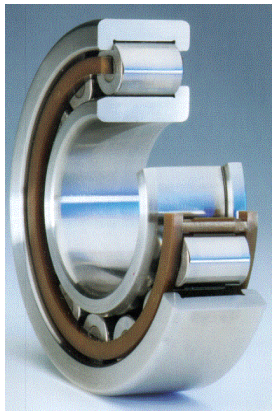


Double Row Deep Groove Ball Bearing (DRDGBB)

Four Point Angular Contact Ball Bearing (FPACBB)

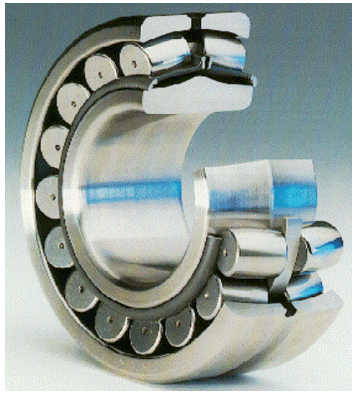
Self Aligning Ball Bearing (SABB)

Roller Bearings

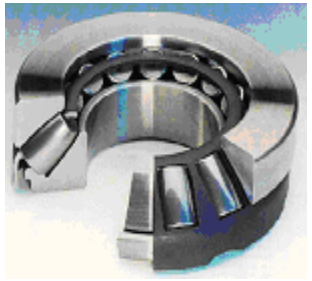


Cylindrical roller bearing

Taper roller bearing



Spherical roller bearing



Spherical roller thrust bearing

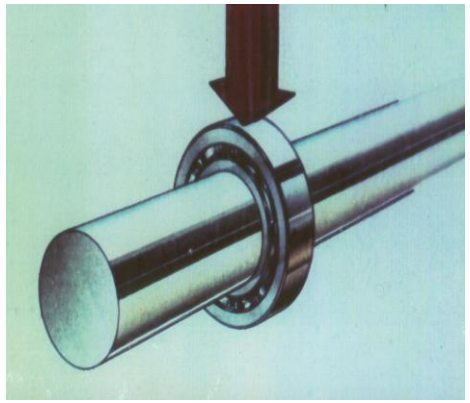
Compact aligning roller bearing (CARB)

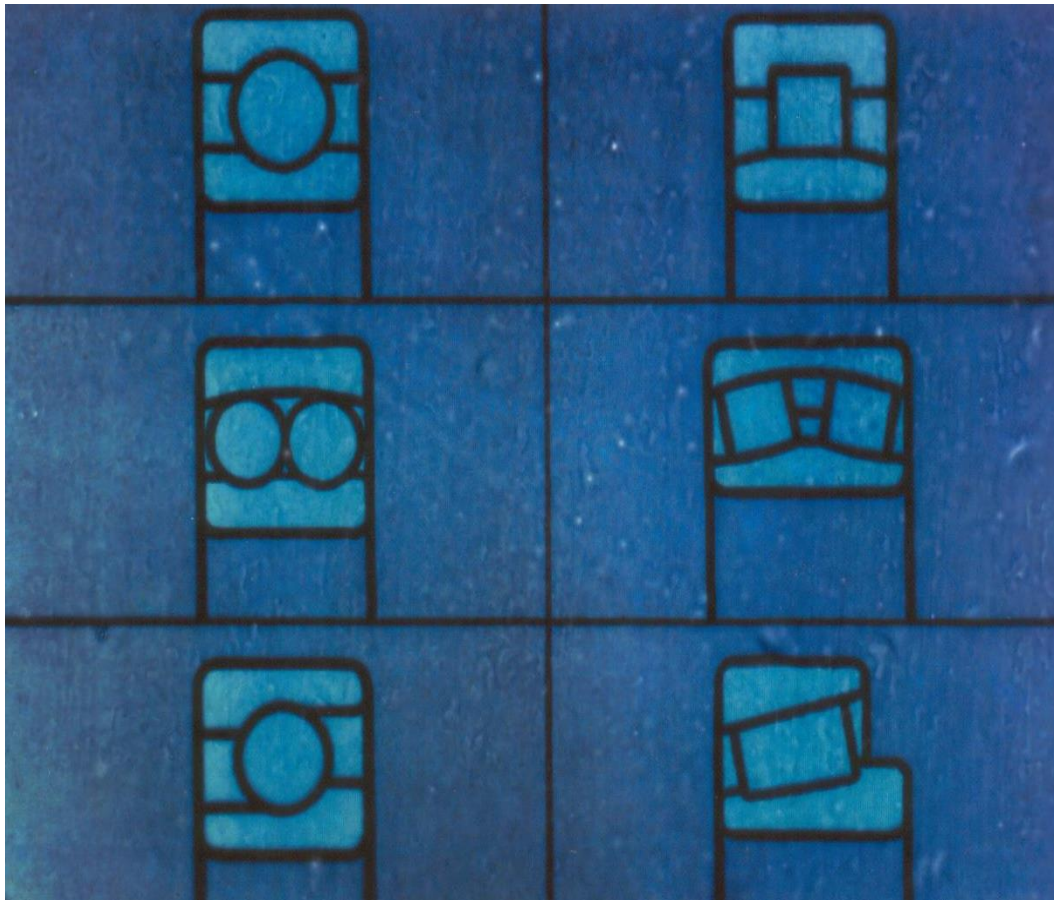
Radial load

✓**Radial load acts perpendicular to the shaft.**

- **Motor's rotor load**
- **Car wheel (straight line)**
- **Fans**

Probable bearing types in case of radial load



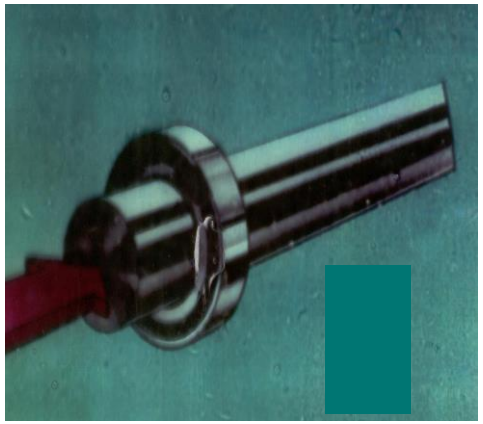


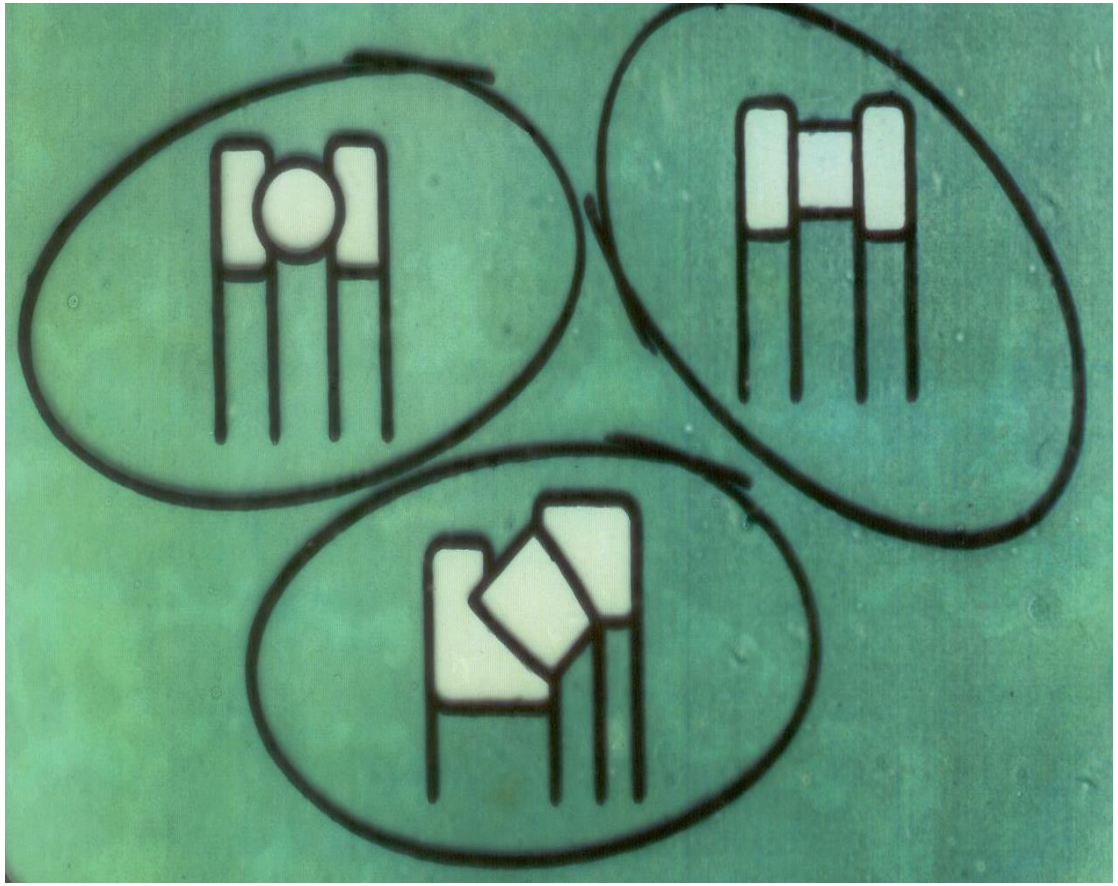
Axial Load

✓Load acts parallel to the shaft.

- Drill press
- Cranes

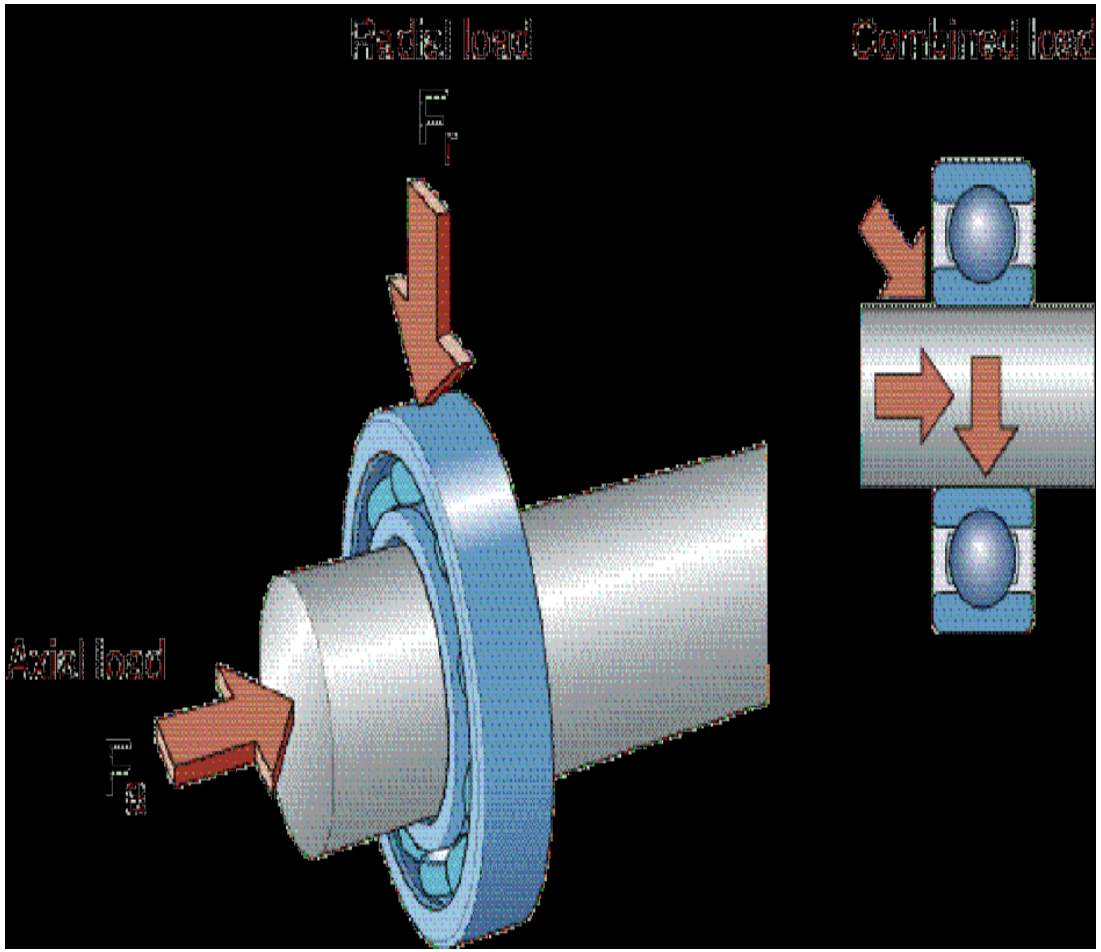
Probable bearing types in case of axial load



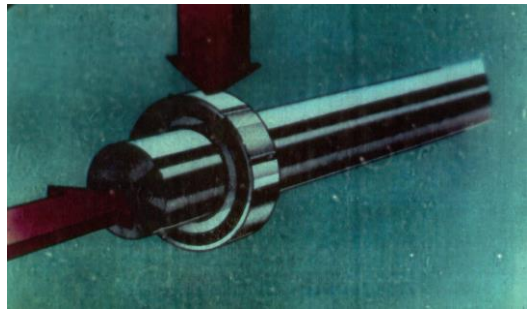


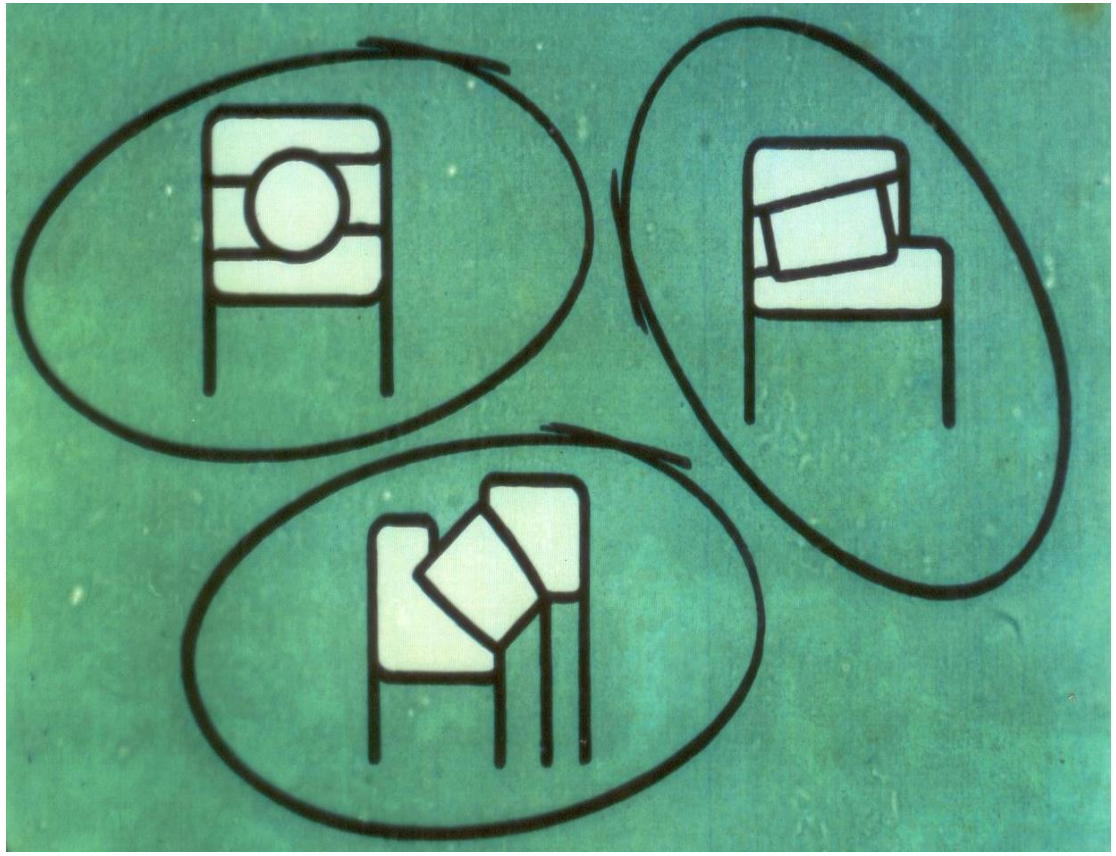
combined load

- Pumps (fluid /media exerting thrust load)
- Car wheel (Turning)

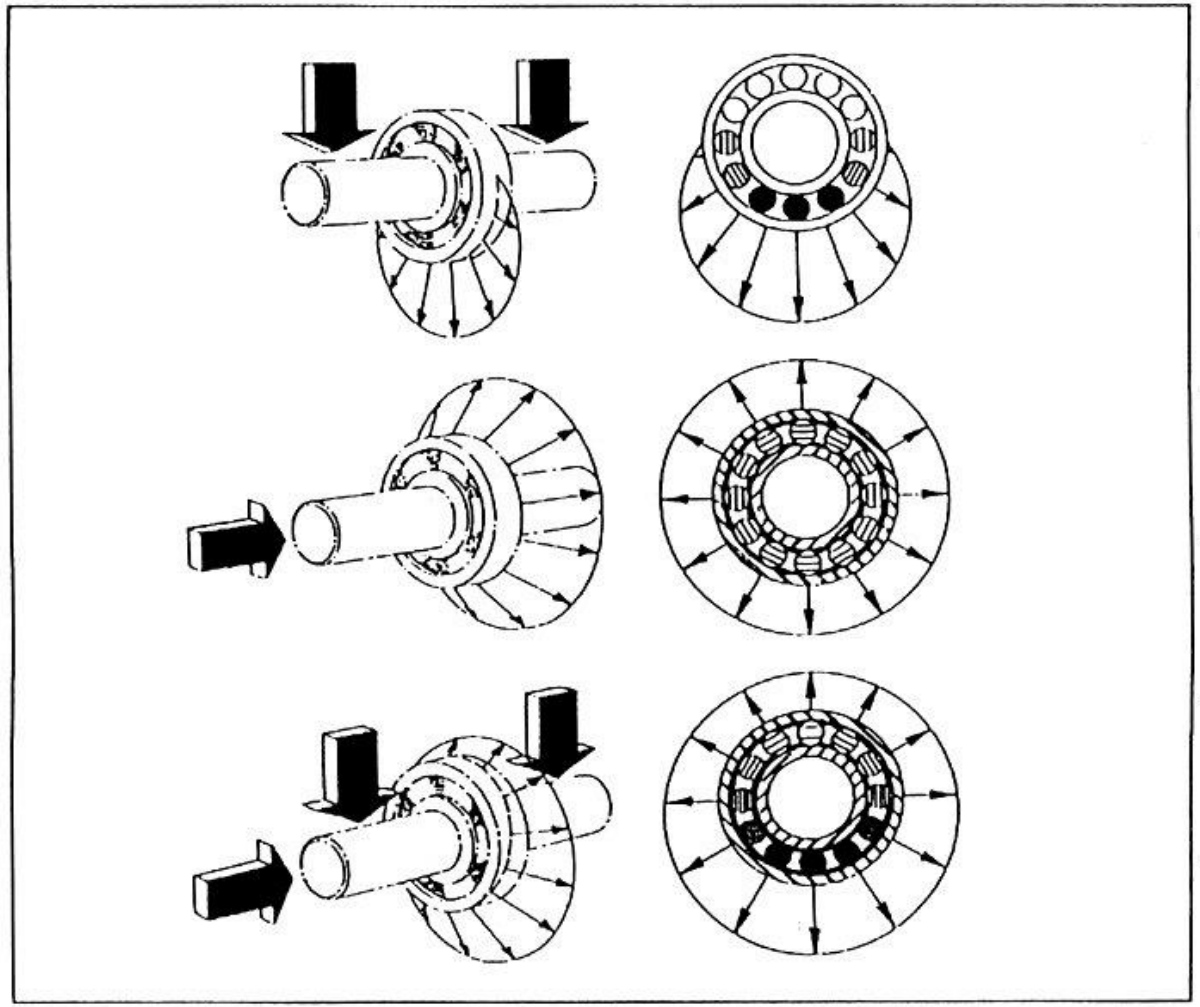


Probable bearings types in case of combined load

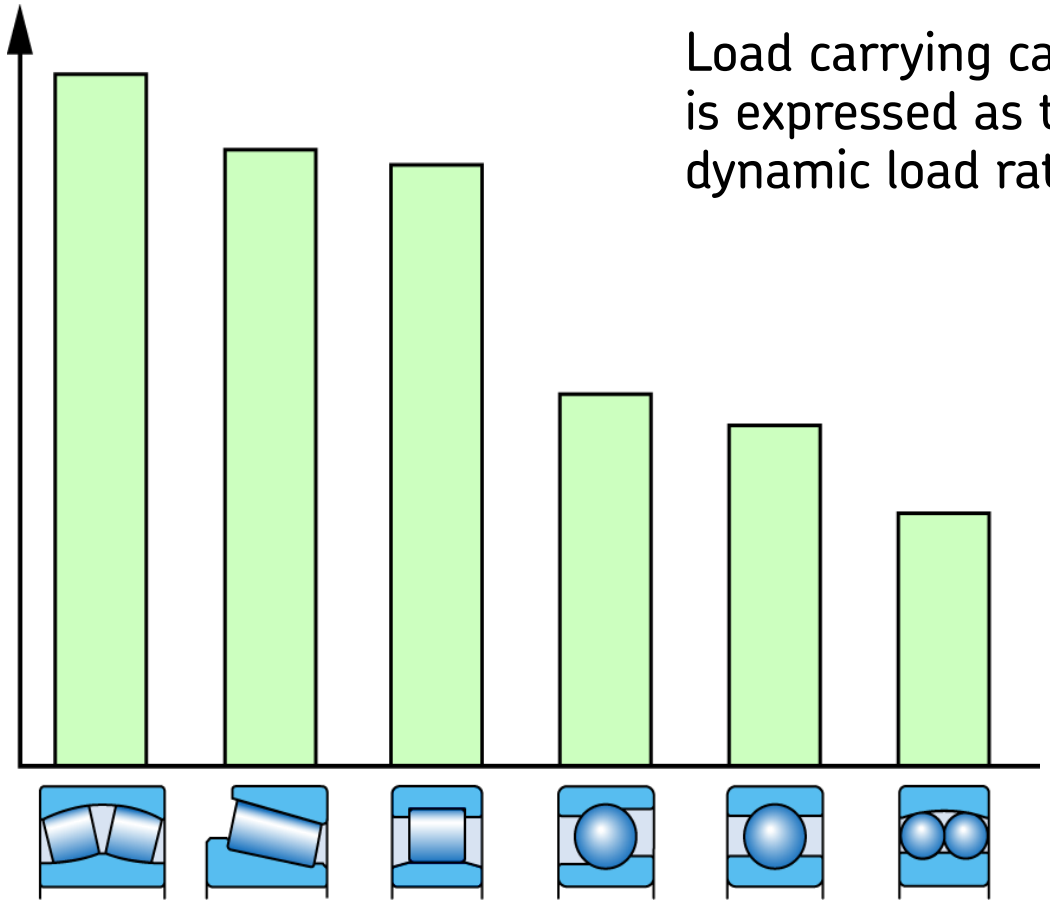




Typical Load Zones

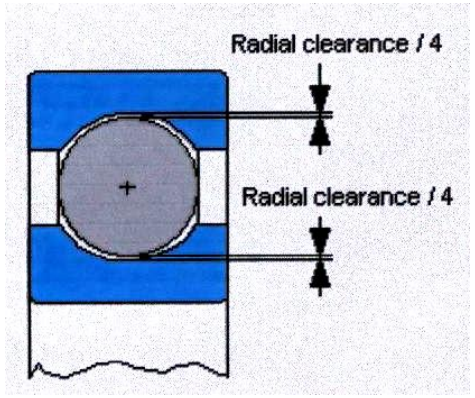


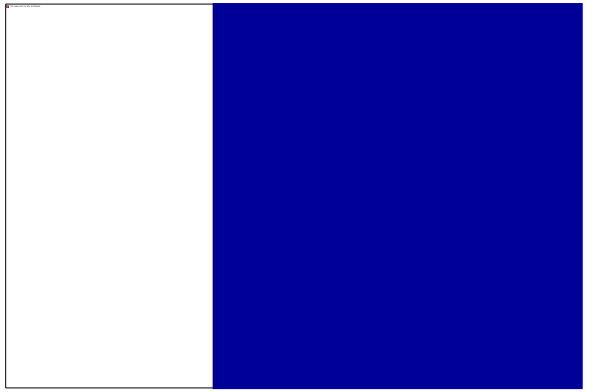
Load Capabilities

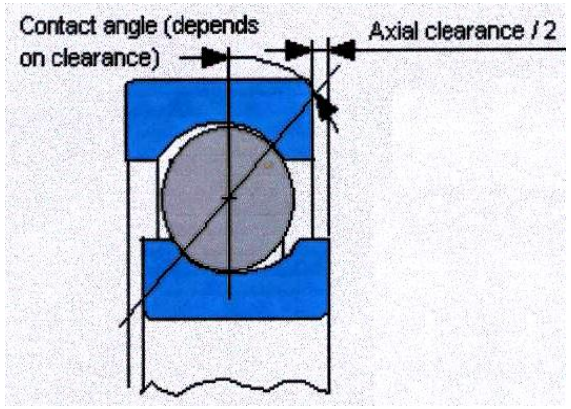


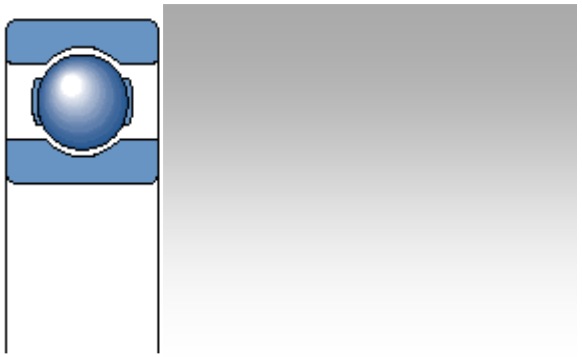
Load carrying capacity
is expressed as the basic
dynamic load rating

Internal Clearances



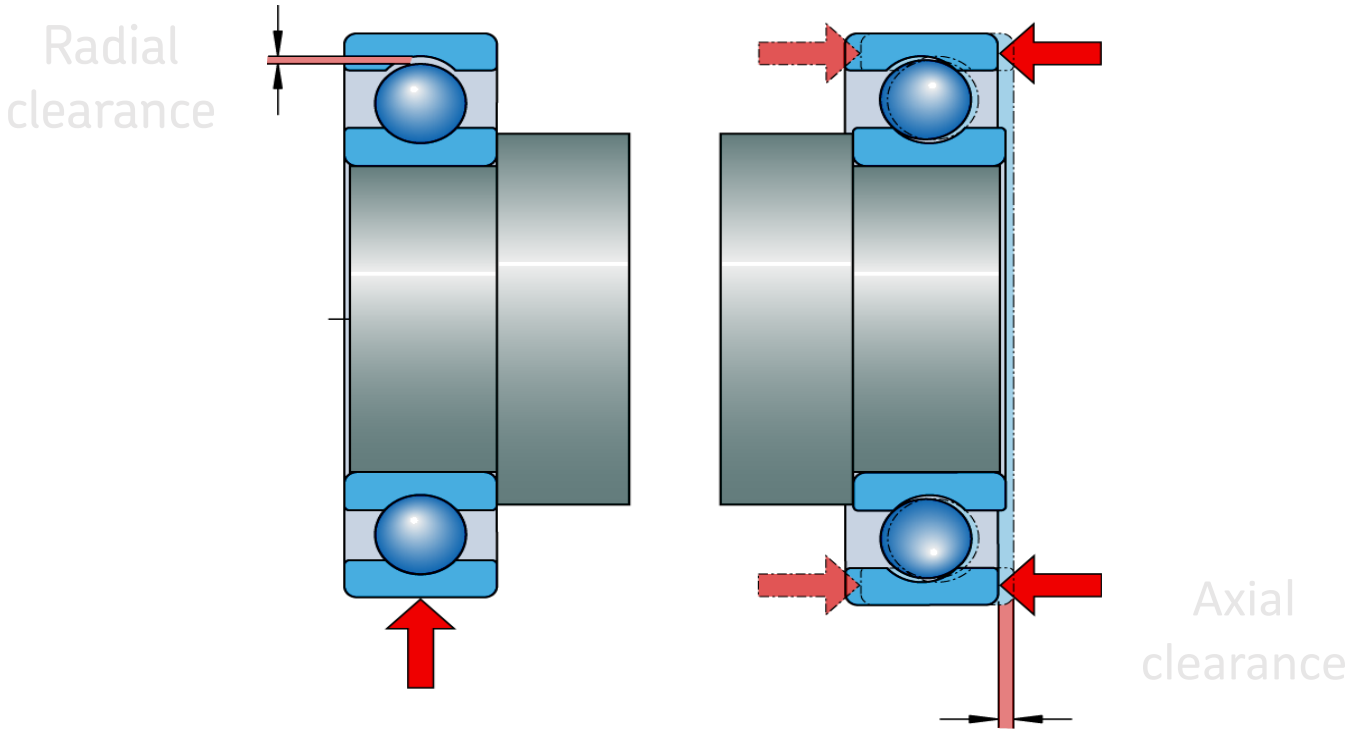






Internal Clearances

The bearing internal clearance is defined as the total distance through which one bearing ring can be moved relative to other under zero measuring load.



Internal Clearances

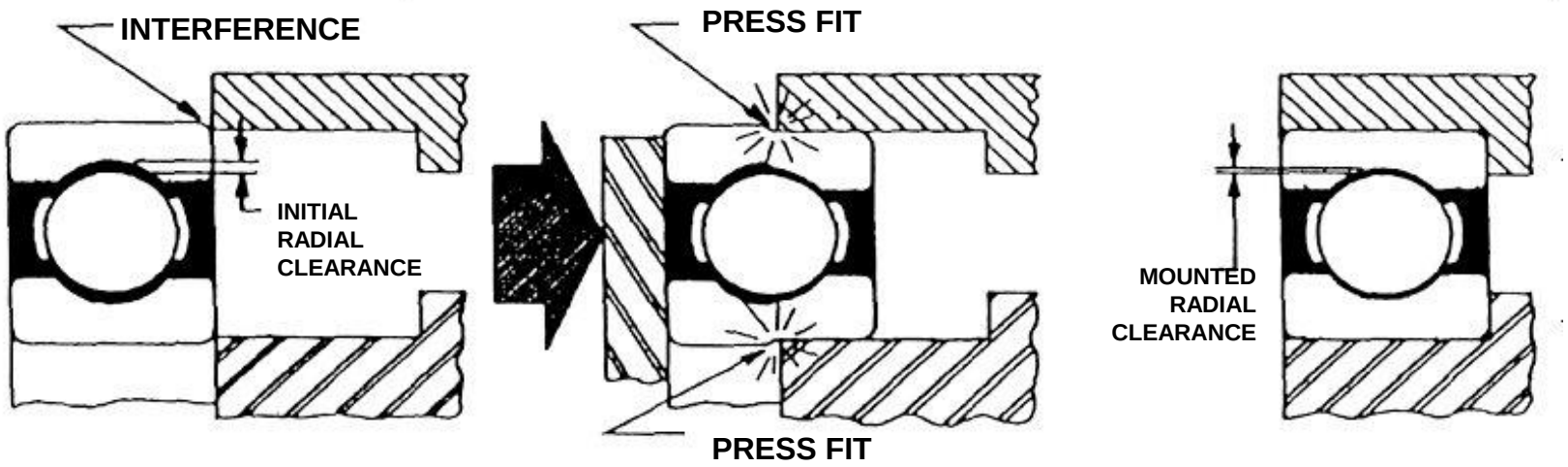
✓Rolling bearings are delivered with different internal clearances. The internal clearance will vary from bearing type to bearing type.

✓WHY INTERNAL CLEARANCE?

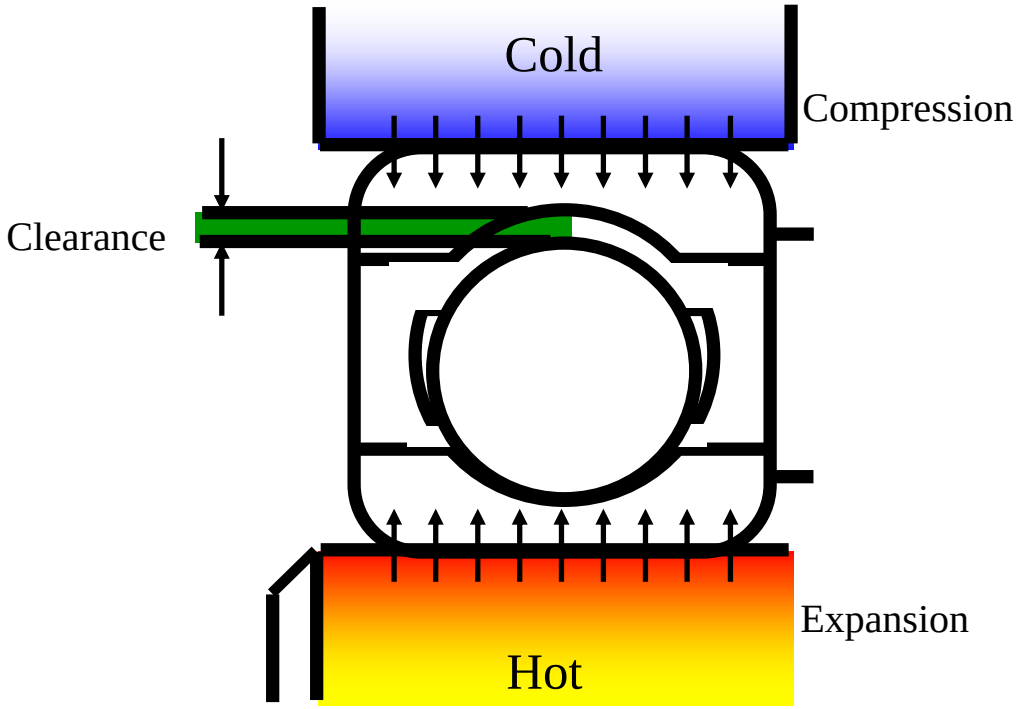
- Strong fits.
- Operating temperatures.
- Higher speeds.

✓In case of doubt a bearing with greater internal clearance shall always be selected!

Clearance Reduced Due To Press Fit



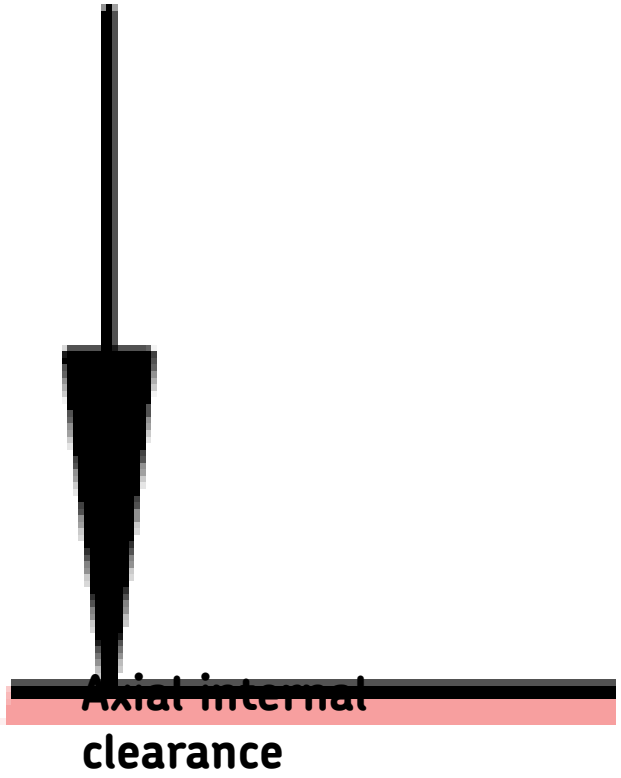
Clearance Reduced Due To Thermal Expansion



Suffix - - - Variant

Clearance

Radial internal clearance



C1 clearance less than C2
C2 clearance less than Normal
C3 clearance greater than Normal
C4 clearance greater than C3
C5 clearance greater than C4

CA small axial internal clearance
CB axial internal clearance greater than CA
CC axial internal clearance greater than CB

CG Zero clearance

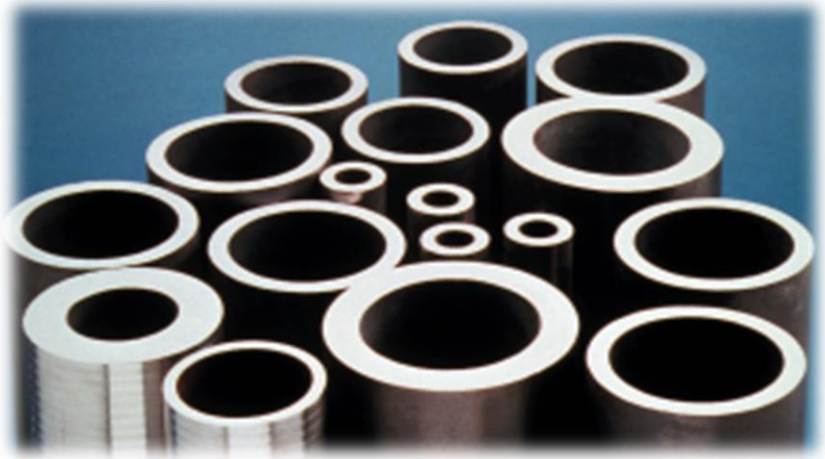
GA Light preload

GB Preload greater than GA

Steel

- Bearing Steel;

1. Through-hardened steel.
2. Case-hardened steel.
3. Corrosion resistant steel.
4. High temperature steel.
5. Non-magnetic steel.



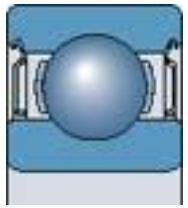
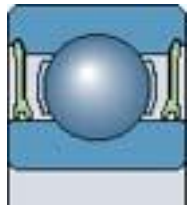
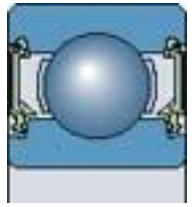
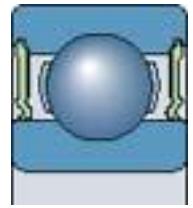
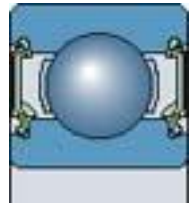
High Quality Bearing Steel

✓ The composition of commonly used high quality steel:

Carbon	= 1.0%
Manganese	= 0.35%
Chromium	= 1.5%
Silicon	= 0.25%

✓ The hardness of good quality rolling elements and rings is generally between 57 to 65 HRC.

Standard sealing solutions for Deep Groove Ball Bearings

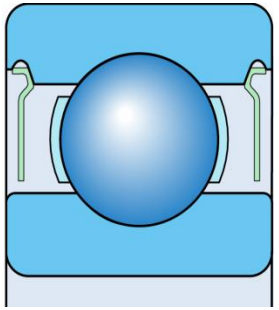
Metallic shields	Low friction seals	Contacting seals
 2Z	 2RZ  2RSL	 2RS1  2RSH

Maintenance free Deep Groove Ball Bearing

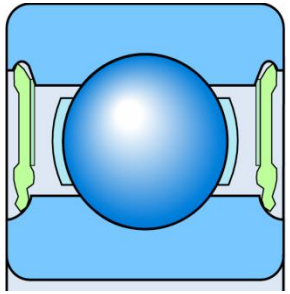
✓Requirement because of high number of use.

✓For those places where it is difficult to reach.

SHIELDS



SEALS



SHIELDS

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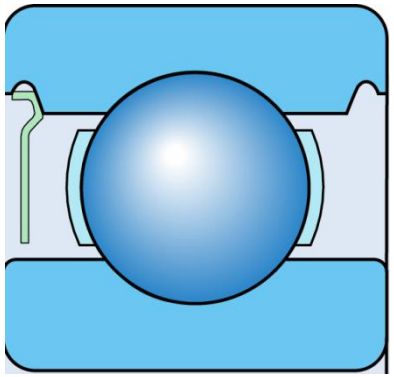
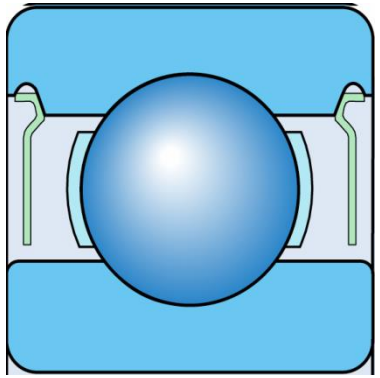
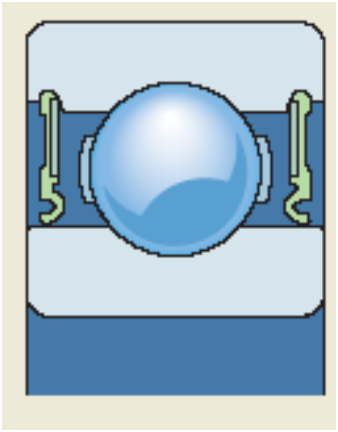


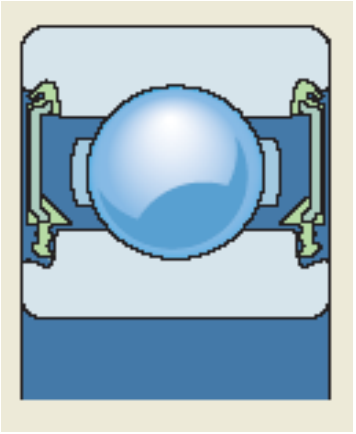
2Z



High Friction Seals



2RSL

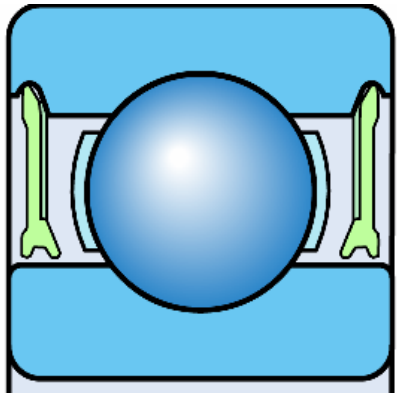


2RSH

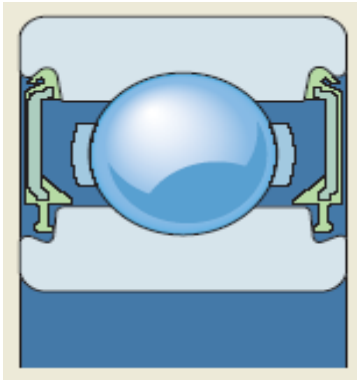
Characteristics	Seal type RSH	RS1
Low friction	0	0
Speed ability	0	0
Grease retention	+++	++
Dust exclusion	+++	+++
Static water exclusion	+++	++
Dynamic water exclusion	+	+
High pressure water exclusion	+++	0

Symbols:
+++ = excellent ++ = very good + = good o = fair

Low-Friction Seals



2RZ



2RSL

Characteristics	Seal type RSH	RS1
Low friction	o	o
Speed ability	o	o
Grease retention	+++	++
Dust exclusion	+++	+++
Static water exclusion	+++	++
Dynamic water exclusion	+	+
High pressure water exclusion	+++	o

Symbols:
+++ = excellent ++ = very good + = good o = fair

Characteristics of Shield & Seals

Requirement	Shields	Low-friction seals		Contact seals	
	Z	RSL	RZ	RSH	RS1
Low friction	+++	++	+++	o	o
High speeds	+++	+++	+++	o	o
Grease retention	o	+++	+	+++	++
Dust exclusion	o	++	+	+++	+++
Water exclusion					
- static	-	o	-	+++	++
- dynamic	-	o	-	+	+
- high pressure	-	o	-	+++	o

Symbols: +++ excellent ++ very good + good o fair - not recommended

NO WEAR bearings

These bearings have been surface treated to withstand arduous operating conditions such as smearing, zero load or boundary lubrication conditions

CAN WITHSTAND SEVERE OPERATING CONDITIONS :

- Longer periods of insufficient lubrications
- Sudden variations in load
- Rapid speed changes
- Vibrations
- Oscillation
- Can run at 350 °C

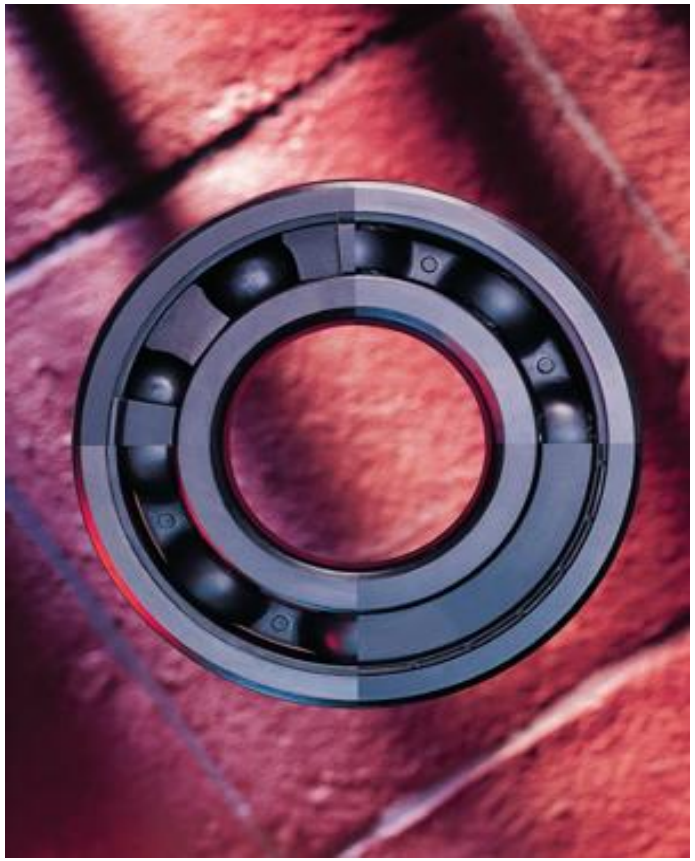
Properties of NO WEAR bearings

Properties	No Wear
Hardness	1200 HV 10
Coating Thickness - Depending on bearing size	1.....3 micro m
Coefficient of friction - Dry sliding against steel	0.1 .....0.2
Operating temperature - No Wear Coating	+350 deg C

High Temperatures

Where requirement is to work at high temperatures like 350°C this bearing is right choice

- Suitable for kiln and furnace trolleys or any equipment working on high temperatures and lowest speeds



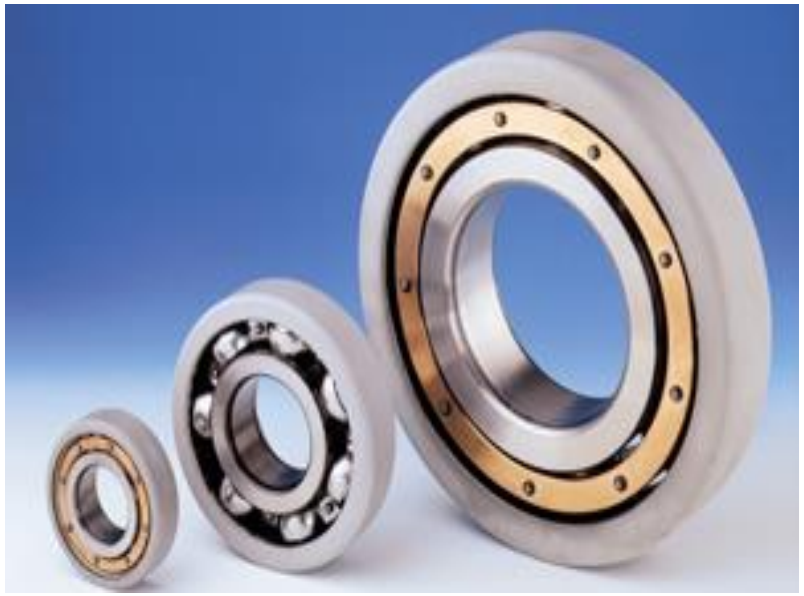
- 6206 2Z VA208 (10mm to 100mm)

INSOCOAT bearings

Insulated bearings for electrical applications

- Where there are good chances of passage of electrical current for instance VFD Drives
- These bearing have aluminum oxide coating on the outer ring surfaces

Available sizes from 55 to 150 mm



SKF Hybrid Bearings

Manufactured with standard steel rings but with ceramic balls

- *Engineering ceramic (Silicon Nitride Si3N4) is three time as strong bearing steel and has very low wear rate*
- *This bearing can run at very high speeds at high temperatures and under severe condition of contaminations.*

-E.g. 6314 2RS1/ HC5

Stainless steel deep groove ball bearing

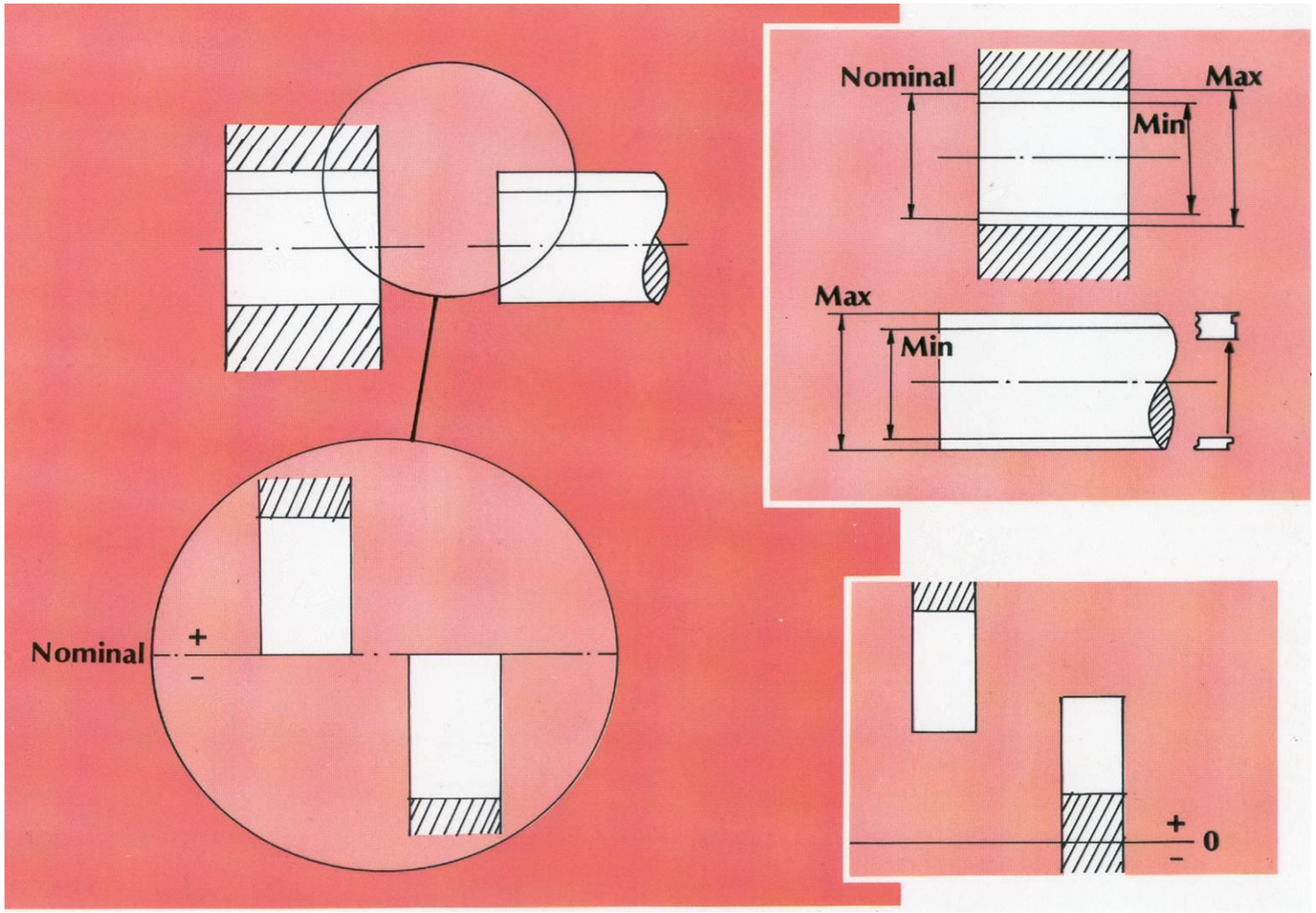
- Reliable bearing solutions for a corrosive environment
- Longer service life in a severe environment
- Open or sealed
- E.g; W 6206 2RSH

Applications

- Food and beverage industry
- Chemical equipment
- Medical equipment
- Optical instrument
- Printing machines
- Nuclear technology
- Engines and pumps
- Paper mills
- Off shore Marine industry

Fits & Tolerance

Shaft & Housing



Shaft and Housing Fits

FOR MAXIMUM UTILIZATION OF LCA:

Bearing rings must be supported around complete circumference and across the whole width.

The support must be firm even and can be provided by a cylindrical or tapered seating.

The seating must be made with adequate accuracy.

The seating surface must be uninterrupted by grooves or holes or other features.

THE RINGS MUST BE RADIALLY SECURED TO PREVENT THEM FROM CREEPING OR TURNING UNDER LOAD.

Tolerance Definition

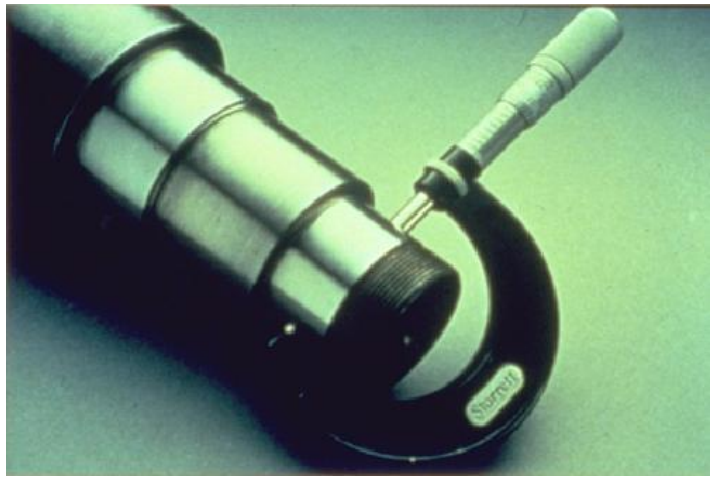
Permissible limits for the variation of the size (dimension)

Importance of Correct Fit

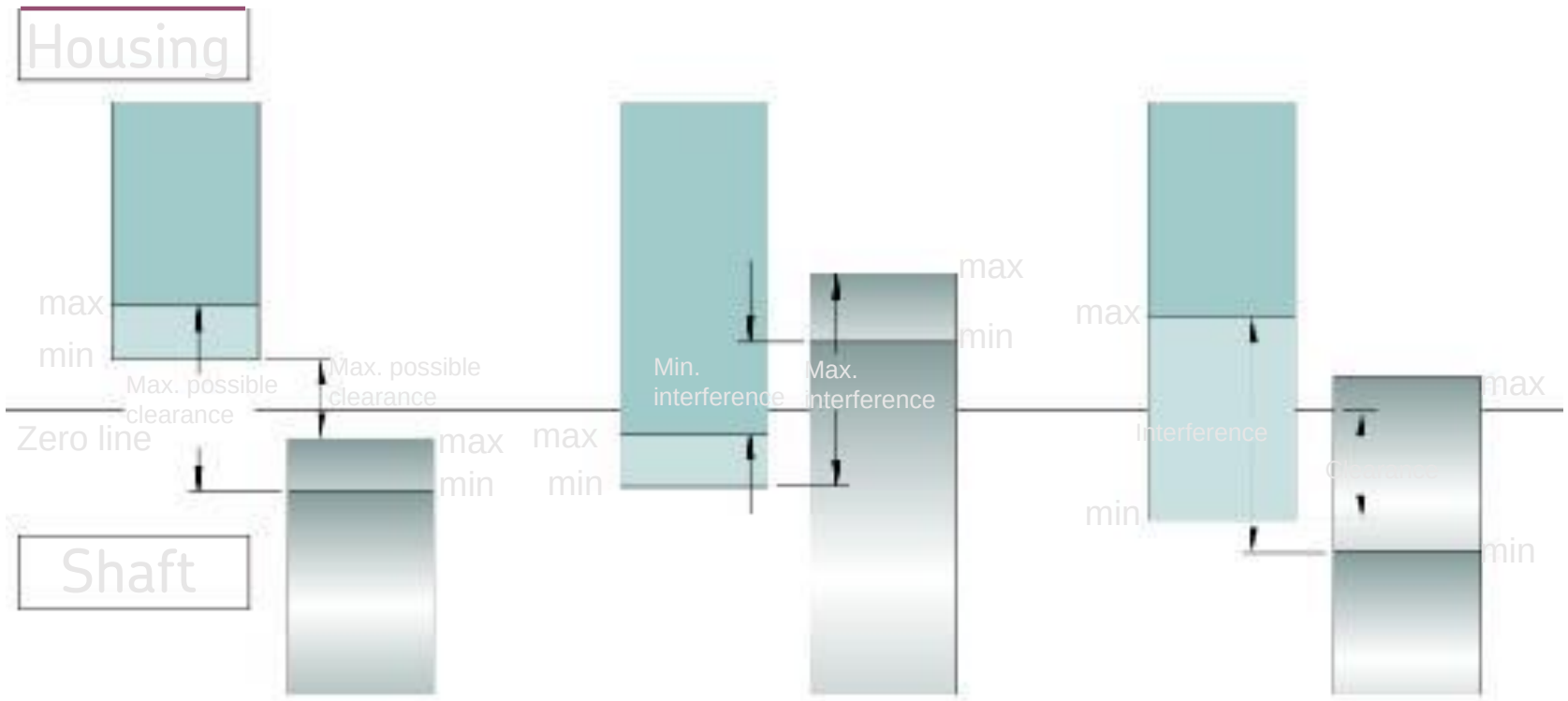
- Excessively loose fit
- Allows relative movement between mating components, causing
  - * Heat (smearing)
  - * Wear (scoring)
  - * Fretting (ring fracture)
- Excessively tight fight
- Creates reduction of internal clearance, causing
  - * Increased operating temperature
  - * Ring fracture
  - * Increased mounting forces

Shaft and Housing Fits

- Mechanics generally remove, inspect, repair if needed and replace
- Machinists and designers
  - When checking, rebuilding, or specifying new fits
  - Contact SKF applications engineering
- SKF Standard: 80% minimum metal-to-metal contact between mating parts
- New OEM fit 95%



Types of Fit Examples



Clearance fit

Interference fit

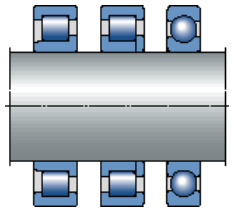
Transition fit

Bearing Fit Criteria

- Conditions of Rotation
- Load magnitude
- Bearing internal clearance
- Temperature conditions
- Running accuracy
- Shaft and housing material/design
- Ease of mounting and dismounting
- Displacement of non-locating bearing
- Bearings with tapered bore

Radial location of bearings

Rings must be radially secured to prevent them from creeping or turning under load



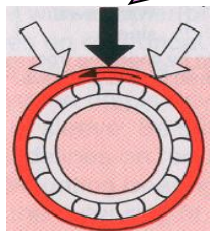
Bearings with cylindrical bore

Critical factors for selection of "fits"

- Condition of rotation

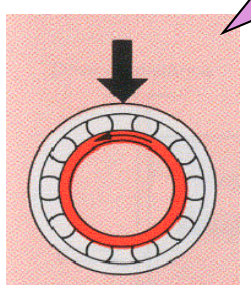
Rotating load

Use interference fit on the ring for which all points around the race way are subjected to load in the course of one revolution

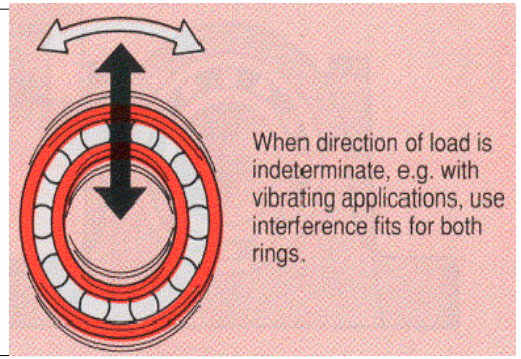


Stationary load

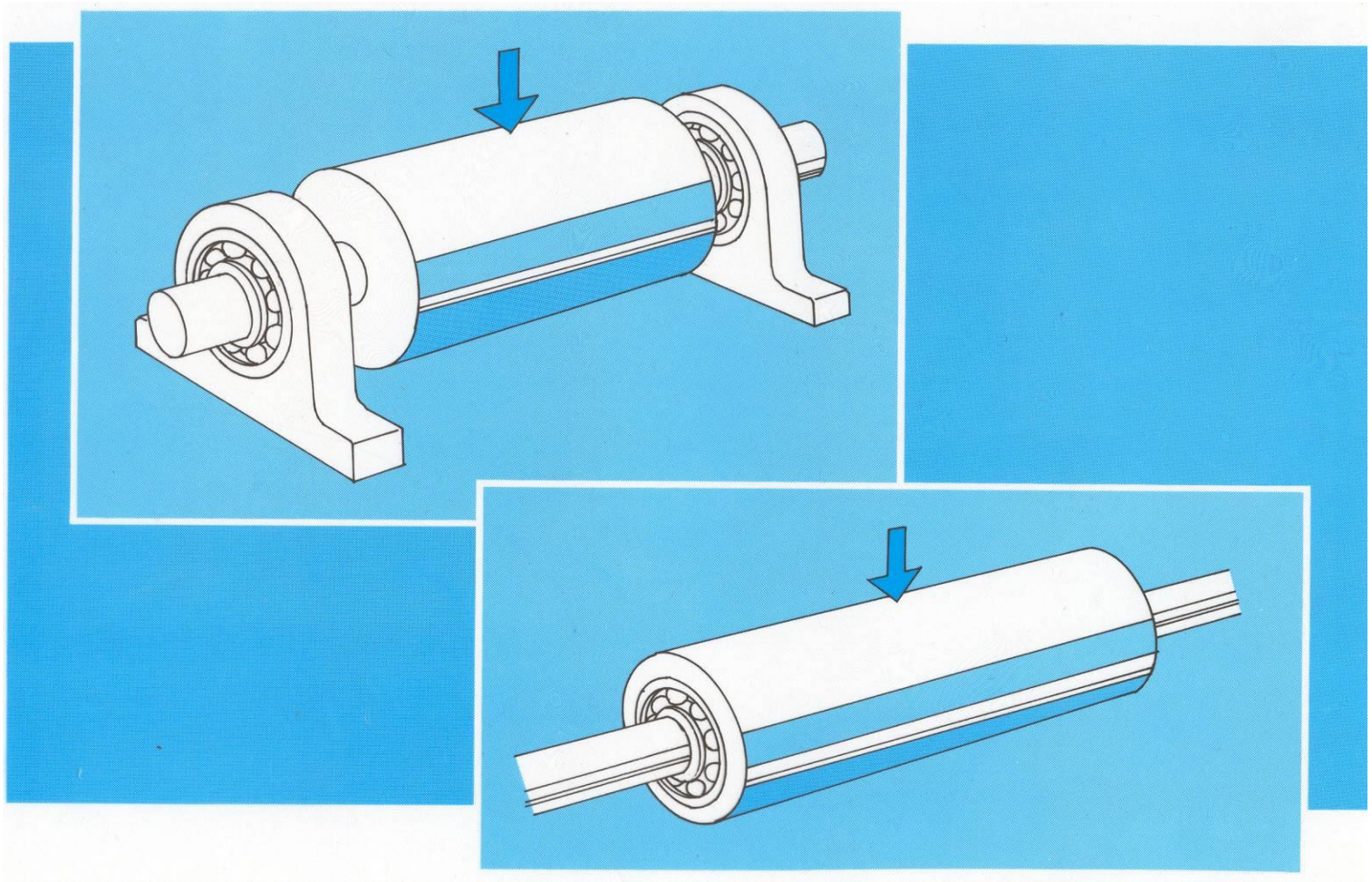
Use interference fit on the rotating ring



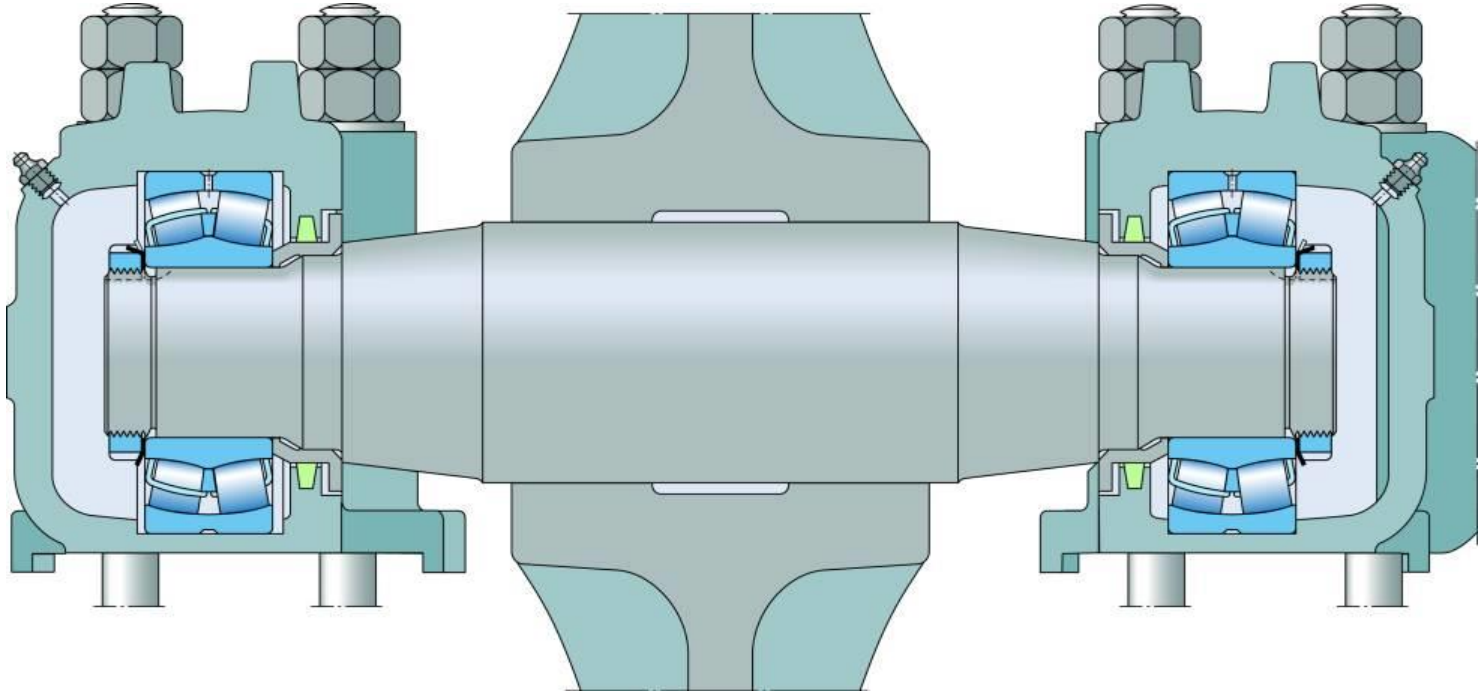
Condition of rotation



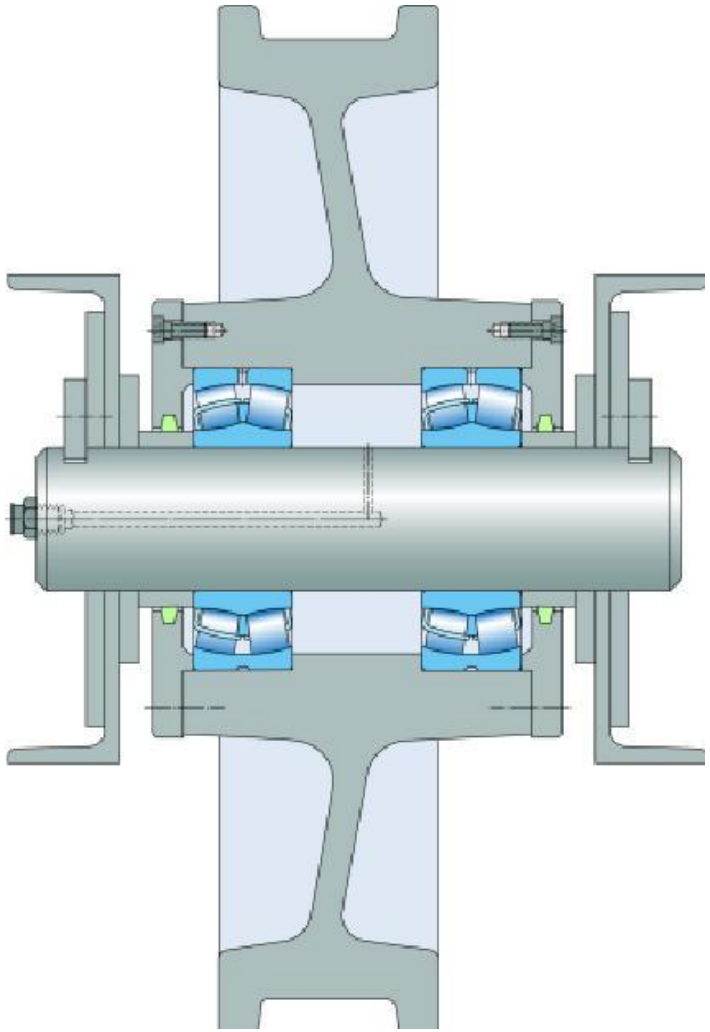
Fits & Tolerance



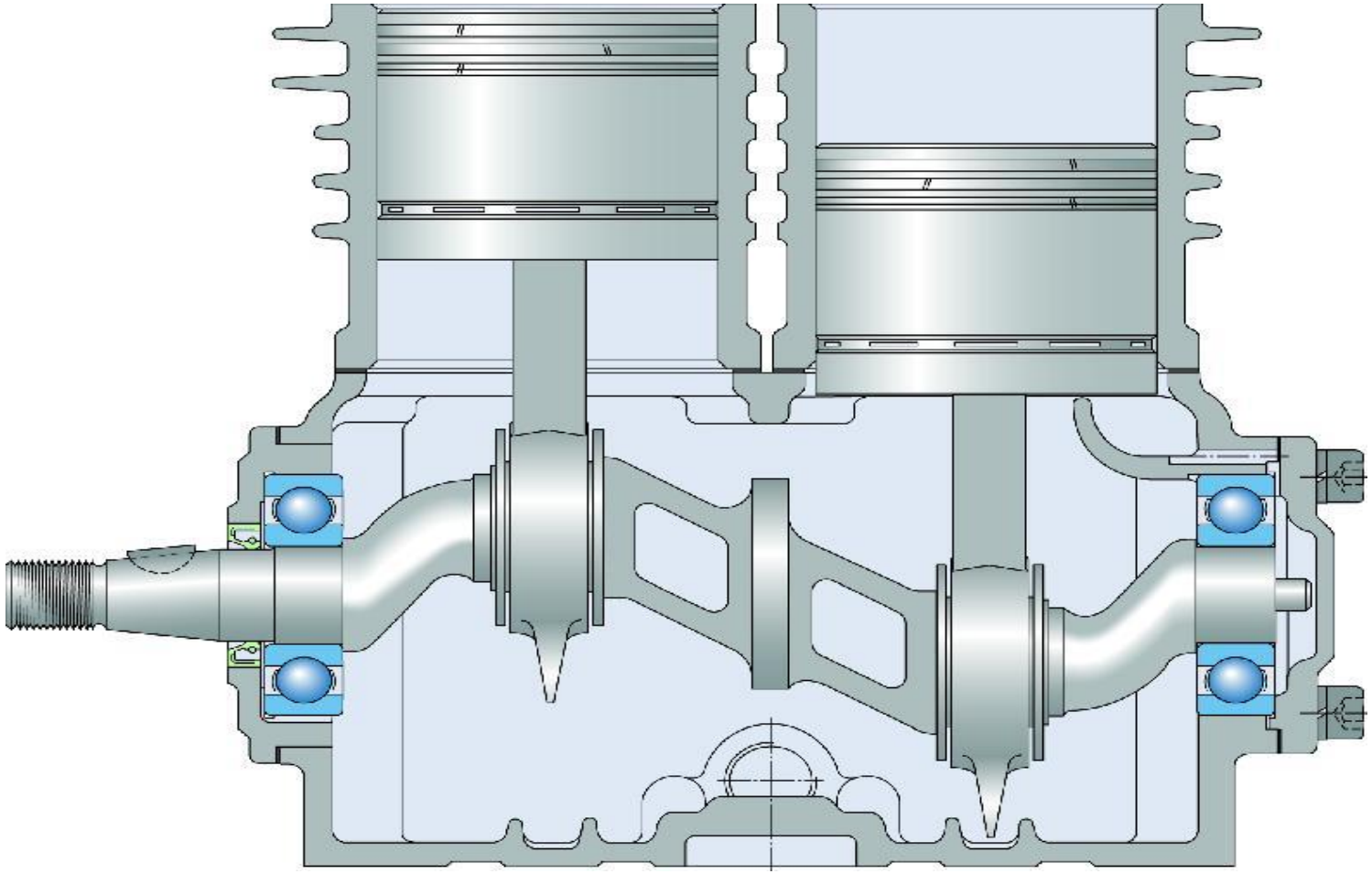
Inner Ring Rotating Load



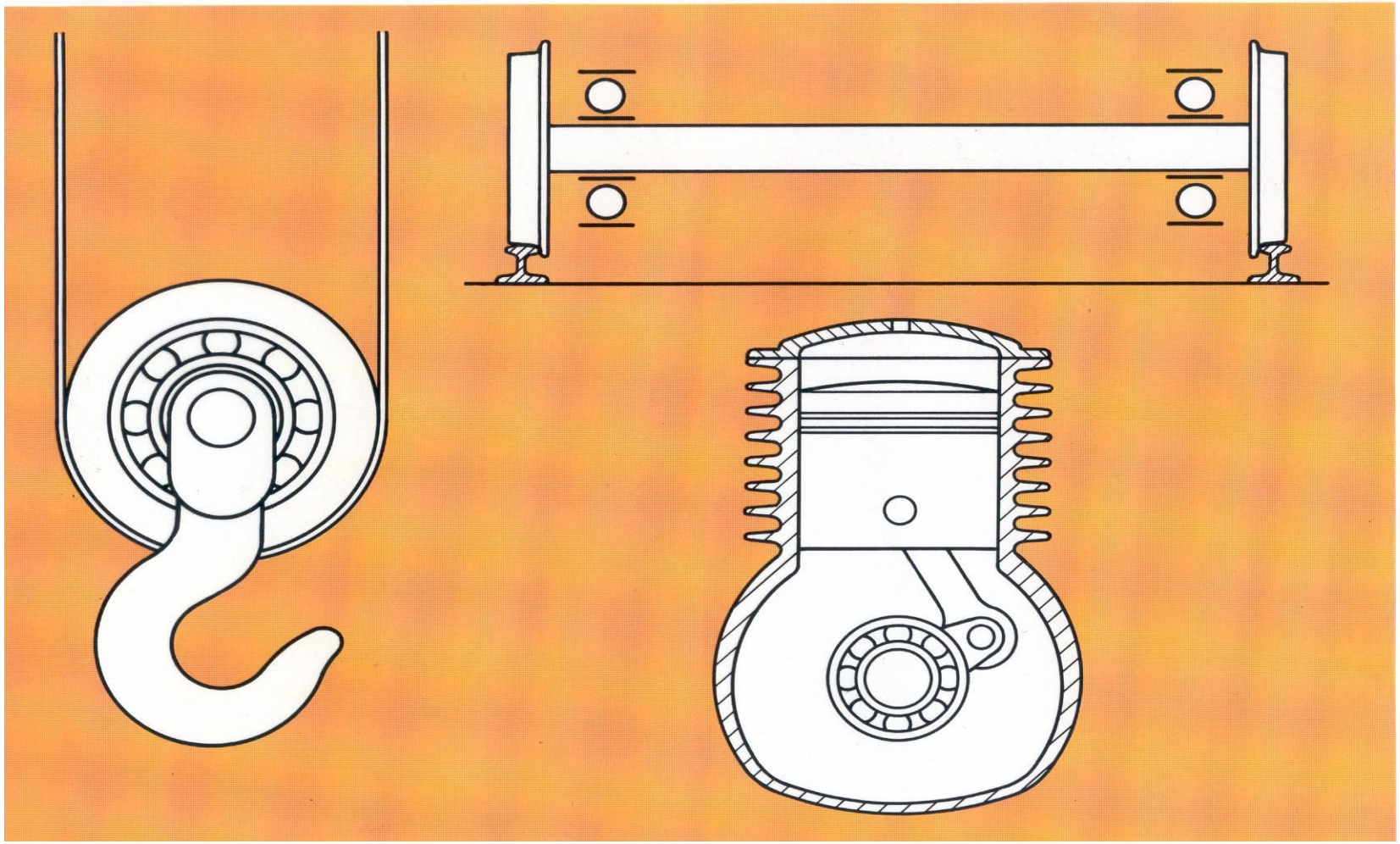
Outer Ring Rotating Load



Indeterminate Load Conditions

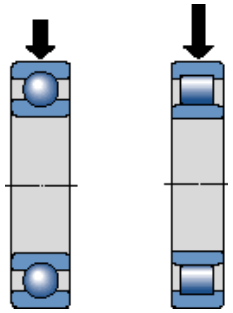


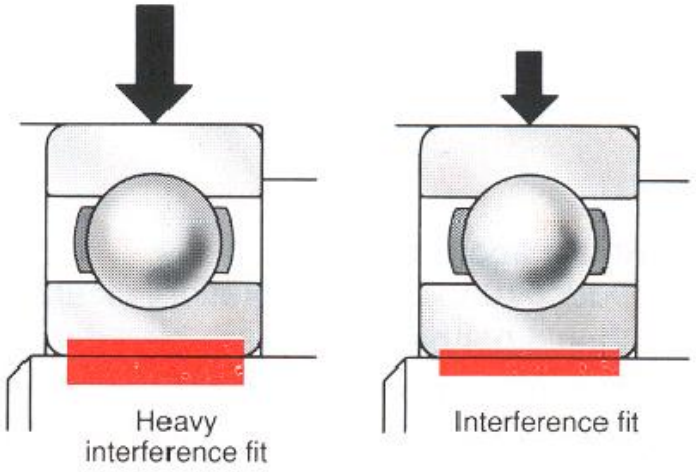
Fits & Tolerance



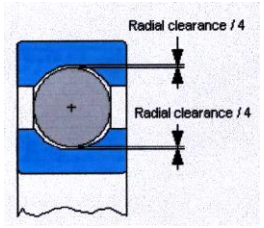
Fits & Tolerance

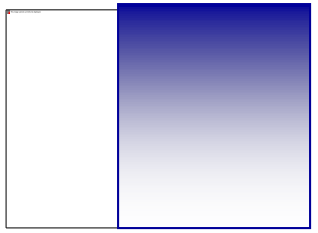
- Load magnitude

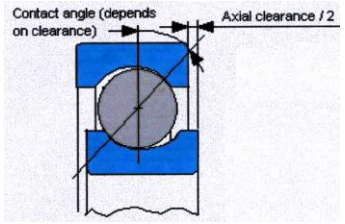


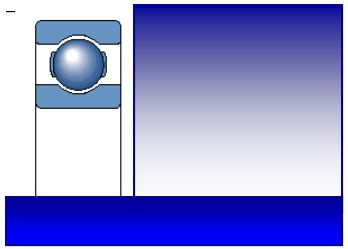


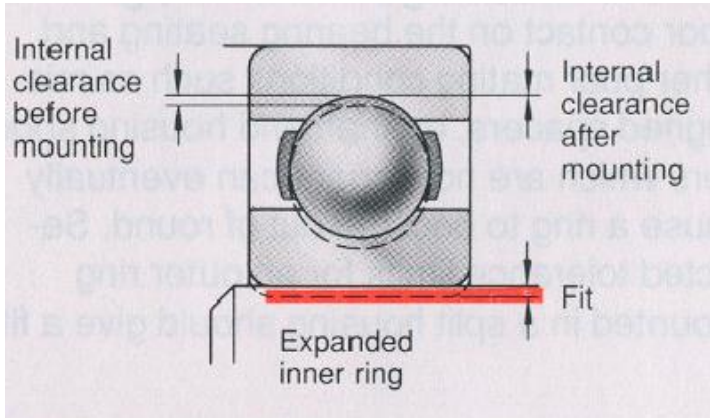
- Bearing Internal Clearance





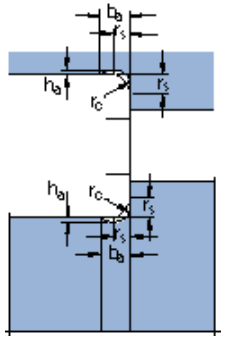


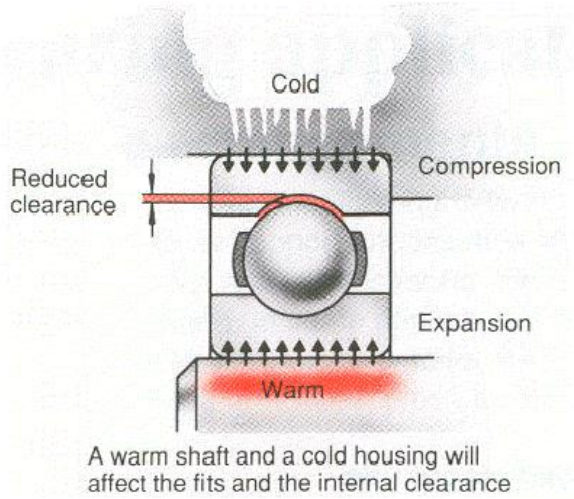




Fits & Tolerance

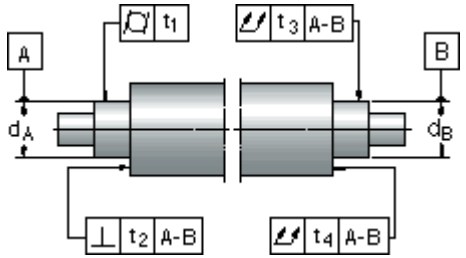
➢Temperature conditions

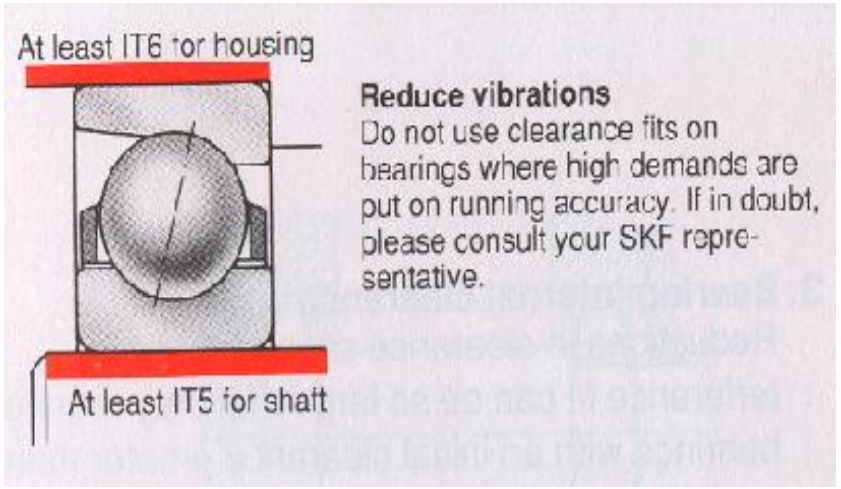




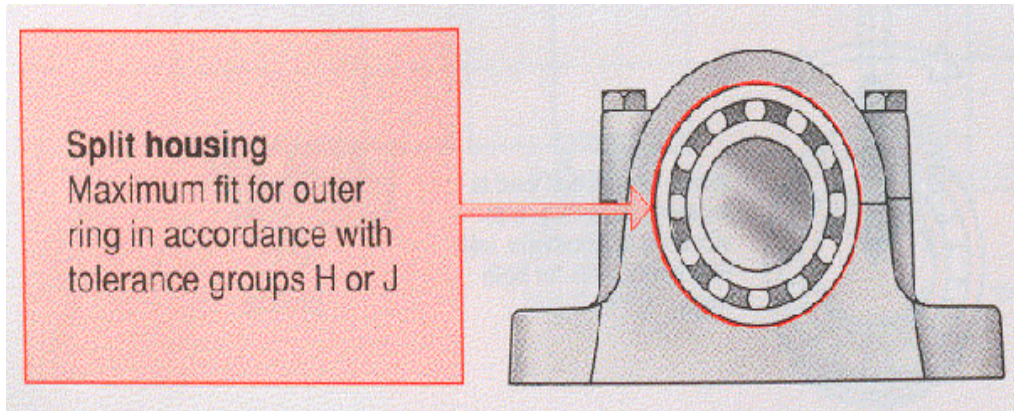
A warm shaft and a cold housing will affect the fits and the internal clearance

➢Running accuracy

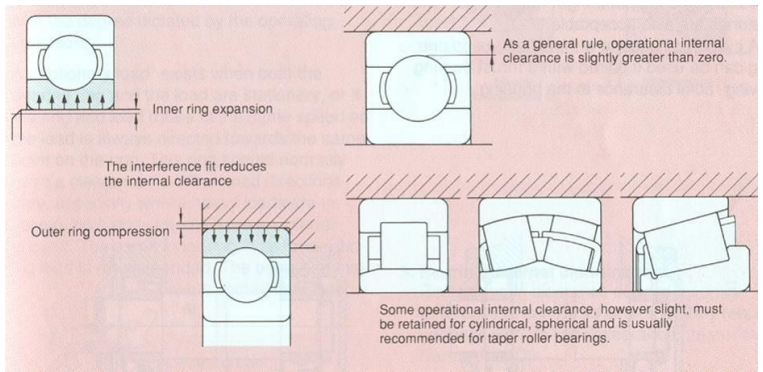


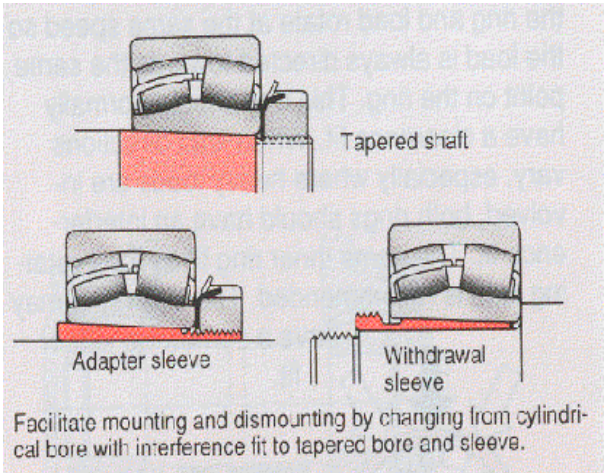


➢Shaft and housing material/design

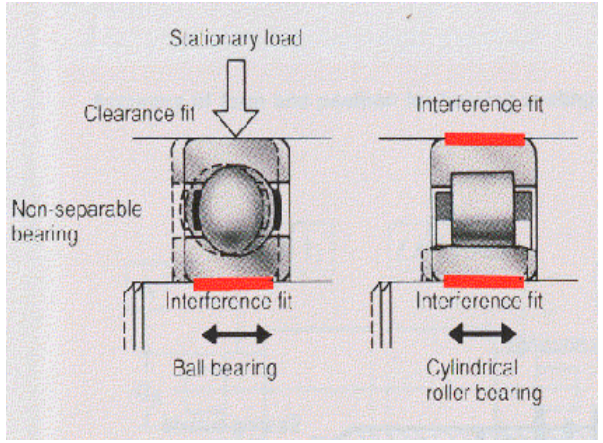


➢Ease of mounting and dismounting

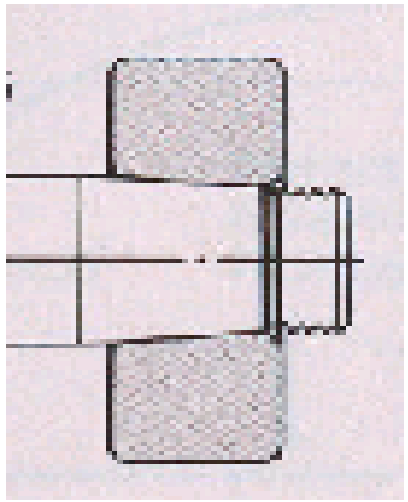


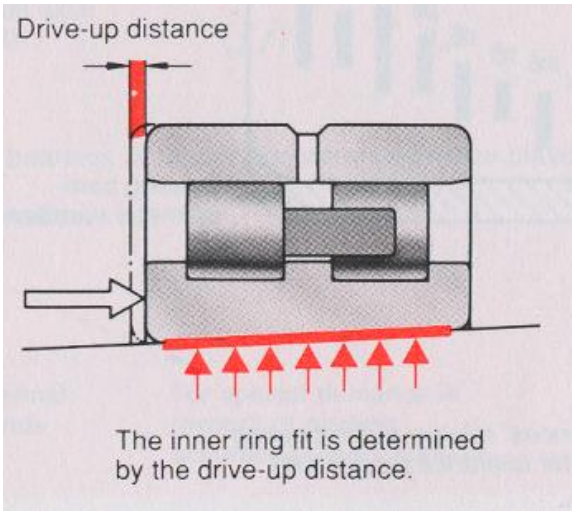


➢Displacement of non-locating bearing

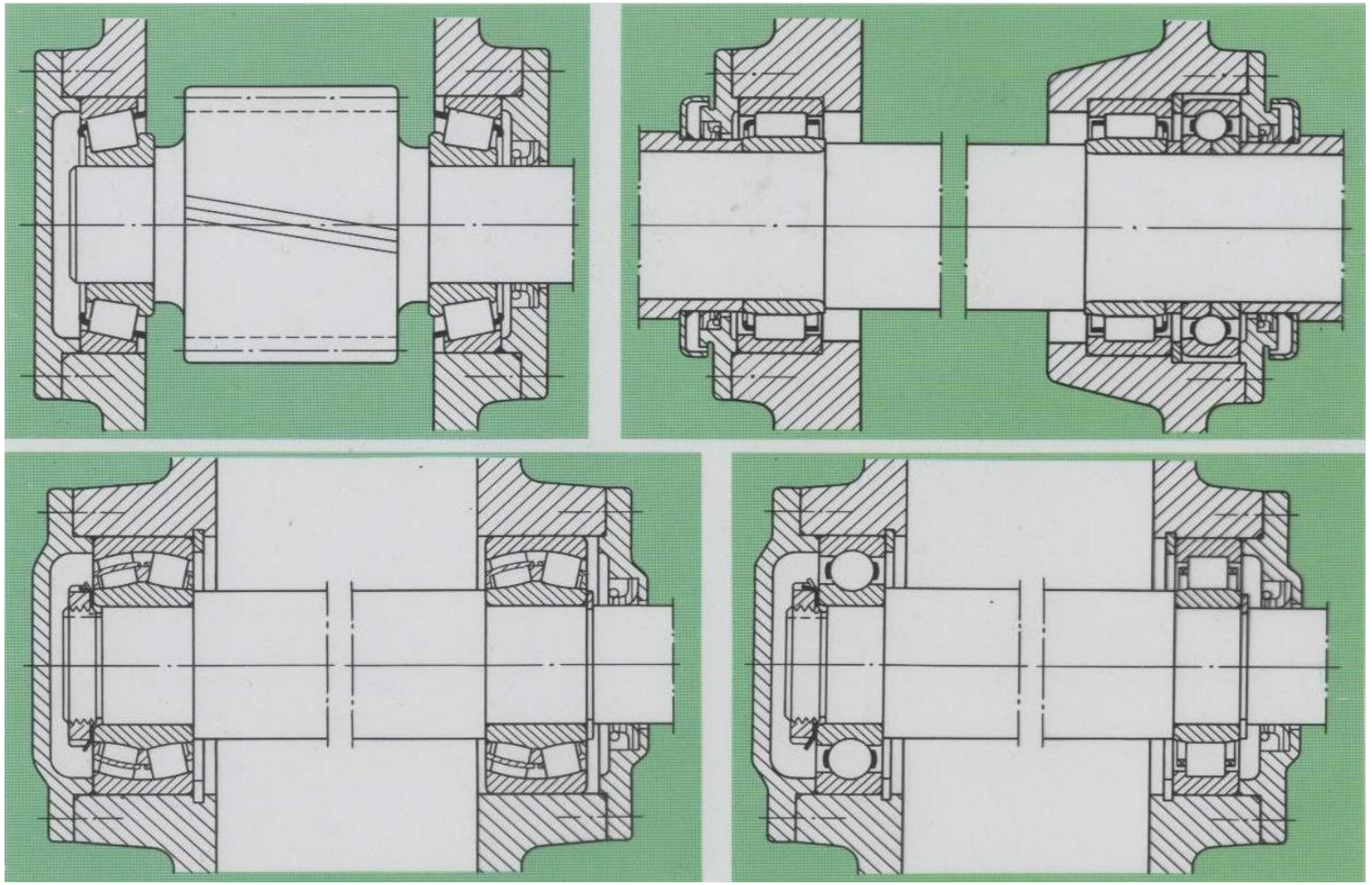


➢Bearing with tapered bores

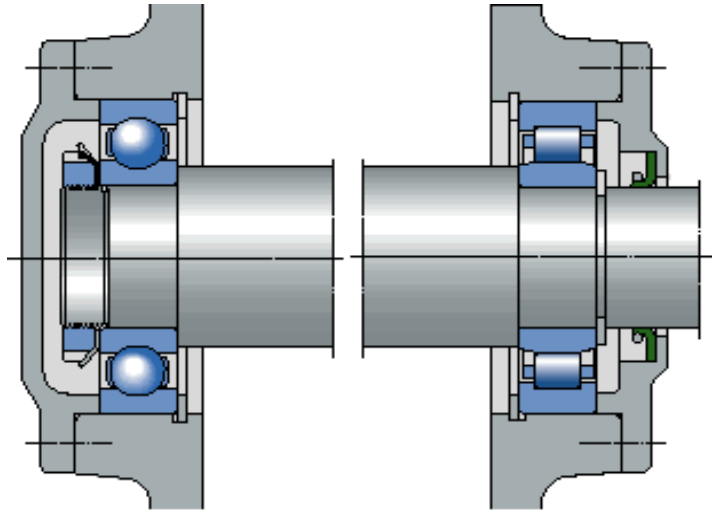




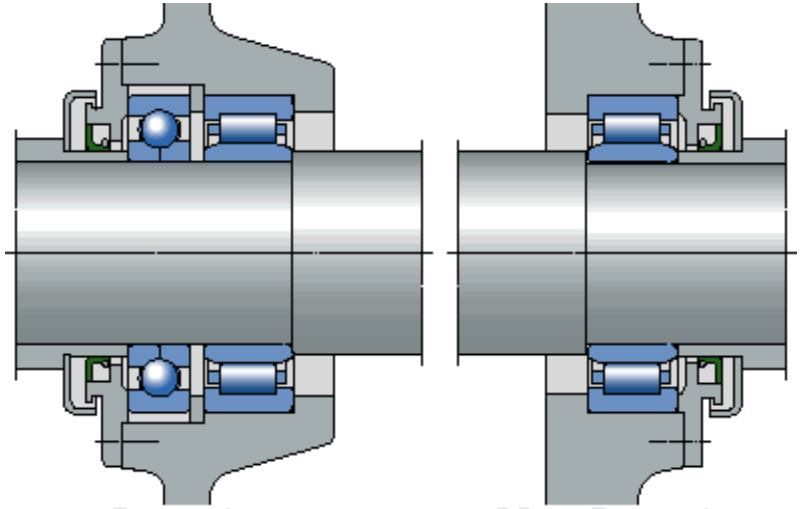
Fits & Tolerance



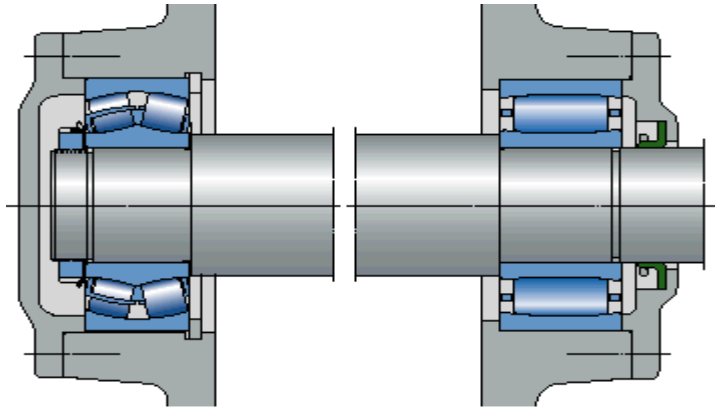
Fits & Tolerance



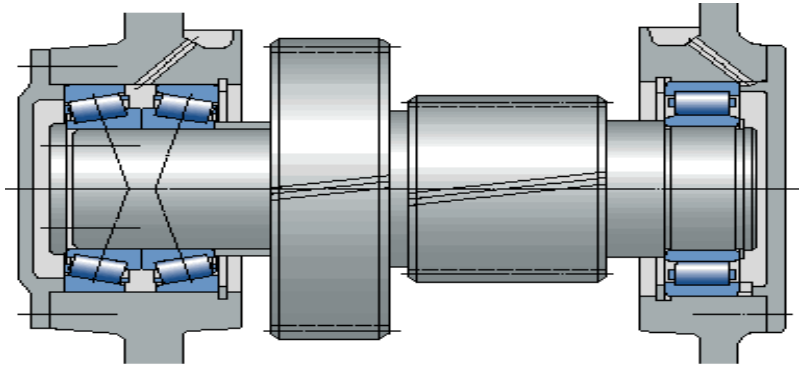
Locating Non Locating



Locating Non Locating



Locating Non Locating



Locating Non Locating

Fits & Tolerance

Example:

A deep groove ball bearing 6208 is to be mounted on a motor shaft.

What are the shaft and housing tolerances and limits ?

Given Data: (Bearing Type & Condition of Rotation)

Radial bearing with cylindrical bore

Rotating inner ring load

Inner diameter Ø 40 mm. Outer diameter Ø 80 mm

Shaft Tolerances and Resultant Fit

According to the Table 1– SKF General Catalog page # 169

Fits & Tolerance

Table 1 Fits for solid steel shafts

Radial bearings with cylindrical bore

Conditions	Examples	Shaft diameter, mm Ball bearings[1]	Cylindrical, needle[2] and taper roller bearings	Spherical roller bearings	Tolerance
Rotating inner ring load or direction of load indeterminate					
Light and variable loads ($P \leq 0{,}06\ C$)	Conveyors, lightly loaded gearbox bearings	(18) to 100 (100) to 140	≤ 40 (40) to 100	– –	j6 k6
Normal and heavy loads ($P > 0{,}06\ C$)	Bearing applications generally, electric motors, turbines, pumps internal combustion engines, gearing, woodworking machines	≤ 18 (18) to 100 (100) to 140 (140) to 200 (200) to 280 – – –	– ≤ 40 (40) to 100 (100) to 140 (140) to 200 (200) to 400 – –	– ≤ 40 (40) to 65 (65) to 100 (100) to 140 (140) to 280 (280) to 500 > 500	j5 k5 (k6)[3] m5 (m6)[3] m6 n6 p6 r6[4] r7[4]
Very heavy loads and shock loads with difficult working conditions ($P > 0{,}12\ C$)	Axleboxes for heavy railway vehicles, traction motors, rolling mills	– – –	(50) to 140 (140) to 200 > 200	(50) to 100 (100) to 140 > 140	n6[4] p6[4] r6[4]
High demands on running accurary with light loads ($P \leq 0{,}06\ C$)	Machine tools	≤ 18 (18) to 100 (100) to 200 –	– ≤ 40 (40) to 140 (140) to 200	– – – –	h5[5] j5[5] k5[5] m5[5]
Stationary inner ring load					
Easy axial displacement of inner ring on shaft desirable	Wheels on non-rotating axles				g6[6]
Easy axial displacement of inner ring on shaft unnecessary	Tension pulleys, rope sheaves				h6
Axial loads only					
	Bearing applications of all kinds	≤ 250 > 250	≤ 250 > 250	≤ 250 > 250	j6 js6

Fits & Tolerance

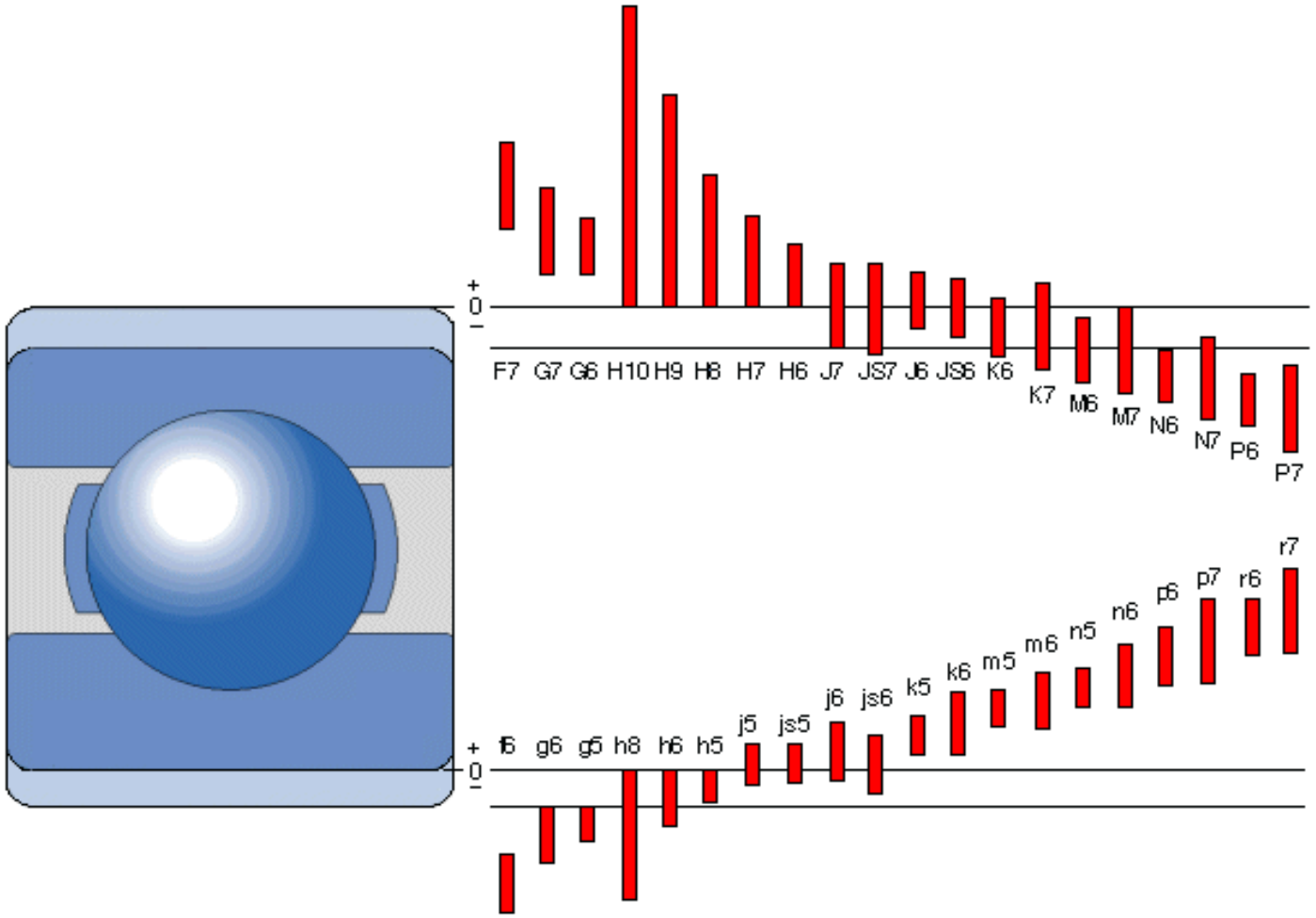


Table 1d: Shaft tolerances and resultant fits

Shaft diameter		Bearing bore diameter		Deviations of shaft diameter, resultant fits Tolerances								
d Nominal		Δ_{dmp}		k5		k6		m5		m6		n5
				Deviations (shaft diameter)								
				Theoretical interference(+)/clearance(-)								
over	incl.	low	high	Probable interference(+)/clearance(-)								
mm		µm		µm								
1	**3**	-8	0	+4	0	+6	0	+6	+2	+8	+2	+8
				+12	0	+14	0	+14	+2	+16	+2	+16
				+11	+1	+12	+2	+13	+3	+14	+4	+15
3	**6**	-8	0	+6	+1	+9	+1	+9	+4	+12	+4	+13
				+14	+1	+17	+1	+17	+4	+20	+4	+21
				+13	+2	+15	+3	+16	+5	+18	+6	+20
6	**10**	-8	0	+7	+1	+10	+1	+12	+6	+15	+6	+16
				+15	+1	+18	+1	+20	+6	+23	+6	+24
				+13	+3	+16	+3	+18	+8	+21	+8	+22
10	**18**	-8	0	+9	+1	+12	+1	+15	+7	+18	+7	+20
				+17	+1	+20	+1	+23	+7	+26	+7	+28
				+15	+3	+18	+3	+21	+9	+24	+9	+26
18	**30**	-10	0	+11	+2	+15	+2	+17	+8	+21	+8	+24
				+21	+2	+25	+2	+27	+8	+31	+8	+34
				+19	+4	+22	+5	+25	+10	+28	+11	+32
30	**50**	-12	0	+13	+2	+18	+2	+20	+9	+25	+9	+28
				+25	+2	+30	+2	+32	+9	+37	+9	+40
				+22	+5	+26	+6	+29	+12	+33	+13	+37
50	**80**	-15	0	+15	+2	+21	+2	+24	+11	+30	+11	+33
				+30	+2	+36	+2	+39	+11	+45	+11	+48
				+26	+6	+32	+6	+35	+15	+41	+15	+44
80	**120**	-20	0	+18	+3	+25	+3	+28	+13	+35	+13	+38
				+38	+3	+45	+3	+48	+13	+55	+13	+58
				+33	+8	+39	+9	+43	+18	+49	+19	+53
120	**180**	-25	0	+21	+3	+28	+3	+33	+15	+40	+15	+45
				+46	+3	+53	+3	+58	+15	+65	+15	+70
				+40	+9	+46	+10	+52	+21	+58	+22	+64
180	**250**	-30	0	+24	+4	+33	+4	+37	+17	+46	+17	+51
				+54	+4	+63	+4	+67	+17	+76	+17	+81
				+48	+10	+55	+12	+61	+23	+68	+25	+75

Fits & Tolerance

Deviation of shaft diameter, resultant fit:

	+ 0.013	40.013	Upper Limit
Ø 40	=		
	+ 0.002	40.002	Lower Limit

Housing Bore Tolerances and Resultant Fit

According to the Table 3– SKF General Catalog page # 114

According to the Table 3 Housing fits – SKF General Catalog page # 114

Fits for cast iron and steel housing

Radial bearings – solid housing

Conditions	Examples	Tolerance	Displacement of outer ring
Rotating outer ring load			
Heavy loads on bearings in thin-walled housings, heavy shock loads ($P > 0{,}12\ C$)	Roller bearing wheel hubs, big-end bearings	P7	Cannot be displaced
Normal and heavy loads ($P > 0{,}06\ C$)	Ball bearing wheel hubs, big-end bearings, crane travelling wheels	N7	Cannot be displaced
Light and variable loads ($P \leq 0{,}06\ C$)	Conveyor rollers, rope sheaves, belt tension pulleys	M7	Cannot be displaced
Direction of load indeterminate			
Heavy shock loads	Electric traction motors	M7	Cannot be displaced
Normal and heavy loads ($P > 0{,}06\ C$), axial displacement of outer ring unnecessary	Electric motors, pumps, crankshaft bearings	K7	Cannot be displaced as a rule
Accurate or silent running[1]			
	Small electric motors	J6[2]	Can be displaced

[1] For high precision bearings other recommendations apply, see SKF catalogue "Precision bearings"
[2] When easy displacement required use H6 instead of J6

Fits & Tolerance

Table 2d: Housing tolerances and resultant fits

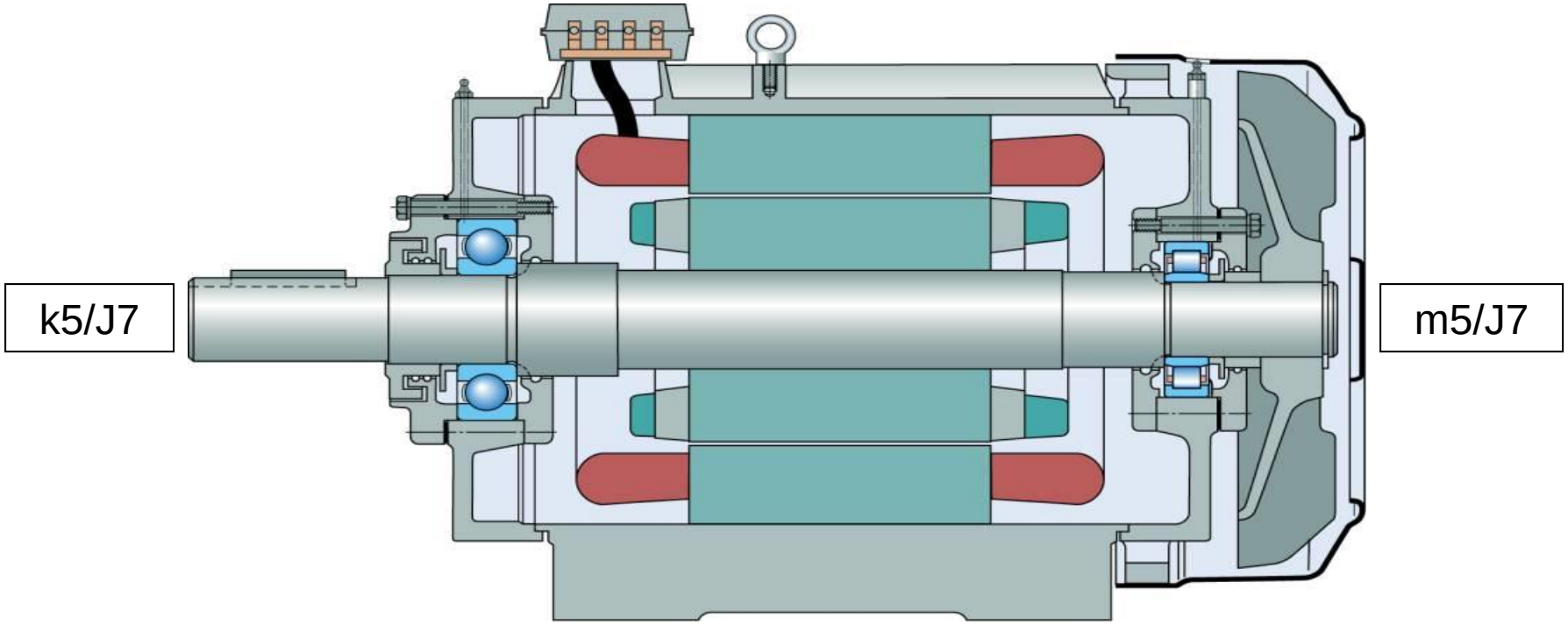
Housing bore diameter D Nominal		Bearing outside diameter Δ_{Dmp}		Deviation of housing bore diameter, resultant fits Tolerances								
				K6		K7		M5		M6		M7
				Deviations (housing bore diameter)								
				Theoretical interference(+)/clearance(-)								
over	incl.	high	low	Probable interference(+)/clearance(-)								
mm		µm		µm								
6	**10**	0	-8	-7	+2	-10	+5	-10	-4	-12	-3	-15
				+7	-10	+10	-13	+10	-4	+12	-5	+15
				+5	-8	+7	-10	+8	-2	+10	-3	+12
10	**18**	0	-8	-9	+2	-12	+6	-12	-4	-15	-4	-18
				+9	-10	+12	-14	+12	-4	+15	-4	+18
				+7	-8	+9	-11	+10	-2	+13	-2	+15
18	**30**	0	-9	-11	+2	-15	+6	-14	-4	-17	-4	-21
				+11	-11	+15	-15	+14	-4	+17	-5	+21
				+8	-8	+12	-12	+12	-2	+14	-2	+18
30	**50**	0	-11	-13	+3	-18	+7	-16	-5	-20	-4	-25
				+13	-14	+18	-18	+16	-6	+20	-7	+25
				+10	-11	+14	-14	+13	-3	+17	-4	+21
50	**80**	0	-13	-15	+4	-21	+9	-19	-6	-24	-5	-30
				+15	-17	+21	-22	+19	-7	+24	-8	+30
				+11	-13	+16	-17	+16	-4	+20	-4	+25
80	**120**	0	-15	-18	+4	-25	+10	-23	-8	-28	-6	-35
				+18	-19	+25	-25	+23	-7	+28	-9	+35
				+13	-14	+20	-20	+19	-3	+23	-4	+30
120	**150**	0	-18	-21	+4	-28	+12	-27	-9	-33	-8	-40
				+21	-22	+28	-30	+27	-9	+33	-10	+40
				+15	-16	+21	-23	+22	-4	+27	-4	+33
150	**180**	0	-25	-21	+4	-28	+12	-27	-9	-33	-8	-40
				+21	-29	+28	-37	+27	-16	+33	-17	+40
				+14	-22	+20	-29	+21	-10	+26	-10	+32
180	**250**	0	-30	-24	+5	-33	+13	-31	-11	-37	-8	-46
				+24	-35	+33	-43	+31	-19	+37	-22	+46
				+16	-27	+23	-33	+25	-13	+29	-14	+36
250	**315**	0	-35	-27	+5	-36	+16	-36	-13	-41	-9	-52
				+27	-40	+36	-51	+36	-22	+41	-26	+52
				+18	-31	+24	-39	+28	-14	+32	-17	+40

Fits & Tolerance

Deviation of shaft diameter, resultant fit:

	+ 0.009		80.009 Upper Limit
Ø 80		=	
	- 0.021		79.797 Lower Limit

Electric Motor



Fits & Tolerance

What interference is required to prevent ring-creep

$$\triangle = 0{,}25\sqrt{\frac{d \cdot f}{10 \cdot B}}$$

$\triangle$ = The difference in diameter μm
B = Ring width mm
F = Radial bearing load N

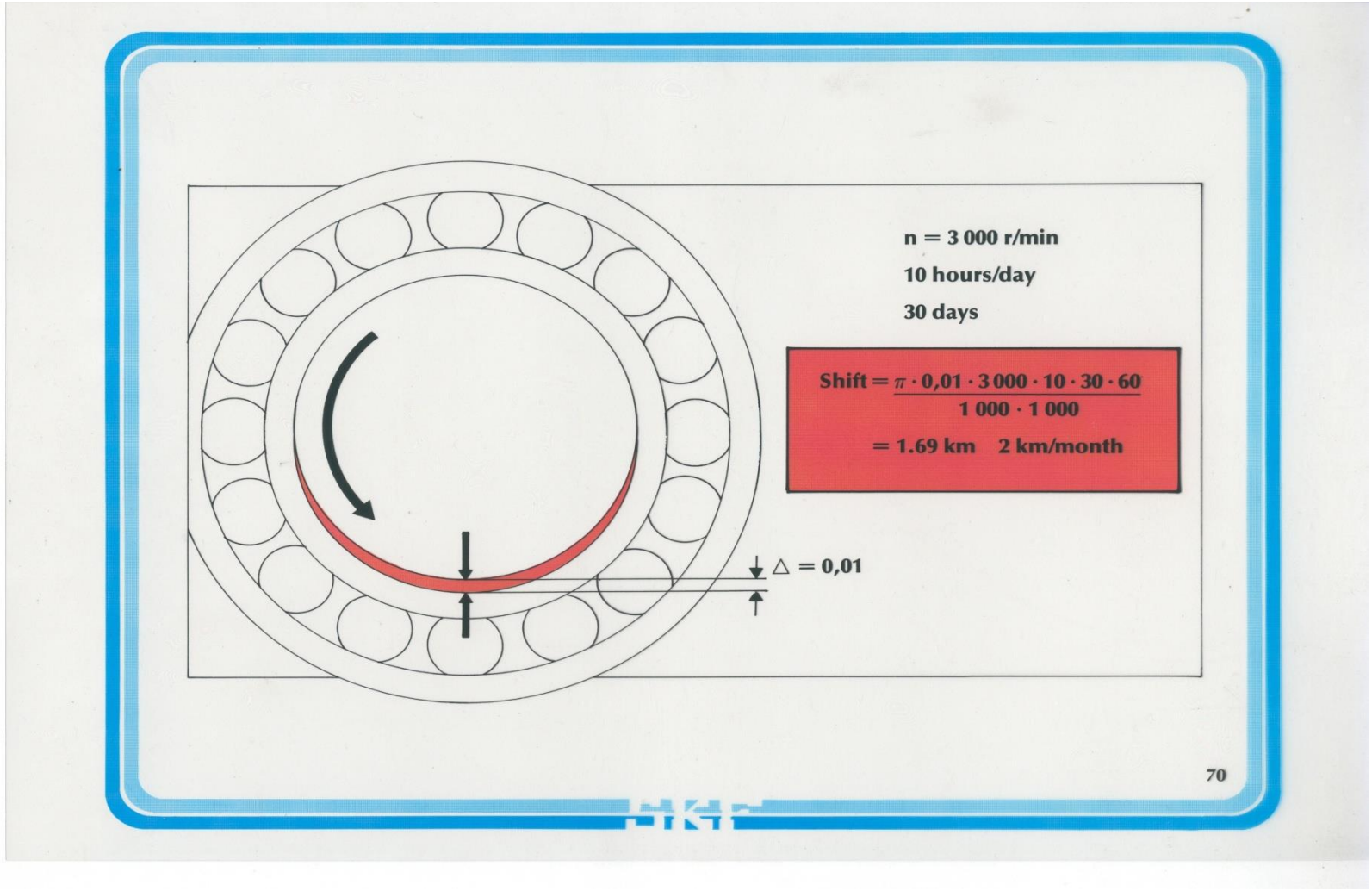
Example

22318 CC F = 100 000 N
d = 90 B = 64

$$\triangle = 0{,}25\sqrt{\frac{90 \cdot 100\,000}{10 \cdot 64}}$$

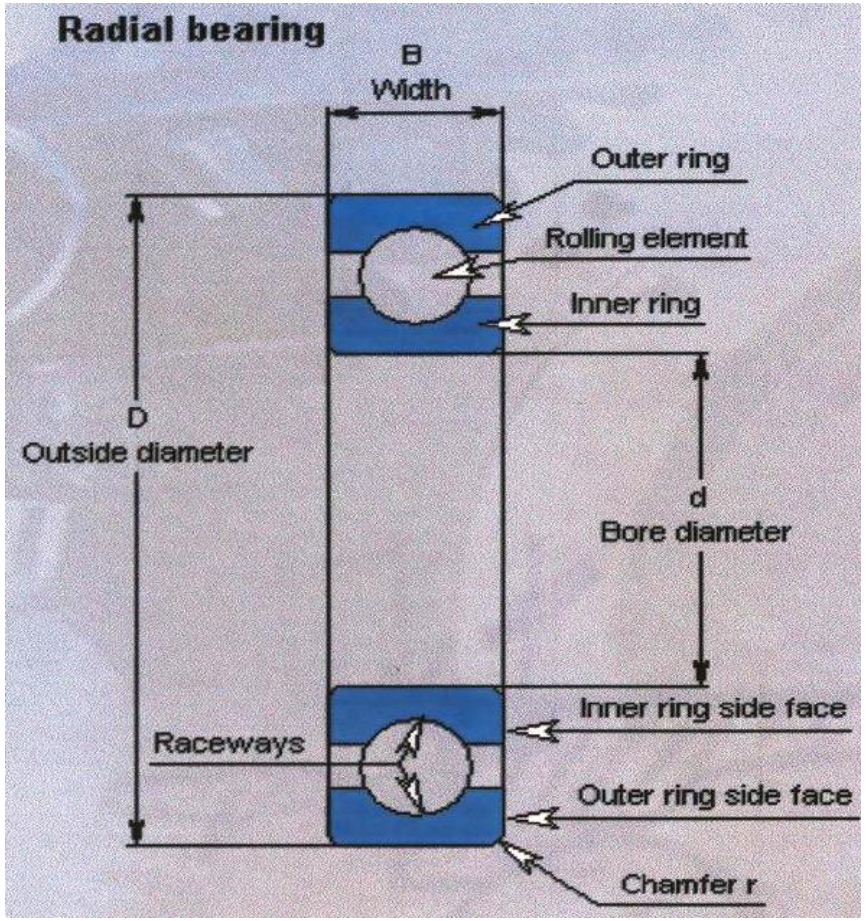
$\triangle \approx 30\ \mu m$

Fits & Tolerance

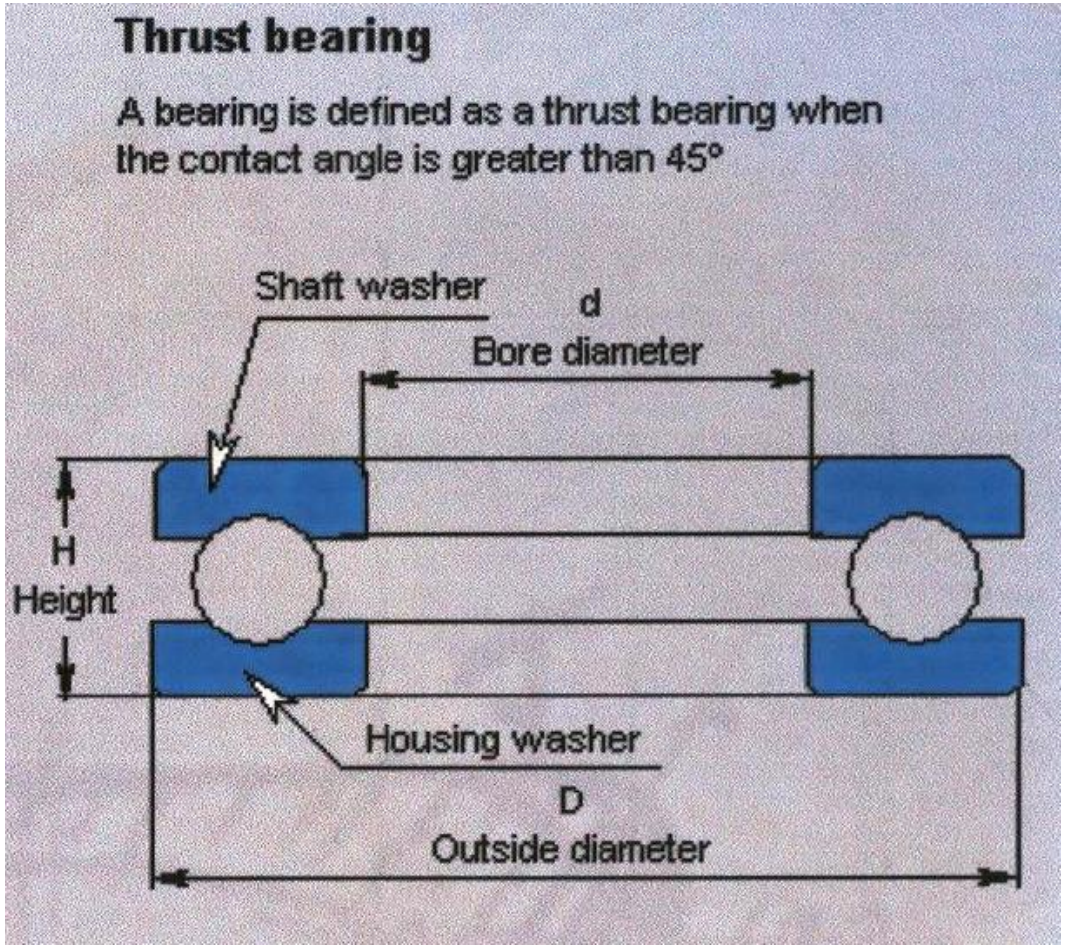


Bearing Designation System

Bearing Designation System



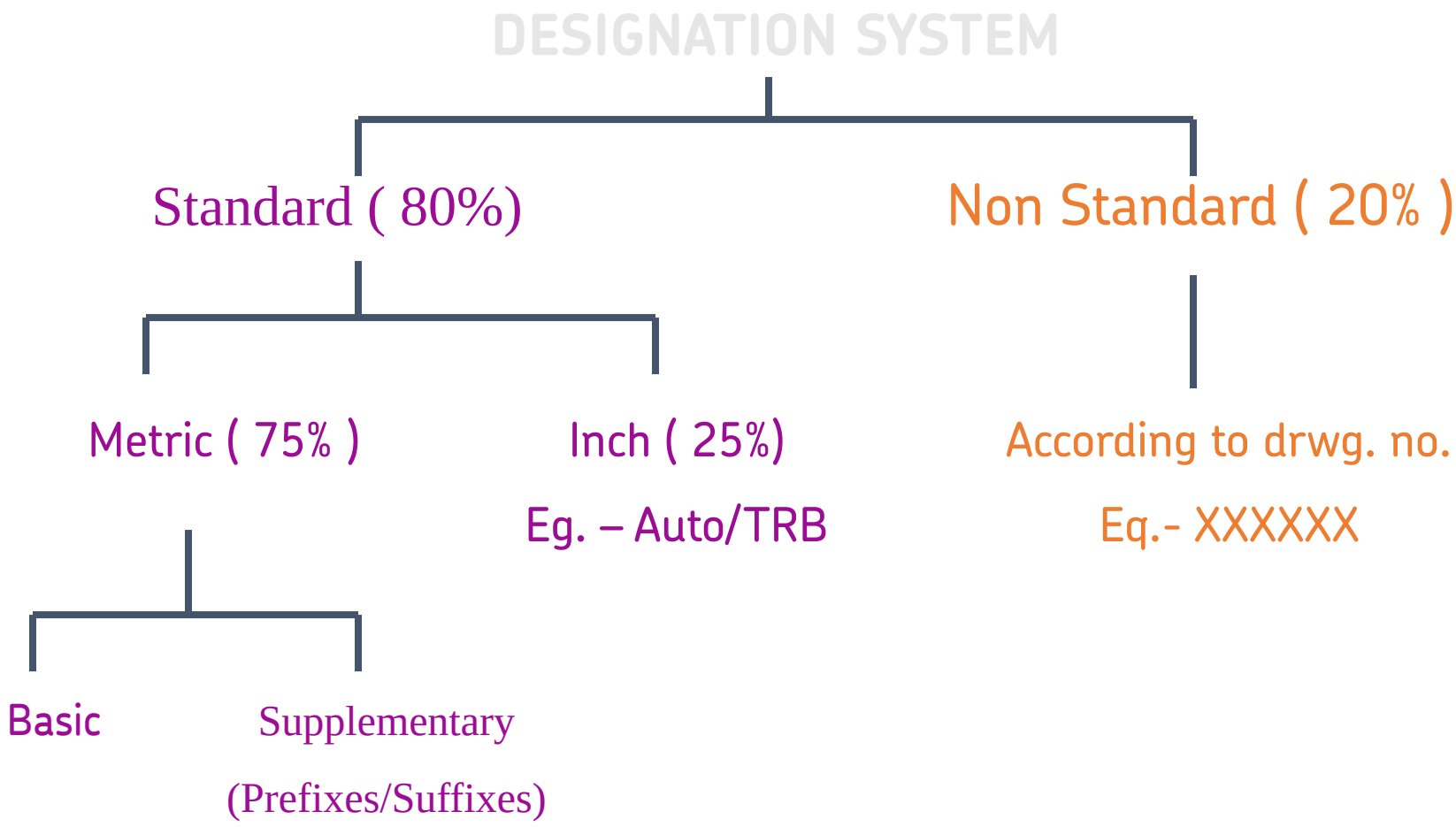
Bearing Designation System



ISO

International Standardization for Organization

Bearing Designation System



Bearing Designation System

Bearing Designation System

- ✓ Basic designation identifies:
  - Product type
  - Standard design
  - Bore size

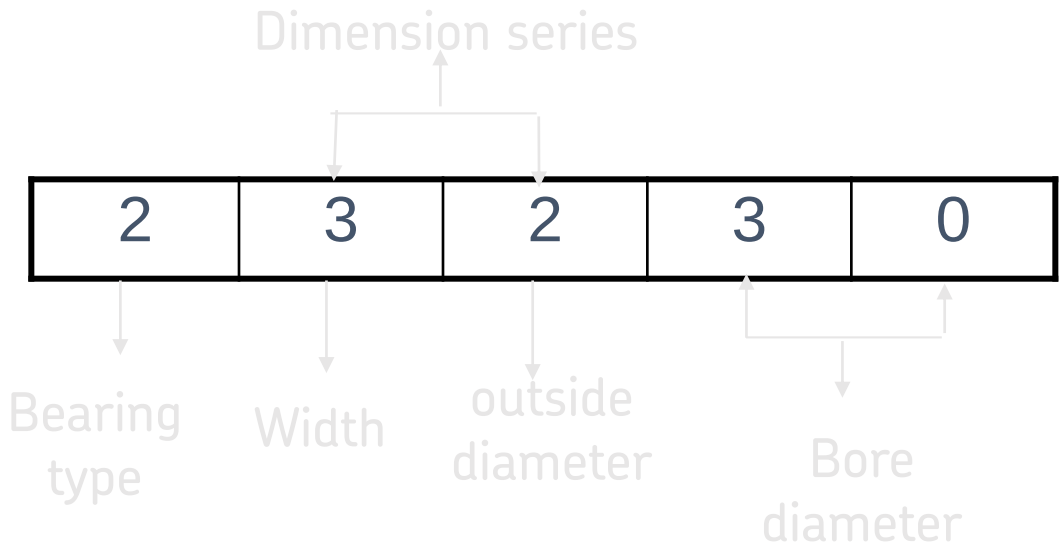
- ✓ Supplementary designation identifies:
  - Special variants
  - Bearing component

Basic Designation

✓ Each SKF bearing of standard metric design is given a basic designation, which normally consists of three, four or five figures

- Bearing number directly indicates bore size.
- Bearing number only gives an idea about outer diameter and width

BASIC DESIGNATION



Basic Designation ----- Bearing type

✓ The first figures in the basic designation identifies the bearing type

2	3	2	3	0

(0) : Angular contact ball bearing , double row

1 : Self-aligning ball bearings

2 : Spherical roller bearings & spherical roller thrust bearings.

3 : Taper roller bearings

4 : Deep groove ball bearing , double row

5 : Thrust ball bearing

6 : Deep groove ball bearing , single row

7 : Angular contact ball bearing ,single row

8 : Cylindrical roller thrust bearing

N : Cylindrical roller bearings

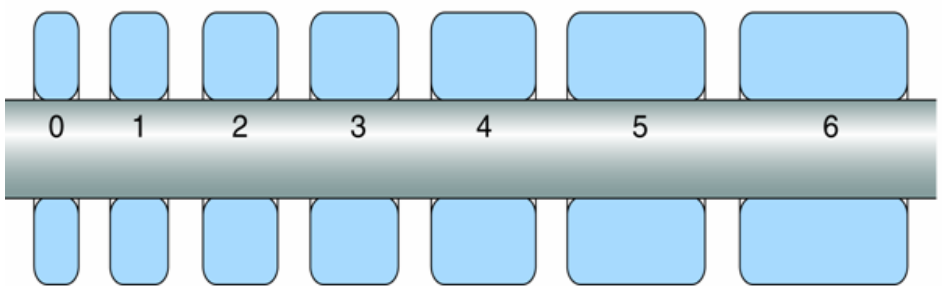
QJ : Four-point contact ball bearing

C : CARB

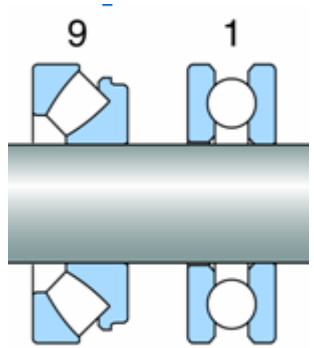
Basic Designation ----- Width series / Height series

2	3	2	3	0

Width series



Height series



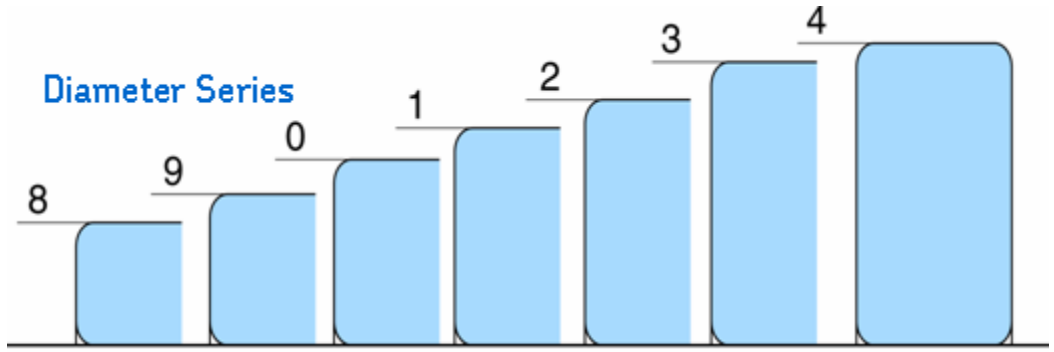
Radial bearing .....Width series = 0,1,2,3,4,5 and 6

Taper roller bearings ..... Width series = 0,2 and 3

Thrust bearings ..... Height series = 7,9 and 1

Basic Designation ----- Diameter series

2	3	2	3	0



Radial bearing .....diameter series = 8,9,0,1,2,3 and 4

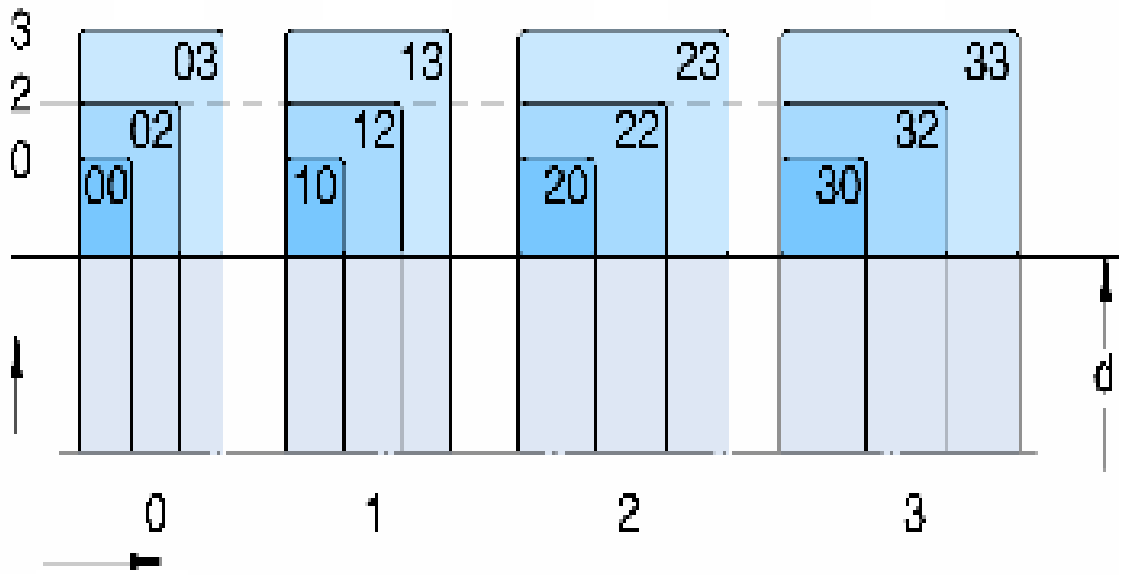
Taper roller bearings ..... diameter series = 9,0,2 and 3

Thrust bearings ..... diameter series = 0,1,2,3,4and 5

Basic Designation ----- Dimension series

2	3	2	3	0

The combination of a Diameter series with a width or height series results in dimension series e.g ; Dimension series 02 is the width series 0 and the diameter series 2.



Basic Designation ----- Bore diameter

2	3	2	3	0

✓ The two final figures in the basic designation ,when multiplied by five , identified the bore diameter in mm.

✓ The size identification of small and large bearing differs from this rule

✓ Bearing Bore has four groups:

(1) Bore below 10 mm

(2) Bore from 10 to 17 mm

(3) Bore from 20 mm to 480 mm.

(4) Bore equal and above 500 mm.

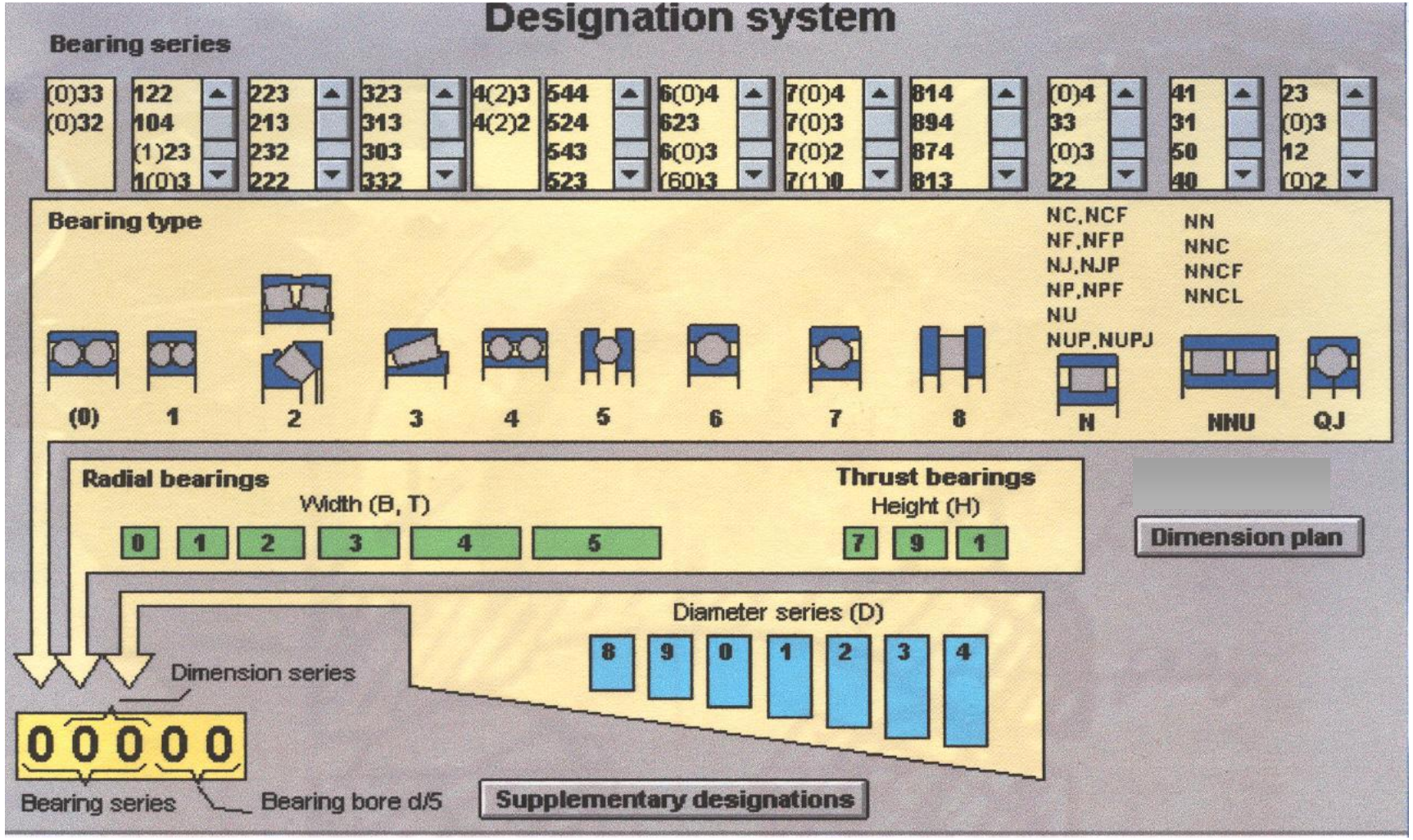
Basic Designation ----- Bore diameter

Bore	Designation	Example
3	3	623
7	7	637
9	9	629
10	00	6200
12	01	1201
15	02	7202
17	03	7003
20	04	6204
85	17	22217
240	48	NU 248

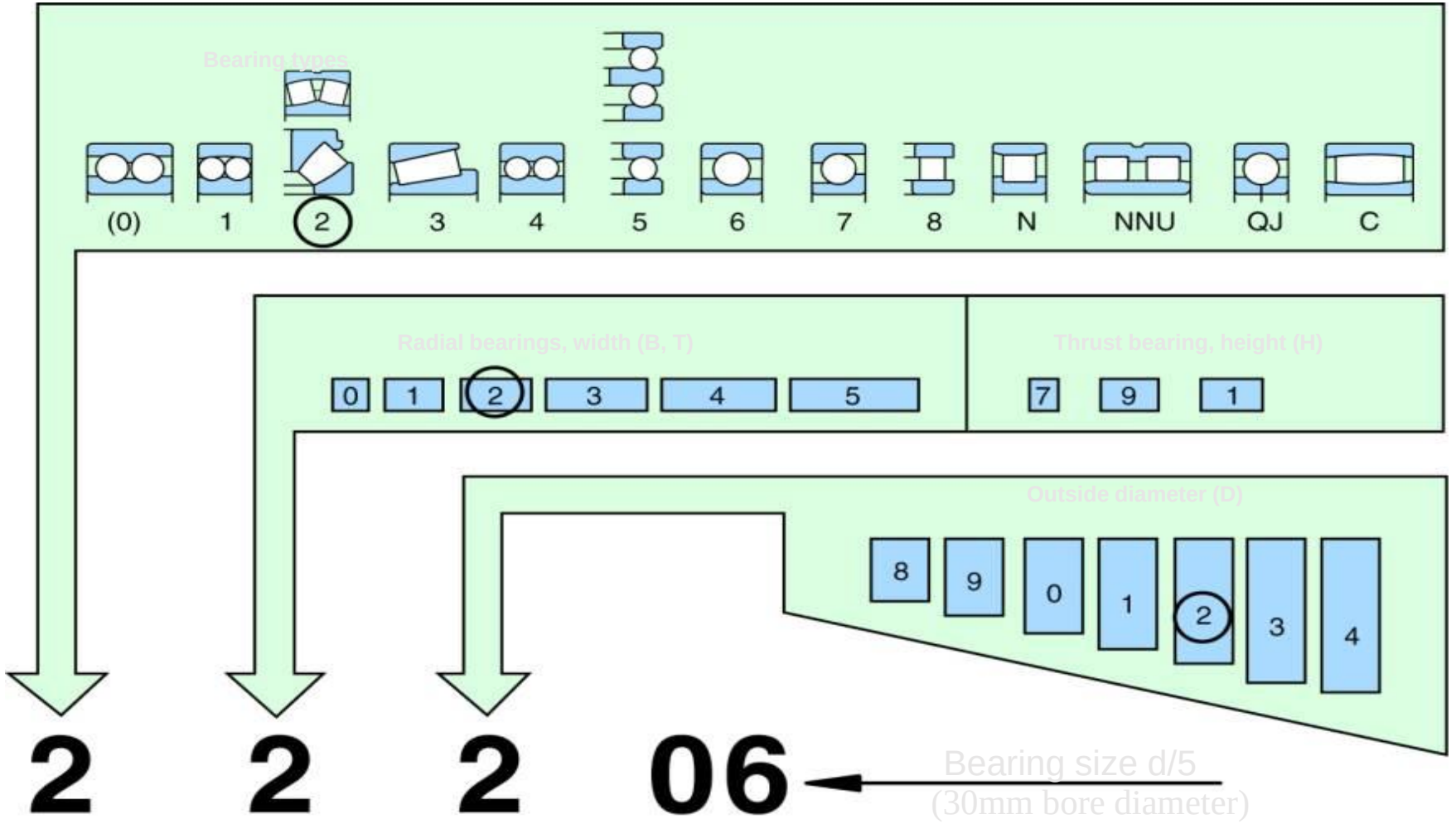
Basic Designation ----- Bore diameter

Bore	Designation	Example
500	/ 500	241 / 500
530	/ 530	239 / 530

Bearing Designation System



How the Designation System Works



Supplementary Designation

The supplementary designations consist of both prefixes and suffixes

Prefix

W 6202– Stainless Steel

Suffix

3204 ATN9

Supplementary Designation - - - Prefix

Prefixes identify component parts of a bearing

Prefix

IR – 5 X 8 X 12

AR : Ball and cage assembly or roller and cage assembly

IR : Inner ring of radial bearing

OR : Outer ring of radial ring

L : Removable inner or outer ring of a separable bearing

R : Separable bearing without inner or outer ring

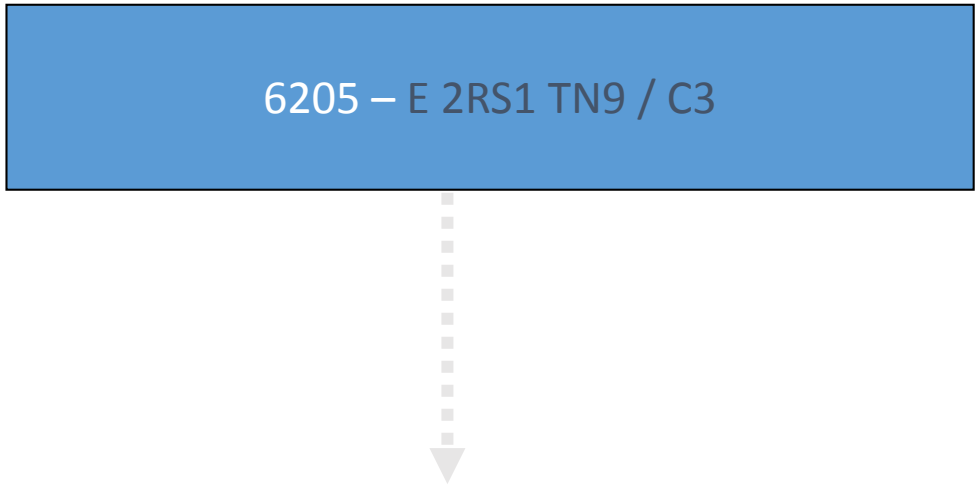
K : Cylindrical roller and cage thrust assembly

Supplementary Designation - - - Suffix

✓The suffixes identify designs that differ from the original design.

✓They are divided into four groups.

- Internal design
- External design
- Cage design
- Variants.



E	2RS1	TN9	C3
Internal design	External design	Cage design	Variant

Suffix - - - Internal design

E	2RS1	TN9	C3
Internal design	External design	Cage design	Variant

✓Bearings with suffix of A,B,C,D,E or any combination of these have a deviating or modified internal design.

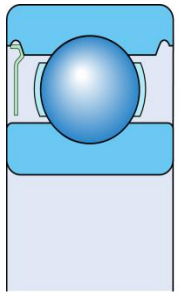
✓The standard boundary dimensions are the same

Suffix - - - External design

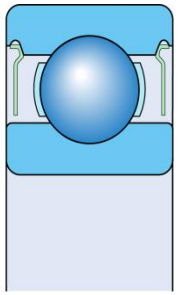
E	2RS1	TN9	C3
Internal design	External design	Cage design	Variant

✓External design denotes modifications such as to the outer ring during during the manufacturing process so that the bearing accepts seals , shields or snap rings

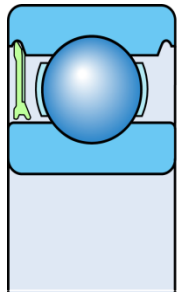
Suffix - - - External design



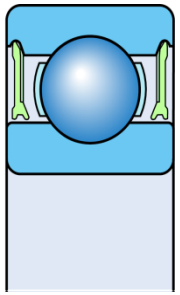
Z



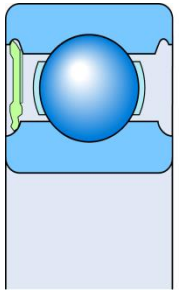
2Z



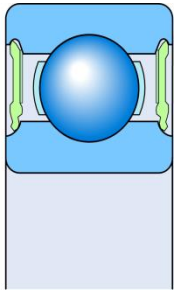
RZ



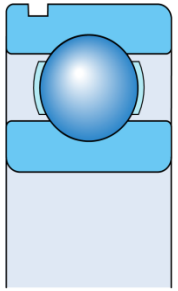
2RZ



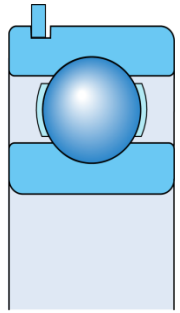
RS



2RS



NU

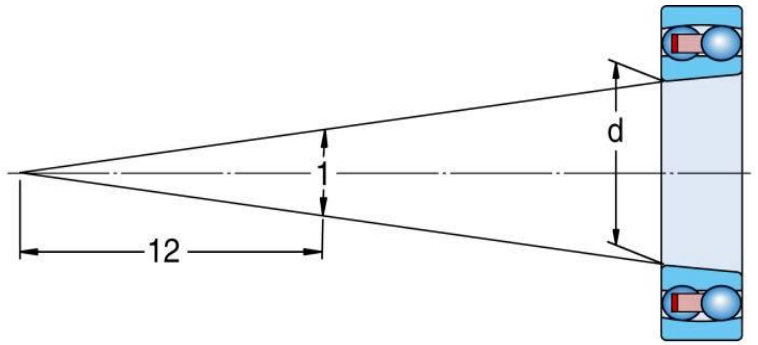


NR

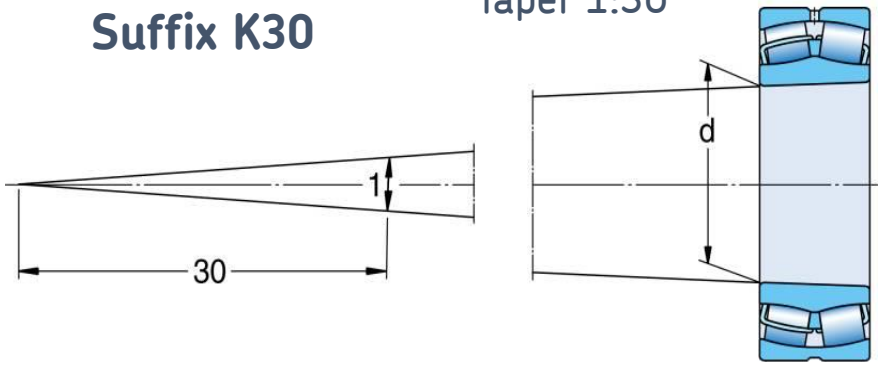
Suffix - - - External design

✓ Another example of modification to the external design is suffix K for bearing with a conical (tapered) bore

Suffix K Taper 1:12



Suffix K30 Taper 1:30



Suffix - - - Cage design

F	2RS1	TN9	C3
Internal design	External design	Cage design	Variant

F : Machined cage of steel or special cast iron

J : Pressed steel cage

M : Machined brass cage

TN9 : Injection moulded cage of glass fibre reinforced polyamide 6,6

✓The cage suffix specifies :

P : Injection moulded cage of glass fibre reinforced polyamide 6,6

- how the cage is manufactured
- and what material it is made of

V : Bearing without cage (with full complement of rolling elements)

Suffix - - - Variant

E	2RS1	TN9	C3
Internal design	External design	Cage design	Variant

✓Variant suffixes are placed at the end of the designation , after an oblique stroke.

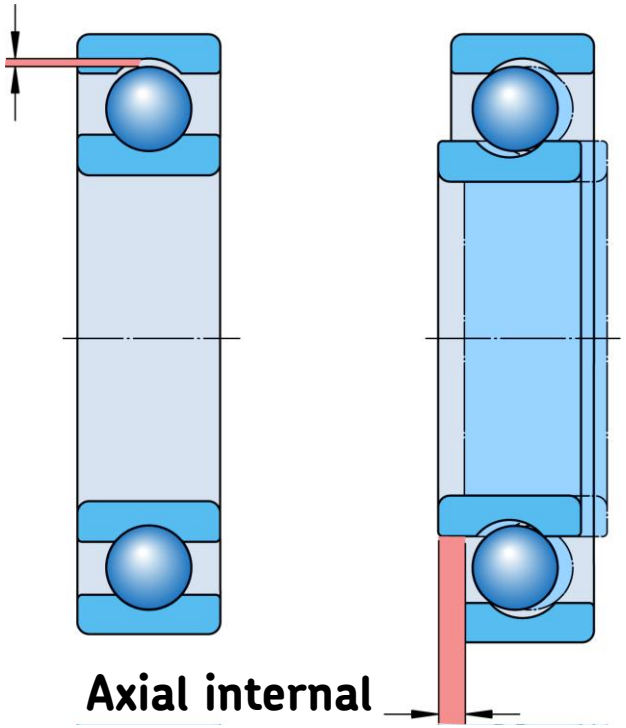
✓ Examples of common variant suffixes are :

- Clearances
- Heat treatment
- Lubrication

Suffix - - - Variant

Clearance

Radial internal clearance



Axial internal clearance

C1 clearance less than C2
C2 clearance less than Normal
C3 clearance greater than Normal
C4 clearance greater than C3
C5 clearance greater than C4

CA small axial internal clearance
CB axial internal clearance greater than CA
CC axial internal clearance greater than CB

CG Zero clearance

GA Light preload

GB Preload greater than GA

Suffix - - - Variant

Material , Heat treatment

✓ A variant suffix can describe material and heat treatment of an entire bearing or part of a bearing.

✓Examples :

HA3 : Case hardened inner ring

HB1 : Bainite hardened outer ring

HC5 : Silicon nitride rolling element.

Suffix - - - Variant

Lubrication

✓ The suffix used to describe the grease a bearing is filled with , consists of a combination of letters to denote the temperature range

HT : Grease for high temperature (-20°C to +130°C)

MT : Grease for medium temperature (-30°C to +110°C)

LT : Grease for low temperature (-50°C to +80°C)

WT : Grease for wide temperature range(-40°C to +160°C)

Bearing Designation System

QUESTION :

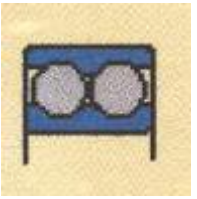
What do you understand with the bearing designation

6205-ERS1M/C3LT

Bearing Designation System

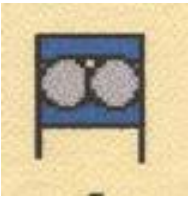
(0) **Angular contact ball bearing, double row**

e.g. 3217, 3307 A-2RS1



1 **Self Align ball bearing**

e.g. 1209 E, 2313 K/C3



2

Spherical roller bearing

e.g. 22222 E, 23028CCK/W33/C4

Spherical roller thrust bearings

e.g. 29230 , 29444 E

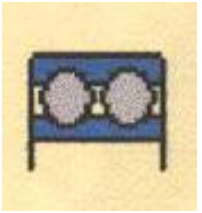
3 **Taper roller bearings**

e.g. 32004 X, 33207

Bearing Designation System

4 **Deep groove ball bearing, double row**

e.g. 4204 A, 4312 A



5 **Thrust bearing**

e.g. 51103, 51317

6 **Deep groove ball bearing, single row**

e.g. 623, 6000, 6209-2Z /C3, 6315-2RS1, 6410 NR

7 **Angular contact ball bearings, single row**

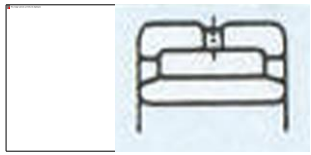
e.g. 7204 BE, 7330 BCB, 7211 BECBP, 7307BEGAJ

Bearing Designation System

8 **Cylindrical roller thrust bearings**
e.g. 81104, 81110

N **Cylindrical roller bearings**
e.g. NU 204 EC, NJ 2304 EC, NNC 4912 V

NA **NK** **Needle roller bearings**
e.g. RNA 4902, NK 20/20, NKS 50



QJ **Four-point contact ball bearings**
e.g. QJ 304, QJ 210

T **Taper roller bearings**
(Bearing with dimensions to ISO 355. Taper roller bearings belonging to an American standard series are classified separately)