

A detailed cross-sectional illustration of a spherical roller bearing. The image shows the internal components: two outer rings (races) with spherical inner surfaces, several cylindrical rollers arranged between them, and a cage that holds the rollers in place. The rollers are shaded with a yellow-to-orange gradient, while the races and cage are in shades of gray. The perspective is from the side, showing the curved geometry of the races.

Rollway spherical roller bearing

Quick Reference Guide

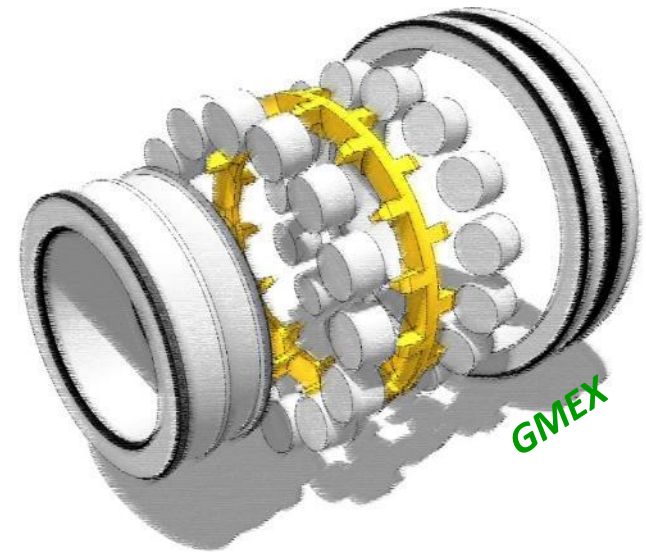
Design, properties and applications

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Part 1

Bearing characteristics

- *Exploded views*
- *Characteristics*
- *Application radar*
- *Series*
- *Nomenclature*



Cage types

Design

Selection

Fit

Mounting

Industry



C-cage

CA-cage

GMEX-cage

MB-cage

VS F80 C4-cage

MAF80C4 - cage

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Exploded view C-cage



FLOATING RING

- 1 pressed steel floating ring

CAGE:

- 2 piece cage made from pressed steel sheet
- Guided on the floating ring

OUTER RING

- Includes lubrication groove and 3 holes (W33)

INNER RING

- Design without flanges or ribs

ROLLERS

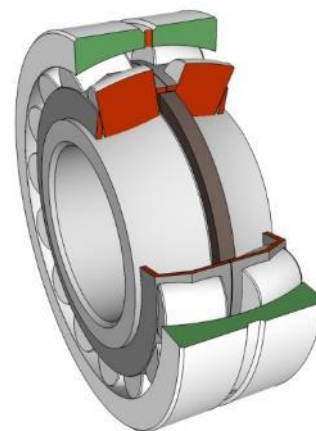
- Symmetrical profile
- 2 rows

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C - type features



- Outstanding radial load carrying capacity.
- High axial load carrying capacity.
- High noise level: steel cage absorb less noise.
- Lubrication with grease or oil.
- Available series:



CAGE	bore in mm	213	222	223	230	231	232	238	239	240	241	248
C	25 - 280	X	X	X	X	X	X		X		X	

Exploded view CA-cage

CAGE:

- 1 piece machined brass cage
- Guided on the rollers
- Asymmetrical pockets position

INNER RING

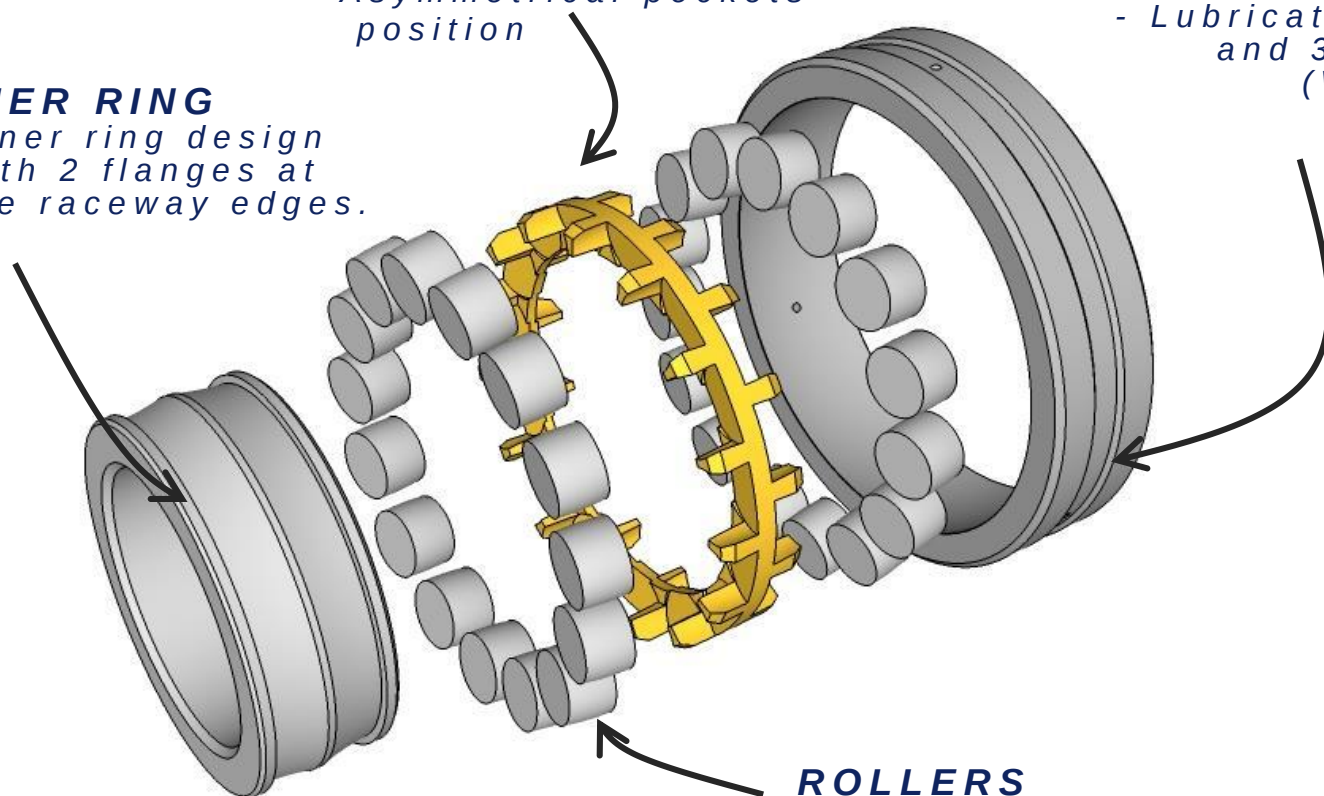
- Inner ring design with 2 flanges at the raceway edges.

OUTER RING

- Lubrication groove and 3 holes (W33)

ROLLERS

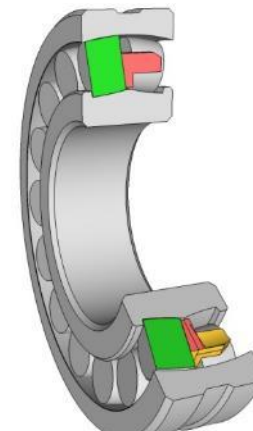
- Symmetrical profile
- 2 rows



CA - type features



- Outstanding radial load carrying capacity.
- Good axial load carrying capacity.
- Low noise level: Brass cage absorbs noise
- Limited axial movement of the rollers due to the inner ring flanges.
- Lubricate with grease or oil..
- Available series:



CAGE	bore in mm	213	222	223	230	231	232	238	239	240	241	248
CA	20 - 1800	X	X	X	X	X	X	X	X	X	X	X

Exploded view GMEX-cage



CAGE:

- Robust, single piece brass cage
- Guided on the rollers
- Asymmetrical pockets position

OUTER RING

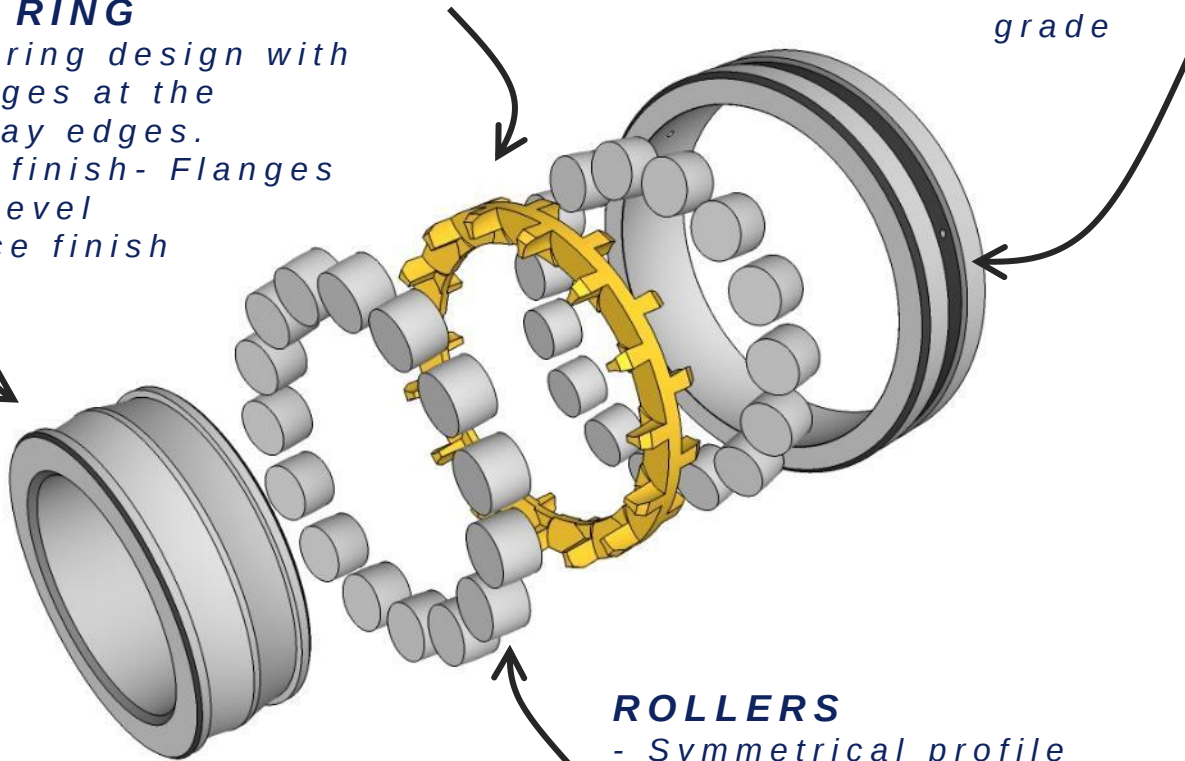
- lubrication groove and 3 holes(W33)
- Black finish- W33
- Made from higher steel grade

INNER RING

- Inner ring design with 2 flanges at the raceway edges.
- Black finish- Flanges
- High level surface finish

ROLLERS

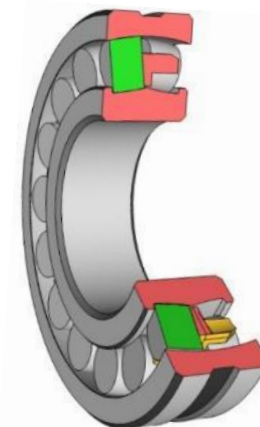
- Symmetrical profile
- 2 rows



GMEX - type features



- *Optimized precision and roundness. High level surface finish.*
- *Low noise due to less friction and considerable power consumption reduction.*
- *Rings and rollers are manufactured in high grade ROL2 steel.*
- *Outstanding radial load carrying capacity.*
- *Good axial load carrying capacity.*
- *Lubricate with grease or oil.*
- *Available series:*



CAGE	bore in mm	213	222	223	230	231	232	238	239	240	241	248
GMEX	25 - 140	X	X	X								

Exploded view MB-cage



Design

Selection

Fit

Mounting

Industry

INNER RING

- Design with 2 flanges at the raceway edges and a central rib

CAGE:

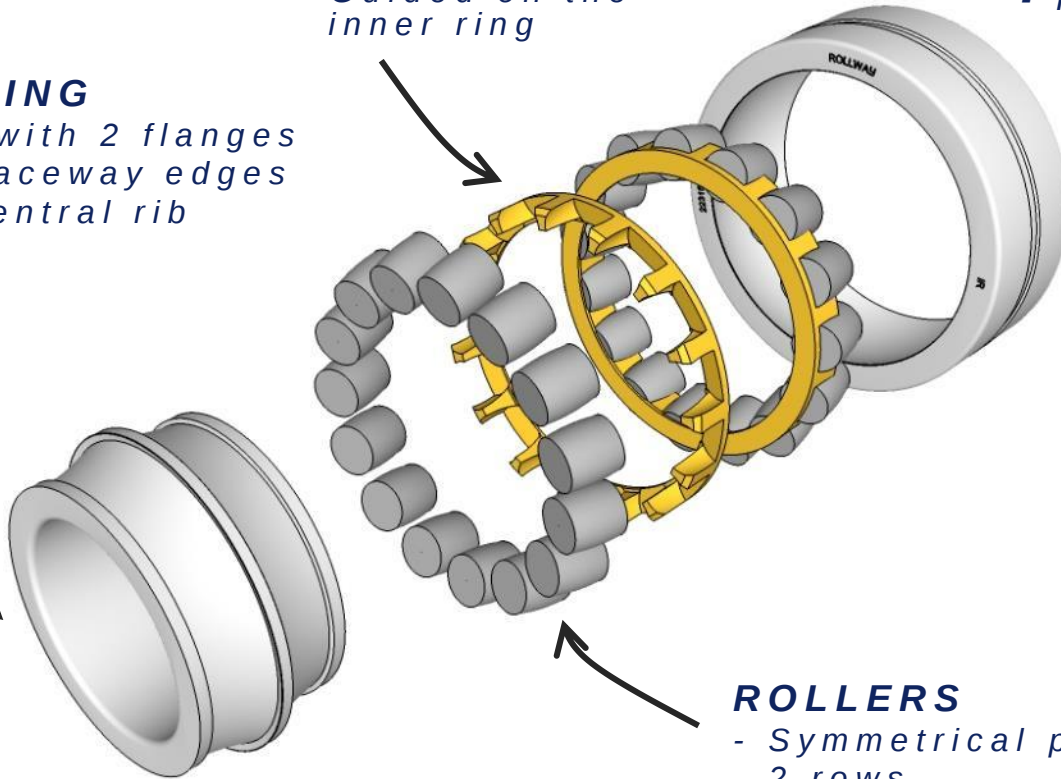
- 2 piece machined brass cages
- Guided on the inner ring

OUTER RING

- Includes lubrication groove and 3 holes (W33)

ROLLERS

- Symmetrical profile
- 2 rows



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MB - type features

Design

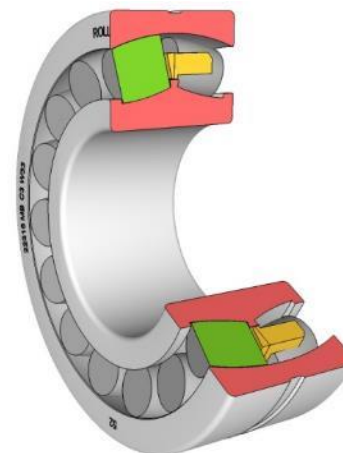
Selection

Fit

Mounting

Industry

- Outstanding radial load carrying capacity.
- Fair axial load carrying capacity.
- Low noise level: Brass cage
- Less internal friction due to 2 independent cages.
- Lubricate with grease or oil.
- Available series:



CAGE	bore in mm	213	222	223	230	231	232	238	239	240	241	248
MB	20 - 340	X	X	X	X	X	X					

Exploded view VS C4 F80-cage



CAGE:

- 1 piece machined brass cage
- Guided on the outer ring
- Asymmetrical pockets position
- 2 mounting flats surfaces

OUTER RING

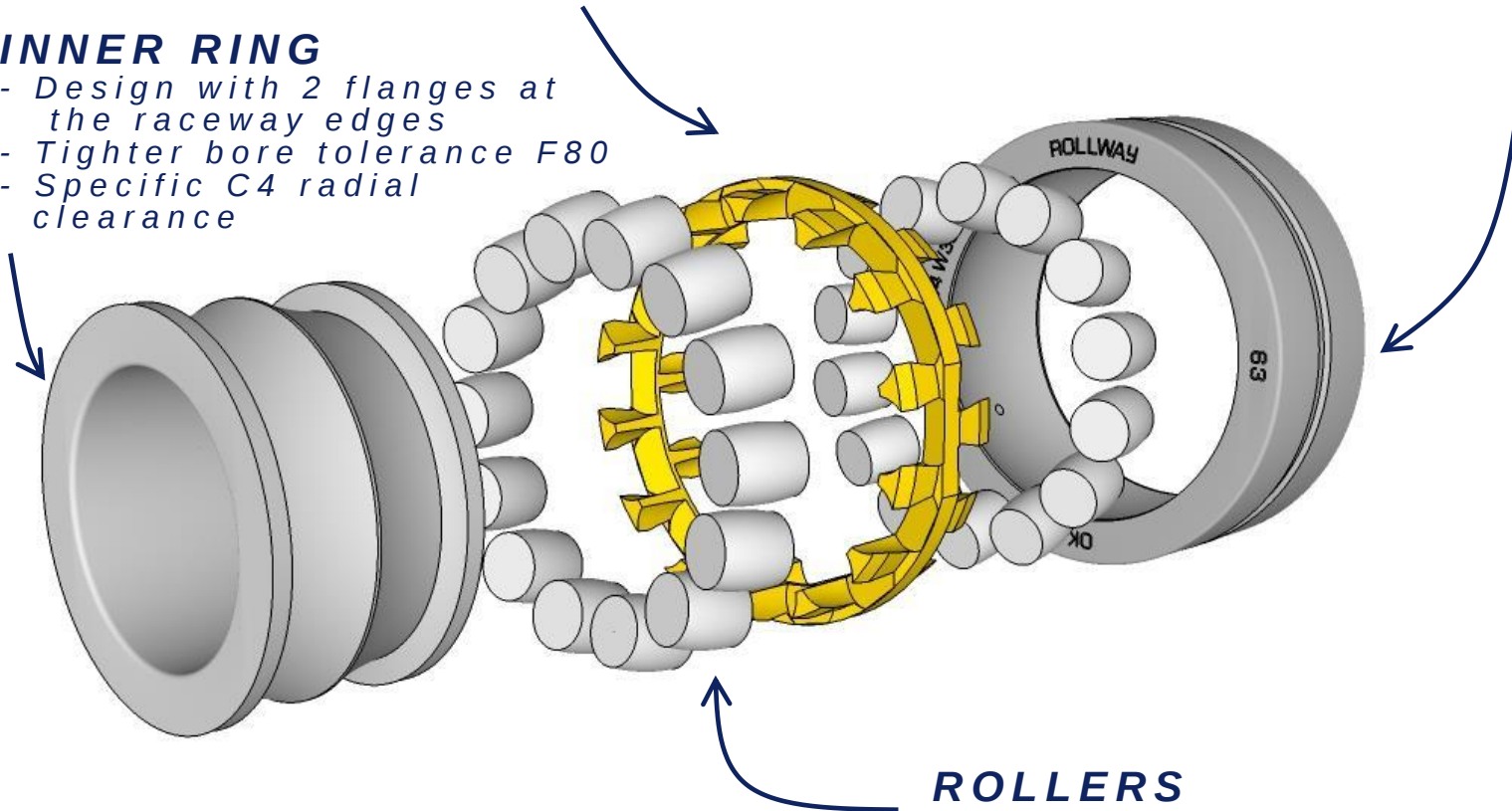
- Lubrication groove and 3 holes (W33)
- Tighter OD tolerance F80

INNER RING

- Design with 2 flanges at the raceway edges
- Tighter bore tolerance F80
- Specific C4 radial clearance

ROLLERS

- Symmetrical profile
- 2 rows



VS C4 F80 - type features



- *Typical design for vibration screen application.*
- *F80 tighter tolerance set for bore and out side diameter.*
- *Modified C4 clearance set. Between C4 (mid-upper) and C5 (lower-mid)*
- *Outstanding radial load carrying capacity.*
- *Fair axial load carrying capacity.*
- *Optimized internal lubrication flow due to inner ring design without central flange.*
- *Lubrication with oil recommended.*
- *Available series:*



CAGE	bore in mm	213	222	223	230
VS F80 C4	45 - 150			X	

Exploded view MA C4 F80 - type

Design

Selection

Fit

Mounting

Industry

INNER RING

- Design with 2 flanges at the raceway edges and 1 central rib
- Tighter bore tolerance (F80)
 - Specific C4 radial clearance

CAGE:

- 2 piece machined brass cages
- Guided on the outer ring
- 2 mounting flats surfaces

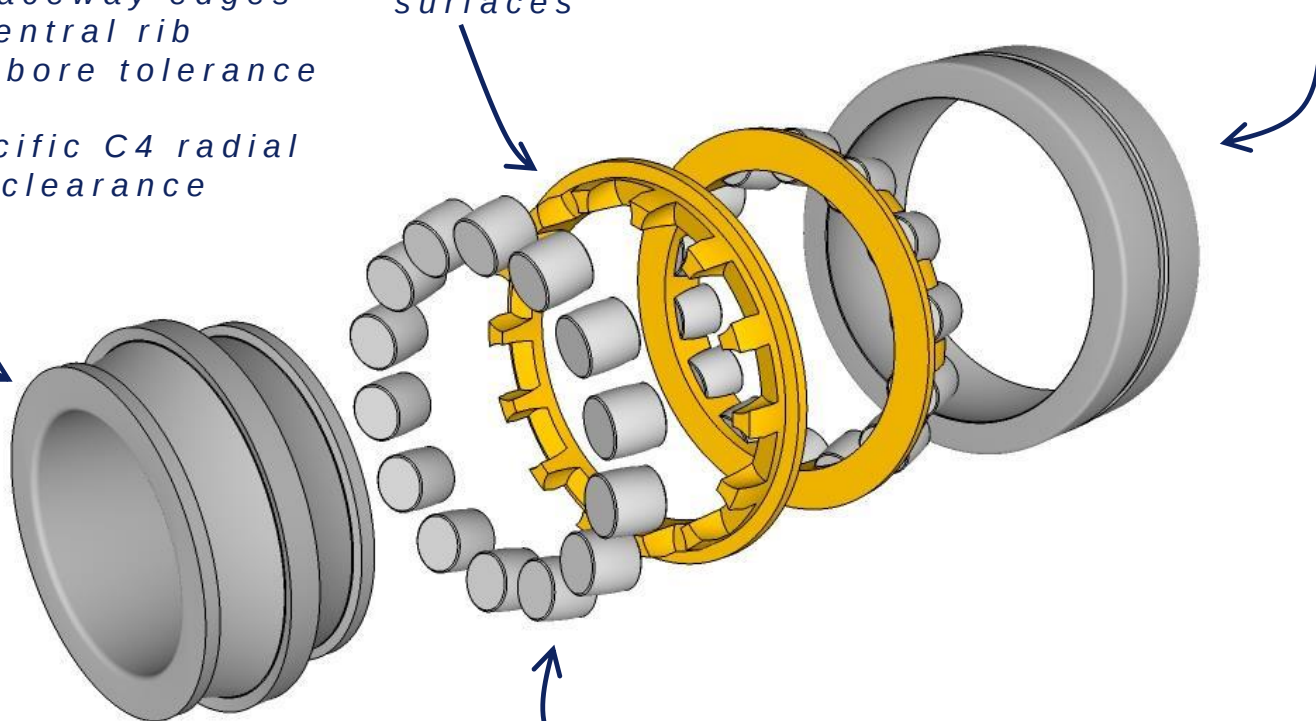
OUTER RING

- Lubrication groove and 3 holes (W33)
- Tighter OD tolerance F80



ROLLERS

- Asymmetrical profile
- 2 rows

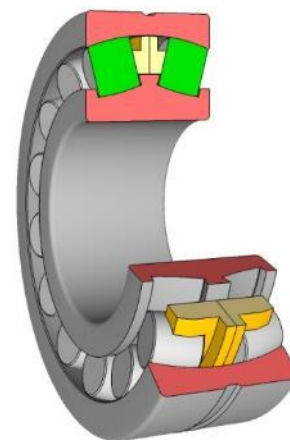


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MA C4 F80 - type features



- *Typical design for vibration screen application.*
- *F80 tolerance set for bore and out side diameter.*
- *Modified C4 clearance set.*
- *Outstanding radial load carrying capacity.*
- *Fair axial load carrying capacity.*
- *Limited axial movement of the rollers.*
- *Lubrication with oil recommended.*
- *Available series:*



CAGE	bore in mm	213	222	223	230
MA F80 C4	150 - 200			X	

Cage pro and con



Cage type	C	CA	GMEX	MB	VS F80 C4	MA F80 C4
Material	Steel	Brass	Brass	Brass	Brass	Brass
Mass	Light	Heavy	Heavy	Heavy	Heavy	Heavy
Cage volume	Small	Large	Large	Large	Large	Large
Roller stability	👎	👍	👍	👍👍	👍	👍👍
Out of balance forces	👍	👍	👍	👍👍	👍👍👍	👍👍👍
Shock absorption	👎	👍	👍	👍	👍👍👍	👍👍👍
Temperature range	👍👍	👍👍	👍👍	👍👍	👍👍	👍👍
Heat dissipation	👎	👍	👍	👍	👍	👍
Speed	👍👍	👍👍	👍👍	👍	👍👍	👍
Chemical resistance	👍👍	👍	👍	👍	👍	👍
Axial load carrying	👍👍👍	👍👍	👍👍	👍	👍	👍

Design

Selection

Fit

Mounting

Industry

Nomenclature

Prefix:

Basic number:

Suffix



Type

B&D serie

Bore diameter (d)

A

B

C

D

E

2

1

3

5

0

CA K C3 W33 P6 S2

A
2

B
1
2
3
4

C
0
1
2
3
8
9

Bore diameter is:

$50 \times 5 = 250 \text{ mm}$

or

$213/500 \Rightarrow 500 \text{ mm}$

- Cage: C - CA - CAF - MB - GMEX - VSF80 - MAF80
- Tapered bore: K - K30 (for 240 & 241 serie)
- Radial clearance: C2 - C0 - C3 - C4 - C5
- Lubrication: W33 - W20 - W...
- Precision class: P0 - P6
- Operating temperature: S0 - S1 - S2

C0 - P0 - S0 are omitted in the designation

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Design

Selection

Fit

Mounting

Industry

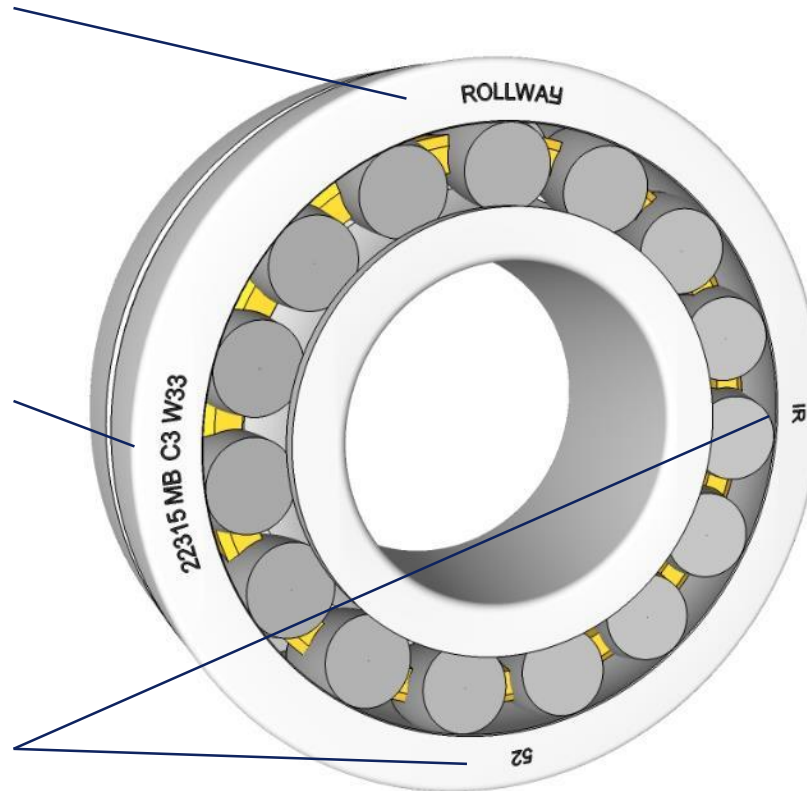
Marking



- *Brand name*

- *Bearing type*

- *Production codes*



Genuine packing



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Design

Selection

Fit

Mounting

Industry

Part 2

Bearing selection criterias

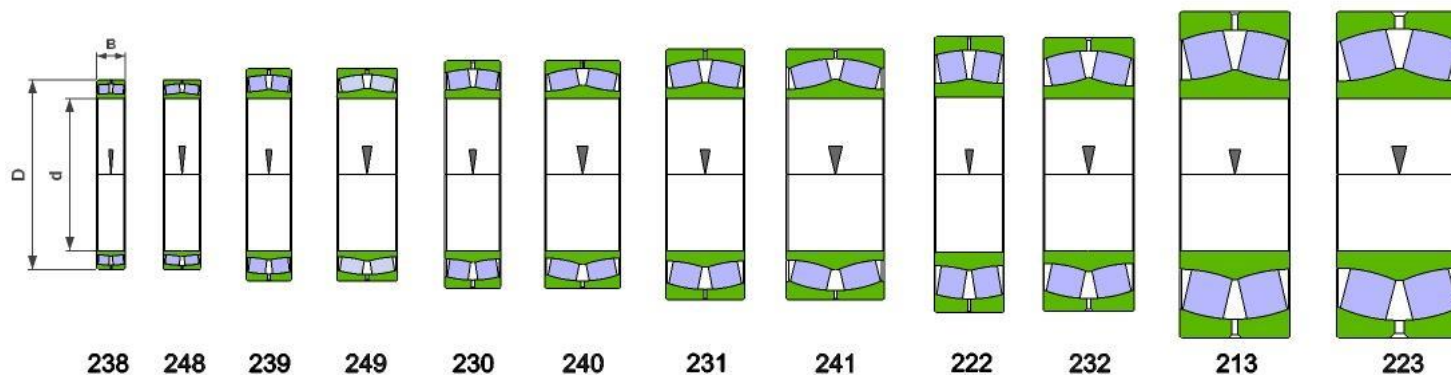
- *Available space*
- *Materials*
- *Load magnitude and direction*
- *Bearing L10 life calculation*
- *Load and speed*
- *Noise, speed and friction*
- *Misalignment*
- *Radial clearance*
- *Precision class*
- *Mounting and dismounting*



Dimensions



- Boundary dimensions as per ISO 15
- Available series:



CAGE	bore in mm	213	222	223	230	231	232	238	239	240	241	248
C	25 - 280	X	X	X	X	X	X	X	X	X	X	X
CA	20 - 1800	X	X	X	X	X	X	X	X	X	X	X
GMEX	25 - 140	X	X	X								
MB	20 - 340	X	X	X	X	X	X					
VS F80 C4	45 - 140			X								
MA F80 C4	150 - 200			X								

Material



- Ring material: 100Cr6 (nr.:1.3505) or 100CrMnSi6-4 (nr.:13520)

Steel grade		Chemical Composition %					
		C	Mn	Si	Cr	S	P
ROL1	100 Cr6	0.90..1.05	0.25..0.40	0.15..0.35	1.40..1.65	<0.025	<0.025
	100 CrMnSi6-4	0.90..1.05	1.00..1.20	0.50..0.70	1.40...1.60	0.020	<0.025
ROL 2 (GMEX)		0.94~1.04	0.25~0.45	0.15~0.35	1.40~1.60	≤0.012	≤0.020

- Max. operating temperature:

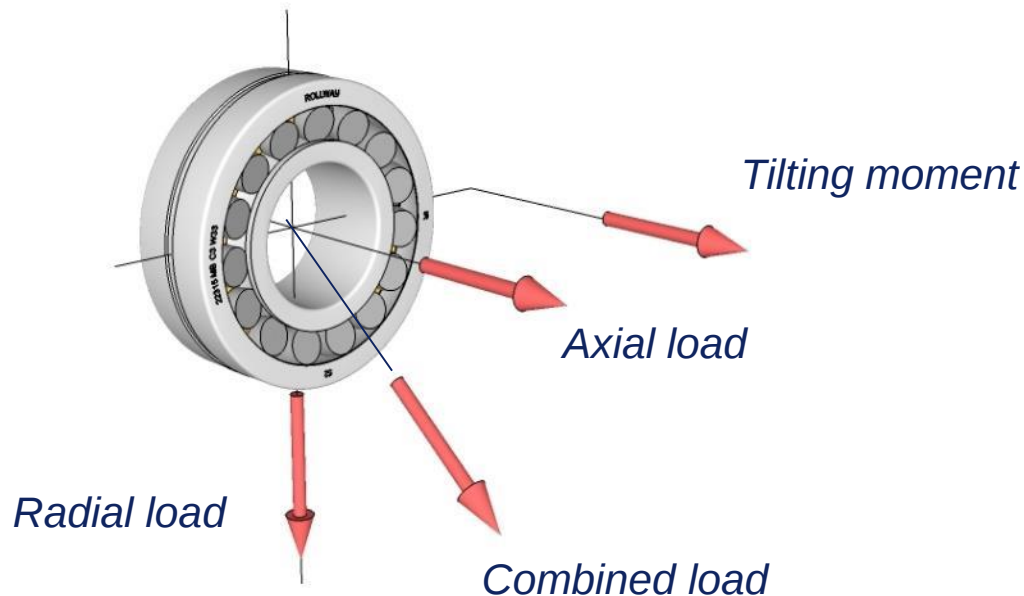
Suffix	S0	S1	S2	S3
Operating temperature in °C	< 150	< 200	< 250	< 300
Life time reduction factor	1	0.73	0.42	0.22

- Heat treatment: through hardened or case hardened (on request)
- Hardness basic: 58 HRc - 64 HRc
GMEX: 58 HRc - 62 HRc

Load magnitude and direction



- Dynamic load (C) rating as per ISO 281
- Normal radial load (F_r) is ≈ 0.10 of bearing dynamic load rating
- Minimum radial load is ≈ 0.02 of bearing dynamic load rating
- Maximum permissible axial load is $F_a < F_r \times e$ (see data table)



Precision class



- Bearing precision class as per ISO 492
- Bore diameter (Vdp) - Outside diameter (VDp) - Width (VBs)
- Run out (Kia / Kea) - Out of roundness (Vdmp) - Taper
- Suffixes: P0 - P6 - P5 - P4 - P2
- SRB are standard available in P0 (normal)
- Typical precision table for tapered bore
- For vibration screen bearings: F80 tolerance set

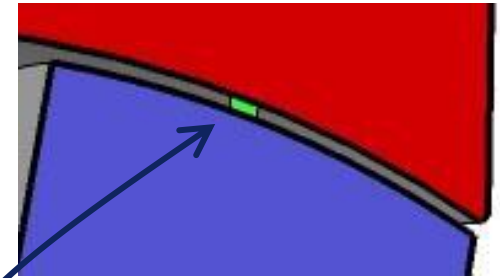
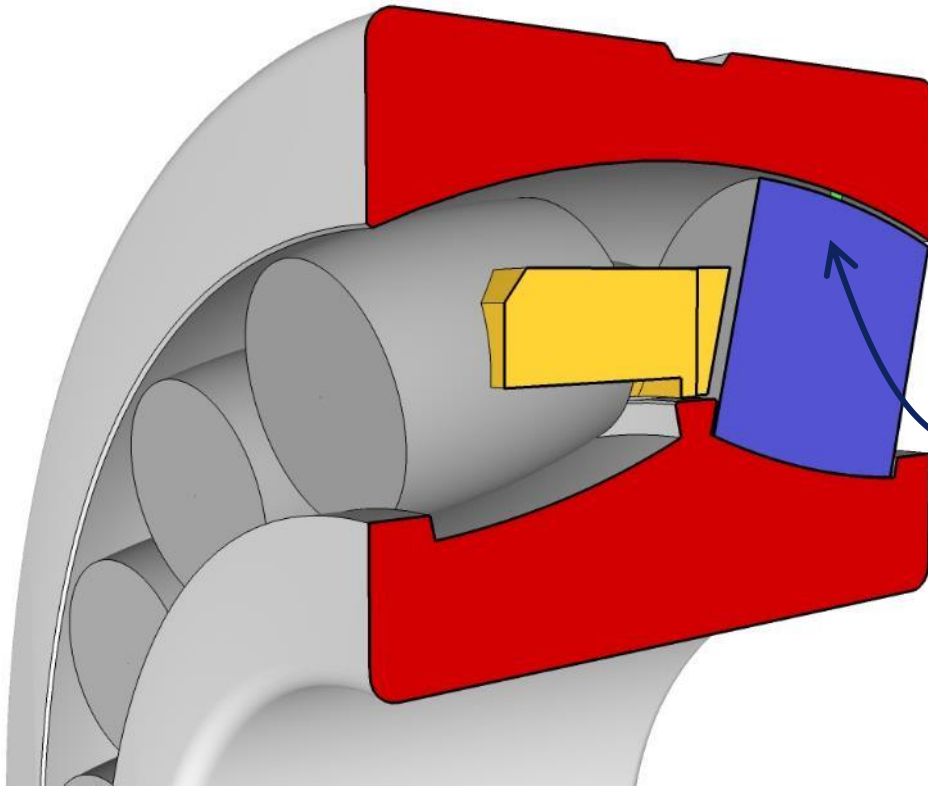
DIN SYSTEM	ISO SYSTEM	ABEC SYSTEM
P0		ABEC 1
P6	Class 6	ABEC 3
P5	Class 5	ABEC 5
P4	Class 4	ABEC 7
P2	Class 2	ABEC 9



Radial clearance



- Radial clearance as per ISO 5753 (C2-CN-C3-C4-C5)

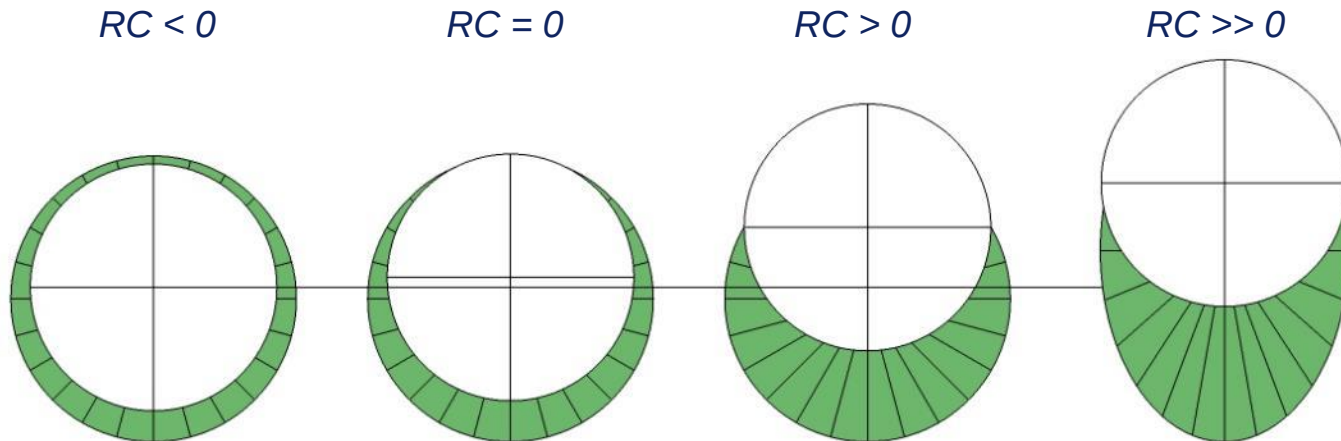


*Is the air space between the upper roller and the outer ring when the bearing is in vertical position.
Must be measured over the total length of the roller.*

Radial clearance (RC)



- *Compensate the thermal expansion from the inner ring (IR)*
- *Compensate IR expansion / OR contraction due to the fits*
- *Under load, the RC will increase due to material elasticity*
- *High speed will generate more heat. Bigger RC is recommended*
- *IR temperature is $\approx 10^{\circ}\text{C}$ warmer than OR*



Green area is load distribution

Radial clearance

- Radial clearance selection guidelines



RADIAL CLEARANCE	SHAFT SEAT INTERFERENCE FIT	HOUSING SEAT INTERFERENCE FIT	TEMPERATURE
			T° _{SHAFT} >>> T° _{HOUSING}
C2	NO	NO	NO
CN	YES / NO	NO / YES	YES
C3	YES	YES	NO
C4	YES	YES	YES

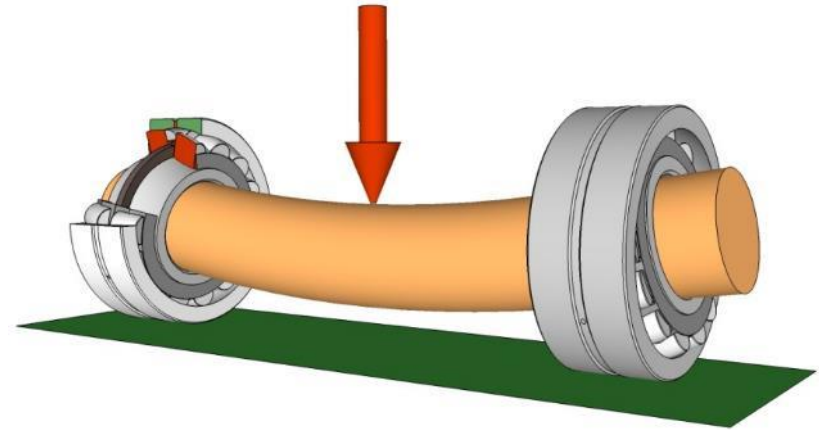
- Under normal operating condition:

T°inner ring is +10° / +15°C regarding the outer ring.

Misalignment



- *Origin:*
 - *The shaft bends due to the operating load*
 - *The housings are not perfectly aligned. (separated)*
- *Misalignment will shorten life time and increase noise*



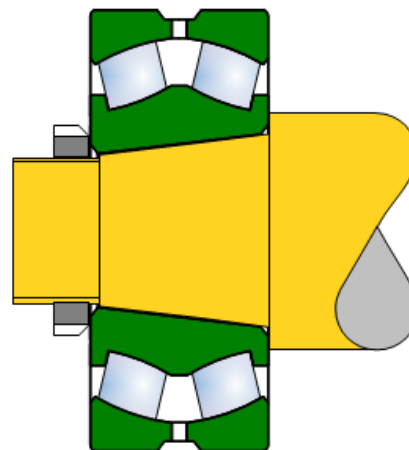
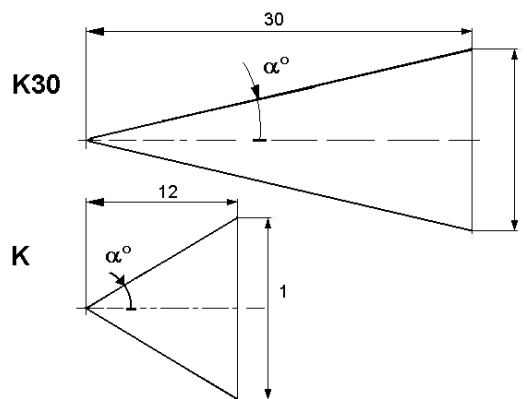
- *Misalignment values:*

Series	213	222	223	230	231	232	238	239	240	241
Misalign. in Deg°	1°	1.5°	2°	1.5°	1.5°	2.5°	1°	1.5°	2°	2.5°

Tapered bore



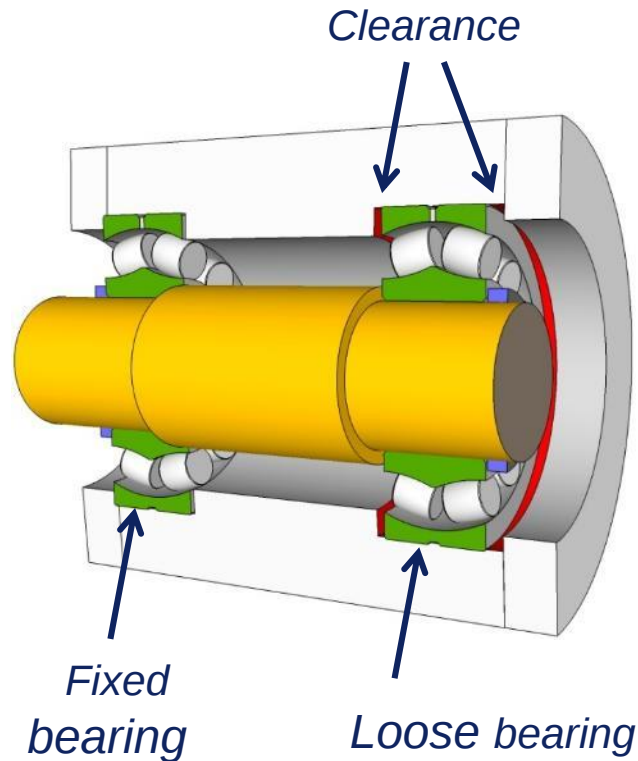
- *Standard* $1:12$ $\alpha = 2^\circ 23' 9.4''$ *suffix: K*
- *Series 240 and 241* $1:30$ $\alpha = 0^\circ 57' 17.4''$ *suffix: K30*
- *Radial clearance adjustment*
- *Easy mounting / dismounting*
- *Use of sleeves*
- *Respect mounting data table*



Axial displacement



- One bearing should move relative to the opposite bearing
- Depends on:
 - Extension of shafts
 - Heat
 - Vibrations



Part 3

Mounting fit and machining

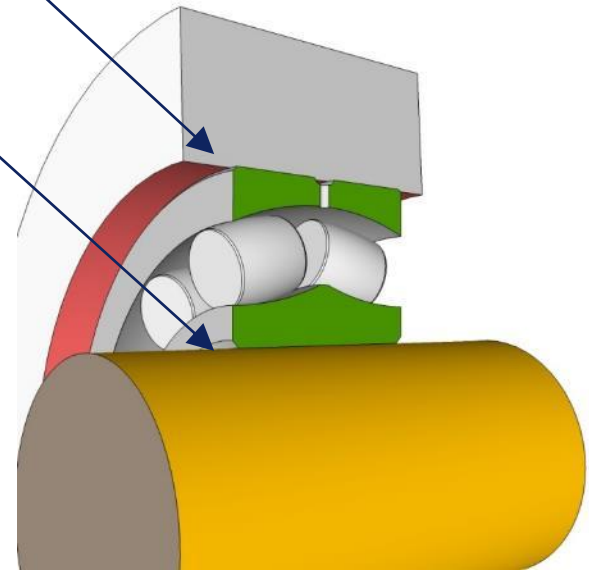
- *Mounting fit*
- *Shaft and housing machining*
- *Tapered shaft*



Mounting fit

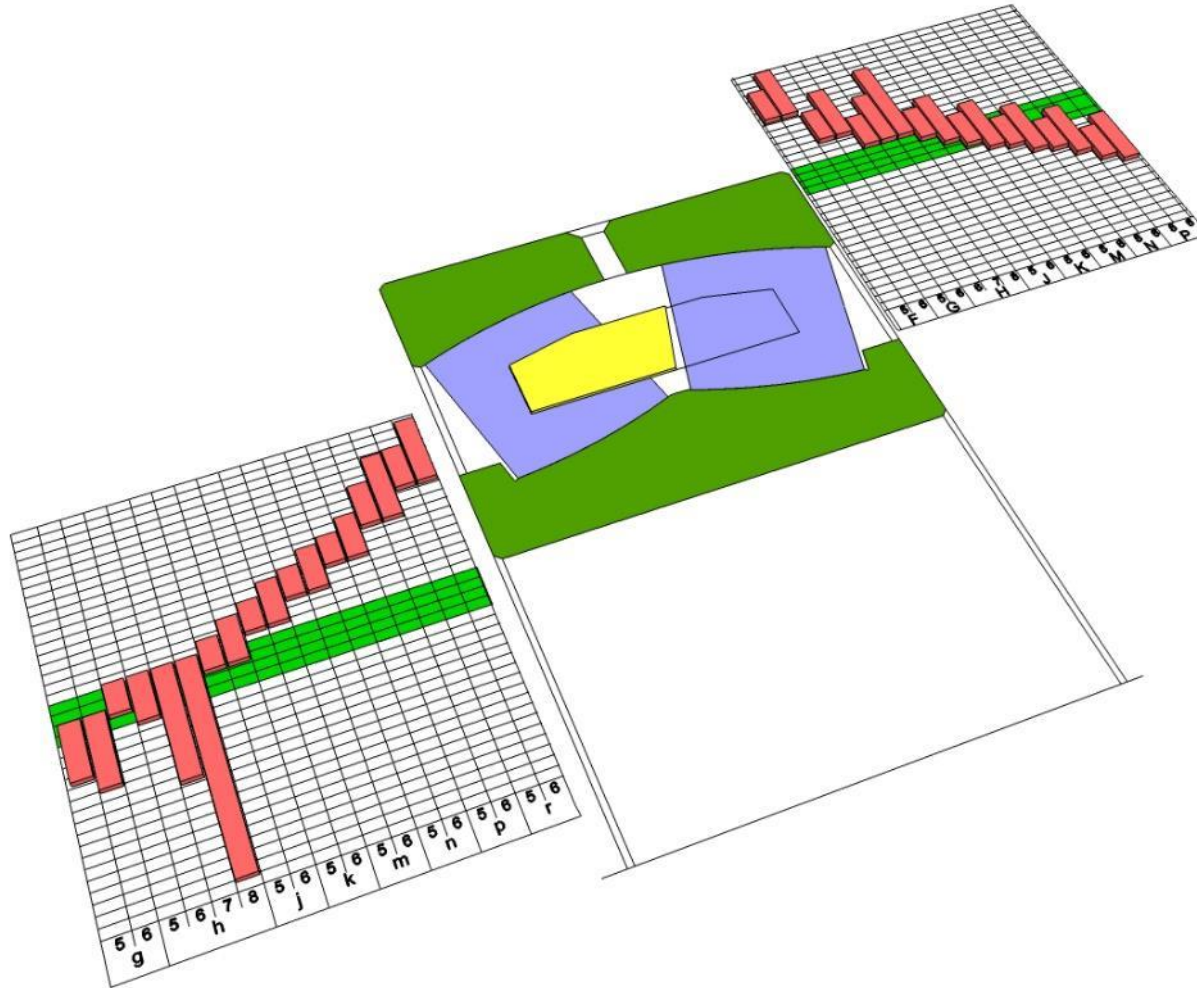


- To promote satisfactory performance under variable operating conditions
 - The outer ring and the housing
 - The inner ring and the shaft
- Fit selection depends of:
 - Load magnitude
 - Turning ring
 - Vibrations
 - Shaft material
 - Shaft size
- Fit Influence the radial clearance



Mounting fit

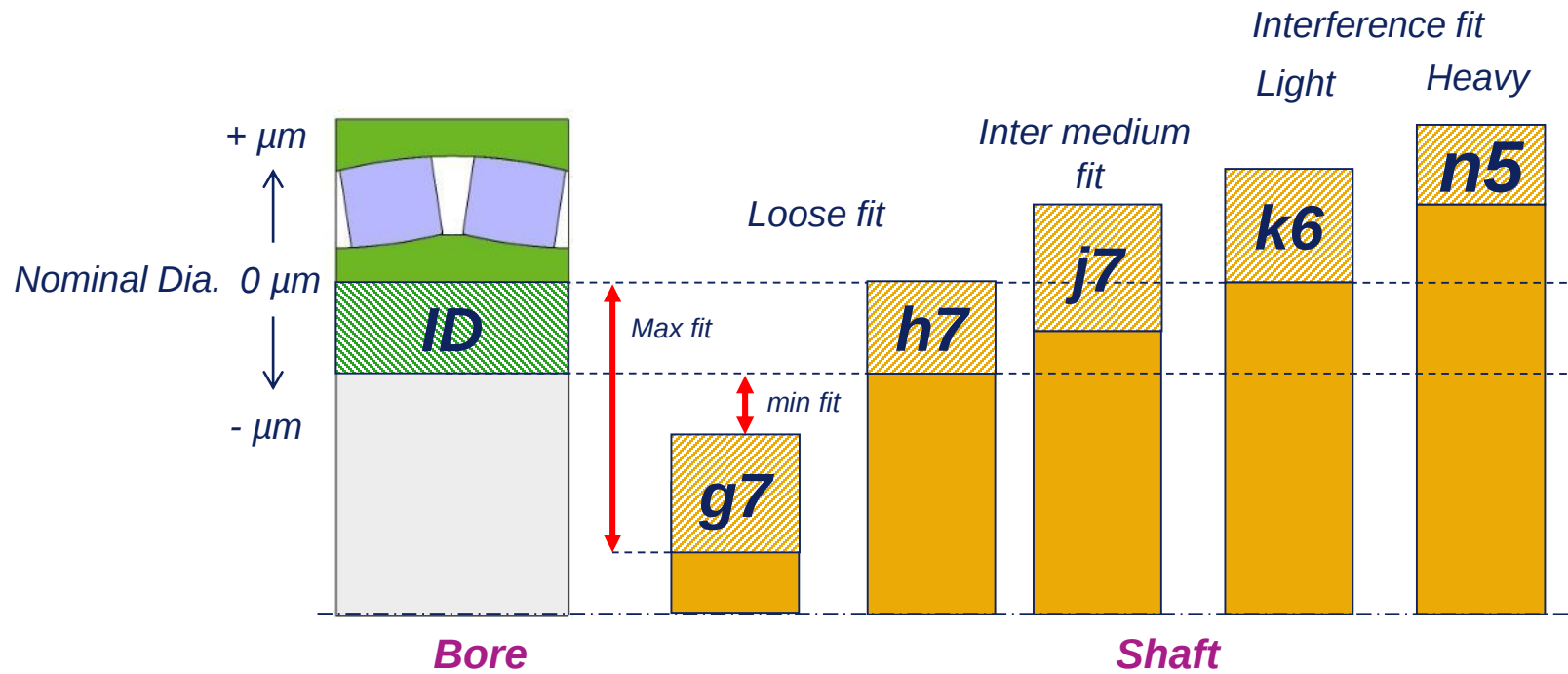
- *Shaft & housing fit*



Shaft fit



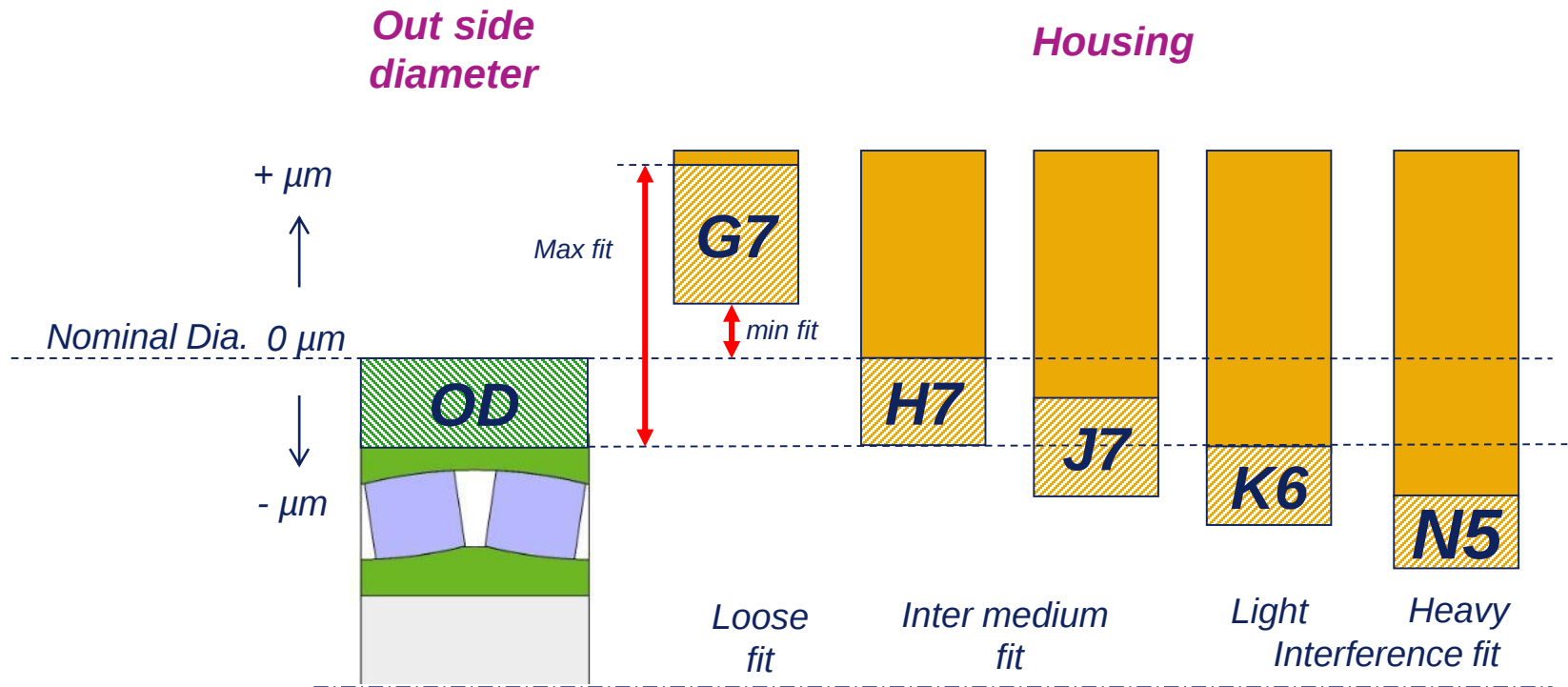
- Shaft fit



Housing fit



- Housing fit



Part 4

Bearing mounting guidelines

- *Storage*
- *Tips & tricks*
- *Cleanness*
- *Cylindrical bore*
- *Tapered bore*
- *Recommendation.*
- *Dismounting*
- *Maintenance*
-



Storage guidelines

Design

Selection

Fit

Mounting

Industry

- *Genuine packing remain close*
- *Horizontal position*
- *Shock free*
- *Micro vibration free*
- *Dry area*
- *Preservation oil film (2 year)*
- *Long term stock (mounted on the machine):
turn inner ring on regularly bases.*



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Mounting tips and tricks



- *Work in a clean environment*
- *Measure shaft - bore - OD - housing before mounting*
- *Use special tooling*
- *Heating method (oil bath - cooking plate - inductive equipment)*
- *Cooling method*
- *Use an adapter- or withdrawal sleeve*
- *Use hydraulic sleeves for ease mounting*
- *Avoid shocks direct on the bearing*
- *Avoid direct flame*

Design

Selection

Fit

Mounting

Industry

Mounting cleanness



- *Work in clean condition.*
- *Use gloves.*
- *Remove preservation oil film before mounting.*
- *Always cover the bearing before mounting starts.*
Remove protection just before start of mounting operation.
- *Safety must be a priority.*



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Design

Selection

Fit

Mounting

Industry

Mounting



- Measure all components before mounting to avoid mounting issues
 - Shaft
 - Bore
 - OD
 - Housing

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Bearing Mounting Measuring Sheet

Machine: shaft 2
Date: 17/07/2011
Operator: John
Tool: Ext micrometer 100 - 150mm - nr 215.25
Int micrometer 50 - 80mm - nr 0231.28

Bearing: 112 MB C3 W33				112 MB C3 W33			
Shaft	OD	+S / -SE	re	Shaft	OD	+S / -SE	re
	low	middle	upper		low	middle	upper
1	60,0120	60,0130	60,0130	1	60,0130	60,0130	60,0130
2	60,0090	60,0090	60,0090	2	60,0090	60,0090	60,0090
3	60,0150	60,0150	60,0150	3	60,0150	60,0150	60,0150
Bore				Bore			
	low	middle	upper		low	middle	upper
1	60,0120	110,015	60,0100	1	60,0120	110,015	60,0100
2	60,0800	110,020	60,0800	2	60,0800	110,020	60,0800
3	60,0100	110,014	60,0100	3	60,0100	110,014	60,0100
Housing				Housing			
	low	middle	upper		low	middle	upper
1	110,015	110,015	110,015	1	110,015	110,015	110,015
2	110,010	110,010	110,010	2	110,010	110,010	110,010
3	110,014	110,014	110,014	3	110,014	110,014	110,014
OD				OD			
	low	middle	upper		low	middle	upper
1	108,995	108,995	108,995	1	108,995	108,995	108,995
2	108,998	108,998	108,998	2	108,998	108,998	108,998
3	108,997	108,997	108,997	3	108,997	108,997	108,997

Mounting - Bearing with cylindrical bore



- *Impact set mounting tools for medium and light interference fit.*



Mounting - Bearing with cylindrical bore



- *Oil bath heating for light and heavy interference fit.*
- *Special care for cleanness must be taken.*
- *Max bearing temperature should not exceed 80°C above ambient temperature.*



Mounting - Bearing with cylindrical bore



- *Induction heaters*

- *Max +80°C*



- *Portable model*

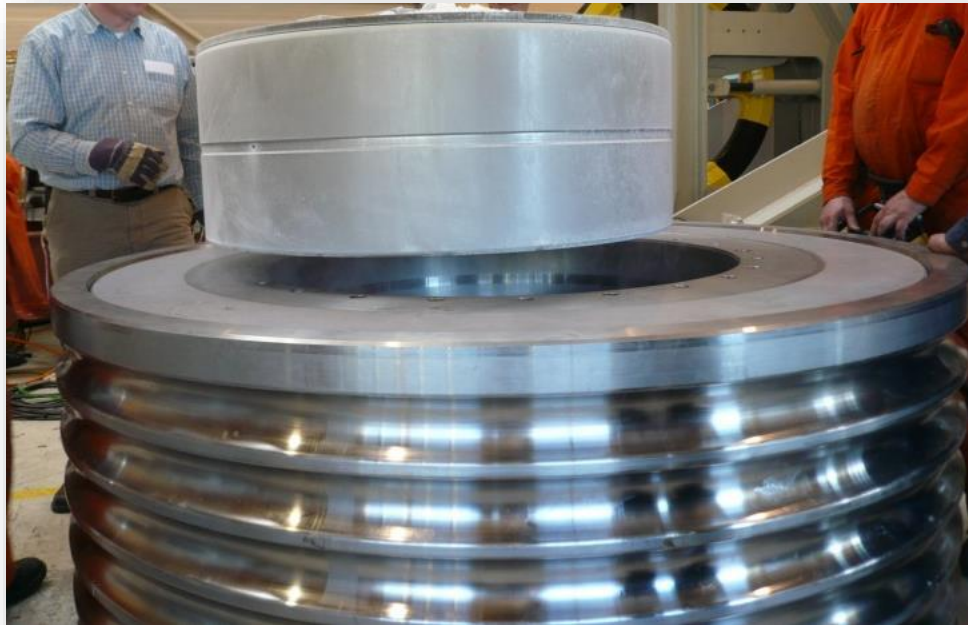
- *Large size bearing*



Mounting - Bearing with cylindrical bore



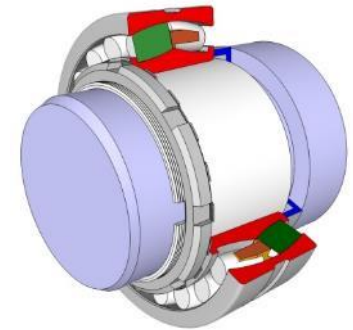
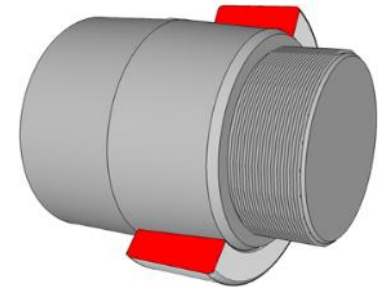
- *Cooling (- 85°C)*
 - *Large size bearing mounting into a pulley*



Mounting - Bearing with tapered bore



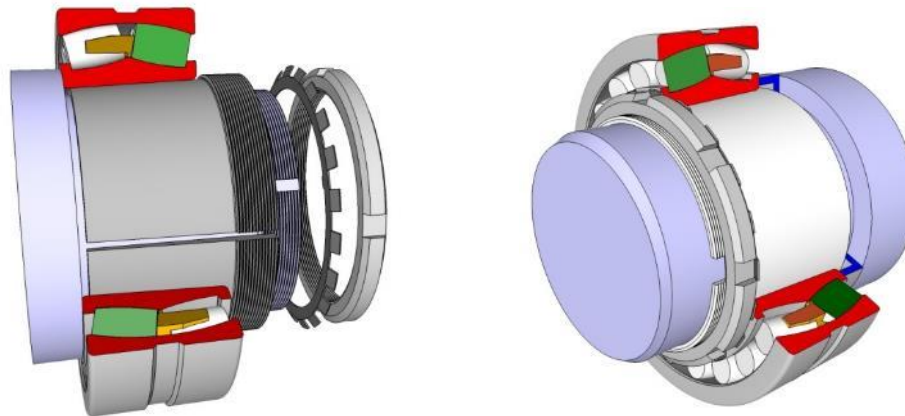
- *Direct mounting on a tapered shaft*
 - *complex shaft machining*
- *Use an adapter or withdrawal sleeve*
 - *easy mounting / dismounting for large bearing*
- *In both case:*
 - *respect the displacement and radial clearance reduction values from the table*
 - *measure the radial clearance reduction during tighing operation*



Benefits of sleeves



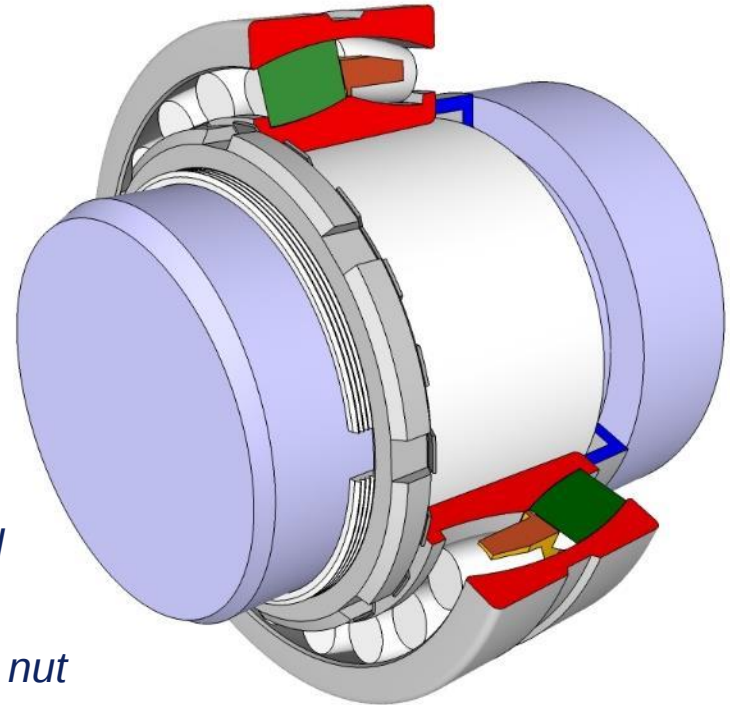
- *Easy mounting / dismounting*
- *Adjustable radial clearance*
- *Adjustable bearing position on the shaft*
- *Reduction of the shaft diameter*
- *Use of hydraulic power during mounting dismounting operation*
- *The choice for adapter - or withdrawal sleeve is a choice of the machine constructor.*



Mounting - Bearing with tapered bore



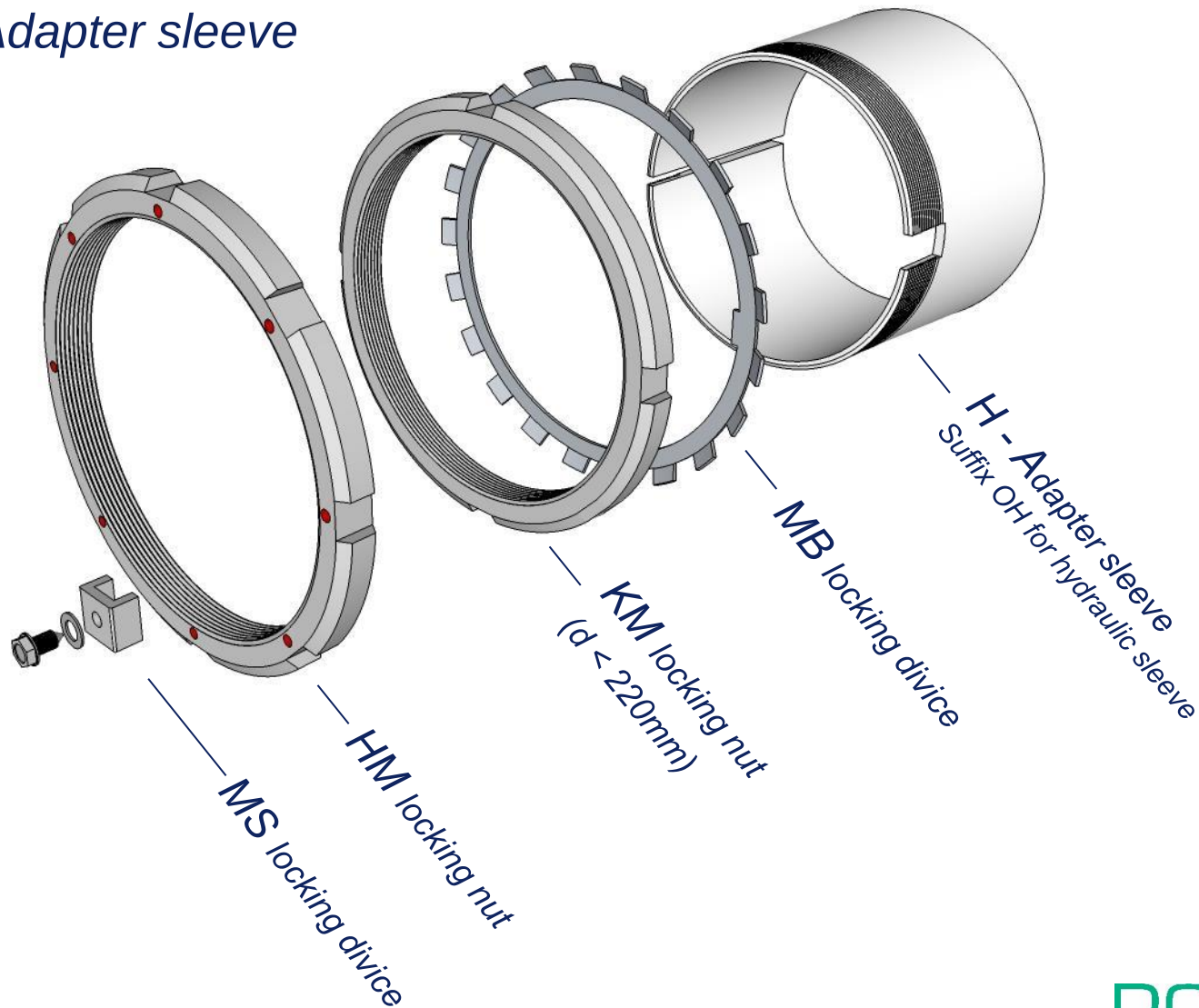
- *Adapter sleeve*
 - *Pull the sleeve through the bearing bore*
 - *Mount the nut on the sleeve thread*
 - *Lock the nut by folding the lip in the nut notch*
 - *For large sleeves, bearing $d \geq 220$ mm, the lock nut is replaced by an lock clip*
 - *For large size bearings, $d = 220$ mm, the use of hydraulic sleeves is recommended*
 - *During dismounting operation, mount the nut on the shaft tread and push the sleeve*



Mounting - Bearing with tapered bore



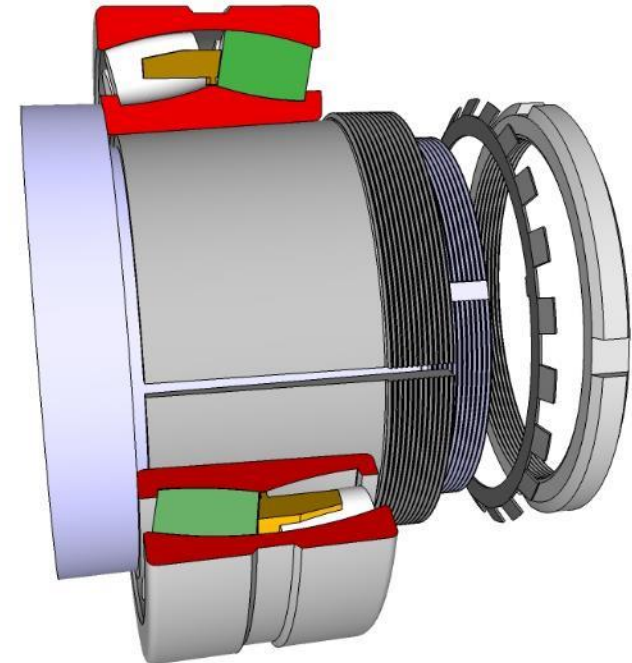
- Adapter sleeve



Mounting - Bearing with tapered bore



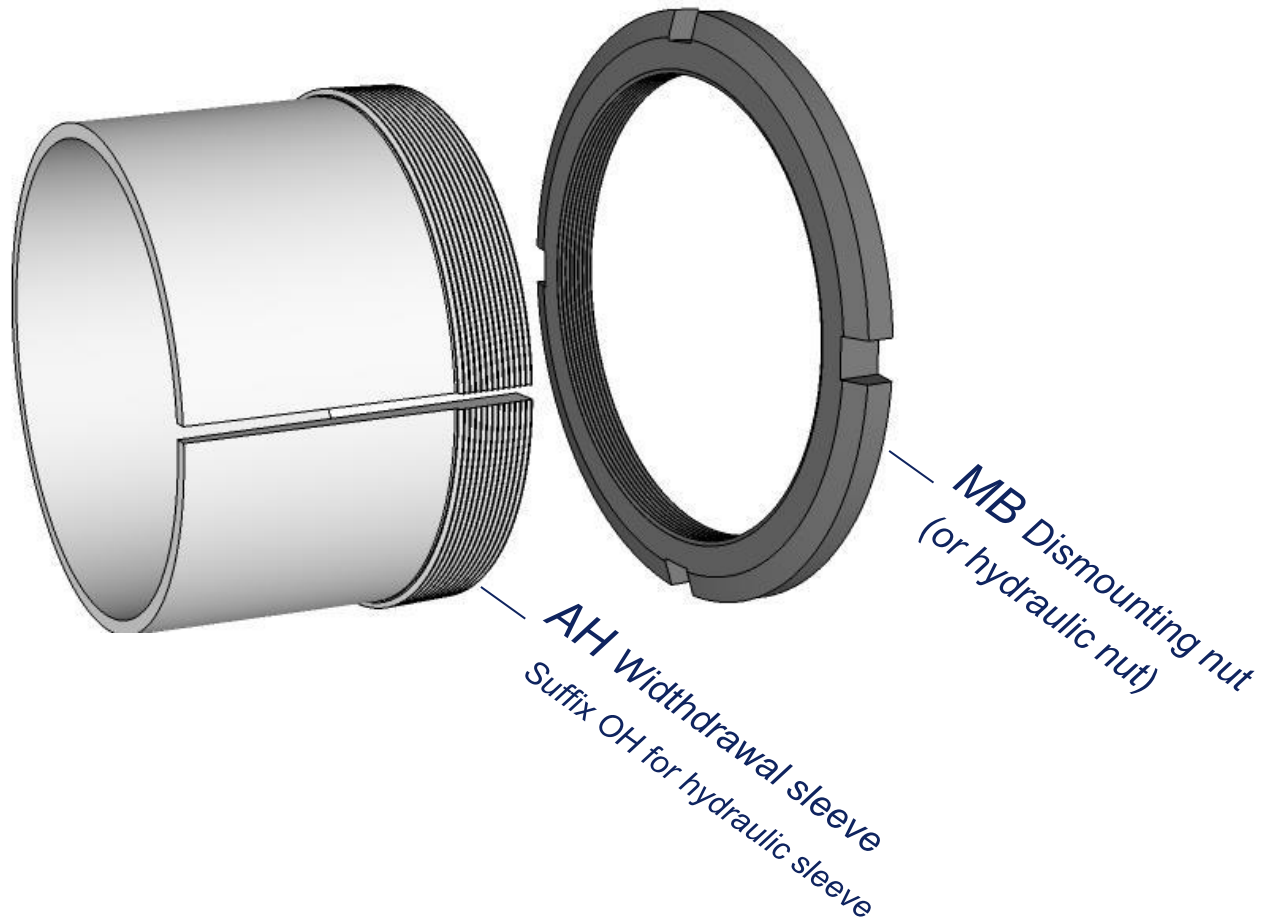
- *Withdrawal sleeve*
 - *Push the sleeve through the bearing bore*
 - *Mount the nut on the shaft thread*
 - *Lock the nut by folding the lip in the nut notch*
 - *For large sleeves, bearing $d \geq 220$ mm, the lock nut is replaced by an lock clip*
 - *For large size bearings, $d = 220$ mm, the use of hydraulic sleeves is recommended*
 - *During dismounting operation, mount the nut on the sleeve tread and pull the sleeve*



Mounting - Bearing with tapered bore



- *Withdrawal sleeve*



Mounting recommendations



- *Avoid shocks direct on the bearing (hammer)*
- *Avoid direct heat source (flame)*



Dismounting



- *Non-destructive*
 - *Special tools*
 - *Sleeves*
- *Destructive*
 - *Cutting (grinding disc)*
 - *Heating (flame)*
one section of the ring - line

Design

Selection

Fit

Mounting

Industry

Dismounting special tooling

- *Pullers*

- *Manual*



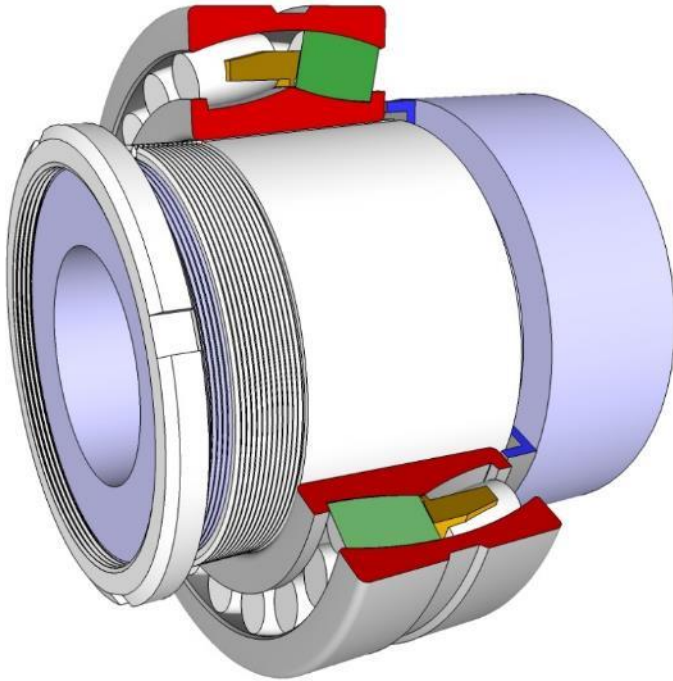
- *Hydraulic*



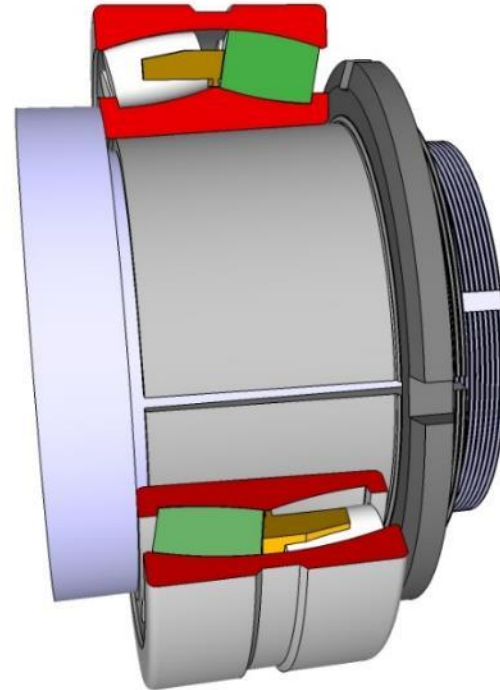
Dismounting



- *Adapter sleeve*



- *Withdrawal sleeve*



Dismounting



- *Destructive*
 - *Cutting (grinding disc)*
 - *Heating (acetylene flame)*
one section(line) of the ring



Maintenance



- *Most premature bearing failures are caused by: wrong specification, incorrect mounting, lack of lubrication, contamination, overdue maintenance.*
- *Fix interval*
 - *Replacement during planned maintenance*
 - *Calculated interval*
- *Variable interval*
 - *Temperature mastering*
 - *Vibration - noise mastering*
 - *Oil quality mastering*
- *Destructive*



Part 5

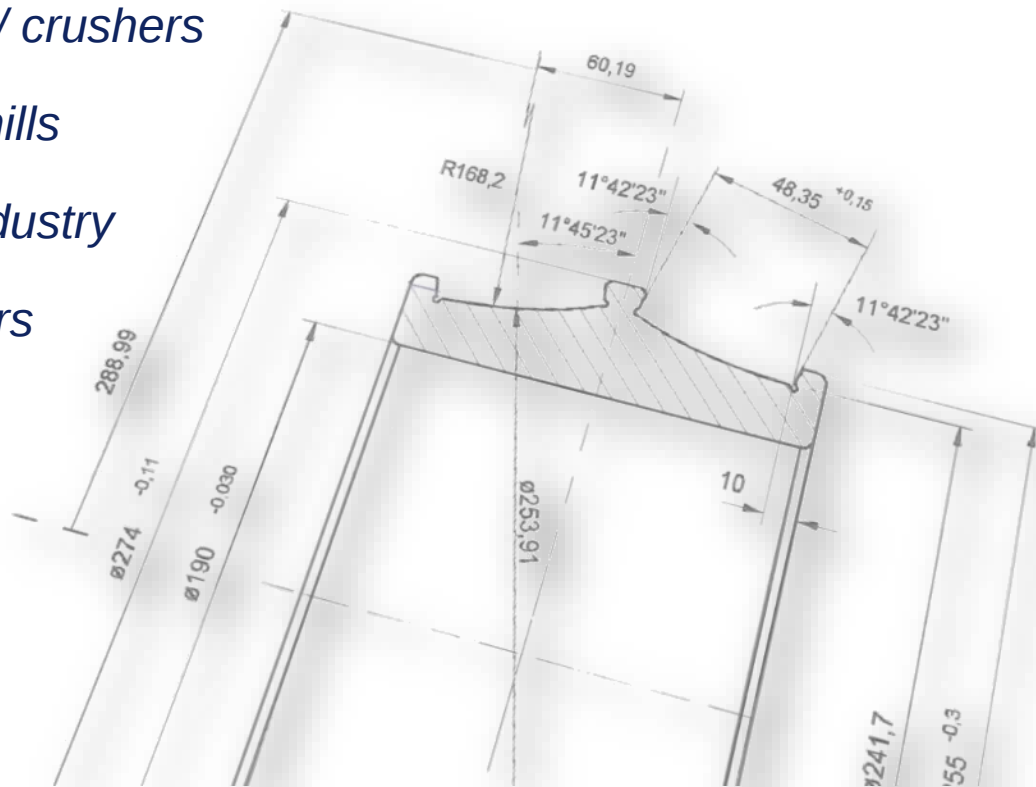
Typical application



Applications



- *Industrial heavy duty equipment*
- *Gearboxes*
- *Wheels*
- *Winches*
- *Shakers / crushers*
- *Rolling mills*
- *Paper industry*
- *Conveyors*



ROLLWAY®

Design

Selection

Fit

Mounting

Industry

Rollway Bearing in the Industry



Mining Industry



Cement industry



Design

Selection

Fit

Mounting

Industry

ROLLWAY®

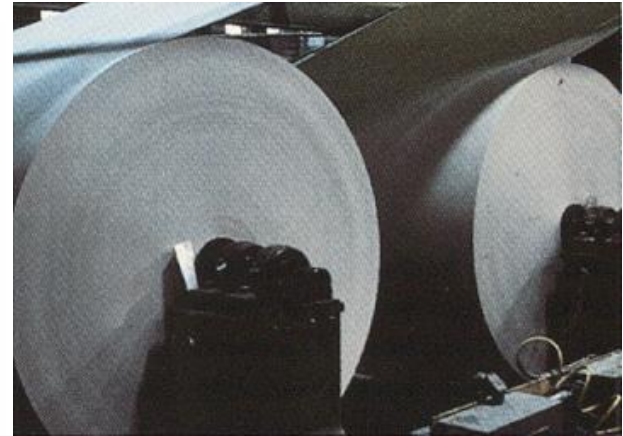
Rollway Bearing in the Industry



Steel mill



Paper Industry



Design

Selection

Fit

Mounting

Industry

ROLLWAY®

Rollway Bearing in the Industry



Mining



Mining



Design

Selection

Fit

Mounting

Industry

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Petrochemical industry



Oil fields



Design

Selection

Fit

Mounting

Industry

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Marine applications



Winches



Design

Selection

Fit

Mounting

Industry

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Cranes



Port Equipment



Design

Selection

Fit

Mounting

Industry

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Stone crushers



Gear Boxes



Design

Selection

Fit

Mounting

Industry