

FAG



Tapered Roller Bearing Units TAROL Mounting, Maintenance, Repair

SCHAEFFLER GROUP
INDUSTRIAL

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Tapered Roller Bearing Units TAROL

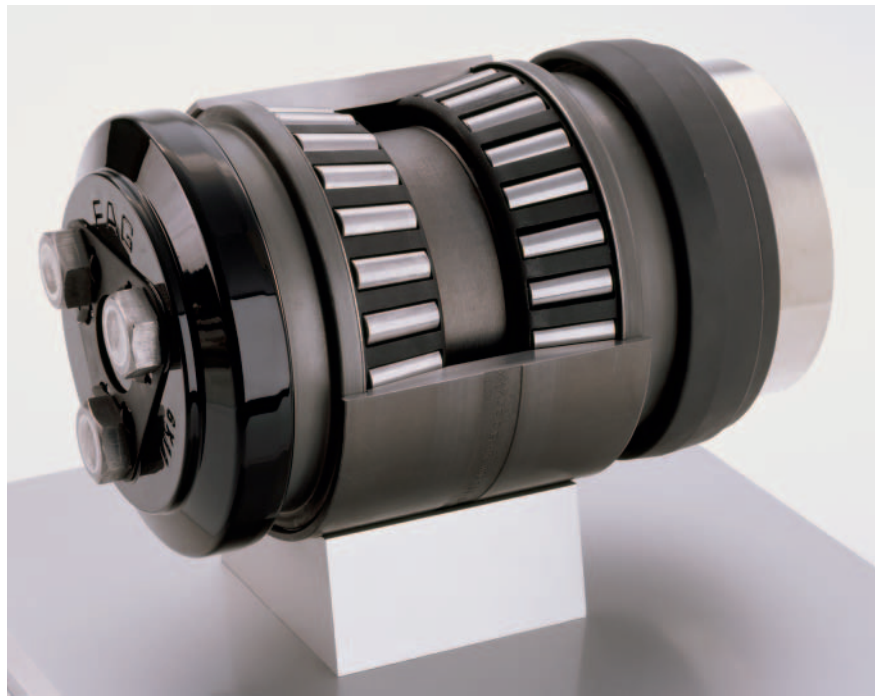
TAROL units (Tapered Roller Bearings) are double row tapered roller bearings that are supplied with factory-set clearance, greased and sealed. The TAROL units are thus supplied ready-to-fit and are pressed onto the shaft journal by means of a hydraulic unit.

TAROL units are used as wheelset bearing supports on rail vehicles such as goods wagons and passenger carriages. They can be mounted quickly and easily: The bearing is pressed onto the shaft journal in a single operation and is secured by additional parts and bolts. Due to the press fit of the unit on a shaft journal of a diameter within the specified tolerances, the bearing support achieves the necessary axial clearance.

TAROL units are filled as standard with greases proven in practice. The standard grease in the bearing units with metric dimensions is certified in accordance with EN 12081. Grease approved to AAR is used as standard in the inch dimension units.

We can also supply TAROL units with relubrication holes in the outer ring on request. The relubrication intervals are defined in accordance with the application.

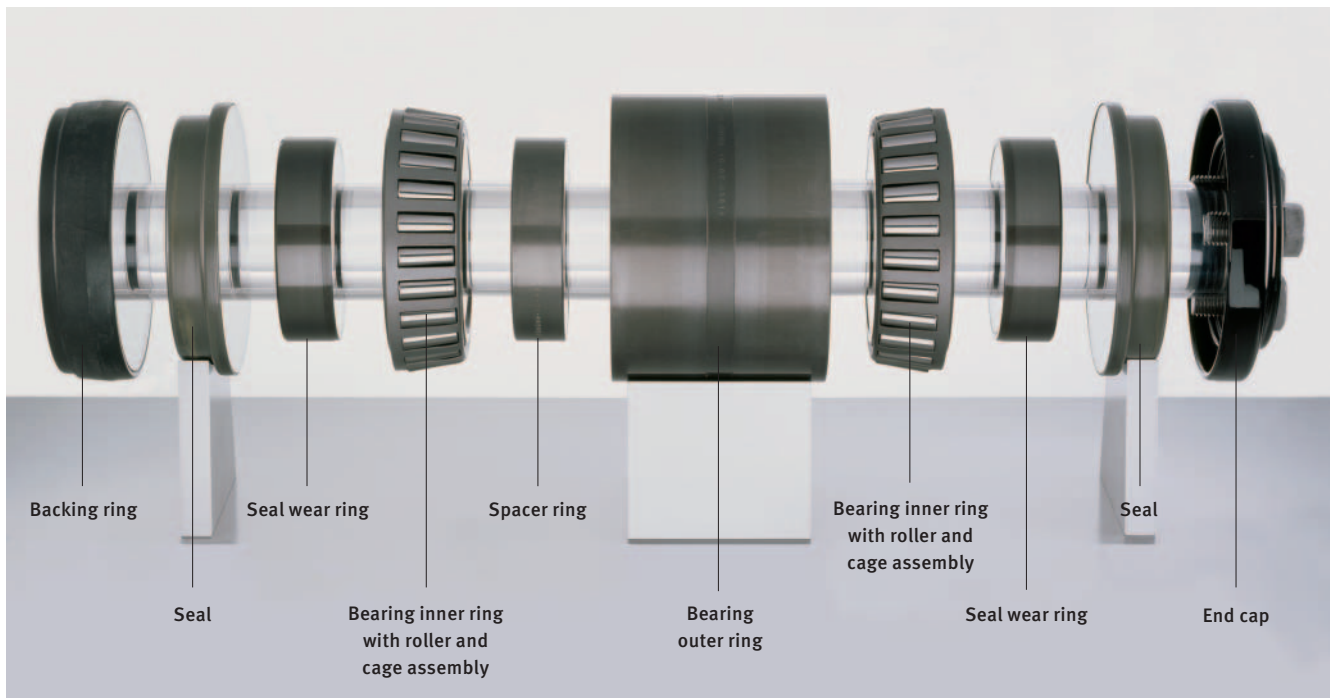
We supply TAROL units in inch and metric dimensions for all standardized shaft journals on rail vehicles. Special dimensions, individual parts, replacement parts and housing adapters are available by agreement.



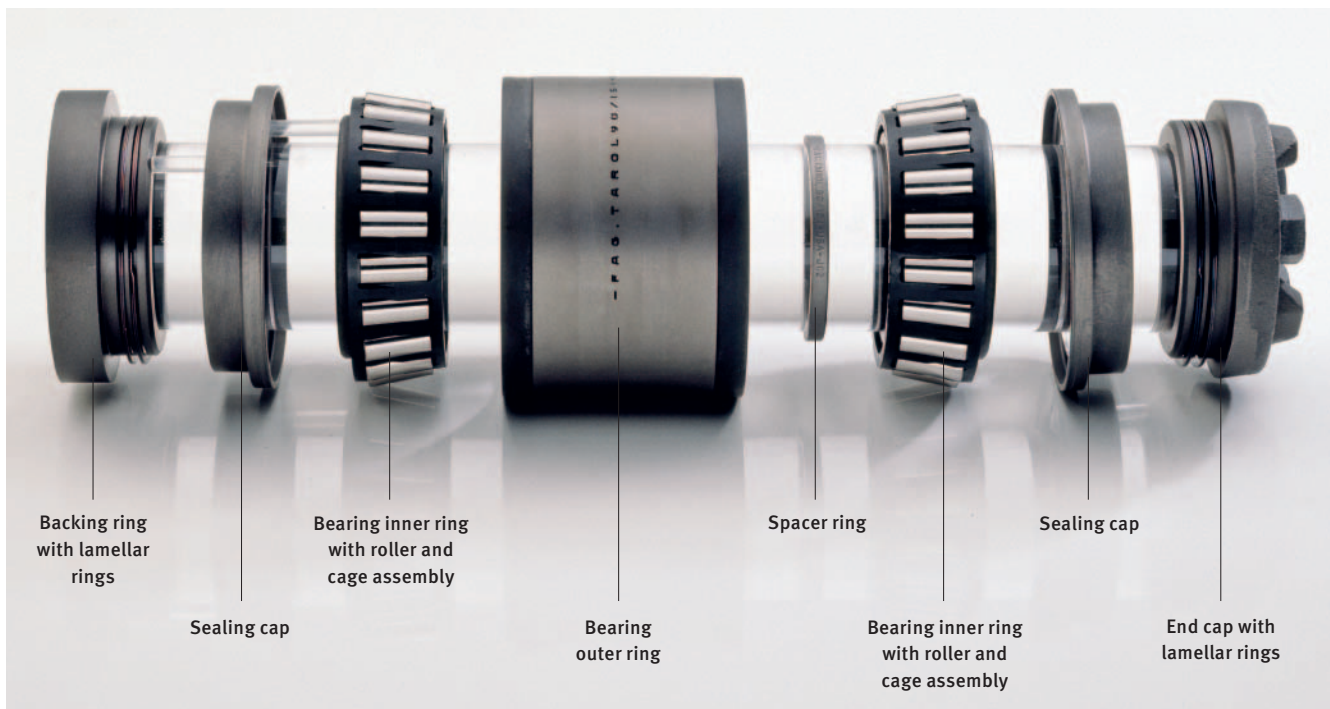
View inside a TAROL unit with inch dimensions



View inside a TAROL unit with metric dimensions



Individual parts of a TAROL unit with rotary shaft seals

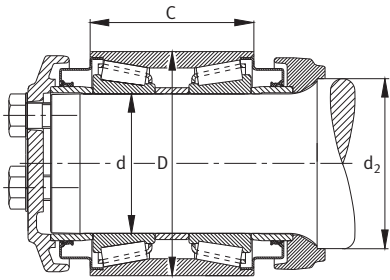


Individual parts of a TAROL unit with lamellar rings

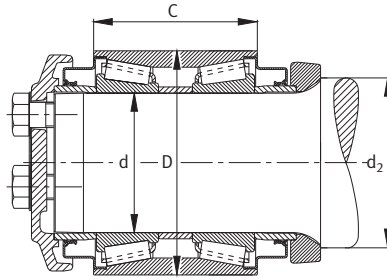
Tapered Roller Bearing Units TAROL – Inch Dimensions

Type according to AAR specification (Association of American Railroads)

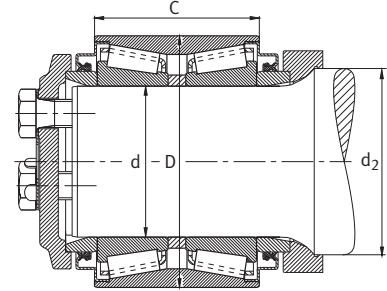
Schematics of various designs



Classes E, F, G, GG



Classes B, C, D



Class K

Tapered roller bearing units TAROL with inch dimensions

Design/ Size	Dimensions Bearing			Ordering designation
	d	D min	C	
	inch mm	inch mm	inch mm	
class B 4¼ × 8	4 101,6	6,5 165,1	4,5 114,3	TAROL4-1/4X8-U-JP
class C 5 × 9	4,6875 119,063	7,6875 195,263	5,63 142,9	TAROL5X9-U-JP
class D 5½ × 10	5,187 131,75	8,1875 207,963	6 152,4	TAROL5-1/2X10-U-JP
class E 6 × 11	5,687 144,45	8,6875 220,663	6,437 163,5	TAROL6X11-U-JP
class F 6½ × 12	6,187 157,15	9,9375 252,413	7,25 184,15	TAROL6-1/2X12-U-JP
class K 6½ × 9	6,187 157,15	9,8375 249,873	6,3 160	TAROL6-1/2X9-U-JP
class G 7 × 12	6,9995 177,787	10,875 276,225	7,31 185,74	TAROL7X12-U-JP
GG 6½	6,4995 165,087	11,882 301,803	7,75 196,85	TAROLGG6-1/2-U-JP
GG 6⅞	6,8745 174,612	11,882 301,803	7,75 196,85	TAROLGG6-7/8-U-JP

Suffixes:

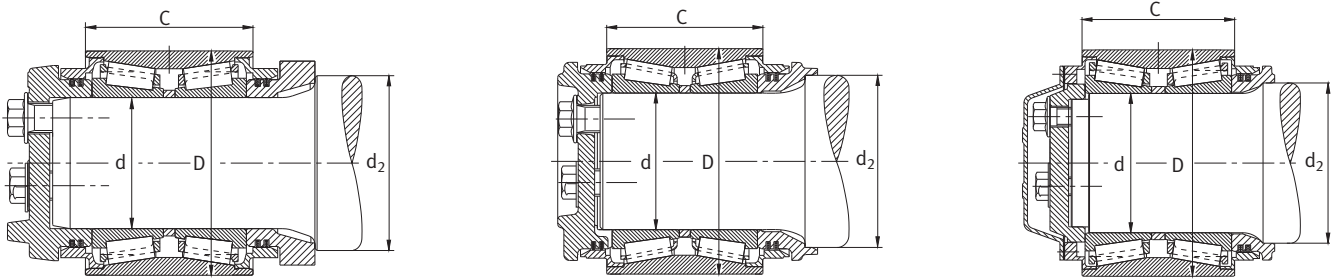
U	Complete unit
JP	Sheet steel cage

Designs D, E, F, G, K, in accordance with AAR Standard M-934. Irrespective of the data given, the bearings are always matched to the AAR specifications. For standard greasing, a grease approved to AAR is used.

Design/ Size	Dimensions Shaft			Load rating ABEC/RBEC C1	Load rating DIN ISO 281 C	Mass TAROL unit
	d min	d max	d ₂	lbs kN	kN	lbs kg
	inch mm	inch mm	inch mm			
class B	4,003	4,004	5	106 000		32,6
4¼ × 8	101,676	101,702	127	465	415	14,8
class C	4,6905	4,6915	5,875	146 000		54,7
5 × 9	119,139	119,164	149,225	655	570	24,8
class D	5,1905	5,1915	6,375	160 000		60,2
5½ × 10	131,839	131,864	161,925	720	620	27,3
class E	5,6905	5,6915	7,030 – 7,032	166 000		77,0
6 × 11	144,539	144,564	178,562 – 178,613	750	655	34,9
class F	6,1905	6,1915	7,530 – 7,532	232 000		116,6
6½ × 12	157,239	157,264	191,262 – 191,313	1 020	900	52,9
class K	6,1905	6,1915	7,530 – 7,532	232 000		89,7
6½ × 9	157,239	157,264	191,262 – 191,313	1 020	900	40,7
class G	7,003	7,004	8,000 – 8,002	265 000		132,5
7 × 12	177,876	177,902	203,200 – 203,251	1 180	1 020	60,1
GG	6,503	6,504	7,905 – 7,906	344 000		179,5
6½	165,176	165,202	200,79 – 200,81	1 530	1 320	81,4
GG	6,878	6,879	7,870 – 7,873	344 000		170,4
6⅞	174,701	174,727	199,898 – 199,974	1 530	1 320	77,3

TAROL Tapered Roller Bearing Units – Metric Dimensions

Schematics of various designs



Tapered roller bearing units TAROL with metric dimensions

Base bearing	Dimensions Bearing			Shaft	
	d mm	D mm	C mm	d mm	d ₂ mm
TAROL90/154-R-TVP ^{*)}	90	154	115	90 n6	120
TAROL100/165-R-JP	100	165	114,3	100 n6 (p6)	126 k8
TAROL100/175-R-TVP	100	175	120	100 n6 (p6)	126 k8
TAROL100/180-R-TVP	100	180	130,2	100 n6	120 t7
TAROL110/180-R-TVP	110	180	142	110 p6	140 t7
TAROL120/195-R-TVP ^{*)}	120	195	131,4	120 p6	138 t7
TAROL130/210-R-JP	130	210	132	130 p6	150 t7
TAROL130/220-R-TVP ^{*)}	130	220	150	130 p6	160 t7
TAROL130/230-R-TVP ^{*)}	130	230	160	130 p6	160 t7
TAROL130/240-R-TVP ^{*)}	130	240	160	130 p6	160 t7
TAROL140/220-R-JP	140	220	140	140 p6	160 t7
TAROL150/250-R-TVP ^{*)}	150	250	160	150 p6	170 t7
TAROL160/270-R-TVP ^{*)}	160	270	150	160 p6	190 t7
TAROL160/280-R-TVP	160	280	180	160 p6	189 k6

^{*)} This size also available with JP cage version

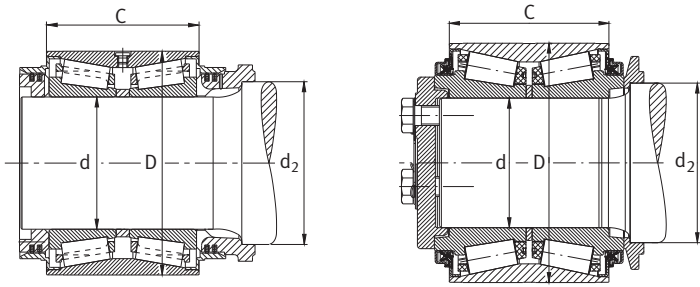
There are in some cases inch size versions adapted to the requirements of the European area but also new designs that are based substantially on the standards of the UIC. The standard greasing is carried out with a grease approved to EN 12081. In relation to the connecting parts, the bearings listed represent only a selection from the product range. The connecting parts and seals can be agreed for specific customer requirements.

Cage versions:

TVP Polyamide cage
JP Sheet steel cage

Suffixes:

U Complete unit
R Base bearing



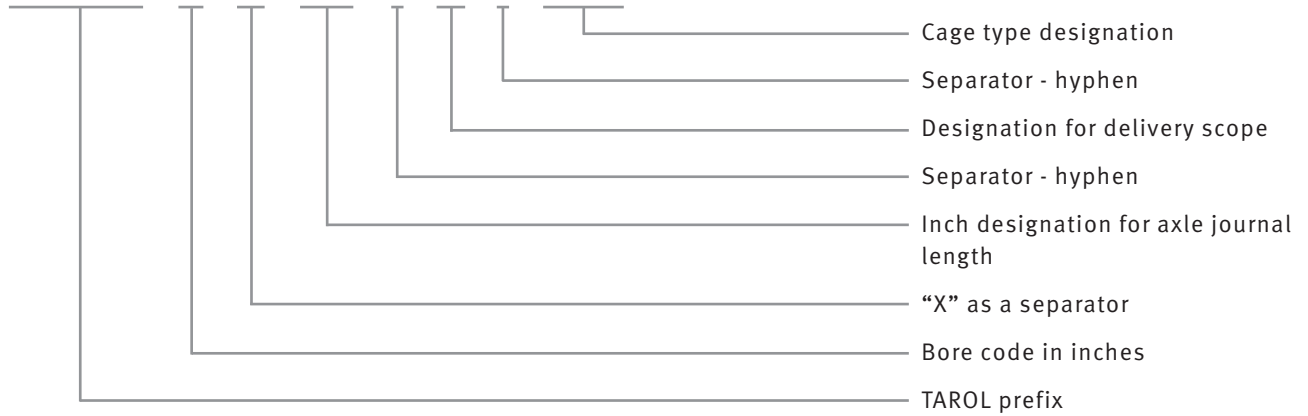
Load rating DIN ISO 281 C kN	Load rating ABEC/RBEC C1 kN	Mass Base bearing kg	Typical ordering designation for complete unit	Mass TAROL unit kg
390	450	7,5	Z-572103.02.TAROL90/154-U-TVP	15
415	475	9,16	Z-517874.TAROL100/165-U-JP	13,9
510	585	10,7	Z-578693.TAROL100/175-U-TVP	18,5
510	585	12,3	F-572314.TAROL100/180-U-TVP	16
560	655	14	F-561286.TAROL110/180-U-TVP	18
560	640	13,6	Z-517905.02.TAROL120/195-U-TVP	19
620	720	16,7	Z-517906.TAROL130/210-U-JP	22
780	900	20	F-800050.TAROL130/220-U-TVP	25,6
850	965	25,5	Z-577997.04.TAROL130/230-U-TVP	33,7
930	980	28,9	F-565057.TAROL130/240-U-TVP	38,5
655	750	18,5	Z-517907.TAROL140/220-U-JP	27
900	1 020	28,9	F-803295.TAROL150/250-U-TVP	40
1 050	1 200	33	Designation on request	–
1 270	1 460	42	F-804595.TAROL160/280-U-TVP	50,5

Tapered Roller Bearing Units TAROL

Key to Designation System

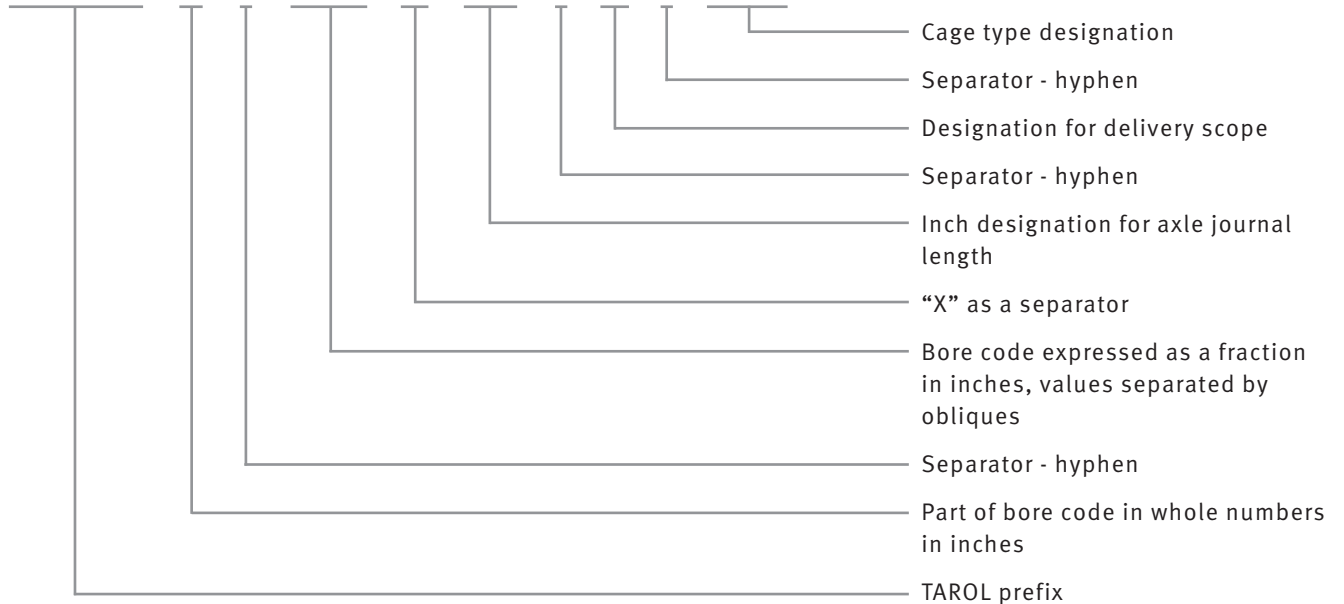
Inch size TAROL with dimensions in whole numbers

TAROL N X NN - X - XXX



TAROL with inch dimensions in fractions

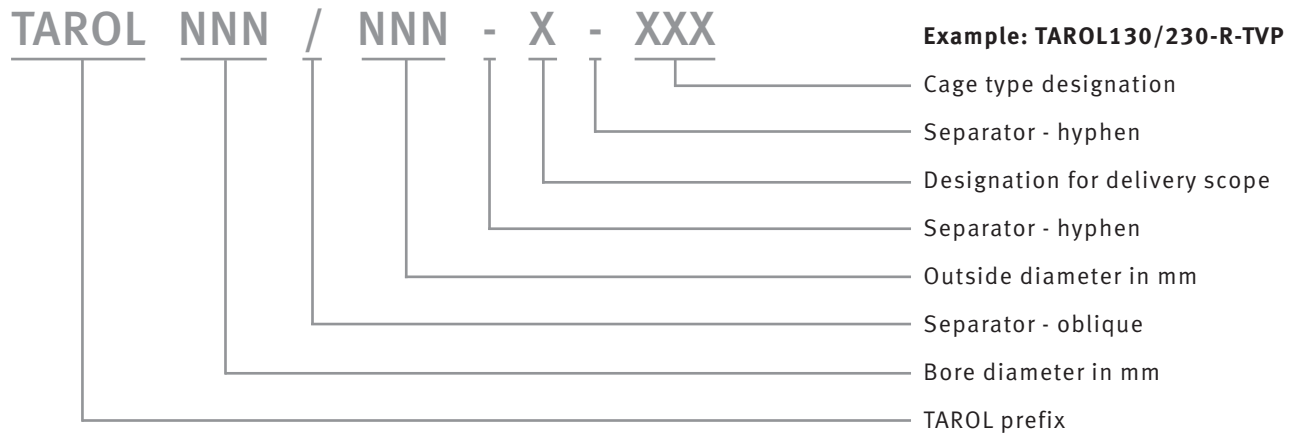
TAROL N - N/N X NN - X - XXX



Tapered Roller Bearing Units TAROL

Key to Designation System

Metric TAROL



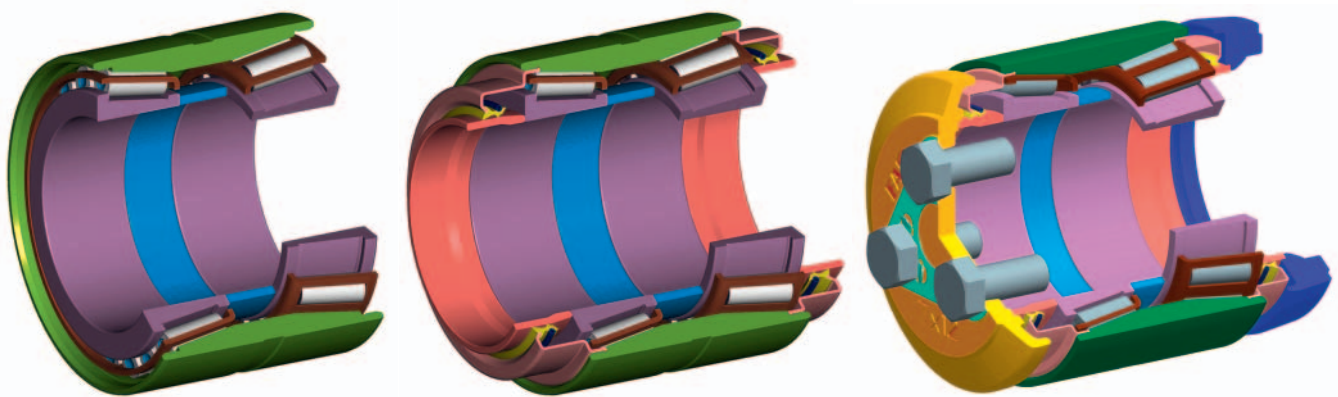
The ordering designation is preceded by a drawing number for customer-specific designs, e.g. **F-803507.01.TAROL7X12-B-TVP** or **Z-517874.04.TAROL100/165-U-JP**.

Designation for delivery scope

- R = Base bearing (without grease and seal)
- B = Base unit (greased and sealed)
- U = Complete unit (base unit including adjacent components)

Available cage types

- JP = Sheet steel cage
- TVP = Polyamide cage



Scope of delivery variants using the example of an inch size bearing: R (left), B (center) and U (right)

Prior to Mounting

The mounting location must be clean, dry, spacious and separated from machine tools, welding equipment or equipment operated with compressed air.

Shaft journal inspection

- Thoroughly remove all contamination, chips and the anti-corrosion protective coating.
- Smooth blow and corrosion marks with a fine abrasive medium. The bearing seating surface should be smooth and free from score marks and notches.
- Demagnetize magnetized shafts before mounting.
- Measure shaft journal, whereby shaft and tool should have the same temperature.

The shaft journal is measured using the snap gage that has been set with the master disk. The shaft journal dimensions must be within the values which are specified in the bearing tables.

Tolerances for shaft journals with inch dimensions:

The terms of the “Manual of Standards and Recommended Practices” of the AAR (including Specification M-101) apply here. In relation to dimensional and geometrical accuracy, for example, the values for out-of-roundness and conicity must not exceed 0,025 mm (0,001 inch).

The mounting of bearings in accordance with the AAR Specification is subject not only to the information in this brochure but also to the current issue of the AAR mounting specifications. These can be found mainly in the Sections G, G-II, H and H-II of the Manual of Standards and Recommended Practices. The specifications include repeated tightening of the end cap screws until there is no further rotational movement of the screws at the specified tightening torque.

Tolerances for shaft journals with metric dimensions:

As a general rule, the cylindricity tolerance must be a maximum of 0,01 mm.



Mounting and Dismounting

Mounting the TAROL Units

Tapered roller bearing units TAROL are compact, ready-to-fit rolling bearings which have been greased, sealed and adjusted for axial clearance. They can be pressed onto the shaft journal in a single operation. If the shaft journal diameter is within the specified tolerance, the necessary axial internal clearance is set by the press fit of the bearing.

- Screw mount the guide bush to the shaft journal using the centring bush (a).
- Coat shaft journal with a very thin layer of mounting paste (the metallic sheen should turn matt), e.g. ARCANOL MOUNTING PASTE from FAG, so that no score marks are caused when pressing on the unit.
- Remove TAROL unit from the packaging and push it onto the guide bush. On bearing units with rubber seals, the seal wear ring must not slip out of the sealing cap (b).
- Position mobile hydraulic unit close to mounting location and lay out spindle with lock nut and fitting sleeve ready for use (c).
- Check that the mobile hydraulic unit functions correctly (d).
- Push spindle with lock nut screwed in place through the tubular piston from the rear of the hydraulic unit.
- Push fitting sleeve onto the spindle of the piston press (e).



Mounting and Dismounting

Mounting the TAROL Units

- Align hydraulic unit with TAROL unit and shaft journal (a).
- Push fitting sleeve onto guide bush.
- Screw spindle of hydraulic unit into guide bush using crank (b).
- Operate hydraulic unit. Press bearing unit from the guide bush onto the shaft journal using the fitting sleeve. The outer ring should be rotated to and fro by hand when doing this so that no stresses occur in the bearing (c).

The pressure increases rapidly if the backing ring is located axially on the shoulder of the shaft. The greatest press capacity should correspond to the maximum contact forces in the following tables. The highest contact force is applied again to ensure the bearing unit is correctly located.



Maximum contact force for TAROL units with inch dimensions

TAROL unit with inch dimensions	Max. contact force ¹⁾		
	kN	to	lbs
B 4¼ × 8	350 ± 50	35 ± 5	79 000 ± 11 000
C 5 × 9	350 ± 50	35 ± 5	79 000 ± 11 000
D 5½ × 10	500 ± 50	50 ± 5	112 000 ± 11 000
E 6 × 11	500 ± 50	50 ± 5	112 000 ± 11 000
F 6½ × 12	500 ± 50	50 ± 5	112 000 ± 11 000
K 6½ × 9	500 ± 50	50 ± 5	112 000 ± 11 000
G 7 × 12	650 ± 50	65 ± 5	146 000 ± 11 000
GG 6½	650 ± 50	65 ± 5	146 000 ± 11 000
GG 6⅞	650 ± 50	65 ± 5	146 000 ± 11 000

Maximum contact force for TAROL units with metric dimensions

TAROL unit with metric dimensions	Max. contact force ¹⁾	
	kN	to
90	200 ± 20	20 ± 2
100	250 ± 20	25 ± 2
110	250 ± 20	25 ± 2
120	250 ± 20	25 ± 2
130	350 ± 20	35 ± 2
140	350 ± 20	35 ± 2
150	350 ± 20	35 ± 2
160	400 ± 20	40 ± 2

¹⁾ For converting into contact pressure, see hydraulic unit user manual

Mounting and Dismounting

Mounting the TAROL Units

- Screw spindle with lock nut out of the guide bush and remove from the hydraulic unit.
- Move hydraulic unit to one side.
- Remove fitting sleeve.
- Unscrew guide bush from the shaft journal (d).
- Screw end cap together with retaining element (locking plate or washer) onto the end face of the shaft.

- Tighten end cap screws with the tightening torque specified in the tables (e).
- Where locking plates are fitted, bend over both the tabs of the locking plate on all end cap screws (f).

In the case of designs with end cover:

- After tightening the end cap screws with the specified tightening torque and securing them with the locking plates, mount the end cover on the end cap.



Tightening torque of the end cap screws for TAROL units with inch dimensions

TAROL unit Class/Size	Thread dimension of end cap screw	Tightening torque	
		Tolerance ± 4 % N m	ft lbs
B 4¼ × 8	¾ inch	156	115
C 5 × 9	7⁄8 inch	197	145
D 5½ × 10	7⁄8 inch	217	160
E 6 × 11	1 inch	393	290
F 6½ × 12	1 ⅜ inch	569	420
K 6½ × 9	1 ⅜ inch	569	420
G 7 × 12	1 ¼ inch	664	490
GG 6½	7⁄8 inch	502	370
GG 67⁄8	7⁄8 inch	502	370

Tightening torque of the end cap screws for TAROL units with metric dimensions

Screw size	Tightening torque	
	Normal screws with retainer Tolerance ± 5 N m N m	Self-retaining screws
M12	75	80
M16	180	205
M20	370	415

The specified tightening torques are standard values for axle end cap parts supplied by FAG. Values for components from other suppliers may differ.

Mounting and Dismounting

Dismounting the TAROL Units

Removing the end cap

- Clean bearing and adjacent parts.
- Dismount end cover, where fitted.
- Where locking plates are fitted, bend tabs of the locking plate away from the side faces of the screw heads.
- Remove screws.
- Remove end cap without removing the seal wear ring.

Removing the unit

- Screw mount guide bush using centring bush.
- Push spindle without lock nut through the tubular piston of the hydraulic unit and align with the shaft (a).
- Screw spindle into guide bush (b).
- Position drawing frame with an insert suitable for the extractor shoe.
- The extractor shoe must be in contact with shaft behind the shaft shoulder (c).
- Secure the extractor shoe with a crane to prevent damage to the shaft caused by the extractor shoe following dismounting.

- Operate hydraulic unit.
- Rotate the outer ring to and fro by hand during removal to prevent stresses occurring in the bearing.
- Switch off the hydraulic unit following the removal process.
- Lift off drawing frame and place to one side.
- Screw spindle out of the guide bush.
- Move hydraulic unit to one side.
- Remove bearing from guide bush.
- Unscrew guide bush.



Dismounting and Repair

The TAROL unit is dismantled from the shaft journal for inspection, repair and lubrication. See section “Dismounting the TAROL Units”.

Firstly remove the seals. Then clean all bearing parts and examine each part for damage. Measure the parts and the axial internal clearance of the bearing. The unit is then reassembled with inspected or new parts. The unit is regreased according to the section “Greasing the Bearings” on page 25.

All tools for mounting, dismantling and repairing TAROL units can be purchased from FAG Industrial Services. Suitable tools in good working order are required to ensure that bearings and seals are not damaged during maintenance operations. Suitable tools are described on page 18.

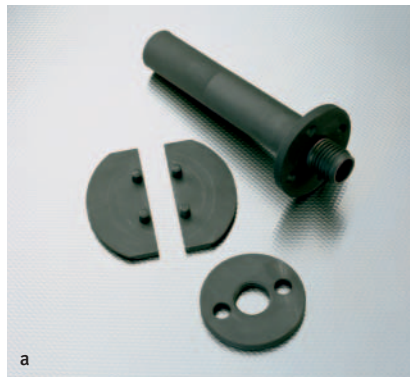


Dismounting and Repair

Removing the Seals and Lamellar Rings

Removing the seals

- Remove seal wear ring on front side.
- Withdraw backing ring with seal wear ring from the unit.
- Lay out ram with ram plate and lock nut, press-out segments and support ring ready for use (a, b).
- Insert press-out segments between inner ring and sealing cap (c).
- Guide ram through the bearing bore until the pins on the segments locate in the holes in the ram plate (d).
- Screw lock nut onto the ram and axially secure ram and segments (e).
- Insert bearing in the support ring (f).
- Place bearing with support ring in the press and align (g).
- Press out seal or sealing cap.
- Remove inner ring and spacer ring which are now loose. Unscrew the lock nut from the ram.
- Press out seal on the opposing side of the outer ring as described above.



Removing lamellar rings

The lamellar rings can be withdrawn from the unit together with the ring carrier, the end cap and the backing ring without using any special devices.

The lamellar rings are lifted with a narrow-blade screwdriver, lightly pulled apart by hand and subsequently screwed out of the groove (h).



Dismounting and Repair

Cleaning the Bearing Parts

- Remove residual grease from the parts with a grease centrifuge, wooden spatula and lint-free cloth.
- Washing machines are used for batch maintenance tasks. Washing containers are used for cleaning by hand.
- Inner rings, roller and cage assemblies, outer ring and spacer ring are cleaned with kerosene or with cleaning agents in a separate washing container.
- The bearing parts are sprayed with light machine oil after cleaning.
- Adapter, end caps, backing rings and fixing screws are washed in a washing container specially provided for these parts.



Tools for Mounting and Dismounting

Mounting tools for FAG tapered roller bearing units TAROL are also suitable for dismounting cylindrical roller bearing units that have been fully greased and sealed on axle journals.

Our publication WL 80 250 contains details of additional devices and services for mounting and maintaining rolling bearings. These products can be purchased via the external sales representative responsible for your area or via FAG Industrial Services.



Tool set and tools for mounting individual TAROL sizes for use with a mobile hydraulic unit (see page 19).

Tools for mounting and dismounting TAROL units with metric dimensions^{*)}

The tools for metric TAROL units are always individually matched since these units always have customized adjacent constructions.

Example of ordering designations for TAROL unit Z-572103.02.TAROL90/154-U-TVP:

Mounting and dismounting device (tool set): TOOL-RAILWAY-AXLE-Z-572103.02
Tools for fitting and removing the sealing caps: TOOL-RAILWAY-SEALCAP-Z-572103.02
Grease cover: TOOL-RAILWAY-GREASER-Z-572103.02

Tools for mounting and dismounting TAROL units with inch dimensions^{*)}

TAROL design	Mounting equipment (Tool set)	Tools for mounting and dismounting the sealing caps	Grease cover
B 4¼ × 8	TOOL-RAILWAY-AXLE-B4-1/4X8	TOOL-RAILWAY-SEALCAP-B4-1/4X8	TOOL-RAILWAY-GREASER-B4-1/4X8
C 5 × 9	TOOL-RAILWAY-AXLE-C5X9	TOOL-RAILWAY-SEALCAP-C5X9	TOOL-RAILWAY-GREASER-C5X9
D 5½ × 10	TOOL-RAILWAY-AXLE-D5-1/2X10	TOOL-RAILWAY-SEALCAP-D5-1/2X10	TOOL-RAILWAY-GREASER-D5-1/2X10
E 6 × 11	TOOL-RAILWAY-AXLE-E6X11	TOOL-RAILWAY-SEALCAP-E6X11	TOOL-RAILWAY-GREASER-E6X11
F 6½ × 12	TOOL-RAILWAY-AXLE-F6-1/2X12	TOOL-RAILWAY-SEALCAP-F6-1/2X12	TOOL-RAILWAY-GREASER-F6-1/2X12
K 6½ × 9	TOOL-RAILWAY-AXLE-K6-1/2X9	TOOL-RAILWAY-SEALCAP-K6-1/2X9	TOOL-RAILWAY-GREASER-K6-1/2X9
G 7 × 12	TOOL-RAILWAY-AXLE-G7X12	TOOL-RAILWAY-SEALCAP-G7X12	TOOL-RAILWAY-GREASER-G7X12
GG 6½	TOOL-RAILWAY-AXLE-GG6-1/2	TOOL-RAILWAY-SEALCAP-GG6-1/2	TOOL-RAILWAY-GREASER-GG6-1/2
GG 6⅞	TOOL-RAILWAY-AXLE-GG6-7/8	TOOL-RAILWAY-SEALCAP-GG6-7/8	TOOL-RAILWAY-GREASER-GG6-7/8

^{*)} Tools for other designs are available by agreement.

Please **always** consult FAG Industrial Services GmbH before ordering. See page 28 for contacts.

Tools for Mounting and Dismounting

Mobile hydraulic unit

For mounting TAROL units (400 V, 50 Hz; special voltages on request), universally applicable in combination with bearing specific tool sets (see page 18).

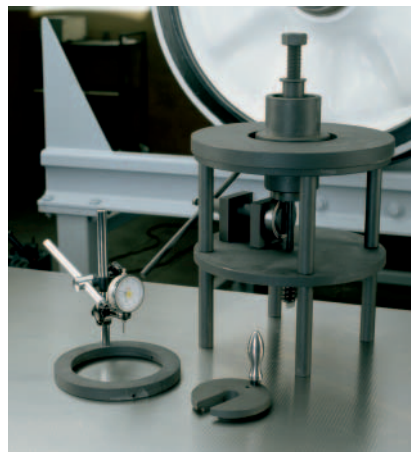
Ordering designation:
TOOL-RAILWAY-AGGREGATE



Axial clearance measuring device

For measuring axial clearance before mounting.

Ordering designation for base device and sized set:
TOOL-RAILWAY-CLEARANCE-BASIC
TOOL-RAILWAY-CLEARANCE-TOP-+...



Grease dispensing unit

For dispensing measured amounts of grease for lubricating rolling bearings. The metering range is between 10 and 133 cm³

Ordering designation:
ARCA-PUMP-25 for 25 kg container
ARCA-PUMP-180 for 180 kg drum



Plate press

For pressing in and pressing out seals.

Ordering designation:
TOOL-RAILWAY-PLATEPRESS



Visual inspection device

For visual inspections of the running surfaces of rings and rolling elements after dismantling.

Ordering designation:
TOOL-RAILWAY-INSPECTION-DEVICE



Examining the Bearing Parts

In order to examine the condition of the bearing, the bearing outer ring and the rows of rolling elements of TAROL units can be checked after dismantling. A device with a lamp and a magnifying glass (see visual inspection device on page 19) enables the raceways of rings and rolling elements to be viewed. The raceways are inspected for wear marks and indentations caused by foreign particles. If parts are found to have defects or damage, a decision must be taken whether they can be reused, or whether they must be repaired or replaced with new parts. For a correct assessment, it is important that the individual parts of a bearing that has been disassembled and cleaned are not mixed with parts from another bearing.

Surface corrosion

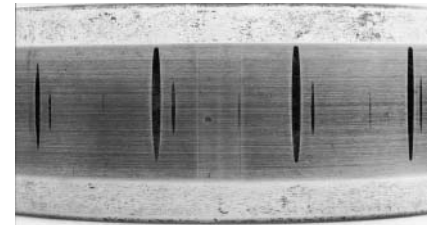
Surface corrosion on bearing rings and rollers appears as rust discoloration, etching and pitting.

- Rolling bearing parts do not need to be scrapped if discoloration and spots can be removed with fine emery cloth. Particles of abrasive medium must always be completely washed out of parts.
- The parts can be reused if etching marks caused by water and acid can be removed by polishing without leaving behind large indentations.

Polishing disks and paste are used for polishing corrosion marks. In favorable cases, spots can be removed using this method. If rust and corrosion have resulted in deeper pitting, the bearing rings and rollers cannot be reused. Bearing parts which show signs of heat discoloration must be scrapped.

Rolling element indentations

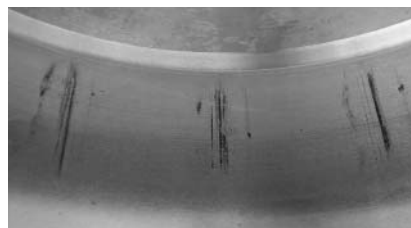
Rolling element indentations (false brinelling) in the raceway surfaces are caused by high shock loads or vibrations while stationary.



False brinelling has formed at the spacing of the rolling elements on an inner ring raceway.



False brinelling on rollers



False brinelling in the outer ring raceway

Examining the Bearing Parts

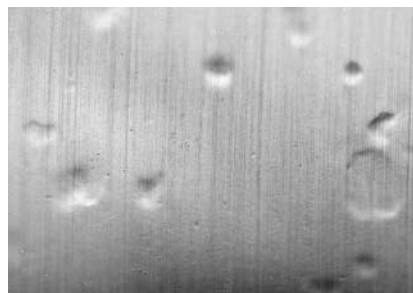
Fatigue damage

Fatigue damage on the raceways is made noticeable by pitting. Bearings with fatigue damage should generally be replaced.



Raceway indentations caused by contamination

Contamination in the lubricant can also result in indentations in the raceway. The parts can be reused as long as the raceway indentations are not made noticeable by roughness when rotating the bearing by hand.

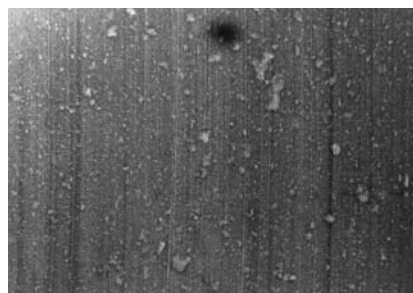
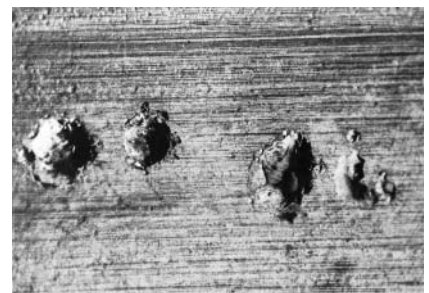


Damage caused by the passage of current

Bearings with false brinelling or craters, which have been caused by the passage of current, cannot be reused.

Cages and spacer rings

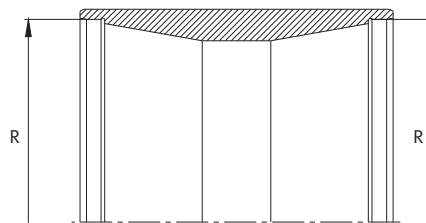
Cages may also only be reused if they do not have cracks and deformation. If the spacer ring has cracks, notches or burn marks, it must be replaced.



Examining the Bearing Parts

Seal and sealing cap seat

Before assembling the bearing, a measurement is made to check whether the seat for the seal or sealing cap on the outer ring still has the required dimension. The diameter is measured with an inside micrometer and must be within the specified tolerances which can be found in the tables.



Bearing accessories

- The end cap is examined for cracks, fractures and deformation.
- Lamellar rings, which no longer press against the sealing cap, must be replaced with new parts.
- The hexagonal screw threads must be undamaged. Checks must be made to see if the screws have been subjected to stretching.
- The locking plates are replaced at every inspection.

The following applies for inch size bearings:

- The seal wear rings must not be broken, torn or deformed. The surfaces in the contact area of the seal lips must be smooth and have no wear. To make mounting easier, the inner seal wear ring must be a press fit in the backing ring (interference 0,05 mm to 0,175 mm).
- The backing ring must not be damaged. The support radius is checked with a gage. The gage must be in contact on both sides. The seals with the vulcanized rubber part must generally be replaced with new components when the unit is repaired.

TAROL unit with inch dimensions Dimension for the seal seat in the outer ring

TAROL unit Class/Size	Diameter R		Diameter R	
	min. mm	max. mm	min. inch	max. inch
B 4¼ × 8	153,924	154,102	6,060	6,067
C 5 × 9	182,499	182,677	7,185	7,192
D 5½ × 10	196,723	196,977	7,745	7,755
E 6 × 11	209,423	209,677	8,245	8,255
F 6½ × 12	237,998	238,252	9,370	9,380
K 6½ × 9	237,998	238,252	9,370	9,380
G 7 × 12	260,858	261,112	10,270	10,280
GG 6½	284,05	284,23	11,18	11,19
GG 6⅞	284,05	284,23	11,18	11,19

TAROL unit with metric dimensions Dimension for the sealing cap seat in the outer ring

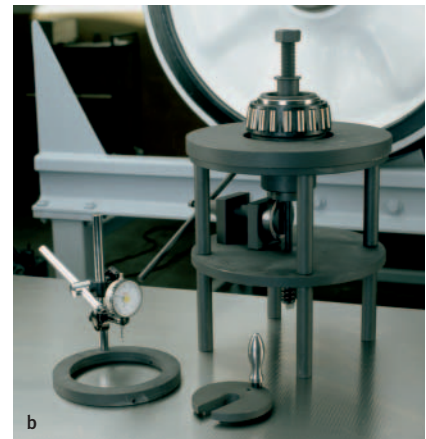
TAROL unit Size	Diameter R	
	min. mm	max. mm
TAROL90/154	144,475	144,525
TAROL100/165	153,97	154,04
TAROL100/175	165	165,07
TAROL110/180	non-standardized	
TAROL120/195	182,56	182,63
TAROL130/210	196,85	196,92
TAROL130/220	209,55	209,62
TAROL130/230	218,33	218,40
TAROL130/240	228	228,07
TAROL140/220	209,55	209,62
TAROL150/250	238,125	238,195
TAROL160/270	255,9	255,97
TAROL160/280	265	265,07

Measuring the Axial Internal Clearance

Checking the axial internal clearance of the bearing after dismantling is also included in maintenance operations. This ensures that the spacer ring has the necessary width to assure that the bearing has the required axial clearance when fitted. The bearing parts are immersed in machine oil or anti-corrosion oil after cleaning. The axial internal clearance of the bearing must never be measured when the bearing is dry.

The measurement is made using an axial internal clearance gage. The following procedure is used:

- Position a suitable centring bush and firmly clamp using grub screw (fit centring ring in the case of some bearings) (a).
- Push an inner ring with roller and cage assembly and intermediate ring on to the centring bush until it rests on the supporting plate (b).
- Push outer ring over the inner ring whilst rotating the outer ring by hand.
- Insert second inner ring with roller and cage assembly in the outer ring whilst rotating the outer ring.
- Eccentric UP, i.e. rotate in an upwards direction; the bearing is lifted.
- Position retaining washer with grip. Retaining washer must not be in contact with cage or outer ring!
- Rotate the retaining washer to and fro whilst tightening the nut finger tight using the wrench (c).
- Eccentric DOWN, i.e. rotate in a downwards direction.
- Rotate inner rings by means of the grip (approx. $12 \times 360^\circ$) until the rollers are in contact with the large rib of the upper inner ring (d).



Measuring the Axial Internal Clearance

- Position support ring with dial gage on the outer ring and set dial gage to “0” (e).
- Eccentric UP, i.e. rotate in an upwards direction.
- Rotate outer ring to and fro (approx. $10 \times 45^\circ$) until the rollers are in contact with the large rib of the lower inner ring (f). The indicator on the dial gage will then remain stationary.
- Read off the axial internal clearance on the dial gage and note the measured value (axial internal clearance measured on the work bench).
- Repeat the measurement.
- Eccentric DOWN, i.e. rotate in a downwards direction.
- Remove support ring with dial gage.
- Rotate inner rings by means of grip (approx. $12 \times 360^\circ$) until the rollers are in contact with the large rib of the upper inner ring.
- Position support ring with dial gage on the outer ring and set dial gage to “0” (e).
- Eccentric UP, i.e. rotate in an upwards direction.
- Rotate outer ring to and fro (approx. $10 \times 45^\circ$) until the rollers are in contact with the large rib of the lower inner ring. The indicator on the dial gage will then remain stationary.
- Read off the axial internal clearance on the dial gage. The measured value is acceptable if three consecutive measurements are equal to within 0,020 mm.
- If the difference is more than 0,020 mm, repeat the measuring procedure until the measured value can be reproduced.

Axial internal clearance values for dismantled TAROL units with inch dimensions (axial internal clearance of the bearing measured on the work bench)

TAROL unit Class/Size	Axial internal clearance			
	min. mm	max. mm	min. inch	max. inch
B $4\frac{1}{4} \times 8$	0,46	0,61	0,018	0,024
C 5×9	0,46	0,61	0,018	0,024
D $5\frac{1}{2} \times 10$	0,51	0,66	0,020	0,026
E 6×11	0,51	0,66	0,020	0,026
F $6\frac{1}{2} \times 12$	0,51	0,66	0,020	0,026
K $6\frac{1}{2} \times 9$	0,51	0,66	0,020	0,026
G 7×12	0,51	0,66	0,020	0,026
GG $6\frac{1}{2}$	0,46	0,61	0,018	0,024
GG $6\frac{7}{8}$	0,46	0,61	0,018	0,024

Axial internal clearance values for dismantled TAROL units with metric dimensions (axial internal clearance of the bearing measured on the work bench)

TAROL unit Size	Axial internal clearance	
	min. mm	max. mm
TAROL90/154	0,53	0,63
TAROL100/165	0,53	0,68
TAROL100/175	0,53	0,68
TAROL100/180	0,53	0,68
TAROL110/180	0,53	0,68
TAROL120/195	0,533	0,685
TAROL130/210	0,533	0,685
TAROL130/220	0,51	0,66
TAROL130/230	0,51	0,66
TAROL130/240	0,59	0,63
TAROL140/220	0,533	0,685
TAROL150/250	0,533	0,685
TAROL160/270	0,6	0,75
TAROL160/280	0,6	0,75

The spacer ring is reground if the axial internal clearance is too large. If the axial internal clearance is too small, a wider spacer ring is selected. The matching spacer ring and all the other bearing parts form a unit and must remain together until fitting.

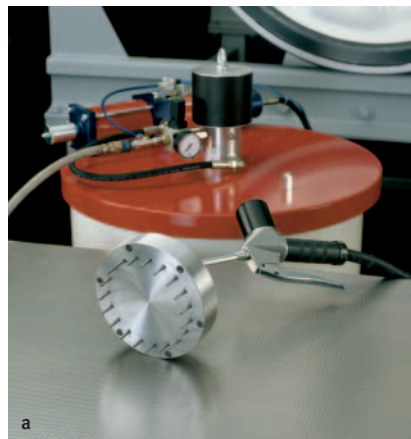
Greasing the Bearings

Use only approved greases. High-quality, acid-free greases must be used which are resistant to oxidation and aging. Greases should preferably be lithium soap based with an anti-corrosion additive. Grease should be stored in the sealed, heat-protective original packaging. The specified amount of grease may only be introduced to the bearing when it is disassembled. Pressing grease into the bearing when it is mounted on the shaft is not permitted.

TAROL units in the NFL design (no field lubrication) have no lubrication nipple and no screw plug in the end cap. The bearing unit is filled with sufficient grease for the entire kilometric performance until the next maintenance interval. We supply TAROL units with a relubrication facility on request. No contamination (dust, sand, chips, ashes, fibers, lint and other contaminants) must be allowed to enter the grease or come into contact with bearing parts when greasing. The end faces of all bearing parts, which come into contact with the shaft after mounting the unit, must remain free from grease.

The specified amount of grease for an inner ring with roller and cage assembly is introduced using a grease dispensing unit (a):

- Lay inner ring on the base plate of the unit.
- Fit the grease distributor of the dispensing unit and introduce the amount of grease according to the table (b). The end faces of the inner ring must remain free from grease.



Lubrication of TAROL units with inch dimensions
Amount and distribution of grease for initial or subsequent filling.
Lubricants according to AAR specification M942 must be used.

TAROL unit	Amount of grease and grease distribution in the bearing unit						
	Outer roller end faces per row	Inner ring with roller and cage assembly per cage assembly	Space between the roller rows		Total amount of grease		
Class/Size	g	ounce	g	ounce	g	ounce	
B 4¼ × 8	55	2,0	115	4,0	225	8,0	
C 5 × 9	85	3,0	170	6,0	340	12,0	
D 5½ × 10	lightly	115	4,0	225	8,0	455	16,0
E 6 × 11	grease	115	4,0	225	8,0	455	16,0
F 6½ × 12		170	6,0	340	12,0	680	24,0
K 6½ × 9		170	6,0	30	1,0	370	13,0
G 7 × 12		225	8,0	450	16,0	900	32,0
GG 6½		250	9,0	450	16,0	950	34,0
GG 6¾		250	9,0	450	16,0	950	34,0

Greasing the Bearings

- Insert inner ring with roller and cage assembly in the upright outer ring from above.
- Grease outer roller end faces.
- Clean any residues of grease from end face of the inner ring.
- Position sealing cap.
- Position outer ring on support ring.
- Lay press-in ring on the sealing cap (c).
- Place parts in the press, align, and press sealing cap into place (d).
- Remove bearing from the support ring, turn it over and position it again on the support ring with the sealing cap that has already been pressed into place.
- Insert spacer ring.
- Spread the amount of grease specified according to the table along the inner wall of the outer ring (e).
- Insert second, fully greased inner ring with roller and cage assembly.
- Grease outer roller end faces.
- The end faces of the inner ring must not be greased.
- Position the second sealing cap and press-in ring. Press bearing together in the press until the sealing cap snaps into place in the outer ring.



Lubrication of TAROL units with metric dimensions
The grease specified in the engineering delivery drawing must be used.

TAROL unit	Total amount of grease in the bearing unit	
	Sheet steel cage JP	Polyamide cage TVP
Size	g	g
TAROL90/154	120	120
TAROL100/165	150	–
TAROL100/175	–	140
TAROL110/180	–	145
TAROL120/195	190	170
TAROL130/210	250	–
TAROL130/220	300	300
TAROL130/230	300	300
TAROL130/240	–	240
TAROL140/220	280	–
TAROL150/250	390	390
TAROL160/270	–	350
TAROL160/280	–	530

- Correct distribution of grease for manual greasing:
- Space between both the roller rows: 90% of the free space
 - Inner ring with roller and cage assembly: Residual amount divided between both roller and cage assemblies

Completing Assembly of the TAROL Units

Units with rubber seals

These are mounted without using mounting equipment. The outside seal wear ring is carefully pushed into the seal until it is in contact with the inner ring.

The seal wear ring for the inside of the bearing is inserted in the backing ring.

Both parts are carefully pushed into the seal, exactly as far as the inner ring. All end faces of the parts must be free from grease.

Do not fold or damage the lips of the rubber seals.

Units with lamellar rings

Lamellar rings are forced slightly apart and are slipped into the grooves of the ring carrier with a screwing motion. Only a small amount of grease is spread on the rings.

The ring carriers complete with lamellar rings can easily be fitted by hand in the sealing caps.

The sealing caps have corresponding chamfers. The end faces of the ring carriers must be free from grease.

Both the double lamellar rings press against the non-rotating sealing cap and form an effective labyrinth seal with the grooves.

Before mounting the end cap

A new locking plate and three hexagonal bolts must be provided in addition to the clean end cap.

Packaging and storage

If the repaired TAROL unit is not to be mounted immediately, it is packed and stored like a new bearing unit.

Contacts and Literature

Contacts

Please do not hesitate to contact us at the following address should you have any questions about FAG tapered roller bearing units TAROL, testing center and test rigs, mounting and dismounting procedures, lubrication and grease as well as bearing unit maintenance:

Schaeffler Technologies GmbH & Co. KG

Railway Bearings Product Line
Georg-Schaefer-Strasse 30
97421 Schweinfurt, Germany

Telephone +49 9721 91-3998

Fax +49 9721 91-3788

E-Mail rail_transport@schaeffler.com

Please contact F'IS at the following address if you have any questions about tools for mounting and dismounting as well as accessories, bearing reconditioning, and training for TAROL unit maintenance:

FAG Industrial Services GmbH

Kaiserstrasse 100
52134 Herzogenrath, Germany

Telephone +49 2407 9149-66

Fax +49 2407 9149-59

E-Mail info@fis-services.de

Literature

You can find further brochures about the services provided by INA and FAG for railway vehicles and a selection of reference sheets with application examples in the library sections of the following homepages:

www.ina.com und **www.fag.com**.

Schaeffler Technologies

GmbH & Co. KG

Georg-Schäfer-Straße 30
97421 Schweinfurt (Germany)

Internet www.fag.com

E-Mail rail_transport@schaeffler.com

Telephone +49 9721 91-3998

Fax +49 9721 91-3788

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