



FAG



Products for railway applications

SCHAEFFLER GROUP
INDUSTRIAL

Together we move the world...

Schaeffler Group Industrial is, through its brands INA and FAG, one of the world's leading manufacturers of rolling and plain bearings. In close partnership with manufacturers and operators, carefully matched solutions are developed for any application in rail vehicles. The product portfolio includes wheelset bearings together with housings as well as bearings and components for traction motors and gearboxes, for wagon joints and tilting mechanisms, for doors and sliding panels.

Bearing arrangements for rail vehicles are subjected to extreme loads and are required to fulfil high safety standards. Schaeffler Group Industrial has more than 140 years of experience in the rail sector. We can thus offer comprehensive technical expertise, the highest quality and precise matching of products to any area of application. The reliability of the bearings is tested under extreme conditions on test rigs we have developed in-house. The railway test shop at the FAG Schweinfurt site is recognised and certified as a test facility for rail vehicle bearing arrangements by the Federal German Railway Authority.

It is also authorised by the DAP (German Accreditation System for Testing) to perform tests in accordance with DIN EN ISO/IEC 17025: 2000 in the field "Performance capacity of wheelset bearings for railway applications".

Our services include expert application advisory work, rolling bearing calculations, testing and assembly. We have a close-meshed network of external sales engineers, service and sales technicians working worldwide for you to ensure short travel distances and rapid response times. As a special service, FAG Industrial Services (F'IS) offers the skilled and economical reconditioning of railway bearings.

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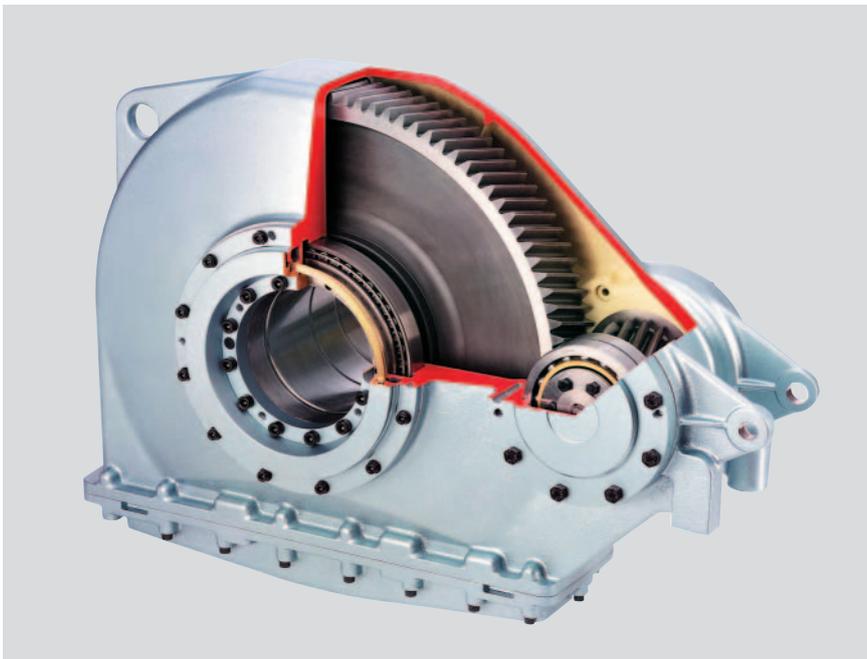
Bearing arrangements for drive units

Modern rail vehicles offer high travel comfort, generate little noise and are economical while achieving very high performance capacity. Rolling bearings from Schaeffler Group Industrial in gearboxes, traction motors and nose and axle-suspended motor bearing arrangements make an important contribution here. For locomotives, power cars and multiple units or for local trains: FAG bearing solutions for drive systems are specifically designed for the particular application.



Bearing arrangements for drive units

Gearbox bearing arrangements



Gearbox for Berlin S-Bahn urban train

Gearbox bearing arrangements

Rolling bearings in gearboxes stabilise the shaft and support the transmission of forces. In doing so, they must withstand extreme loads under complex environmental influences. The bearing types principally used for gearboxes are tapered roller bearings, four point contact bearings and cylindrical roller bearings. Bearing types used less frequently include deep groove ball bearings, spherical roller bearings and angular contact ball bearings.

The main requirements for bearings in gearboxes are:

- high speeds
- high loads
- vibrations and shocks
- high temperatures
- high guidance accuracy
- compact construction.

Based on these characteristics, bearings are selected in consultation with the gearbox manufacturer.

Characteristic features of FAG gearbox bearings:

- strengthened internal construction
- special cage design
- restricted tolerances and adjusted internal clearance
- retaining slots in the outer ring to prevent “co-rotation”.

Examples of bearing arrangements

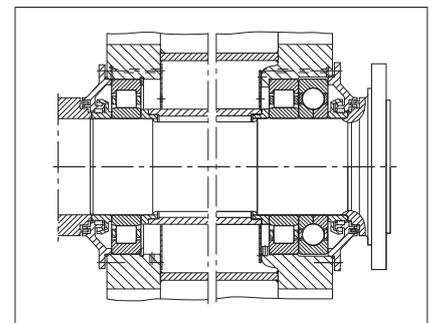
FAG rolling bearings are used in all common railway gearboxes.

For example, four typical bearing arrangements have proved effective in the case of pinion shafts.

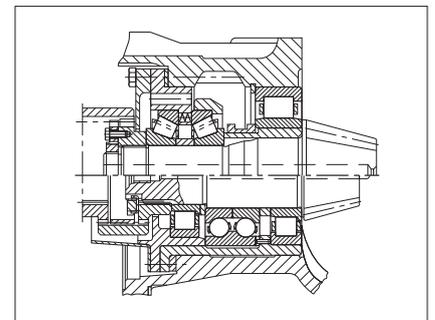
Example 1 shows the pinion shaft with tapered roller bearings (O arrangement) and a cylindrical roller bearing, while Example 2 has

two cylindrical roller bearings and one double row angular contact ball bearing.

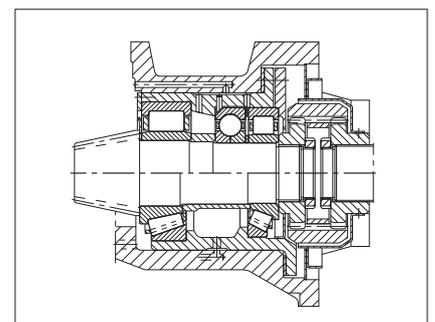
Bearing arrangements comprising two cylindrical roller bearings and one four point contact bearing, Example 3, or two tapered roller bearings, Example 4, have also proved effective.



Bearing arrangement for gearbox shaft



Bearing arrangement for pinion shaft.
Example 1 (top), Example 2 (bottom)



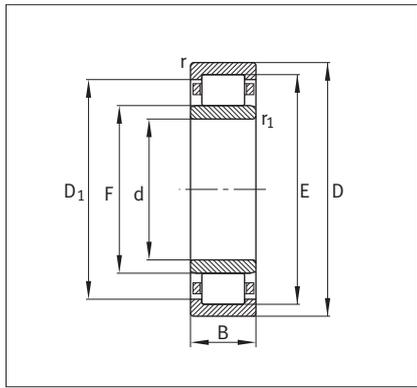
Bearing arrangement for pinion shaft.
Example 3 (top), Example 4 (bottom)

Bearing arrangements for drive units

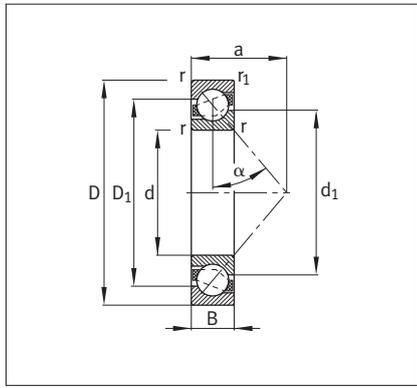
Gearbox bearing arrangements

FAG bearing types and designs for gearboxes

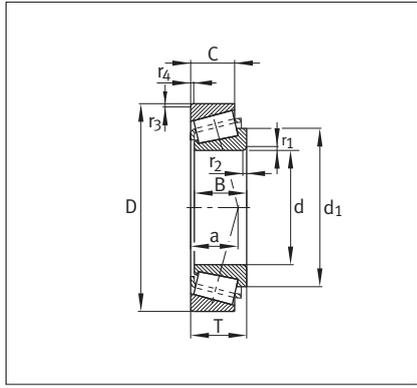
Bearing types and designs	Series	Inside diameter range mm
Cylindrical roller bearings		
NU, NJ, NUP, NJP	10, 2..-E, 3..-E, 4, 22E, 23E, 18, 19, 29	20–400
Deep groove ball bearings		
	60, 62, 63, 64, 160	10–260
Four point contact bearings		
QJ	10..-N2, 2..-N2, 3..-N2	25–260
Angular contact ball bearings		
	3..DA, 72..B, 73..B	10–170
Spherical roller bearings		
	222..-MB, 223..-MB, 232..-MB, 230..-MB, 239..-MB	25–300
Tapered roller bearings		
	302..-A, 313, 320..-X, T7FC, 323..-B	55–220
Special bearings, mainly inch sizes		
	Z-500000, F-500000, F-800000	160–380



Cylindrical roller bearing



Deep groove ball bearing

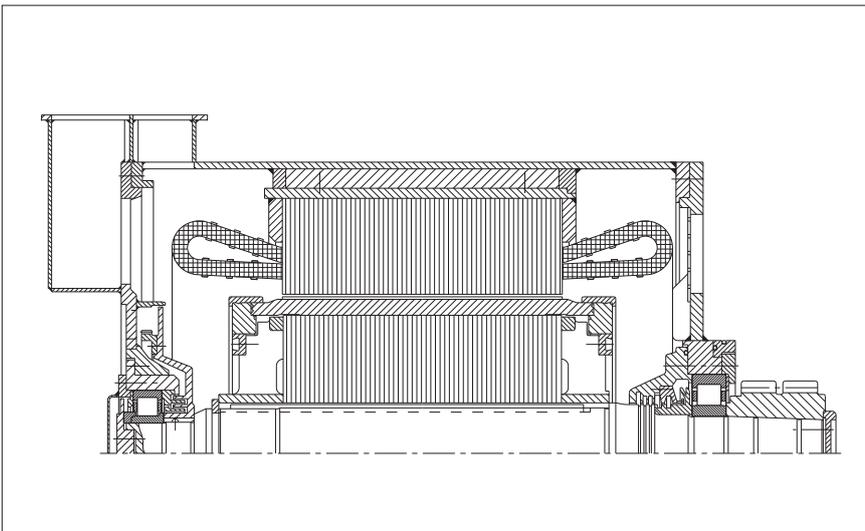


Tapered roller bearing

Suffix	Description
E	Increased capacity design
N	Annular slot in outside surface profile of outer ring
N2	Two retaining slots in outer ring
DA	Inner ring split
MPA, MP1A, M1A	Solid brass cage, rib-guided on outer ring
M, MP, M1	Solid brass cage, guided by rolling elements
MB	Solid brass cage, rib-guided on inner ring
Other designs and sizes available by agreement	

Bearing arrangements for drive units

Traction motor bearing arrangements



Traction motor

Traction motor bearing arrangements

In most cases, traction motors have the following bearing arrangement:

- Pinion side
Cylindrical roller bearing NU
- Fan side
Deep groove ball bearing or cylindrical roller bearing NJ with L-section ring HJ, cylindrical roller bearing NUP

Current-insulated FAG bearings

Under unfavourable conditions, bearings in electric motors may be damaged by the passage of current. Magnetic asymmetries, which cannot be avoided even when the motors are manufactured with the greatest of care, induce a voltage difference between the rotor and stator.

The circuit is formed through the bearings. In order to prevent this, Schaeffler Group Industrial offers innovative solutions, for example inner or outer rings coated with oxide ceramic or hybrid bearings with ceramic rolling elements. Coated bearings are suitable, depending on the coating thickness (100 or 200 μm) for puncture voltages up to at least 500 V or 1000 V respectively. Even better protection is possible by the use of hybrid bearings with ceramic rolling elements.



Current-insulated bearings

Bearing arrangements for drive units

Traction motor bearing arrangements

Current-insulated bearings for traction motors from European manufacturers

The oxide ceramic is applied to the bearing surfaces using the plasma spraying method. Oxide ceramic is very hard, resistant to wear and has good thermal conductivity.

The advantages of this coating are:

- high insulation protection
- Due to a special sealing method, the **J20AA coating** gives insulation even in a damp environment.
- The external dimensions of the current-insulated rolling bearings correspond to the dimensions in accordance with DIN 616 (ISO 15). Current-insulated bearings are therefore interchangeable with standard bearings.

For special applications, for example with a rotating outer ring, coating of the inner ring to J20C is recommended.

Traction motors can be fitted, for example, with a cylindrical roller bearing FAG

NU215-E-TVP2-F1-J20AA-C4 as a non-locating bearing on the drive side and a deep groove ball bearing FAG **6215-M-J20AA-C3** as a locating bearing on the opposing side.

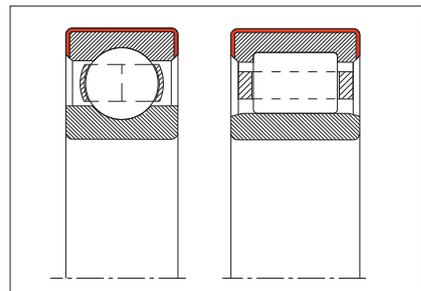
FAG bearing types and designs for traction motors

Bearing types and designs	Series	Inside diameter range mm
Deep groove ball bearings		
	60, 62, 63	40–240
Cylindrical roller bearings		
NU	10	130–240
NU, NJ, NUP	2..-E, 22, -E	60–200
NU, NJ, NUP	3..-E	40–190
Special bearings		
	500000, 800000	40–240

Suffix	Description
C3, C4, C5	Radial internal clearance larger than normal
M	Solid brass cage, guided by rolling elements
J20AA	Current-insulated, oxide ceramic coating on outer ring (coating thickness $\approx 200 \mu\text{m}$)
J20B	Current-insulated, oxide ceramic coating on outer ring (coating thickness $< 100 \mu\text{m}$)
J20C	Current-insulated, oxide ceramic coating on inner ring (coating thickness $\approx 200 \mu\text{m}$)
F1	Cylindrical roller bearings for traction motors to DIN 43283
M1	Solid brass cage, with riveted crosspieces, guided by rolling elements
TVP, TVP2	Solid window cage made from polyamide
Other designs and sizes available by agreement	
All bearing arrangements are also current-insulated	



Plasma spraying method



J20B / J20A / J20AA

Bearing arrangements for drive units

Traction motor bearing arrangements

FAG rolling bearings for traction motor manufacturers in the USA

Manufacturer Designation	Motor number	Pinion side	Commutator side	
General Electric	GE-716	Z-558826.04.ZL	NJ318E-M1-F1-T51F	HJ318E-F1
	GE-720	Z-558826.04.ZL	NJ318E-M1-F1-T51F	HJ318E-F1
	GE-723	NU322E-M1-F1-T51F	NJ317E-M1-F1-T51F	HJ317E-F1
	GE-726	Z-558830.03.ZL	Z-558320.03.ZL	
	GE-730	Z-558830.03.ZL	Z-558320.03.ZL	
	GE-731	Z-558826.04.ZL	NJ318E-M1-F1-T51F	HJ318E-F1
	GE-733	NU412M1-F1-T51F	6212-Z	
	GE-741	NU412M1-F1-T51F	6212-Z	
	GE-746	Z-558830.03.ZL	Z-558320.03.ZL	
	GE-748	NU418M1-F1-T51F	6313-C3	
	GE-752	Z-558830.03.ZL	6320-R114-139	
	GE-754	Z-558826.04.ZL	NJ318E-M1-F1-T51F	HJ318E-F1
	GE-755	Z-558830.03.ZL	Z-558320.03.ZL	
	GE-756	NU322M1-F1-T51F	6316-C3	
	GE-761	Z-558826.04.ZL	6318-R66-84	
	GE-792A	NU324-E-M1-F1-T51F	6318-R66-84	
	GE-793A	Z-558540.04.ZL	6318-R66-84	
	GE-1204	6313-Z-C3	6309-Z-C3	
	GE-1213	6313-Z-C3	6310-Z-C3	
	GE-1240	NU314E-M1-F1-T51F	6312-C3	
GEB-13	N2236E-807603-R460-490	6418M-R114-139-J20A-T36		
GEB-15	Z-558830.09.ZL	6320-R114-139		
HM-833	NU322E-M1-F1-T51F	NJ317E-M1-F1-T51F	HJ317E-F1	
HM-838	NU320E-M1-F1-T51F	NJ316E-M1-F1-T51F	HJ316E-F1	
HM-846	NU316E-M1-F1-T51F	NJ312E-M1-F1-T51F	HJ312E-F1	

Other designs and sizes available by agreement.

FAG rolling bearings for traction motor manufacturers in the USA

Manufacturer Designation	Motor number	Pinion side	Commutator side	
Westinghouse	WE-362-D	Z-558826.04.ZL	NJ318E-M1-F1-T51F	HJ318E-F1
	WE-362-DZ	NU328E-M1-F1-T51F	NJ322E-M1-F1-T51F	HJ322E-F1
	WE-370	NU328E-M1-F1-T51F	NJ318E-M1-F1-T51F	HJ318E-F1
	WE-370-DEZ	NU328E-M1-F1-T51F	NJ318E-M1-F1-T51F	HJ318E-F1
	WE-561	NU324E-M1-F1-T51F	NJ314E-M1-F1-T51F	HJ314E-F1
	WE-563	NU322E-M1-F1-T51F	NJ312E-M1-F1-T51F	HJ312E-F1
	WE-776	NU328E-M1-F1-T51F	NJ318E-M1-F1-T51F	HJ318E-F1
	WE-970	NU322E-M1-F1-T51F	NJ314E-M1-F1-T51F	HJ314E-F1
	WE-974	NU322E-M1-F1-T51F	NJ312E-M1-F1-T51F	HJ312E-F1
	Electro Motive	D7-77	Z-558540.04.ZL	Z-558320.03.ZL
D7-78		Z-558540.04.ZL	Z-558320.03.ZL	
D7-87		Z-558830.03.ZL	Z-558320.03.ZL	

Suffix	Description
E	Increased capacity design
F1	Bearings for traction motors to DIN 43283
M1	Solid brass cage with riveted crosspieces, roller-guided
M	Solid brass cage with steel rivets, roller-guided
C3/C4	Radial internal clearance larger than normal
J20A	Current-insulated (thick coating)
J20B	Current-insulated (thin coating)
T51F	Bearings for US traction motors

Ordering example

Locating bearing NJ318E.M1.F1.T51F with HJ318E.F1

Non-locating bearing NU328E.M1.F1.T51F

Other designs and sizes available by agreement.

Bearing arrangements for drive units

Nose and axle-suspended motor bearing arrangements



Mounting of nose and axle-suspended motor bearing

Nose and axle-suspended motor bearing arrangements

Nose and axle-suspended motor bearing arrangements are fitted in electric freight locomotives in order to support the traction motor mounted transverse to the direction of travel that sits directly on the wheelset shaft at two bearing positions, the so-called noses. In order to achieve a nose and axle-suspended motor bearing arrangement with a long service life (basic rating life more than 2 million kilometres), roller bearings with high load carrying capacity are selected.

FAG nose and axle-suspended motor bearings for rail vehicles

Bearing types and designs

Series

Cylindrical roller bearings

NU+HJ, NJ+NJ, NU+NUP

10, 19

Spherical roller bearings

222..-MB, 223..-MB
with special cage

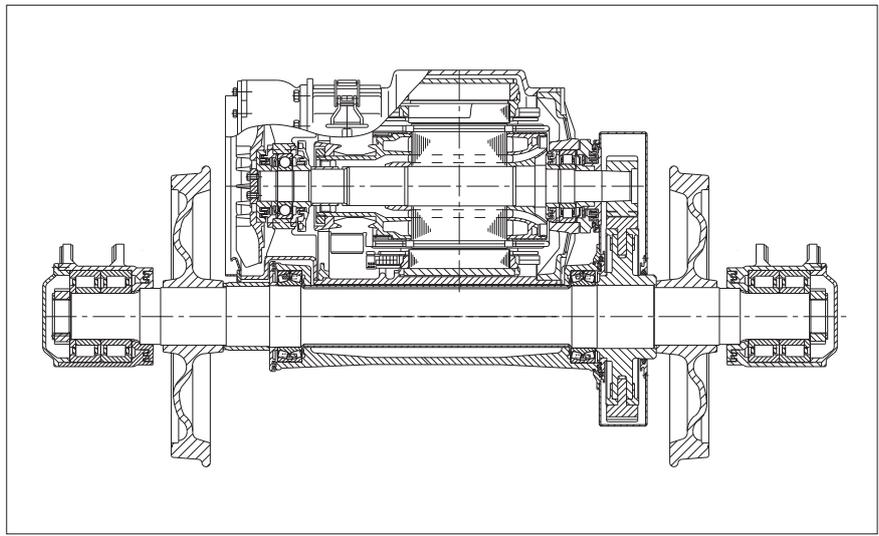
Other designs and sizes available by agreement.

Bearing arrangements for drive units

Nose and axle-suspended motor bearing arrangements



Tapered roller bearing

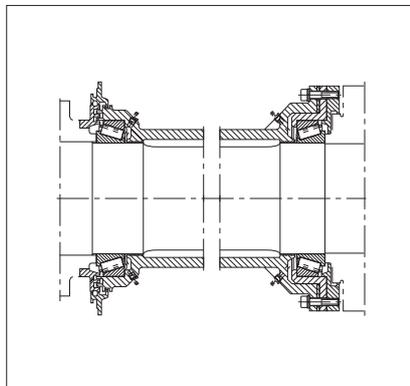


Nose and axle-suspended motor bearing arrangement – spherical roller bearings

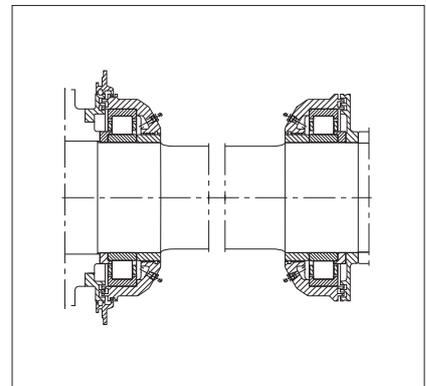
FAG nose and axle-suspended motor bearings for rail vehicles

Nose and axle-suspended motor bearing arrangements with tapered roller bearings can support particularly high radial and axial forces and facilitate close axial guidance of the tooth set. The high loads from vibrations and shocks are supported by special tapered roller bearings with an increased capacity sheet metal cage.

Cylindrical roller bearings support high radial forces and facilitate easy mounting, spherical roller bearings are used in preference where high radial and axial forces in both directions must be supported and good self-alignment capability is required.



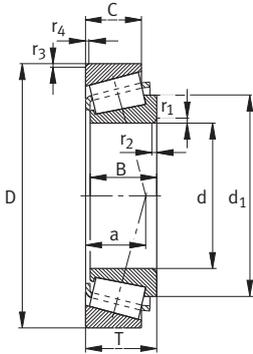
Nose and axle-suspended motor bearing arrangement – tapered roller bearings



Nose and axle-suspended motor bearing arrangement – cylindrical roller bearings

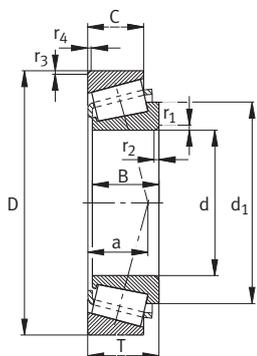
Bearing arrangements for drive units

Nose and axle-suspended motor bearing arrangements



FAG nose and axle-suspended motor bearings for rail vehicles – tapered roller bearings

Designation	Dimensions				Basic load rating dyn. C kN
	d mm	D	T	B	
Z-536326.TR1	189,738	279,4	52,388	57,15	455
Z-536325.TR1	190,475	279,4	52,388	57,15	455
Z-566565.TR1	198,298	279,4	46,038	49,212	355
F-809055.TR1 ²⁾	198,298	282,575	46,038	49,212	640
Z-566566.TR1	199,949	282,575	46,038	49,212	355
Z-548100.TR1	200,025	276,225	42,863	46,038	340
Z-527100.TR1	200,025	292,1	57,945	61,913	480
Z-547285.TR1	200,812	292,1	57,945	61,913	480
Z-548101.TR1	203,987	276,225	42,863	46,038	340
Z-548101.02.TR1 ¹⁾	203,987	276,225	42,863	46,038	340
Z-530994.TR1	216,408	285,75	46,038	49,213	365
Z-530995.TR1	216,713	285,75	46,038	49,213	365
F-801812.TR1 ¹⁾	220	285	41	40	365
F-801813.TR1 ¹⁾	223,175	300	50	48	455
Z-522416.TR1	230,188	317,5	47,625	52,388	455
Z-522417.TR1	231,775	317,5	47,625	52,388	455
Z-525862.TR1	231,775	336,55	65,088	69,85	640
F-809555.TR1	234,848	314,325	49,212	53,975	390



FAG nose and axle-suspended motor bearings for rail vehicles – tapered roller bearings

Designation	Dimensions				Basic load rating dyn. C kN
	d mm	D	T	B	
Z-578361.TR1	234,95	314,325	49,212	49,212	455
F-804744.TR1	235,331	336,55	65,088	69,85	640
F-801376.TR1	237,33	336,55	65,088	69,85	640
F-809146.TR1 ²⁾	240	336,55	65,088	69,85	850
Z-578072.TR1	240	360	76	76	830
F-808428.TR1	240,5	336,55	65,088	69,85	640
Z-578073.TR1	241	360	76	76	830
Z-574019.01.TR1	254	324,925	39	41,5	325
Z-574019.02.TR1 ¹⁾	254	324,925	39	41,5	325
Z-546556.TR1	254	358,775	71,438	71,438	695
Z-547733.02.TR1 ²⁾	254	384,175	71,438	76,2	720
Z-547734.TR1	255,6	342,9	57,15	63,5	510
Z-547734.01.TR1 ¹⁾	255,6	342,9	57,15	63,5	510
Z-547733.TR1	257,175	358,775	71,438	76,2	720
Z-547733.01.TR1 ¹⁾	257,175	358,775	71,438	76,2	720
Z-546569.TR1	257,175	342,9	57,15	63,5	510

Suffix Description

TR1 Single row tapered roller bearing

¹⁾ Case hardening steel

²⁾ Outer ring with flange

Other designs and sizes available by agreement.

Bearing arrangements for chassis

Maximum reliability and operational security is now expected not only by manufacturers and operators of rail vehicles but also by passengers themselves – whether the vehicle is a tram or a high speed train. In local trains, the principal requirement is for the greatest possible low-floor design and multiple unit construction. The chassis, bogies and their components must thus be of a particularly compact design. In any rail vehicle, the chassis and bogies are components highly relevant to safety. Accordingly, the quality of the rolling and plain bearings developed and manufactured by Schaeffler Group Industrial is also very high.



Bearing arrangements for chassis

Wheelset bearings



Bombardier, Itino

Wheelset bearings

FAG wheelset bearings comprise the interface between the wheelset and the bogie frame; they are therefore subjected to extreme loads and must fulfil a wide range of technical requirements. If the rolling bearing components are subjected to a series of tests in accordance with DIN EN 12080 – including ultrasonic inspection of the inner rings and outer rings – they conform to the highest quality class and are designated as “Class 1”. In addition, compliance with DIN EN 12082 is verified on special wheelset bearing test rigs.

Wheelset bearings are developed in close cooperation with manufacturers and operators of rail vehicles in order to ensure optimum matching to the specific operating conditions.

The bearings predominantly used in wheelset bearings are cylindrical and tapered roller bearings as well as spherical roller bearings.

Cylindrical roller bearings and cylindrical roller bearing units

Cylindrical roller bearings have proved effective for decades in wheelset bearing arrangements of



Cylindrical roller bearing unit

all types for standard gauge railways as well as local trains.

They have undergone progressive development and their performance capacity has thereby been matched to the requirements of modern rail vehicles. Cylindrical roller bearings are also available with cages made from glass fibre reinforced polyamide.

Tapered roller bearings, tapered roller bearing units TAROL

TAROL units are supplied ready for mounting. The bearing arrangement comprises double row tapered roller bearings that are supplied already set for clearance, greased and sealed. Tapered roller bearings can be fitted with cages made from glass fibre reinforced polyamide and have even longer grease operating life in this case.



TAROL unit

Bearing arrangements for chassis

Wheelset bearings



Spherical roller bearing with brass cage



Closed adapter, special manufacture



Cylindrical roller bearing with brass cage for inner bearing arrangement

Spherical roller bearings

Schaeffler Group Industrial supplies spherical roller bearings under the FAG brand for wheelset bearings with a rigid inner ring rib and a solid brass cage or sheet steel cage.

Mechatronics

Wheelset bearings with integral generators allow a continuous supply of electricity, for example for driving telematics systems.

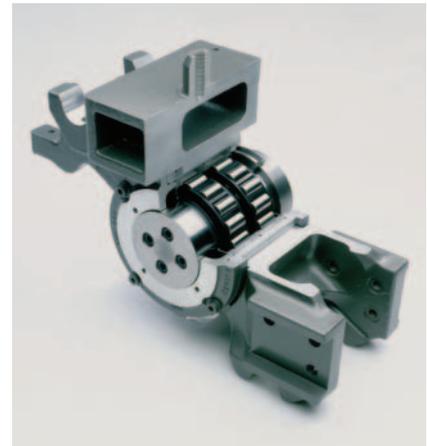
If the sensor system is integrated in the bearing, speed information and measured temperature values can be reliably transmitted.

Wheelset bearing housings and adapters

We supply wheelset bearing housings and adapters made from spheroidal graphite cast iron and cast light metal; these can also be made from cast steel in special cases.

Single row FAG cylindrical roller bearings

Single row cylindrical roller bearings offer, in comparison with other conventional bearing types in wheelset bearings (such as TAROL units or spherical roller bearings), the advantage that they can be easily separated (without the use of tools) into an inner ring and an outer ring with a roller and cage assembly. This offers the user practical benefits in relation to mounting, dismounting, maintenance and inspection.



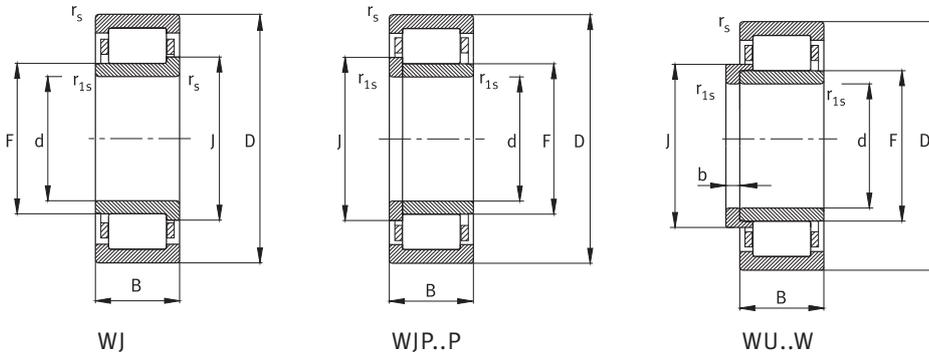
Cylindrical roller bearing with polyamide cage



Wheelset bearing with sensor system

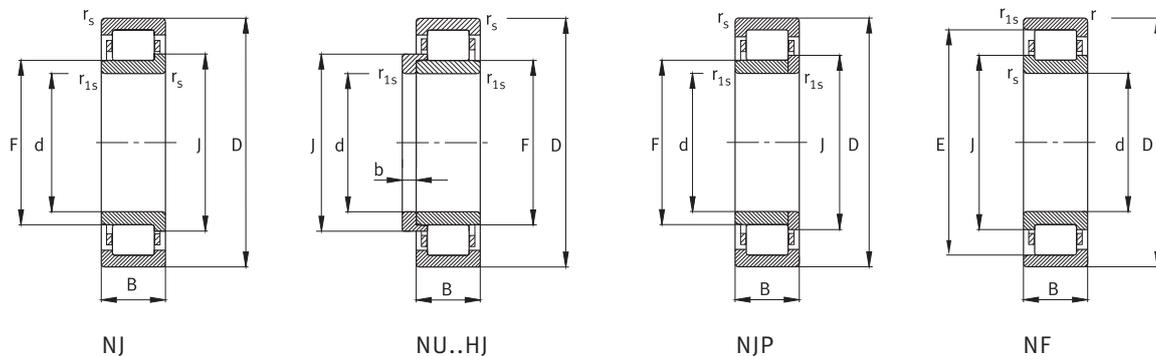
Bearing arrangements for chassis

Wheelset bearings



Single row FAG cylindrical roller bearings

Designation	Dimensions									Basic load rating dyn. C kN	Type/cage	Mass kg
	d mm	D	B	r _{s min}	r _{1s min}	J	F	b	E			
WJ80X140-TVP	80	140	42	2	2	101,5	95,3			186	WJ/TVP	2,4
WJP80X140-P-TVP	80	140	42	2	2	101,5	95,3			186	WJP/TVP	2,4
F-565630.ZL	80	170	58	2,1	2,1	110,6	101			355	NJ/TVP	5,9
F-565631.ZL	80	170	58	2,1	2,1	110,6	101			355	NJP/TVP	5,9
Z-574332.ZL	90	160	48	2	2	114,25	107			240	NJ/TVP	3,6
Z-574333.ZL	90	160	48	2	2	114,25	107			240	NJP/TVP	3,8
WJ90X160-TVP	90	160	52,4	2	2	114,25	107			240	WJ/TVP	3,8
WJP90X160-P-TVP	90	160	52,4	2	2	114,25	107			240	WJP/TVP	4,0
F-565632.ZL	90	190	64	3	3	124	113,5			430	NJ/TVP	8,0
F-565633.ZL	90	190	64	3	3	124	113,5			430	WJP/TVP	8,0
F-565624.ZL	100	180	46	2,1	2,1	127,3			163	335	NF/M1	4,8
F-574334.ZL	100	180	55	2,1	2,1	127,3	119			335	NJ/TVP	3,8
F-574335.ZL	100	180	55	2,1	2,1	127,3	119			335	NJP/TVP	3,8
WJ100X180-TVP	100	180	60,3	2,1	2,1	127,3	119			335	WJ/TVP	5,7
WJP100X180-P-TVP	100	180	60,3	2,1	2,1	127,3	119			335	WJP/TVP	5,7
WJ100x200-M1	100	200	67	4	4	132	121,5			390	WJ/M	10,3
WJP100x200-P-M1	100	200	67	4	4	132	121,5			390	WJP/M	10,3
WU100x200-W-M1	100	200	67	4	4	132	121,5	13		390	WUP/M	10,8
F-565065.ZL	100	215	73	3	3	139,6	127,5			570	NJ/TVP	12,0
F-565064.ZL	100	215	73	3	3	139,6	127,5			570	NJP/TVP	12,0
Z-577935.ZL	110	180	55	2	2	132,9			165	280	NF/M1	5,0
F-803325.ZL	110	200	53	2,1	2,1	141,6			180,5	380	NF/TVP	6,7
WJ110X215-M1	110	215	73	4	4	147	135,5			455	WJ/M1	12,5
WJP110X215-P-M1	110	215	73	4	4	147	135,5			455	WJP/M1	12,5



Single row FAG cylindrical roller bearings

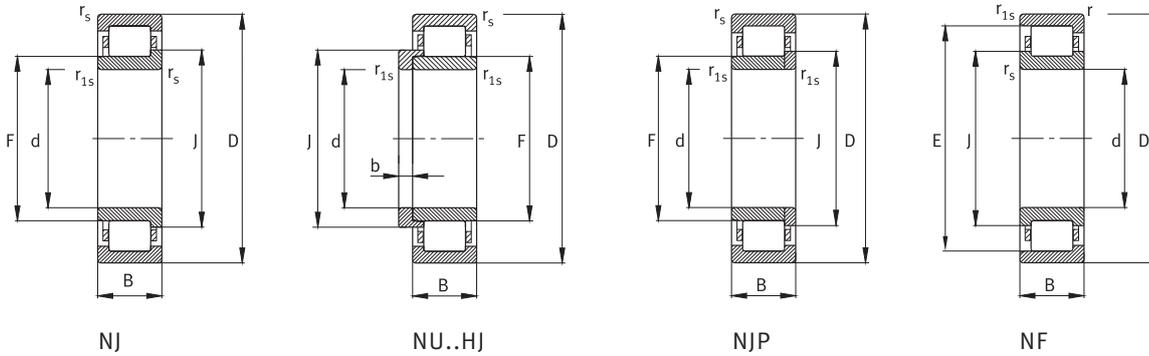
Designation	Dimensions									Basic load rating dyn. C kN	Type/cage	Mass kg
	d mm	D	B	r _{s min}	r _{1s min}	J	F	b	E			
F-804970.ZL	120	180	44	2	1,1	140,4	134		166	245	NF/M1	3,9
F-565625.ZL	120	215	58	2,1	2,1	153,5			195,5	450	NF/M1	8,3
WJ120X215-TVP	120	215	73	3	3	150,8	140,5			520	WJ/TVP	10,4
WJP120X215-P-TVP	120	215	73	3	3	150,8	140,5			520	WJP/TVP	10,4
WJ120X240-M1	120	240	80	4	4	161	150			560	WJ/M1	17,9
WJP120X240-P-M1	120	240	80	4	4	161	150			560	WJP/M1	17,9
WJ120X240-TVP	120	240	80	4	4	161	150			560	WJ/TVP	16,0
WJP120X240-P-TVP	120	240	80	4	4	161	150			560	WJP/TVP	16,0
Z-579021.ZL	130	220	62	4	4	160,15	150			465	NJP/TVP	8,9
Z-579020.ZL	130	220	62	4	4	160,15	150			465	NJ/TVP	8,9
Z-514494.01.ZL	130	220	73	3	3	160,35	151			500	NJP/TVP	10,7
Z-514493.01.ZL	130	220	73	3	3	160,35	151			500	NJ/TVP	10,7
WJ130X240-M1	130	240	80	4	4	167,5	157			540	WJ/M1	16,8
WJP130X240-P-M1	130	240	80	4	4	167,5	157			540	WJP/M1	16,8
WJ130X240-TVP	130	240	80	4	4	167,5	157			540	WJ/TVP	15,2
WJP130X240-P-TVP	130	240	80	4	4	167,5	157			540	WJP/TVP	15,2
Z-581171.01.ZL	130	250	80	2	1,1	170,4	158			600	NJ/TVP	16,6
Z-581172.01.ZL	130	250	80	2	1,1	170,4	158			600	NJP/TVP	16,6
WJ130X260-M1	130	260	86	4	4	178	164			695	WJ/M1	22,6
WJP130X260-P-M1	130	260	86	4	4	178	164			695	WJP/M1	22,6

Suffix	Description
M1	Solid brass cage with riveted crosspieces
P	Rib washer
TVP	Polyamide cage
W	L-section ring
ZL	Cylindrical roller bearing

Other designs and sizes available by agreement.

Bearing arrangements for chassis

Wheelset bearings



Single row FAG cylindrical roller bearings

Designation	Dimensions									Basic load rating dyn. C kN	Type/cage	Mass kg
	d mm	D	B	r _{s min}	r _{1s min}	J	F	b	E			
F-801086.ZL	150	250	60	2	1,5	184,7	174			520	NJ/M1	12,5
F-801087.ZL	150	250	60	2	1,5	184,7	174			520	NJP/M1	12,5
F-803122.ZL	150	270	73	3	3	193,7	182			655	NJ/TVP	17,4
F-803121.ZL	150	270	73	3	3	193,7	182	12		655	NU/TVP	17,4
WJ150X300-M1	150	300	102	5	5	203	188			865	WJ/M1	35,8
WJP150X300-P-M1	150	300	102	5	5	203	188			865	WJP/M1	35,8
F-565626.ZL	160	290	80	3	3		193			800	NU/M1	23,5
F-565627.ZL	160	290	80	3	3	206,8	193			800	NJ/M1	23,5
F-565628.ZL	180	320	86	4	4		215			1000	NU/M1	30,9
F-565629.ZL	180	320	86	4	4	228,9	215			1000	NJ/M1	30,9
WU180X340-W-M1	180	340	100	4	4		220	15		1000	WU...W/M1	45,7
WJ180X340-M1	180	340	100	4	4	235,35	222			1000	WJ/M1	43,7

Suffix Description

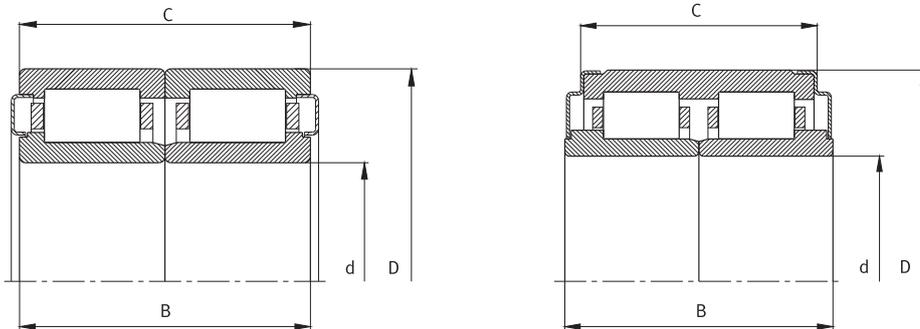
M1 Solid brass cage

TVP Polyamide cage

Other designs and sizes available by agreement.

Bearing arrangements for chassis

Wheelset bearings



Double row FAG cylindrical roller bearing units, sealed

Designation	Dimensions				Basic load rating dyn. C kN	Cage	Seal	Mass kg
	d mm	D	B	C				
F-804630.ZL	100	180	120,6	124,6	575	TVP	Sheet metal cap	12,1
F-807081.ZL	120	215	146	146	520	TVP	Sheet metal cap	21,5
F-808246.ZL	120	200	130	130	680	TVP	Sheet metal cap	15,1
F-803419.ZL	130	220	160	160	800	TVP	Sheet metal cap	22
F-803417.01.ZL	130	220	160	160	1000	TVP	Sheet metal cap	24
F-804490.01.ZL	130	220	160	160	930	TVP	Sheet metal cap	22
F-804986.ZL¹⁾	130	220	160	160	930	TVP	Sheet metal cap	21,6
F-804315.ZL	130	240	160	164	925	TVP	Sheet metal cap	30,6
F-809403.ZL	130	240	160	164	925	TVP	Sheet metal cap	30,6
F-809100.ZL	150	250	160	160	965	TVP	Sheet metal cap	30,6
F-801804.ZL	160	270	170	150	1080	TVP	Sheet metal cap	37
F-807850.ZL²⁾	160	270	170	160	1130	TVP	Sheet metal cap	34,5
F-804116.ZL¹⁾	160	270	176	160	1080	TVP	Sheet metal cap	33,8
F-803870.ZL	180	280	145	145	750	TVP	Sheet metal cap + rubber lip	28

Suffix	Description
ZL	Cylindrical roller bearing

¹⁾ Displacement bearing

²⁾ WJ/WJP

Other designs and sizes available by agreement.

Bearing arrangements for chassis

Wheelset bearings

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.



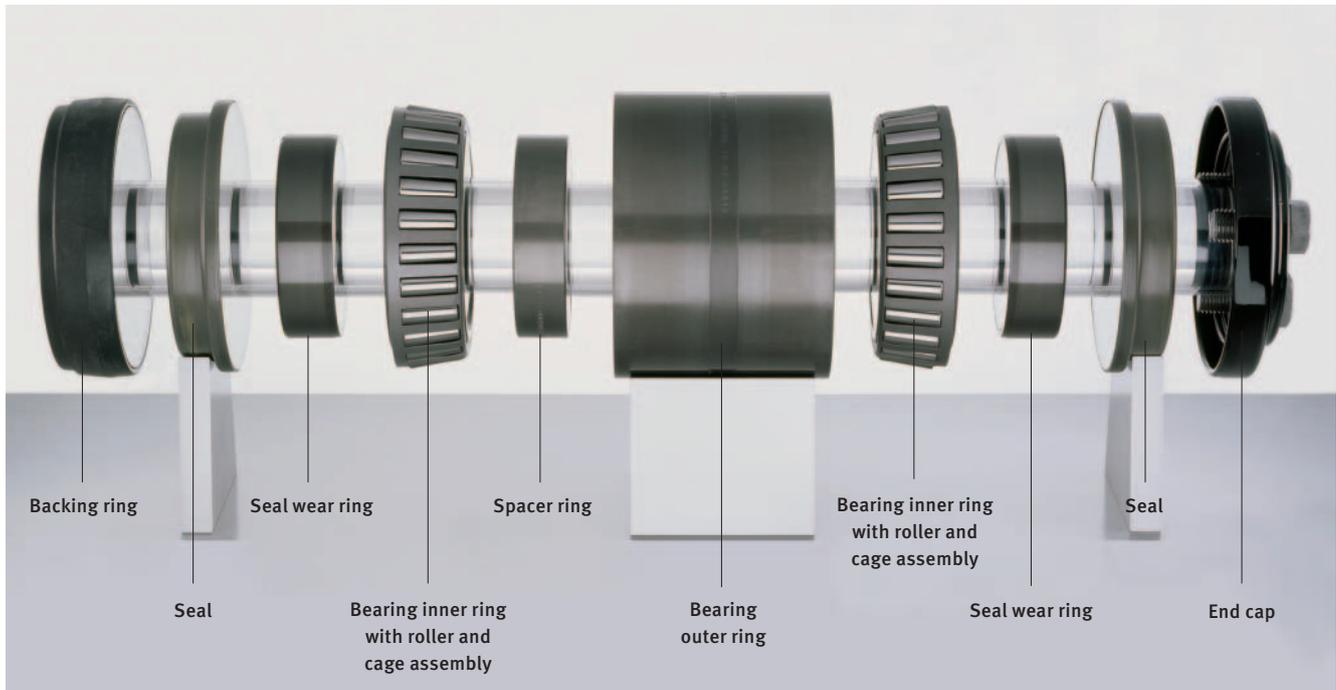
View inside a TAROL unit with inch dimensions



View inside a TAROL unit with metric dimensions

Bearing arrangements for chassis

Wheelset bearings



Individual parts of a TAROL unit with rotary shaft seals

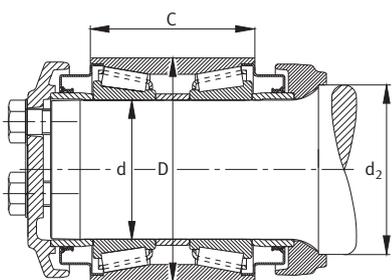


Individual parts of a TAROL unit with lamellar rings

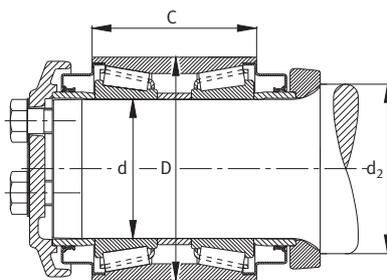
Bearing arrangements for chassis

Wheelset bearings

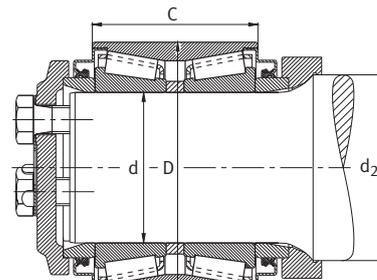
Schematics of various designs



Classes E, F, G, GG



Classes B, C, D



Class K

FAG 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

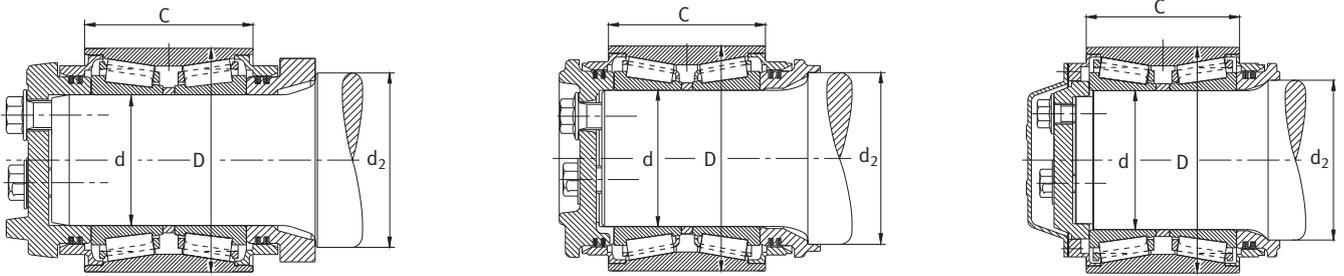
Designs D, E, F, G, K, in accordance with AAR Standard M-934. Irrespective of the data given, the bearings are always matched to the AAR specifications. For standard greasing, a grease approved to AAR is used.

Design/ Size	Dimensions Shaft			Load rating ABEC/RBEC C1 lbs kN	Load rating DIN ISO 281 C kN	Mass TAROL unit lbs kg
	d min inch mm	d max inch mm	d ₂ inch mm			
Class B 4¼ × 8	4,003 101,676	4,004 101,702	5 127	106 000 465	415	32,6 14,8
Class C 5 × 9	4,6905 119,139	4,6915 119,164	5,875 149,225	146 000 655	570	54,7 24,8
Class D 5½ × 10	5,1905 131,839	5,1915 131,864	6,375 161,925	160 000 720	620	60,2 27,3
Class E 6 × 11	5,6905 144,539	5,6915 144,564	7,030 – 7,032 178,562 – 178,613	166 000 750	655	77,2 34,9
Class F 6½ × 12	6,1905 157,239	6,1915 157,264	7,530 – 7,532 191,262 – 191,313	232 000 1 020	900	116,6 52,9
Class K 6½ × 9	6,1905 157,239	6,1915 157,264	7,530 – 7,532 191,262 – 191,313	232 000 1 020	900	89,7 40,7
Class G 7 × 12	7,003 177,876	7,004 177,902	8,000 – 8,002 203,200 – 203,251	265 000 1 180	1 020	132,5 60,1
GG 6½	6,503 165,176	6,504 165,202	7,905 – 7,906 200,79 – 200,81	344 000 1 530	1 320	179,5 81,4
GG 6⅝	6,878 174,701	6,879 174,727	7,870 – 7,873 199,898 – 199,974	344 000 1 530	1 320	170,4 77,3

Bearing arrangements for chassis

Wheelset bearings

Schematics of various designs



FAG tapered roller bearing units TAROL with metric dimensions

Base bearing	Dimensions			Shaft	
	Bearing 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.

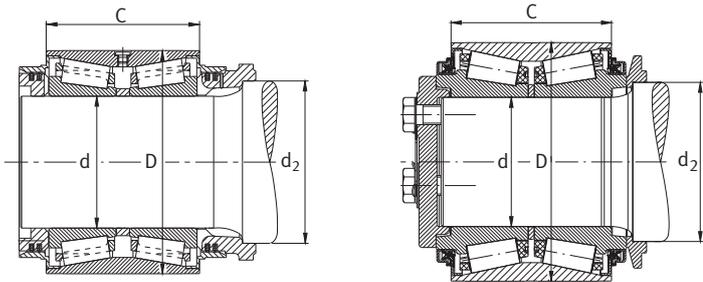
In relation to the connecting parts, the bearings listed represent only a selection from the product range. The connecting parts and seals can be agreed for specific customer requirements.

Cage versions:

- TVP Polyamide cage
- JP Sheet steel cage

Suffixes:

- U Complete unit
- R Base bearing



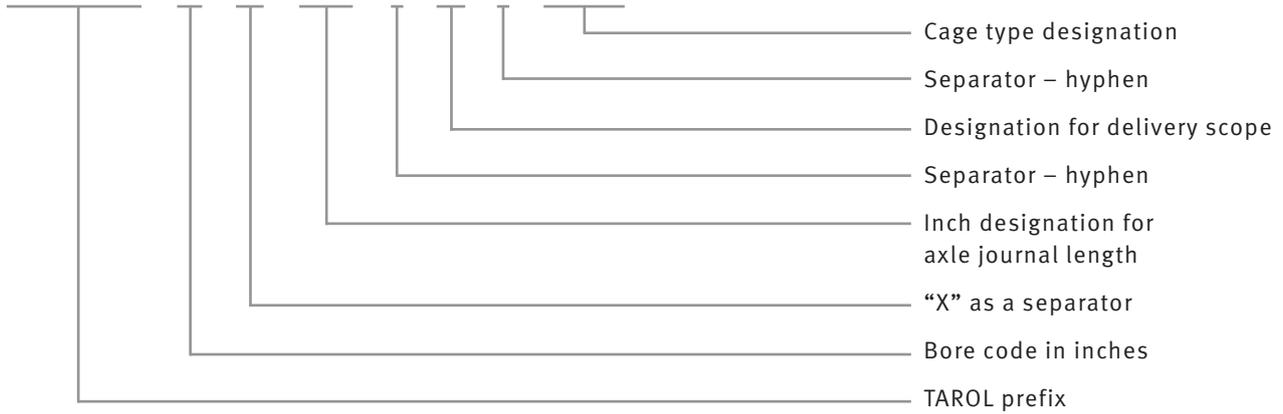
Load rating DIN ISO 281 C kN	Load rating ABEC/RBEC C1 kN	Mass Base bearing kg	Typical ordering designation for complete unit	Mass TAROL unit kg
390	450	7,5	Z-572103.02.TAROL90/154-U-TVP	15
415	475	9,16	Z-517874.TAROL100/165-U-JP	13,9
510	585	10,7	Z-578693.TAROL100/175-U-TVP	18,5
510	585	12,3	F-572314.TAROL100/180-U-TVP	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

Bearing arrangements for chassis

Wheelset bearings

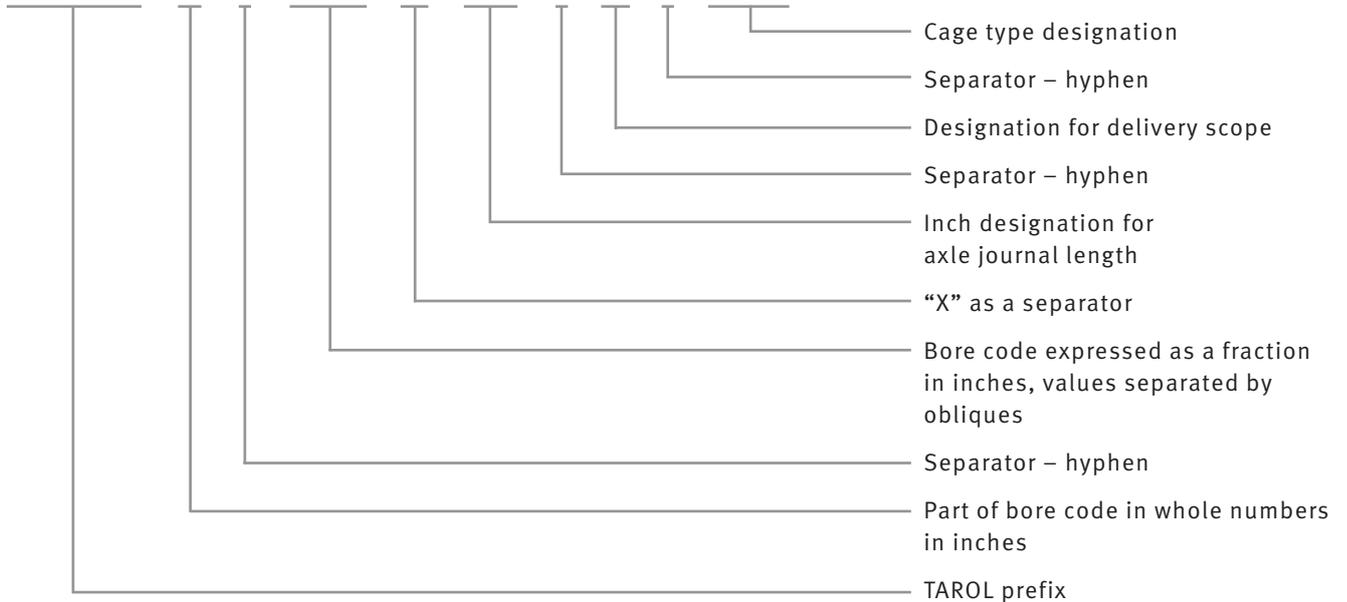
Inch size TAROL with dimensions in whole numbers

TAROL N X NN - X - XXX



Inch size TAROL with dimensions in fractions

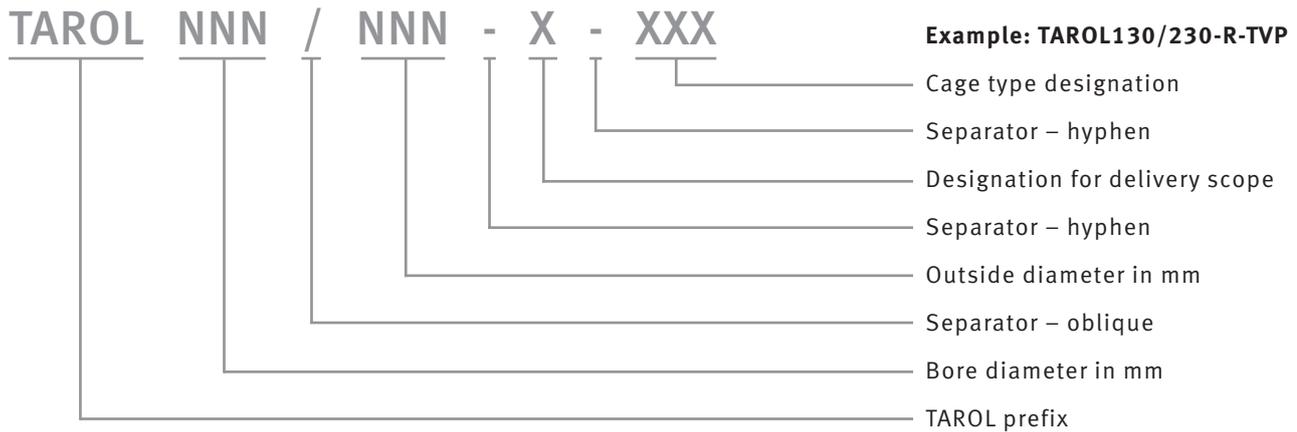
TAROL N - N/N X NN - X - XXX



Bearing arrangements for chassis

Wheelset bearings

Metric TAROL



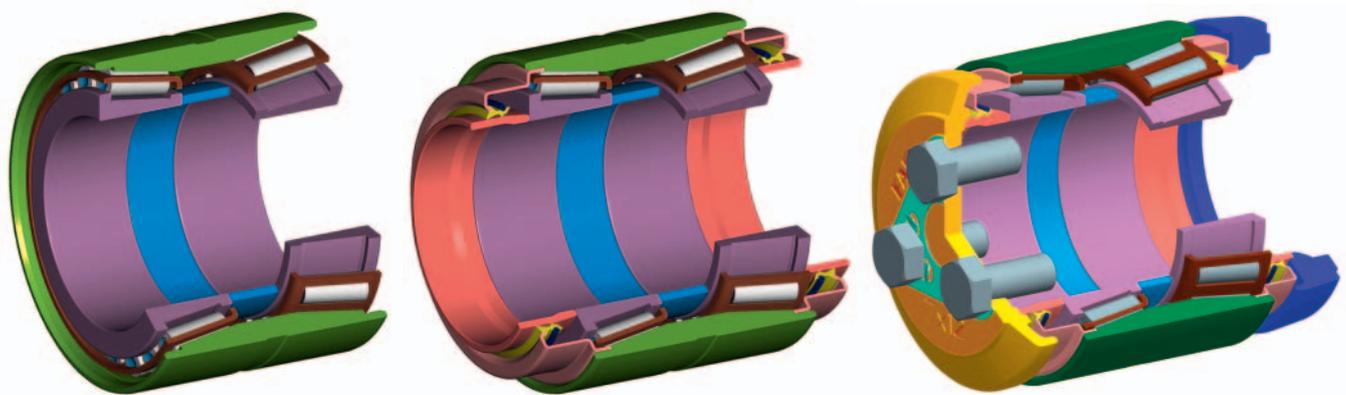
The ordering designation is preceded by a drawing number for customer-specific designs, e.g. **F-803507.01.TAROL7X12-B-TVP** or **Z-517874.04.TAROL100/165-U-JP**.

Designation for delivery scope

- R = Base bearing (without grease or 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 (centre) and U (right)

Bearing arrangements for chassis

Wheelset bearings

Tapered roller bearing units TAROL – tools for mounting and dismantling

Various tools perfectly matched to requirements are available for mounting and dismantling FAG tapered roller bearing units TAROL.

Our publication WL 80 250 contains details of additional devices and services for rolling bearing mounting and maintenance. 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 31).

FAG mounting and dismantling 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 dismantling 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

FAG mounting and dismantling TAROL units with inch dimensions*)

TAROL design	Mounting device (tool set)	Tool for fitting and dismantling of 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.

Bearing arrangements for chassis

Wheelset bearings

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 30).

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 of seals.

Ordering designation:
TOOL-RAILWAY-PLATEPRESS



Visual inspection device

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

Ordering designation:
TOOL-RAILWAY-INSPECTION-DEVICE



Bearing arrangements for chassis

Wheelset bearings

Wheelset bearings with integral generator

If railway wagons have a requirement for electrical energy in order to power monitoring equipment, FAG wheelset bearings with integral generators are the ideal solution. Magnets in the axle cap rotate with the wheel axle, acting as a rotor, while the coils in the housing cover remain stationary and act as a stator.

The current generated in this way is stored in a rechargeable battery and is thus available even when the train is stationary. As a result, telematics systems with additional functions such as wheelset bearing diagnosis and hazardous goods monitoring can transfer their data at very short intervals thanks to an adequate and continuous power supply.

Two systems are currently available: a low-power design with a 5 Watt rating and a higher power variant with a continuous 100 Watt rating. Customer-specific solutions can be implemented with voltages of, for example, 6 V to 24 V.



Y25 housing with low-power generator



UIC freight wagon housing with high-power generator

Mounting of the generator requires little work: the housing cover and axle cap of a standard housing (UIC or Y25) are simply replaced by the appropriate parts with a fitted generator.

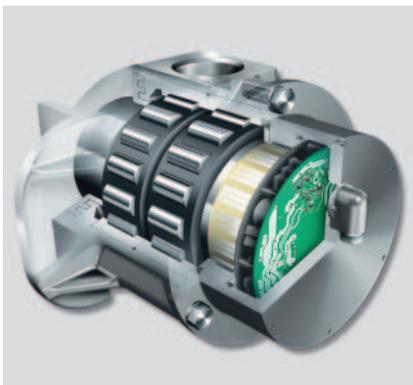
The sensor system can also be used to continuously generate the information on direction of rotation that is required for the newly developed rail traffic management systems (ERTMS/ETCS).

Ordering example:

F-809 915.TAROL 130/210

Wheelset bearing with integral sensor system

The engineers of Schaeffler Group Industrial have developed and optimised a wheelset bearing unit with an integral sensor system (bearing with sensors and housing). The sensors give reliable transmission of, for example, speed information to the anti-skid and braking system, the tachometer and the automatic door closing systems. Temperature values are continuously available and can be used for condition monitoring of the bearing. As a result, any problems can be detected at an early stage and can be rectified in a planned manner.



Generator bearing



Wheelset bearing with integral sensor system

Bearing arrangements for chassis

Wheelset bearings

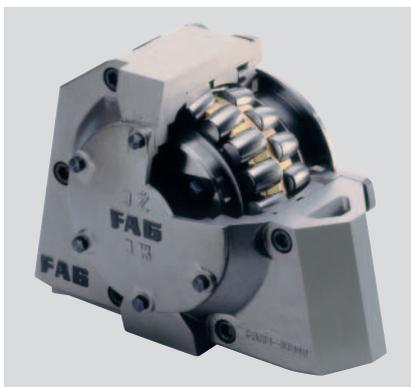
FAG spherical roller bearings

When one spherical roller bearing is used, axle deflection can be compensated without any additional forces. Spherical roller bearings are used in wheelset bearings for freight wagons, locomotives and other rail vehicles.

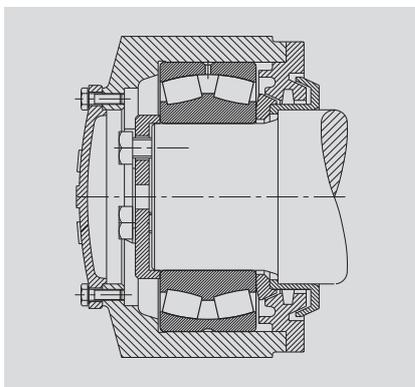
Bearing arrangements for chassis, FAG spherical roller bearings

Designation	Dimensions			Mass kg
	d mm	D	B	
Z-502472.06PRL	130	220	73	11,4
Z-536628.01.PRL	140	220	73	10,3

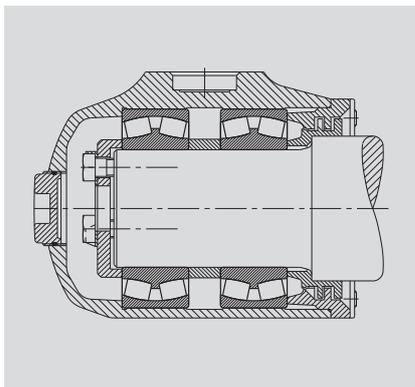
Other designs and sizes available by agreement.



Spherical roller bearing for locomotive



Spherical roller bearing for freight wagon according to UIC specification



Bearing arrangements for chassis

Wheelset bearings

Wheelset bearing housings and adapters

Schaeffler Group Industrial supplies wheelset bearing housings and adapters made from spheroidal graphite cast iron and cast light metal; these can also be made from cast steel in special cases.

The design of the housing is individually matched to the adjacent construction and the optimum layout is supported by BEM calculations.

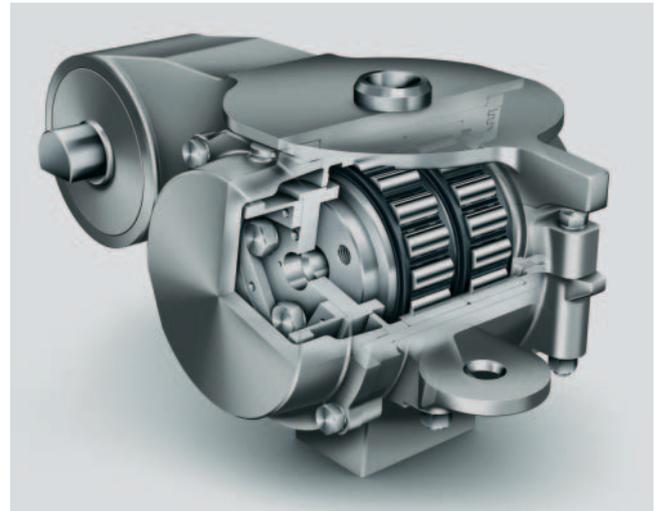
Ordering example with designation system:

F-561860.ANM 130-T-A

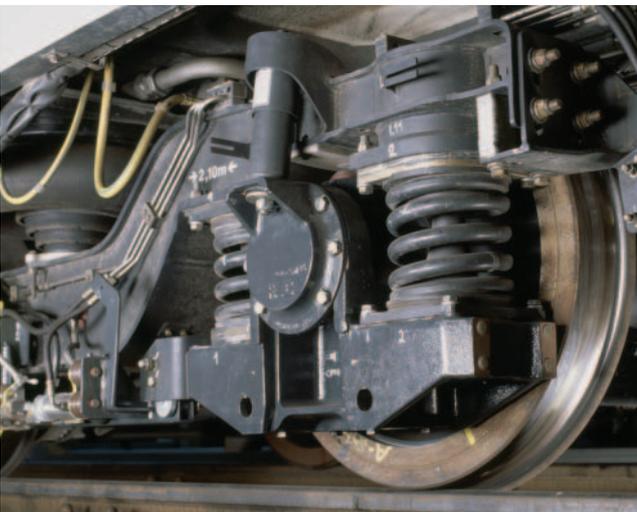
F: Schaeffler designation
561860: Drawing number
ANM: Housing type
130: Axle journal
T: Bearing type
A: Quantity series



Alstom Transport, Coradia LIREX



Wheelset bearing for Coradia LIREX



Siemens AG, Nürnberg underground train



SF 1000, Nürnberg underground train

Bearing arrangements for chassis

Wheelset bearings

Split design of changeover axle housing

Due to the split design of the changeover axle housing, the axle can be easily removed from the bogie for any maintenance work required by removing the lower section.

A further special feature of the housing is the material used. The austempered spheroidal graphite cast iron (ADI) has the advantage of high strength with good ductility while giving a low housing mass. It is only the use of this material that makes it possible to produce the compact, optimised mass housing design.

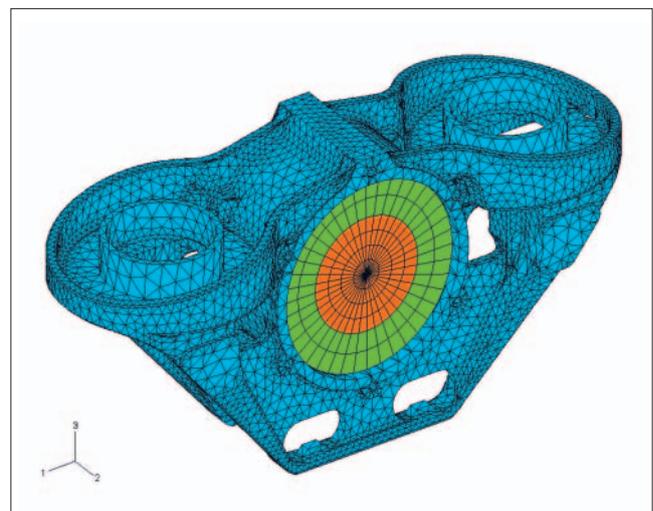
Wheelset bearing housing Z-176548.ASZ160-Z-*

The main housing body can be used at any bearing position. The housings **Z-176548.ASZ160-Z-*** are available, depending on the cover design, in different variants and are supplied completely painted and ready for mounting. Quality control of the spheroidal graphite cast iron housings was ensured on the basis of EN 1563 and by means of additional component inspections. In addition, the housing bodies were calculated by means of modern structural analysis methods and optimised for the application.

Double row cylindrical roller bearings F-801804.ZL with polyamide cage and sealing caps can be considered for the wheelset bearings.



Bombardier Transportation, BR 185



Housing calculation by means of Finite Element Analysis

Bearing arrangements for chassis

Bearing arrangements for tilting mechanisms and track stabilisation

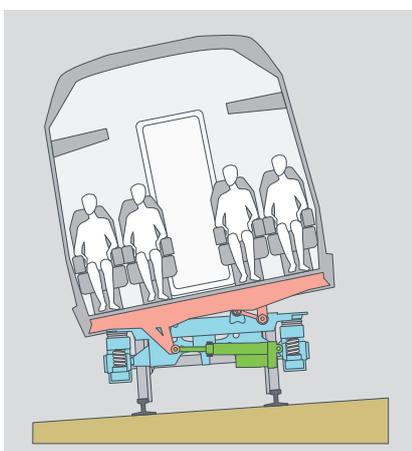


TR 600 (Trenitalia); ETR 610 (Cisalpio) with 4th generation tilting system

Bearing arrangements for tilting mechanisms and track stabilisation

Vehicles with tilting mechanisms can achieve significantly higher speeds on conventional tracks than conventional vehicles. This gives shorter travel times and increases the attractiveness of InterCity travel.

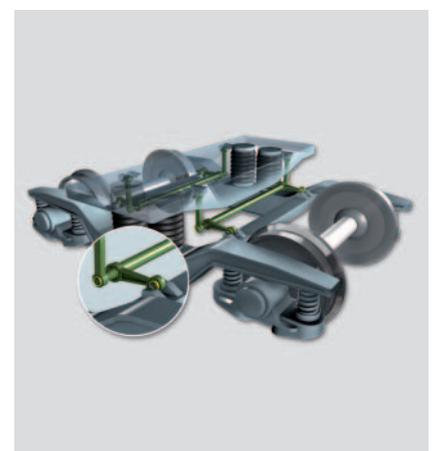
INA bearing arrangements provide a convincing solution in the main tilting mechanism, the drive units for tilting motion and in the anti-roll bars/torsion bars. The solutions, which are specially designed for long life and long maintenance intervals, have proved effective in reliable daily operation over many years. Depending on the application, service lives of up to several million kilometres can be achieved.



Tilt drive system



Main bolster



Track stabilisation, torsion bar

Bearing arrangements for chassis

Bearing arrangements for tilting mechanisms and track stabilisation

Bearing arrangements for the main bolsters

Tilting motion of the vehicle body is made possible by a bolster that is integrated in the bogie and to which the vehicle body is attached.

Bearing arrangement with yoke type track roller units

Yoke type track roller units are complete units comprising a shaft and two yoke type track rollers. Two yoke type track rollers are used to support the bolster for one bogie which is the load-bearing element that allows the tilting motion of the vehicle body.

Bearing arrangement with cylindrical roller bearings

Full complement cylindrical roller bearings with snap ring grooves, designed as a locating bearing, support axial forces in both directions as well as radial forces. They can be located using the snap ring grooves and are protected against contamination and spray water by means of lip seals on both



Yoke type track roller units

INA/ELGES bearing arrangements for the main bolster

Bearing types and designs	Shaft diameter range mm
Yoke type track roller units	
NNTR	60 to 90
Cylindrical roller bearings with snap ring grooves	
SL0450..PP	40 to 70
Maintenance-free radial spherical plain bearings with ELGOGLIDE®	
GE..UK-2RS	40 to 70
Suffix	Description
2RS	Sealed by lip seals on both sides
PP	Sealing rings on both sides
RR	Corrosion-resistant design with Corrotect® coating
Other designs and sizes available by agreement	

sides. In each case two bearings are fitted in connecting rods that allow the tilting motion of the vehicle body.

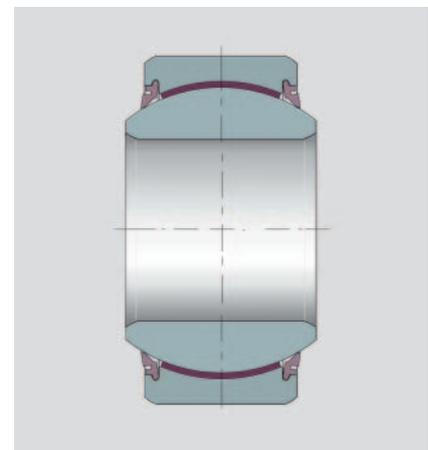
Bearing arrangement with radial spherical plain bearings

The maintenance-free ELGES radial spherical plain bearings can

support radial and axial forces and compensate misalignments. In each case two bearings are pressed into a connecting rod and allow the tilting motion of the bolster. These bearings, which are insensitive to vibration and shocks, are characterised by their absolutely maintenance-free operation.



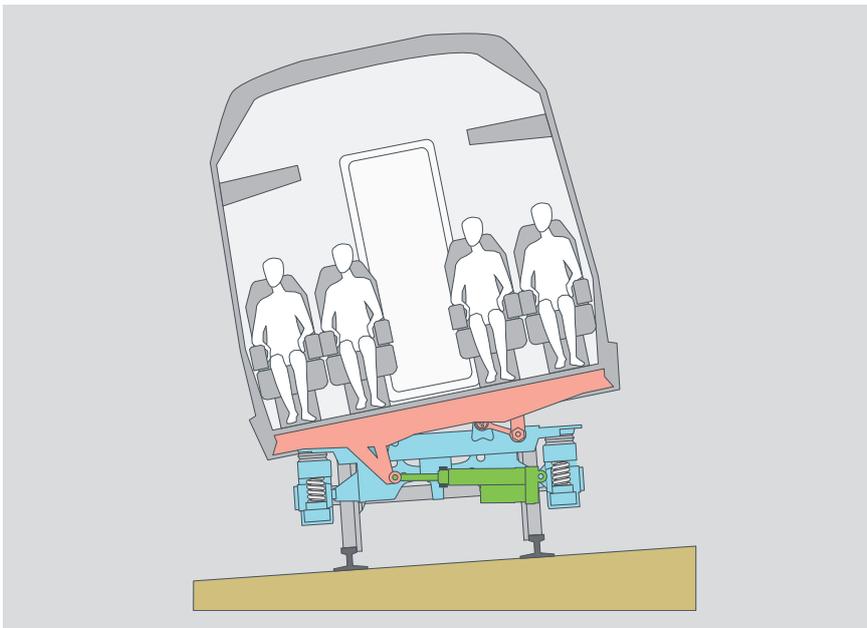
Cylindrical roller bearing with snap ring grooves



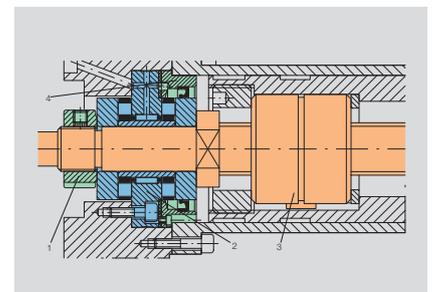
Maintenance-free ELGOGLIDE® radial spherical plain bearing

Bearing arrangements for chassis

Bearing arrangements for tilting mechanisms and track stabilisation



Tilt drive system



Bearing arrangement of screw drive

Bearing arrangements for tilt drives

In active tilting systems, the vehicle body is moved and stabilised to the required tilt position by means of actuators. The linear motion required for the positioning motion is provided by electric or hydraulic actuators. In electric actuators, planetary roller screws have proved effective in providing highly dynamic linear motion from the rotary motion of the servomotor. A reliable bearing arrangement is achieved using needle roller/axial cylindrical roller bearings that can support high axial and radial forces. The bearings are axially located by means of precision locknuts that are secured by axial or radial means. The non-locating bearing function is performed by compact needle roller bearings with inner rings.

INA bearing arrangements for tilt drives

Bearing types and designs

Shaft diameter range
mm

Needle roller/axial cylindrical roller bearings, precision locknuts

ZARF, ZARN	40 to 90
AM	

Planetary roller screws

RGT	27 to 63
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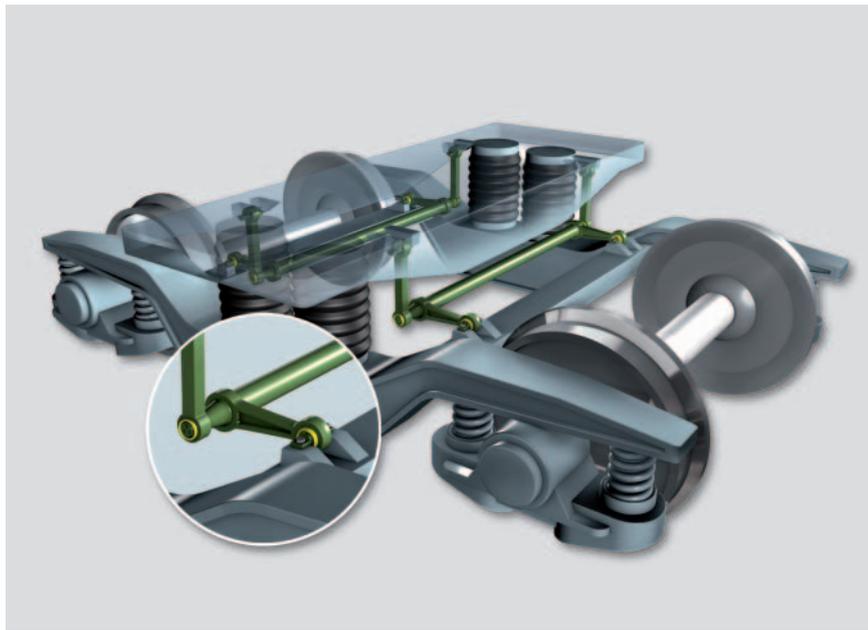
Needle roller bearings, inner rings

NKI, NA49, NK	40 to 90
RNA49	
IR	

Suffix	Description
RSR	Contact seal on one side
2RSR	Contact seals on both sides
RR	Corrosion-resistant design with Corrotect® coating
Other designs and sizes available by agreement	

Bearing arrangements for chassis

Bearing arrangements for tilting mechanisms and track stabilisation



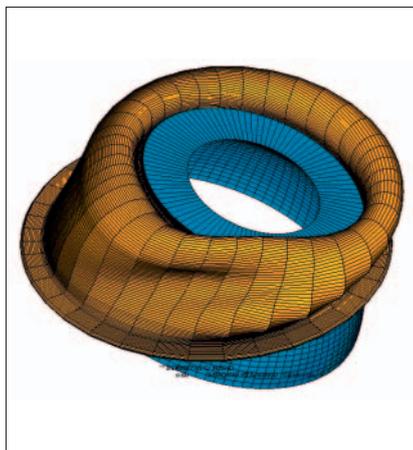
Track stabilisation

Bearing arrangements for torsion bars/anti-roll bars/suspension struts

Highly dynamic systems for stabilising railcar bodies are fitted with maintenance-free special spherical plain bearings with specially developed bellows.

These give very long life and high reliability under challenging operating conditions in an unprotected mounting area subjected to heavy contamination and alternating loads with large tilt and swivel angles.

The tilt and swivel angles are up to $\pm 20^\circ$.



Bellows development by means of Finite Element Analysis

INA/ELGES bearing arrangements for torsion bars/anti-roll bars/suspension struts

Bearing types and designs

Shaft diameter range mm

Maintenance-free radial spherical plain bearings with ELGOGLIDE®

GE..UK-2RS, GE..FW-2RS
GE *

30 to 70
Available by agreement

Maintenance-free axial spherical plain bearings with ELGOGLIDE®

GE..AW

20 to 70

Suffix Description

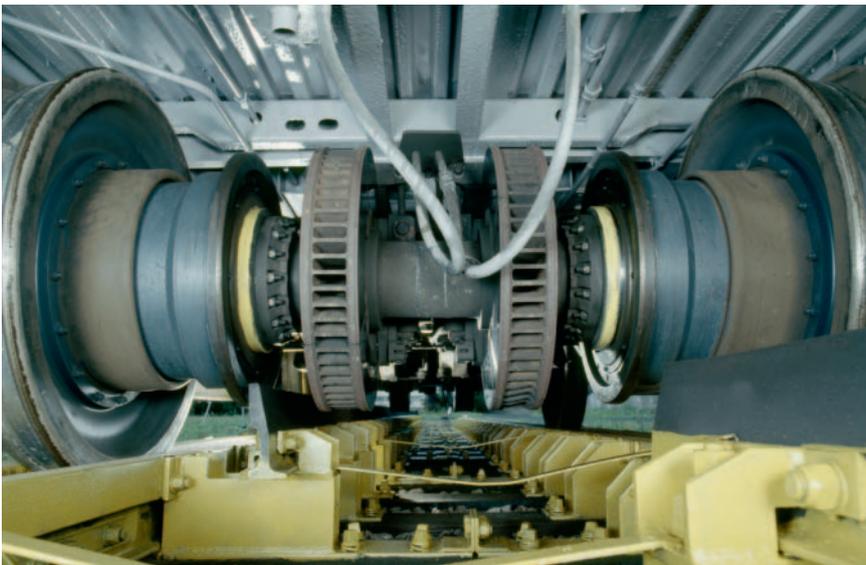
2RS Sealed by lip seals on both sides

Other designs and sizes available by agreement

* Special bearing with bellows

Bearing arrangements for chassis

Bearing arrangements for gauge adjustment systems



Wheelset for gauge adjustment

have a very high radial load carrying capacity and good damping capacity. Vehicles with wheelset loads of 18 t to 22,5 t are being used successfully in operation and vehicles up to 25 t are in development.

Advantages of the system:
There is no need to relieve the load on the bearings during the gauge change operation. Suitability for passenger carriages and freight wagons.

Bearing arrangements for gauge adjustment systems

Differences in gauges in Europe and Asia always lead to delays at border crossings for passenger and freight traffic.

The solution is an automatic gauge change system. Gauge change facilities at border stations, together with an adjustable gauge wheelset on the vehicle, allow rapid matching of the wheel spacing on the axle.

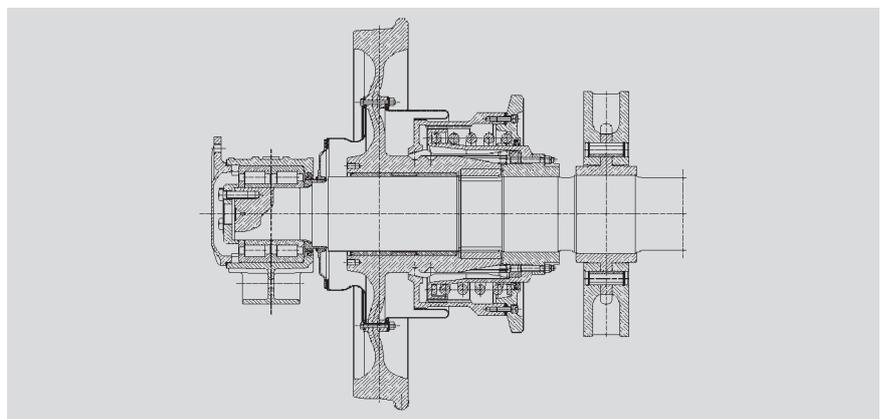
Maintenance-free cylindrical plain bushes

The gauge change mechanism is supported by plain bearings from Schaeffler Group Industrial, contributing to extension of the maintenance intervals for the complex adjustment equipment. In field use, service lives of more than 500 000 km are achieved.

The bearing arrangement of the adjustable wheels on the wheelset axle is successfully achieved using plain bushes of the ELGES brand with ELGOGLIDE® coating. The low-friction cylindrical bushes comprise a steel support body to which the ELGOGLIDE® sliding fabric layer is firmly attached by means of an adhesive bond that is resistant to moisture. These maintenance-free plain bushes require no lubricant,



Maintenance-free cylindrical plain bush



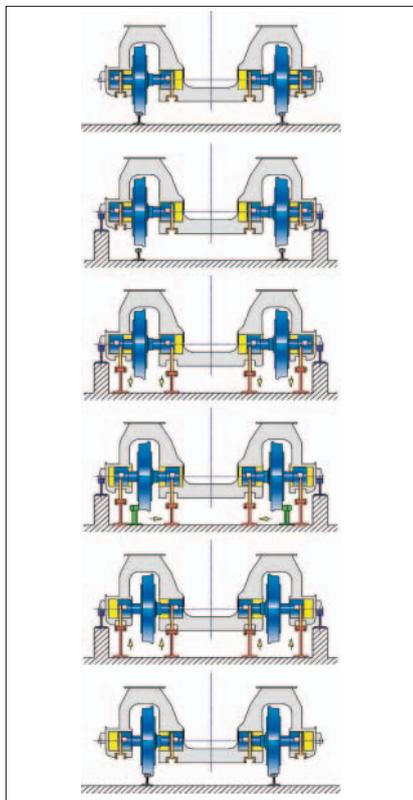
System SUW from ZNTK Pozán S.A.

Bearing arrangements for chassis

Bearing arrangements for gauge adjustment systems

Needle roller and cage assemblies for support rollers

In the gauge change system TALGO, the wheelsets are relieved of load during the gauge change operation. This can be carried out by means of support rollers that bear the entire mass of the carriage during the gauge change operation. These are special support rollers fitted with INA needle roller and cage assemblies. The bearing arrangements demonstrate their performance capacity daily under the shock loads occurring and the high accelerations.



Gauge change system TALGO

INA/ELGES bearing arrangements for gauge adjustment systems

Bearing types and designs	Shaft diameter range mm
Maintenance-free cylindrical plain bushes	
ZGB	160 to 250
Rolling bearings for support rollers in gauge adjustment systems	
Radial needle roller and cage assemblies	40 to 60
K	
Housing locating washers	40 to 60
GS	
Axial needle roller and cage assemblies	40 to 60
AXK	
Support rollers	
RLB	40 to 60

Suffix	Description
ZW	Double row
RR	Corrosion-resistant design with Corrotect® coating
Other designs and sizes available by agreement	

Radial needle roller and cage assemblies bear the high radial loads and support the vehicle during the gauge change operation.



Radial needle roller and cage assembly

The axial forces acting on the support roller outer ring are borne by axial needle roller bearings and housing locating washers.



Axial needle roller and cage assembly

Bearing arrangements for chassis

Bearing arrangements for braking systems



Brake caliper unit, photo: Knorr-Bremse systems for rail vehicles



Oil-free compressor, photo: Knorr-Bremse systems for rail vehicles



Axial needle roller and cage assembly and axial needle roller bearing

Bearing arrangements for braking systems

The requirements placed on modern braking systems in rail vehicles include low mass, minimal design envelope, smooth running and reliability.

The advantages of needle roller bearings, drawn cup needle roller bearings with closed end, axial needle roller bearings, drawn cup roller clutches and support rollers of the INA brand are particularly significant here and lead to forward-looking developments.

Schaeffler Group Industrial offers possible solutions for all bearing positions and bearing types, for brake caliper units, wedge brakes, brake linkage adjusters, wear compensation systems or brake compressors. Standard catalogue bearings are frequently used in these cases or additional functions are integrated in bearings specially matched to the application. As functional elements relevant to safety, these brakes and thus the bearings too must function correctly under extreme climatic conditions.

Bearing arrangements for chassis

Bearing arrangements for braking systems

INA/ELGES bearing arrangements for braking systems

Bearing types and designs	Shaft diameter range mm
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Needle roller bearings, inner rings

RNA, NK IR	20 to 60
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Drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end

HK, BK	25 to 60
--------	----------

Drawn cup roller clutches

HF, HFL	20 to 35
---------	----------

Axial needle roller and cage assemblies, axial bearing washers

AXK LS, WS	30 to 60
---------------	----------

Deep groove ball bearings

618, 619	20 to 80
----------	----------

Axial ball and cage assemblies

AKU	35 to 60
-----	----------

Stud type track rollers, yoke type track rollers, ball bearing track rollers

KR, KRV NATV, RSTO, LR	12 to 50
---------------------------	----------

Radial spherical plain bearings requiring maintenance

GE..DO	20 to 40
--------	----------

Suffix	Description
ZW	Double row
PP	Plastic axial plain washer with formed seal lip on both sides of the yoke type track roller, giving a three-stage seal
RR	Corrosion-resistant by means of INA Corrotect® special coating
RS	Contact seal on one side
2RS	Protected lip seal on both sides of the yoke type track roller
2RSR	Lip seal with radial contact on both sides of the yoke type track roller
Other designs and sizes available by agreement	

Needle roller bearings are complete units comprising machined outer rings and needle roller and cage assemblies. If necessary, they can be combined with separable inner rings. The low radial section height allows compact designs. The needle roller bearings can be relubricated via the outer ring and can also be supplied in sealed designs. They have a high radial load carrying capacity.

Drawn cup needle roller bearings with open ends and with closed end comprise thin-walled outer rings and needle roller and cage assemblies, with seals if required. They require even less radial space than needle roller bearings. Drawn cup needle roller bearings with closed end are protected against moisture and contamination by the closed base.

Modern brakes have devices for automatic compensation of brake lining wear. These mechanisms contain drawn cup roller clutches with bearing arrangements as an indexing clutch for compensation movement.

The stud type track rollers, yoke type track rollers and ball bearing track rollers used in wedge brakes offer the possibility of location on a stud or by means of an inner ring. The pressures at the contact with the mating track can be effectively reduced by an optimised outer ring profile.

Bearing arrangements for railcar bodies

Developments in rail-based passenger transport are focussed increasingly on compact solutions – including the connection to railcar bodies. For local transport in particular, vehicles with complete through passage, low floors and multiple units are being developed. This allows more open spaces and quicker passenger changeover. This requires flexible and compact bearing solutions – bearing solutions from Schaeffler Group Industrial.



Bearing arrangements for railcar bodies

Bearing arrangements for connection of railcar bodies and bogies



Slewing ring with anti-roll damper

Slewing rings

INA slewing rings have proved effective in this difficult environment due to:

- good seals with effective protection against steam spray
- Corrotect® anti-corrosion protection
- preloaded raceway systems
- special greasing
- long maintenance intervals

Special types, for example with additional cover hoods and integrated anti-roll damping, have also been used successfully for many years.

Bearing arrangements for connection of railcar bodies and bogies

Carriage bodies and bogies in modern trams and underground trains are frequently connected by slewing rings of a four point contact bearing design or by maintenance-free spherical plain bearings. A wide variety of requirements are placed on these bearings, since they are exposed to extreme contamination and strong vibrations. Long operating periods are required. Access to the mounting positions of the bearings both for assembly and for maintenance is very difficult. Long maintenance intervals and high reliability of the bearing arrangements are therefore required. These are achieved by the most modern design tools, such as Finite Element Analysis.

INA bearing arrangements for connection of railcar bodies and bogies

Bearing types and designs

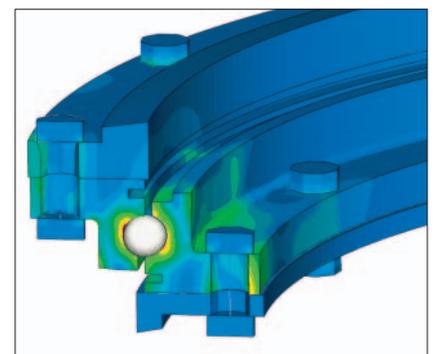
Inside diameter range
mm

Slewing rings based on four point contact bearings

VU, VLU

300 to 1000

Other designs and sizes available by agreement



FE analysis for ball type slewing ring

Bearing arrangements for railcar bodies

Bearing arrangements for connection of railcar bodies and bogies

Maintenance-free spherical plain bearings

A completely maintenance-free alternative here is available in the form of maintenance-free ELGES angular contact spherical plain bearings and the ELGES axial spherical plain bearings. With a vertical bearing axis, they can support the weight of the railcar bodies and also transmit acceleration forces from the bogie. If tilting moments must also be supported, two bearings can for example be fitted in an O arrangement or a maintenance-free cylindrical plain bush can fulfil the radial support function.

ELGES bearing arrangements for connection of railcar bodies and bogies

Bearing types and designs

Inside diameter range
mm

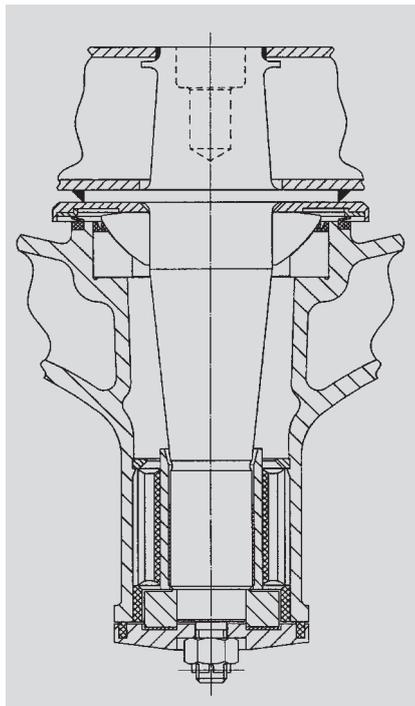
Maintenance-free angular contact and axial spherical plain bearings and cylindrical plain bushes

GE..-SW	70 to 140
GE..-AW	
ZGB	

Other designs and sizes available by agreement

Maintenance-free cylindrical plain bushes

Maintenance-free cylindrical plain bushes with the ELGOGLIDE® sliding fabric layer are insensitive to vibrations while giving high load carrying capacity and a long life.



Pivot bearing arrangement in high-floor vehicles



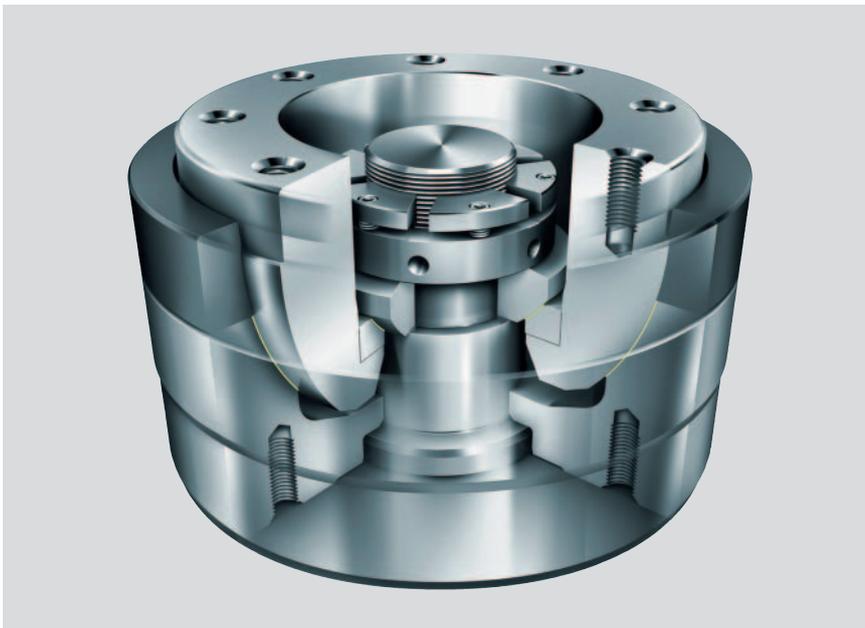
Maintenance-free cylindrical plain bush



Maintenance-free angular contact spherical plain bearing

Bearing arrangements for railcar bodies

Bearing arrangements for connection of railcar bodies with each other



Special spherical plain bearing unit, maintenance-free, ready-to-fit

Bearing arrangements for connection of railcar bodies with each other

Bearing arrangements for railcar bodies, lower centre joint

In many modern rail vehicles, the carriage bodies are connected to each other by gangways so that passengers can move from one part of the vehicle to another. INA ball-type slewing rings or maintenance-free ELGES spherical plain bearings/ELGES rod ends with the ELGOGLIDE® sliding layer connect the two railcar bodies to each other, support the weight and acceleration forces and allow swivel motion of the railcar bodies when travelling on a curved track.

INA/ELGES bearing arrangements for railcar bodies, lower centre joint

Bearing types and designs	Inside diameter range mm
Ball-type slewing rings VU, VLU	300 to 1 000
Maintenance-free angular contact and axial spherical plain bearings or maintenance-free special spherical plain bearing units GE..-SW, GE..-AW GE	80 to 200
Maintenance-free asymmetrical special spherical plain bearing GE	80 to 120
Other designs and sizes available by agreement	

Slewing rings

In this area of application, not only two-ring but also three-ring slewing rings are used.

The outermost ring serves to guide the bellows frame. The inner rings transmit the acceleration forces between the vehicles.

Maintenance-free spherical plain bearings or spherical plain bearing units

These bearings also permit all the tilting and rolling movements when travelling on curved tracks or through cuttings. The bearings types used for the main bearing or anti-lift device are angular contact or axial spherical plain bearings. In order to reduce the mounting work, complete special spherical plain bearing units for screw mounting or asymmetrical radial spherical plain bearings are used in preference. In particular, asymmetrical radial spherical plain bearings combine very high load carrying capacity under extreme load (for example buffer shock loads up to 1500 kN in accordance with VDV 152 or EN 12663) with small bearing dimensions, low bearing friction and long operating life.

Bearing arrangements for railcar bodies

Bearing arrangements for connection of railcar bodies with each other



Joint rod as upper centre joint

Bearing arrangements for railcar bodies, upper centre joint

Upper centre joints are required especially where the lower centre joint is based on a spherical plain bearing and allows rolling movement of the vehicle body. They are frequently designed as joint rods with maintenance-free ELGES spherical plain bearings. In some cases, damped designs are used that, for example, allow rolling movement within specified ranges.

Maintenance-free rod ends comprise a spherical plain bearing and a shank for location purposes. They can support forces in a tensile or compressive direction. In some cases, maintenance-free designs have an ELGOGLIDE® sliding fabric layer and a corrosion-resistant zinc coating.

INA/ELGES bearing arrangements for railcar bodies, upper centre joint

Bearing types and designs

Shaft diameter range mm

Maintenance-free radial spherical plain bearing with ELGOGLIDE®

GE..-UK-2RS, GE..-FW-2RS	30 to 70
GE *	30 to 45

Maintenance-free rod ends

GIR..-UK, GIR..-UK-2RS	17 to 60
GAR..-UK, GAR..-UK-2RS	
GAKSR..-PS, GIKSR..-PS (alloy steel / PTFE-bronze film)	20 to 30
GK	20 to 60 (weldable)

Maintenance-free cylindrical plain bushes

ZGB	20 to 60
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Universal joint bearings

BBUB..PB	25 to 50
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Suffix	Description
2RS	Sealed by lip seals on both sides

Other designs and sizes available by agreement

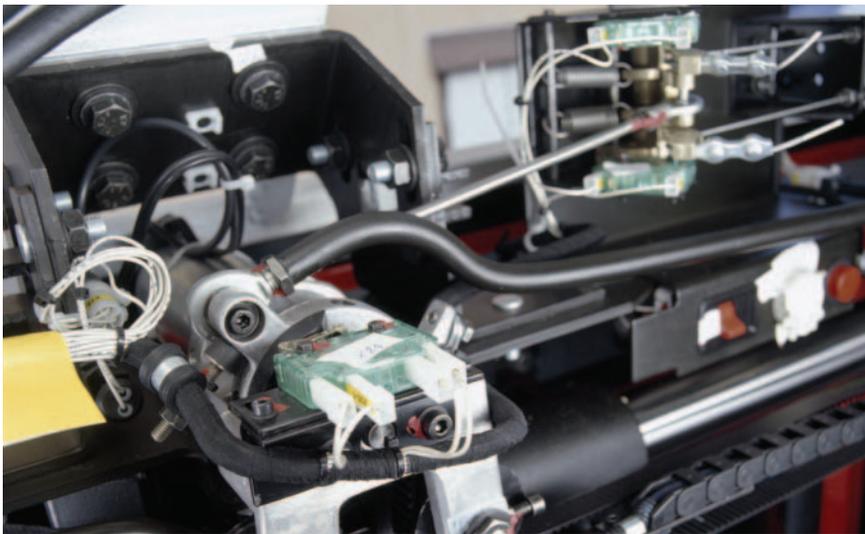
* Special bearing with bellows



Maintenance-free rod ends

Bearing arrangements for railcar bodies

Bearing arrangements for door systems and entry aids



Door system

INA/ELGES bearing arrangements for door systems and entry aids

Bearing types and designs	Shaft diameter range mm
Drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end and inner rings	
HK, BK; IR	15 to 40
Track rollers, stud type track rollers and yoke type track rollers	
LR, LFR	6 to 40
ZLR, ZLE	Eccentric, concentric
KR..PP, KRE..PP, NATR..PP	
Maintenance-free radial spherical plain bearing with ELGOGLIDE®	
GE..-UK-2RS	6 to 30
GE..-FW-2RS	6 to 25
Maintenance-free rod ends	
GIR..-UK, GAR..-UK (hard chromium/PTFE composite)	6 to 30
GAKSR..-PS, GIKSR..-PS (alloy steel/PTFE-bronze film)	5 to 30
Rod ends requiring maintenance	
GAKR..-PB, GIKR..-PB	6 to 30 Steel/bronze sliding contact surface
Other designs and sizes available by agreement	

Bearing arrangements for door systems and entry aids

Bearing arrangements for door systems and entry aids in passenger carriages

Door systems in passenger carriages are heavily loaded, complex subsystems. They are subjected to very high requirements in terms of reliability and long maintenance intervals.

The operating duration is specified by the passenger carriage manufacturers. Depending on the vehicle type, more than 2,5 million opening cycles may be required. The opening operation often consists of a swivel-type unhooking movement and a linear opening movement of the door panels.

The swivel-type movements proceed reliably by means of maintenance-free spherical plain bearings and rod ends. Radial insert ball bearings with flanged housings are also used in some cases.

During the linear movement, the door system is guided by linear ball bearings, monorail guidance systems or special track rollers. The bearings used are standard catalogue bearings or specially developed parts that, for example, optimise the pressures at the outer ring/mating track contact where increased requirements are present.

The corrosion-resistant rod ends are available with a left or right hand internal or external thread.

Bearing arrangements for railcar bodies

Bearing arrangements for door systems and entry aids



Linear ball bearing KS

In these vehicle components, linear motion must be carried out in a reliable manner. INA linear ball bearings with smooth running, long rating life and where necessary with a self-aligning facility have proved very effective here. Depending on the bearing type, they can compensate misalignments of up to $\pm 40'$. Due to their compact dimensions and small radial section height, linear ball bearings require little space. Depending on the requirements, they are generally sealed and can, if necessary, be supplied in a corrosion-resistant design.

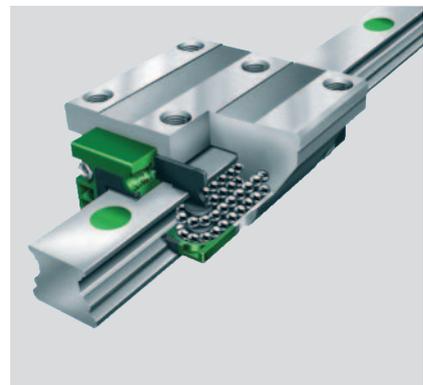
In conjunction with linear ball bearings, high precision shafts of rolling bearing quality are used, with the option of corrosion-resistant designs; hollow shafts are particularly suitable for designs with reduced mass. Customer-specific lengths and machined features can be realised in accordance with the fitting conditions.

Where applications involve heavy loads, high running and positional accuracy as well as high rigidity,

INA bearing arrangements for door systems and entry aids

Bearing types and designs	Size
Linear ball bearings, linear ball bearing and housing units	
Solid shafts, hollow shafts	
KN..-B-PP	12 to 50
KS..-PP	
W, WH	4 to 80 depending on shaft design
Monorail guidance systems	
KUVE..-B	15 to 55 guideway width
Track roller guidance systems	
LF, LFL, LFKL, LFCL	20 to 52 guideway width
Suffix	Description
2Z, 2RSR, 2RS	Seal types (in conjunction with track rollers LFR)
PP	Sealed by lip seals on both sides (in conjunction with linear ball bearing)
RR, RRF, RRFT	Anti-corrosion protection, special coating Corrotect®
KD	Anti-wear protection, special coating Protect A
KDC	Anti-wear and anti-corrosion protection, special coating Protect B
Other designs and sizes available by agreement	

monorail guidance systems are suitable. Where necessary, a versatile sealing and lubrication concept as well as INA special coatings for extreme operating conditions are available.



Four-row linear recirculating ball bearing and guideway assembly KUVE..-B

Bearing arrangements for railcar bodies

Bearing arrangements for door systems



Shutter mechanism for self-discharging cars

Bearing arrangements for door systems in freight wagons

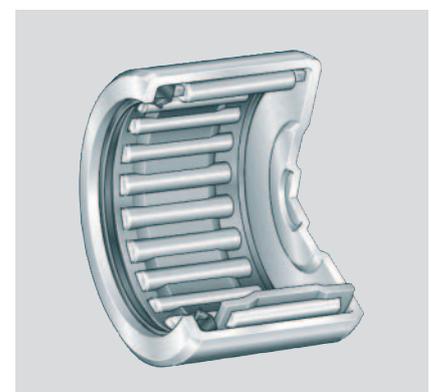
The priorities for bearing applications in door systems on freight wagons, such as sliding panel wagons (HIBBNS, ...) and self-discharging cars (FALNS, ...) are robust design, long life and low maintenance requirements. Yoke type track rollers, track rollers, needle roller bearings and spherical plain bearings are used for shutter and cover mechanisms, displacement devices, guides and moment supports as well as for articulation rods and bearing arrangements.

INA/ELGES bearing arrangements for door systems in freight wagons

Bearing types and designs	Diameter range mm
Drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end, inner rings HK, BK, IR	15 to 40
Track rollers, stud type track rollers, and yoke type track rollers LR, ZLR, ZLE KR..PP, KRE..PP, NATR..PP	6 to 40 Concentric, eccentric
Maintenance-free radial spherical plain bearings with ELGOGLIDE® GE..-UK-2RS, GE..-FW-2RS	20 to 80
Maintenance-free rod ends GIR..-UK-2RS, GAR..-UK-2RS GAKSR..-PS, GIKSR..-PS (alloy steel/PTFE-bronze film)	20 to 80 10 to 30
Split radial spherical plain bearings for camshaft bearing arrangement in bulk goods wagons GE	55 to 70
Suffix	Description
2RS, PP	Sealed by lip seals on both sides
Other designs and sizes available by agreement	



Stud type track rollers, yoke type track rollers



Drawn cup needle roller bearing with closed end

Bearing arrangements for railcar bodies

ELGES spherical plain bearings for couplings



Twin level car transporter wagon Laes 559, Tatravagónka a.s

Spherical plain bearings for couplings

Couplings are used to transmit the tractive forces of locomotives to the attached wagons or to connect several driven units to each other.

Some special designs such as close couplings transmit not only tractive forces but also compressive forces and weight, such as the close coupling for the intermodal wagon SGRSS. The loads to be transmitted in accordance with UIC 577 or EN12663 are up to 2 000 kN.

ELGES spherical plain bearings have been used in this area of application for more than 30 years. While steel/steel spherical plain bearings requiring maintenance were originally used, the performance capacity of the sliding fabric material ELGOGLIDE® now allows maintenance-free versions with very long rating life in many cases. This goes a long way towards fulfilling the requirements of vehicle operators with reduced maintenance costs and downtime.

ELGES spherical plain bearings for couplings

Bearing types and designs

Inside diameter range mm

Radial spherical plain bearings requiring maintenance

GE..-DO-2RS	60 to 200
GE..-FO-2RS	

Maintenance-free radial spherical plain bearings with ELGOGLIDE®

GE..-UK-2RS	60 to 200
GE..-FW-2RS	

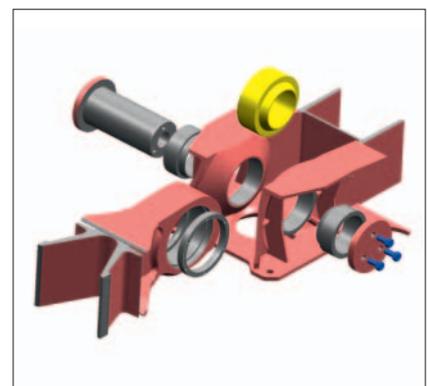
Special spherical plain bearings with additional sealing

GE	60 to 160
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Suffix Description

2RS	Sealed by lip seals on both sides
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Other designs and sizes available by agreement



Coupling housing with spherical plain bearing

Bearing arrangements for railcar bodies

Bearing arrangements for pantographs



Alstom Transport, Coradia LIREX

Bearing arrangements for pantographs

Pantographs transfer the electrical energy from the fixed overhead wires carrying the current to the electrical equipment on the vehicle.

They must fulfil this task reliably under a wide variety of operating conditions. The operating conditions range from very high speeds up to more than 500 km/h to operating temperatures below $-40\text{ }^{\circ}\text{C}$ and the components are exposed to these climate conditions without any protection.

Bearings from the Schaeffler Group allow low-friction, smooth-running, compact solutions that give both the necessary rigidity and freedom from clearance for years of problem-free operation in the field.

INA bearing arrangements for pantographs

Bearing types and designs	Inside diameter range mm
Deep groove ball bearings, double row angular contact ball bearings 60, 62, 63 30..-B, 32..-B, 33..-B	15 to 50
Drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end HK, HK..2RS, BK, BK..RS	10 to 30
Flanged housing unit TCFTR	20 to 60

Suffix	Description
DB	Two deep groove ball bearings in O arrangement, clearance-free
DF	Two deep groove ball bearings in X arrangement, clearance-free
DT	Two deep groove ball bearings in tandem arrangement, clearance-free
PP	Sealed by lip seals on both sides
PR	Three-stage seal on both sides comprising plastic axial plain washer with integral seal lip
2RSR	Lip seals on both sides
ZW	Double row
Other designs and sizes available by agreement	



Pantograph

Bearing arrangements for track

The track network on which rail vehicles run is of decisive importance for rail traffic. It is subjected to a heavy burden over many years and represents a long term investment as a long-lived economic asset. The plain and rolling bearings from Schaeffler Group Industrial used in this sector fulfil these demands precisely.



Bearing arrangements for track

Bearing arrangements for points and counterweights



Points by Siemens

Bearing arrangements for track

The heavy burden placed on the track is composed of loads due to overrolling processes, the climatic conditions (such as temperatures, precipitation etc.), contamination due to lubricants and environmental dust, mechanical stresses arising from travel (e.g. stone impacts) and maintenance work on the track network.

Bearings from the Schaeffler Group are used, for example, in points and counterweights and facilitate years of reliable operation.

ELGES radial spherical plain bearings requiring maintenance are particularly suitable for alternating loads with impact type and shock type stresses. The low-moment transmission of motion and forces keeps bending stresses away from the construction elements. They are thus ideal for use in the rail network. Maintenance-free radial spherical plain bearings offer the advantage of reduced work associated with operational activities. Due to the environmental influences present, there is a need here for reliable additional sealing.

ELGES bearing arrangements for track

Bearing types and designs

Inside diameter range mm

Radial spherical plain bearings/rod ends requiring maintenance

GE..-DO-2RS	12 to 80
GE..-FO-2RS	Right hand thread, left hand thread, internal thread, external thread
GIR..-DO-2RS	
GIL..-DO-2RS	

Maintenance-free radial spherical plain bearings and rod ends with ELGOGLIDE®

GE..-UK-2RS	25 to 80
GE..-FW-2RS	Right hand thread, left hand thread, internal thread, external thread
GIR..-UK-2RS	
GIL..-UK-2RS	
GAKS..-PS, GIKSR..-PS (alloy steel/PTFE-bronze film)	10 to 30

Suffix Description

PP	Sealing rings on both sides
RR	Corrosion-resistant design with Corrotect® coating
2RS	Sealed by lip seals on both sides
Other designs and sizes available by agreement	

Bearing arrangements for track

Bearing arrangements for points and counterweights

INA bearing arrangements for track

Bearing types and designs	Inside diameter range mm
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Axial angular contact ball bearings

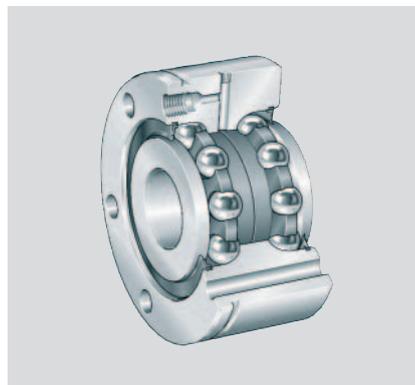
ZKLF...-2RS, ZKLN...-2RS	15 to 30
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Full complement cylindrical roller bearings with snap ring grooves

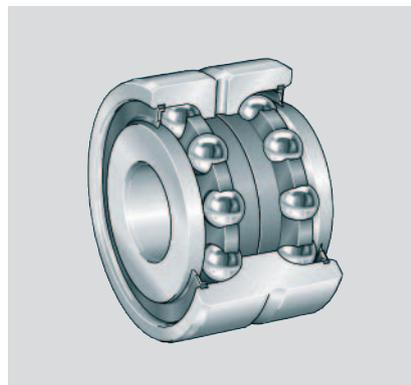
SL04 50...-PP	20 to 70
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Suffix	Description
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PP	Sealing rings on both sides
RR	Corrosion-resistant design with Corrotect® coating
2RS	Sealed by lip seals on both sides
Other designs and sizes available by agreement	



Axial angular contact ball bearing; for screw mounting



Axial angular contact ball bearing; not for screw mounting



Full complement cylindrical roller bearing with snap ring grooves

In the actuation mechanisms of points, high axial forces sometimes occur due to manual operation or special load cases. Axial angular contact ball bearings exhibit, in comparison with radial angular contact ball bearings, increased axial load carrying capacity and allow reliable, compact bearing solutions. The available variants include bearings with normal outer ring location due to bearing seats/shoulders or a ready-to-fit version with an outer ring for screw mounting.

Full complement cylindrical roller bearings with snap ring grooves are used predominantly as cable sheave bearings in cranes. They have the advantage of easy location in the adjacent construction by means of snap rings. They can be used beneficially on railway track in counterweights. Efficient sealing and the option of anti-corrosion protection by means of Corrotect® form the basis for cost-effective, long-lived and low-maintenance solutions.

Notes

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