KINEX

Rolling Bearings for Railway Vehicles

CONTENT:

INTRODUCTION

COMPANY PROFILE

Production program of the KINEX BEARINGS includes wide assortment of standard and special rolling bearings for different industrial branches. Production plants went through complicated historical development from their establishment and presently the KINEX BEARINGS with its large scale production program belongs to global producers of the rolling bearings.

Production of the rolling bearings has a long term tradition. KINEX BEARINGS offers complex services in the field of research, development and production of the rolling bearings and rolling elements. One of the most significant industrial segments in term of volume of sold bearings is the railway industry. Beginning of production in segment of single row roller bearings for the railway vehicles dates from year 1959. A commercial corporation KINEX BEARINGS, a.s. belongs at the moment to leaders in field of the roller bearings supplies for axles of the railway vehicles in Europe and disposes of validations for different products supplies needed for application of the above mentioned bearings in various territories. Production of the single row roller bearings that are used in railway industry is assured in accordance with requirements of the European standard EN 12080. KINEX BEARINGS, a.s. (Joint Stock Company) offers also deliveries of the bearing units for axles of the goods wagons with load on the axle 22.5 tons and axle load of 25 tons.

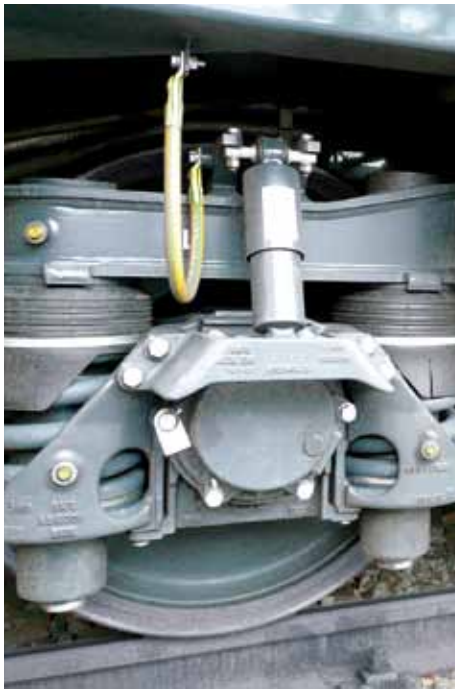
APPLICATION

- bearings of the axles for the goods wagons, passenger wagons, electric and diesel locomotives, electric and diesel engine vehicles and motor units
- gear boxes, driving traction motors and generators, motors of compressors (air pumps) and drives of ventilators, actuators and charging generator of the electric and diesel locomotive engines

REFERENCES

Manufacturers
BONATRANS (FZ), GATX (PL, DE), GHH Valdunes (F), Gredelj (HR), IRS (Astra Arad, Meva, Romvag) (ROM), LUCCHINI (I), MAV TISZAVAS (H), Škoda Transportation (CZ), Tábor Szynowy Opole (PL), Tatravagónka (SK)

Railway Companies
BR (GB), CFL (LUX), ČD (CZ), Deutsche Bahn (D), HŽ (HR), MAV (H), ÖBB (A), PKP CARGO (PL), PKP INTERCITY (PL), RZD (RUS), SBB (CH), SISTEMA DETREN ELECTRICO URBANO (MEX), SNCB (B), SZ (SLO), TCDD (TR), ZSSK (SK), ZSSK CARGO (SK), ŽS (SRB)



TECHNICAL DATA

ROLLING BEARINGS FOR THE RAILWAY VEHICLES

Rolling bearings used in production of railway vehicles are produced in standardized types ISO and also as special single row cylindrical roller bearings. The main advantages of cylindrical roller bearings usage are their simple design, easy assembly, easy maintenance and reliability in operation. Cylindrical roller bearings are characterized by low friction resistance, low temperature, low component wear and high load rating.

Essential condition of reliable operation of cylindrical roller bearings is observance of mounting and dismounting principles:

- fitting tolerances
- shape deviations
- warming up of bearings (inner rings)
- qualified mounting workplace
- trained and qualified employees
- using of suitable jigs
- keeping of fixed procedures

Special single row cylindrical roller bearings used in axle railway vehicle seatings are produced with machined brass cage and glass-fibre inforced polyamide cage. Reinforced polyamide cage improves reliability and safety. Single row cylindrical roller bearings in design NU, NJ, NUP used in railway drive systems and traction motors are produced with machined brass cage version E.

MATERIAL

Structure of the steel after heat treatment:
Martensite in which the residual austenite varies in the range from 3 to 10 %.
This residual austenite in axle bearings is ≤ 2 %.

Hardness of the bearing rings after heat treatment is in the range:
58-64 HRC (dispersion of measured values between all rings of one bearing must not be more than 3 HRC)
To assure dimensional stability through the whole operational period, the bearing rings for axle bearings are stabilized by means of heat treatment on 200 °C (S1).

Hardness of rollers after heat treatment is in the range:
60-65 HRC (dispersion of measured values between all rollers of one bearing must not be more than 4 HRC)

Bearing rings:
Chromium steel through-hardening in the whole cross section: 100 Cr6, 100 CrMnSi6-4

Bearing rollers:
Chromium steel through-hardening in the whole cross section: 100 Cr6, 100 CrMnSi6-4

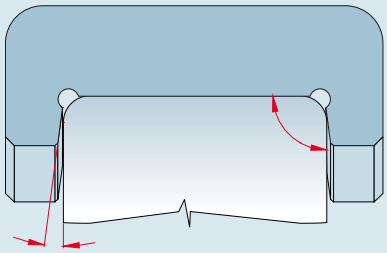
Cages:
Polyamide cage: material PA 66GF25 HZ
Machined brass cage: material CuZn40Pb2, CuZn37Al1, CuZn3lMnAM, MS58Al

TECHNICAL DATA

INTERNAL DESIGN

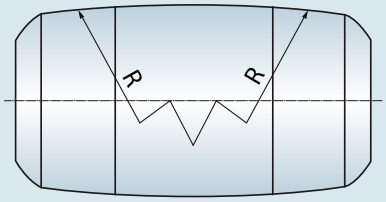
Design of roller face and quide flange

- it optimizes lubrication of a contact zone in the contact area and thus it increases axial load carrying capacity of the bearing.



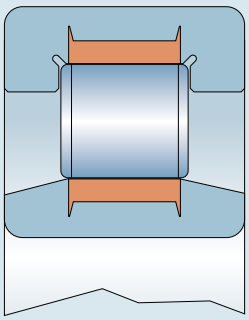
ZB profile of the roller raceway

- it takes part on minimizing of the edge stress and thus also on increasing of durability and reliability of the bearing.

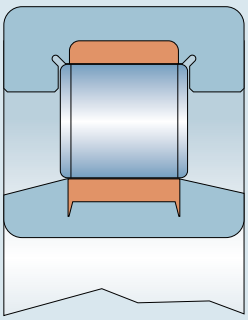


ZB profile of rollers

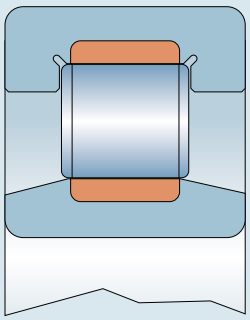
- it optimizes the contact effective stress created on external and internal bearing ring



Cylindrical roller without ZB profile
and non-convexed
raceways of the rings.



Roller ZB profile
and raceway ZB profile of the outer ring.
Non-convexed raceway of the inner ring.



Roller ZB profile
and convexed raceways
of the rings.

BEARING ARRANGEMENT

INFLUENCE OF ARRANGEMENT ON BEARING LIFE

Bearing life is considerably influenced by arrangement of bearing rings on the shaft and at the housing. These parts should be manufactured with required quality and tolerances. According to the concrete operational conditions the rings are either push fitted (clearance fit) or force fitted (interference fit)

Essential condition for bearing arrangement is that the ring loaded on its circumference must be force fitted. Recommended values of shaft diameters and housing bore tolerances take into consideration all operational influences (type, direction and intensity of load, temperature …) with loading during the whole workload time.

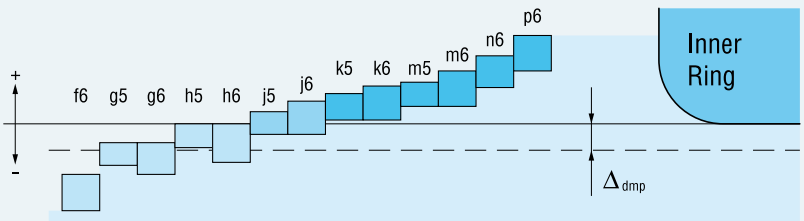
Recommended tolerances of journals diameters and housing bores

Arrangement	Journal diameter		Tolerance	Housing bore diameter	Tolerance
	Ball	Roller			
Fans	18 to 100	to 40	j6	Fans	J7
Generators	100 to 200	40 to 140	k6	Electic motors	K7
Electric motors	18 to 100	to 40	k5	Traction motors	
	100 to 200	40 to 140	m5		M7
	140 to 200	100 to 140	m6		
Axlebox bearings		50 to 140	*n6, p6	Axlebox bearings	H7
Traction motorbearings		140 to 500			

* It is necessary to use bearings with higher radial clearance at these arrangement.

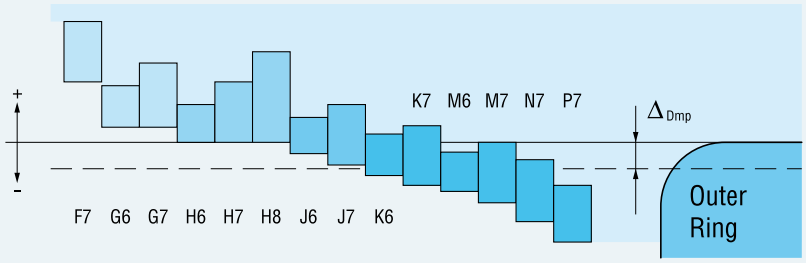
Journal diameter tolerance limiting deviations

Journal nominal diameter		k5		m5		j6		k6		m6		n6		p6	
mm		μm													
over	to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
30	50	+13	+2	+20	+9	+11	-5	+18	+2	+25	+9	+33	+17	+42	+26
50	80	+15	+2	+24	+11	+12	-7	+21	+2	+30	+11	+39	+20	+51	+32
80	120	+18	+3	+28	+13	+13	-9	+25	+3	+35	+13	+45	+23	+59	+37
120	180	+21	+3	+33	+15	+14	-11	+28	+3	+40	+15	+52	+27	+68	+43
180	250	+24	+4	+37	+17	+16	-13	+33	+4	+46	+17	+60	+31	+79	+50



Bore diameter tolerance limiting deviations

Nominal bore diameter		H7		J7		K7		M7	
mm		μm							
over	to	upper	lower	upper	lower	upper	lower	upper	lower
50	80	+30	0	+18	-12	+9	-21	0	-30
80	120	+35	0	+22	-13	+10	-25	0	-35
120	180	+40	0	+26	-14	+12	-28	0	-40
180	250	+46	0	+30	-16	+13	-33	0	-46
250	315	+52	0	+36	-16	+16	-36	0	-52
315	400	+57	0	+39	-18	+17	-40	0	-57



SHAPE DEVIATIONS

The further condition to achieve high bearing life in arrangements is to keep prescribed shape deviations of supporting areas and their surface quality. The shape deviations of supporting surfaces i.e. permissible deviation from roundness and cylindrical shape and permissible run – out of bearing surfaces with regard to the axle must be smaller than range of diameter tolerances.

Tolerance class	Place of arrangement	Permissible deviation from cylindrical shape	Permissible run-out of bearing surfaces with regard to the axle
P0, P6	shaft	IT 5/2	IT 3
	shape	IT 6/2	IT 4

Values of standard tolerances IT

Nominal diameter		Tolerance class				
mm		μm				
over	to	IT 2	IT 3	IT 4	IT 5	IT 6
18	30	2.5	4	6	9	13
30	50	2.5	4	7	11	16
50	80	3	5	8	13	19
80	120	4	6	10	15	22
120	180	5	8	12	18	25

Arrangement quality is influenced also by roughness of bearing supporting surfaces. These surfaces are smoothened at mounting procedures. Interface in the arrangement is more reduced if the surfaces are more roughness.

Supporting surface	Nominal diameter of the bearing	
	from 10 to 80	over 80
	Ra_{max} μm	
Shaft	0.63	1.25
Housing´s bore	0.63	1.25
Face of jounal shaft or housing	1.25	1.25

SINGLE – ROW CYLINDRICAL ROLLER BEARINGS LIFE CALCULATION

SINGLE - ROW CYLINDRICAL ROLLER BEARINGS LIFE CALCULATION FOR RAILWAY VEHICLE AXLEBOXES

Single-row cylindrical roller bearings life calculation for railway vehicle axleboxes is based on the radial static load acting on the bearings of one wheel set i.e. axle load which is calculated from the equation:

$$G_1 = \frac{G}{n} - G_2$$

where:

G	- weight of the vehicle	(kN)
G_1	- radial static load acting on one wheel set (axle load)	(kN)
G_2	- weight of a wheel set and others unsprung parts	(kN)
n	- number of wheel sets	

Then radial static load acting on one bearing will be:

$$P_{or} = \frac{G_1}{4}$$

where:

G_1	- radial static load acting on one wheel set	(kN) (axle load)
P_{or}	- radial static load acting on one bearing	(kN)

Radial equivalent dynamic load acting on one bearing is calculated from the equation:

$$P_r = P_{or} \cdot f_d$$

P_r	- radial equivalent dynamic load acting on one bearing	(kN)
P_{or}	- radial static load acting on one bearing	(kN)
F_d	- factor of additional forces	(see table 1)

Factors of additional forces **Table 1**

Type of vehicle	f_d
Passenger carriages	1.2 to 1.3
Goods, self – discharging and ingot wagons	1.2 to 1.4
Locomotives	1.3 to 1.8

Basic bearing life can be calculated from the equation:

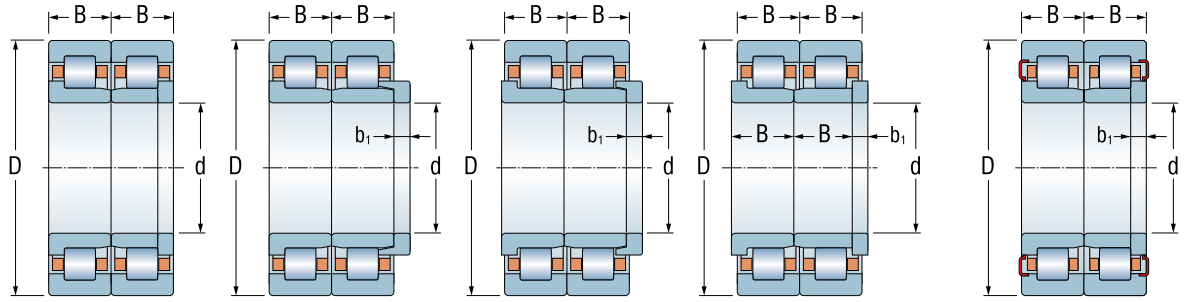
$$L_{10km} = \left(\frac{C_r}{P_r}\right)^{\frac{10}{3}} . \pi . D_k . 10^{-3}$$

where:

L_{10km}	- basic bearing life	(10^6 km)
C_r	- basic radial dynamic load rating (see dimension tables)	(kN)
P_r	- radial equivalent dynamic load acting on one bearing	(kN)
D_k	- diameter of the vehicle wheel	(m)

SINGLE - ROW CYLINDRICAL ROLLER BEARINGS

FOR AXLEBOXES



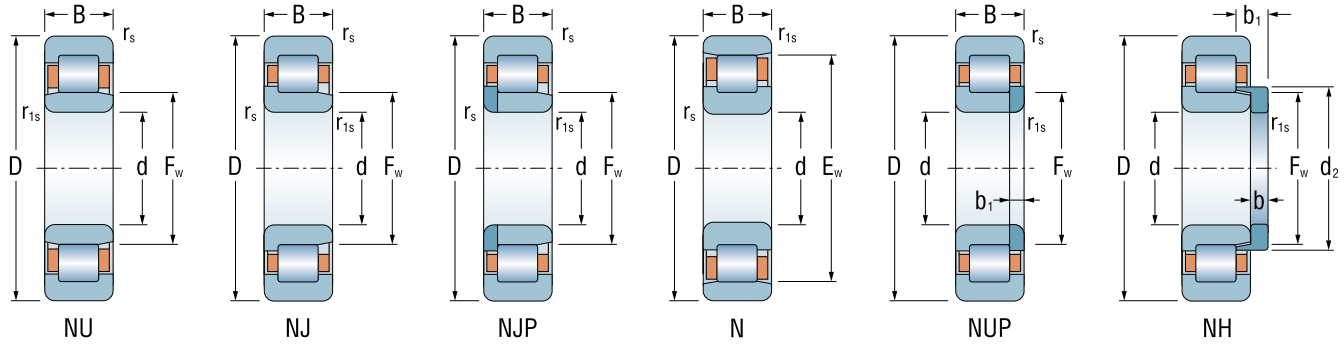
Dimension				Basic load rating		Maximum speed of railway vehicle	Weight of a pair of bearings	Bearings designation		Fig.	Cage	Radial clearance µm		Tolerance class
d	D	B	b_1	dyn. cr	static cor							min	max	
mm				kN		km/hour	kg							
100	180	60.3	-	333.5	444.4	160	12	**PLC 49-200-2-1**	**PLC 49-201-2** 1) 3) 4)	1	TNG	105	140	P6
110	215	73	-	494.5	668.6	160	24.9	**PLC 410-207-1**	**PLC 410-208-1** 1) 2) 4)	1	M	105	160	P6
118	215	80	-	519.8	740.9	160	25.7	**PLC 410-213-3**	**PLC 410-214-3** 1) 2) 4)	1	M	125	165	P0
	240	80		553.8	742.5	160	32.3	**PLC 410-13-2-3**	**PLC 410-14-2-3** 1) 3) 4)	1	TNG	120	160	P6
	240	80	-	553.8	742.5	160	34.2	**PLC 410-23**	**PLC 410-24** 1) 2) 4)	1	M	120	160	P0
119	240	80	-	553.8	742.5	160	32.1	**PLC 410-13-2-4**	**PLC 410-14-2-4** 1) 3) 4)	1	TNG	120	160	P6
119.3	240	80	-	553.8	742.5	160	31.7	**PLC 410-13-2-5**	**PLC 410-14-2-5**	1	TNG	120	160	P6
120	200	62	-	372.8	549.1	120	16	**PLC 49-202**	**PLC 49-203** 1) 2) 4)	1	M	125	165	P0
	215	80	-	519.8	740.9	160	25.2	**PLC 410-213**	**PLC 410-214** 1) 2) 4)	1	M	125	165	P0
	240	80	-	553.8	742.5	160	33.7	**PLC 410-13**	**PLC-410-14** 1) 2) 4)	1	M	120	160	P0
	240	80	-	553.8	742.5	160	33.7	**PLC 410-13-1**	**PLC 410-14-1** 1) 2) 4)	1	M	120	160	P6
	240	80	-	553.8	742.5	160	31.7	**PLC 410-13-2**	**PLC 410-14-2** 1) 3) 4)	1	TNG	120	160	P6
129	240	80	-	539.6	775.4	160	30.2	**PLC 410-33-2-4**	**PLC 410-34-2-4**	1	TNG	135	180	P6
130	220	73	-	496.1	744.1	160		**PLC 410-219-2**	**PLC 410-220-2**	1	TNG	135	180	P6
	240	80	-	516.3	752.1	160	32.7	**PLC 410-15**	**PLC 410-16** 1) 2) 4)	1	M	135	180	P0
	240	80	-	516.3	752.1	160	30.65	**PLC 410-15-2**	**PLC 410-16-2** 1) 3) 4)	1	TNG	135	180	P6
	240	80	-	539.6	775.4	160	32.7	**PLC 410-33-1**	**PLC 410-34-1** 1) 2) 4)	1	M	135	180	P6
	240	80	-	539.6	775.4	160	30.2	**PLC 410-33-2**	**PLC 410-34-2** 1) 3) 4)	1	TNG	135	180	P6
	240	80	-	539.6	775.4	200	30.6	**PLC 410-215**	**PLC 410-216**	5	TNG	130	180	P6
	250	80	-	580.0	800.3	160	36.6	**PLC 410-17**	**PLC 410-18** 1) 2) 4)	1	M	135	180	P0
158	300	84	15	869.5	1214.3	160	58.3	**PLC 411-200**	**PLC 411-201** 1) 2) 4)	2	M	130	195	P0
159	300	84	15	869.5	1214.3	160	57.9	**PLC 411-20**	**PLC 411-21** 1) 2) 4)	2	M	130	195	P0
160	300	84	15	869.5	1214.3	160	57.5	**PLC 411-10**	**PLC 411-12** 1) 2) 4)	2	M	130	195	P0
180	320	86	12	713.5	1082.8	160	64.6	**NJ2236M C4A450-900**	**NUC2236M C4** + **HJ2236X16,33**	2	M	150	215	P0
	320	86	15	713.5	1082.8	160	64.9	**NJ2236XM C4**	**NUC2236M C4** + **PLC 810-1**	3	M	150	215	P0
	320	86	15	713.5	1082.8	160	64.9	**NJ2236XMAS C4**	**NUC2236MAS C4** + **PLC 810-1**	3	MAS	150	215	P0
	320	86	17	713.5	1082.8	160	64.8	**NJ2236XM C4**	**NUC2236M C4** + angle ring. **NUP2236**	4	M	150	215	P0

1) Pair of bearings is marked shortly e. g. PLC 410-13/14
2) Machined brass cage (steel riveted) or -1 (cross piece riveted)
3) Glass-fiber reinforced polyamide cage, roller centred
4) Inner ring interchangeable

M – two piece machined brass cage, roller centred
MAS – two piece machined brass cage with lubrication grooves, outer ring centred

SINGLE - ROW CYLINDRICAL ROLLER BEARINGS

FOR LOCOMOTIVES



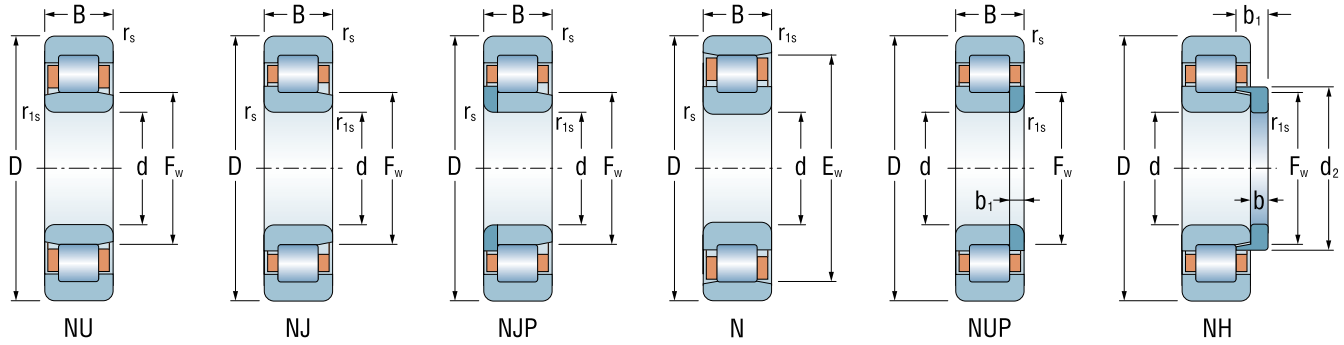
NU NJ NJP N NUP NH

Dimension			Bearings designation	Angle ring	Basic load rating		Limiting speed for lubrication		Mass of		Dimensions							
					dyna-mic	static			Bea-ring	Angle-ring								
d	D	B		HJ	C_r	C_{or}	grease	oil			rs_{min}	$r1s_{min}$	Fw	Ew	d2	b	b1	$s^{1)}$
mm					kN		min^{-1}		kg		mm							
90	190	43	**NJ318EM**	**HJ318E**	310.8	346.9	3 000	3 500	6.230	0.641	4	4	113.5		124	12	18.5	2
	190	43	**NU318EM**	**HJ318E**	310.8	346.9	3 000	3 500	6.229	0.641	4	4	113.5		124	12	18.5	2
	190	43	**NJ318M**	**HJ318**	234.9	258.4	3 200	3 800	6.070	0.667	4	4	115		125	12	21	2
	190	43	**N318**		234.9	258.4	3 200	3 800	5.250		4	4		165				2
	190	43	**NU318M**	**HJ318**	234.9	258.4	3 200	3 800	5.910	0.667	4	4	115		125	12	21	2
	190	43	**NU318MA**	**HJ318**	234.9	258.4	3 200	3 800	5.910	0.667	4	4	115		125	12	21	2
	190	43	**NJ318**	**HJ318**	234.9	258.4	3 200	3 800	5.520	0.667	4	4	115		125	12	21	2
	190	43	**NU318**	**HJ318**	234.9	258.4	3 200	3 800	5.360	0.667	4	4	115		125	12	21	2
95	200	45	**NJ319EM**		328.9	378.5	2 800	3 300	7.170		4	4	121.5					1.9
	240	55	**NJ419M**		415.2	465.0	2 500	3 000	13.860		4	4	133.5					2.5
	240	55	**NU419M**		415.2	465.0	2 500	3 000	13.570		4	4	133.5					2.5
100	215	47	**NU320EMA**		379.1	424.3	2 700	3 200	8.840		4	4	127.5					2
105	260	60	**NJ421M**	**HJ421**	515.1	585.1	2 200	2 700	17.620	1.740	4	4	144.5		159.7	16	27	2.5
	260	60	**NU421M**	**HJ421**	515.1	585.1	2 200	2 700	17.250	1.740	4	4	144.5		159.7	16	27	2.5
110	240	50	**NJ322EM**		439.6	507.6	2 400	2 800	12.006		4	4	143					2.9
	240	50	**NU322EM**		439.6	507.6	2 400	2 800	11.806		4	4	143					2.9
	240	50	**NJ322M**	**HJ322**	401.0	467.1	2 500	3 000	11.830	1.020	4	4	143		147.5	13	22.5	2.7
	240	50	**NJ322MA**		401.0	467.1	2 500	3 000	11.830	1.020	4	4	143		147.5	13	22.5	2.7
	240	50	**N322M**		401.0	467.1	2 500	3 000	11.420		4	4		207				2.7
	240	50	**NU322M**	**HJ322**	401.0	467.1	2 500	3 000	11.580	1.020	4	4	143		147.5	13	22.5	2.7
	280	65	**NJ422M**		569.5	654.7	2 100	2 500	22.350		4	4	155					2.7
	280	65	**NU422M**		569.5	654.7	2 100	2 500	21.880		4	4	155					2.7
120	260	55	**NU324M**		465.1	534.1	2 400	2 800	14.7		4	4	154			14		
	260	55	**NJ324M**		465.1	534.1	2 400	2 800	14.7		4	4	154			14		
	260	55	**NUP324M**		465.1	534.1	2 400	2 800	14.7		4	4	154			14		
	260	55	**NH324M**	**HJ324**	465.1	534.1	2 400	2 800	14.7	1.4	4	4	154			14		
	260	55	**NU324EM**		516.2	592.8	2 200	2 700	15.2		4	4	154					
	310	72	**NU424M**		714.4	834.5	1 900	2 200	30.59		5	5	170					
	310	72	**NJ424M**		714.4	834.5	1 900	2 200	30.59		5	5	170					

1) Permissible axial displacement out of central position
E – bearings with higher load rating
M – two piece machined brass cage, roller centred
MA – two piece machined brass cage, outer ring centred

SINGLE - ROW CYLINDRICAL ROLLER BEARINGS

FOR LOCOMOTIVES

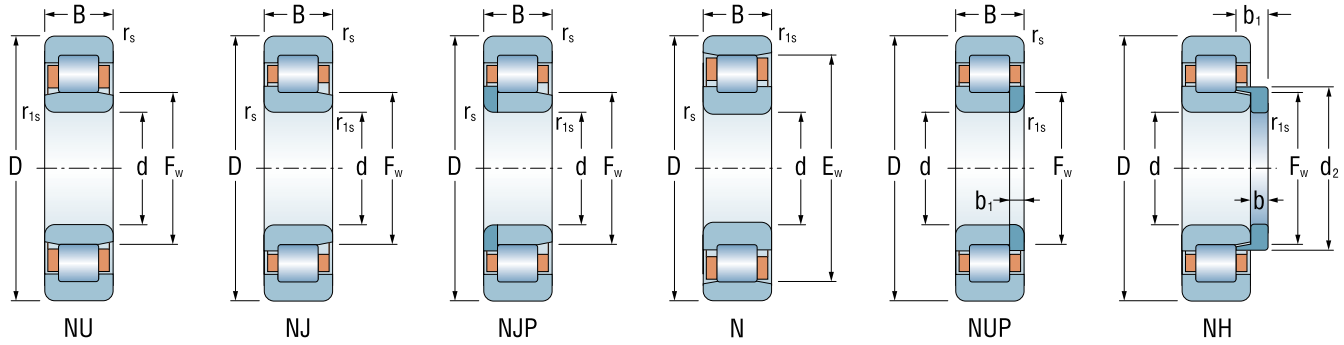


Dimension			Bearings designation	Angle ring	Basic load rating		Limiting speed for lubrication		Mass of		Dimensions							
					dyna-mic	static			Bea-ring	Angle-ring								
d	D	B		HJ	C_r	C_{or}	grease	oil			rs_{min}	$r1s_{min}$	Fw	Ew	d2	b	b1	s^1
mm					kN		min^{-1}		kg		mm							
130	280	58	**NU326EM**	**HJ326E**	603.2	715.6	2 000	2 400	18.600	1.700	4	4	167		182	14	23	2.9
	280	58	**NJ326EM**	**HJ326E**	603.2	715.6	2 000	2 400	19.000	1.700	4	4	167		182	14	23	2.9
140	250	42	**NJP228EMA**		385.1	502.0	2 300	2 800	9.650		4	4	169					1.6
	250	42	**NU228EMA**		385.1	502.0	2 300	2 800	9.440		4	4	169					1.6
	250	42	**N228M**		318.3	410.5	2 500	3 000	8.897		4	4		221				2.5
	250	42	**NUP228M**		318.3	410.5	2 500	3 000	9.870		4	4	169					
	250	42	**NJ228M**		318.3	410.5	2 500	3 000	9.330		4	4	169					2.5
	250	42	**NU228M**		318.3	410.5	2 500	3 000	9.110		4	4	169					2.5
	300	62	**NU328M**		603.4	725.8	2 000	2 400	22.100		4	4	180					2.7
	300	62	**NJ328M**		603.4	725.8	2 000	2 400	22.840		4	4	180					2.7
	300	102	**NJ2328EM**		1 018.8	1 384.5	1 900	2 200	37.600		4	4	180					7.9
	300	102	**NJP2328M**		909.3	1 229.8	2 000	2 400	36.760		4	4	180					9.2
	300	102	**NU2328EM**		1 018.8	1 384.5	1 900	2 200	37.600		4	4	180					7.9
	300	102	**NJ2328M**	**HJ2328**	909.3	1 229.8	2 000	2 400	36.100	2.380	4	4	180		197.6	15	33.5	9.2
	300	102	**NU2328M**	**HJ2328**	909.3	1 229.8	2 000	2 400	35.300	2.380	4	4	180		197.6	15	33.5	9.2
150	270	45	**NJP230EMA**		440.2	581.3	2 200	2 700	12.520		4	4	182					2.4
	270	45	**NJ230EMA**		440.2	581.3	2 200	2 700	12.520		4	4	182					2.4
	270	45	**NU230EMA**		440.2	581.3	2 200	2 700	12.160		4	4	182					2.4
	270	45	**NJ230EM**		440.2	581.3	2 200	2 700	12.520		4	4	182					2.4
	270	45	**NU230EM**		440.2	581.3	2 200	2 700	12.000		4	4	182					2.4
	270	45	**NUP230M**		367.7	480.5	2 200	2 700	12.050		4	4	182					
	270	45	**NJ230M**		367.7	480.5	2 200	2 700	11.800		4	4	182					2.4
	270	45	**NU230M**		367.7	480.5	2 200	2 700	11.800		4	4	182					2.4
	320	65	**NJ330EM**		757.6	921.6	1 800	2 100	27.100		4	4	193					1.8
	320	65	**NJ330M**	**HJ330**	663.1	807.4	1 900	2 200	26.840	2.420	4	4	193		210	15	26.5	2.7
	320	65	**NU330M**	**HJ330**	663.1	807.4	1 900	2 200	26.280	2.420	4	4	193		210	15	26.5	2.7

1) Permissible axial displacement out of central position
E – bearings with higher load rating
M – two piece machined brass cage, roller centred
MA – two piece machined brass cage, outer ring centred

SINGLE - ROW CYLINDRICAL ROLLER BEARINGS

FOR LOCOMOTIVES



Dimension			Bearings designation	Angle ring	Basic load rating		Limiting speed for lubrication		Mass of		Dimensions							
					dyna-mic	static			Bea-ring	Angle-ring								
d	D	B		HJ	C_r	C_{or}	grease	oil			rs_{min}	$r1s_{min}$	Fw	Ew	d2	b	b1	s^{1}
mm					kN		min^{-1}		kg		mm							
160	290	48	**NJ232EM**	**HJ232E**	498.6	666.4	2 000	2 400	14.70	1.520	4	4	195		206.2	12	20	2.5
	290	48	**NJ232EM**	**HJ232E**	498.6	666.4	2 000	2 400	14.70	1.520	4	4	195		206.2	12	20	2.5
	340	67	**NJ332EM**		857.8	1 053.2	1 700	2 000	32.20		4	4	195		204	12	20	2.5
170	310	52	**NJ234EM**		589.0	777.2	1 900	2 200	18.400		4	4	207					2.9
	310	52	**NJ234EM**	**HJ234E**	589.0	777.2	1 900	2 200	19.200	1.740	4	4	207		221.4	12	20	2.9
	310	52	**NU234EM**	**HJ234E**	589.0	777.2	1 900	2 200	16.600	1.740	4	4	207		221.4	12	20	2.9
180	280	46	**NU1036M**		334.6	474.5	2 100	2 500	9.858		2.1	2.1	205					3.6
	320	52	**NJ236EM**	**HJ236E**	611.3	826.0	1 800	2 100	19.500	1.820	4	4	217		230.5	12	20	2.9
	320	52	**NU236EM**	**HJ236E**	611.3	826.0	1 800	2 100	19.200	1.820	4	4	217		230.5	12	20	2.9
190	290	46	**NJP1038EMA**		411.2	612.0	1 970	2 360	12.100		2.1	2.1	214					2.5
	290	46	**NU1038M**		354.8	520.3	1 900	2 200	9.510		2.1	2.1	215					3.5
200	310	51	**NUP1040M**		381.9	567.1	1 900	2 200	14.750		2.1	2.1	229					
	310	51	**NJ1040M**		381.9	567.1	1 900	2 200	14.000		2.1	2.1	229					4.2
	310	51	**NU1040M**		381.9	567.1	1 900	2 200	13.804		2.1	2.1	229					4.2
	360	58	**NJ240EM**	**HJ240E**	749.9	1 033.7	1 500	1 800	27.900	2.710	4	4	243		257.8	14	23	2.9
	360	58	**NU240EM**	**HJ240E**	749.9	1 033.7	1 500	1 800	27.300	2.710	4	4	243		257.8	14	23	2.9

1) Permissible axial displacement out of central position
E – bearings with higher load rating
M – two piece machined brass cage, roller centred
MA – two piece machined brass cage, outer ring centred

RULES OF MOUNTING AND DISMOUNTING OF BEARINGS

WARMING UP OF BEARING INNER RINGS

Bearings of higher diameter series, used mostly in railway vehicles, require a bigger force to be pressed on at tight fitting. Therefore warming up of inner rings of bearings is used advantageously at the time of mounting them.

The bearings can be warmed up:

- inductively
- by air in electric furnace

Sufficient thermal expansion is achieved at the temperature 80 – 100 degrees centigrade. In no case the temperature should go over 120 degrees centigrade during warming up. The abutment dimensions of the axle journal and axlebox must be checked by measuring prior to bearings mounting procedure. The ring faces must be seated on their whole circumferences. Prior to mounting works it is necessary to check if the marking on the bearing is in conformity with the data on the drawing and at the list of parts.

Protection of contact surfaces and lubrication

Before fitting of the bearings it is advantageous to coat the contact surface of the axle journal and axlebox with a fine thin layer of LFAG 3 paste or with some other suitable agent in order to prevent rise of contact corrosion. At the time of mounting procedure, the bearings will be filled with a base grease, the brand and quantity of which is specified by the railway company with the consent of the bearings manufacturer.

Conditions for assembling

Mounting works must be carried out at a dry and dustfree workplace. The bearings, axleboxes and accessories must be protected from humidity and dirtiness during storage, checking and mounting procedures.

Dismounting of the bearings

If the bearings are to be reused after dismounting, this procedure must be carried out professionally with the help of suitable jigs and in accordance with the beforehand fixed procedure at a dry and dustfree workplace.

Jigs used for dismounting

It is important to be careful about that, only the ring which is to be pulled off was caught by the extracting jig. The force needed for dismounting must not be in any case carried through the rolling elements, since it would cause damage of raceways.

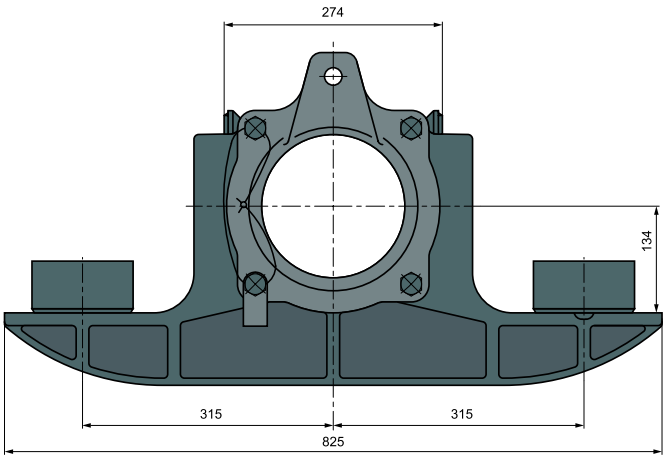
QUALITY MANAGEMENT

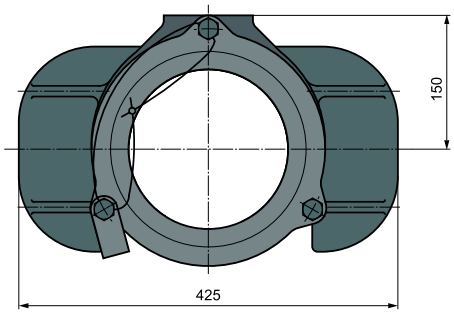
Production plants of the KINEX BEARINGS are certified in accordance with standards ISO 9001, ISO / TS 16 949, ISO 14 001 and BS OHSAS 18001 for the field of development and production of the roller and ball bearings by a certification Company TUV NORD Slovakia.
KINEX BEARINGS prepares implementation of the international railway industry standard IRIS. Because of the amount of all certificates we work simultaneously on a complex quality management system that will allow us to joint the mutual requirements of those standards with effective implementation of other requirements.

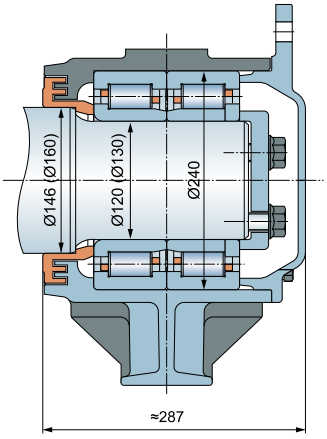
FREIGHT WAGON AXLEBOXES

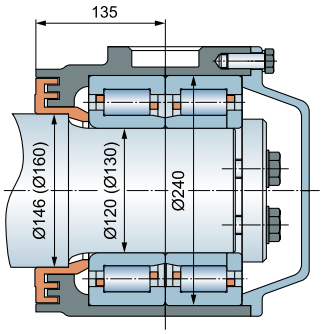
Axlebox BA 182	
Bogie	Y 25
Axle load	22,5 tons
Cylindrical roller bearing	PLC 410-33-2/34-2 (WJ/WJP 130x240)
Maximum speed	120 kmph
Suspension	helical coil springs
Box material	spheroidal grafite cast iron

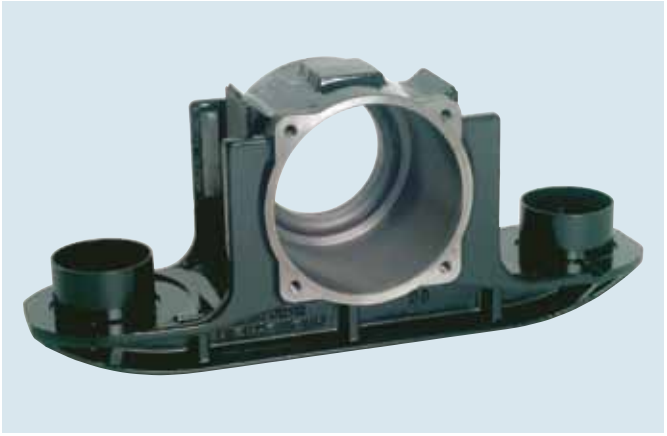
Axlebox BA 381	
Bogie	2 and 4 axle goods wagon
Axle load	22.5 tons
Cylindrical roller bearing	PLC 410-33-2/34-2 (WJ/WJP 130x240)
Maximum speed	120 kmph
Suspension	leaf spring
Box material	spheroidal grafite cast iron







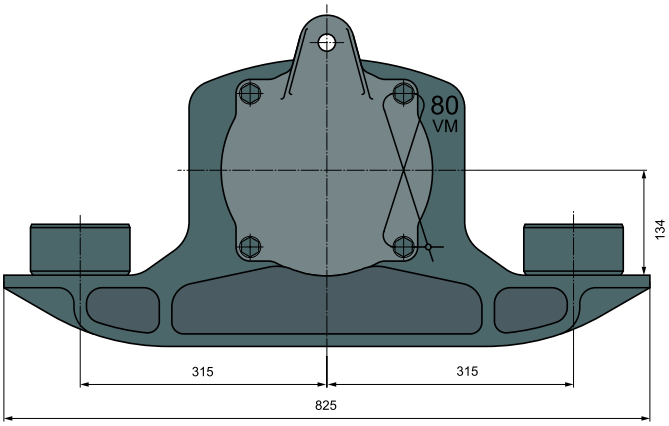


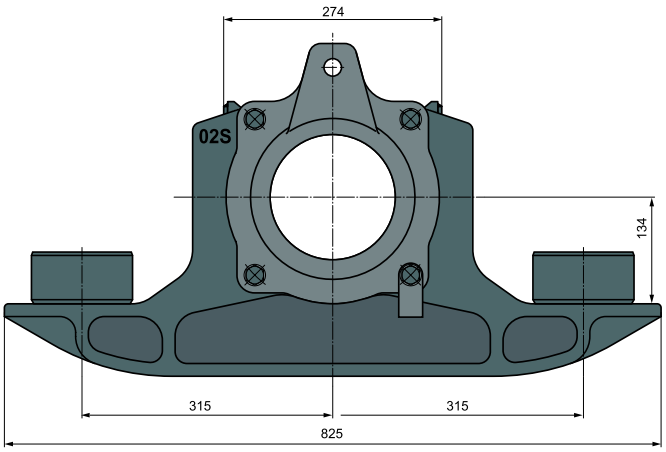


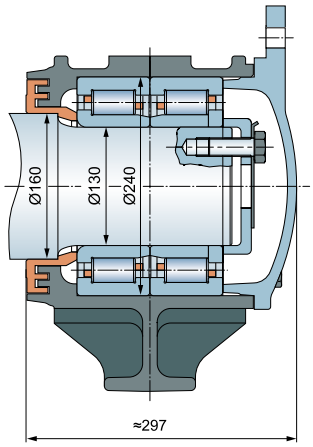
FREIGHT WAGON AXLEBOXES

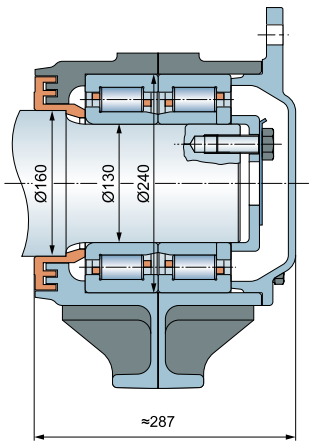
Axlebox 80 VM	
Bogie	Y 25
Axle load	25 tons
Cylindrical roller bearing	PLC 410-33-2/34-2 (WJ/WJP 130x240)
Maximum speed	120 kmph
Suspension	helical coil springs
Box material	cast steel

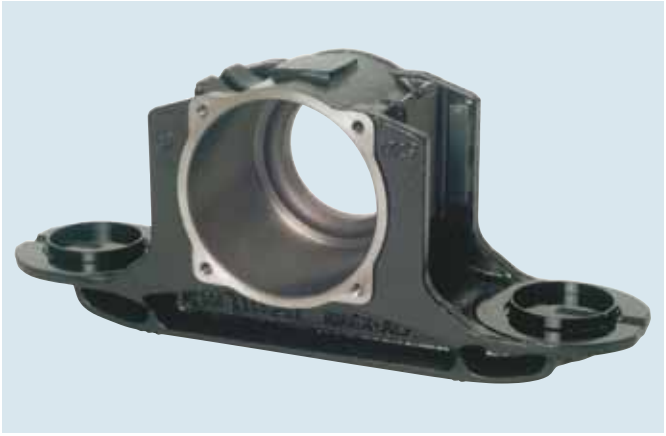
Axlebox BA 386 (02S)	
Bogie	Y 25
Axle load	25 tons
Cylindrical roller bearing	PLC 410-33-2/34-2 (WJ/WJP 130x240)
Maximum speed	120 kmph
Suspension	helical coil springs
Box material	spheroidal grafite cast iron











ELECTRICALLY INSULATED BEARINGS

Passage of electric current through rolling bearings used in electric motors is possible to avoid using bearings with insulated layer on aluminium oxide base. The insulated layer is coated on the outside diameter and the faces of the outer ring. The layer prevents creation of damages caused by electric current passing through individual parts of the bearing and thereby increases bearing field reliability. The rolling bearings with insulated layer are interchangeable with standard rolling bearings and are in accordance with requirements of ISO standards. The layer resistance for breakdown voltage is 500 and 1000 V.

Bearing designation:

- for breakdown voltage up to 500 V : SP1A
- for breakdown voltage up to 1000 V : SP2A

RESEARCH AND DEVELOPMENT

KINEX BEARINGS HAS BEEN GIVING CONTINUOUS ATTENTION TO:

- new products development
- present products improvement

An important factor of quality improvement of cylindrical roller bearings is continuing design improvement that optimises lubrication, increases loading capacity and minimizes edge stresses.

Continuing design improvement increases bearing‘s life and reliability.

PRODUCTION, INSPECTION AND ROLLING BEARINGS TESTING

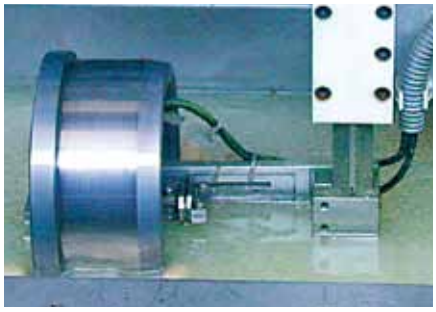
The production of axlebox cylindrical roller bearings used in railway industry is assured in accordance with requirements of european standard EN 12 080.

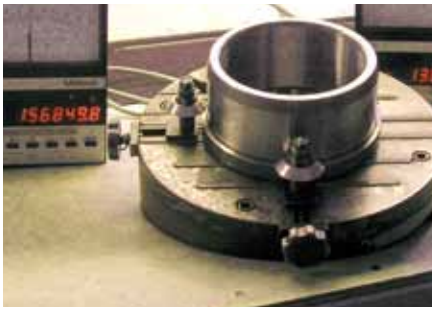
Rig performance tests of axlebox cylindrical roller bearings according to EN 12082, UIC 515-5.

- axle load 22,5 tons, speed 120 km per hour
- axle load 16 tons, speed 200 km per hour
- axle load 25 tons, speed 120 km per hour

Axlebox bearings performance test rig

Inspection





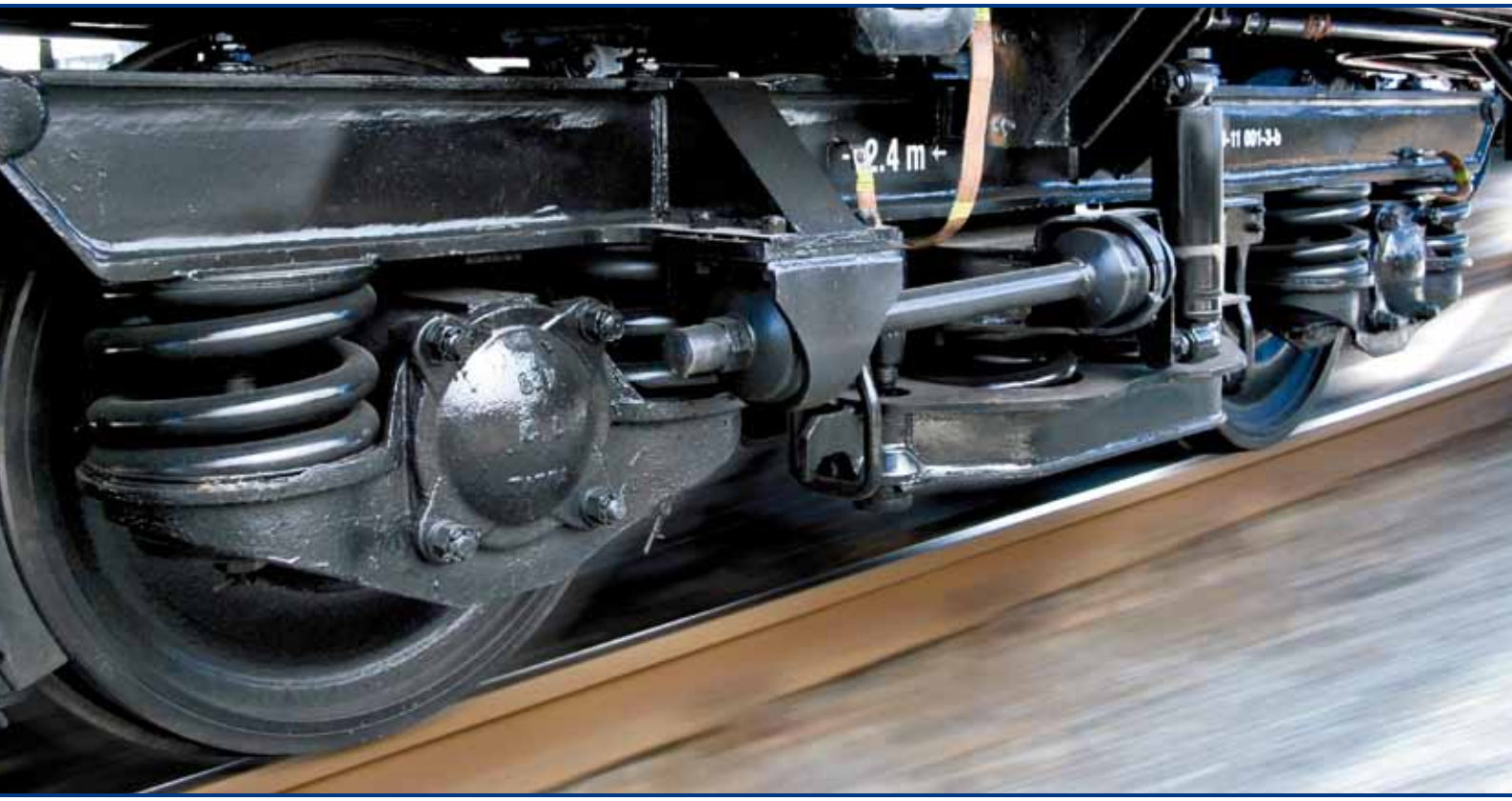
STANDARD SPECIFICATIONS

STN EN 12080		Railway vehicles; Axle boxes; Rolling bearings
STN EN 120B1		Railway vehicles; Axle boxes; Plastic lubricants
STN EN 12082		Railway vehicles; Axle boxes; Performance test
STN EN ISO	683-17	Steel intended for heat treatment; Alloyed and free cutting steel
	Part 17:	Steel for the rolling bearings
STN EN 1982		Copper and copper alloys. Ingots and castings
STN EN 12420		Copper and copper alloys. Forged pieces
ISO 28 1		Rolling bearings. Dynamic load carrying capacity and durability
ISO 76		Rolling bearings. Static load carrying capacity

TECHNICAL SUPPORT FOR USERS OF THE BEARINGS

We recommend consulting of all topics related with mounting structure and operation of the bearings in railway vehicles and equipments with technical service of KINEX BEARINGS at e-mail address: servis@kinex-klf.sk

RAILWAY BEARINGS DEPARTMENT
Tel.: 00421 41 420 1893
Fax: 00421 41 420 1234
e-mail: railway@kinexbearings.sk



KINEX
Member of HTC holding

Contact:

KINEX BEARINGS, a.s.
1. maja 71/36
014 83 Bytca, Slovakia

www.kinex.sk

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