

TIMKEN

Where You Turn



Global Rail Capabilities



Timken has been a leader in the rail industry since the 1920s. To demonstrate that tapered roller bearings could be successfully used on locomotive axles, in 1929 Timken commissioned the "Four Aces" – the first steam locomotive equipped with Timken® tapered roller bearings. Another major innovation came in 1954, with the introduction of the Timken® AP™ bearing. It replaced friction journal bearings and quickly became the industry standard. This commitment to innovation became a hallmark of Timken's rail business. It extends to the new millennium with the revolutionary Timken® AP-2™ bearing, which has become the new standard for rail bearing design.

Timken is globally respected in the rail industry. You'll find Timken products helping to ensure smooth rail operation in Europe, Asia, South America, North America, Africa and Australia for markets including freight, locomotive, passenger, tram and high-speed.

Our commitment to being your friction management solutions provider is stronger than ever. With an unbeatable product line, a dedication to research and innovation, industry-leading technical support and bearing reconditioning services, Timken is where the world of rail turns for quality products and services.

Investments in research

Timken is supported by 13 technology centers all over the world and invests nearly \$50 million annually in research and product development. Skilled engineers, scientists and technicians study all aspects of rail need, leading to continued innovation and improvements for increasingly demanding application requirements.



Timeline

Highlights of The Timken Company's innovations and achievements in the rail industry:

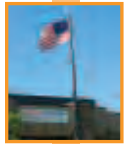


1929 Timken commissions the "Four Aces" – the first steam locomotive equipped with Timken tapered roller bearings.



1954 Timken pioneers the AP bearing, replacing friction journal bearings.

1958 The Timken AP bearing receives American Association of Railroads (AAR) conditional approval Certificate No. 1.



1967 The company's patented three-step seal case is introduced.

1970 The Timken AP bearing receives AAR unconditional approval Certificate No. 1-A. A patented lanced-tab locking plate design to improve cap screw retention is introduced.



1973 The Timken® XP™ bearing is introduced. It is the forerunner of the AAR standard that was put into practice four years later.

1976 The Timken fitted backing ring becomes AAR mandatory on new Class F bearings. The No Field Lubrication (NFL) bearing concept, a spin-off from the Timken XP bearing, is adopted by AAR.



1981 Timken bearings are selected for SNCF TGV locomotive that breaks the world speed record (350km/hour).



1982 Proprietary ultrasonic macro-inclusion detection method results in improvements to quality of Timken bearing steel.

1988 Timken pioneers HDL Seal technology.



1994 AP-2 compact bearing placed into service, becoming the new industry standard.

Timeline



1995

Timken bearings are selected for the JR West 500 Series, the first high-speed train in Japan equipped with tapered roller bearings. Timken acquires Rail Bearing Service, the authorized remanufacturer of Timken AP bearings. Timken announces the new tank car bearing.



1996

Test lab capabilities expand to include "hot box" and "why made code 04" analysis.



1997

New railroad bearing reconditioning facility opens in Great Britain. AAR grants unconditional approval for Timken HDL Seal and Sleeve axle salvage and repair procedure.

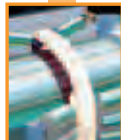
1999

Timken celebrates its 100th anniversary.



2001

TracGlide top-of-rail lubrication delivery system demonstrates significant fuel savings.



2002

Timken introduces the Guardian, an intelligent, wireless, sensor technology bearing and low torque bearing for rail applications. Timken bearings are selected for Talgo 350 power cars and coaches in Spain that set a constant-speed world record (non-magnetic) of 350 km/hour.



2003

Timken acquires The Torrington Company and expands its line of products and services for rail.



2004

Introduction of Sure-Fit universal backing ring, which significantly reduces the potential for the backing ring to loosen while in service. Timken supplies the Federal Railroad Administration (FRA) with Generator/Guardian bearings.



2005

Timken creates a new company to enhance South African economic empowerment.

2006

Timken reconditions the first bearings for China's Daqin Coal Line. Timken journal bearings are selected for locomotives that operate on the highest railway in the world, through the Himalayan mountain region.

A Better Design... A Better Bearing

The patented Timken AP-2 bearing quickly became the compact bearing design of choice for the rail industry. As the industry evolves, Timken continues to develop new seals and other unique components, making the AP-2 bearing distinctly different from competitor bearings while increasing performance capability.

This AP-2 design provides for reduced journal axle flexure and less fretting wear. Its compact design uses fewer components and reduces bearing weight.

The AP-2 bearing offers improved safety and reliability.



Why the AP-2 is the Bearing of Choice

Reduction in bearing failure due to water ingress. The HDL seal, standard on all Timken AP-2 bearings, provides the best protection against water and other contaminants entering the bearing cavity.

Reduces bearing set outs. In addition to the HDL seal providing excellent sealing, it also lowers seal operating temperatures.

Reduces fuel cost. The HDL seal operates with significantly lower torque, which results in lower fuel operating costs.

Reduction in component wear rejection. Coupled with less flexure due to the increased axle dust guard diameter, the Timken design provides the shortest distance between the cone face and the dust guard. This design reduces the amount of movement and the resultant wear.

Reduction in axle fillet damage. Fitted backing ring design reduces the potential for water ingress and resulting fretting corrosion in the axle fillet area.

Decreased potential axle failure. The shorter axle journal design provides a longer and stiffer dust guard. This reduces stress at the crucial axle fillet area.

Elimination of axle grooving. By removing the seal wear ring in the Timken design, axle grooving and resulting scrapping of the seal wear ring or expensive repairs are eliminated.

Timken AP-2 Bearing

Other Bearing Design

Distance of Other Bearing Design

Weight Savings Comparison

Timken AP Bearing vs. Timken AP-2 Bearing (Weights in pounds)

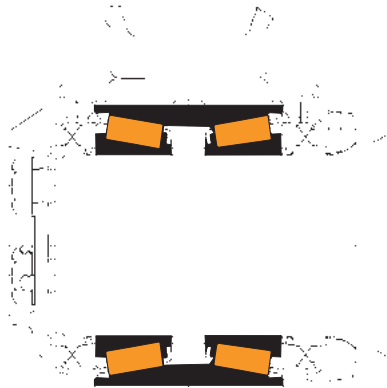
AP-2 CLASS K (6 1/2 X 9) FOR 286,000 LBS (130,000 KG) GRL CARS

	BEARINGS(2)	ADAPTERS(2)	AXLE	TOTAL
CLASS F SHROUDED	223.5	70.5	1175.0	1469.0
CLASS K	178.0	64.0	1168.0	1410.0
SAVINGS PER WHEELSET				59.0
SAVINGS PER CAR				236.0



Global Rail Applications

Prominent examples of Timken's thousands of bearing designs are included on the following pages.



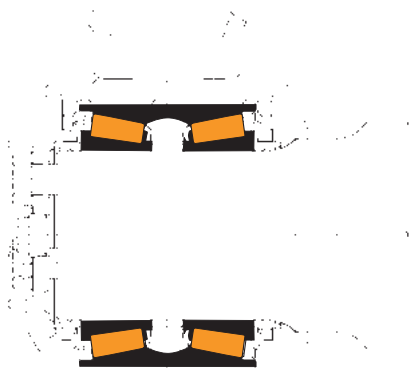
Class G

Customer/Application:

- Heavy haul freight cars in Australia and Colombia
- Intermodal freight and passenger cars in North America
- Freight locomotives throughout the world

Series: HM 136948 grease lubricated

Axle: 6½ to 7 inches diameter



Short G

Customer/Application:

- Heavy haul freight cars in Australia and Colombia
- Intermodal freight and passenger cars in North America
- Freight locomotives throughout the world

Series: HM 136948 grease lubricated

Axle: 6½ to 7 inches diameter

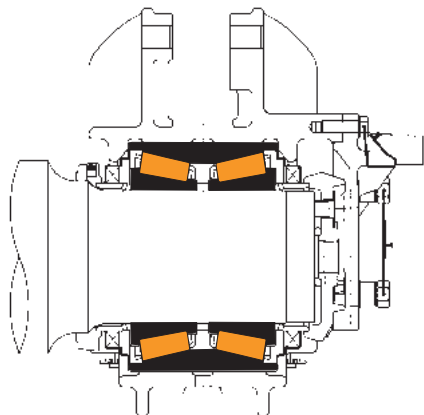
Freight Car Designations*

CLASS	Nominal Journal Size	CAR CAPACITY (TONS)	Gross Rail Load (LBS)	Nominal Axle Load (TONS) up to
B	4½ X 8	30	103,000	13
C	5 X 9	40	142,000	18
D	5½ X 10	50	177,000	22
E	6 X 11	70	220,000	28
L	6 X 8	70	220,000	28
F	6½ X 12	100	263,000	33
K	6½ X 9	100 - 120	286,000	36
G	7 X 12	125	315,000	40
M	7 X 9	125	315,000	40

*From the American Association of Railroads (AAR).



Global Rail Applications

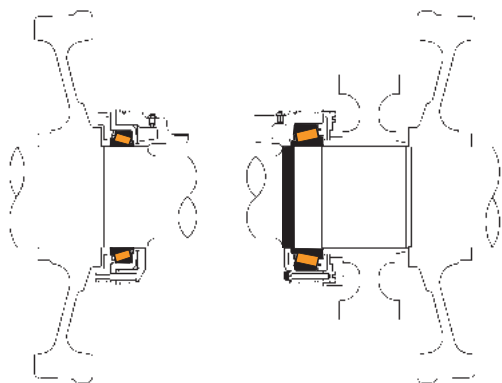


Class GG

Customer/Application: Locomotives

Series: H337844 grease lubricated

Axle: 6½ to 6⅝ inches diameter



MSU

Customer/Application: Locomotives throughout the world

Popular series: M249700, M349500, LM742700, M244200, M246900 grease lubricated

Comments: Product is case carburized, which enhances bearing performance and durability



Bearing Portfolio

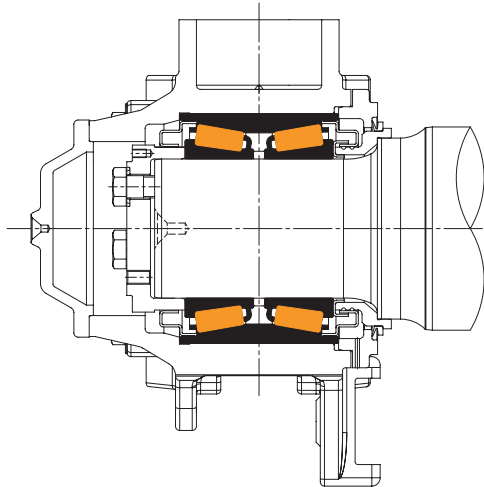
Class & Size			Dimension (inch)			Dimension (mm)			Load Ratings		Cone & Cup Part Number			
Class	Size (Inch)	Size (Metric)	cone bore (in)	cup O.D. (in)	cup width (in)	cone bore (mm)	cup O.D. (mm)	cup width (mm)	C90(2) (lbf)	C90(2) (kN)	Cone Part Number	Double Cup Part Number		
B	4 x 8	SP100	4.0000	6.5000	4.5000	101.60	165.10	114.3	26,900	120	HM120848	HM120817XD		
						100.00	165.10	114.3			HM120846			
C	5 x 9	SP120	4.6875	7.6875	5.6250	119.06	195.26	142.9	38,600	172	HM124646	HM124618XD		
						120.00	195.00	131.4			HM124649	HM124616XD		
D	5½ x 10	SP130	5.1870	8.1875	6.0000	131.75	207.96	152.4	41,800	186	HM127446	HM127415XD		
						130.00	210.00	132.0			HM127442	HM127417XD		
						130.00	230.00	160.0			53,200	237	H127746	H127715XD
						130.00	250.00	159.0			53,000	236	NP178837	NP023784
E	6 x 11	SP140	5.6870	8.6875	6.4374	144.45	220.66	163.5	43,800	195	HM129848	HM129814XD		
						140.00	220.00	140.0			HM129843	HM129813XD		
F	6½ x 12	SP150	6.1870	9.9375	7.2500	157.15	252.41	184.2	59,700	266	HM133444	HM133416XD		
						150.00	250.00	160.0			HM133436	HM133413XD		
						160.00	250.00	160.0			HM133448			
G	7 x 12		6.9995	10.8750	7.3120	177.79	276.23	185.7	68,600	305	HM136948	HM136916XD		
GG	7		6.4995	11.8780	7.7500	165.09	301.70	196.85	87,300	388	H337840	H337816XD		
			6.8745			174.61					H337844			
L	6 x 8		5.6870	8.6564	5.5118	144.45	219.87	140.0	43,800	195	NP891226	NP379567		
K	6½ x 9		6.1870	9.8375	6.2992	157.15	249.87	160.0	59,700	266	NP877824	NP335917		
M	7 x 9		6.4995	10.3750	6.5620	165.09	263.53	166.7	67,200	299	NP239427	NP540329		

AP

AP-2



Global Rail Applications



Avanto

Customer: Siemens SGP

Location: Graz, Austria

Application: Tram/commuter train

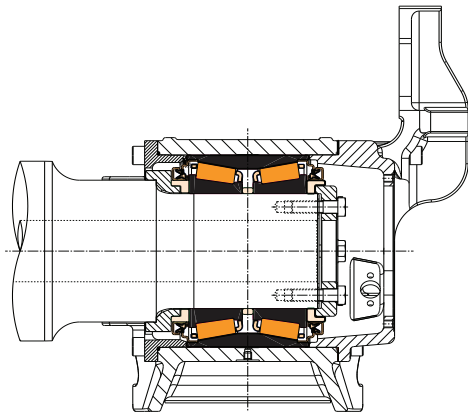
Max speed: 120 km/hr

Bearing series: HM120800 grease lubricated

Journal size: 100mm

Housing type: Outboard – made from aluminum alloy

Comments: End users include SNCF in France and operators in the USA (San Diego and Charlotte)



E4000

Customer: Vossloh Locomotives

Location: Valencia, Spain

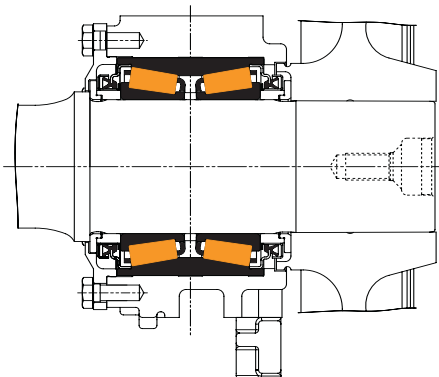
Application: Passenger/freight locomotive

Max speed: 160 km/hr

Bearing series: HM133400 grease lubricated

Journal size: 150mm

Housing type: Outboard – made from cast iron



FlexCity

Customer: Gutehoffnungshütte Radsatz GmbH (for Bombardier)

Location: Oberhausen, Germany

Application: City tram

Max speed: 80 km/hr

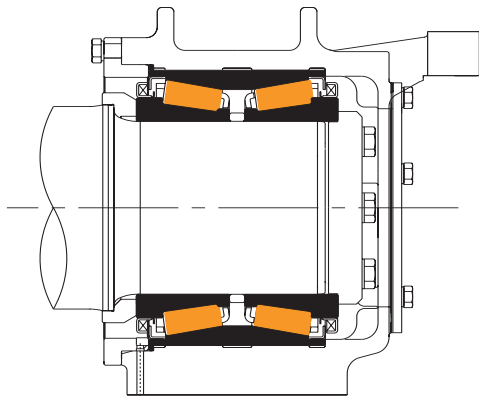
Bearing series: HM124600 grease lubricated

Journal size: 120mm

Housing type: Inboard – made from cast iron

Comments: German and international operations, including Frankfurt, Dresden, Adelaide and Norköpping

Global Rail Applications



G2000

Customer: Vossloh Locomotives GmbH

Location: Kiel, Germany

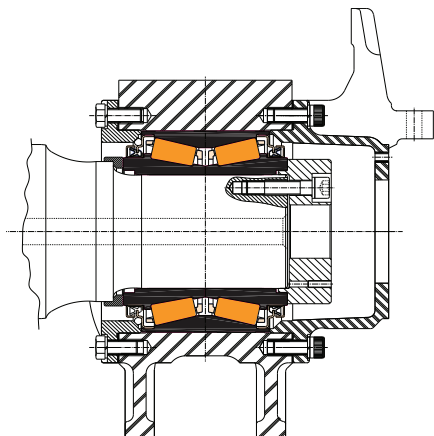
Application: Freight locomotive

Max speed: 120 km/hr

Bearing series: NP877800 grease lubricant

Journal size: 157.15mm

Housing type: Outboard – made from cast iron



Talgo 350

Customer: Bombardier

Location: Kassel and Siegen, Germany

Application: High-speed power car

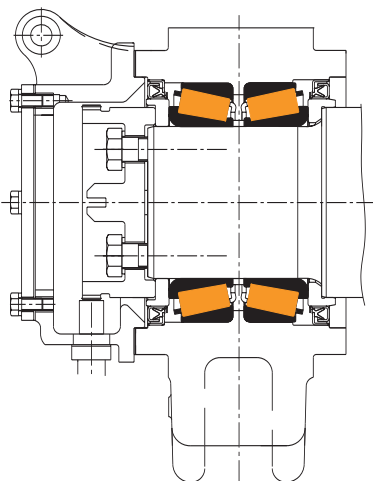
Max speed: 350 km/hr

Bearing series: XC2323 grease lubricated

Journal size: 130mm

Housing type: Outboard – made from aluminum alloy

Comments: Timken XC2323 bearings are on all Talgo 350 passenger cars on the RENFE Madrid-Barcelona high-speed line.



Vienna U Bahn

Customer: Siemens

Location: Vienna, Austria

Application: Metro

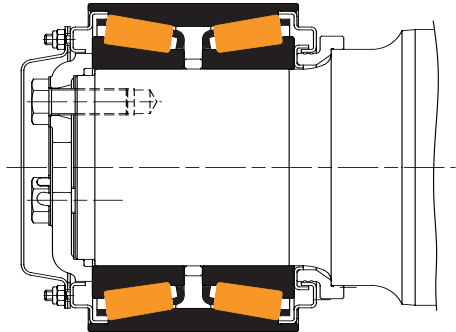
Max speed: 80 km/hr

Bearing series: HM220100 grease lubricated

Journal size: 100mm

Housing type: Outboard – made from aluminum alloy

Global Rail Applications



Plasser & Theurer

Customer: Plasser & Theurer

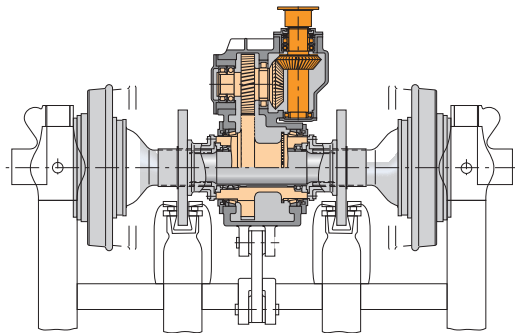
Location: Linz, Austria

Application: Rail working vehicle

Max speed: 120 km/hr

Bearing series: HM133400 grease lubricated

Journal size: 150mm



Voith Brava

Customer: Voith

Location: Heidenheim, Germany

Application: CAF Alaris

Max speed: 250 km/h

Bearing series: L860000 & 36900

Comments: EMU for end user RENFE with variable gauge width



For more information on Timken rail solutions for your application, contact your local Timken representative or visit www.timken.com/rail.



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Bearings • Specialty Steel •
Precision Components • Lubrication •
Seals • Remanufacture and Repair •
Engineering Services

www.timken.com

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