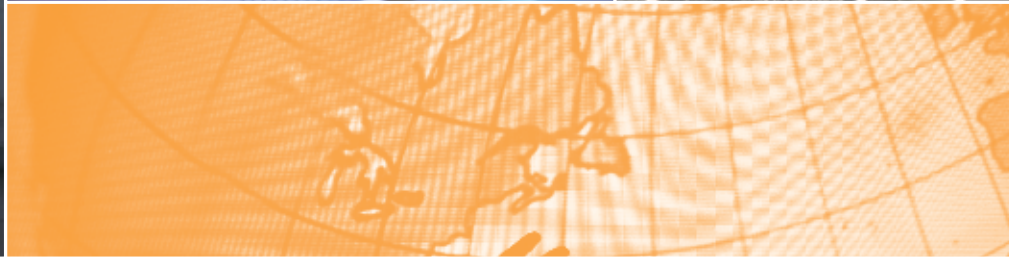
TIMKEN

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 and forever changed the 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 then 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.

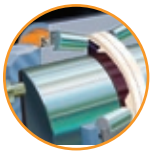
Timken Innovation at Work

AP™ Bearing
- Self-contained, pre-assembled and pre-lubricated
- Reduces maintenance costs, more miles per bearing and greater fuel efficiency
- The industry standard

AP-2™ Bearing
- The new industry standard
- Carries heavier loads with reduced width and bearing weight
- Shorter journal reduces axle flexure
- Less fretting wear between bearing components

Axle-Saver Seal Wear Ring™
- Rigid interface between the seal wear ring and the axle and cone face
- Reduces rate of fretting wear
- Lower-cost alternative to HDL™ Seal

Generator Bearing
- Generates energy via rotation
- EPC Braking
- GPS/GSM System
- Uses other power consuming modules



Guardian™ Bearing (Sensor)
- Able to sense temperature, speed and vibration
- Detects bearing or wheel failure, stuck hand brakes and more
- Available in wired or wireless
- Good tool for condition monitoring and preventive maintenance

HDL™ Seal
- Lower torque, lower temperatures and better fuel efficiency
- Fewer set-outs and higher service speeds
- Lower operating costs

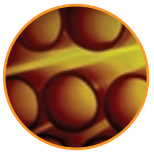
Mobile Reconditioning Unit
- Self-contained repair facility
- On-site bearing reconditioning performed by Timken associates or your in-house team

MSU (Motor Suspension Unit) Tubes
- Increases reliability
- Reduced radial clearance and maintenance costs
- Low starting torque
- Grease lubrication, so no oil levels to maintain

Performance Plus™ Bearing
- Increases bearing life and reliability
- Eliminates axle grooving, false set-outs and loose backing rings
- A reconditioned bearing assembly with exceptional value

StatusCheck™
- Unique condition monitoring system
- Detects temperature and vibration
- Wireless transmitters fit almost anywhere
- Customized reading and easy installation

SureFit™ Universal Backing Ring
- Provides the benefit of a fitted backing ring for all axle dust guard diameters
- Increases performance and improves safety and reliability
- Reduces wheelset removals and enhances journal axle fillet protection



Timken Alloy Steel
- Used in numerous rail applications – steel bars forged into wheels, high-performing grades for piston pins and cylinder liners
- Rail industry relies on special grades of Timken Parapremium™ steel for axle applications
- Other steel produced for bearings into rail, cushioning units, axles, rail car wheels, piston pins and cylinder liners in locomotives

Timken Premium Rail Grease
- Specifically designed for rail applications
- Lasts longer and provides better protection
- Increases protection against water etching and other damage
- Increases anti-corrosion properties, especially in humid environments

Timken® Torrington® Products
- Broad array of components, including needle bearings, ball bearings, and tapered, spherical and cylindrical roller bearings
- Specialized coatings and surface finishes can be applied for specific applications
- All components derived from more than a century of leadership in applied friction management and power transmission technology

TracGlide™ – Intelligent Top-of-Rail Lubrication System
- On-board system applies an innovative friction modifier to the top of rails
- Acts as a lubricant under rolling conditions and a friction agent when braking
- Lubricates more completely, provides greater savings and improves performance
- Governed by an on-board lubrication control computer

Cost-Effective Reconditioning

Rail Bearing Service and Timken Rail Services

Timken is the global leader in bearing reconditioning for the rail industry. Timken Rail Service (TRS) throughout the world and Rail Bearing Service (RBS) in North America bring new life to used bearings by replacing worn and damaged parts. All Timken facilities are ISO certified. All facilities supplying North America are approved by the Association of American Railroads (AAR) and certified under the AAR M-1003 Quality Assurance Program.

For freight cars, locomotives, passenger vehicles or high-speed trains, you can depend on TRS and RBS for remanufacturing and reconditioning. Reconditioning programs are easily integrated with existing maintenance regimes. Along with significant cost savings, reconditioned bearings include a full-service warranty. Rail Bearing Service and Timken Rail Service's state-of-the-art tooling can be custom designed using the company's vast service engineering experience and knowledge of global rail operations.

Services include:

Rail Bearing Reconditioning
- Bearings are cleaned and inspected and fitted with new parts, if needed.
- Refurbished bearings are then requalified and reassembled.
- All bearings are completely inspected to meet appropriate reconditioning specifications.

On-site Vehicle Maintenance
- Timken repair specialists travel to customer locations to repair and lubricate axle boxes and perform other maintenance tasks.

Locomotive Journal Box Conversion
- Hyatt journal box housing is modified to accept a Timken Class GG bearing.
- GG bearing has fewer parts – seven versus 20 – easing assembly and reducing maintenance costs.

Hyatt Locomotive Journal Bearing Reconditioning
- Hyatt cylindrical bearing locomotive journal boxes are requalified or exchanged for reconditioned units.

Traction Motor Suspension Unit (MSU) Reconditioning
- More than 28,000 MSUs operate on Timken bearings.
- Comprehensive solution offers higher reliability, reduced radial clearance, low starting torque and reduced maintenance costs.

Axle Box Overhaul
- Reconditioning and remanufacturing of axle boxes includes bearings and other components.

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.

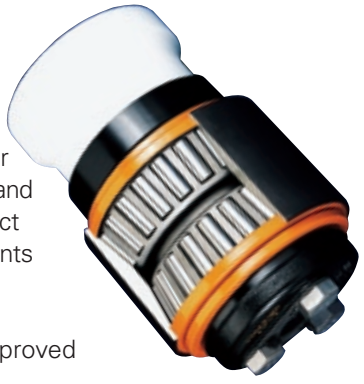
2003 Timken acquires The Torrington Company and expands its line of products and services for rail.

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.

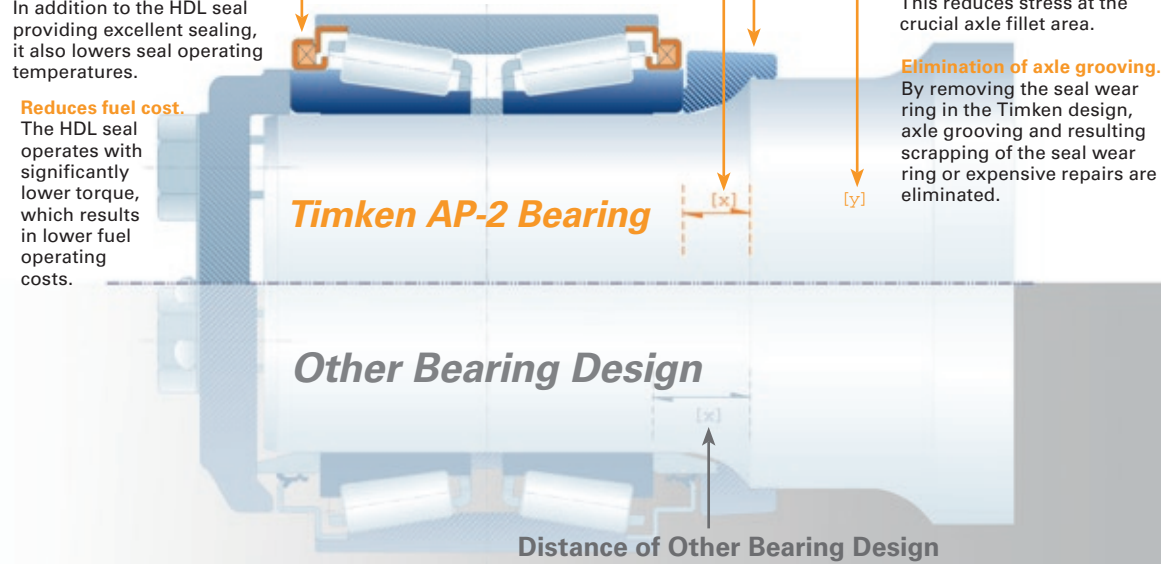
Reduces fuel cost. The HDL seal operates with significantly lower torque, which results in lower fuel operating costs.

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.



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

AP-2 CLASS K (6 11/16 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

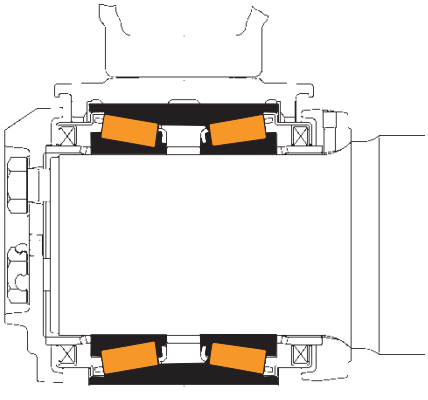
Timken Rail: At Work Around the World

Timken has developed thousa

nds of bearings specifically for the rail industry.

Global Rail Applications

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

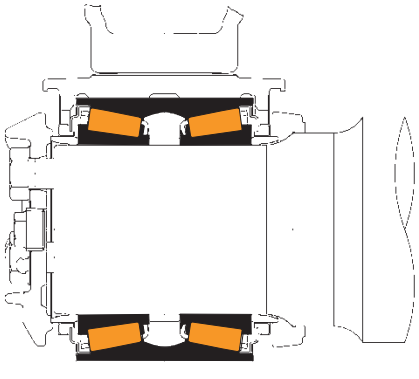


Class G

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: 6 1¼ 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: 6 1¼ to 7 inches diameter

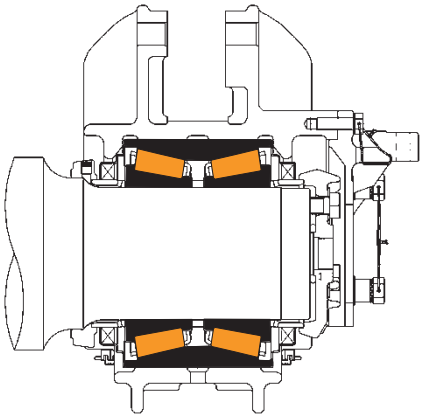
Freight Car Designations*

CLASS	Nominal Journal Size	CAR CAPACITY (TONS)	Gross Rail Load (LBS)	Nominal Axle Load (TONS) up to
B	4¼ X 8	30	103,000	13
C	5 X 9	40	142,000	18
D	5¼ X 10	50	177,000	22
E	6 X 11	70	220,000	28
L	6 X 8	70	220,000	28
F	6¼ X 12	100	263,000	33
K	6¼ 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).

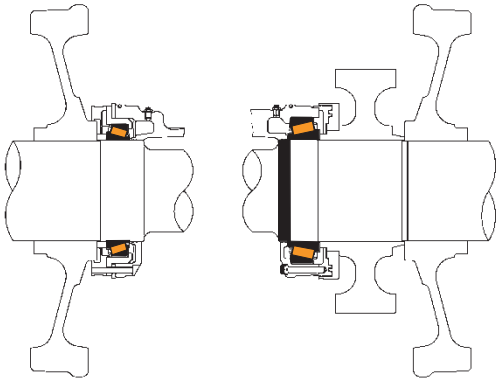



Global Rail Applications



Class GG

Customer/Application: Locomotives
Series: H337844 grease lubricated
Axle: $6^{1}1/4_{2}$ to $6^{7}1/4_{8}$ 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

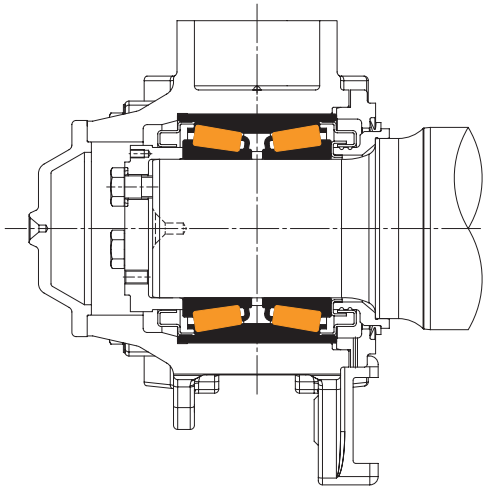
Bearing Portfolio

AP

AP-2

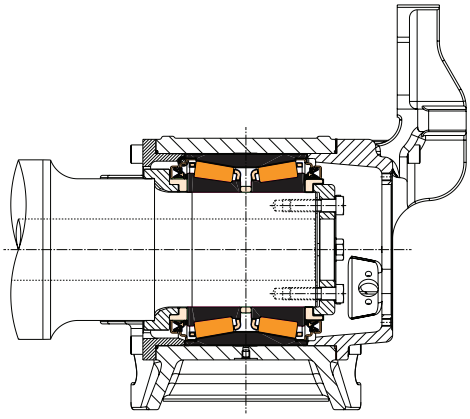
Class & Size			Dimension (inch)			Dimension (mm)			Load Ratings		Cone & Cup Part Number	
Class	Size (Inch)	Size (Metric)	cone bore (in)	cup O.D. (in)	cup width (in	cone bore (mm)	cup O.D. (mm)	cup width (mm)	C90(2) (lbf)	C90(2) (kN)	Cone Part Number	Double Cup Part Number
B	4 x 8		4.0000	6.5000	4.5000	101.60	165.10	114.3	26,900	120	HM120848	HM120817XD
		SP100				100.00	165.10	114.3			HM120846	
C	5 x 9		4.6875	7.6875	5.6250	119.06	195.26	142.9	38,600	172	HM124646	HM124618XD
		SP120				120.00	195.00	131.4			HM124649	HM124616XD
D	5 11/42 x 10		5.1870	8.1875	6.0000	131.75	207.96	152.4	41,800	186	HM127446	HM127415XD
		SP130				130.00	210.00	132.0			HM127442	HM127417XD
		130				130.00	230.00	160.0	53,200	237	H127746	H127715XD
		130				130.00	250.00	159.0	53,000	236	NP178837	NP023784
E	6 x 11		5.6870	8.6875	6.4374	144.45	220.66	163.5	43,800	195	HM129848	HM129814XD
		SP140				140.00	220.00	140.0			HM129843	HM129813XD
F	6 11/42 x 12		6.1870	9.9375	7.2500	157.15	252.41	184.2	59,700	266	HM133444	HM133416XD
		SP150				150.00	250.00	160.0			HM133436	HM133413XD
		SP160				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	6 11/42 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

Global Rail Applications



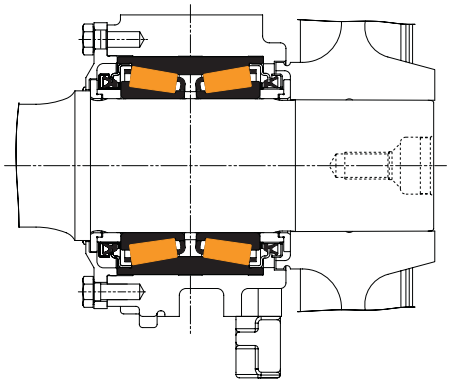
Avanto

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

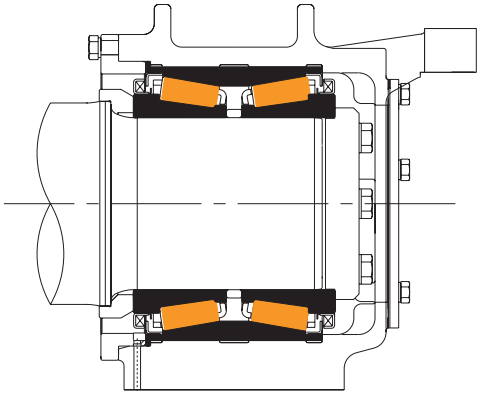
Customer: Vossloh Locomotives
Location: Valencia, Spain
Application: Passenger/freight locomotive
Max speed: 160 km/hr
Bearing series: HM133400 grease lubricated
Journal size: 150mm
Housing type: Outboard – made from cast iron



FlexCity

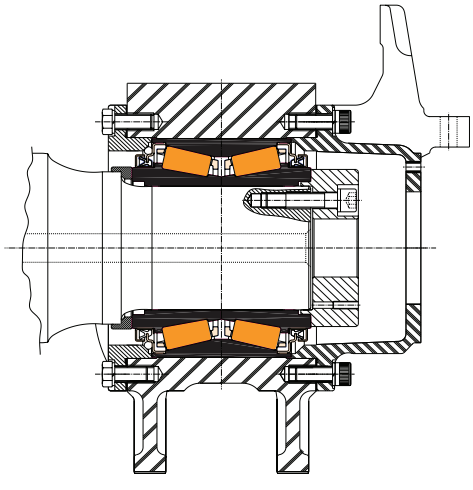
Customer: Gutehoffnungshütte Radsatz GmbH (for Bombardier)
Location: Oberhausen, Germany
Application: City tram
Max speed: 80 km/hr
Bearing series: HM124600 grease lubricated
Journal size: 120mm
Housing type: Inboard – made from cast iron
Comments: German and international operations, including Frankfurt, Dresden, Adelaide and Norköpping

Global Rail Applications



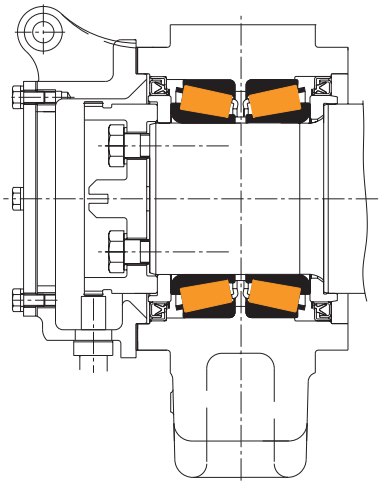
G2000

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

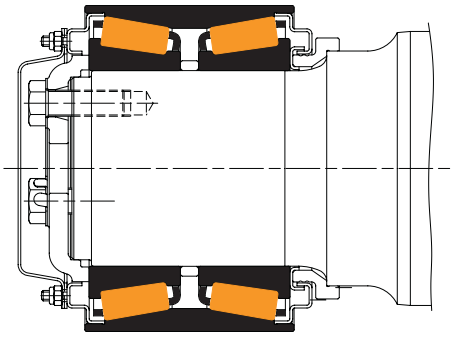
Customer: Bombardier
Location: Kassel and Siegen, Germany
Application: High-speed power car
Max speed: 350 km/hr
Bearing series: XC2323 grease lubricated
Journal size: 130mm
Housing type: Outboard – made from aluminum alloy
Comments: Timken XC2323 bearings are on all Talgo 350 passenger cars on the RENFE Madrid-Barcelona high-speed line.



Vienna U Bahn

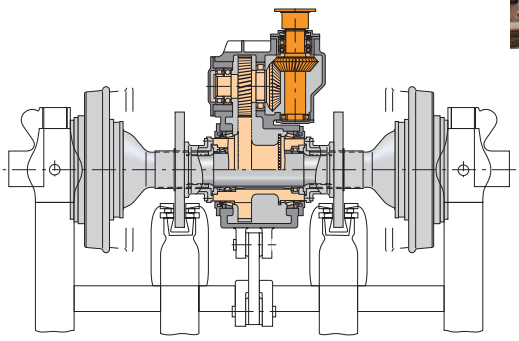
Customer: Siemens
Location: Vienna, Austria
Application: Metro
Max speed: 80 km/hr
Bearing series: HM220100 grease lubricated
Journal size: 100mm
Housing type: Outboard – made from aluminum alloy

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.

Global contact information:

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800.964.2626
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Seals • Remanufacture and Repair •
Industrial Services

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