

Autonomous Train Market Report by Component (Camera, Accelerometer, Odometer, Tachometer, Radio set, and Others), Train Type (Metro/Monorail, Light Rail, High-Speed Rail/Bullet Train), Automation Grade (GoA 1, GoA 2, GoA 3, GoA 4), Technology (CBTC, ERTMS, ATC, PTC), Application (Passenger Train, Freight Train), and Region 2024-2032

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Abstracts

The global autonomous train market size reached US\$ 9.0 Billion in 2023. Looking forward, IMARC Group expects the market to reach US\$ 14.3 Billion by 2032, exhibiting a growth rate (CAGR) of 5.16% during 2024-2032. The increasing demand for efficient and sustainable transportation solutions, shifting focus on improved safety and reduced human errors in rail operations, advancements in artificial intelligence (AI) and sensor technology, growing emphasis on environmental sustainability, and the need for seamless connectivity are some of the factors stimulating the market growth.

Autonomous Train Market Analysis:

Market Growth and Size: The global autonomous train market is experiencing substantial growth, driven by increasing demand for efficient, safe, and reliable public transportation. The market size is expanding due to factors such as rapid urbanization, growing environmental concerns, and burgeoning investments in rail infrastructure.

Major Market Drivers: The market is propelled by several key drivers, such as the rising urban population and the need for efficient public transport systems. Additionally, the development of electrically powered trains, the increasing demand for safety and reliability in transportation systems, and the growing focus on smart cities and digital infrastructure development are boosting the market growth. Furthermore, the evolution of fifth-generation (5G) technology and enhanced connectivity options and the need for

better traffic management systems are bolstering the market growth.

Technological Advancements: Developments in AI and machine learning (ML) algorithms have enabled trains to operate with minimal human intervention, significantly enhancing safety and efficiency. The integration of the Internet of Things (IoT) devices allows for real-time monitoring and predictive maintenance, reducing downtime and operational costs. Advanced signaling and communication systems, like the European Rail Traffic Management System (ERTMS) and Communication-Based Train Control (CBTC), have revolutionized train control mechanisms.

Industry Applications: Autonomous trains find diverse and significant applications across industries. They play a crucial role in urban transit systems, reducing congestion and ensuring efficient public transportation. In freight transport, they enhance cargo movement efficiency, benefiting mining, agriculture, and manufacturing sectors. Long-distance passenger services benefit from improved safety and travel times.

Key Market Trends: The autonomous train market is characterized by several emerging trends, such as the growing emphasis on sustainability, the adoption of smart technologies, such as big data analytics, for predictive maintenance and efficient operations, and the development of advanced onboard amenities and services. In line with this, the integration of autonomous trains into multimodal transport networks, a trend towards the standardization of technologies and operating protocols, and the growing public-private partnerships in rail infrastructure projects are further driving market growth.

Geographical Trends: Currently, Asia Pacific leads the autonomous train market, attributed to its rapid urbanization and infrastructure development, particularly in countries like China, Japan, and South Korea. Europe is another key region, with advanced rail infrastructure, stringent safety regulations, and high investment in technology. North America, although lagging slightly, is witnessing growth due to increasing urban transport projects and technological adoption. The market in the Middle East and Africa is emerging, with investments in rail infrastructure and smart city projects. Latin America, while still in nascent stages, shows potential due to urbanization and modernization initiatives.

Competitive Landscape: The competitive landscape of the autonomous train market is dynamic, with a mix of established players and emerging entrants. There is also a significant presence of specialized technology providers focusing on specific aspects like signaling systems, AI algorithms, and onboard electronics. Collaboration and partnerships between manufacturers and technology firms are common, aiming to leverage each other's strengths. The market is also witnessing the entry of new players, particularly from the tech sector, bringing in fresh perspectives and disruptive technologies.

Challenges and Opportunities: The autonomous train market faces several challenges,

such as the high initial investment and maintenance costs associated with advanced technologies. However, this drives opportunities for developing cost-effective and scalable solutions. Moreover, the need for skilled labor and technical expertise presents challenges in workforce development, but it also creates opportunities for education and training programs. Additionally, the varying degrees of infrastructure readiness across different regions pose challenges, but they also open up markets for customized and adaptable solutions.

Autonomous Train Market Trends:

Growing demand for efficient and sustainable transportation solutions

The growing demand for efficient and sustainable transportation solutions is a primary driver fueling the expansion of the global autonomous train market. As urbanization continues to surge, cities around the world are grappling with issues related to traffic congestion and pollution. Autonomous trains are designed to operate with precision and efficiency, optimizing routes and reducing travel times. This not only enhances the overall passenger experience but also reduces energy consumption and operating costs. By eliminating the need for human operators, autonomous trains can run consistently, maintaining optimal speeds and reducing the variability in travel times associated with human-controlled systems.

Improved safety and reduced human errors

The surging demand for enhanced safety and a reduction in human errors in rail operations is another critical driver for the market growth. Human errors, whether in the form of misjudgment, fatigue, or distraction, can lead to accidents and operational disruptions in the rail industry. Autonomous train systems are designed to minimize these risks significantly. Autonomous trains are equipped with advanced sensors and artificial intelligence (AI) algorithms that constantly monitor the surroundings and make real-time decisions to ensure safe operation. They can detect obstacles on the tracks, respond to sudden changes in conditions, and apply emergency brakes, when necessary, all without human intervention. Additionally, autonomous trains are not susceptible to human factors such as fatigue or impaired judgment, which can affect human operators.

Rapid advancements in technology

Advancements in technology, particularly in the fields of AI and sensor technology, have played a pivotal role in driving the growth of the autonomous train market. These

technological innovations have enabled the development of highly sophisticated autonomous train systems that are more reliable and efficient. AI algorithms enable trains to process vast amounts of data from sensors, cameras, and other sources in real-time. This data is used to make split-second decisions, such as adjusting speed, braking, and changing tracks, to ensure safe and efficient operation. As AI continues to evolve, these systems become increasingly capable of handling complex and dynamic environments, further boosting the feasibility of autonomous trains in various settings.

Emphasis on reducing operational costs in the rail industry

The emphasis on reducing operational costs in the rail industry is a compelling driver supporting the market growth. Rail operators are continually seeking ways to optimize their operations and reduce expenses while maintaining safety and efficiency. Autonomous trains offer a range of cost-saving benefits that make them an attractive option. One of the primary ways in which autonomous trains reduce operational costs is through improved efficiency. These systems can optimize routes, minimize energy consumption, and ensure that trains run on time consistently. By eliminating the need for human operators, labor costs are reduced, and there is no reliance on manual control, which can introduce variability and inefficiency. Maintenance costs are also positively impacted by autonomous train technology. These systems often incorporate predictive maintenance capabilities, allowing rail operators to identify and address maintenance needs before they lead to costly breakdowns.

Autonomous Train Industry Segmentation:

IMARC Group provides an analysis of the key trends in each segment of the market, along with forecasts at the global, regional, and country levels for 2024-2032. Our report has categorized the market based on component, train type, automation grade, technology, and application.

Breakup by Component:

- Camera
- Accelerometer
- Odometer
- Tachometer
- Radio set
- Others

The report has provided a detailed breakup and analysis of the market based on the component. This includes camera, accelerometer, odometer, tachometer, radio set, and

others.

Breakup by Train Type:

Metro/Monorail

Light Rail

High-Speed Rail/Bullet Train

The report has provided a detailed breakup and analysis of the market based on the train type. This includes metro/monorail, light rail, and high-speed rail/bullet train.

Breakup by Automation Grade:

GoA 1

GoA 2

GoA 3

GoA 4

GoA 1 mounted accounts for the majority of the market share

The report has provided a detailed breakup and analysis of the market based on the automation grade. This includes GoA 1, GoA 2, GoA 3, and GoA 4. According to the report, GoA 1 represented the largest segment.

Breakup by Technology:

CBTC

ERTMS

ATC

PTC

CBTC accounts for the majority of the market share

The report has provided a detailed breakup and analysis of the market based on the technology. This includes CBTC, ERTMS, ATC, and PTC. According to the report, CBTC represented the largest segment.

Breakup by Application:

Passenger Train
Freight Train

Passenger train accounts for the majority of the market share

The report has provided a detailed breakup and analysis of the market based on the application. This includes passenger train and freight train. According to the report, passenger train represented the largest segment.

Breakup by Region:

North America

United States

Canada

Asia-Pacific

China

Japan

India

South Korea

Australia

Indonesia

Others

Europe

Germany

France

United Kingdom

Italy

Spain

Russia

Others

Latin America

Brazil

Mexico

Others

Middle East and Africa

Asia Pacific leads the market, accounting for the largest autonomous train market share

The market research report has also provided a comprehensive analysis of all the major regional markets, which include North America (the United States and Canada); Asia

Pacific (China, Japan, India, South Korea, Australia, Indonesia, and others); Europe (Germany, France, the United Kingdom, Italy, Russia, Spain, and others); Latin America (Brazil, Mexico, and others); and the Middle East and Africa. According to the report, Asia Pacific accounted for the largest market share.

The market research report has provided a comprehensive analysis of the competitive landscape. Detailed profiles of all major companies have also been provided. Some of the key players in the market include:

ABB Ltd.
Alstom SA
Belden Inc.
Bombardier Inc.
CAF Construcciones y Auxiliar de Ferrocarriles S.A.
CRRC Corporation Limited
General Electric Company
Hitachi Ltd.
Kawasaki Heavy Industries Ltd.
Mitsubishi Heavy Industries Ltd.
Siemens AG
Thales Group

Key Questions Answered in This Report

1. What was the size of the global autonomous train market in 2023?
2. What is the expected growth rate of the global autonomous train market during 2024-2032?
3. What are the key factors driving the global autonomous train market?
4. What has been the impact of COVID-19 on the global autonomous train market?
5. What is the breakup of the global autonomous train market based on the automation grade?
6. What is the breakup of the global autonomous train market based on the technology?
7. What is the breakup of the global autonomous train market based on the application?
8. What are the key regions in the global autonomous train market?
9. Who are the key players/companies in the global autonomous train market?

Contents

1 PREFACE

2 SCOPE AND METHODOLOGY

- 2.1 Objectives of the Study
- 2.2 Stakeholders
- 2.3 Data Sources
 - 2.3.1 Primary Sources
 - 2.3.2 Secondary Sources
- 2.4 Market Estimation
 - 2.4.1 Bottom-Up Approach
 - 2.4.2 Top-Down Approach
- 2.5 Forecasting Methodology

3 EXECUTIVE SUMMARY

4 INTRODUCTION

- 4.1 Overview
- 4.2 Key Industry Trends

5 GLOBAL AUTONOMOUS TRAIN MARKET

- 5.1 Market Overview
- 5.2 Market Performance
- 5.3 Impact of COVID-19
- 5.4 Market Forecast

6 MARKET BREAKUP BY COMPONENT

- 6.1 Camera
 - 6.1.1 Market Trends
 - 6.1.2 Market Forecast
- 6.2 Accelerometer
 - 6.2.1 Market Trends
 - 6.2.2 Market Forecast
- 6.3 Odometer

- 6.3.1 Market Trends
- 6.3.2 Market Forecast
- 6.4 Tachometer
 - 6.4.1 Market Trends
 - 6.4.2 Market Forecast
- 6.5 Radio set
 - 6.5.1 Market Trends
 - 6.5.2 Market Forecast
- 6.6 Others
 - 6.6.1 Market Trends
 - 6.6.2 Market Forecast

7 MARKET BREAKUP BY TRAIN TYPE

- 7.1 Metro/Monorail
 - 7.1.1 Market Trends
 - 7.1.2 Market Forecast
- 7.2 Light Rail
 - 7.2.1 Market Trends
 - 7.2.2 Market Forecast
- 7.3 High-Speed Rail/Bullet Train
 - 7.3.1 Market Trends
 - 7.3.2 Market Forecast

8 MARKET BREAKUP BY AUTOMATION GRADE

- 8.1 GoA
 - 8.1.1 Market Trends
 - 8.1.2 Market Forecast
- 8.2 GoA
 - 8.2.1 Market Trends
 - 8.2.2 Market Forecast
- 8.3 GoA
 - 8.3.1 Market Trends
 - 8.3.2 Market Forecast
- 8.4 GoA
 - 8.4.1 Market Trends
 - 8.4.2 Market Forecast

9 MARKET BREAKUP BY TECHNOLOGY

9.1 CBTC

9.1.1 Market Trends

9.1.2 Market Forecast

9.2 ERTMS

9.2.1 Market Trends

9.2.2 Market Forecast

9.3 ATC

9.3.1 Market Trends

9.3.2 Market Forecast

9.4 PTC

9.4.1 Market Trends

9.4.2 Market Forecast

10 MARKET BREAKUP BY APPLICATION

10.1 Passenger Train

10.1.1 Market Trends

10.1.2 Market Forecast

10.2 Freight Train

10.2.1 Market Trends

10.2.2 Market Forecast

11 MARKET BREAKUP BY REGION

11.1 North America

11.1.1 United States

11.1.1.1 Market Trends

11.1.1.2 Market Forecast

11.1.2 Canada

11.1.2.1 Market Trends

11.1.2.2 Market Forecast

11.2 Asia-Pacific

11.2.1 China

11.2.1.1 Market Trends

11.2.1.2 Market Forecast

11.2.2 Japan

11.2.2.1 Market Trends

- 11.2.2.2 Market Forecast
- 11.2.3 India
 - 11.2.3.1 Market Trends
 - 11.2.3.2 Market Forecast
- 11.2.4 South Korea
 - 11.2.4.1 Market Trends
 - 11.2.4.2 Market Forecast
- 11.2.5 Australia
 - 11.2.5.1 Market Trends
 - 11.2.5.2 Market Forecast
- 11.2.6 Indonesia
 - 11.2.6.1 Market Trends
 - 11.2.6.2 Market Forecast
- 11.2.7 Others
 - 11.2.7.1 Market Trends
 - 11.2.7.2 Market Forecast
- 11.3 Europe
 - 11.3.1 Germany
 - 11.3.1.1 Market Trends
 - 11.3.1.2 Market Forecast
 - 11.3.2 France
 - 11.3.2.1 Market Trends
 - 11.3.2.2 Market Forecast
 - 11.3.3 United Kingdom
 - 11.3.3.1 Market Trends
 - 11.3.3.2 Market Forecast
 - 11.3.4 Italy
 - 11.3.4.1 Market Trends
 - 11.3.4.2 Market Forecast
 - 11.3.5 Spain
 - 11.3.5.1 Market Trends
 - 11.3.5.2 Market Forecast
 - 11.3.6 Russia
 - 11.3.6.1 Market Trends
 - 11.3.6.2 Market Forecast
 - 11.3.7 Others
 - 11.3.7.1 Market Trends
 - 11.3.7.2 Market Forecast
- 11.4 Latin America

11.4.1 Brazil

11.4.1.1 Market Trends

11.4.1.2 Market Forecast

11.4.2 Mexico

11.4.2.1 Market Trends

11.4.2.2 Market Forecast

11.4.3 Others

11.4.3.1 Market Trends

11.4.3.2 Market Forecast

11.5 Middle East and Africa

11.5.1 Market Trends

11.5.2 Market Breakup by Country

11.5.3 Market Forecast

12 SWOT ANALYSIS

12.1 Overview

12.2 Strengths

12.3 Weaknesses

12.4 Opportunities

12.5 Threats

13 VALUE CHAIN ANALYSIS

14 PORTERS FIVE FORCES ANALYSIS

14.1 Overview

14.2 Bargaining Power of Buyers

14.3 Bargaining Power of Suppliers

14.4 Degree of Competition

14.5 Threat of New Entrants

14.6 Threat of Substitutes

15 PRICE ANALYSIS

16 COMPETITIVE LANDSCAPE

16.1 Market Structure

16.2 Key Players

16.3 Profiles of Key Players

16.3.1 ABB Ltd.

16.3.1.1 Company Overview

16.3.1.2 Product Portfolio

16.3.1.3 Financials

16.3.1.4 SWOT Analysis

16.3.2 Alstom SA

16.3.2.1 Company Overview

16.3.2.2 Product Portfolio

16.3.2.3 Financials

16.3.2.4 SWOT Analysis

16.3.3 Belden Inc.

16.3.3.1 Company Overview

16.3.3.2 Product Portfolio

16.3.3.3 Financials

16.3.3.4 SWOT Analysis

16.3.4 Bombardier Inc.

16.3.4.1 Company Overview

16.3.4.2 Product Portfolio

16.3.4.3 Financials

16.3.4.4 SWOT Analysis

16.3.5 CAF Construcciones y Auxiliar de Ferrocarriles S.A.

16.3.5.1 Company Overview

16.3.5.2 Product Portfolio

16.3.5.3 Financials

16.3.6 CRRC Corporation Limited

16.3.6.1 Company Overview

16.3.6.2 Product Portfolio

16.3.6.3 Financials

16.3.7 General Electric Company

16.3.7.1 Company Overview

16.3.7.2 Product Portfolio

16.3.7.3 Financials

16.3.7.4 SWOT Analysis

16.3.8 Hitachi Ltd.

16.3.8.1 Company Overview

16.3.8.2 Product Portfolio

16.3.8.3 Financials

16.3.8.4 SWOT Analysis

16.3.9 Kawasaki Heavy Industries Ltd.

16.3.9.1 Company Overview

16.3.9.2 Product Portfolio

16.3.9.3 Financials

16.3.9.4 SWOT Analysis

16.3.10 Mitsubishi Heavy Industries Ltd.

16.3.10.1 Company Overview

16.3.10.2 Product Portfolio

16.3.10.3 Financials

16.3.10.4 SWOT Analysis

16.3.11 Siemens AG

16.3.11.1 Company Overview

16.3.11.2 Product Portfolio

16.3.11.3 Financials

16.3.11.4 SWOT Analysis

16.3.12 Thales Group

16.3.12.1 Company Overview

16.3.12.2 Product Portfolio

16.3.12.3 Financials

16.3.12.4 SWOT Analysis

List Of Tables

LIST OF TABLES

Table 1: Global: Autonomous Train Market: Key Industry Highlights, 2023 and 2032

Table 2: Global: Autonomous Train Market Forecast: Breakup by Component (in Million US\$), 2024-2032

Table 3: Global: Autonomous Train Market Forecast: Breakup by Train Type (in Million US\$), 2024-2032

Table 4: Global: Autonomous Train Market Forecast: Breakup by Automation Grade (in Million US\$), 2024-2032

Table 5: Global: Autonomous Train Market Forecast: Breakup by Technology (in Million US\$), 2024-2032

Table 6: Global: Autonomous Train Market Forecast: Breakup by Application (in Million US\$), 2024-2032

Table 7: Global: Autonomous Train Market Forecast: Breakup by Region (in Million US\$), 2024-2032

Table 8: Global: Autonomous Train Market: Competitive Structure

Table 9: Global: Autonomous Train Market: Key Players

List Of Figures

LIST OF FIGURES

Figure 1: Global: Autonomous Train Market: Major Drivers and Challenges

Figure 2: Global: Autonomous Train Market: Sales Value (in Billion US\$), 2018-2023

Figure 3: Global: Autonomous Train Market Forecast: Sales Value (in Billion US\$), 2024-2032

Figure 4: Global: Autonomous Train Market: Breakup by Component (in %), 2023

Figure 5: Global: Autonomous Train Market: Breakup by Train Type (in %), 2023

Figure 6: Global: Autonomous Train Market: Breakup by Automation Grade (in %), 2023

Figure 7: Global: Autonomous Train Market: Breakup by Technology (in %), 2023

Figure 8: Global: Autonomous Train Market: Breakup by Application (in %), 2023

Figure 9: Global: Autonomous Train Market: Breakup by Region (in %), 2023

Figure 10: Global: Autonomous Train (Camera) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 11: Global: Autonomous Train (Camera) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 12: Global: Autonomous Train (Accelerometer) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 13: Global: Autonomous Train (Accelerometer) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 14: Global: Autonomous Train (Odometer) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 15: Global: Autonomous Train (Odometer) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 16: Global: Autonomous Train (Tachometer) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 17: Global: Autonomous Train (Tachometer) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 18: Global: Autonomous Train (Radio set) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 19: Global: Autonomous Train (Radio set) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 20: Global: Autonomous Train (Other Components) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 21: Global: Autonomous Train (Other Components) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 22: Global: Autonomous Train (Metro/Monorail) Market: Sales Value (in Million

US\$), 2018 & 2023

Figure 23: Global: Autonomous Train (Metro/Monorail) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 24: Global: Autonomous Train (Light Rail) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 25: Global: Autonomous Train (Light Rail) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 26: Global: Autonomous Train (High-Speed Rail/Bullet Train) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 27: Global: Autonomous Train (High-Speed Rail/Bullet Train) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 28: Global: Autonomous Train (GoA 1) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 29: Global: Autonomous Train (GoA 1) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 30: Global: Autonomous Train (GoA 2) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 31: Global: Autonomous Train (GoA 2) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 32: Global: Autonomous Train (GoA 3) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 33: Global: Autonomous Train (GoA 3) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 34: Global: Autonomous Train (GoA 4) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 35: Global: Autonomous Train (GoA 4) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 36: Global: Autonomous Train (CBTC) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 37: Global: Autonomous Train (CBTC) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 38: Global: Autonomous Train (ERTMS) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 39: Global: Autonomous Train (ERTMS) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 40: Global: Autonomous Train (ATC) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 41: Global: Autonomous Train (ATC) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 42: Global: Autonomous Train (PTC) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 43: Global: Autonomous Train (PTC) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 44: Global: Autonomous Train (Passenger Train) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 45: Global: Autonomous Train (Passenger Train) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 46: Global: Autonomous Train (Freight Train) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 47: Global: Autonomous Train (Freight Train) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 48: North America: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 49: North America: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 50: United States: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 51: United States: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 52: Canada: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 53: Canada: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 54: Asia-Pacific: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 55: Asia-Pacific: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 56: China: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 57: China: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 58: Japan: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 59: Japan: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 60: India: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 61: India: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 62: South Korea: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 63: South Korea: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 64: Australia: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 65: Australia: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 66: Indonesia: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 67: Indonesia: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 68: Others: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 69: Others: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 70: Europe: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 71: Europe: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 72: Germany: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 73: Germany: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 74: France: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 75: France: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 76: United Kingdom: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 77: United Kingdom: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 78: Italy: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 79: Italy: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 80: Spain: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 81: Spain: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 82: Russia: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 83: Russia: Autonomous Train Market Forecast: Sales Value (in Million US\$),

2024-2032

Figure 84: Others: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 85: Others: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 86: Latin America: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 87: Latin America: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 88: Brazil: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 89: Brazil: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 90: Mexico: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 91: Mexico: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 92: Others: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 93: Others: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 94: Middle East and Africa: Autonomous Train Market: Sales Value (in Million US\$), 2018 & 2023

Figure 95: Middle East and Africa: Autonomous Train Market: Breakup by Country (in %), 2023

Figure 96: Middle East and Africa: Autonomous Train Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 97: Global: Autonomous Train Industry: SWOT Analysis

Figure 98: Global: Autonomous Train Industry: Value Chain Analysis

Figure 99: Global: Autonomous Train Industry: Porter's Five Forces Analysis

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