

3D Metrology Market Report by Offering (Hardware, Software, Services), Product (Coordinate Measuring Machine (CMM), Optical Digitizer & Scanner (ODS), Video Measuring Machine (VMM), 3D Automated Optical Inspection System (AoI), Form Measurement), Application (Quality Control & Inspection, Reverse Engineering, Virtual Simulation, and Others), End-Use Industry (Aerospace & Defense, Automotive, Architecture & Construction, Medical, Electronics, Energy & Power, Heavy Industry, Mining, and Others), and Region 2024-2032

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# **Abstracts**

The global 3D metrology market size reached US\$ 10.3 Billion in 2023. Looking forward, IMARC Group expects the market to reach US\$ 20.5 Billion by 2032, exhibiting a growth rate (CAGR) of 7.8% during 2024-2032. Growing precision in manufacturing, technological advancements, the integration of Industry 4.0, the expansion of the automation industry, the proliferation of three-dimensional (3D) printing, and the rising demand for precision in automotive and aerospace industries are some of the factors propelling the market growth.

## 3D Metrology Market Analysis:

Major Market Drivers: The global 3D metrology market is driven by the growing need for 3D metrology solutions that are provided on-site rather than off-site, the pressure for environmental sustainability, and the drive for personalized products. In line with this, the complexity of design characteristics in industrial use, the large scale of data, the



need to advance optical technology, and the increase of virtual simulation in product development are some of the other factors stimulating the 3D metrology systems market. Besides this, the regulatory pressures for compliance, the importance of reverse engineering, and the pervasion of smart manufacturing practices are factors moving the 3D metrology market share.

Key Market Trends: The primary 3D metrology market trends include the surging use of artificial intelligence (AI) and machine learning (ML) for predictive maintenance, escalating demand for cloud-based metrology services, and development of collaborative automated robots for metrological solutions. Furthermore, the integration of 3D printing with metrology is offering numerous opportunities for market expansion. It helps the manufacturers to monitor and control the printing process, verify part conformity, and optimize production for industries like healthcare to aerospace. According to a recent report published by IMARC Group, 3D metrology sector is expected to reach US\$ 20.5 billion by 2032, growing at rate of 7.8% annually. Moreover, the availability of wireless metrological solutions, easy-to-use metrological solutions through software innovation, metrology applications for mobile devices are other factors driving the 3D metrology industry. Apart from this, the surging reliance of augmented reality (AR) for visual examination and the utilization of scanning services instead of traditional metrological techniques are driving the 3D metrology industry growth. Geographical Trends: The Asia-Pacific region dominates the 3D metrology industry on account of the presence of a strong manufacturing sector, especially in countries like China, Japan, and South Korea. The region's position can also be attributed to burgeoning investments in the automotive, electronics, and aerospace industries, coupled with a focus on research and development (R&D). As advanced manufacturing technologies are being adopted, and with key market players in the region, the Asia-Pacific area is further solidifying its leadership in the 3D metrology market forecast. Competitive Landscape: Some of the key players in the market include several 3D metrology market companies, such as 3d Digital Corporation, Automated Precision Inc., Carl Zeiss AG, Creaform Inc., FARO Technologies, Inc., GOM GmbH, Hexagon AB, Jenoptik AG, KLA Corporation, Mitutoyo Corporation, Nikon Metrology NV, Perceptron, Inc., Renishaw PLC., etc.

Challenges and Opportunities: As per the 3D metrology market analysis, the high initial investment cost, rising skilled personnel demand, and technological complexity remain some of the major market challenges. However, they are also an avenue for market growth as new cost-effective solutions are created, training programs are established to ensure trained personnel, and user-friendly systems are developed. The growing number of fields where 3D metrology can be applied, such as for 3D prosthetics and implants or 3D-cultural heritage preservation, further demonstrates the potential for the 3D metrology industrial demand.



## 3D Metrology Market Trends: Surging Product Demand in Manufacturing Sectors

The 3D metrology market growth is heavily influenced by the increasing need for precision engineering and quality control. The demand is prominent in various manufacturing industries, such as automotive, aerospace, and electronics, as the sectors are transitioning to more intricate geometries and component miniaturization. Traditional measurement instruments are inadequate for such degree of geometric detail, which has further surged the demand for 3D metrology solution. For exceptional quality control, manufacturers are increasingly using 3D metrology in all stages of production, from product design to the buying of final products to reduce wasted products and elevate product quality to maintain conformity with international standards.

Technological Advancements in 3D Metrology

Technology has greatly contributed to the growth of the 3D metrology market. Technological advances in technology, software algorithms, and computing power have strengthened the capabilities of 3D metrology systems. These systems can currently process measured values and large data volumes more quickly and accurately, magnifying the opportunities for applying the equipment. As a result, quality control processes become more efficient, and the entire concept can be stretched to in-line as well as portable metrology, shifting the application fields primarily from a back-office application to an on-field application covering the real live measuring on the production plant. Moreover, the introduction of automated robotic metrology is playing a crucial in strengthening the market share. For instance, ABB Robotics has unveiled Flexley Tug T702 autonomous mobile robot equipped with AI-based Visual SLAM navigation technology and the new AMR Studio software. It enables first-time robot users to easily program and operate entire fleets of mobile robots. Furthermore, its simple configuration reduces commissioning time by up to 20%, paving the way for a workplace where intelligent robots operate autonomously, amid a critical shortage of skilled labor.

## Integration of the Product with Industry 4.0

The advantages of the application of 3D metrology in combination with Industry 4.0 is the disruptive nature of those practices regarding conventional comparative dimensional metrology and quality-control procedures. As such, it will ensure in-process monitoring and quality control, ensuring the possibility of error identification and their proactive correction. Due to data analysis and integration of the Internet of Things (IoT), smart



factory solutions, and visualization, 3D metrology facilitates obtaining actionable data which allows for process optimization and the reduction of non-productive time. It will ensure the immaculate grind of the production process, making 3D metrology the new paradigm for modern manufacturing.

3D Metrology Market 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 offering, product, application, and end-use industry.

Breakup by Offering:

Hardware Software Services

Hardware represents the leading market segment

The report has provided a detailed breakup and analysis of the market based on the offering. This includes hardware, software, and services. According to the report, hardware represented the largest segment.

The hardware segment in the global 3D metrology market is driven by the increasing need for high-precision equipment in manufacturing processes. As industries such as automotive, aerospace, and electronics strive for greater accuracy and efficiency in their production lines, the demand for advanced measurement hardware, including 3D scanners, laser trackers, and coordinate measuring machines, escalates. This trend is further bolstered by continuous technological innovations that improve the speed, accuracy, and versatility of hardware solutions, enabling their application in a wider range of conditions and materials. Moreover, the integration of hardware with advanced software capabilities enhances its functionality, making it indispensable for quality assurance and control in manufacturing. The push towards miniaturization of components and complex geometries in product design also necessitates the adoption of sophisticated metrology hardware that can capture detailed measurements at a high resolution, thus ensuring that products meet stringent quality standards.

Breakup by Product:



Coordinate Measuring Machine (CMM) Optical Digitizer & Scanner (ODS) Video Measuring Machine (VMM) 3D Automated Optical Inspection System (AoI) Form Measurement

Coordinate measuring machine (CMM) represents the leading market segment

The report has provided a detailed breakup and analysis of the market based on the product. This includes coordinate measuring machine (CMM), optical digitizer & scanner (ODS), video measuring machine (VMM), 3D automated optical inspection system (AoI), and form measurement. According to the report, coordinate measuring machine (CMM) represented the largest segment.

The coordinate measuring machine (CMM) segment is driven by the increasing demand for precision engineering and the automation of quality control processes across various industries. This demand is particularly pronounced in sectors such as automotive, aerospace, and electronics, where the precise dimensions and tolerances of components are critical for performance and safety. Additionally, the integration of CMM technology with computer-aided design (CAD) and computer-aided manufacturing (CAM) systems enhances its applicability in the manufacturing process, allowing for direct comparison between the manufactured product and the original CAD design. Furthermore, advancements in CMM technology, including portability, ease of use, and the ability to measure complex geometries, have expanded its use beyond traditional manufacturing environments to on-site applications in construction and large-scale assembly.

Breakup by Application:

Quality Control & Inspection Reverse Engineering Virtual Simulation Others

Quality control & inspection represents the leading market segment

The report has provided a detailed breakup and analysis of the market based on the application. This includes quality control & inspection, reverse engineering, virtual simulation, and others. According to the report, quality control & inspection represented



the largest segment.

The quality control and inspection segment is driven by the increasing emphasis on product quality and reliability across manufacturing industries, which necessitates rigorous inspection protocols. The adoption of stringent regulatory standards worldwide compels companies to adopt advanced quality control measures, including 3D metrology, to ensure compliance and maintain competitive advantage. Additionally, the rise of complex product designs and the integration of new materials necessitate precise and detailed inspection processes to guarantee functionality and safety. The drive towards automation in manufacturing also fuels the demand for sophisticated quality control and inspection technologies that can seamlessly integrate into automated production lines, enhancing efficiency and reducing human error. The trend towards globalization of supply chains further amplifies the need for uniform quality standards across borders, making advanced inspection technologies indispensable.

Breakup by End Use Industry:

Aerospace & Defense Automotive Architecture & Construction Medical Electronics Energy & Power Heavy Industry Mining Others

Automotive represents the leading market segment

The report has provided a detailed breakup and analysis of the market based on the end use industry. This includes aerospace & defense, automotive, architecture & construction, medical, electronics, energy & power, heavy industry, mining, and others. According to the report, automotive represented the largest segment.

The automotive segment is driven by increasing demands for precision, safety, and efficiency in vehicle manufacturing, necessitating advanced quality control measures. Stringent environmental regulations require automakers to develop lighter and more fuel-efficient vehicles, leading to the use of new materials and complex designs that rely on 3D metrology for validation. The shift towards electric vehicles and autonomous driving



technologies further accelerates the need for precise engineering and manufacturing processes, where 3D metrology plays a crucial role in ensuring the reliability and performance of components. Additionally, the competitive landscape of the automotive industry pushes manufacturers to innovate and improve product quality continuously, making 3D metrology an indispensable tool in design, testing, and production phases.

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

North America leads the market, accounting for the largest 3D metrology market share

The report has also provided a comprehensive analysis of all the major regional markets, which include North America (the United States and Canada); Europe (Germany, France, the United Kingdom, Italy, Spain, Russia, and others); Asia Pacific (China, Japan, India, South Korea, Australia, Indonesia, and others); Latin America



(Brazil, Mexico, and others); and the Middle East and Africa. According to the report, North America represents the largest regional market for 3D metrology.

The North American 3D metrology market is driven by several key factors, emphasizing the region's innovative and industrial capabilities. The increasing adoption of advanced manufacturing technologies, particularly in the automotive and aerospace sectors, is a primary driver, as companies seek to maintain competitive edges through precision engineering and quality assurance. The region's strong emphasis on research and development activities, supported by substantial investments from both public and private sectors, fosters the innovation of new 3D metrology solutions. Additionally, North America benefits from a highly skilled workforce, capable of operating sophisticated metrology equipment and interpreting complex data, further enhancing the market's growth. The presence of leading 3D metrology companies within the region, which actively collaborate with industries to tailor solutions to specific needs, also plays a crucial role. This collaborative environment, coupled with a robust regulatory framework that emphasizes product quality and safety, ensures the continued expansion and relevance of the 3D metrology market in North America.

#### Competitive Landscape:

The market research report has also provided a comprehensive analysis of the competitive landscape in the market. Detailed profiles of all major companies have also been provided. Some of the major market players in the 3D metrology industry include 3d Digital Corporation, Automated Precision Inc., Carl Zeiss AG, Creaform Inc., FARO Technologies, Inc., GOM GmbH, Hexagon AB, Jenoptik AG, KLA Corporation, Mitutoyo Corporation, Nikon Metrology NV, Perceptron, Inc., Renishaw PLC., etc. Key players in the 3D metrology market are actively engaging in a variety of strategic initiatives to strengthen their market positions and drive industry growth. These include heavy investments in research and development (R&D) to innovate and enhance the accuracy, speed, and usability of 3D metrology solutions, catering to the evolving needs of various industries such as automotive, aerospace, healthcare, and manufacturing. Additionally, they are expanding their product portfolios through acquisitions and partnerships, aiming to offer comprehensive solutions that cover a wide range of measurement applications. To address the growing demand for skilled professionals in 3D metrology, these companies are also investing in training and educational programs, ensuring customers can fully leverage the capabilities of their technologies. Furthermore, they are focusing on the development of user-friendly software and integrating artificial intelligence to simplify data analysis, making 3D metrology more accessible to a broader audience.



3D Metrology Market News:

In January 2020: Hexagon AB announced acquisition of Volume Graphics. The closing of the acquisition of Volume Graphics and the acquisitions announced will impact the income statement during the fourth quarter 2019 with one-off items of -25 MEUR. The one-off items relate to impairment of overlapping technologies, transaction costs and integration costs.

In October 2022: Renishaw PLC unveiled its new RFP fringe probe for use with its REVO® 5-axis measurement system on October 12, 2022. The RFP probe extends the capabilities of the REVO system by enabling high-speed scanning of reflective and shiny materials, enhancing measurement accuracy and efficiency.

Key Questions Answered in This Report

1. What was the size of the global 3D metrology market in 2023?

2. What is the expected growth rate of the global 3D metrology market during 2024-2032?

- 3. What has been the impact of COVID-19 on the global 3D metrology market?
- 4. What are the key factors driving the global 3D metrology market?
- 5. What is the breakup of the global 3D metrology market based on the offering?
- 6. What is the breakup of the global 3D metrology market based on the product?
- 7. What is the breakup of the global 3D metrology market based on the application?

8. What is the breakup of the global 3D metrology market based on the end-use industry?

9. What are the key regions in the global 3D metrology market?

10. Who are the key players/companies in the global 3D metrology 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 3D METROLOGY MARKET**

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

#### 6 MARKET BREAKUP BY OFFERING

- 6.1 Hardware
- 6.1.1 Market Trends
- 6.1.2 Market Forecast
- 6.2 Software
  - 6.2.1 Market Trends
  - 6.2.2 Market Forecast
- 6.3 Services



- 6.3.1 Market Trends
- 6.3.2 Market Forecast

## 7 MARKET BREAKUP BY PRODUCT

- 7.1 Coordinate Measuring Machine (CMM)
  - 7.1.1 Market Trends
  - 7.1.2 Market Forecast
- 7.2 Optical Digitizer & Scanner (ODS)
- 7.2.1 Market Trends
- 7.2.2 Market Forecast
- 7.3 Video Measuring Machine (VMM)
- 7.3.1 Market Trends
- 7.3.2 Market Forecast
- 7.4 3D Automated Optical Inspection System (AoI)
  - 7.4.1 Market Trends
  - 7.4.2 Market Forecast
- 7.5 Form Measurement
  - 7.5.1 Market Trends
  - 7.5.2 Market Forecast

## **8 MARKET BREAKUP BY APPLICATION**

- 8.1 Quality Control & Inspection
  - 8.1.1 Market Trends
  - 8.1.2 Market Forecast
- 8.2 Reverse Engineering
  - 8.2.1 Market Trends
  - 8.2.2 Market Forecast
- 8.3 Virtual Simulation
- 8.3.1 Market Trends
- 8.3.2 Market Forecast
- 8.4 Others
  - 8.4.1 Market Trends
  - 8.4.2 Market Forecast

## 9 MARKET BREAKUP BY END-USE INDUSTRY

9.1 Aerospace & Defense



9.1.1 Market Trends 9.1.2 Market Forecast 9.2 Automotive 9.2.1 Market Trends 9.2.2 Market Forecast 9.3 Architecture & Construction 9.3.1 Market Trends 9.3.2 Market Forecast 9.4 Medical 9.4.1 Market Trends 9.4.2 Market Forecast 9.5 Electronics 9.5.1 Market Trends 9.5.2 Market Forecast 9.6 Energy & Power 9.6.1 Market Trends 9.6.2 Market Forecast 9.7 Heavy Industry 9.7.1 Market Trends 9.7.2 Market Forecast 9.8 Mining 9.8.1 Market Trends 9.8.2 Market Forecast 9.9 Others 9.9.1 Market Trends

#### **10 MARKET BREAKUP BY REGION**

9.9.2 Market Forecast

10.1 North America 10.1.1 United States 10.1.1.1 Market Trends 10.1.2 Market Forecast 10.1.2 Canada 10.1.2.1 Market Trends 10.1.2.2 Market Forecast 10.2 Asia Pacific 10.2.1 China 10.2.1.1 Market Trends



10.2.1.2 Market Forecast 10.2.2 Japan 10.2.2.1 Market Trends 10.2.2.2 Market Forecast 10.2.3 India 10.2.3.1 Market Trends 10.2.3.2 Market Forecast 10.2.4 South Korea 10.2.4.1 Market Trends 10.2.4.2 Market Forecast 10.2.5 Australia 10.2.5.1 Market Trends 10.2.5.2 Market Forecast 10.2.6 Indonesia 10.2.6.1 Market Trends 10.2.6.2 Market Forecast 10.2.7 Others 10.2.7.1 Market Trends 10.2.7.2 Market Forecast 10.3 Europe 10.3.1 Germany 10.3.1.1 Market Trends 10.3.1.2 Market Forecast 10.3.2 France 10.3.2.1 Market Trends 10.3.2.2 Market Forecast 10.3.3 United Kingdom 10.3.3.1 Market Trends 10.3.3.2 Market Forecast 10.3.4 Italy 10.3.4.1 Market Trends 10.3.4.2 Market Forecast 10.3.5 Spain 10.3.5.1 Market Trends 10.3.5.2 Market Forecast 10.3.6 Russia 10.3.6.1 Market Trends 10.3.6.2 Market Forecast 10.3.7 Others



10.3.7.1 Market Trends 10.3.7.2 Market Forecast 10.4 Latin America 10.4.1 Brazil 10.4.1.1 Market Trends 10.4.1.2 Market Forecast 10.4.2 Mexico 10.4.2.1 Market Trends 10.4.2.2 Market Forecast 10.4.3 Others 10.4.3.1 Market Trends 10.4.3.2 Market Forecast 10.5 Middle East and Africa 10.5.1 Market Trends 10.5.2 Market Breakup by Country 10.5.3 Market Forecast

#### **11 SWOT ANALYSIS**

11.1 Overview11.2 Strengths11.3 Weaknesses11.4 Opportunities11.5 Threats

## **12 VALUE CHAIN ANALYSIS**

## **13 PORTERS FIVE FORCES ANALYSIS**

- 13.1 Overview
- 13.2 Bargaining Power of Buyers
- 13.3 Bargaining Power of Suppliers
- 13.4 Degree of Competition
- 13.5 Threat of New Entrants
- 13.6 Threat of Substitutes

#### **14 PRICE ANALYSIS**

## **15 COMPETITIVE LANDSCAPE**



15.1 Market Structure 15.2 Key Players 15.3 Profiles of Key Players 15.3.1 3d Digital Corporation 15.3.1.1 Company Overview 15.3.1.2 Product Portfolio 15.3.1.3 Financials 15.3.1.4 SWOT Analysis 15.3.2 Automated Precision Inc. 15.3.2.1 Company Overview 15.3.2.2 Product Portfolio 15.3.3 Carl Zeiss AG 15.3.3.1 Company Overview 15.3.3.2 Product Portfolio 15.3.3.3 SWOT Analysis 15.3.4 Creaform Inc. 15.3.4.1 Company Overview 15.3.4.2 Product Portfolio 15.3.5 FARO Technologies, Inc 15.3.5.1 Company Overview 15.3.5.2 Product Portfolio 15.3.5.3 Financials 15.3.6 GOM GmbH 15.3.6.1 Company Overview 15.3.6.2 Product Portfolio 15.3.6.3 Financials 15.3.6.4 SWOT Analysis 15.3.7 Hexagon AB 15.3.7.1 Company Overview 15.3.7.2 Product Portfolio 15.3.7.3 Financials 15.3.7.4 SWOT Analysis 15.3.8 Jenoptik AG 15.3.8.1 Company Overview 15.3.8.2 Product Portfolio 15.3.8.3 Financials 15.3.9 KLA Corporation

15.3.9.1 Company Overview





15.3.9.2 Product Portfolio 15.3.9.3 Financials 15.3.9.4 SWOT Analysis 15.3.10 Mitutoyo Corporation 15.3.10.1 Company Overview 15.3.10.2 Product Portfolio 15.3.11 Nikon Metrology NV 15.3.11.1 Company Overview 15.3.11.2 Product Portfolio 15.3.12 Perceptron, Inc. 15.3.12.1 Company Overview 15.3.12.2 Product Portfolio 15.3.12.3 Financials 15.3.13 Renishaw PLC 15.3.13.1 Company Overview 15.3.13.2 Product Portfolio 15.3.13.3 Financials



## **List Of Tables**

#### LIST OF TABLES

Table 1: Global: 3D Metrology Market: Key Industry Highlights, 2023 and 2032

Table 2: Global: 3D Metrology Market Forecast: Breakup by Offering (in Million US\$), 2024-2032

Table 3: Global: 3D Metrology Market Forecast: Breakup by Product (in Million US\$), 2024-2032

Table 4: Global: 3D Metrology Market Forecast: Breakup by Application (in Million US\$), 2024-2032

Table 5: Global: 3D Metrology Market Forecast: Breakup by End-Use Industry (in Million US\$), 2024-2032

Table 6: Global: 3D Metrology Market Forecast: Breakup by Region (in Million US\$), 2024-2032

Table 7: Global: 3D Metrology Market: Competitive Structure

Table 8: Global: 3D Metrology Market: Key Players



## **List Of Figures**

#### LIST OF FIGURES

Figure 1: Global: 3D Metrology Market: Major Drivers and Challenges Figure 2: Global: 3D Metrology Market: Sales Value (in Billion US\$), 2018-2023 Figure 3: Global: 3D Metrology Market: Breakup by Offering (in %), 2023 Figure 4: Global: 3D Metrology Market: Breakup by Product (in %), 2023 Figure 5: Global: 3D Metrology Market: Breakup by Application (in %), 2023 Figure 6: Global: 3D Metrology Market: Breakup by End-Use Industry (in %), 2023 Figure 7: Global: 3D Metrology Market: Breakup by Region (in %), 2023 Figure 8: Global: 3D Metrology Market Forecast: Sales Value (in Billion US\$), 2024-2032 Figure 9: Global: 3D Metrology (Hardware) Market: Sales Value (in Million US\$), 2018 & 2023 Figure 10: Global: 3D Metrology (Hardware) Market Forecast: Sales Value (in Million US\$), 2024-2032 Figure 11: Global: 3D Metrology (Software) Market: Sales Value (in Million US\$), 2018 & 2023 Figure 12: Global: 3D Metrology (Software) Market Forecast: Sales Value (in Million US\$), 2024-2032 Figure 13: Global: 3D Metrology (Services) Market: Sales Value (in Million US\$), 2018 & 2023 Figure 14: Global: 3D Metrology (Services) Market Forecast: Sales Value (in Million US\$), 2024-2032 Figure 15: Global: 3D Metrology (Coordinate Measuring Machine- CMM) Market: Sales Value (in Million US\$), 2018 & 2023 Figure 16: Global: 3D Metrology (Coordinate Measuring Machine- CMM) Market Forecast: Sales Value (in Million US\$), 2024-2032 Figure 17: Global: 3D Metrology (Optical Digitizer & Scanner- ODS) Market: Sales Value (in Million US\$), 2018 & 2023 Figure 18: Global: 3D Metrology (Optical Digitizer & Scanner- ODS) Market Forecast: Sales Value (in Million US\$), 2024-2032 Figure 19: Global: 3D Metrology (Video Measuring Machine- VMM) Market: Sales Value (in Million US\$), 2018 & 2023 Figure 20: Global: 3D Metrology (Video Measuring Machine- VMM) Market Forecast: Sales Value (in Million US\$), 2024-2032 Figure 21: Global: 3D Metrology (3D Automated Optical Inspection System- Aol) Market: Sales Value (in Million US\$), 2018 & 2023



Figure 22: Global: 3D Metrology (3D Automated Optical Inspection System- AoI) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 23: Global: 3D Metrology (Form Measurement) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 24: Global: 3D Metrology (Form Measurement) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 25: Global: 3D Metrology (Quality Control & Inspection) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 26: Global: 3D Metrology (Quality Control & Inspection) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 27: Global: 3D Metrology (Reverse Engineering) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 28: Global: 3D Metrology (Reverse Engineering) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 29: Global: 3D Metrology (Virtual Simulation) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 30: Global: 3D Metrology (Virtual Simulation) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 31: Global: 3D Metrology (Other Applications) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 32: Global: 3D Metrology (Other Applications) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 33: Global: 3D Metrology (Aerospace & Defense) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 34: Global: 3D Metrology (Aerospace & Defense) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 35: Global: 3D Metrology (Automotive) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 36: Global: 3D Metrology (Automotive) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 37: Global: 3D Metrology (Architecture & Construction) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 38: Global: 3D Metrology (Architecture & Construction) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 39: Global: 3D Metrology (Medical) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 40: Global: 3D Metrology (Medical) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 41: Global: 3D Metrology (Electronics) Market: Sales Value (in Million US\$),



2018 & 2023

Figure 42: Global: 3D Metrology (Electronics) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 43: Global: 3D Metrology (Energy & Power) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 44: Global: 3D Metrology (Energy & Power) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 45: Global: 3D Metrology (Heavy Industry) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 46: Global: 3D Metrology (Heavy Industry) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 47: Global: 3D Metrology (Mining) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 48: Global: 3D Metrology (Mining) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 49: Global: 3D Metrology (Other End-Use Industries) Market: Sales Value (in Million US\$), 2018 & 2023

Figure 50: Global: 3D Metrology (Other End-Use Industries) Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 51: North America: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 52: North America: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 53: United States: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 54: United States: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 55: Canada: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 56: Canada: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 57: Asia Pacific: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 58: Asia Pacific: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 59: China: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 60: China: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 61: Japan: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 62: Japan: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032



Figure 63: India: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 64: India: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 65: South Korea: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 66: South Korea: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 67: Australia: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 68: Australia: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 69: Indonesia: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 70: Indonesia: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 71: Others: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 72: Others: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 73: Europe: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 74: Europe: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 75: Germany: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 76: Germany: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 77: France: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 78: France: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 79: United Kingdom: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 80: United Kingdom: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 81: Italy: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 82: Italy: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 83: Spain: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 84: Spain: 3D Metrology Market Forecast: Sales Value (in Million US\$),

2024-2032

Figure 85: Russia: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 86: Russia: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 87: Others: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 88: Others: 3D Metrology Market Forecast: Sales Value (in Million US\$),



2024-2032

Figure 89: Latin America: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 90: Latin America: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 91: Brazil: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 92: Brazil: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 93: Mexico: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 94: Mexico: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 95: Others: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023 Figure 96: Others: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 97: Middle East and Africa: 3D Metrology Market: Sales Value (in Million US\$), 2018 & 2023

Figure 98: Middle East and Africa: 3D Metrology Market Forecast: Sales Value (in Million US\$), 2024-2032

Figure 99: Global: 3D Metrology Industry: SWOT Analysis

Figure 100: Global: 3D Metrology Industry: Value Chain Analysis

Figure 101: Global: 3D Metrology Industry: Porter's Five Forces Analysis



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