



2021

ANNUAL REPORT



MKS Instruments, Inc.

(NASDAQ: MKSI) is a global provider of instruments, systems, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity for our customers.

Our VISION

Enabling Technologies
That Transform
Our World

Our MISSION

Innovation Leader
and Trusted Partner
Pushing the Boundaries
of Possibility

To Our **SHAREHOLDERS**

The year 2021 presented MKS with a number of challenges due to the worldwide COVID-19 pandemic and the unprecedented constraints impacting global supply chains. I am incredibly proud and humbled by how our teams overcame these challenges with innovation, perseverance, and flexibility. Both our Semiconductor and Advanced Markets continue to be vibrant growth industries driven by the fundamental trends of miniaturization and complexity. As we marked our 60th year anniversary of innovating to solve our customers' most complex challenges, our focus on execution enabled MKS to report another year of record financials. We are incredibly grateful for the dedication and service of our employees and the support of our customers and partners across the markets we serve.

We delivered record revenue of \$2.9 billion, an increase of 27% from \$2.3 billion in 2020. This strong performance was broad-based, with record revenue in both our Semiconductor and Advanced Markets, growing 32% and 19%, respectively, compared to 2020 levels. This strong top-line revenue, coupled with

our prudent management of expenses, allowed us to grow profitability 57%, more than twice our revenue growth rate, to \$551 million, also another record. These exceptional results were particularly impressive given the unprecedented supply chain constraints and continuous COVID disruptions that impacted the operations of our business, as well as that of our suppliers and customers. We overcame these challenges by executing with a laser focus on meeting our customers' needs, while ensuring the safety and well-being of our employees.

MKS is a foundational enabler of the key trends so crucial to the success of today's technology-driven economy. The most satisfying achievement of this past year is that we have shown we can respond to multiple challenges and still invest in our core capabilities to address our customers' increasingly complex needs. We invested in a number of areas to drive future organic growth across our Vacuum and Analysis, Light and Motion, and Equipment and Solutions divisions. In fact, our investments over the past few years translated into market share gains, such as in RF Power Solutions, as well as strong design win momentum across our laser, optics and motion portfolios.



\$2.9B

2021 REVENUE

27%

YOY GROWTH



\$551M

2021 NET INCOME

57%

YOY GROWTH



The most satisfying achievement of this past year is that we have shown we can respond to multiple challenges and still invest in our core capabilities to address our customers' increasingly complex needs.



We also made important strides in strengthening our Corporate Social Responsibility (CSR) efforts. We issued our inaugural CSR report, in which we articulated our strong commitments to diversity, equity and inclusion, as well as environmental management, employee development, and governance. Importantly, we aligned our disclosure with generally accepted frameworks, such as the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-Related Financial Disclosures (TCFD). For us, sustainability is not only good for our business, but it is also the right thing to do.

All of these achievements, combined with expected attractive industry tailwinds, position MKS for an exciting 2022.

In closing, I want to again thank our dedicated employees for their resilience, innovation and teamwork. I am privileged to lead such an extraordinary group of people. I also want to thank our customers, suppliers and shareholders for your continued confidence in MKS.

John T.C. Lee
President and Chief Executive Officer

Executive TEAM



John T.C. Lee
President and CEO



Seth H. Bagshaw
SVP, CFO and
Treasurer



Kathleen F. Burke
SVP, General Counsel
and Secretary



Mark M. Gitin
SVP and GM,
Light and Motion
Division



David P. Henry
SVP, Corporate Marketing,
PMO and Global Service



Jennifer J. Reilly
SVP, CHRO



James A. Schreiner
SVP, COO



Francis J. Tan
SVP, Strategic Development



Eric R. Taranto
SVP and GM,
Vacuum and Analysis
Division



John Williams
VP and GM,
Equipment and Solutions
Division

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934 regarding the future financial performance, business prospects and growth of MKS. These statements are only predictions based on current assumptions and expectations. Any statements that are not statements of historical fact (including statements containing the words “will,” “projects,” “intends,” “believes,” “plans,” “anticipates,” “expects,” “estimates,” “forecasts,” “continues” and similar expressions) should be considered to be forward-looking statements. Actual events or results may differ materially from those in the forward-looking statements set forth herein. Among the important factors that could cause actual events to differ materially from those in the forward-looking statements are manufacturing and sourcing risks, including the impact and duration of supply chain disruptions, component shortages and price increases, the ability of MKS to complete its acquisition of Atotech, the terms of MKS’ existing term loan, the terms and availability of financing for the Atotech acquisition, the substantial indebtedness MKS expects to incur in connection with the Atotech acquisition and the need to generate sufficient cash flows to service and repay such debt, MKS’ entry into Atotech’s chemicals technology business, in which MKS does not have experience and which may expose it to significant additional liabilities, the risk of litigation relating to the Atotech acquisition, the risk that disruption from the Atotech acquisition materially and adversely affects the respective businesses and operations of MKS and Atotech, the ability of MKS to realize the anticipated synergies, cost savings and other benefits of the Atotech acquisition, competition from larger or more established companies in MKS’ and Atotech’s respective markets, the ability of MKS to successfully grow its business and the businesses of Atotech, Photon Control Inc., which it acquired in July 2021, and Electro Scientific Industries, Inc., which it acquired in February 2019, potential adverse reactions or changes to business relationships resulting from the announcement, pendency or completion of the Atotech acquisition, conditions affecting the markets in which MKS and Atotech operate, including the fluctuations in capital spending in the semiconductor industry and other advanced manufacturing markets, and fluctuations in sales to MKS’ and Atotech’s major customers, the ability to anticipate and meet customer demand, the challenges, risks and costs involved with integrating the operations of the companies we have acquired, potential fluctuations in quarterly results, dependence on new product development, rapid technological and market change, acquisition strategy, volatility of stock price, international operations, financial risk management, and the other factors described in “Risk Factors” in Part 1, Item 1A of the Form 10-K for the year ended December 31, 2021 included in this report. Additional risk factors may be identified from time to time in MKS’ future filings with the Securities and Exchange Commission. MKS is under no obligation to, and expressly disclaims any obligation to, update or alter these forward-looking statements, whether as a result of new information, future events or otherwise after the date of this report.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549
FORM 10-K

(MARK ONE)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2021

Or

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____ to _____

Commission File number 0-23621

MKS INSTRUMENTS, INC.

(Exact Name of Registrant as Specified in Its Charter)

Massachusetts
*(State or other Jurisdiction of
Incorporation or Organization)*
2 Tech Drive, Suite 201, Andover, Massachusetts
(Address of Principal Executive Offices)

04-2277512
*(I.R.S. Employer
Identification No.)*
01810
(Zip Code)

(978) 645-5500

(Registrant's Telephone Number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, no par value	MKSI	Nasdaq Global Select Market

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer Accelerated filer Emerging growth company
Non-accelerated filer Smaller reporting company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with or any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

Aggregate market value of the voting and non-voting common equity held by nonaffiliates of the registrant as of June 30, 2021 based on the closing price of the registrant's common stock on such date as reported by the Nasdaq Global Select Market: \$9,867,033,883.

Number of shares outstanding of the issuer's common stock, no par value, as of February 11, 2022: 55,517,182

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the definitive Proxy Statement for our 2022 Annual Meeting of Shareholders, to be filed with the Securities and Exchange Commission no later than 120 days after the close of our fiscal year ended December 31, 2021, are incorporated by reference into Part III of this Annual Report on Form 10-K.

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

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SUMMARY OF RISK FACTORS

Below is a summary of the principal factors that make an investment in MKS speculative or risky. The following summary does not contain all of the information that may be important to you, and you should read the below summary in conjunction with the more detailed discussion of risks set forth under the heading “Risk Factors” in Part I, Item 1A of this Annual Report on Form 10-K.

Risks Related to Our Pending Acquisition of Atotech

We may be unable to complete our pending acquisition of Atotech Limited, or Atotech, or otherwise realize the benefits of the acquisition of Atotech, which could have a material adverse effect on us, and we are exposed to significant risks relating to the acquisition of Atotech.

Our consolidated indebtedness will increase substantially in connection with the acquisition of Atotech, which increased level of indebtedness could adversely affect us, including by decreasing our business flexibility.

Risks Related to the COVID-19 Pandemic and other Widespread Health Crises

The COVID-19 pandemic has negatively impacted our business, and the pandemic and other widespread health crises may have a materially adverse effect on our business, financial condition and operating results.

Risks Related to Operating a Global Business

We face significant risks associated with doing business internationally.

Unfavorable currency exchange rate fluctuations may lead to lower operating margins or may cause us to change customer pricing, which could result in reduced sales and losses.

Risks Related to Our Industries and Markets

Our business depends significantly on capital spending in the semiconductor and electronics manufacturing industries, which are characterized by periodic fluctuations that may cause a reduction in demand for our products.

Many of the markets and industries we serve are highly competitive, are subject to rapid technological advancement, and have narrow design windows, and if we fail to introduce new and innovative products or improve our existing products, or if our products or the applications we invest in do not achieve widespread adoption, our business, financial condition and operating results will be harmed.

We offer products for multiple markets and must face the challenges of supporting the distinct needs of each of the markets we serve.

Risks Related to Our Operations

Supply chain disruptions or other manufacturing interruptions or delays could affect our ability to meet customer demand and lead to higher costs, while the failure to estimate customer demand accurately could result in excess or obsolete inventory.

Our dependence on sole and limited source suppliers and international suppliers could affect our ability to manufacture products and systems.

Our failure to successfully manage the transition of certain of our products to other manufacturing locations and/or to contract manufacturers would likely harm our business, financial condition and operating results.

Our products could contain defects, which would increase our costs and seriously harm our business, financial condition, operating results and customer relationships.

We outsource a number of services to third-party service providers, which decreases our control over the performance of these functions. Disruptions or delays at our third-party service providers could adversely impact our operations.

The loss of net revenues from any one of our major customers would likely have a material adverse effect on us.

Key personnel may be difficult to attract and retain.

Acquisition Risks

As part of our business strategy, we have entered into and may continue to pursue business combinations and acquisitions that may be difficult to identify and complete, challenging and costly to integrate, disruptive to our business and our management, and/or dilutive to stockholder value.

Financial Risks

The terms of our Term Loan Facility and ABL Facility impose significant financial obligations and risks upon us, limit our ability to take certain actions, and could discourage a change in control.

A material amount of our assets represents goodwill and intangible assets, and our net income would be reduced if our goodwill or intangible assets become impaired.

Legal, Tax, Regulatory and Compliance Risks

If significant tariffs or other trade restrictions on our products or components that are imported from or exported to China continue or are increased, our business, financial condition and operating results may be materially harmed.

We are subject to international trade compliance regulations, and violations of those regulations could result in fines or trade restrictions, which could have a material adverse effect on us.

Changes in tax rates or tax regulation or the termination of tax incentives could affect our operating results.

We are subject to environmental regulations. If we fail to comply with these regulations, our business could be harmed.

We are exposed to various risks related to legal proceedings, including product liability claims, intellectual property infringement claims, contractual claims and securities class action litigation, which if successful, could have a material adverse effect on our commercial relationships, business, financial condition and operating results.

Risks Related to Cybersecurity, Data Privacy and Intellectual Property Protection

We are exposed to risks related to cybersecurity threats and incidents and subject to restrictions of and changes in laws and regulations governing data privacy and data protection that could have a material adverse effect on our business.

Our proprietary technology is important to the continued success of our business. Our failure to protect this proprietary technology may significantly impair our competitive position.

Risks Related to Owning Our Common Stock

Our quarterly operating results have fluctuated, and are likely to continue to vary significantly, which may result in volatility in the market price of our common stock.

The market price of our common stock has fluctuated and may continue to fluctuate for reasons over which we have no control.

We may not pay dividends on our common stock.

Some provisions of our restated articles of organization, as amended, our amended and restated by-laws and Massachusetts law could discourage potential acquisition proposals and could delay or prevent a change in control.

PART I

Item 1. *Business*

MKS Instruments, Inc. (“MKS” or the “Company”) was founded in 1961 as a Massachusetts corporation. We are a global provider of instruments, systems, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity for our customers. Our products are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, vacuum technology, temperature sensing, lasers, photonics, optics, precision motion control, vibration control and laser-based manufacturing systems solutions. We also provide services relating to the maintenance and repair of our products, installation services and training. Our primary served markets include semiconductor, industrial technologies, life and health sciences and research and defense.

Recent Events

Acquisitions

On July 15, 2021, we completed our acquisition of Photon Control Inc. (“Photon Control” and such acquisition, the “Photon Control Acquisition”), pursuant to a definitive agreement. Photon Control designs, manufactures and distributes a wide range of optical sensors and systems to measure temperature and position used in semiconductor wafer fabrication. At the effective time of the Photon Control Acquisition, each share of Photon Control’s common stock issued and outstanding as of immediately prior to the effective time of the Photon Control Acquisition was converted into the right to receive 3.60 per share in cash in Canadian dollars (“CAD”), without interest and subject to deduction for any required withholding tax. We paid to the former Photon Control securityholders aggregate consideration of CAD 379 million or \$303 million, excluding related transaction fees and expenses. We funded the payment of the aggregate consideration with available cash on hand. Photon Control is included in our Light & Motion segment.

The Photon Control Acquisition has helped us deliver on one of our long-term strategic objectives, which is to broaden our portfolio of key technologies to better serve our customers. The Photon Control Acquisition further advances our strategy to enhance our Surround the Chamber® offering by adding optical sensors for temperature control for critical etch and deposition applications in semiconductor wafer fabrication.

On July 1, 2021, we entered into a definitive agreement (as amended from time to time, the “Implementation Agreement”) to acquire Atotech Limited (“Atotech”), a leading process chemicals technology company and a market leader in advanced electroplating solutions. Pursuant to the Implementation Agreement, we agreed to pay \$16.20 per share in cash and 0.0552 of a share of our common stock for each outstanding common share of Atotech. At the time of the announcement of the acquisition, the total value of the aggregate cash and stock consideration was approximately \$5.1 billion. The final value of the consideration will be determined at the time of the closing of the acquisition, which is expected to occur in the first quarter of 2022, subject to the satisfaction of certain closing conditions, including receipt of regulatory approval from China and approval by the Royal Court of Jersey. Our obligations to complete the acquisition are not subject to any financing condition. We intend to fund the cash portion of the transaction with a combination of available cash on hand and committed term loan debt financing. In connection with entering into the Implementation Agreement, we entered into (a) a commitment letter (the “Initial Commitment Letter”), dated as of July 1, 2021, with JPMorgan Chase Bank, N.A. and Barclays Bank PLC (collectively, the “Initial Commitment Parties”) and (b) joinders to the Initial Commitment Letter to add certain additional lender parties (the “Commitment Letter Joinders” and, together with the Initial Commitment Letter, the “Commitment Letter”) dated as of July 23, 2021, with the Initial Commitment Parties and the additional lenders party thereto (collectively, the “Supplemental Commitment Parties” and, together with the Initial Commitment Parties, the “Commitment Parties”), pursuant to which, subject to the terms and conditions set forth therein, the Commitment Parties committed to provide (i) a senior secured term loan credit facility in an aggregate principal amount of \$5.3 billion (the “New Term Loan Facility”) and (ii) a senior secured revolving credit facility with aggregate total commitments of \$500 million (the “New Revolving Credit Facility”). The New Term Loan Facility and New Revolving Credit Facility would refinance our existing term loan facility (the “Term Loan Facility”) and our existing asset-based revolving credit facility (the “ABL Facility”), respectively, and the New Term Loan Facility would be used to finance a portion of the acquisition and to refinance certain existing indebtedness of Atotech.

On October 22, 2021, we completed the syndication of the New Term Loan Facility, comprised of two tranches: a \$4.7 billion loan at LIBOR plus 2.25%, a floor of 0.50% and 0.25% of original issue discount, and a Euro tranche of 0.5 billion

Euro (“EUR”), or approximately \$0.6 billion at EURIBOR plus 2.75%, a floor of 0.00% and 0.25% of original issue discount. Subsequent to the syndication, the \$4.7 billion tranche is expected to be modified to reference a term rate based on the Secured Overnight Financing Rate (plus an applicable credit spread adjustment) as the benchmark rate.

The Commitment Parties’ obligations under the Commitment Letter and the closing and initial funding under the New Term Loan Facility are subject to certain customary conditions including, without limitation, the consummation of the acquisition of Atotech in accordance with the Implementation Agreement, the accuracy of specified representations and warranties of us and other customary closing conditions.

Where You Can Find More Information

We file reports, proxy statements and other documents with the Securities and Exchange Commission (“SEC”). Our SEC filings are available to you on the SEC’s website at <http://www.sec.gov>.

Our website is <http://www.mksinst.com>. We are not including the information contained in our website as part of, or incorporating it by reference into, this Annual Report on Form 10-K. We make available free of charge through our website our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to these reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), as soon as reasonably practicable after we electronically file such materials with, or furnish them to, the SEC.

Markets and Applications

Since our inception, we have focused on satisfying the needs of our customers by establishing long-term collaborative relationships. We have a diverse base of customers and our primary served markets include semiconductor, industrial technologies, life and health sciences, research and defense.

We have developed the following two product strategies that have been instrumental in delivering value to our customers and helping them solve their most complex problems:

Our Surround the Chamber® offering includes a wide range of products, design and development services, system level integration, training programs, calibration, service, and repair for our semiconductor customers. This unique combination of products and services enables our customers to solve the challenges of ultra-thin layers, new materials and complex 3D structures while maintaining quality and productivity levels. We have cultivated this strategy over the past two decades by adding critical enabling technologies to our portfolio.

Our Surround the Workpiece® offering includes product design and development, system level integration, research and development, system, subsystem and component selection, and maintenance, repair and calibration services in the field of laser-based guidance and control for manufacturing processes.

At our core, MKS is a foundational enabler of miniaturization and complexity. We believe there are three secular trends benefitting MKS. First is the impact of a world that continues to be increasingly interconnected, driving the need for smaller, more powerful and feature-rich advanced electronic devices, which is enabled by semiconductor manufacturing and laser processing solutions. Second is the increasing complexity of technology transitions in semiconductor manufacturing, which leads to inflections, such as extreme vertical structures and process engineering at the atomic level. These inflections provide additional growth opportunities for MKS as we believe we are uniquely positioned to deliver the broadest and deepest portfolio of solutions. Third is the accelerating need for laser-based precision manufacturing techniques, which are enabled by lasers, photonics, optics, precision motion control, vibration control and systems solutions.

We believe our long history and deep expertise in solving critical problems position us well to address these challenges for our customers.

Semiconductor Market

A significant portion of our sales are derived from products sold to semiconductor capital equipment manufacturers and semiconductor device manufacturers. Our products are used in major semiconductor processing steps, such as depositing thin films of material onto silicon wafer substrates, etching, cleaning, lithography, metrology, packaging and inspection. The semiconductor industry continually faces new challenges as products become smaller, more powerful and highly mobile. Ultra-thin layers, smaller critical dimensions, new materials, 3D structures, and the ongoing need for higher yield and productivity

drive the need for tighter process measurement and control, all of which MKS supports. We believe we are the broadest critical subsystem provider in the wafer fabrication equipment ecosystem and address over 85% of the market.

Approximately 62%, 59%, and 49% of our net revenues for 2021, 2020 and 2019, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers. As a percentage of net revenues from our top ten customers, semiconductor market revenue accounted for greater than 90% in each of these years.

Advanced Markets

In addition to the semiconductor market, our products are used in the industrial technologies, life and health sciences, and research and defense markets.

Industrial Technologies

Industrial technologies encompasses a wide range of diverse applications, including advanced electronics manufacturing comprising flexible and rigid printed circuit board (“PCB”) processing/fabrication, electronic component manufacturing, glass coating and electronic thin films. Electronic thin films are a primary component of numerous electronic products including flat panel displays, light emitting diodes, solar cells and data storage media. Other applications include laser marking, measurement and scribing, natural gas and oil production and environmental monitoring.

Life and Health Sciences

Our products for life and health sciences are used in a diverse array of applications, including bioimaging, medical instrument sterilization, medical device manufacturing, analytical, diagnostic and surgical instrumentation, consumable medical supply manufacturing and pharmaceutical production.

Research and Defense

Our products for research and defense are sold to government, university and industrial laboratories for applications involving research and development in materials science, physical chemistry, photonics, optics and electronics materials. Our products are also sold for monitoring and defense applications including surveillance, imaging and infrastructure protection.

Approximately 38%, 41% and 51% of our net revenues in the years 2021, 2020 and 2019, respectively, were from advanced markets.

International Markets

A significant portion of our net revenues are from sales to customers in international markets. For 2021, 2020 and 2019, international net revenues accounted for approximately 57%, 55% and 53% of our total net revenues, respectively. A significant portion of our international net revenues were from sales to customers in China, Israel, Japan, South Korea and Taiwan. We expect that international revenues will continue to account for a significant percentage of total net revenues for the foreseeable future. Long-lived assets located outside of the United States accounted for approximately 25% and 28% of our total long-lived assets in 2021 and 2020, respectively. Long-lived assets include property, plant and equipment, net, right-of-use assets, and certain other assets and exclude goodwill, intangible assets and long-term tax-related accounts.

Reportable Segments, and Product and Service Offerings

We group our product offerings by the following reportable segments: Vacuum & Analysis (“V&A”), Light & Motion (“L&M”) and Equipment & Solutions (“E&S”). Global Service represents our service offerings and consists of total services from all three of our reportable segments.

The V&A segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery and vacuum technology. Its products include:

Pressure and Vacuum Control Solutions Products, which consist of direct and indirect pressure measurement.

Materials Delivery Solutions Products, which include flow and valve technologies as well as integrated pressure measurement and control subsystems, which provide customers with precise control capabilities.

Power Solutions Products, which consist of microwave, power delivery systems, radio frequency matching networks and metrology products. Our power delivery solutions are used to provide energy to various etching, stripping and deposition processes.

Plasma and Reactive Gas Products, which consist of reactive gas products that create reactive species. A reactive gas is used to facilitate various chemical reactions in the processing of thin films, including the deposition of films, etching and cleaning of films and surface modifications.

The L&M segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in lasers, photonics, optics, temperature sensing, precision motion control and vibration control. Its products include:

Laser Products, which consist of continuous wave and pulsed nanosecond and ultrafast lasers based on diode, diode-pumped solid-state and fiber laser technologies.

Photonics Products, which include precision motion control, optical tables and vibration isolation systems, photonic instruments, high-performance optics and optical assemblies, opto-mechanical components, temperature sensing products for wafer fabrication systems, laser and LED measurement products, including laser power and energy meters and laser beam profilers and complex optical and photonic subsystems.

The E&S segment provides a range of laser-based systems and test products. Its products include:

Laser-based systems for PCB manufacturing, which include flexible interconnect PCB processing systems and high-density interconnect solutions for rigid PCB manufacturing and substrate processing.

Multi-layer ceramic capacitor (“MLCC”) test systems, which include testing of ultra-small form factor MLCCs, used mainly in smartphones and other electronics manufacturing and large chip MLCCs, used mainly in automotive and infrastructure applications.

For further information on our segments, see Note 21 to the Notes to Consolidated Financial Statements contained in Part II, Item 8 of this Annual Report on Form 10-K.

Global Service includes:

Installation services and training for many of our products.

Technical support offices located near many of our customers’ facilities.

Repair and calibration services at internal service depots and authorized service providers located worldwide.

Warranties on our products for periods that typically range from one to three years, with the majority of the warranties on our products ranging from one to two years. We typically provide warranties on our repair services for periods ranging from 90 days to up to one year, depending upon the type of repair. We also offer extended warranties ranging from one to five years.

Customers

We sell our products and services to thousands of customers worldwide, in a wide range of end markets. Revenues from our top ten customers accounted for 47%, 44% and 33% of net revenues for 2021, 2020 and 2019, respectively, with the increasing percentages attributable to increasing semiconductor market sales. As a percentage of net revenues from our top ten customers, semiconductor market revenue accounted for greater than 90% in each of these years. Lam Research Corporation and Applied Materials, Inc. were our top two customers in 2021 and together accounted for approximately 27% of our net revenues. Both of these customers are in the semiconductor market. The semiconductor market has historically experienced cyclical variations in product supply and demand. It is subject to rapid demand shifts, which are difficult to predict, and we cannot be certain as to the timing or extent of future demand or any future weakness in the semiconductor capital equipment industry. For example, our semiconductor market revenue sequentially increased 32% in 2021, sequentially increased 49% in 2020, and sequentially decreased 19% in 2019. We believe net revenues attributable to our semiconductor market customers are affected by the cyclical nature of the semiconductor market.

Sales and Marketing

Our worldwide sales and marketing organizations are also critical to our strategy of maintaining close relationships with semiconductor capital equipment manufacturers, semiconductor device manufacturers and manufacturers of advanced

applications. We market and sell our products and services through our global direct sales organization, an international network of independent distributors and sales representatives, our websites and product catalogs. As of December 31, 2021, we had approximately 800 sales and marketing employees worldwide. We maintain a marketing staff that identifies customer requirements, assists in product planning and specifications, and focuses on future trends in the markets we serve.

Research and Development

Our products incorporate sophisticated technologies to measure, monitor, deliver, analyze, power, control and improve complex semiconductor and advanced manufacturing processes, thereby enhancing uptime, yield and throughput for our customers. Our products have continuously advanced as we strive to meet our customers' evolving needs. We have developed, and continue to develop, new products to address industry trends, such as the shrinking of integrated circuit critical dimensions and technology inflections, and, in the flat panel display and solar markets, the transition to larger substrate sizes, which require more advanced processing and process control technology, the continuing drive toward more complex and accurate components and devices within the handset and tablet market, the transition to 5G for both devices and infrastructure, supporting the growth in units and via counts of the High Density Interconnect PCB drilling market, and the industry transition to electric cars in the automotive market. In addition, we have developed, and continue to develop, products that support the migration to new classes of materials, ultra-thin layers, and 3D structures that are used in small geometry manufacturing.

We involve our marketing, engineering, manufacturing and sales personnel in the development of new products in order to reduce the time to market for new products. Our employees also work closely with our customers' development personnel, helping us to identify and define future technical needs on which to focus research and development efforts. We support research at academic institutions targeted at advances in materials science, semiconductor process development and photonics.

As of December 31, 2021, we had approximately 900 research and development employees located in facilities around the world. Our research and development expenses were \$200 million, \$173 million and \$164 million for 2021, 2020 and 2019, respectively. Our research and development efforts include numerous projects, none of which are individually material, and generally have a duration of 3 to 30 months, depending upon whether the product is an enhancement of existing technology or a new product. Our current initiatives include projects to enhance the performance characteristics of older products, to develop new products and to integrate various technologies into subsystems.

Manufacturing

Manufacturing activities include the assembly and testing of components and subassemblies, which are integrated into our products. Our manufacturing facilities are located in Austria, Canada, China, France, Germany, Israel, Italy, Romania, Singapore, South Korea and the United States. We also rely on significant subcontracted operations in Mexico and selected contract manufacturers in Asia. Our business depends on the timely supply of products and services that meet the rapidly changing technical and volume requirements of our customers, which depends in part on the timely delivery of parts, components and subassemblies from suppliers, including contract manufacturers. We purchase a wide range of electronic, optical, mechanical and electrical components, some of which are designed to our specifications. We consider our lean manufacturing techniques and responsiveness to customers' significantly fluctuating product demands to be a competitive advantage. As of December 31, 2021, we had approximately 4,200 manufacturing-related employees.

Backlog

We generally schedule production of our products based upon our customers' delivery requirements. Our lead times are very short, as a large portion of our orders are received and shipped within 90 days. In many cases, orders may be subject to cancellation or rescheduling by the customer with limited or no penalty. Our backlog at any particular date, therefore, is not necessarily indicative of actual sales which may be generated for any succeeding period. Historically, our backlog levels have fluctuated based upon the ordering patterns of our customers and changes in our manufacturing capacity. Beginning in 2021, semiconductor market customers generally both increased order volumes and extended lead times. We believe recent ordering patterns reflect our customers' efforts to mitigate the impact of supply chain constraints and provide us with increased visibility to schedule production and secure materials.

Competition

The market for our products is cyclical and highly competitive. Principal competitive factors include:

- Product quality, performance and price;
- Historical customer relationships;
- Breadth of product line;
- Ease of use;
- Manufacturing capabilities and responsiveness; and
- Customer service and support.

Although we believe that we compete favorably with respect to these factors, we can make no assurances that we will continue to do so.

We encounter substantial competition in most of our product lines, although no single competitor competes with us across all product lines. Certain of our competitors have greater financial and other resources than we do. In some cases, competitors are smaller than we are, but are well established in specific product niches.

For example, Advanced Energy Industries, Inc. offers products that compete with our power solutions and reactive gas generator products. Hitachi Ltd. and Horiba Ltd. products compete with our mass flow controllers. Inficon, Inc. offers products that compete with our vacuum measurement and gas analysis products and our vacuum gauging products. Brooks Instrument and VAT, Inc. offer products that compete with our vacuum components. Sigma Koki Co., Ltd. offers products that compete with our optics and photonics products. Coherent, Inc. offers products that compete with our lasers and photonics instruments. Qioptiq offers products that compete with our laser and optics products. IPG Photonics, Inc. offers products that compete with our laser products. Jenoptik AG offers products that compete with our laser, optics, and photonics products. PI miCos GmbH offers products that compete with our photonics products. Thorlabs, Inc. offers products that compete with our optics, lasers and photonics products. Trumpf Group, Lumentum Holdings Inc., Edgwave GmbH, Amplitude Systemes SA, Wuhan Raycus Fiber Laser Technologies Co., Ltd, Maxphotonics Co. Ltd., Photonics Industries, Advanced Optowave Corporation and Light Conversion UAB offer products that compete with our laser products. Our laser systems primarily compete with laser systems provided by Via Mechanics, Ltd., EO Technics Co., Ltd., LPKF Laser & Electronics AG, Mitsubishi Electric Corporation, and Han's Laser Technology Industry Group Co., Ltd. Our component test products primarily compete with Humo Laboratory Ltd., as well as component manufacturers that develop systems for internal use.

Patents and Other Intellectual Property Rights

We rely on a combination of patent, copyright, trademark and trade secret laws and license agreements to establish and protect our proprietary rights. As of December 31, 2021, we owned 682 U.S. patents and 1,656 foreign patents that expire at various dates through 2044. As of December 31, 2021, we had 90 pending U.S. patent applications. Foreign counterparts of certain U.S. applications have been filed or may be filed at the appropriate time.

We require each of our employees, including our executive officers, to enter into standard agreements pursuant to which the employee agrees to keep confidential all of our proprietary information and to assign to us all inventions while they are employed by us.

Government Regulations

We are subject to various federal, state, local and international laws and regulations relating to the development, manufacture, sale and distribution of our products and services, and it is our policy to comply with the laws in every jurisdiction in which we conduct business. Regulations include but are not limited to those related to environment, corruption, bribery, import and export controls, competition, product safety, workplace health and safety, employment, labor and data privacy. The following describes certain significant regulations that may have a material effect on our capital expenditures, earnings and competitive position. For additional information about risks related to government regulations, please refer to "Risk Factors – Legal, Tax, Regulatory and Compliance Risks" in Part I, Item 1A of this Annual Report on Form 10-K.

Trade Compliance

We are subject to trade compliance laws in both the United States and other jurisdictions where we operate, including export regulations such as the U.S. Export Administration Regulations, administered by the U.S. Department of Commerce's Bureau of Industry and Security, and the International Traffic in Arms Regulation, administered by the Department of State's Directorate of Defense Trade Controls.

Environmental Regulations

We are subject to various, federal, state, local and international regulations relating to the protection of the environment, including those governing discharges of pollutants into the air and water, the management and disposal of hazardous substances and waste and the cleanup of contaminated sites.

Human Capital

In order to compete and succeed in highly competitive markets and industries that are subject to rapid technological change, we believe it is critical to attract, motivate and retain a dedicated, talented and innovative team of employees. As part of these efforts, we strive to foster a diverse, equitable and inclusive community, invest in continuous learning and development, engage meaningfully with employees, offer a competitive compensation and benefits program and provide a safe and healthy workplace.

As of December 31, 2021, we had a total workforce of approximately 6,400 individuals across 19 countries, with 26% located in the Asia-Pacific region, 24% located in Europe and the Middle East and 50% located in North America. Of our total workforce, approximately 6,000 were employees and approximately 400 were temporary workers. Of our total workforce, 14% work in research and development, 66% work in operations, manufacturing, service and quality assurance, and 20% work in sales, order administration, marketing, finance, legal, information technology, general management and other administrative functions.

Diversity, Equity and Inclusion

At MKS, our commitment to diversity, equity and inclusion ("DE&I") is core to our culture. We believe that diversity of gender, race, ethnicity, sexual orientation, culture, education, background and experience fuels innovation and results as well as enables our employees to succeed. Our executive team is comprised of 20% female members and 20% racially diverse members. Our Board of Directors is comprised of 38% female members, 25% racially diverse members and 13% LGBTQ+, members and our Lead Director is a woman. We have been recognized for our commitment to advancing women's representation on the boards of directors of public companies.

We have taken a number of steps to foster DE&I at MKS:

Over the last two years, approximately 240 of our leaders around the world completed a six-week DE&I program hosted by a consulting firm recognized as best-in-class in the area of DE&I capability building.

In 2021, we offered DE&I training for all employees and began bias awareness training for our global talent acquisition team.

We proactively provide our hiring managers with diverse candidate slates in our employee recruiting process and, in accordance with our Corporate Governance Guidelines, seek diverse candidates for the pool from which our Board of Director nominees are chosen.

We regularly conduct robust analyses of pay practices across gender globally and other diversity factors within the United States to detect any existing disparities within base and total compensation, taking prompt and effective action to correct any identified disparities. Our most recent analysis of our global employees' compensation, which was conducted over the past two years, has, with minimal required adjustments, resulted in equitable pay for our employees.

We offer regional and global initiatives that afford employees opportunities to engage in mentoring programs, book reading groups and facilitated discussion groups, webinars and workshops that celebrate and recognize awareness months and days.

Learning and Development

MKS is committed to investing in learning and professional development. Our employees have access to a wide range of programs, classes and resources to help them excel in their careers and share what they learn with their colleagues. Our performance management process includes performance feedback and career development discussions that are dynamic and

actionable throughout the year. In 2021, we broadly rolled out a course to develop our focus on employee engagement, change management and leadership excellence. Over the last two years, our leaders also completed the DE&I course described above. In addition, we provide financial support for college and graduate education for U.S. employees and access to online learning for all employees in local languages to help further the careers of our entire workforce.

Employee Engagement

MKS is committed to meaningful engagement with its employees. In 2021, MKS conducted its first global employee engagement survey, the results of which were thoroughly assessed and shared with our Chief Executive Officer and executive leadership team as well as our Board of Directors. We plan to conduct employee engagement surveys on an annual basis and use the feedback we receive to examine current practices and drive new initiatives.

Our executive management team also conducts quarterly calls with employees around the world to ensure they are connected to the progress of the Company. In addition, during the COVID-19 pandemic, we have increased our employee engagement efforts through employee surveys and regular written and video communications.

Compensation and Benefits

MKS is committed to providing total compensation packages that attract, motivate and retain our employees. Additionally, MKS is committed to recognizing and rewarding each employee's sustained performance and results. In 2020, we launched a recognition program for all U.S. employees, which allows peer-to-peer recognition and recognition by managers. We plan to expand our recognition program globally in 2022. We also maintain a global flexible work policy that will extend beyond the ongoing COVID-19 pandemic. We are committed to ensuring that our total compensation packages are externally competitive while supporting our business plans and strategies.

As employee turnover is an indicator of employee satisfaction, we monitor turnover globally. MKS has a very stable and committed workforce, as evidenced by low voluntary turnover. Our 12-month rolling average for voluntary turnover at the end of 2021 was below 7%. Our employee average tenure is more than 10 years.

Health and Safety and Pandemic Response

MKS is committed to providing a safe and healthy workplace for all employees. We accomplish this through strict compliance with applicable laws and regulations regarding workplace safety, including recognition and control of workplace hazards, tracking injury and illness rates, utilizing a global travel health program and maintaining detailed emergency and disaster recovery plans. We also offer employees and eligible family members a full range of health and wellness programs, as well as many clinical and administrative services.

MKS' top priority during the ongoing COVID-19 pandemic has been and continues to be protecting the health and safety of our employees and their families, our customers and our community. The commitment to this effort is evidenced by the extensive planning and numerous actions MKS swiftly took to respond to the pandemic, including the development and implementation of an infectious disease playbook, a work-from-home program, health check protocols and screenings for all employees working on site, new process workflows at physical sites to ensure reduced contact for employees working on site, contact tracing processes and protocols, quarantining and testing protocols for exposure and positive tests, travel guidelines and protocols to ensure employees who must travel for work can do so safely, and phased return-to-work plans and approval processes to enable non-manufacturing employees to return to work when permitted by local government regulations. MKS continues to maintain workplace flexibility such as working remotely where possible to reduce the number of people who are on site each day.

Additional information regarding MKS' activities related to its people and sustainability can be found in our Corporate Social Responsibility Report, which is accessible through the Corporate Social Responsibility section of our website at <https://www.mksinst.com/corporate-social-responsibility>. Our Corporate Social Responsibility Report is updated periodically. This website address is intended to be an inactive textual reference only. None of the information on, or accessible through, MKS' website is part of this Annual Report on Form 10-K or is incorporated by reference herein.

Item 1A. Risk Factors

This section describes certain risks we face in our business. Additional risks that we do not yet know of or that we currently believe are immaterial may also impair our business. If any of the events or circumstances described in this section actually occurs, our business, financial condition or operating results could suffer, and the market price of our common stock could decline. In assessing these risks, investors should also refer to the other information contained or incorporated by reference in this report and our other filings with the Securities and Exchange Commission.

Risks Related to Our Pending Acquisition of Atotech

We may be unable to complete our pending acquisition of Atotech Limited, or Atotech, or otherwise realize the benefits of the acquisition of Atotech, which could have a material adverse effect on us, and we are exposed to significant risks relating to the acquisition of Atotech.

On July 1, 2021, we announced that we had entered into a definitive agreement (as amended, the “Implementation Agreement”) to acquire Atotech, a leading process chemicals technology company (the “Atotech Acquisition”). Pursuant to the Implementation Agreement, and subject to the terms and conditions contained therein, at the closing of the acquisition, we will acquire all of the outstanding shares of Atotech for \$16.20 in cash and 0.0552 of a share of MKS common stock for each Atotech common share. At the time of the announcement of the acquisition, the total value of the aggregate cash and stock consideration was approximately \$5.1 billion. The final value of the consideration will be determined at the time of the closing of the acquisition, which is expected to occur in the first quarter of 2022, subject to satisfaction of certain closing conditions, including receipt of regulatory approval from China and approval from the Royal Court of Jersey. The failure to receive regulatory approval from China or the Royal Court of Jersey, or the failure to satisfy any other closing condition could delay the completion of the acquisition or prevent it from occurring. Any delay in completing the acquisition could cause us to not realize some or all of the benefits that we expect to achieve. Further, even if we are unable to complete the acquisition, we will still have incurred substantial expenses and diverted significant management time and resources from our ongoing business. There can be no assurance that the remaining closing conditions will be satisfied or waived or that the transaction will be completed.

Until the completion of the acquisition, we will operate independently of Atotech. It is possible that the pendency of the acquisition could result in the loss of key employees, higher than expected costs, diversion of management attention or the disruption of our ongoing businesses, which may adversely affect the combined company’s ability to maintain relationships with customers, vendors and employees or to achieve the anticipated benefits and cost savings of the acquisition. Our obligations under the Implementation Agreement to acquire Atotech are not subject to any financing condition. In connection with the proposed acquisition, as further described under “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Recent Events” contained in Part II, Item 7 of this Annual Report on Form 10-K, we entered into a debt commitment letter with JPMorgan Chase Bank, N.A. and Barclays Bank PLC (together with certain additional lenders party thereto via joinder, the “Commitment Parties”) to obtain a senior secured term loan credit facility in the aggregate principal amount of \$5.3 billion to finance, in part, the acquisition and a \$500 million senior secured revolving credit facility, which may be used to finance, in part, the payment of fees and expenses in connection with the acquisition, for working capital and for general corporate purposes. The obligations of the Commitment Parties under the commitment letter are subject to certain conditions. We can provide no assurance that the Commitment Parties will ultimately provide the financing as contemplated by the commitment letter or that the terms of any indebtedness we incur will not be less favorable to us than we expect.

Although we have completed the syndication of the aforementioned senior secured term loan and senior secured revolving credit facilities, the closing and initial funding thereunder is subject to certain customary conditions including, without limitation, the consummation of the acquisition of Atotech in accordance with the Implementation Agreement, the accuracy of our specified representations and warranties and other customary closing conditions.

We have incurred, and we will continue to incur, transaction fees, including legal, regulatory and other costs associated with closing the transaction, as well as expenses related to formulating and implementing integration plans, including facilities and systems consolidation costs and employment-related costs. We may be unable to offset transaction and integration-related costs with the elimination of duplicative costs or the realization of other efficiencies related to the integration of the business.

The success of the Atotech Acquisition, if completed, will depend in part on our ability to realize the anticipated business opportunities and growth prospects from combining our business with that of Atotech. We may never realize these business opportunities and growth prospects. We do not have previous experience in the specialty chemistry industry, which Atotech serves. The specialty chemistry industry is also subject to highly complex environmental regulations, across multiple jurisdictions around the globe, and may expose us to significant additional liabilities for past or future activities. There can be

no assurances we will have success in this industry. In addition, we may experience increased competition that limits our ability to expand our business. Integrating operations will be complex and will require significant effort and expenditures on the part of both us and Atotech. Combining our businesses could make it more difficult to maintain relationships with customers, employees or suppliers. If we are unable to successfully or timely integrate the operations of Atotech's business, we may be unable to realize the revenue growth, synergies and other anticipated benefits resulting from the acquisition and our business could be adversely affected.

Our consolidated indebtedness will increase substantially in connection with the Atotech acquisition, which increased level of indebtedness could adversely affect us, including by decreasing our business flexibility.

In connection with the Atotech Acquisition, we expect to incur up to \$5.3 billion of indebtedness, which could have the effect, among other things, of reducing our flexibility to respond to changing business, industry and economic conditions, limiting our ability to obtain financing in the future and increasing interest expense. We will also incur various costs and expenses associated with our indebtedness. The amount of cash required to pay interest on our increased indebtedness levels following completion of the acquisition, and thus the demands on our cash resources, will be greater than the amount of cash flows required to service the levels of indebtedness we have incurred prior to the transaction. Our increased levels of indebtedness following completion of the acquisition could also reduce funds available for working capital, capital expenditures, acquisitions and other general corporate purposes and may create competitive disadvantages relative to other companies with lower debt levels. If we do not achieve the expected benefits and cost savings from the acquisition, or if the financial performance of the combined company does not meet current expectations, then our ability to service our indebtedness may be adversely impacted.

All of the indebtedness to be incurred in connection with the acquisition will bear interest at variable interest rates. If interest rates increase, variable rate debt will create higher debt service requirements, which could adversely affect our cash flows. Although we plan to hedge a portion of the variable rate indebtedness, any hedges are likely to carry a higher initial interest cost or require the payment of premiums to our counterparties. In addition, our credit ratings affect the cost and availability of future borrowings and, accordingly, our cost of capital. Our ratings reflect each rating organization's opinion of our financial strength, operating performance and ability to meet our debt obligations. While we have obtained ratings of our indebtedness from nationally recognized statistical rating organizations in connection with the debt financing, there can be no assurance that we will achieve or maintain any particular rating in the future. Moreover, we may be required to raise substantial additional financing to fund working capital, capital expenditures, acquisitions or other general corporate requirements. Our ability to arrange additional financing or refinancing will depend on, among other factors, our financial position and performance, as well as prevailing market conditions and other factors beyond our control. There can be no assurance that we will be able to obtain additional financing or refinancing on terms acceptable to us or at all.

In addition, while we expect that the negative covenants in the definitive agreements governing our indebtedness will not affect our ability to pay quarterly dividends in the future, consistent with past practices, the terms of such definitive agreements will restrict our ability to pay dividends in certain circumstances.

Risks Related to the COVID-19 Pandemic and other Widespread Health Crises

The COVID-19 pandemic has negatively impacted our business, and the pandemic and other widespread health crises may have a materially adverse effect on our business, financial condition and operating results.

The COVID-19 pandemic has subjected, and the evolution of the COVID-19 pandemic or the emergence of other widespread health crises may continue to subject, our business, financial condition and operating results to a number of risks, including:

Supply chain disruptions and other operational challenges, including shortages of and significant price increases and increased lead times for raw materials, components and subassemblies, increased employee turnover, increased health and safety measures, site closures, and other restrictions on the movement of people, goods and raw materials, which could frustrate our ability to obtain materials from suppliers and meet customer demand, in each case on favorable terms, on a timely basis, or at all, harming our relationships with customers, creating opportunities for competitors and exposing us to contractual disputes or liability;

The implementation of government mandates and other regulatory actions, including business shutdowns, manufacturing restrictions, and quarantines, which could reduce or halt our operations or the operations of our customers and suppliers, carry into the future for an extended or unknown duration, and contain complex requirements that make compliance difficult;

Decreased employee productivity or availability, whether due to illnesses or due to the measures we or government authorities may take to mitigate their spread and effects, including site closures, restrictions on travel and vaccine mandates, which could lead to employee attrition; and

A decline in industry and global economic conditions that reduces demand from and weakens the financial health of our customers, resulting in delayed or canceled orders, requests for payment deferrals or other contract modifications, and, if we do not anticipate significant or sudden decreases in order patterns, excess inventory.

These risks may be heightened in certain geographies, segments and markets, or under certain other circumstances. For example, in the first half of 2020, our research and defense market was negatively impacted by university and research lab closures caused by the COVID-19 pandemic. Since the first quarter of 2021, we have experienced significant constraints due to global supply chain disruptions, including procuring electronic components, which have negatively impacted, and continue to impact, our sales, costs and margins, and our ability to produce timely products to meet customer demand. In addition, since 2021, we believe certain of our semiconductor market customers have increased order volumes to mitigate the impact of supply chain constraints arising from the COVID-19 pandemic, which could lead to a future decrease in order volumes. In the future, we may be more likely to be affected by government mandates in China, where we and our customers and suppliers have a significant presence and where the government has taken strict measures to eliminate the spread of COVID-19. We are more likely to be affected by supply chain disruptions where we rely on sole and limited source suppliers for raw materials, components and subassemblies critical to the manufacturing of our products due to unique component designs, including customers' "copy exact" requirements, or specialized quality and performance requirements. In addition, the effects of the COVID-19 pandemic and other widespread health crises could exacerbate the other risks described in this Annual Report on Form 10-K.

Risks Related to Operating a Global Business

We face significant risks associated with doing business internationally.

We face significant risks from our substantial operations in and sales to international markets. We maintain operations in more than 15 countries, with significant employee populations and/or facilities in Asia (especially China, Israel and South Korea), Europe (especially France and Germany) and Mexico, and we make sales to customers in approximately 90 countries, with a significant number of customers in Asia (especially China, South Korea, Japan and Taiwan) and Europe (especially Germany). Our presence in international markets, and the risks associated with doing business internationally, may change or increase as our business grows. These risks include:

Adverse changes or instability in political or economic conditions in countries or regions where we and our customers and suppliers are located, including currency devaluations, debt defaults, lack of liquidity and recessions;

Challenges of administering our diverse business and product lines globally;

Actions of government regulatory authorities, including embargoes, sanctions (including "anti-blocking" rules), executive orders, import, export and reexport restrictions, antiboycott laws, tariffs (including anti-dumping and countervailing duties), currency controls, trade restrictions and trade barriers (including retaliatory actions), license requirements (including license-specific restrictions and provisos), citizenship requirements, environmental requirements and other rules and regulations (including extraterritorial rules and regulations) applicable to the manufacture, import, export and reexport of our products, all of which may be complicated and conflicting, require significant investments in cost, time and resources for compliance, and impose strict and severe penalties for noncompliance;

Political and social attitudes, laws, rules, regulations and policies within countries that favor domestic companies over non-domestic companies, including customer- or government-supported efforts to promote the development and growth of local competitors;

Greater risk of violations of U.S. and international laws and regulations, including anti-corruption and trade laws, by our employees, sales representatives, distributors or other agents;

Increased credit risk and differing financial conditions of customers and distributors, resulting in longer accounts receivable collection periods and payment cycles, increased bad debt write-offs and additions to reserves;

Overlapping, burdensome and differing tax structures and laws;

Potential for certain tax benefits to be revoked or reclaimed;

Reduced, inconsistent or differing protection of intellectual property;

Increasingly stringent privacy, security, consumer and data protection laws, including the E.U. General Data Protection Regulation, the Data Security Law of China and the China Personal Information Protection Law;

Shipping, logistics and other supply chain complications or cargo security requirements, including forced-labor mitigation rules;

Adverse currency exchange rate fluctuations;
Restrictions on currency conversion or the transfer of funds, including restrictions on certain financial institutions themselves;
Compliance costs, withholding taxes and legal and contractual restrictions associated with repatriating overseas earnings;
Increased risk of exposure to significant health concerns (such as COVID-19, Sudden Acute Respiratory Syndrome, Avian Influenza and the H7N9, Ebola or Zika viruses);
Differences in business practices, culture, language and management style;
Complex, burdensome and differing labor and employment laws and practices;
Changing labor conditions and difficulties staffing, managing, and rationalizing our foreign operations, including, rising wages and other labor costs, retention of employees, the formation of labor unions and works councils and the maintenance of defined benefit pension plans;
Nationalization or other expropriation of private enterprises;
Involuntary geopolitical annexations or accessions through military force or otherwise; and
Increased risk of exposure to civil unrest, terrorism and military activities.

If we experience any of the risks associated with doing business internationally, our business, financial condition and operating results could be significantly harmed.

We have significant facilities and operations and a considerable number of employees in Israel. A number of our products are manufactured in facilities located in Israel. The Middle East remains a volatile region, and the future of peace efforts between Israel and neighboring countries remains extremely uncertain. Any armed conflicts or significant political instability in the region is likely to negatively affect business conditions and could significantly disrupt our operations in Israel. Further, many of our employees in Israel may be called for active military duty under emergency circumstances. If a military conflict or war arises, our operations in Israel could be disrupted by the absence of one or more key employees or a significant number of other employees. Any such disruptions could adversely affect our business.

The U.S. government continues to take action against certain of our customers, particularly in Asia, including indictments for various criminal charges, and in some cases, restrictions on doing business with these customers (or restrictions on third parties from engaging designated entities), including the suspension of our ability to fill outstanding orders. These actions have caused us, and may in the future cause us, to lose anticipated revenue from product sales, the amount of which could be significant. In addition, these or other customers could elect to purchase products from unaffected non-U.S. competitors, even when trade restrictions are not in place, jeopardizing our long-term relationship with them. Further, compliance with regulatory restrictions may cause us to breach contractual obligations, which could result in costs, penalties and litigation.

Additionally, potential customers in certain countries, particularly in Asia, have a strong preference for technology and products developed by suppliers based in their home countries. The trade dispute between the U.S. government and the Chinese government has reinforced and broadened this preference, as potential and existing customers seek to avoid the uncertainty related to the trade dispute. While we have attempted to mitigate these issues by establishing a significant local presence in many of these countries, companies like us that are based elsewhere remain at a disadvantage.

Unfavorable currency exchange rate fluctuations may lead to lower operating margins or may cause us to change customer pricing, which could result in reduced sales and losses.

Although we report our financial position and operating results in U.S. dollars, a significant portion of our net revenues are from customers in international markets and we have facilities where costs are incurred in currencies other than the U.S. dollar. In addition, we carry certain assets and liabilities in currencies other than the U.S. dollar. Our expected indebtedness for the Atotech Acquisition includes a Euro tranche of EUR 0.5 billion, or approximately \$0.6 billion. Currency exchange rate fluctuations could have an adverse effect on our assets, liabilities, net revenues, expenses and operating results and we could experience losses with respect to our hedging activities. Unfavorable exchange rate fluctuations could require us to increase or decrease prices to customers, which could result in lower net revenues from such customers. Alternatively, if we do not adjust the prices for our products in response to unfavorable currency fluctuations, our operating results would be adversely affected by declining net revenues or profit margins for our products. Such exchange rate fluctuations could also increase the costs and expenses of our non-U.S. operations when translated into U.S. dollars or require us to modify our current business practices. In addition, most sales made by our foreign subsidiaries are denominated in the currency of the country in which these products are sold and the currency they receive in payment for such sales could be less valuable on a U.S. dollar basis at the time of

receipt as a result of exchange rate fluctuations. We enter into foreign exchange forward contracts to reduce a portion of our currency exposure arising from intercompany sales of inventory as well as intercompany accounts receivable and intercompany loans. However, we cannot be certain that our efforts will be adequate to protect us from significant exchange rate fluctuations or that such efforts will not expose us to additional exchange rate risks.

Risks Related to Our Industries and Markets

Our business depends significantly on capital spending in the semiconductor and electronics manufacturing industries, which are characterized by periodic fluctuations that may cause a reduction in demand for our products.

Our business depends upon the capital expenditures of semiconductor device manufacturers, which in turn depends upon the demand for semiconductors. Approximately 62%, 59% and 49% of our net revenues for 2021, 2020 and 2019, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers. We anticipate that sales to these customers will continue to account for a substantial portion of our net revenues. Although our business is not as dependent upon our industrial technologies market, capital expenditures in electronics manufacturing can also have a significant impact on our business, financial condition and operating results. The semiconductor and electronics manufacturing industries have historically experienced cyclical variations in product supply and demand. For example, our sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers sequentially increased 32% in 2021, sequentially increased 49% in 2020 and sequentially decreased 19% in 2019. These sometimes sudden and severe cycles can result from many factors, including overall consumer and industrial spending and demand for electronic products that drive manufacturer production. These cycles can also result from manufacturers' capacity utilization, timing of new product introductions, demand for customers' products, inventory levels relative to demand, access to affordable capital, labor conditions, prices of commodities and energy costs. The timing, severity and duration of these cycles are difficult to predict, and we may not be able to respond effectively to these cycles.

During downturns in the semiconductor and electronics manufacturing industries, periods of overcapacity have resulted in rapid and significantly reduced demand for our products, which may result in lower gross margins due to reduced absorption of manufacturing overhead, as our ability to rapidly and effectively reduce our cost structure in response to such downturns is limited by the fixed nature of many of our expenses in the near term. Further, our ability to reduce our long-term expenses is constrained by our need to continue investment in next-generation product technology and to support and service our products. In addition, due to the relatively long manufacturing lead times for some of the products we sell to these industries, we may incur expenditures or purchase raw materials or components for products we are unable to sell. As a result, downturns in these industries may materially harm our business, financial condition and operating results. Conversely, during upturns in these industries, we may have difficulty rapidly and effectively increasing our manufacturing capacity to meet sudden increases in customer demand. If we fail to do so, we may lose business to our competitors and our relationships with our customers may be harmed.

Many of the markets and industries we serve are highly competitive, are subject to rapid technological advancement, and have narrow design windows, and if we fail to introduce new and innovative products or improve our existing products, or if our products or the applications we invest in do not achieve widespread adoption, our business, financial condition and operating results will be harmed.

We operate in highly competitive markets characterized by rapid technological advances, frequent product introductions and enhancements, changing customer requirements, evolving industry standards, substantial capital investment and increasing price pressure. Our success depends upon our ability to continuously develop, market and support superior products, processes and solutions. Factors that could harm our competitive position include:

- Our failure to anticipate demand for and internally develop or acquire new, improved and disruptive technologies;
- Our investment in emerging applications that do not achieve widespread adoption or significant growth;
- Delays in introducing new, enhanced and differentiated products, many of which are difficult to design and manufacture because of their sophistication and complexity;
- Reduced manufacturing capabilities, customer service or support;
- Our inability to have semiconductor device manufacturers direct semiconductor capital equipment manufacturers to use our products at their semiconductor fabrication facilities;
- Failure of customers to achieve market demand for their products that incorporate our technologies;
- Efforts of customers to internally develop products that compete with our technologies or to engage subcontract manufacturers or system integrators to manufacture competitive products on their behalf;
- Competitors that develop products that offer superior performance or technological features;
- Competitors with greater financial, technical, marketing and other resources, including ownership by or affiliations with members of government, political entities or larger, multinational businesses, which may offer a number of

competitive advantages, such as the ability to incur lower costs due to control over sources of components and raw materials or exclusive agreements with suppliers thereof;
Competitors with greater recognition and stronger presences in specific product niches and/or regions;
Competitors, particularly in China, that are able to develop low-cost competitive products;
Difficulties in displacing competitors' products that are designed into customers' products;
Pricing pressure from customers and competitors, particularly new competitors that offer aggressive price and payment terms in an attempt to gain market share, and especially during cyclical downturns in our markets, when end-markets become more sensitive to costs and competitors are more likely to seek to maintain or increase market share, reduce inventory or introduce more technologically advanced or lower-cost products; and
Industry consolidation among competitors, which could exacerbate certain of these factors.

Certain of these factors could cause customers to defer or cancel orders for our products and/or place orders for our competitors' products. This is particularly significant to us, as our success depends on many of our products being designed into new generations of equipment and manufacturing processes. Certain markets in which we operate, such as the semiconductor capital equipment market and the mobile phone market, which is part of our industrial technologies market, experience cyclical and unevenness in capital spending. If we are unable to introduce new products in a timely manner or are otherwise unsuccessful in making sales to customers, we may miss market upturns or fail to have our products or subsystems designed into our customers' products. For example, new products designed by capital equipment manufacturers typically have a lifespan of five to fifteen years. We must develop products that are technologically advanced in a timely manner so that they are positioned to be chosen for use in each successive generation of capital equipment.

These factors could also prompt us to agree to pricing concessions or extended payment terms with our customers, in an effort to expand into new markets, gain volume orders or improve customer cost of ownership in highly competitive applications. In other cases, we may discontinue selling certain products if we cannot offset price erosion through shifts in operations.

Finally, these factors could render the portfolios of products or lines of business from which we generate significant net revenues obsolete. If our customers or the industries we serve shift to other technologies, our business, financial condition and operating results would be harmed.

We offer products for multiple markets and must face the challenges of supporting the distinct needs of each of the markets we serve.

We offer products for very diverse markets. Because we operate in multiple markets, we must work constantly to understand the needs, standards and technical requirements of many different applications within these markets, and must devote significant resources to developing different products for these markets. Product development is costly and time consuming. We must anticipate trends in our customers' industries and develop products before our customers' products and processes are commercialized. If we do not anticipate our customers' needs and future activities, we may invest substantial resources in developing products that do not achieve broad market acceptance. Our growth prospects rely in part on successful entry into new segments, which depends on displacing competitors who are more familiar with these markets and better known to customers. In many cases, we are attempting to enter or expand our presence in these new segments with newly introduced products that are not yet proven in the industry. Our decision to continue to offer products to a given market or to penetrate new markets is based in part on our judgment of the size, growth rate, profitability and other factors that contribute to the attractiveness of a particular market. If our product offerings in any particular market are not competitive, our analyses of a market are incorrect or our sales and marketing approach for a market is ineffective, we may not achieve anticipated growth rates in this market, and our business, financial condition and operating results would be harmed.

Further, serving diverse markets requires an understanding of different sales cycles and customer types, and the development and maintenance of a complex global sales team and sales channels to support the markets' differing needs. It also requires dynamic operations that can support both complex, customized product builds as well as quick turn-around for commercial off-the-shelf sales. If we fail to provide sales and operational support for our diverse markets, our business, financial condition and operating results would be harmed.

Risks Related to Our Operations

Supply chain disruptions or other manufacturing interruptions or delays could affect our ability to meet customer demand and lead to higher costs, while the failure to estimate customer demand accurately could result in excess or obsolete inventory.

Our business depends on the timely supply of products and services that meet the rapidly changing technical and volume requirements of our customers, which depends in part on the timely delivery of parts, components and subassemblies from suppliers, including contract manufacturers. For example, since the first quarter of 2021, we have experienced significant constraints due to global supply chain disruptions, including procuring electronic components, which have negatively impacted, and continue to impact, our sales, costs and margins, and our ability to produce timely products to meet customer demand. Cyclical industry conditions and volatility of demand for manufacturing equipment increase capital, technical, operational and other risks for us and for companies throughout our supply chain. We may also experience significant disruptions in our supply chain, interruptions of our manufacturing operations, delays in our ability to deliver products or services, increased costs or customer order cancellations as a result of:

- Volatility in the availability and cost of materials, including rare earth elements, whether due to interruptions in production by suppliers, allocations of products to other purchasers, fluctuations in foreign currency exchange rates, changes in worldwide price levels, environmental limitations or other factors;
- Pandemics such as COVID-19, natural disasters or other events beyond our control (such as earthquakes at our facilities in California and Portland, Oregon, floods or storms, wildfires, power outages (particularly rolling blackouts recently experienced in China), regional economic downturns, social unrest, political instability, terrorism, or acts of war), particularly where we or our suppliers, subcontractors and contract manufacturers conduct manufacturing;
- Global logistics network challenges, such as limited availability of and constraints on freight capacity;
- Information technology or infrastructure failures; and
- New laws or regulations.

In addition, if we need to rapidly increase our business and manufacturing capacity to meet increases in demand or expedited shipment schedules, this may exacerbate any interruptions in our manufacturing operations and supply chain and the associated effect on our working capital. Moreover, if actual demand for our products is different than expected, we may purchase more/fewer parts than necessary or incur costs for canceling, postponing or expediting delivery of parts. If we purchase inventory in anticipation of customer demand that does not materialize, or if our customers reduce or delay orders, we may incur excess inventory charges. Any of these factors could materially and adversely affect our business, financial condition and operating results.

Our dependence on sole and limited source suppliers and international suppliers could affect our ability to manufacture products and systems.

We rely on sole and limited source suppliers and international suppliers for some of our components and subassemblies that are critical to manufacturing our products and/or our testing and operations processes due to unique component designs as well as specialized quality and performance requirements. This reliance involves several risks, including:

- The inability to obtain an adequate supply of required components;
- Quality and reliability problems with components, which in turn adversely affects our products' quality and reliability;
- Prohibitively higher component prices due to the imposition of tariffs;
- Supply chain disruptions, including as a result of the relocation of our low-cost and sole and limited source suppliers to less-developed countries, such as the movement of some suppliers from China to the Philippines or Vietnam;
- Reduced control over pricing and timing of delivery of components;
- The inability of our suppliers to develop technologically advanced products to support our growth and development of new products;
- The unavailability of service and/or spare parts for critical capital equipment; and
- The inability or unwillingness of our suppliers to continue to offer supplies or services on commercially acceptable terms.

We may not be able to obtain and qualify alternative sources of these components on favorable terms, on a timely basis, or at all, because there are a limited number of suppliers. The use of alternative sources could also require us to redesign our products, resulting in increased costs, likely shipping delays and the potential need to requalify products with customers, particularly those who have "copy exact" requirements. Any inability to redesign our products could result in further costs and shipping delays. Increased costs would decrease our profit margins if we could not pass the costs to our customers. Further, shipping delays could damage our relationships with customers and have a material adverse effect on our business and operating results.

Our failure to successfully manage the transition of certain of our products to other manufacturing locations and/or to contract manufacturers would likely harm our business, financial condition and operating results.

As part of our continuous cost-reduction efforts, we continue to relocate the manufacture of certain of our existing product lines and subassemblies to, and initiate the manufacture of certain new products in, our facilities in China, Israel, Romania and Singapore, as well as to our significant subcontracted operations in Mexico and selected contract manufacturers in Asia. In the future, we may expand the level of manufacturing, administrative and certain other operations that we move to other global locations to take advantage of cost efficiencies available to us in those locations. However, we may not achieve the significant cost savings or other benefits that we anticipate from moving manufacturing and other operations, and costs may increase as development and manufacturing expertise increase and labor, material, shipping and facility-related costs rise, as we have seen in our manufacturing locations in China. If these costs increase to the extent that we no longer realize suitable gross margins from our products manufactured in these countries, we may need to relocate the manufacture of these products to other lower-cost regions. Additionally, if we are unable to successfully manage the relocation, initiation or oversight of the manufacture of these products, our business, financial condition and operating results would be harmed.

In particular, transferring product lines to other manufacturing locations and/or to our contract manufacturers' facilities often requires us to transplant complex manufacturing equipment and processes across a large geographical distance and to train a completely new workforce concerning the use of this equipment and these processes. In addition, certain of our customers may require the requalification of products supplied to them in connection with the relocation of manufacturing operations. If we are unable to manage these transfers and training smoothly and comprehensively, or if we are unable to requalify products in a timely manner, we could suffer manufacturing and supply chain delays, excessive product defects, harm to our operating results and our reputation with our customers, and loss of customers. Further, the utilization of overseas manufacturing locations and contract manufacturers may require additional customs tariffs or may require export licenses, which may be difficult or costly to obtain.

Additionally, qualifying contract manufacturers and commencing volume production is expensive and time-consuming, and there is no guarantee we will continue to do so successfully. Further, our reliance on contract manufacturers reduces our control over the assembly process, quality assurance, production costs and material and component supply for our products. If we fail to manage our relationships with our contract manufacturers, or if any of our contract manufacturers experience financial difficulty, or delays, disruptions, capacity constraints or quality control problems in their operations, our ability to ship products to our customers could be impaired and our competitive position and reputation could be harmed. Further, if we or our contract manufacturers are unable to negotiate with suppliers for reduced material or component costs, our operating results could be harmed.

In addition, our contract manufacturers may terminate our agreements with them upon prior notice to us or immediately for reasons such as if we become insolvent, or if we fail to perform a material obligation under the agreements. If we are required to change contract manufacturers or assume internal manufacturing operations for any reason, including the termination of one of our contract manufacturing contracts, we will likely suffer manufacturing and shipping delays, lost sales, increased costs and damage to our customer relationships, any of which would harm our business, financial condition and operating results.

Our products could contain defects, which would increase our costs and seriously harm our business, financial condition, operating results and customer relationships.

Many of our products are inherently complex in design and, in some cases, require extensive customization and/or ongoing regular maintenance. Further, the manufacture of these products often involves a highly complex and precise process and the utilization of specially qualified components that conform to stringent specifications. Many of our products also require highly skilled labor. As a result of the technical complexity of these products, design defects, skilled labor turnover, changes in our or our suppliers' manufacturing processes or the inadvertent use of defective or nonconforming materials by us or our suppliers could adversely affect our manufacturing yields and product reliability. This could in turn harm our business, operating results, financial condition and customer relationships.

We provide warranties for our products, and we accrue allowances for estimated warranty costs at the time we recognize revenue for the sale of the products. The determination of such allowances requires us to make estimates of product return rates and expected costs to repair or replace the products under warranty. We establish warranty reserves based on historical warranty costs for our products. If actual return rates or repair and replacement costs differ significantly from our estimates, our operating results would be negatively impacted.

Our customers may discover defects in our products after the products have been fully deployed and operated under peak stress conditions. In addition, some of our products are combined with products from other suppliers, which may contain defects. Further, some of our customers use our products in ways other than their intended purpose. As a result, should problems occur, it may be difficult to identify the source of the problem. If we are unable to promptly identify and fix defects or other problems, we could experience, among other things:

- Loss of customers;
- Increased costs of product returns and warranty expenses;
- Increased costs required to analyze and mitigate the defects or problems;
- Damage to our reputation;
- Failure to attract new customers or achieve market acceptance;
- Diversion of development, engineering and service resources; and/or
- Legal action by our customers.

The occurrence of any of these factors could seriously harm our business, financial condition and operating results.

We outsource a number of services to third-party service providers, which decreases our control over the performance of these functions. Disruptions or delays at our third-party service providers could adversely impact our operations.

We outsource a number of services, including certain information technology systems management, logistics functions, contract manufacturing and accounting functions, to third-party service providers. While outsourcing arrangements may lower our cost of operations, they also reduce our direct control over the services rendered. This diminished control may have an adverse effect on the quality or quantity of services rendered, on our ability to quickly respond to changing market conditions, or on our ability to ensure compliance with all applicable domestic and foreign laws and regulations. If we do not effectively develop and manage our outsourcing strategies, if required export and other governmental approvals are not timely obtained, if our third-party service providers do not perform as anticipated, or do not adequately protect our data from cyber-related security breaches, or if there are delays or difficulties in enhancing business processes, we may experience operational difficulties (such as limitations on our ability to pay suppliers in a timely manner), increased costs, manufacturing or service interruptions or delays, loss of intellectual property rights or other sensitive data, quality and compliance issues, and challenges in managing our product inventory or recording and reporting financial and management information, any of which could materially and adversely affect our business, financial condition and operating results.

The loss of net revenues from any one of our major customers would likely have a material adverse effect on us.

Our top ten customers accounted for approximately 47%, 44% and 33% of our net revenues for 2021, 2020 and 2019, respectively. Our top two customers, Lam Research Corporation and Applied Materials, Inc., together accounted for approximately 27%, 24% and 18% of net revenues for the years 2021, 2020 and 2019, respectively. In any one reporting period, a single customer or several customers may contribute even a larger percentage of our consolidated net revenues. Further, our Equipment & Solutions Division also depends on a few significant customers for a large portion of its revenue in any given quarter. The loss of a major customer or any significant reduction in orders by these customers, including reductions due to market or competitive conditions, would likely have a material adverse effect on our business, financial condition and operating results. None of our significant customers has entered into an agreement with us requiring it to purchase any minimum quantity of our products.

Attempts to lessen the adverse effect of any loss or reduction of net revenues through the rapid addition of new customers would be difficult because a relatively small number of companies dominate the semiconductor and electronics manufacturing industries. Further, prospective customers typically require lengthy qualification periods prior to placing volume orders with a new supplier. Our future success will continue to depend upon:

- Our ability to maintain relationships with existing key customers;
- Our ability to attract new customers and satisfy any required qualification periods;
- Our ability to introduce new products in a timely manner for existing and new customers;
- The successes of our original equipment manufacturing (“OEM”) customers in creating demand for their capital equipment products that incorporate our products; and
- Our ability to gain significant customers in new, emerging segments of our markets.

Key personnel may be difficult to attract and retain.

Our ability to maintain and grow our business is directly related to the service of our employees in each area of our business, as we consider talent to be a significant asset. Our performance is directly tied to our ability to hire, train, motivate and retain qualified personnel, including highly skilled technical, financial, managerial, and sales and marketing personnel. There is significant competition for personnel in the technology marketplace, particularly in certain geographies where we are located, including the Boston area, the Orange County, California area, the San Francisco Bay area, China, Germany and Singapore. Also, as a result of the COVID-19 pandemic, employees in our industries are increasingly able to work remotely, which could increase employee mobility and turnover, making it more difficult for us to attract and retain employees. In addition, many of our product manufacturing processes and product service require deep technical expertise, and it can be particularly challenging to identify and attract candidates and retain employees possessing such expertise. We have experienced and may continue to experience attrition in certain key positions. A related challenge is that a significant portion of our technical talent is nearing retirement age, and we may have difficulty attracting a sufficient number of employees with the necessary skills to replace them. If we are unable to hire sufficient numbers of qualified employees or retain and motivate existing employees, our business and operating results would be harmed.

Acquisition Risks

As part of our business strategy, we have entered into and may continue to pursue business combinations and acquisitions that may be difficult to identify and complete, challenging and costly to integrate, disruptive to our business and our management, and/or dilutive to stockholder value.

As a part of our business strategy, we have entered into and continue to pursue business combinations and acquisitions. In particular, the acquisitions of Newport Corporation (“Newport”) in April 2016 and Electro Scientific Industries, Inc. (“ESI”) in February 2019 significantly increased our size, including with respect to net revenues, product offerings, and/or number of employees and facilities. Our ability to successfully identify suitable acquisition targets, complete acquisitions on acceptable terms, and efficiently and effectively integrate our acquired businesses is critical to our growth. We may not be able to identify target companies that meet our strategic objectives or successfully negotiate and complete acquisitions with companies we have identified on acceptable terms. Further, we may incur significant expense in pursuing acquisitions that cannot be completed, or are significantly delayed, due to regulatory or other restrictions. Additionally, our credit facilities only permit us to make acquisitions under certain circumstances, and also restrict our ability to incur additional indebtedness in certain circumstances. We may not realize the benefits we anticipate from these acquisitions, including our pending acquisition of Atotech, because of significant challenges, such as:

- The difficulty, distraction, resource requirements, cost and disruption of integrating the operations, technology and personnel of the acquired companies;
- The potential disruption of our ongoing business and distraction of management;
- Possible internal control or other compliance weaknesses of the acquired companies;
- Significant expenses related to the acquisitions, including any resulting shareholder litigation;
- The assumption of unknown or contingent liabilities associated with acquired businesses;
- The potential to incur or record significant cash or non-cash charges or write down the carrying value of intangible assets and goodwill obtained in the acquisitions, which could adversely impact our cash flow or lower our earnings in the period or periods for which we incur such charges or write down such assets;
- Potentially incompatible cultural differences between the two companies;
- Incorporating the acquired companies’ technology and products into our current and future product lines, and successfully generating market demand for these expanded product lines;
- Potential additional geographic dispersion of operations;
- The difficulty in achieving anticipated synergies and efficiencies;
- The difficulty in leveraging the acquired companies’ and our combined technologies and capabilities across our product lines and customer base;
- Burdensome requirements or conditions imposed by government regulators in connection with their review of acquisitions, including divestitures and restrictions on the conduct of our business or the business of the acquired companies;
- Potential sales disruptions as a result of integrating the acquired companies’ sales channels with our sales channels;
- and
- Our ability to retain key customers, suppliers and employees of the acquired companies.

We may also face competitive disadvantages by selling products that are new to us and/or selling products in markets and geographies that are new to us. In addition, if we are not successful in completing acquisitions or integrating acquired

businesses, we may be required to re-evaluate our growth strategy. We may incur substantial expenses and devote significant management time and resources to complete acquisitions that may not generate the financial results we planned to achieve.

In particular, we continue to experience some significant risks associated with the acquisition of ESI (the “ESI Merger”), including our ability to retain key personnel and to realize the anticipated growth in net revenues from the acquired business, as well as the potential to incur or record significant cash or non-cash charges or write down the carrying value of intangible assets and goodwill obtained in the ESI Merger, which could adversely impact our cash flow or lower our earnings in the period or periods for which we incur such charges or write down such assets.

In addition, we could use substantial portions of our available cash for all or a portion of the purchase price of future acquisitions. We could also issue additional securities as consideration for or to finance these acquisitions, which could cause significant stockholder dilution, or obtain additional debt financing, which would increase our costs, reduce our future cash flow and subject us to covenants and other restrictions that may impede our ability to manage our operations, without achieving the desired accretion to our business.

As a result of our previous acquisitions, we have several different decentralized operating and accounting systems. We will need to continue to modify our accounting policies, internal controls, procedures and compliance programs to provide consistency across all of our operations. In order to increase efficiency and operating effectiveness and improve corporate visibility into our decentralized operations, we continue to review opportunities to integrate Enterprise Resource Planning systems where practical. Any future implementations may risk potential disruption of our operations during the conversion periods and the implementations could require significantly more management time and higher implementation costs than currently estimated.

Financial Risks

The terms of our Term Loan Facility and ABL Facility impose significant financial obligations and risks upon us, limit our ability to take certain actions, and could discourage a change in control.

The total outstanding principal balance of our Term Loan Facility, as defined and as described further in Item 7 of this Annual Report on Form 10-K, at December 31, 2021 was \$824 million. Our ABL Facility, as defined and as described further in Item 7 of this Annual Report on Form 10-K, provides us with a senior secured asset-based revolving credit facility of up to \$100 million, subject to a borrowing base limitation. We have not borrowed against our ABL Facility to date.

A significant portion of the amount outstanding under the Term Loan Facility bears interest at a variable interest rate. Although we hedge some of the variable interest rate exposure, if interest rates increase, variable rate debt will create higher debt service requirements, which would adversely affect our cash flows. In addition, our credit ratings could affect the cost and availability of future borrowings and, accordingly, our cost of capital. Our ratings of our indebtedness reflect each nationally recognized statistical rating organization’s opinion of our financial strength, operating performance and ability to meet our debt obligations. We cannot make any assurances that we will achieve or maintain a particular rating in the future. Moreover, we may be required to raise substantial additional financing to fund working capital, capital expenditures, acquisitions or other general corporate requirements. Our ability to obtain additional financing or refinancing will depend on, among other factors, our financial position and performance, as well as prevailing market conditions and other factors beyond our control. We cannot make any assurances that we will be able to obtain additional financing or refinancing on terms acceptable to us or at all.

Our Term Loan Facility and ABL Facility contain several negative covenants that, among other things and subject to certain exceptions, restrict our ability and/or our subsidiaries’ ability to:

- Incur additional indebtedness;
- Pay certain dividends on our capital stock or redeem, repurchase or retire certain capital stock or certain other indebtedness;
- Make certain investments, loans and acquisitions;
- Engage in certain transactions with our affiliates;
- Sell assets, including capital stock of our subsidiaries;
- Materially alter the business we conduct;
- Consolidate or merge;
- Incur liens; and
- Engage in sale-leaseback transactions.

These restrictions on our ability to engage in or benefit from these actions limit our flexibility in planning for, or reacting to, changes in and opportunities for our business, such as limiting our ability to engage in mergers and acquisitions. This could place us at a competitive disadvantage. If the matters described in our other risk factors result in a material adverse effect on our business, financial condition or operating results, we may be unable to comply with the terms of our credit facilities or experience an event of default.

Our Term Loan Facility and ABL Facility contain customary events of default, including:

- Failure to make required payments;
- Failure to comply with certain agreements or covenants;
- Materially breaching any representation or warranty;
- Failure to pay, or cause acceleration of, certain other indebtedness;
- Certain events of bankruptcy and insolvency;
- Failure to pay certain judgments; and
- A change in control of us.

The amount of cash available to us for repayment of amounts owed under these credit facilities will depend on our usage of our existing cash balances and our operating performance and ability to generate cash flow from operations, which will be subject to financial, business and other factors affecting our operations, many of which are beyond our control. We cannot provide any assurances that we will generate sufficient cash flow from operations to service our debt obligations. Any failure to repay these obligations as they become due would result in an event of default under the credit facilities.

If an event of default occurs, the lenders may end their obligation to make loans to us under the credit facilities and may declare any outstanding indebtedness under these credit facilities immediately due and payable. In such case, we would need to obtain additional financing or significantly deplete our available cash, or both, to repay this indebtedness. Any additional financing may not be available on reasonable terms or at all, and significant depletion of our available cash would harm our ability to fund our operations or execute our broader corporate objectives. If we were unable to repay outstanding indebtedness following an event of default, then in addition to other available rights and remedies, the lenders could initiate foreclosure proceedings on substantially all of our assets. Any such foreclosure proceedings or other rights and remedies successfully implemented by the lenders in an event of default would have a material adverse effect on our business, financial condition and operating results.

Further, because a change in control of us constitutes an event of default under these credit facilities, this may be a deterrent to some potential acquirers, as it would likely require an acquirer to repay any outstanding borrowings under these credit facilities.

In addition, each of our Term Loan Facility and ABL Facility, each as amended, uses London Interbank Offered Rate (“LIBOR”) as a reference rate, such that the interest due pursuant to such loans may be calculated using LIBOR (subject to a stated minimum value). On July 27, 2017, the United Kingdom’s Financial Conduct Authority, which regulates LIBOR, announced that it desired to phase out LIBOR by the end of 2021. On November 30, 2020, the ICE Benchmark Administration Limited, which administers LIBOR, announced that it planned to consult on ceasing publication of LIBOR on December 31, 2021 for the one week and two month LIBOR tenors (for which publication has now ceased), and on June 30, 2023 for all other LIBOR tenors, including the LIBOR tenor that we use. In light of these announcements, the future of LIBOR at this time is uncertain and any changes in the methods by which LIBOR is determined or regulatory activity related to LIBOR’s phaseout could cause LIBOR to perform differently than in the past or cease to exist. The Alternative Reference Rates Committee selected the Secured Overnight Financing Rate (“SOFR”), a new index calculated by reference to short-term repurchase agreements backed by Treasury securities as determined by the Federal Reserve System, as its preferred replacement for U.S. dollar LIBOR. Prior to the phase-out of LIBOR, we expect to reach agreement with our lenders on an amendment to our Term Loan Facility and ABL Facility to use SOFR in lieu of LIBOR. We do not expect a significant change to the effective interest rate on our borrowing as a result of any replacement reference rate. Whether SOFR attains market acceptance as a LIBOR replacement tool is uncertain. In the event we are unable to reach agreement on a replacement reference rate, the term loans outstanding under our Term Loan Facility and any revolving loans borrowed under our ABL Facility from time to time using LIBOR as a reference rate will convert to the base rate, which could result in higher interest rates on these term loans and any such revolving loans.

A material amount of our assets represents goodwill and intangible assets, and our net income would be reduced if our goodwill or intangible assets become impaired.

As of December 31, 2021, our goodwill and intangible assets, net, represented approximately \$1.8 billion, or 40% of our total assets. Goodwill is generated in our acquisitions when the cost of an acquisition exceeds the fair value of the net tangible and identifiable intangible assets we acquire. For example, as a result of the ESI Merger, we added approximately \$474 million of additional goodwill and intangible assets. Goodwill and indefinite-lived intangible assets are subject to an impairment analysis at least annually based on the fair value of the reporting unit. Intangible assets relate primarily to the developed technologies, customer relationships and patents and trademarks acquired by us as part of our acquisitions of other companies and are subject to an impairment analysis whenever events or changes in circumstances exist that indicate that the carrying value of the intangible asset might not be recoverable. We will continue to monitor and evaluate the carrying value of goodwill and intangible assets. If market and economic conditions or business performance deteriorate, the likelihood that we would record an impairment charge would increase, which impairment charge could materially and adversely affect our financial condition and operating results.

Legal, Tax, Regulatory and Compliance Risks

If significant tariffs or other trade restrictions on our products or components that are imported from or exported to China continue or are increased, our business, financial condition and operating results may be materially harmed.

Trade tensions between the United States and China have increased substantially in recent years, resulting in significant tariff increases, additional sanctions against specified entities, and the broadening of restrictions and license requirements for specified uses of those of our products that are subject to these restrictions, including restrictions surrounding specific product groups, applications and/or end uses. U.S. Government concerns relate to, among other things, national security concerns and the concept of ‘military/civil fusion’ in China - a national strategy wherein military technologies are developed or produced alongside commercial, non-military items, often by private or quasi-government companies. In addition to targeted comprehensive sanctions against specific firms, in recent years, “Entity List” designations and “military end-user” controls have been significantly modified, as were some rules relating to items produced outside the United States that incorporate more than de minimis levels of U.S. controlled content or derived from (i.e., the “direct product” of) U.S. origin technologies. These regulations have resulted in additional export license requirements on shipments of our products, parts and supplies, loss of business and increased administrative burdens. While we have adjusted our practices to ensure continued compliance with these regulations, and we will seek to mitigate their impact, there can be no assurances that current or future regulations and tariffs will not have a material adverse effect on our business.

Since the beginning of 2019, the pace at which regulatory changes have been implemented has been extraordinarily high, which increases the resources needed to monitor and comply with the regulation, while heightening the risk of non-compliance. Between May 2019 and August 2020, the U.S. Department of Commerce’s Bureau of Industry and Security (“BIS”) added China-based Huawei Technologies Co., Ltd. (“Huawei”) and a total of 152 of its affiliates onto its Entity List, thereby requiring an export license for the sale of U.S. items to Huawei. In May 2020, BIS also modified the Foreign Direct Product rule to further restrict Huawei’s ability to directly or indirectly source U.S. origin items, and then modified the existing “military end-use” rule, expanding the scope of products and technologies that would require licenses for military end-uses, primarily in China. BIS further named 103 specific companies as “military end users” (mostly in China). In December 2020, Hong Kong lost its favorable trade status and BIS added Semiconductor Manufacturing International Corporation (“SMIC”) and ten of its affiliates, along with 66 other companies to the Entity List. BIS continues to add Chinese-based companies onto its Entity List. Accordingly, we have implemented additional monitoring processes and suspended orders from Huawei, SMIC and certain other designated Chinese-based customers where subject to U.S. jurisdiction. We have also been negatively impacted by the cancellation of orders from customers who are suppliers to these firms.

In addition, China has adopted, and announced its intention to further adopt, new regulations, which could have an adverse effect on our operations. For example, in response to the imposition of U.S. tariffs in 2018 and 2019, China imposed its own retaliatory tariffs. In May 2019, China’s Ministry of Commerce announced an “unreliable entity list” under which non-Chinese entities that cut off suppliers to Chinese companies may be subject to government action. In September 2020, it disclosed potential enforcement mechanisms in the form of an “Unreliable Entity List.” This regulation has yet to be implemented, and its effects are unknown at this time.

The ongoing geopolitical and economic uncertainty between the United States and China caused by recent tariffs, Entity List and “military end user” designations, and foreign-made product rules, and the unknown impact of current and future Chinese trade regulations, may continue to cause increased costs, as well as restrictions on our ability to sell, or a decreased demand from customers to purchase, our products, directly and indirectly, which could materially harm our business, financial condition and operating results. This trade uncertainty has caused, and may continue to cause, customers to delay or cancel

orders, as they limit expenditures that could be affected by future actions and evaluate ways to mitigate their own tariff and cost exposure by sourcing from locally-based suppliers or suppliers based in other countries. Such delays and cancellations could have a material impact on our business, financial condition and operating results. It is possible that additional restrictions on trade will be imposed, and that existing tariffs will be increased on imports of our products or the components used in our products and/or that our business will be impacted by additional retaliatory tariffs or restrictions imposed and/or increased by China or other countries in response to existing or future tariffs, causing us to potentially lose additional sales and customers, incur increased costs and lower margins, seek alternative suppliers, raise prices or make changes to our operations, any of which could materially harm our business, financial condition and operating results.

We are subject to international trade compliance regulations, and violations of those regulations could result in fines or trade restrictions, which could have a material adverse effect on us.

We are subject to trade compliance laws in both the United States and other jurisdictions where we operate. For example, exports of our products and technology developed or manufactured in the United States are subject to export controls imposed by the U.S. Government and administered by the U.S. Departments of Commerce and, to a lesser extent, State and Treasury. Export regulations govern exports of our products and technology developed or manufactured in other countries, including, for example, Austria, China, France, Germany, Israel, Romania and Singapore. In certain instances, these regulations may require obtaining licenses from the administering agency prior to exporting products or technology to international locations or foreign nationals, including foreign nationals employed by us in the United States and abroad. For products and technology subject to the U.S. Export Administration Regulations administered by BIS, the requirement for a license is dependent on the type and end use of the product and technology, the final destination and the identity and nationality of the end user. Virtually all exports from the United States of defense articles subject to the International Traffic in Arms Regulations, administered by the Department of State's Directorate of Defense Trade Controls, require a license. The Israeli Ministry of Economy and the Defense Export Control Agency of the Israeli Ministry of Defense administer similar export regulations and license requirements, which apply to many of our products and technology developed or manufactured in Israel. In addition, the Romanian Ministry of Foreign Affairs and the Department for Export Controls administer similar export regulations and license requirements, which apply to many of our products and technology developed or manufactured in Romania. Obtaining export licenses can be difficult and time-consuming, and we may not be successful in obtaining them. Failure to obtain export licenses to enable product and technology exports could reduce our net revenues, harm our relationships with our customers and could adversely affect our business, financial condition and operating results. Compliance with export regulations may also subject us to additional fees and costs. The absence of comparable export restrictions on competitors, whether due to technical specifications or the competitor's geography, may adversely affect our competitive position. In addition, if we or our international representatives or distributors fail to comply with any of these export regulations, we or they could be subject to civil and criminal and monetary and non-monetary penalties and costly consent decrees, and we could experience disruptions to our business, restrictions on our ability to export products and technology, damage to our reputation and significant harm to our business and operating results. While we have implemented policies and procedures to comply with these laws, we cannot be certain that our employees, contractors, suppliers or agents will not violate such laws or our policies.

Changes in tax rates or tax regulation or the termination of tax incentives could affect our operating results.

As a global company, we are subject to taxation in the United States and various other countries. Significant judgment is required to determine and estimate worldwide tax liabilities. Our future annual and quarterly effective tax rates could be affected by numerous factors, including changes in the applicable tax laws; composition of pre-tax income in countries with differing tax rates; our determinations of tax liabilities; and/or valuation of our deferred tax assets and liabilities.

The enactment of the Tax Cuts and Jobs Act (the "TCJA") in December 2017 significantly affected U.S. tax law by changing how the United States imposes tax on multinational corporations. The U.S. Department of Treasury has broad authority under the TCJA to issue regulations and interpretive guidance. Some of the proposed and final regulations that have been issued regarding the TCJA have been challenged in court. We have applied available guidance to estimate our tax obligations, but new guidance issued by the U.S. Treasury Department may cause us to adjust our tax estimates in future periods. The ultimate impact of the TCJA on our U.S. tax liabilities is based upon our understanding and interpretation of the regulatory guidance that has been issued regarding the TCJA. A new administration took office in January 2021. As a result of the new administration and the change in control of the U.S. Senate in 2021, additional tax legislation may be enacted, which could reverse provisions of the TCJA or make other changes impacting our tax liabilities.

On October 4, 2021, 136 members of the Organization for Economic Co-operation and Development ("OECD") agreed to a global minimum tax rate of 15%. On December 20, 2021, OECD published its model rules on the agreed minimum tax known as the Global Anti-Base Erosion ("GloBE") rules. The GloBE rules provide a framework for a coordinated multi-country system of taxation intended to ensure large multinational enterprise groups pay a minimum level of tax on the income

arising in each of the jurisdictions where they operate. Individual country legislation is expected in 2022 and the expected effective date of such legislation is in 2023.

Additionally, on November 19, 2021, the U.S. House of Representatives approved the Build Back Better Act (the “BBBA”). The BBBA contains proposed corporate and international tax reforms, including a 15% minimum tax on the adjusted financial statement income of certain large corporations, a 1% interest excise tax on certain publicly traded corporations that buy back stock from their shareholders and additional limitations on the deduction for business interest, among other tax provisions. This version of the bill has not been approved by the U.S. Senate. In the event that the GloBE rules are implemented and/or the BBBA or similar legislation is enacted, we could be subject to an increase in our effective tax rate, which would adversely impact our financial results.

We are subject to regular examination by the U.S. Internal Revenue Service and state, local and foreign tax authorities. We regularly assess the likelihood of favorable or unfavorable outcomes resulting from these examinations to determine the adequacy of our provision for income taxes. Although we believe our tax estimates are reasonable, we can make no assurances that any final determination of tax liability will not be materially different from the treatment reflected in our historical income tax provisions and accruals, which could materially and adversely affect our financial condition and operating results.

In certain foreign jurisdictions, we qualify for tax incentives and tax holidays based on our ability to meet, on a continuing basis, various tests relating to our employment levels, research and development expenditures and other qualification requirements in a particular foreign jurisdiction. While we intend to operate in such a manner to maintain and maximize our tax incentives, we can make no assurances that we have so qualified or that we will so qualify for any particular year or jurisdiction. If we fail to qualify or remain qualified for certain foreign tax incentives and tax holidays, the tax incentives we previously received may be terminated and/or retroactively revoked, requiring repayment of past tax benefits, and we would be subject to an increase in our effective tax rate, which would adversely impact our financial results.

We are subject to environmental regulations. If we fail to comply with these regulations, our business could be harmed.

Our operations are subject to various federal, state, local and international laws and regulations relating to environmental protection, including those governing discharges of pollutants into the air and water, the management and disposal of hazardous substances and waste and the cleanup of contaminated sites. In the United States, we are subject to the federal regulation and control of the Environmental Protection Agency (“EPA”), and we are subject to regulations and controls of comparable authorities in other countries. Some of our operations require environmental permits and controls to prevent and reduce air and water pollution, and these permits are subject to modification, renewal and revocation by issuing authorities. Future developments, administrative actions or liabilities relating to environmental matters could have a material adverse effect on our business, financial condition or operating results.

Although we believe that our safety procedures for using, handling, storing and disposing of such materials comply with the standards required by applicable federal, state, local and international laws and regulations, we cannot completely eliminate the risk of accidental contamination or injury from these materials. We have been, and may in the future be, subject to claims by employees or third parties alleging contamination or injury, and could be liable for damages, which liability could exceed the amount of our liability insurance coverage (if any) and the resources of our business.

Certain portions of the soil at the former facility of our Spectra-Physics lasers business, located in Mountain View, California, and certain portions of the aquifer surrounding the facility, through which contaminated groundwater flows, are part of an EPA-designated Superfund site and are subject to a cleanup and abatement order from the California Regional Water Quality Control Board. Spectra-Physics, which we acquired as part of the Newport acquisition in April 2016 and which had been acquired by Newport in 2004, along with other entities with facilities located near the Mountain View, California facility, were identified as responsible parties with respect to this Superfund site, due to releases of hazardous substances during the 1960s, 1970s and 1980s. Spectra-Physics and the other responsible parties entered into cost-sharing agreements covering the costs of remediating the off-site groundwater impact. The site is mature, and investigations, monitoring and remediation efforts by the responsible parties have been ongoing for approximately 30 years.

We have certain ongoing costs related to investigation, monitoring and remediation of the site that have not been material to us as a whole in the recent past. However, while we benefitted from the indemnification of certain costs by a third party in the past, that indemnification is now in a transition period, and we will become subject to a greater portion of costs of remediation going forward. Our ultimate costs of remediation and other potential liabilities are difficult to predict. In the event that the EPA and the California Regional Water Quality Control Board determine that the site cleanup requires additional measures to ensure that it meets current standards for environmental contamination, or if they enhance any of the applicable required standards, we will likely become subject to additional remediation obligations in the future. In addition to our investigation, monitoring and remediation obligations, we may be liable for property damage or personal injury claims relating

to this site. While we are not aware of any material claims at this time, such claims could be made against us in the future. If significant costs or other liability relating to this site arise in the future, our business, financial condition and operating results would be adversely affected.

The environmental regulations that we are subject to include a variety of federal, state, local and international regulations that restrict the use and disposal of materials used in the manufacture of our products or require design changes or recycling of our products. If we fail to comply with any present or future regulations, we could be subject to future liabilities, the suspension of manufacturing or a prohibition on the sale of products we manufacture. In addition, these regulations could restrict our ability to equip our facilities or could require us to acquire costly equipment, or to incur other significant expenses to comply with environmental regulations, including expenses associated with the recall of any non-compliant product and the management of historical waste. For example, the European Union (“EU”) has enacted the Restriction on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive, which regulates the use of certain hazardous substances in certain products, and the Waste Electrical and Electronic Equipment Directive, which requires the collection, reuse and recycling of waste from certain products. Compliance with such laws requires significant resources. These regulations may require us to redesign our products or source alternative components to ensure compliance with applicable requirements, for example by mandating the use of different types of materials in certain components. Any such redesign or alternative sourcing may increase the cost of our products, adversely impact the performance of our products, add greater testing lead-times for product introductions, or in some cases limit the markets for certain products. Further, such environmental laws are frequently amended, which increases the cost and complexity of compliance. For example, such amendments have in the past, and may in the future, result in certain of our products falling in the scope of a directive, even if they were initially exempt. In addition, certain of our customers, particularly OEM customers whose end products may be subject to these directives, may require that the products we supply to them comply with these directives, even if not mandated by law. Because certain directives, for example, those issued from the EU, are implemented in individual member states, compliance is particularly challenging. Our failure to comply with any of such regulatory requirements or contractual obligations could result in our being directly or indirectly liable for costs, fines or penalties and third-party claims, and could jeopardize our ability to conduct business in certain countries.

We are exposed to various risks related to legal proceedings, including product liability claims, intellectual property infringement claims, contractual claims and securities class action litigation, which if successful, could have a material adverse effect on our commercial relationships, business, financial condition and operating results.

From time to time, we may be involved in legal proceedings, enforcement actions or claims regarding product performance, product warranty, product certification, product liability, patent infringement, misappropriation of trade secrets, other intellectual property rights, antitrust, environmental regulations, securities, contracts, unfair competition, employment, workplace safety, and other matters. We can provide no assurance of the outcome of these legal proceedings, enforcement actions or claims or that the insurance we maintain will be adequate to cover them.

For example, some of our products, such as certain ultrafast lasers, are used in medical and scientific research applications where malfunctions could result in serious injury. In addition, certain of our products may be hazardous if not operated properly or if defective. We are exposed to significant risks for product liability claims in the event of a significant line down situation or if death, personal injury or property damage results from the use of our products. We may experience material product liability losses in the future. We currently maintain insurance for certain product liability claims. However, our insurance coverage may not continue to be available on acceptable terms, if at all. This insurance coverage also may not adequately cover liabilities that we incur. Further, if our products are defective, we may be required to recall or redesign these products. A successful claim against us that exceeds our insurance coverage level or that is not covered by insurance, or any product recall, could have a material adverse effect on our commercial relationships, business, financial condition and operating results.

In addition, securities class action lawsuits and derivative lawsuits are often brought against companies who have entered into business combinations and acquisitions. We are currently involved in securities class action litigation in connection with the acquisition of Newport and previously were involved in a securities class action litigation in connection with the acquisition of ESI. In each case, the plaintiffs alleged, among other things, that the then-current directors of the acquired company breached their fiduciary duties to their respective shareholders by agreeing to sell the company through an inadequate and unfair process, leading to inadequate and unfair consideration, by agreeing to unfair deal protection devices, and by omitting material information from the proxy statement. We, or the companies we acquire, may be subject to additional securities class action litigation in connection with future business combinations and acquisitions.

Regardless of the outcome, securities class action litigation such as this can be time-consuming, result in significant expense to us and divert attention and resources of our management and other key employees. Costs and expenses, or an

unfavorable outcome in such cases, could exceed applicable insurance coverage, if any. Any such unfavorable outcome could have a material adverse effect on our business, financial condition, operating results and cash flows.

With respect to our intellectual property, we have from time to time received claims from third parties alleging that we are infringing certain trademarks, patents or other intellectual property rights held by them. Such infringement claims have in the past and may in the future result in litigation or enforcement action. Any such action could be protracted and costly, and we could become subject to damages for infringement, or to an injunction preventing us from making, selling or using certain of our products or services, or using certain of our trademarks. Such claims could also result in the necessity of obtaining a license or paying damages relating to one or more of our products, services or current or future technologies, which may not be available on commercially reasonable terms or at all. Any intellectual property action and the failure to obtain necessary licenses or other rights or develop substitute technology may divert management's attention from other matters and could have a material adverse effect on our business, financial condition and operating results. In addition, the terms of some of our customer contracts require us to indemnify the customer for any claim of infringement brought by a third party based on our products. Claims of this kind may have a material adverse effect on our business, financial condition or operating results.

Although our standard commercial documentation sets forth the terms and conditions that we intend to apply to commercial transactions with our business partners, counterparties to these transactions may not explicitly agree to our terms and conditions. In situations where we engage in business with a third party without an explicit written agreement regarding the applicable terms and conditions, or where the commercial documentation applicable to the transaction is subject to interpretation, we may have disputes with those third parties regarding the applicable terms and conditions of our transaction with them. These disputes could result in deterioration of commercial relationships, costly and time-consuming litigation or additional concessions or obligations being offered by us to resolve these disputes, or could impact our net revenue or cost recognition. Any of these outcomes could materially and adversely affect our business, financial condition and operating results.

In addition, from time to time in the normal course of business we indemnify parties with whom we enter into contractual relationships, including customers, suppliers, consultants and lessors, with respect to certain matters. We have agreed, under certain conditions, to hold these parties harmless against specified losses, such as those arising from a breach of representations or covenants, negligence or willful misconduct, and other third-party claims that our products and/or technologies infringe intellectual property rights. We may be compelled to enter into or accrue for probable settlements of alleged indemnification obligations, or we may be subject to potential liability arising from our customers' involvement in legal disputes. In addition, notwithstanding the provisions related to limitations on our liability that we seek to include in our business agreements, the counterparties to such agreements may dispute our interpretation or application of such provisions, and a court of law may not interpret or apply such provisions in our favor, any of which could result in an obligation for us to pay significant additional damages and engage in costly legal proceedings. It is difficult to determine the maximum potential amount of liability under any indemnification obligations, whether or not asserted, due to the unique facts and circumstances likely to be involved in any particular claim. Our business, financial condition and operating results in a reported fiscal period could be materially and adversely affected if we expend significant amounts in defending or settling any asserted claims, regardless of their merit or outcomes.

Legal proceedings, enforcement actions and claims, whether with or without merit, and associated internal investigations, may be time-consuming and expensive to prosecute, defend or conduct; divert management's attention and other resources; inhibit our ability to sell our products or services; result in adverse judgments for damages, injunctive relief, penalties and fines; and negatively affect our business. We can make no assurances regarding the outcome of current or future legal proceedings, enforcement actions, claims or investigations or that the insurance we maintain will be adequate to cover them.

Risks Related to Cybersecurity, Data Privacy and Intellectual Property Protection

We are exposed to risks related to cybersecurity threats and incidents and subject to restrictions of and changes in laws and regulations governing data privacy and data protection that could have a material adverse effect on our business.

We rely on various information technology networks and systems, some of which are managed by third parties, to process, transmit and store electronic information and to carry out and support a variety of business activities, including finance and accounting, order management, human resources, communications, manufacturing, research and development, intellectual property, supply chain management, sales and IT, including critical functions such as internet connectivity, network communications, and email. Some of these activities are processed via Software-as-a-Service ("SaaS") products provided by third parties and hosted on their own networks and servers, or third-party networks and servers. The data on such various information technology networks and systems includes confidential information, personally identifiable information, transactional information and intellectual property belonging to us and our employees, customers, suppliers and other business partners.

Like other companies, we are subject to ongoing cybersecurity threats, including hacking, phishing, malware, ransomware, denial of service attacks, and other attacks. These threats may be related to employee error or misuse to sophisticated and targeted attempts by bad actors to gain unauthorized access to information systems. We and our third-party vendors have experienced, and expect to continue to be subject to, cybersecurity threats and incidents, including industry-wide vulnerabilities, such as Log4j, which was reported in December 2021. We cannot guarantee that these and other attacks will not have an impact in the future.

Despite the implementation of a variety of security controls and measures, as well as those of our third-party vendors, there is no assurance that such actions will be sufficient to prevent a cybersecurity incident due to attacks by hackers, employee error or malfeasance, computer viruses, malware and ransomware, telecommunication failures, systems failures, natural disasters, or other catastrophic events. We also face the challenge of supporting our older systems and implementing necessary upgrades. Further, as we transition to using more cloud-based solutions that are dependent on the internet or other networks to operate, we may become a greater target for cyber threats. As cyber threats continue to rapidly evolve and become increasingly more difficult to detect and defend against, our current security controls and measures may not be effective in preventing cybersecurity incidents and we may not have the capabilities to detect certain vulnerabilities. These risks may be further amplified by the increased reliance on remote access to IT systems as a result of use of SaaS software and cloud services as well as employees working remotely in response to the COVID-19 pandemic. Additionally, our merger, acquisition and divestiture activity may also require transitions to or from, and the integration of, various information management systems. Those systems that we acquire or that are used by acquired entities or businesses may also pose security risks of which we are unaware or unable to mitigate, particularly during the transition of these systems.

While we continue to assess and address the implications of existing and new domestic and foreign regulations relating to data privacy, the evolving regulatory landscape presents a number of legal and operational challenges, and our efforts to comply with these regulations may be unsuccessful. For example, regulations in the EU and China have established a prohibition on the transfer of personally identifiable information from their respective countries to other countries whose laws do not protect personal data to an adequate level of privacy or security. While we have utilized certain permitted approaches for transferring personally identifiable information from these countries to the United States, these approaches may be reviewed and invalidated by courts or regulatory bodies and we may be required to ascertain an alternative legal basis for such transfers.

A failure to comply with the ever-changing regulatory landscape, or a breach of our operational or security systems or infrastructure, or those of our customers, suppliers and other business partners, could disrupt our business; result in the disclosure, misuse, corruption or loss of confidential information, including intellectual property, personally identifiable information and other critical data of ours and our employees, customers, suppliers and other business partners; result in competitive disadvantages to the extent the information is competitively sensitive; damage our reputation; affect our relationships with our, employees, customers, suppliers and other business partners, including loss of confidence which could lead to loss of or reduction in orders; decrease the value of our investment in research, development and engineering; adversely affect our business operations including disruption of manufacturing processes; cause losses; result in liability under contracts; result in litigation; result in investigations; require notifications to regulatory authorities and impacted individuals; result in significant penalties and/or fines from regulatory bodies, including privacy laws and export control laws; add to the complexity of our compliance obligations; and increase our cybersecurity protection and remediation costs.

The costs of compliance with, and other burdens imposed by, privacy, cybersecurity, data protection and data localization laws, regulations and policies, including restrictions on marketing activities, could have a material adverse effect on our business, financial condition and operating results. Further, customers and third-party providers increasingly demand rigorous contractual provisions regarding privacy, cybersecurity, data protection, confidentiality, and intellectual property, which may also increase our overall compliance burden.

Although we maintain insurance related to cybersecurity risks, all of these costs, expenses, liability and other matters may not be covered adequately by insurance and may result in an increase in our costs for insurance or insurance not being available to us on economically feasible terms, or at all. Insurers may also deny us coverage as to any future claim. Any of these results could harm our financial condition, business and reputation.

Our proprietary technology is important to the continued success of our business. Our failure to protect this proprietary technology may significantly impair our competitive position.

Our success and ability to compete depend in large part upon protecting our proprietary technology. We rely on a combination of patent, trademark and trade secret protection and other agreements, such as nondisclosure agreements and other contractual agreements with our employees and third parties, to protect our proprietary rights. The steps we have taken may not be sufficient to prevent the misappropriation of our intellectual property, particularly in countries outside the United States, where the laws may not protect our proprietary rights as fully as in the United States. For example, the patent prosecution and

enforcement systems within China, where we have a significant customer base and manufacturing presence, and where we have recently transferred several important laser product lines, are less robust than these systems in other jurisdictions and as a result, we may be limited in our ability to enforce our intellectual property rights there. We would also likely be at a disadvantage in any enforcement proceeding in China as a foreign entity seeking protection against a Chinese company. Patent and trademark laws and trade secret protection may not be adequate to deter third party infringement or misappropriation of our patents, trademarks, trade secrets and similar proprietary rights. In addition, patents issued to us may be challenged, invalidated or circumvented. The loss or expiration of any of our key patents could lead to a significant loss of sales of certain of our products and could materially affect our future operating results. We have in the past and may in the future be subject to or may initiate interference proceedings or validity challenges in the U.S. Patent and Trademark Office, or similar international agencies, which can demand significant financial and management resources. The process of seeking patent protection can be time consuming and expensive and patents may not be issued from currently pending or future applications. Moreover, our existing patents or any new patents that may be issued may not be sufficient in scope or strength to provide meaningful protection or any commercial advantage to us. We may initiate claims, enforcement actions or litigation against third parties for infringement of our proprietary rights in order to determine the scope and validity of our proprietary rights or the proprietary rights of our competitors, which claims could result in costly litigation, the diversion of our technical and management personnel and the assertion of counterclaims by defendants, including counterclaims asserting invalidity of our patents. We will take such actions where we believe that they are of sufficient strategic or economic importance to us to justify the cost.

Risks Related to Owning Our Common Stock

Our quarterly operating results have fluctuated, and are likely to continue to vary significantly, which may result in volatility in the market price of our common stock.

A substantial portion of our shipments occurs shortly after an order is received, and therefore we generally operate with a relatively low level of backlog. As a result, a decrease in demand for our products from one or more customers could occur with limited advance notice and could have a significant adverse effect on our operating results in any particular period. Further, we often recognize a significant portion of the revenue of certain of our business lines in the last month of each fiscal quarter, due in part to the tendency of some customers to wait until late in a quarter to commit to purchase our products as a result of capital expenditure approvals and budgeting constraints occurring at the end of a quarter, or the hope of obtaining more favorable pricing from a competitor. Thus, variations in timing of sales can cause significant fluctuations in our quarterly sales, gross margin and profitability. In addition, orders expected to ship in one period could shift to another period due to changes in the timing of our customers' purchase decisions, requests for rescheduled delivery dates, material shortages, manufacturing capacity constraints or logistics delays. Our orders are generally subject to rescheduling without penalty or cancellation without penalty other than reimbursement for certain labor and material costs. Our operating results for a particular period may be adversely affected if our customers, particularly our largest customers, cancel or reschedule orders, or if we cannot fill orders in time due to material shortages, capacity constraints or unexpected delays in manufacturing, testing, shipping, delivery or product acceptance. Also, we base our manufacturing plans on our forecasted product mix. If the actual product mix varies significantly from our forecast, we may not be able to fill some orders, which would result in delays in the shipment of our products and could shift sales to a subsequent period. Moreover, a significant percentage of our expenses are fixed and based in part on expectations of net revenues. Our inability to adjust spending quickly enough to compensate for any shortfall would magnify the adverse impact of a shortfall in net revenues on our operating results.

Customers of our high-value, more complex products often require substantial time to qualify our products and make purchase decisions. In addition, some of our sales to defense and security customers are under major defense programs that involve lengthy competitive bidding and qualification processes. These customers often perform, or require us to perform, extensive configuration, testing and evaluation of our products before committing to purchasing them, which can require a significant upfront investment in time and resources. The sales cycle for these products from initial contact through shipment varies significantly, is difficult to predict and can last more than a year. If we fail to anticipate the likelihood of, or the costs or timing associated with, sales of these products, or the cancellation or rescheduling of orders for these products, our business and operating results would be harmed.

Our worldwide sales to customers in the research and defense markets rely to a large extent on government funding for research and defense-related programs. Any decline in government funding as a result of reduced budgets in connection with fiscal austerity measures, revised budget priorities or other causes would likely result in reduced sales of our products that are purchased either directly or indirectly with government funding, which would have an adverse impact on our operating results. Concerns regarding the global availability of credit may also make it more difficult for our customers to raise capital, whether debt or equity, to finance their projects and purchases of capital equipment, which would adversely affect sales of our products and therefore harm our business and operating results.

Other factors that could cause fluctuations in our financial results include:

A worldwide economic slowdown or disruption in the global financial markets;
Fluctuations in our customers' capital spending, industry cyclicality (particularly in the semiconductor and electronics manufacturing industries), market seasonality (particularly in the research, defense and electronics manufacturing industries), levels of government funding available to our customers (particularly in the life and health sciences, and research and defense markets) and other economic conditions within the markets we serve;
The timing of the receipt of orders within a given period;
Demand for our products and the products sold by our customers;
Disruption in sources of supply;
Production capacity constraints;
Regulatory and trade restrictions in the countries we manufacture and sell our products;
Specific features requested by customers;
Natural disasters or other events beyond our control (such as earthquakes, floods or storms, regional economic downturns, pandemics, social unrest, political instability, terrorism, or acts of war);
The timing of product shipments and revenue recognition within a given quarter;
Changes in our pricing practices or in the pricing practices of our competitors or suppliers;
Our and our competitors' timing in introducing new products;
Engineering and development investments relating to new product introductions, and significant changes to our manufacturing and outsourcing operations;
Market acceptance of any new or enhanced versions of our products;
The timing and level of inventory obsolescence, scrap and warranty expenses;
The availability, quality and cost of components and raw materials we use to manufacture our products;
Changes in our effective tax rates;
Changes in our capital structure, including cash, marketable securities and debt balances, and changes in interest rates;
Changes in bad debt expense based on the collectability of our accounts receivable;
The timing, type and size of acquisitions and divestitures, and related expenses and charges;
Fluctuations in currency exchange rates;
Our expense levels;
Impairment of goodwill and amortization of intangible assets; and
Fees, expenses and settlement costs or judgments against us relating to litigation or regulatory compliance.

As a result of these factors, among others, we may experience quarterly or annual fluctuations in our operating results, and our operating results for any period may fall below our expectations or the expectations of public market analysts or investors. In any such event, the price of our common stock could fluctuate or decline significantly. Consequently, we believe that quarter-to-quarter and year-to-year comparisons of our operating results, or any other similar period-to-period comparisons, may not be reliable indicators of our future performance.

The market price of our common stock has fluctuated and may continue to fluctuate for reasons over which we have no control.

The stock market has from time to time experienced, and is likely to continue to experience, extreme price and volume fluctuations. Prices of securities of technology companies have been especially volatile and have often fluctuated for reasons that are unrelated to the operating performance of the companies. Historically, the market price of shares of our common stock has fluctuated greatly and could continue to fluctuate due to a variety of factors. In the past, companies that have experienced volatility in the market price of their stock have been the objects of securities class action litigation. If we become the subject of securities class action litigation, it could result in substantial costs and a diversion of our management's attention and resources.

We may not pay dividends on our common stock.

Holders of our common stock are only entitled to receive dividends when and if they are declared by our Board of Directors. Our credit facilities restrict our ability to pay dividends on our capital stock under certain circumstances. Although we have declared cash dividends on our common stock since 2011, and occasionally increased the dividends from prior

quarters, we are not required to do so, and we may reduce or eliminate our cash dividend in the future. This could adversely affect the market price of our common stock.

Some provisions of our restated articles of organization, as amended, our amended and restated by-laws and Massachusetts law could discourage potential acquisition proposals and could delay or prevent a change in control.

Anti-takeover provisions could diminish opportunities for stockholders to participate in tender offers, including tender offers at a price above the then-current market price of our common stock. Such provisions may also inhibit increases in the market price of our common stock that could result from takeover attempts. For example, while we have no present plans to issue any preferred stock, our Board of Directors, without further stockholder approval, may issue preferred stock that could have the effect of delaying, deterring or preventing a change in control of us. The issuance of preferred stock could adversely affect the voting power of the holders of our common stock, including the loss of voting control to others. In addition, our amended and restated by-laws provide for a classified Board of Directors consisting of three classes. Our classified board could also have the effect of delaying or deterring a change in control of our Company.

Item 1B. *Unresolved Staff Comments*

None.

Item 2. *Properties*

The following table provides information concerning MKS' principal and certain other owned and leased facilities as of December 31, 2021:

Country	City	Sq. Ft.	Activity	Reportable Segment	Owned/Leased
China	Shenzhen	302,000	Manufacturing and Service	V&A and L&M	Leased
	Wuxi	65,000	Manufacturing, Sales, Customer Support, Service and Warehouse	L&M	Leased
France	Beaune-la-Rolande	93,000	Manufacturing, Research and Development	L&M	Owned
Israel	Jerusalem	118,000	Manufacturing, Sales and Research and Development	L&M	Owned and Leased
Mexico	Nogales	248,000	Manufacturing and Service	V&A and L&M	Leased
Singapore	Singapore	50,000	Manufacturing and Sales	E&S	Leased
United States	Andover, MA	158,000	Corporate Headquarters, Manufacturing and Research and Development	V&A	Owned and Leased
	Beaverton, OR	113,000	Manufacturing, Office and Warehouse	E&S	Leased
	Broomfield, CO	107,000	Manufacturing, Research and Development	V&A	Leased
	Irvine, CA	233,000	Manufacturing, Research and Development	L&M	Leased
	Milpitas, CA	103,000	Manufacturing, Sales, Customer Support, Service and Research and Development	L&M	Leased
	Rochester, NY	156,000	Manufacturing, Sales, Customer Support, Service and Research and Development	V&A	Owned
	Wilmington, MA	118,000	Manufacturing, Customer Support, Service and Research and Development	V&A	Owned

In addition to the significant facilities listed above, MKS also provides manufacturing, worldwide sales and marketing, customer support and services from various other leased and owned facilities throughout the world. See “Business–Sales and Marketing” and “Business–Reportable Segments, and Product and Service Offerings” in Part I, Item 1 of this Annual Report on Form 10-K. We believe that our current facilities are suitable and adequate to meet our needs.

Item 3. *Legal Proceedings*

For a description of our material pending legal proceedings, see Note 23 to the Notes to the Consolidated Financial Statements contained in Part II, Item 8 of this Annual Report on Form 10-K.

Item 4. *Mine Safety Disclosures*

Not applicable.

PART II

Item 5. *Market for the Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities*

Common Stock

Our common stock is traded on the Nasdaq Global Select Market under the symbol MKSI.

On February 17, 2022, we had 75 stockholders of record.

Dividend Policy and Cash Dividends

Holders of our common stock are entitled to receive dividends when and if they are declared by our Board of Directors. During 2021, our Board of Directors declared a cash dividend of \$0.20 per share during the first quarter and \$0.22 per share during each of the second, third and fourth quarters, which totaled \$48 million or \$0.86 per share. During 2020, our Board of Directors declared a cash dividend of \$0.20 per share during each quarter, which totaled \$44 million or \$0.80 per share.

On February 7, 2022, our Board of Directors declared a quarterly cash dividend of \$0.22 per share to be paid on March 11, 2022 to shareholders of record as of February 28, 2022.

Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of our Board of Directors. The Board of Directors intends to declare and pay cash dividends on our common stock based on our financial conditions and results of operations of the Company, although it has no obligation to do so. Our credit facilities contain covenants that restrict our ability to grant cash dividends in certain circumstances.

Share Repurchase Program

On July 25, 2011, our Board of Directors approved, and on July 27, 2011, we publicly announced a share repurchase program for the repurchase of up to an aggregate of \$200 million of our outstanding common stock from time to time in open market purchases, privately negotiated transactions or through other appropriate means. The timing and quantity of any shares repurchased depends upon a variety of factors, including business conditions, stock market conditions and business development activities, including, but not limited to, merger and acquisition opportunities. These repurchases may be commenced, suspended or discontinued at any time without prior notice.

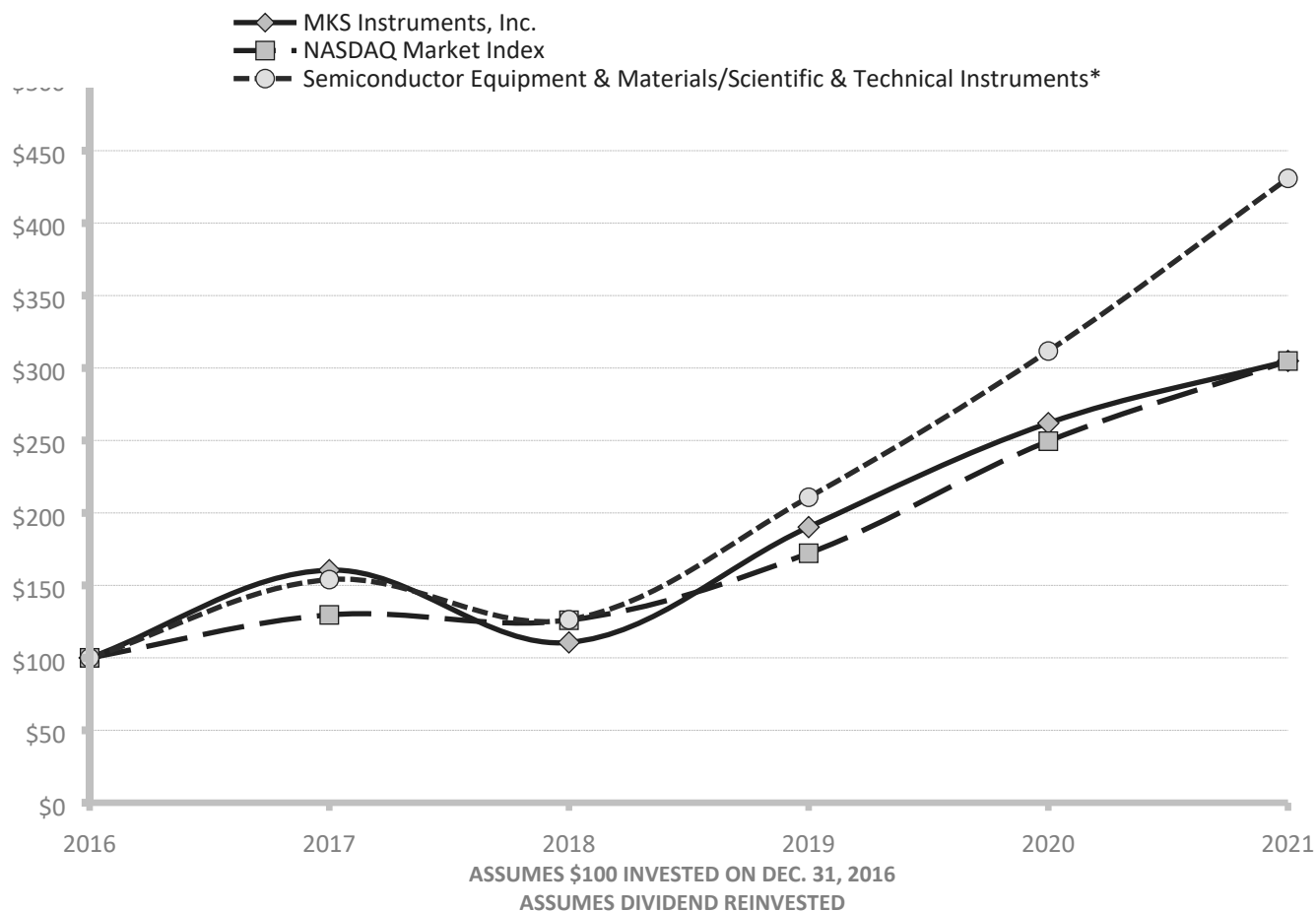
During 2021 and 2020, the Company did not repurchase any shares of common stock. We have repurchased approximately 2.6 million shares of common stock for approximately \$127 million pursuant to the program since its adoption.

Comparative Stock Performance

The following graph compares the cumulative total shareholder return (assuming reinvestment of dividends) from investing \$100 on December 31, 2016, and plotted at the last trading day of each of the fiscal years ended December 31, 2017, 2018, 2019, 2020 and 2021 of MKS' common stock; a peer group index which represents a combination of all companies comprising the Morningstar Global Semiconductor Equipment & Materials Industry Group Index and Morningstar Global Scientific & Technical Instruments Industry Group Index, with these indices weighted equally; and the Nasdaq Market Index. The stock price performance on the graph below is not necessarily indicative of future price performance.

Performance Graph

COMPARISON OF CUMULATIVE TOTAL RETURN



* Morningstar Global Semiconductor Equipment & Materials and Morningstar Global Scientific & Technical Instruments indices weighted equally.

Item 6. Reserved.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The Management's Discussion and Analysis of Financial Condition and Results of Operations, or MD&A, describes principal factors affecting the results of our operations, financial condition, cash flows and liquidity, as well as our critical accounting policies and estimates that require significant judgment and thus have the most significant potential impact on our Consolidated Financial Statements, and is intended to better allow investors to view the Company from management's perspective. This section focuses on material events and uncertainties known to management that are reasonably likely to cause reported financial information not to be necessarily indicative of our future operating results or of our future financial condition. This section provides an analysis of our financial results for the year ended December 31, 2021 compared to the year ended December 31, 2020. For the discussion and analysis covering the year ended December 31, 2020 compared to the year ended December 31, 2019, please refer to "Management's Discussion and Analysis of Financial Condition and Results of Operations" in Part II, Item 7 of our Annual Report on Form 10-K for the year ended December 31, 2020, as filed with the SEC on February 23, 2021.

Overview

We are a global provider of instruments, systems, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity for our customers. Our products are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, vacuum technology, temperature sensing, lasers, photonics, optics, precision motion control, vibration control and laser-based manufacturing systems solutions. We also provide services relating to the maintenance and repair of our products, installation services and training. Our primary served markets include semiconductor, industrial technologies, life and health sciences and research and defense.

Recent Events

Acquisitions

On July 15, 2021, we completed our acquisition of Photon Control Inc. ("Photon Control" and such acquisition, the "Photon Control Acquisition"), pursuant to a definitive agreement. Photon Control designs, manufactures and distributes a wide range of optical sensors and systems to measure temperature and position used in semiconductor wafer fabrication. At the effective time of the Photon Control Acquisition, each share of Photon Control's common stock issued and outstanding as of immediately prior to the effective time of the Photon Control Acquisition was converted into the right to receive 3.60 per share in cash, in Canadian dollars ("CAD"), without interest and subject to deduction for any required withholding tax. We paid to the former Photon Control securityholders aggregate consideration of CAD 379 million or \$303 million, excluding related transaction fees and expenses. We funded the payment of the aggregate consideration with available cash on hand. Photon Control is included in our Light & Motion ("L&M") segment.

The Photon Control Acquisition has helped us deliver on one of our long-term strategic objectives, which is to broaden our portfolio of key technologies to better serve our customers. The Photon Control Acquisition further advances our strategy to enhance our Surround the Chamber® offering by adding optical sensors for temperature control for critical etch and deposition applications in semiconductor wafer fabrication.

On July 1, 2021, we entered into a definitive agreement (as amended from time to time, the "Implementation Agreement") to acquire Atotech, a leading process chemicals technology company and a market leader in advanced electroplating solutions. Pursuant to the Implementation Agreement, we agreed to pay \$16.20 per share in cash and 0.0552 of a share of our common stock for each outstanding common share of Atotech. At the time of the announcement of the acquisition, the total value of the aggregate cash and stock consideration was approximately \$5.1 billion. The final value of the consideration will be determined at the time of the closing of the acquisition, which is expected to occur in the first quarter of 2022, subject to the satisfaction of certain closing conditions, including receipt of regulatory approval from China and approval by the Royal Court of Jersey. Our obligations to complete the acquisition are not subject to any financing condition. We intend to fund the cash portion of the transaction with a combination of available cash on hand and committed term loan debt financing. In connection with entering into the Implementation Agreement, we entered into (a) a commitment letter (the "Initial Commitment Letter"), dated as of July 1, 2021, with JPMorgan Chase Bank, N.A. and Barclays Bank PLC (collectively, the "Initial Commitment Parties") and (b) joinders to the Initial Commitment Letter to add certain additional lender parties (the "Commitment Letter Joinders" and, together with the Initial Commitment Letter, the "Commitment Letter") dated as of July 23, 2021, with the Initial Commitment Parties and the additional lenders party thereto (collectively, the "Supplemental Commitment Parties" and, together with the Initial Commitment Parties, the "Commitment Parties"), pursuant to which, subject to the terms and conditions set forth therein, the Commitment Parties committed to provide (i) a senior

secured term loan credit facility in an aggregate principal amount of \$5.3 billion (the “New Term Loan Facility”) and (ii) a senior secured revolving credit facility with aggregate total commitments of \$500 million (the “New Revolving Credit Facility”). The New Term Loan Facility and New Revolving Credit Facility would refinance our existing term loan facility (the “Term Loan Facility”) and our existing asset-based revolving credit facility (the “ABL Facility”), respectively, and the New Term Loan Facility would be used to finance a portion of the acquisition and to refinance certain existing indebtedness of Atotech.

On October 22, 2021, we completed the syndication of the New Term Loan Facility, comprised of two tranches: a \$4.7 billion loan at LIBOR plus 2.25%, a floor of 0.50% and 0.25% of original issue discount, and a Euro tranche of 0.5 billion Euro (“EUR”), or approximately \$0.6 billion at EURIBOR plus 2.75%, a floor of 0.00% and 0.25% of original issue discount. Subsequent to the syndication, the \$4.7 billion tranche is expected to be modified to reference a term rate based on SOFR (plus an applicable credit spread adjustment) as the benchmark rate.

The Commitment Parties’ obligations under the Commitment Letter and the closing and initial funding under the New Term Loan Facility are subject to certain customary conditions including, without limitation, the consummation of the acquisition of Atotech in accordance with the Implementation Agreement, the accuracy of specified representations and warranties of us and other customary closing conditions.

Segments and Markets

The Vacuum & Analysis (“V&A”) segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, and vacuum technology.

The L&M segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in lasers, photonics, optics, temperature sensing, precision motion control and vibration control.

The Equipment & Solutions (“E&S”) segment provides a range of products including laser-based systems for PCB manufacturing, which include flexible interconnect PCB processing systems and high-density interconnect solutions for rigid PCB manufacturing and substrate processing and MLCC test systems.

Semiconductor Market

A significant portion of our sales is derived from products sold to semiconductor capital equipment manufacturers and semiconductor device manufacturers. Our products are used in major semiconductor processing steps, such as depositing thin films of material onto silicon wafer substrates, etching, cleaning, lithography, metrology and inspection. The semiconductor industry continually faces new challenges as products become smaller, more powerful and highly mobile. Ultra-thin layers, smaller critical dimensions, new materials, 3D structures, and the ongoing need for higher yield and productivity drive the need for tighter process measurement and control, all of which MKS supports. We believe we are the broadest critical subsystem provider in the wafer fabrication equipment (“WFE”) ecosystem and address over 85% of the market.

Approximately 62% and 59% of our net revenues for 2021 and 2020, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers. We estimate global spending on WFE was approximately \$80 billion in 2021 compared to approximately \$56 billion in 2020, driven by increases in memory and logic and reflective of strong secular demand trends increasing semiconductor demand, such as robust data growth, 5G, Internet-Of-Things, artificial intelligence, and autonomous vehicles. We anticipate that the semiconductor market will continue to account for a substantial portion of our sales.

Net revenues in our semiconductor market increased by \$439 million, or 32%, in 2021, compared to 2020, due to increases in net revenues in V&A and L&M, offset by decreases in net revenues in E&S. V&A net revenues in our semiconductor market increased \$393 million due to broad-based increases in demand for V&A products. L&M net revenues in our semiconductor market increased \$73 million, driven by demand for our photonics solutions in lithography, metrology and inspection, as well as contributions from our acquisition of Photon Control. These increases were offset by a decrease of \$27 million in net revenues in E&S, resulting from the discontinuation of certain non-core products.

The semiconductor capital equipment industry is subject to rapid demand shifts, which are difficult to predict, and we cannot be certain as to the timing or extent of future demand or any future weakness in the semiconductor capital equipment industry.

In 2021, we experienced supply chain disruptions, component shortages and significant price increases for certain components in our semiconductor market due to global capacity constraints compounded by increasing global demand as well as the ongoing COVID-19 pandemic. We expect these disruptions and shortages to continue in the near-term while our suppliers adjust to significant increases in demand and respond to the challenges posed by the COVID-19 pandemic, all of which may negatively impact net revenues from our semiconductor market for the three months ending March 31, 2022.

Advanced Markets

In addition to the semiconductor market, our products are used in the industrial technologies, life and health sciences, research and defense markets.

Industrial Technologies

Industrial technologies encompasses a wide range of diverse applications, including advanced electronics manufacturing comprising flexible and rigid printed circuit board (“PCB”) processing/fabrication, electronic component manufacturing, glass coating and electronic thin films. Electronic thin films are a primary component of numerous electronic products including flat panel displays, light emitting diodes, solar cells and data storage media. Other applications include laser marking, measurement and scribing, natural gas and oil production and environmental monitoring.

Life and Health Sciences

Our products for life and health sciences are used in a diverse array of applications, including bioimaging, medical instrument sterilization, medical device manufacturing, analytical, diagnostic and surgical instrumentation, consumable medical supply manufacturing and pharmaceutical production.

Research and Defense

Our products for research and defense are sold to government, university and industrial laboratories for applications involving research and development in materials science, physical chemistry, photonics, optics and electronics materials. Our products are also sold for monitoring and defense applications including surveillance, imaging and infrastructure protection.

Approximately 38% and 41% of our net revenues in the years ended December 31, 2021 and 2020, respectively, were from advanced markets.

Net revenues from customers in our advanced markets increased by \$180 million, or 19%, in 2021, compared to 2020, with E&S, V&A and L&M recording net revenue increases of \$67 million, \$62 million and \$51 million, respectively. Net revenues in our industrial technologies market increased \$164 million, primarily in advanced electronics manufacturing applications such as PCB processing/fabrication and electronic component manufacturing. Net revenues in our research and defense market increased \$11 million, due to a rebound in demand following university and research lab closures in the first half of 2020 caused by the COVID-19 pandemic.

International Markets

A significant portion of our net revenues is from sales to customers in international markets. International net revenues accounted for approximately 57% and 55% of our total net revenues in 2021 and 2020, respectively. A significant portion of our international net revenues was from China, Israel, Japan, South Korea and Taiwan. Long-lived assets located outside of the United States accounted for approximately 25% and 28% of our total long-lived assets in 2021 and 2020, respectively. Long-lived assets include, property, plant and equipment, net, right-of-use assets, and certain other assets and exclude goodwill, intangible assets and long-term tax-related accounts.

Critical Accounting Policies and Estimates

The MD&A discusses our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States (“U.S. GAAP”). The preparation of these financial statements requires

management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. On an on-going basis, we evaluate our estimates and judgments, including those related to revenue recognition, inventory, warranty costs, pension plan valuations, stock-based compensation expense, intangible assets, goodwill and other long-lived assets and income taxes. We base our estimates and judgments on historical experience and on various other factors that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

We believe the following critical accounting policies affect the most significant judgments, assumptions and estimates we use in preparing our consolidated financial statements:

Revenue Recognition. We account for revenue using Accounting Standards Codification 606 (“ASC 606”). We apply ASC 606 using the following steps:

- Identify the contract with a customer
- Identify the performance obligations in the contract
- Determine the transaction price
- Allocate the transaction price to performance obligations in the contract
- Recognize revenue when or as we satisfy a performance obligation

Revenue under ASC 606 is recognized when or as obligations under the terms of a contract with our customer has been satisfied and control has transferred to the customer. The majority of our performance obligations, and associated revenue, are transferred to customers at a point in time, generally upon shipment of a product to the customer or receipt of the product by the customer and without significant judgments. Installation services are not significant and are usually completed in a short period of time (normally less than two weeks) and therefore, recorded at a point in time when the installation services are completed, rather than over time as they are not material. Extended warranty, service contracts, and repair services, which are transferred to the customer over time, are recorded as revenue as the services are performed. For repair services, we make an accrual at each quarter end based upon historical repair times within our product groups to record revenue based upon the estimated number of days completed to date, which is consistent with ratable recognition. Customized products with no alternative future use to us, and that have an enforceable right to payment for performance completed to date, are also recorded over time. We consider this to be a faithful depiction of the transfer to the customer of revenue over time as the work is performed or service is delivered, ratably over time. The adjustments for custom products were not material for 2021 or 2020.

Revenue is measured as the amount of consideration we expect to receive in exchange for transferring goods or providing services. Performance obligations promised in a contract are identified based on the products or services that will be transferred to the customer that are both capable of being distinct, whereby the customer can benefit from the product or service either on its own or together with other resources that are readily available from third parties or from us, and are distinct in the context of the contract, whereby the transfer of the product or service is separately identifiable from other promises in the contract. Sales, value add, and other taxes we collect concurrent with revenue-producing activities are excluded from revenue. Our normal payment terms are 30 to 60 days but vary by the type and location of our customers and the products or services offered. The time between invoicing and when payment is due is not significant. For certain products and services and customer types, we require payment before the products or services are delivered to, or performed for, the customer. None of our contracts as of December 31, 2021 contained a significant financing component.

We periodically enter into contracts with our customers in which a customer may purchase a combination of goods and or services, such as products with installation services or extended warranties. These contracts include multiple promises that we evaluate to determine if the promises are separate performance obligations. Once we determine the performance obligations, we then determine the transaction price, which includes estimating the amount of variable consideration to be included in the transaction price, if any. To the extent the transaction price includes variable consideration, we estimate the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method depending on the method we expect to better predict the amount of consideration to which it will be entitled. There are no constraints on the variable consideration recorded. We then allocate the transaction price to each performance obligation in the contract based on a relative stand-alone selling price charged separately to customers or using an expected cost-plus margin method. The corresponding revenues are recognized when or as the related performance obligations are satisfied, which are noted above. The impact of variable consideration has been immaterial.

We sometimes sell separately priced service contracts and extended warranty contracts related to certain of our products, especially our laser products. The separately priced contracts generally range from 12 to 60 months. We normally receive payment at the inception of the contract or beginning of an annual period and recognize revenue over the term of the agreement in proportion to the costs expected to be incurred in satisfying the obligations under the contract.

We monitor and track the amount of product returns, provide for sales return allowances and reduce revenue at the time of shipment for the estimated amount of such future returns, based on historical experience. While product returns have historically been within our expectations and the provisions established, there is no assurance that we will continue to experience the same return rates that we have in the past. Any significant increase in product return rates could have a material adverse impact on our operating results for the period or periods in which such returns materialize.

While we maintain a credit approval process, significant judgments are made by management in connection with assessing our customers' ability to pay at the time of shipment. Despite this assessment, from time to time, our customers are unable to meet their payment obligations. We continuously monitor our customers' credit worthiness and use our judgment in establishing a provision for estimated credit losses based upon our historical experience and any specific customer collection issues that we have identified. While such credit losses have historically been within our expectations and the provisions established, there is no assurance that we will continue to experience the same credit loss rates that we have in the past. A significant change in the liquidity or financial position of our customers could have a material adverse impact on the collectability of accounts receivable and our future operating results. Bad debt expense was immaterial in 2021 and 2020.

Inventory. We value our inventory at the lower of cost (first-in, first-out method) or market. We regularly review inventory quantities on hand and record a provision to write-down excess and obsolete inventory to its estimated net realizable value, if less than cost, based primarily on our estimated forecast of product demand. Once our inventory value is written-down and a new cost basis has been established, the inventory value is not increased due to demand increases. Demand for our products can fluctuate significantly. A significant increase in the demand for our products could result in a short-term increase in the cost of inventory purchases as a result of supply shortages or a decrease in the cost of inventory purchases as a result of volume discounts, while a significant decrease in demand could result in an increase in the charges for excess inventory quantities on hand. In addition, our industry is subject to technological change, new product development and product technological obsolescence that could result in an increase in the amount of obsolete inventory quantities on hand. Therefore, any significant unanticipated changes in demand or technological developments could have a significant impact on the value of our inventory and our reported operating results. Excess and obsolete expense was \$16 million and \$25 million for 2021 and 2020, respectively.

Warranty Costs. We provide for the estimated costs to fulfill customer warranty obligations upon the recognition of the related revenue. We provide warranty coverage for our products for periods ranging from 12 to 36 months, with the majority of our products for periods ranging from 12 to 24 months. Short-term accrued warranty obligations, which expire within one year, are included in other current liabilities and long-term accrued warranty obligations are included in other liabilities in the consolidated balance sheets. We estimate the anticipated costs of repairing our products under such warranties based on the historical costs of the repairs and any known specific product issues. The assumptions we use to estimate warranty accruals are re-evaluated periodically in light of actual experience and, when appropriate, the accruals are adjusted. Our determination of the appropriate level of warranty accrual is based upon estimates. Should product failure rates differ from our estimates, actual costs could vary significantly from our expectations. Defective products will be either repaired or replaced, generally at our option, upon meeting certain criteria.

Pension Plans. Several of our non-U.S. subsidiaries have defined benefit pension plans covering employees of those subsidiaries. Some of the plans are unfunded, as permitted under the plans and applicable laws. For financial reporting purposes, we obtained actuarial reports supporting the calculation of net periodic pension costs that used a number of actuarial assumptions, including a discount rate for plan obligations, an assumed rate of return on pension plan assets and an assumed rate of compensation increase for employees covered by the various plans. We reviewed these actuarial assumptions and concluded they were reasonable based upon our judgment, considering known trends and uncertainties. Actual results that differ from these assumptions would impact future expense recognition and the cash funding requirements of our pension plans.

Stock-Based Compensation Expense. We record compensation expense for all stock-based compensation awards to employees and directors based upon the estimated fair market value of the underlying instrument. Accordingly, stock-based compensation cost is measured at the grant date, based upon the fair value of the award.

We typically issue restricted stock units ("RSUs") as stock-based compensation. We also provide certain employees the opportunity to purchase our shares through an Employee Stock Purchase Plan ("ESPP"). For RSUs, the fair value is the closing

market price of the stock on the date of grant. We estimate the fair value of shares issued under our ESPP using the Black-Scholes pricing model, which incorporates a number of complex and subjective variables, including expected stock price volatility over the term of the awards, expected life, risk free interest rate and expected dividends. Management determined that blended volatility, a combination of historical and implied volatility, is more reflective of market conditions and a better indicator of expected volatility than historical or implied volatility alone.

Certain RSUs involve stock to be issued upon the achievement of performance conditions (“performance shares”) under our stock incentive plan. Such performance shares become available, subject to time-based vesting conditions if, and to the extent that, financial performance criteria for the applicable period are achieved. Accordingly, the number of performance shares earned will vary based on the level of achievement of financial performance objectives for the applicable period. Until such time that our financial performance can ultimately be determined, each quarter we estimate the number of performance shares to be earned based on an evaluation of the probability of achieving the financial performance objectives. Such estimates are revised, if necessary, in subsequent periods when the underlying factors change our evaluation of the probability of achieving the financial performance objectives. Accordingly, share-based compensation expense associated with performance shares may differ significantly from the amount recorded in the current period.

The assumptions used in calculating the fair value of share-based compensation awards represents management’s best estimates, but these estimates involve inherent uncertainties and the application of management’s judgment. As a result, if factors change and we use different assumptions, our stock-based compensation expense could be materially different in the future.

Intangible Assets, Goodwill and Other Long-Lived Assets. As a result of our acquisitions, we have identified intangible assets and generated significant goodwill. Definite-lived intangible assets are valued based on estimates of future cash flows and amortized over their estimated useful life. Determining fair value requires the exercise of significant judgment, including assumptions about appropriate discount rates as well as forecasted revenue, gross profit and operating margins.

Goodwill and indefinite-lived intangible assets are subject to annual impairment testing as well as testing upon the occurrence of any event that indicates a potential impairment. Intangible assets and other long-lived assets are also subject to an impairment test if there is an indicator of impairment. If our expectations of future results and cash flows are significantly diminished, intangible assets and goodwill may be impaired and the resulting charge to operations may be material. When we determine that the carrying value of intangibles or other long-lived assets may not be recoverable based upon the existence of one or more indicators of impairment, we use the projected undiscounted cash flow method to determine whether an impairment exists, and then measure the impairment using discounted cash flows. To measure impairment for goodwill, we compare the fair value of our reporting units by measuring discounted cash flows to the book value of the reporting units. Goodwill would be impaired if the resulting implied fair value was less than the recorded book value of the goodwill.

The estimation of useful lives and expected cash flows require us to make significant judgments regarding future periods that are subject to some factors outside of our control. Changes in these estimates can result in significant revisions to the carrying value of these assets and may result in material charges to the results of operations.

We have elected to perform our annual goodwill impairment test as of October 31 of each year, or more often if events or circumstances indicate that there may be impairment. Goodwill is the amount by which the cost of acquired net assets exceeded the fair value of those net assets on the date of acquisition. We allocate goodwill to reporting units at the time of acquisition or when there is a change in the reporting structure and base that allocation on which reporting units will benefit from the acquired assets and liabilities. Reporting units are defined as operating segments or one level below an operating segment, referred to as a component. The estimated fair value of our reporting units was based on discounted cash flow models derived from internal earnings and internal and external market forecasts. Determining fair value requires the exercise of significant judgment, including assumptions about appropriate discount and perpetual growth rates, as well as forecasted revenue growth rates and gross profit and operating margins. Discount rates are based on a weighted average cost of capital (“WACC”), which represents the average rate a business must pay its providers of debt and equity. The WACC used to test goodwill is derived from a group of comparable companies. Assumptions in estimating future cash flows are subject to a high degree of judgment and complexity. We make every effort to forecast these future cash flows as accurately as possible with the information available at the time the forecast is developed.

In performing our annual goodwill impairment test, we are permitted to first assess qualitative factors to determine whether it is more likely than not that the fair value of our reporting unit is less than its carrying amount, including goodwill. In performing the qualitative assessment, we consider certain events and circumstances specific to the reporting unit and to the entity as a whole, such as macroeconomic conditions, industry and market considerations, overall financial performance and cost factors when evaluating whether it is more likely than not that the fair value of the reporting unit is less than its carrying amount. We are also permitted to bypass the qualitative assessment and proceed directly to the quantitative test. If we choose to

undertake the qualitative assessment and we conclude that it is more likely than not that the fair value of the reporting unit is less than its carrying amount, we would then proceed to the quantitative impairment test. In the quantitative assessment, we compare the fair value of the reporting unit to its carrying amount, which includes goodwill. If the fair value exceeds the carrying value, no impairment loss exists. If the fair value is less than the carrying amount, a goodwill impairment loss is measured and recorded.

As of October 31, 2021, we performed our annual impairment assessment of goodwill using a qualitative assessment for all of our reporting units. We determined that it was more likely than not that the fair values were more than the carrying values for each of the reporting units.

We will continue to monitor and evaluate the carrying value of goodwill. If market and economic conditions or business performance deteriorate, this could increase the likelihood of us recording an impairment charge.

Income Taxes. We evaluate the realizability of our net deferred tax assets and assess the need for a valuation allowance on a quarterly basis. The future benefit to be derived from our deferred tax assets is dependent upon our ability to generate sufficient future taxable income in each jurisdiction of the right type to realize the assets. We record a valuation allowance to reduce our net deferred tax assets to the amount that is expected to be realized. To the extent we establish a valuation allowance an expense is recorded within the provision for income taxes line in the consolidated statements of operations and comprehensive income.

Accounting for income taxes requires a two-step approach to recognize and measure uncertain tax positions. The first step is to evaluate the tax position for recognition by determining if, based on the technical merits, it is more likely than not that the position will be sustained upon audit, including resolutions of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount that is more than 50% likely of being realized upon ultimate settlement. We re-evaluate these uncertain tax positions on a quarterly basis. This evaluation is based on factors including, but not limited to, changes in facts or circumstances, changes in tax law, effectively settled issues under audit and new audit activity. Any change in these factors could result in the recognition of a tax benefit or an additional charge to the tax provision.

Results of Operations

The following table sets forth, for the periods indicated, the percentage of total net revenues of certain line items included in our consolidated statements of operations and comprehensive income data:

	Years Ended December 31,	
	2021	2020
Net revenues:		
Product	87.4%	86.5%
Service	12.6	13.5
Total net revenues	100.0	100.0
Cost of revenues:		
Product	46.5	47.5
Service	6.7	7.5
Total cost of revenues (exclusive of amortization shown separately below)	53.2	55.0
Gross profit	46.8	45.0
Research and development	6.8	7.4
Selling, general and administrative	13.0	15.2
Acquisition and integration costs	1.0	0.1
Restructuring and other	0.4	0.4
Amortization of intangible assets	1.9	2.4
Asset impairment	—	0.1
COVID-19 related net credits	—	(0.1)
Income from operations	23.7	19.5
Interest income	—	0.1
Interest expense	0.9	1.3
Other expense, net	0.3	0.1
Income before income taxes	22.5	18.2
Provision for income taxes	3.8	3.1
Net income	18.7%	15.1%

Year Ended December 31, 2021 compared to 2020

Net Revenues

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Product	\$ 2,578.6	\$ 2,014.8
Service	371.0	315.2
Total net revenues	\$ 2,949.6	\$ 2,330.0

Net product revenues increased \$564 million in 2021, compared to 2020. Net product revenues from our semiconductor market increased \$394 million due to broad-based increases in demand for semiconductor capital equipment across memory, foundry and logic manufacturing applications and contributions from Photon Control, offset by a decrease in net revenues from E&S, due to a discontinuation of certain non-core products. Net revenues from our top ten customers accounted for 47%, 44% and 33% of net revenues for 2021, 2020 and 2019, respectively, with the increasing percentages attributable to increasing semiconductor market sales. As a percentage of net revenues from our top ten customers, semiconductor market revenue accounted for greater than 90% in each of these years. The semiconductor market has historically experienced cyclical variations in product supply and demand. It is subject to rapid demand shifts, which are difficult to predict, and we cannot be certain as to the timing or extent of future demand or any future weakness in the semiconductor capital equipment industry. For example, our semiconductor market revenue sequentially increased 32% in 2021, sequentially increased 49% in 2020, and sequentially decreased 19% in 2019. We believe net revenues attributable to our semiconductor market customers are affected by the cyclical nature of the semiconductor market.

Net product revenues in advanced markets increased \$169 million due to increased net revenue from our industrial technologies markets, primarily in advanced electronics manufacturing applications such as PCB processing/fabrication and

electronic component manufacturing. Net product revenues in our research and defense market also increased due to a rebound in demand following university and research lab closures in the first half of 2020 caused by the COVID-19 pandemic.

Net service revenues consisted mainly of fees for services related to the maintenance and repair of our products, sales of spare parts, and installation and training. Service revenues increased \$56 million in 2021, compared to 2020. Net service revenues from our semiconductor customers increased \$45 million and net service revenues from advanced market customers increased \$11 million, both reflective of higher product revenues in both markets.

Total international net revenues, including product and service, were \$1.7 billion in 2021, compared to \$1.3 billion in 2020. The increase in 2021 was primarily due to increases in net revenues from China, Japan, South Korea and Taiwan.

The following table sets forth our net revenues by reportable segment:

Net Revenues

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Vacuum & Analysis	\$ 1,861.5	\$ 1,405.9
Light & Motion	813.4	689.6
Equipment & Solutions	274.7	234.5
Total net revenues	<u>\$ 2,949.6</u>	<u>\$ 2,330.0</u>

Net revenues for our V&A segment increased \$456 million in 2021, compared to 2020, due to a volume increase of \$393 million from our semiconductor customers and an increase of \$63 million from our advanced markets customers, primarily from customers in our industrial technologies market.

Net revenues for our L&M segment increased \$124 million in 2021, compared to 2020, due to an increase of \$73 million from our semiconductor customers and an increase of \$51 million from our advanced markets customers, primarily from customers in our industrial technologies market.

Net revenues from our E&S segment increased \$40 million in 2021, compared to 2020, due to an increase of \$67 million from our advanced markets customers, primarily from customers in our industrial technologies market, partially offset by a decrease of \$27 million from our semiconductor customers, resulting from the discontinuation of certain non-core products.

The following table sets forth gross profit as a percentage of net revenues by product and service:

Gross Profit

<i>(As a percentage of net revenues)</i>	Years Ended December 31,		% Points Change
	2021	2020	
Product	46.8%	45.1%	1.7%
Service	46.5%	44.8%	1.7%
Total gross profit percentage	<u>46.8%</u>	<u>45.0%</u>	<u>1.8%</u>

Gross profit as a percentage of net product revenues increased by 1.7 percentage points in 2021, compared to 2020, primarily due to higher revenue volumes and favorable product mix.

Gross profit as a percentage of net service revenues increased by 1.7 percentage points in 2021, compared to 2020, primarily due to higher utilization of service technicians.

The following table sets forth gross profit as a percentage of net revenues by reportable segment:

Gross Profit

<i>(As a percentage of net revenues)</i>	Years Ended December 31,		% Points Change
	2021	2020	
Vacuum & Analysis	46.6%	45.1%	1.5%
Light & Motion	47.4	44.9	2.5
Equipment & Solutions	46.3	45.2	1.1
Total gross profit percentage	<u>46.8%</u>	<u>45.0%</u>	<u>1.8%</u>

Gross profit as a percentage of net revenues for our V&A segment increased primarily due to higher revenue volumes and favorable product mix.

Gross profit as a percentage of net revenues for our L&M segment increased primarily due to higher revenue volumes and favorable product mix partially offset by unfavorable overhead absorption.

Gross profit as a percentage of net revenues for our E&S segment increased primarily due to improved overhead absorption and lower excess and obsolete charges.

Research and Development

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Research and development	\$ 200.0	\$ 173.1

Research and development expenses increased \$27 million in 2021, compared to 2020, primarily due to increases of \$19 million in compensation-related costs, \$3 million in project materials and \$3 million in occupancy costs.

Our research and development efforts are primarily focused on developing and improving our instruments, components, subsystems, process control and systems solutions to improve process performance and productivity.

We have thousands of products and our research and development efforts primarily consist of a large number of projects related to these products, none of which is individually material to us. Current projects typically have durations of 3 to 30 months, depending upon whether the product is an enhancement of existing technology or a new product. Our products have continuously advanced as we strive to meet our customers' evolving needs. We have developed, and continue to develop, new products to address industry trends, such as the shrinking of integrated circuit critical dimensions and technology inflections, and, in the flat panel display and solar markets, the transition to larger substrate sizes, which require more advanced processing and process control technology, the continuing drive toward more complex and accurate components and devices within the handset and tablet market, the transition to 5G for both devices and infrastructure, supporting the growth in units and via counts of the High Density Interconnect PCB drilling market, and the industry transition to electric cars in the automotive market. In addition, we have developed, and continue to develop, products that support the migration to new classes of materials, ultra-thin layers, and 3D structures that are used in small geometry manufacturing. Research and development expenses consist primarily of salaries and related expenses for personnel engaged in research and development, fees paid to consultants, material costs for prototypes and other expenses related to the design, development, testing and enhancement of our products.

We believe that the continued investment in research and development and ongoing development of new products are essential to the expansion of our markets. We expect to continue to make significant investment in research and development activities. We are subject to risks from products not being developed in a timely manner, as well as from rapidly changing customer requirements and competitive threats from other companies and technologies. Our success primarily depends on our products being designed into new generations of equipment for the semiconductor industry and advanced technology markets. We develop products that are technologically advanced so that they are positioned to be chosen for use in each successive generation of semiconductor capital equipment and advanced markets applications. If our products are not chosen to be designed into our customers' products, our net revenues may be reduced during the lifespan of those products.

Selling, General and Administrative

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Selling, general and administrative	\$ 385.1	\$ 353.1

Selling, general and administrative expenses increased \$32 million during 2021, compared to 2020, primarily due to increases of \$26 million in compensation-related costs, \$7 million in commissions and \$3 million in information technology costs, partially offset by a decrease of \$4 million in professional fees.

Acquisition and Integration Costs

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Acquisition and integration costs	\$ 29.8	\$ 3.8

Acquisition and integration costs incurred during 2021 related to consulting and professional fees in connection with our recently completed acquisition of Photon Control, our pending acquisition of Atotech and our proposed acquisition of Coherent, Inc. Acquisition and integration costs during 2020 consisted of integration costs related to the acquisition of ESI, consisting primarily of bonus and stock-based compensation for certain ESI executives assisting in the integration process and information technology related costs.

Restructuring and other

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Restructuring and other	\$ 11.1	\$ 9.4

Restructuring and other costs incurred in 2021 primarily related to duplicate facility costs attributed to entering into new leases, severance costs due to a global cost saving initiative, severance costs relating to the pending closure of two facilities in Europe and the movement of certain product manufacturing to low cost regions.

Restructuring and other costs in 2020 primarily consisted of duplicate facility costs attributed to entering into new facility leases, costs related to the exit of certain product groups and costs related to the pending closure of a facility in Europe. Such costs were offset by an insurance reimbursement related to a legal settlement.

Amortization of Intangible Assets

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Amortization of intangible assets	\$ 55.3	\$ 55.2

Amortization of intangible assets were consistent in 2021 compared to 2020. New amortization costs in 2021 from our acquisition of Photon Control in July 2021 were offset by the decrease of certain intangible assets in our L&M segment that became fully amortized.

Interest Expense, Net

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Interest expense, net	\$ 24.8	\$ 27.7

Interest expense, net, decreased by \$3 million in 2021, compared to 2020, primarily due to lower interest expense as a result of lower interest rates and lower average debt balances as a result of principal payments made.

Other Expense, Net

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Other expense, net	\$ 8.6	\$ 3.1

Other expense, net, for 2021 and 2020 primarily related to changes in foreign exchange rates.

Provision for Income Taxes

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2021	2020
Provision for income taxes	\$ 114.1	\$ 72.9

Our effective tax rates for 2021 and 2020 were 17.1% and 17.2%, respectively. Our effective tax rates were lower than the U.S. statutory tax rate, mainly due to the geographic mix of income earned by our international subsidiaries being taxed at rates lower than the U.S. statutory tax rate, the deduction for foreign derived intangible income and research credits offset by the tax effects of non-deductible executive compensation and the global intangible low taxed income inclusion.

As of December 31, 2021, the total gross unrecognized tax benefits, which excludes interest and penalties, was \$43 million. As of December 31, 2020, the total gross unrecognized tax benefits, which excludes interest and penalties, was \$47 million. The net decrease was primarily attributable to the release of a reserve related to federal research tax credits, partially offset by an addition of a reserve related to foreign withholding taxes.

We accrue interest and, if applicable, penalties for any uncertain tax positions. Interest and penalties are classified as a component of income tax expense. As of December 31, 2021 and 2020, we accrued interest on unrecognized tax benefits of approximately \$1 million and \$1 million, respectively.

Over the next 12 months, it is reasonably possible that we may recognize approximately \$4 million of previously net unrecognized tax benefits, excluding interest and penalties, related to various U.S. federal, state and foreign tax positions primarily due to the expiration of statutes of limitations.

We are subject to examination by U.S. federal, state and foreign tax authorities. The U.S. federal statute of limitations remains open for tax years 2018 through the present. The statute of limitations for our tax filings in other jurisdictions varies between fiscal years 2015 through present. We also have certain federal credit carryforwards and state tax loss and credit carryforwards that are open to examination for tax years 2002 through the present. In addition, the 2017 transition tax remains open for examination.

In 2021, we recorded a net benefit to income tax expense of \$4 million, excluding interest and penalties, due to reserve releases related to the expiration of certain statutes of limitations for previously open tax years. In 2020, we recorded a net benefit to income tax expense of \$1 million, excluding interest and penalties, due to reserve releases related to the expiration of certain statutes of limitations for previously open tax years and the effective settlement of an Internal Revenue Service audit.

Our future effective tax rate depends on various factors, including the impact of tax legislation, further interpretations and guidance from U.S. federal and state governments on the impact of proposed regulations issued by the IRS, as well as the geographic composition of our pre-tax income and changes in income tax reserves for unrecognized tax benefits. We monitor these factors and timely adjust our estimates of the effective tax rate accordingly. We expect the geographic mix of pre-tax income will continue to have a favorable impact on our effective tax rate. However, the geographic mix of pre-tax income can change based on multiple factors, resulting in changes to the effective tax rate in future periods. While we believe we have adequately provided for all tax positions, amounts asserted by taxing authorities could materially differ from our accrued positions as a result of uncertain and complex application of tax law and regulations. Additionally, the recognition and measurement of certain tax benefits include estimates and judgment by management. Accordingly, we could record additional provisions or benefits for U.S. federal, state, and foreign tax matters in future periods as new information becomes available. On March 11, 2021, President Biden signed into law the American Rescue Plan Act of 2021 (“ARPA”). ARPA contains numerous income tax provisions, among other tax and non-tax provisions, to provide COVID-19 pandemic relief. We evaluated the ARPA legislation in relation to income taxes and it did not have a material impact on our financial statements in

2021. The ARPA income tax provisions that are effective in future years are being evaluated and we have not yet determined the impact on our consolidated financial statements.

Liquidity and Capital Resources

Cash, cash equivalents and short-term marketable investments totaled \$1 billion at December 31, 2021, an increase of \$207 million compared to \$836 million at December 31, 2020. The primary driver in our current and anticipated future cash flows is and will continue to be cash generated from operations, consisting primarily of our net income, excluding non-cash charges and changes in operating assets and liabilities.

Our total cash and cash equivalents and short-term marketable investments at December 31, 2021 consisted of \$619 million held in the United States and \$419 million held by our foreign subsidiaries. We believe that our current cash and investments position and available borrowing capacity, together with the cash anticipated to be generated from our operations, will be sufficient to satisfy our estimated working capital, planned capital expenditure requirements, and any future cash dividends declared by our Board of Directors or share repurchases through at least the next 12 months and the foreseeable future.

In periods when our sales are growing, higher sales to customers will result in increased trade receivables, and inventories will generally increase as we build products for future sales. This may result in lower cash generated from operations. Conversely, in periods when our sales are declining, our trade accounts receivable and inventory balances will generally decrease, resulting in increased cash from operations.

Net cash provided by operating activities was \$639 million for 2021 and resulted from net income of \$551 million, which included non-cash net charges of \$160 million offset by an increase in working capital of \$72 million. The increase in working capital consisted of an increase in inventories of \$92 million and an increase in trade accounts receivable of \$53 million, both of which were the result of increased business levels in 2021, offset by an increase in accounts payable of \$56 million from increased business levels and an increase in current and non-current accrued compensation of \$17 million.

Net cash provided by operating activities was \$513 million for 2020 and resulted from net income of \$350 million, which included non-cash net charges of \$152 million and a decrease in working capital of \$11 million. The decrease in working capital consisted of a decrease in other current and non-current assets of \$41 million, primarily from the collection of income tax receivables, an increase in income taxes payable of \$22 million, an increase in accounts payable of \$21 million, an increase in current and non-current accrued compensation of \$19 million, primarily due to higher variable compensation, and an increase in other current and non-current liabilities of \$5 million, offset by an increase in inventories of \$52 million and an increase in trade accounts receivable of \$45 million, both of which were the result of increased business levels in 2020.

Net cash used in investing activities was \$205 million for 2021, reflecting the purchase of Photon Control for \$268 million, net of cash and cash equivalents acquired, and purchases of property, plant and equipment of \$87 million, primarily for production related equipment, offset by the net sales of short-term investments of \$150 million. Net cash used in investing activities was \$202 million for 2020, reflecting net purchases of short-term investments of \$117 million and purchases of property, plant and equipment of \$85 million, which included the buildout of three newly leased facilities in 2020.

Net cash used in financing activities was \$65 million for 2021 and was primarily due to dividend payments made to holders of our common stock of \$48 million and net payments of short and long-term borrowings of \$14 million.

Net cash used in financing activities was \$121 million for 2020 and was primarily due to a repayment of our Term Loan Facility of \$59 million, dividend payments made to holders of our common stock of \$44 million and net payments related to tax payments for employee stock awards of \$20 million, offset by net proceeds from short-term borrowings of \$2 million.

For the year ended December 31, 2021, we paid cash dividends of \$48 million in the aggregate or \$0.86 per share. For the year ended December 31, 2020, we paid cash dividends of \$44 million in the aggregate or \$0.80 per share. Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of our Board of Directors. Holders of our common stock are entitled to receive dividends when and if they are declared by our Board of Directors. Under the terms of our Term Loan Facility and our ABL Facility, as defined and described further below, we may be restricted from paying dividends under certain circumstances.

On February 7, 2022, our Board of Directors declared a quarterly cash dividend of \$0.22 per share to be paid on March 11, 2022 to shareholders of record as of February 28, 2022.

Atotech Acquisition

On July 1, 2021, we entered into an Implementation Agreement to acquire Atotech, a leading process chemicals technology company and a market leader in advanced electroplating solutions. Pursuant to the Implementation Agreement, we agreed to pay \$16.20 per share in cash and 0.0552 of a share of our common stock for each outstanding common share of Atotech. At the time of the announcement of the acquisition, the total value of the aggregate cash and stock consideration was approximately \$5.1 billion. The final value of the consideration will be determined at the time of the closing of the acquisition, which is expected to occur in the first quarter of 2022, subject to the satisfaction of certain closing conditions, including receipt of regulatory approval from China and approval by the Royal Court of Jersey. Our obligations to complete the acquisition are not subject to any financing condition. Additional information regarding the funding of the acquisition, the New Term Loan Facility, the New Revolving Credit Facility, and the refinancing of the Term Loan Facility and ABL Facility, is discussed under “Recent Events” above.

Senior Secured Term Loan Credit Facility

In connection with the completion of the acquisition of Newport Corporation (“Newport”) in 2016 (the “Newport Merger”), we entered into a term loan credit agreement (as amended, the “Term Loan Credit Agreement”) with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto, which provided a senior secured term loan credit facility (the “Term Loan Facility”) in the original principal amount of \$780.0 million. We have entered into seven amendments to the Term Loan Credit Agreement since 2016, including most recently the May Term Loan Amendment (as defined below). The Term Loan Facility is subject to increase at our option and subject to receipt of lender commitments in accordance with the Term Loan Credit Agreement. The maturity date of the Term Loan Facility is February 2, 2026. As of December 31, 2021, borrowings under the Term Loan Facility bear interest per annum at one of the following rates selected by us: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the “prime rate” quoted in *The Wall Street Journal*, (3) a London Interbank Offered Rate (“LIBOR”) rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00%, and (4) a floor of 1.00%, plus, in each case, an applicable margin of 0.75%; or (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, subject to a LIBOR rate floor of 0.0%, plus an applicable margin of 1.75%. We have elected the interest rate as described in clause (b) of the foregoing sentence. The Term Loan Credit Agreement provides that, unless an alternate rate of interest is agreed, all loans will be determined by reference to the base rate if the LIBOR rate cannot be ascertained, if regulators impose material restrictions on the authority of a lender to make LIBOR rate loans, or for other reasons.

In May 2021, we entered into an amendment (the “May Term Loan Amendment”) to the Term Loan Credit Agreement. The May Term Loan Amendment amends the Term Loan Facility to, among other things, (i) increase our ability to incur additional incremental debt facilities to (x) the greater of (1) \$600 million and (2) 100% of consolidated EBITDA, plus (y) an amount equal to the sum of all voluntary prepayments of term loans under the Term Loan Facility, plus (z) an additional unlimited amount subject to pro forma compliance with a secured leverage ratio test of 3.25:1.00, and (ii) increase our flexibility under certain debt, lien, investment, restricted payment and disposition baskets. The fees incurred, including certain customary lender consent fees, in connection with the May Term Loan Amendment were immaterial.

We are required to make scheduled quarterly amortization payments each equal to 0.25% of the original principal amount of the Term Loan Facility. As of December 31, 2021, the remaining balance of deferred finance fees, original issue discount and repricing fees related to the term loans under the Term Loan Facility was \$8 million.

As of December 31, 2021, after giving effect to all amendments and repayments prior to such date, the outstanding principal amount of the Term Loan Facility was \$824 million, and the interest rate was 1.8%.

Under the Term Loan Credit Agreement, we are required to prepay outstanding term loans, subject to certain exceptions, with portions of our annual excess cash flow as well as with the net cash proceeds of certain of our asset sales, certain casualty and condemnation events and the incurrence or issuance of certain debt.

All obligations under the Term Loan Facility are guaranteed by certain of our domestic subsidiaries and are secured by substantially all of our assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

The Term Loan Credit Agreement contains customary representations and warranties, affirmative and negative covenants and provisions relating to events of default. If an event of default occurs, the lenders under the Term Loan Facility will be entitled to take various actions, including the acceleration of amounts due under the Term Loan Facility and all actions generally permitted to be taken by a secured creditor. At December 31, 2021, we were in compliance with all covenants under the Term Loan Credit Agreement.

Senior Secured Asset-Based Revolving Credit Facility

In February 2019, in connection with the completion of the ESI Merger, we entered into an asset-based revolving credit agreement with Barclays Bank PLC, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto (the “ABL Credit Agreement”), that provides a senior secured asset-based revolving credit facility of up to \$100 million, subject to a borrowing base limitation (the “ABL Facility”). We have entered into two amendments to the ABL Credit Agreement since 2019. As of December 31, 2021, after giving effect to all amendments, the borrowing base for the ABL Facility at any time equals the sum of: (a) 85% of certain eligible accounts; plus (b) prior to certain notice and field examination and appraisal requirements, the lesser of (i) 20% of net book value of eligible inventory in the United States and (ii) 30% of the borrowing base, and after the satisfaction of such requirements, the lesser of (i) the lesser of (A) 65% of the lower of cost or market value of certain eligible inventory and (B) 85% of the net orderly liquidation value of certain eligible inventory and (ii) 30% of the borrowing base; minus (c) reserves established by the administrative agent, in each case, subject to additional limitations and examination requirements for eligible accounts and eligible inventory acquired in an acquisition after February 1, 2019. The ABL Facility includes borrowing capacity in the form of letters of credit up to \$25 million. We have not borrowed against the ABL Facility to date.

As of December 31, 2021, any borrowings under the ABL Facility bear interest at a rate per annum equal to, at our option, any of the following, plus, in each case, an applicable margin: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the “prime rate” quoted in *The Wall Street Journal*, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00% and (4) a floor of 0.00%, plus, in each case, an applicable margin ranging from 0.25% to 0.50%; and (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, with a floor of 0.00%, plus, in each case, an applicable margin ranging from 1.25% to 1.50%. The applicable margin for borrowings thereunder is subject to upward or downward adjustment each fiscal quarter, based on the average historical excess availability during the preceding quarter.

In addition to paying interest on any outstanding principal under the ABL Facility, we are required to pay a commitment fee in respect of the unutilized commitments thereunder equal to 0.25% per annum. We must also pay customary letter of credit fees and agency fees.

Under the ABL Facility, we are required to prepay amounts outstanding under the ABL Facility (1) if amounts outstanding under the ABL Facility exceed the lesser of (a) the commitment amount and (b) the borrowing base, in an amount required to reduce such shortfall, (2) if amounts outstanding under the ABL Facility in any currency other than U.S. dollars exceed the sublimit for such currency, in an amount required to reduce such shortfall, and (3) during any period in which we have excess availability less than the greater of (a) 10.0% of the lesser of (x) the commitment amount and (y) the borrowing base (the “Line Cap”) and (b) \$9 million for 3 consecutive business days, until the time when we have excess availability equal to or greater than the greater of (A) 10.0% of the Line Cap and (B) \$9 million for 30 consecutive days, or during the continuance of an event of default, with immediately available funds in our blocked accounts.

There is no scheduled amortization under the ABL Facility. Any principal amount outstanding under the ABL Facility is due and payable in full on the fifth anniversary of the closing date, subject to a springing maturity in the event that term loans under the Term Loan Facility in an aggregate amount of at least \$100 million have an earlier maturity date than the ABL Facility.

All obligations under the ABL Facility are guaranteed by certain of our domestic subsidiaries and are secured by substantially all of our assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

From the time when we have excess availability less than the greater of (a) 10.0% of the Line Cap and (b) \$9 million until the time when we have excess availability equal to or greater than the greater of (a) 10.0% of the Line Cap and (b) \$9 million for 30 consecutive days, or during the continuance of an event of default, the ABL Credit Agreement requires that we maintain a fixed charge coverage ratio, tested on the last day of each fiscal quarter, of at least 1.0 to 1.0.

The ABL Credit Agreement also contains customary representations and warranties, affirmative covenants and provisions relating to events of default. If an event of default occurs, the lenders under the ABL Facility will be entitled to take various actions, including the acceleration of amounts due under the ABL Facility and all actions permitted to be taken by a secured creditor.

Lines of Credit and Short-Term Borrowing Arrangements

Our Japanese subsidiaries have lines of credit and a financing facility with various financial institutions, many of which generally expire and are renewed at three-month intervals with the remaining having no expiration date. The lines of credit and financing facility provided for aggregate borrowings as of December 31, 2021 of up to an equivalent of \$29 million U.S. dollars. There were no borrowings outstanding under these arrangements at December 31, 2021. Total borrowings outstanding under these arrangements were \$6 million at December 31, 2020.

Contractual Obligations

As of December 31, 2021, we are a party to purchase commitments for certain inventory components and other equipment and services used in our normal operations totaling approximately \$389 million. The majority of these purchase commitments covered by these arrangements are for periods of less than one year.

In addition, we have various operating leases for real estate and non-real estate items. The non-real estate leases are mainly comprised of automobiles but also include office equipment and other lower-valued items. Future payments related to operating leases are as follows:

Year Ending December 31,	Operating Leases
2022	\$ 24.0
2023	22.6
2024	21.0
2025	18.8
2026	16.7
Thereafter	158.1
Total lease payments	261.2
Less: imputed interest	50.6
Total lease liabilities	<u>\$ 210.6</u>

Contractual maturities of our debt obligations as of December 31, 2021 are as follows:

Year Ending December 31,	Amount
2022	\$ 9.0
2023	9.0
2024	9.0
2025	9.0
2026	788.4

We have a number of defined benefit pension plans, which cover substantially all of our full-time employees in France, Germany, Israel, Japan and Taiwan. In addition, we have certain pension assets and liabilities relating to our former employees in the United Kingdom. As of December 31, 2021, our estimated benefit payments over the next 10 years amount to \$15 million. The majority of the benefit payments covered by these arrangements occurs after 2026.

Derivatives

We enter into derivative instruments for risk management purposes only, including derivatives designated as hedging instruments and those utilized as economic hedges. We operate internationally, and in the normal course of business, are exposed to fluctuations in interest rates and foreign exchange rates. These fluctuations can increase the costs of financing, investing and operating the business. We have used derivative instruments, such as foreign exchange forward contracts and options, to manage certain foreign currency exposure, and interest rate swaps to manage interest rate exposure.

By nature, all financial instruments involve market and credit risks. We enter into derivative instruments with major investment grade financial institutions and no collateral is required. We have policies to monitor the credit risk of these counterparties. While there can be no assurance, we do not anticipate any material non-performance by any of these counterparties.

Interest Rate Swap Agreements

We entered into various interest rate swap agreements as described further in Note 9 to the Notes to Consolidated Financial Statements that exchange the variable LIBOR interest rate to a fixed rate in order to manage the exposure to interest rate fluctuations associated with the variable LIBOR interest rate paid on the outstanding balance of the Term Loan Facility. We expect to enter into interest rate swap agreements in order to manage the exposure to interest rate fluctuations associated with the variable SOFR interest rate of the New Term Loan Facility.

Swap	Trade Date	Effective Date	Maturity	Fixed Rate	Notional Amount at Effective Date	Notional Amount	Years Ended December 31,	
							2021	2020
							Fair Value Asset (Liability)	Fair Value (Liability)
1	April 3, 2019	April 5, 2019	March 31, 2023	2.309%	\$ 300	\$ 300	\$ (5)	\$ (12)
2	October 29, 2020	October 26, 2021	February 28, 2025	0.485%	\$ 200	\$ 200	4	(1)
3	October 29, 2020	March 31, 2022	February 28, 2025	0.623%	\$ 100	\$ 100	5	(1)
Total							\$ 4	\$ (14)

The interest rate swaps are recorded at fair value on the balance sheet and changes in the fair value are recognized in Accumulated Other Comprehensive Income. To the extent that these arrangements are no longer an effective hedge, any ineffectiveness measured in the hedging relationships is recorded immediately in earnings in the period it occurs. The fair value of the interest rate swaps is classified in other assets or non-current liabilities, accordingly, in the consolidated balance sheet.

Currency Option Agreements

In conjunction with financing the proposed acquisition of Atotech, we expect to issue EUR 500 million term loan debt. At the expected close, a portion of those proceeds will settle Atotech's existing EUR 200 million term loan, and the EUR 300 million balance will be converted into USD in support of the USD purchase price. We purchased foreign currency option contracts to fix the conversion of EUR 300 million into USD as noted below:

Trade Date	Effective Date	Maturity	Fixed Rate	Notional Amount in EUR	Notional Amount in USD	Year Ended December 31, 2021 Fair Value Asset
October 26, 2021	October 26, 2021	January 31, 2022	\$1.1615	\$ 300	\$ 348	\$ 3

The currency swaps are recorded at fair value on the balance sheet and changes in the fair value are recognized immediately in earnings. The fair value asset is classified in other current assets in the consolidated balance sheet. We recorded an unrealized gain of \$3 million in 2021, net of premiums, which is included in other expense, net.

In conjunction with the Photon Control Acquisition, we entered into a foreign currency contract to hedge the Canadian dollar purchase price. In 2021, we recorded a fair value realized loss of \$10 million, which is included in other expense, net.

Foreign Exchange Contracts

We hedge a portion of our forecasted foreign currency denominated intercompany sales of inventory, over a maximum period of eighteen months, using foreign exchange forward contracts accounted for as cash-flow hedges related to British, Euro, Japanese, South Korean and Taiwanese currencies. To the extent these derivatives are effective in offsetting the variability of the hedged cash flows, and otherwise meet the hedge accounting criteria, changes in the derivatives' fair value are not included in current earnings but are included in accumulated other comprehensive income in stockholders' equity. These changes in fair value will subsequently be reclassified into earnings, as applicable, when the forecasted transaction occurs. To the extent that a previously designated hedging transaction is no longer an effective hedge, any ineffectiveness measured in the hedging relationship is recorded immediately in earnings in the period it occurs. The cash flows resulting from forward exchange contracts are classified in the consolidated statements of cash flows as part of cash flows from operating activities. We do not enter into derivative instruments for trading or speculative purposes.

We also enter into foreign exchange forward contracts to hedge certain balance sheet amounts. To the extent the hedge accounting criteria is not met, the related foreign currency forward contracts are considered as economic hedges and changes in the fair value of these contracts are recorded immediately in earnings in the period in which they occur. These include hedges that are used to reduce exchange rate risks arising from the change in fair value of certain foreign currency-denominated assets and liabilities (i.e., payables, receivables) and other economic hedges where the hedge accounting criteria were not met.

We had foreign exchange forward contracts with notional amounts totaling \$240 million outstanding at December 31, 2021, of which \$108 million was outstanding to exchange South Korean won to U.S. dollars and \$60 million was outstanding to exchange Japanese yen to U.S. dollars. We had forward exchange contracts with notional amounts totaling \$176 million outstanding at December 31, 2020, of which \$62 million was outstanding to exchange South Korean won to U.S. dollars and \$62 million was outstanding to exchange Japanese yen to U.S. dollars.

As of December 31, 2021, the unrealized loss that will be reclassified from accumulated other comprehensive income to earnings over the next twelve months is immaterial. Gains and losses on forward exchange contracts that qualify for hedge accounting are classified in cost of products in 2021 and 2020, and totaled a (loss) gain of \$(2) million and \$2 million, respectively. There were no ineffective portions of the derivatives recorded in 2021 and 2020.

We hedge certain intercompany accounts receivable and intercompany loans with forward exchange contracts. Typically, as these derivatives hedge existing amounts that are denominated in foreign currencies, the derivatives do not qualify for hedge accounting. Realized and unrealized gains and losses on forward exchange contracts that do not qualify for hedge accounting are recognized immediately in earnings. The net foreign exchange gains or losses on these derivatives were immaterial in each of 2021 and 2020. Foreign currency gains or losses are classified in other expense, net. The cash flows resulting from forward exchange contracts are classified in our consolidated statements of cash flows as part of cash flows from operating activities. We do not hold or issue derivative financial instruments for trading purposes.

Recently Issued Accounting Pronouncements

In March 2020, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") No. 2020-04, "Reference Rate Reform (Topic 848): Facilitation of the Effects of Reference Rate Reform on Financial Reporting." This standard provides temporary optional expedients and exceptions to accounting guidance on contract modifications and hedge accounting to ease entities' financial reporting burdens as the market transitions from the London Interbank Offered Rate ("LIBOR") and other interbank offered rates to alternative reference rates. The standard was effective upon issuance and generally can be applied through December 31, 2022. In January 2021, the FASB issued ASU 2021-01, "Reference Rate Reform (Topic 848): Scope." The amendments in this update clarify that certain optional expedients and exceptions in Topic 848 for contract modifications and hedge accounting apply to derivative instruments that use an interest rate for margining, discounting, or contract price alignment that is modified as a result of reference rate reform. Amendments in this update to the expedients and exceptions in Topic 848 capture the incremental consequences of the scope clarification and tailor the existing guidance to derivative instruments affected by the discounting transition. The amendments in this update do not apply to contract modifications made after December 31, 2022, new hedging relationships entered into after December 31, 2022, and existing hedging relationships evaluated for effectiveness in periods after December 31, 2022, except for hedging relationships existing as of December 31, 2022, that apply certain optional expedients in which the accounting effects are recorded through the end of the hedging relationship (including periods after December 31, 2022). The adoption of the requirements of these standards has not resulted in a material impact on our financial position, results of operations and cash flows, but the adoption of the requirements may impact us in the future.

Item 7A. *Quantitative and Qualitative Disclosures about Market Risk*

Market Risk and Sensitivity Analysis

Our primary exposures to market risks include fluctuations in interest rates on our Term Loan Facility, as defined and as described further in Item 7 of this Annual Report on Form 10-K, and investment portfolio, as well as fluctuations in foreign currency exchange rates.

Foreign Exchange Rate Risk

We mainly enter into forward exchange contracts to reduce currency exposure arising from intercompany sales of inventory. We also enter into forward exchange contracts to reduce foreign exchange risks arising from the change in fair value of certain foreign currency denominated assets and liabilities.

We had forward exchange contracts with notional amounts totaling \$240 million outstanding and a net fair value asset of \$3 million at December 31, 2021. We had forward exchange contracts with notional amounts totaling \$176 million outstanding and a net fair value liability of \$7 million at December 31, 2020. The potential fair value loss for a hypothetical 10% adverse change in the currency exchange rate on our forward exchange contracts at December 31, 2021 and 2020 would be immaterial.

Interest Rate Risk

We hold our cash, cash equivalents and short-term investments for working capital purposes. Some of the securities we invest in are subject to market risk. This means that a change in prevailing interest rates may cause the principal amount of such investments to fluctuate. To minimize this risk, we maintain our portfolio of cash, cash equivalents and short-term investments in a variety of securities, including money market funds and government debt securities. Due to the short-term nature of these instruments, we believe that we do not have any material exposure to changes in the fair value of our investment portfolio as a result of changes in interest rates. Declines in interest rates, however, would reduce future interest income. The effect of a hypothetical 10% increase or decrease in overall interest rates would not have had a material impact on our operating results or the total fair value of our portfolio.

We enter into various interest rate swap agreements as described further in “Management’s Discussion and Analysis of Financial Condition and Results of Operations – Derivatives” that exchange the variable LIBOR rate to a fixed rate, to manage the exposure to interest rate fluctuations associated with the variable LIBOR interest rate paid on the outstanding balance of the Term Loan Facility.

We are exposed to market risks related to fluctuations in interest rates related to our Term Loan Facility. As of December 31, 2021, we owed \$824 million, with \$524 million at a variable interest rate of 1.75% plus LIBOR, and \$300 million at a fixed interest rate of 2.309%, plus the applicable credit spread, which was 1.75% at December 31, 2021. We performed a sensitivity analysis on the outstanding portion of our debt obligations as of December 31, 2021. Should the current average interest rate increase or decrease by 10%, the resulting annual increase or decrease to interest expense at December 31, 2021 would be immaterial.

Currency Option Agreements

In conjunction with financing the proposed acquisition of Atotech, we expect to issue EUR 500 million term loan debt. At the expected close, a portion of those proceeds will refinance Atotech’s existing EUR 200 million term loan, the balance to be converted into USD in support of the USD purchase price. We purchased foreign currency option contracts to hedge the conversion of EUR 300 million into USD. We had foreign currency option contracts with notional amounts totaling EUR 300 million outstanding and a net fair value asset of \$3 million at December 31, 2021. The potential fair value loss for a hypothetical 10% adverse change in the currency exchange rate on our forward currency option contracts at December 31, 2021 would be immaterial.

Item 8. Financial Statements and Supplementary Data

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of MKS Instruments, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of MKS Instruments, Inc. and its subsidiaries (the “Company”) as of December 31, 2021 and 2020, and the related consolidated statements of operations and comprehensive income, of stockholders’ equity and of cash flows for each of the three years in the period ended December 31, 2021, including the related notes and schedule of valuation and qualifying accounts for each of the three years in the period ended December 31, 2021 appearing under Item 15(a)(2) (collectively referred to as the “consolidated financial statements”). We also have audited the Company's internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control - Integrated Framework (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management’s Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company’s consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

As described in Management’s Report on Internal Control over Financial Reporting, management has excluded Photon Control Inc. (“Photon Control”) from its assessment of internal control over financial reporting as of December 31, 2021 because it was acquired by the Company in a purchase business combination during 2021. We have also excluded Photon Control from our audit of internal control over financial reporting. Photon Control is a wholly-owned subsidiary whose total assets and total revenues excluded from management’s assessment and our audit of internal control over financial reporting represent approximately 1% of the related consolidated financial statement amounts as of and for the year ended December 31, 2021.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relate to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Acquisition of Photon Control Inc. ("Photon Control") – Valuation of Completed Technology Intangible Asset

As described in Note 5 to the consolidated financial statements, the Company completed its acquisition of Photon Control for a total net purchase price of \$268.4 million, which resulted in recording a \$110 million completed technology intangible asset. The fair value of the acquired completed technology intangible asset was determined using the income approach. In performing the valuation for the intangible asset, the key underlying assumptions used included the appropriate discount rate as well as forecasted revenue growth rates, gross profit and operating margins.

The principal considerations for our determination that performing procedures relating to the acquisition of Photon Control - valuation of completed technology intangible asset is a critical audit matter are the significant judgment by management when developing the fair value of the acquired completed technology intangible asset, which in turn led to a high degree of auditor judgment, subjectivity, and effort in performing procedures and evaluating management's significant assumptions related to the forecasted revenue growth rates and the discount rate. In addition, the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the acquisition accounting, including controls over management's valuation of the acquired completed technology intangible asset and controls over the development of significant assumptions related to the forecasted revenue growth rates and the discount rate. These procedures also included, among others, (i) reading the purchase agreement and (ii) testing management's process for estimating the fair value of the acquired completed technology intangible asset. Testing management's process included evaluating the appropriateness of the income approach, testing the completeness and accuracy of data provided by management, and evaluating the reasonableness of significant assumptions related to the forecasted revenue growth rates and the discount rate for the completed technology intangible asset. Evaluating the reasonableness of the forecasted revenue growth rates involved considering the past performance of the acquired business and industry forecasts. Professionals with specialized skill and knowledge were used to assist in the evaluation of the Company's income approach and the discount rate assumption.

/s/ PricewaterhouseCoopers LLP
Boston, Massachusetts
February 28, 2022

We have served as the Company's auditor since 1981.

MKS Instruments, Inc.
Consolidated Balance Sheets
(in millions, except per share data)

	December 31,	
	2021	2020
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 966.3	\$ 608.3
Short-term investments	76.4	227.7
Trade accounts receivable, net of allowance for doubtful accounts of \$3.6 and \$2.0 at December 31, 2021 and 2020, respectively	442.6	392.7
Inventories	576.7	501.4
Other current assets	85.3	74.3
Total current assets	2,147.3	1,804.4
Property, plant and equipment, net	325.3	284.3
Right-of-use assets	184.3	184.4
Goodwill	1,228.2	1,066.4
Intangible assets, net	576.0	512.2
Long-term investments	6.2	6.5
Other assets	73.0	45.6
Total assets	\$ 4,540.3	\$ 3,903.8
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Short-term debt	\$ 9.0	\$ 14.5
Accounts payable	168.1	110.6
Accrued compensation	131.9	117.9
Income taxes payable	25.1	18.3
Lease liabilities	18.0	15.8
Deferred revenue and customer advances	37.5	31.2
Other current liabilities	71.2	65.6
Total current liabilities	460.8	373.9
Long-term debt, net	807.9	815.0
Non-current deferred taxes	99.1	59.2
Non-current accrued compensation	49.3	49.5
Non-current lease liability	192.6	187.4
Other non-current liabilities	44.0	57.9
Total liabilities	1,653.7	1,542.9
Commitments and contingencies (Note 23)		
Stockholders' equity:		
Preferred stock, \$0.01 par value, 2 shares authorized; none issued and outstanding	—	—
Common stock, no par value, 200 shares authorized; 55.5 and 55.2 shares issued and outstanding at December 31, 2021 and 2020, respectively	0.1	0.1
Additional paid-in capital	906.7	873.2
Retained earnings	1,991.0	1,487.3
Accumulated other comprehensive (loss) income	(11.2)	0.3
Total stockholders' equity	2,886.6	2,360.9
Total liabilities and stockholders' equity	\$ 4,540.3	\$ 3,903.8

The accompanying notes are an integral part of the consolidated financial statements.

MKS Instruments, Inc.
Consolidated Statements of Operations and Comprehensive Income
(in millions, except per share data)

	Years Ended December 31,		
	2021	2020	2019
Net revenues:			
Products	\$ 2,578.6	\$ 2,014.8	\$ 1,611.3
Services	371.0	315.2	288.5
Total net revenues	2,949.6	2,330.0	1,899.8
Cost of revenues:			
Products	1,370.9	1,106.4	913.5
Services	198.5	174.1	155.9
Total cost of revenues (exclusive of amortization shown separately below)	1,569.4	1,280.5	1,069.4
Gross profit	1,380.2	1,049.5	830.4
Research and development	200.0	173.1	164.1
Selling, general and administrative	385.1	353.1	330.3
Acquisition and integration costs	29.8	3.8	37.3
Restructuring and other	11.1	9.4	7.0
Amortization of intangible assets	55.3	55.2	67.4
Asset impairment	—	2.3	4.7
COVID-19 related net credits	—	(1.2)	—
Fees and expenses related to repricing of Term Loan Facility	—	—	6.6
Gain on sale of long-lived assets	—	—	(6.8)
Income from operations	698.9	453.8	219.8
Interest income	0.6	1.4	5.4
Interest expense	25.4	29.1	44.1
Other expense, net	8.6	3.1	3.3
Income before income taxes	665.5	423.0	177.8
Provision for income taxes	114.1	72.9	37.4
Net income	\$ 551.4	\$ 350.1	\$ 140.4
Other comprehensive income, net of tax:			
Changes in value of financial instruments designated as cash flow hedges	\$ 20.0	\$ (10.6)	\$ (10.0)
Foreign currency translation adjustments	(31.5)	34.7	(6.2)
Unrecognized pension loss	—	(1.7)	(0.5)
Unrealized gain on investments	—	0.2	—
Total comprehensive income	\$ 539.9	\$ 372.7	\$ 123.7
Net income per share:			
Basic	\$ 9.95	\$ 6.36	\$ 2.57
Diluted	\$ 9.90	\$ 6.33	\$ 2.55
Weighted average common shares outstanding:			
Basic	55.4	55.1	54.7
Diluted	55.7	55.3	55.1

The accompanying notes are an integral part of the consolidated financial statements.

MKS Instruments, Inc.
Consolidated Statements of Stockholders' Equity
(in millions, except per share data)

	Common Stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive (Loss) Income	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2018	54.0	\$ 0.1	\$ 793.9	\$ 1,084.8	\$ (5.6)	\$ 1,873.2
Net issuance under stock-based plans	0.6		(11.0)			(11.0)
Settlement of share-based compensation awards ⁽¹⁾			30.6			30.6
Stock-based compensation			50.3			50.3
Cash dividend (\$0.80 per common share)				(43.5)		(43.5)
Stock dividends accrued			0.5	(0.5)		—
Comprehensive income (net of tax):						
Net income				140.4		140.4
Other comprehensive loss					(16.7)	(16.7)
Balance at December 31, 2019	54.6	0.1	864.3	1,181.2	(22.3)	2,023.3
Net issuance under stock-based plans	0.6		(20.7)			(20.7)
Stock-based compensation			29.6			29.6
Cash dividend (\$0.80 per common share)				(44.0)		(44.0)
Comprehensive income (net of tax):						
Net income				350.1		350.1
Other comprehensive income					22.6	22.6
Balance at December 31, 2020	55.2	0.1	873.2	1,487.3	0.3	2,360.9
Net issuance under stock-based plans	0.3		(3.3)			(3.3)
Stock-based compensation			36.7			36.7
Cash dividend (\$0.86 per common share)				(47.6)		(47.6)
Stock dividends accrued			0.1	(0.1)		—
Comprehensive income (net of tax):						
Net income				551.4		551.4
Other comprehensive loss					(11.5)	(11.5)
Balance at December 31, 2021	55.5	\$ 0.1	\$ 906.7	\$ 1,991.0	\$ (11.2)	\$ 2,886.6

⁽¹⁾ Represents the vested but unissued portion of Electro Scientific Industries, Inc. (“ESI”) share-based compensation awards as of the acquisition date of February 1, 2019 as described further in Note 5.

The accompanying notes are an integral part of the consolidated financial statements.

MKS Instruments, Inc.
Consolidated Statements of Cash Flows
(in millions)

	Years Ended December 31,		
	2021	2020	2019
Cash flows from operating activities:			
Net income	\$ 551.4	\$ 350.1	\$ 140.4
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	104.1	99.2	110.0
Unrealized (gain) loss on derivatives not designated as hedging instruments	(4.2)	(0.4)	0.1
Amortization of inventory step-up adjustment to fair value	—	—	7.6
Amortization of debt issuance costs and original issue discount	2.3	2.7	7.1
Stock-based compensation	36.7	29.5	49.2
Provision for excess and obsolete inventory	16.2	24.8	24.7
Deferred income taxes	1.2	(7.1)	(4.2)
Asset impairment	—	2.3	4.7
Other	3.3	0.7	(6.6)
Changes in operating assets and liabilities, net of businesses acquired:			
Trade accounts receivable	(52.7)	(44.8)	(0.1)
Inventories	(91.7)	(52.2)	(29.3)
Income taxes payable	1.3	21.6	(12.4)
Other current and non-current assets	(0.3)	40.9	(9.8)
Current and non-current accrued compensation	17.0	19.4	(4.2)
Other current and non-current liabilities	(0.6)	5.5	(8.5)
Accounts payable	55.5	21.0	(24.2)
Net cash provided by operating activities	639.5	513.2	244.5
Cash flows from investing activities:			
Acquisitions of businesses, net of cash acquired	(268.4)	—	(988.6)
Purchases of investments	(497.0)	(522.4)	(246.3)
Maturities of investments	478.3	332.4	142.6
Sales of investments	169.2	72.5	166.9
Proceeds from sale of assets	—	—	42.1
Purchases of property, plant and equipment	(86.7)	(84.9)	(63.9)
Net cash used in investing activities	(204.6)	(202.4)	(947.2)
Cash flows from financing activities:			
Net proceeds from short and long-term borrowings	1.0	27.0	642.2
Payments of short and long-term borrowings	(15.2)	(83.8)	(111.5)
Net payments related to employee stock awards	(3.3)	(20.7)	(11.0)
Dividend payments	(47.6)	(44.0)	(43.5)
Net cash (used in) provided by financing activities	(65.1)	(121.5)	476.2
Effect of exchange rate changes on cash and cash equivalents	(11.8)	4.4	(3.2)
Increase (decrease) in cash and cash equivalents	358.0	193.7	(229.7)
Cash and cash equivalents at beginning of period	608.3	414.6	644.3
Cash and cash equivalents at end of period	\$ 966.3	\$ 608.3	\$ 414.6
Supplemental disclosure of cash flow information:			
Cash paid during the period for:			
Interest	\$ 23.0	\$ 26.3	\$ 39.9
Income taxes	\$ 109.9	\$ 65.6	\$ 35.5

The accompanying notes are an integral part of the consolidated financial statements.

MKS INSTRUMENTS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in millions, except per share data)

1) Business Description

MKS Instruments, Inc. (“MKS” or the “Company”) was founded in 1961 and is a global provider of instruments, systems, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity for its customers. The Company’s products are derived from its core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, vacuum technology, temperature sensing, lasers, photonics, optics, precision motion control, vibration control and laser-based manufacturing systems solutions. The Company also provides services relating to the maintenance and repair of its products, installation services and training. The Company’s primary served markets include semiconductor, industrial technologies, life and health sciences, and research and defense.

2) Basis of Presentation

The consolidated financial statements include the accounts of MKS Instruments, Inc. and its wholly owned subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation.

The consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”). The preparation of these financial statements requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. On an ongoing basis, management evaluates its estimates and judgments, including those related to revenue recognition and allowance for doubtful accounts, inventory valuation, warranty costs, pension plan valuations, stock-based compensation, intangible assets, goodwill, other long-lived assets, in process research and development and income taxes. Management bases its estimates and judgments on historical experience and on various other factors that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

3) Summary of Significant Accounting Policies

Revenue from Contracts with Customers

The Company accounts for revenue using Accounting Standards Codification (“ASC”) 606 (“ASC 606”). The Company applies ASC 606 using the following steps:

- Identify the contract with a customer
- Identify the performance obligations in the contract
- Determine the transaction price
- Allocate the transaction price to performance obligations in the contract
- Recognize revenue when or as the Company satisfies a performance obligation

Revenue is recognized when or as obligations under the terms of a contract with the Company’s customer has been satisfied and control has transferred to the customer. The majority of the Company’s performance obligations, and associated revenue, are transferred to customers at a point in time, generally upon shipment of a product to the customer or receipt of the product by the customer and without significant judgments. Installation services are not significant and are usually completed in a short period of time (normally less than two weeks) and therefore, recorded at a point in time when the installation services are completed, rather than over time as they are not material. Extended warranty, service contracts, and repair services, which are transferred to the customer over time, are recorded as revenue as the services are performed. For repair services, the Company makes an accrual at quarter end based upon historical repair times within its product groups to record revenue based upon the estimated number of days completed to date, which is consistent with ratable recognition. Customized products with no alternative future use to the Company, and that have an enforceable right to payment for performance completed to date, are

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also recorded over time. The Company considers this to be a faithful depiction of the transfer to the customer of revenue over time as the work is performed or service is delivered, ratably over time. These adjustments were not material for 2021 or 2020.

Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring goods or providing services. Performance obligations promised in a contract are identified based on the products or services that will be transferred to the customer that are both capable of being distinct, whereby the customer can benefit from the product or service either on its own or together with other resources that are readily available from third parties or from the Company, and are distinct in the context of the contract, whereby the transfer of the product or service is separately identifiable from other promises in the contract. Sales, value add, and other taxes the Company collects concurrent with revenue-producing activities are excluded from revenue. The Company's normal payment terms are 30 to 60 days, but vary by the type and location of its customers and the products or services offered. For certain products and services and customer types, the Company requires payment before the products or services are delivered to, or performed for, the customer. None of the Company's contracts as of December 31, 2021 contained a significant financing component.

Contracts with Multiple Performance Obligations

The Company periodically enters into contracts with its customers in which a customer may purchase a combination of goods and or services, such as products with installation services or extended warranties. These contracts include multiple promises that the Company evaluates to determine if the promises are separate performance obligations. Once the Company determines the performance obligations, the Company then determines the transaction price, which includes estimating the amount of variable consideration to be included in the transaction price, if any. To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method depending on the method the Company expects to better predict the amount of consideration to which it will be entitled. There are no constraints on the variable consideration recorded. The Company then allocates the transaction price to each performance obligation in the contract based on a relative stand-alone selling price charged separately to customers or using an expected cost-plus-margin method. The corresponding revenues are recognized when or as the related performance obligations are satisfied, which are noted above. The impact of variable consideration was immaterial during 2021, 2020 and 2019.

Deferred Revenues

The Company's standard assurance warranty period is normally 12 to 24 months. The Company sells separately priced service contracts and extended warranty contracts related to certain of its products. The separately priced contracts generally range from 12 to 60 months. The Company normally receives payment at the inception of the contract and recognizes revenue over the term of the agreement in proportion to the costs expected to be incurred in satisfying the obligations under the contract. The Company has elected to use the practical expedient related to disclosing the remaining performance obligations as of December 31, 2021 and 2020, as the majority have a duration of less than one year.

Costs to Obtain and Fulfill a Contract

The Company expenses sales commissions when incurred because the amortization period would have been one year or less. These costs are recorded within selling, general and administration expenses. The Company has elected to recognize the costs for freight and shipping when control over products has transferred to the customer as an expense in cost of sales.

Product revenues, excluding revenue from certain custom products, is recorded at a point in time, while the majority of service revenues and revenue from certain custom products is recorded over time.

Accounts Receivable Allowances

Accounts receivable allowances include sales returns and bad debt allowances. The Company monitors and tracks the amount of product returns and reduces revenue at the time of shipment for the estimated amount of such future returns, based on historical experience. The Company makes estimates evaluating its allowance for doubtful accounts. The Company continuously monitors collections and payments from its customers and maintains a provision for estimated credit losses based upon its historical experience and any specific customer collection issues that it has identified.

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Research and Development

Research and development costs are expensed as incurred and consist mainly of compensation-related expenses and project materials. The Company's research and development efforts include numerous projects, which generally have a duration of 3 to 30 months. Acquired in-process research and development ("IPR&D") expenses, if acquired in a business combination, are capitalized at fair value as an intangible asset until the related project is completed, are then amortized over the estimated useful life of the product. The Company monitors projects and, if they are abandoned, the Company writes them off.

Advertising Costs

Advertising costs are expensed as incurred and were immaterial in 2021, 2020 and 2019.

Leases

The Company accounts for leases under ASC 842, "Leases". Under ASC 842, a contract is or contains a lease when the Company has the right to control the use of the identified asset. The Company determines if an arrangement is a lease at inception of the contract, which is the date on which the terms of the contract are agreed to and the agreement creates enforceable rights and obligations. The commencement date of the lease is the date that the lessor makes an underlying asset available for use.

The Company determines if the lease is an operating or finance lease at the lease commencement date based upon the terms of the lease and the nature of the asset. The lease term used to calculate the lease liability includes options to extend or terminate the lease when it is reasonably certain that the option will be exercised. The Company does not have material financing leases.

The Company measures the lease liability as the present value of future lease payments, discounted using the discount rate for the lease at the commencement date. The Company is typically unable to determine the implicit interest rate, so it uses an incremental borrowing rate based on the lease term and economic environment at commencement date. The ROU asset is initially measured as the amount of the lease liability, adjusted for any initial lease costs, prepaid lease payments and reduced by any lease incentives.

The Company's contracts often include non-lease components such as common area maintenance. MKS has elected the practical expedient to account for the lease and non-lease components as a single lease component. For leases with a term of one year or less the Company has elected not to record the lease asset or liability. The lease payments are recognized in the consolidated statement of earnings on a straight-line basis over the lease term. The Company includes lease costs within cost of revenues and operating expenses.

Stock-Based Compensation

The accounting for share-based compensation expense requires the measurement and recognition of compensation expense for all share-based payment awards made to employees and directors based on estimated fair values. For restricted stock units ("RSUs"), the fair value is measured on the date of grant and expensed normally over a three-year period. The Company also provides certain employees with the opportunity to purchase shares through its 2014 Employee Stock Purchase Plan ("2014 ESPP"). The Company estimates the fair value of shares issued under the 2014 ESPP using the Black-Scholes pricing model, which incorporates a number of complex and subjective variables, including expected stock price volatility over the term of the awards, expected life, risk-free interest rate and expected dividends.

Management determined that blended volatility, a combination of historical and implied volatility, is more reflective of market conditions and a better indicator of expected volatility than historical or implied volatility alone. The assumptions used in calculating the fair value of share-based payment awards represent management's best estimates, but these estimates involve inherent uncertainties and the application of management judgment. As a result, if factors change and the Company uses different assumptions, stock-based compensation expense could be materially different in the future.

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Accumulated Other Comprehensive Income

For foreign subsidiaries where the functional currency is the local currency, assets and liabilities are translated into U.S. dollars at the current exchange rate on the balance sheet date. Revenue and expenses are translated at average rates of exchange prevailing during the year. Translation adjustments resulting from this process are recorded to Accumulated Other Comprehensive Income (“OCI”). Unrealized gains and losses on securities classified as available-for-sale and unrecognized pension gains and losses are included in OCI in consolidated stockholders’ equity. For derivative instruments designated as cash-flow hedges and interest rate swap hedges, the effective portion of the derivative’s gain (loss) is initially reported as a component of OCI and is subsequently recognized in earnings when the hedged exposure is recognized in earnings.

Net Income Per Share

Basic net income per share is based on the weighted average number of common shares outstanding and diluted net income per share is based on the weighted average number of common shares outstanding and all potential dilutive common equivalent shares outstanding. The dilutive effect of equity awards are determined under the treasury stock method using the average market price for the period. Common equivalent shares are included in the per share calculations when the effect of their inclusion would be dilutive.

Cash and Cash Equivalents and Investments

All highly liquid investments with a maturity date of three months or less at the date of purchase are considered to be cash equivalents. The appropriate classification of investments in securities is determined at the time of purchase. Debt securities that the Company does not have the intent and ability to hold to maturity are classified as “available-for-sale” and are carried at fair value.

The Company classifies investments with maturity dates greater than twelve months in short-term investments rather than long-term investments. This method classifies these securities as current based on the nature of the securities and the availability for use in current operations. The Company believes this method is preferable because it is more reflective of the Company’s assessment of its overall liquidity position.

The Company reviews its investment portfolio on a quarterly basis to identify and evaluate individual investments that have indications of possible impairment. The factors considered in determining whether a loss is other-than-temporary include: the length of time and extent to which fair market value has been below the cost basis, the financial condition and near-term prospects of the issuer, credit quality, and the Company’s ability to hold the investment for a period of time sufficient to allow for any anticipated recovery in fair value.

Concentrations of Credit Risk

The Company’s significant concentrations of credit risk consist principally of cash and cash equivalents, investments, forward exchange contracts, interest rate swaps and trade accounts receivable. The Company maintains cash and cash equivalents with financial institutions, including some banks with which it had borrowings. The Company maintains investments primarily in U.S. Treasury and government agency securities and corporate debt securities. The Company enters into forward currency contracts with high credit-quality financial institutions in order to minimize credit risk exposure.

The Company’s largest customers are primarily concentrated in the semiconductor industry, and a limited number of these customers account for a significant portion of the Company’s revenues. The Company regularly monitors the creditworthiness of its customers and believes it has adequately provided for potential credit loss exposures. Credit is extended for all customers based primarily on financial condition, and collateral is not required.

During 2021, 2020 and 2019, approximately 62%, 59% and 49% of the Company’s net revenues, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers. One customer represented approximately 18% of the Company’s accounts receivable balance as of December 31, 2021 and 2020.

Inventories

Inventories are stated at the lower of cost or net realizable value, cost being determined using a standard costing system which approximates cost based on a first-in, first-out method. The Company regularly reviews inventory quantities on hand

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and records a provision to write-down excess and obsolete inventory to its estimated net realizable value, if less than cost, based primarily on its estimated forecast of product demand.

Property, Plant and Equipment

Property, plant and equipment are stated at cost. Expenditures for major renewals and betterments that extend the useful lives of property, plant and equipment are capitalized. Expenditures for maintenance and repairs are charged to expense as incurred. When assets are sold or otherwise disposed of, the cost and related accumulated depreciation are eliminated from the accounts and any resulting gain or loss is recognized in earnings.

Depreciation is provided on the straight-line method over the estimated useful lives of ten to fifty years for buildings and building improvements, three to eighteen years for machinery and equipment, furniture and fixtures, office equipment and software. Leasehold improvements are amortized over the shorter of the lease term or the estimated useful life of the leased asset.

Acquisition Accounting

The fair value of the consideration exchanged in a business combination is allocated to tangible assets and identifiable intangible assets acquired and liabilities assumed at acquisition date fair value. Goodwill is measured as the excess of the consideration transferred over the net fair value of identifiable assets acquired and liabilities assumed. The accounting for an acquisition involves a considerable amount of judgement and estimation. Cost, income, market or a combination of approaches may be used to establish the fair value of consideration exchanged, assets acquired, and liabilities assumed, depending on the nature of those items. The valuation approach is determined in accordance with generally accepted valuation methods. Key areas of estimation and judgment may include the selection of valuation approaches, cost of capital, market characteristics, cost structure, impacts of synergies, and estimates of terminal value, among other factors.

While the Company uses estimates and assumptions as part of the purchase price allocation process to estimate the value of assets acquired and liabilities assumed, estimates are inherently uncertain and subject to refinement. During the measurement period, which maybe up to one year from the acquisition date, the Company may record adjustments to the assets acquired and liabilities assumed, with a corresponding offset to goodwill, to the extent that adjustments are identified to the preliminary purchase price allocation. Upon conclusion of the measurement period, or final determination of the value of the assets acquired and liabilities assumed, whichever comes first, any subsequent adjustments are recorded to results of operations.

Intangible Assets

Intangible assets resulting from the acquisitions of businesses are estimated by management based on the fair value of assets acquired. These include acquired customer lists, technology, patents, trademarks, trade names and IPR&D. Intangible assets are amortized from one to eighteen years on a straight-line basis which represents the estimated periods of benefit and the expected pattern of consumption.

Goodwill

Goodwill is the amount by which the cost of acquired net assets exceeded the fair value of those net assets on the date of acquisition. The Company allocates goodwill to reporting units at the time of acquisition or when there is a change in the reporting structure and bases that allocation on which reporting units will benefit from the acquired assets and liabilities. Reporting units are defined as operating segments or one level below an operating segment, referred to as a component. The Company assesses goodwill for impairment on an annual basis as of October 31 or more frequently when events and circumstances occur indicating that the recorded goodwill may be impaired.

The estimated fair value of the Company's reporting units is based on discounted cash flow models derived from internal earnings and internal and external market forecasts. Determining fair value requires the exercise of significant judgment, including judgments about appropriate discount and terminal growth rates, as well as forecasted revenue, gross profit and operating margins. Discount rates are based on a weighted average cost of capital ("WACC"), which represents the average rate a business must pay its providers of debt and equity. The WACC used to test goodwill is derived from a group of comparable companies. Assumptions in estimating future cash flows are subject to a high degree of judgment and complexity.

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The Company makes every effort to forecast these future cash flows as accurately as possible with the information available at the time the forecast is developed.

In performing the Company's annual goodwill impairment test, the Company is permitted to first assess qualitative factors to determine whether it is more likely than not that the fair value of the Company's reporting unit is less than its carrying amount, including goodwill. In performing the qualitative assessment, the Company considers certain events and circumstances specific to the reporting unit and to the entity as a whole, such as macroeconomic conditions, industry and market considerations, overall financial performance and cost factors when evaluating whether it is more likely than not that the fair value of the reporting unit is less than its carrying amount. The Company is also permitted to bypass the qualitative assessment and proceed directly to the quantitative test. If the Company chooses to undertake the qualitative assessment and concludes that it is more likely than not that the fair value of the reporting unit is less than its carrying amount, the Company would then proceed to the quantitative impairment test. In the quantitative assessment, the Company compares the fair value of the reporting unit to its carrying amount, which includes goodwill. If the fair value exceeds the carrying value, no impairment loss exists. If the fair value is less than the carrying amount, a goodwill impairment loss is measured and recorded.

As of October 31, 2021, the Company performed its annual impairment assessment of goodwill by performing a qualitative analysis for all of its reporting units and determined that it is more likely than not that the fair values of the reporting units exceed their carrying amount.

Impairment of Long-Lived Assets

The Company evaluates the recoverability of its long-lived assets whenever events and changes in circumstances indicate that the carrying amount of an asset may not be fully recoverable. This periodic review may result in an adjustment of estimated depreciable lives or asset impairment. When indicators of impairment are present, the carrying values of the asset are evaluated in relation to their operating performance and future undiscounted cash flows of the underlying business. If the future undiscounted cash flows are less than their carrying value, impairment exists. The impairment is measured as the difference between the carrying value and the fair value of the underlying asset. Fair values are based on estimates of market prices and assumptions concerning the amount and timing of estimated future cash flows and assumed discount rates, reflecting varying degrees of perceived risk.

Foreign Exchange

The functional currency of the majority of the Company's foreign subsidiaries is the applicable local currency. For those subsidiaries, assets and liabilities are translated to U.S. dollars at year-end exchange rates. Income and expense accounts are translated at the average exchange rates prevailing during the year. The resulting translation adjustments are included in accumulated other comprehensive (loss) income in consolidated stockholders' equity. Foreign exchange transaction gains and losses are classified in other income/expense in the statement of operations and comprehensive income.

Net foreign exchange losses resulting from re-measurement were \$8.7, \$3.5 and \$3.6 for the years ended December 31, 2021, 2020, and 2019, respectively, and are included in other expense, net. These amounts do not reflect the corresponding gain (loss) from foreign exchange forward contracts, which are included in cost of sales. See Note 9 regarding foreign exchange contracts.

Employee Benefit Plans

The majority of the Company's employees participate in defined contribution plans, whereby the Company, at its discretion, makes certain matching contributions based on participating employees' annual contribution to the plan and their total compensation.

The Company also has defined benefit retirement plans at certain of its foreign subsidiaries. The Company accounts for these plans based on the provisions of ASC Topic 715, "Compensation-Retirement Benefits." Some of the key assumptions used to calculate the pension expense and projected benefit obligation include the discount rate, rate of forecasted salary increases, the expected long-term rate of return on plan assets and expected mortality. The obligation for these claims and the related periodic costs are measured using actuarial techniques and assumptions. Actuarial gains and losses are deferred and amortized over future periods.

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Income Taxes

The Company records income taxes using the asset and liability method. Deferred income tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective income tax bases, and also for operating loss and tax credit carryforwards. On a quarterly basis, the Company evaluates both the positive and negative evidence that affects the realizability of net deferred tax assets and assesses the need for a valuation allowance. The future benefit to be derived from its deferred tax assets is dependent upon its ability to generate sufficient future taxable income in each jurisdiction of the right type to realize the assets. The Company records a valuation allowance to reduce its net deferred tax assets to the amount that is expected to be realized. To the extent the Company establishes a valuation allowance an expense will be recorded as a component of the provision for income taxes on the statement of operations.

Accounting for income taxes requires a two-step approach to recognize and measure uncertain tax positions. The first step is to evaluate the tax position for recognition by determining if, based on the technical merits, it is more likely than not that the position will be sustained upon audit, including resolutions of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount that is more than 50% likely of being realized upon ultimate settlement. The Company re-evaluates these uncertain tax positions on a quarterly basis. This evaluation is based on factors including, but not limited to, changes in facts or circumstances, changes in tax law, effectively settled issues under audit and new audit activity. Any change in these factors could result in the recognition of a tax benefit or an additional charge to the tax provision.

Income tax effects resulting from changes in tax law are accounted for by the Company in the period in which the law is enacted and the effects are recorded as a component of provision for income taxes from continuing operations.

4) Recently Issued or Adopted Accounting Pronouncements

In October 2021, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) 2021-08, "Business Combinations (Topic 805): Accounting for Contract Assets and Contract Liabilities from Contracts with Customers" ("ASU No. 2021-08"). ASU No. 2021-08 will require companies to apply the definition of a performance obligation under ASC Topic 606 to recognize and measure contract assets and contract liabilities (i.e., deferred revenue) relating to contracts with customers that are acquired in a business combination. Under current U.S. GAAP, an acquirer generally recognizes assets acquired and liabilities assumed in a business combination, including contract assets and contract liabilities arising from revenue contracts with customers, at fair value on the acquisition date. ASU No. 2021-08 will result in the acquirer recording acquired contract assets and liabilities on the same basis that would have been recorded by the acquiree before the acquisition under ASC Topic 606. ASU No. 2021-08 is effective for fiscal years beginning after December 15, 2022, with early adoption permitted. The Company adopted this ASU during the fourth quarter of 2021 and the adoption of this ASU did not have a material impact on its financial position, results of operations and cash flows.

In March 2020, the FASB issued ASU No. 2020-04, “Reference Rate Reform (Topic 848): Facilitation of the Effects of Reference Rate Reform on Financial Reporting.” This standard provides temporary optional expedients and exceptions to accounting guidance on contract modifications and hedge accounting to ease entities’ financial reporting burdens as the market transitions from the London Interbank Offered Rate (“LIBOR”) and other interbank offered rates to alternative reference rates. The standard was effective upon issuance and generally can be applied through December 31, 2022. In January 2021, the FASB issued ASU 2021-01, “Reference Rate Reform (Topic 848): Scope.” The amendments in this update clarify that certain optional expedients and exceptions in Topic 848 for contract modifications and hedge accounting apply to derivative instruments that use an interest rate for margining, discounting, or contract price alignment that is modified as a result of reference rate reform. Amendments in this update to the expedients and exceptions in Topic 848 capture the incremental consequences of the scope clarification and tailor the existing guidance to derivative instruments affected by the discounting transition. The amendments in this update do not apply to contract modifications made after December 31, 2022, new hedging relationships entered into after December 31, 2022, and existing hedging relationships evaluated for effectiveness in periods after December 31, 2022, except for hedging relationships existing as of December 31, 2022, that apply certain optional expedients in which the accounting effects are recorded through the end of the hedging relationship (including periods after December 31, 2022). The Company’s adoption of the requirements of these standards has not resulted in a material impact on its financial position, results of operations and cash flows, but the adoption of the requirements may impact the Company in the future.

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In December 2019, the FASB issued ASU 2019-12, “Income Taxes (Topic 740).” This standard simplifies the accounting for income taxes by removing certain exceptions to the general principles in Topic 740. The amendments also improve consistent application and simplify U.S. GAAP for other areas of Topic 740 by clarifying and amending existing guidance. This standard is effective for annual periods, and interim periods within those fiscal years, beginning after December 15, 2020. The Company adopted this ASU during the first quarter of 2021 and the adoption of this ASU did not have a material impact on its financial position, results of operations and cash flows.

5) Acquisitions

Photon Control

On July 15, 2021, the Company completed its acquisition of Photon Control Inc. (“Photon Control”), a Canadian corporation (the “Photon Control Acquisition”), pursuant to a definitive agreement (the “Arrangement Agreement”). Photon Control designs, manufactures and distributes a wide range of optical sensors and systems to measure temperature and position used in semiconductor wafer fabrication. At the effective time of the Photon Control Acquisition and pursuant to the terms and conditions of the Arrangement Agreement, each share of Photon Control’s common stock issued and outstanding as of immediately prior to the effective time of the Photon Control Acquisition, was converted into the right to receive CAD 3.60 per share in cash, without interest and subject to deduction for any required withholding tax. The Company funded the payment of the aggregate consideration with available cash on hand. Photon Control is included in the Company’s Light & Motion segment.

The Photon Control Acquisition has helped the Company deliver on one of its long-term strategic objectives, which is to broaden its portfolio of key technologies to better serve its customers. The Photon Control Acquisition further advances the Company’s strategy to enhance its Surround the Chamber® offering by adding optical sensors for temperature control for critical etch and deposition applications in semiconductor wafer fabrication.

The purchase price of Photon Control consisted of the following:

Cash paid for outstanding shares ⁽¹⁾	\$	302.7
Less: Cash and cash equivalents acquired		(34.3)
Total purchase price, net of cash and cash equivalents acquired	\$	<u>268.4</u>

⁽¹⁾ Represents cash paid of CAD 3.60 per share for approximately 105.2 shares of Photon Control common stock, without interest and subject to deduction for any required withholding tax.

Under the acquisition method of accounting, the total estimated acquisition consideration is allocated to the acquired tangible and intangible assets and assumed liabilities of Photon Control based on their fair values as of the acquisition date. Any excess of the acquisition consideration over the fair value of assets acquired and liabilities assumed is allocated to goodwill. The Company expects that none of such goodwill or intangible assets will be deductible for tax purposes. The Company believes the amount of goodwill relative to identifiable intangible assets relates to enhancing the Company’s Surround the Chamber® offering by adding optical sensors for temperature control for critical etch and deposition applications in semiconductor wafer fabrication.

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The following table summarizes the allocation of the purchase price to the fair values assigned to assets acquired and liabilities assumed at the date of the Photon Control Acquisition:

Current assets	\$	51.4
Intangible assets		121.2
Goodwill		168.0
Other non-current assets		8.6
Total assets acquired		349.2
Current liabilities		13.7
Non-current deferred taxes		32.1
Other long-term liabilities		0.7
Total liabilities assumed		46.5
Fair value of assets acquired and liabilities assumed		302.7
Less: Cash and cash equivalents acquired		(34.3)
Total purchase price, net of cash and cash equivalents acquired	\$	268.4

The acquired intangible assets are being amortized on a straight-line basis, which approximates the economic use of the assets over their estimated useful lives.

The following table reflects the allocation of the acquired intangible assets and related estimate of useful lives:

Completed technology	\$	110.0	9 years
Customer relationships		9.4	10 years
Trade names		0.2	0.5 years
Backlog		1.6	1.5 years
	\$	121.2	

The fair value of the acquired intangible assets was determined using the income approach. In performing these valuations, the key underlying assumptions used included the appropriate discount rates as well as forecasted revenue growth rates, gross profit and operating margins. Fair value estimates are based on complex series of judgments about future events and uncertainties and rely heavily on estimates and assumptions. The valuations were based on the information that was available as of the acquisition date and the expectations and assumptions that have been deemed reasonable by the Company's management. There are inherent uncertainties and management judgment required in these determinations. This acquisition resulted in a purchase price that exceeded the estimated fair value of tangible and intangible assets, the excess amount of which was allocated to goodwill.

The results of operations of the Photon Control business from the Photon Control Acquisition closing date of July 15, 2021 through December 31, 2021, were not material to the Company's results of operations. The acquisition was also not material to the Company's results of operations, for the periods presented, on a pro forma basis.

Electro Scientific Industries, Inc.

On February 1, 2019, the Company completed its acquisition of Electro Scientific Industries, Inc. ("ESI") pursuant to an Agreement and Plan of Merger, dated as of October 29, 2018 (the "Merger Agreement"), by and among the Company, EAS Equipment, Inc., formerly a Delaware corporation and a wholly-owned subsidiary of the Company, and ESI (the "ESI Merger"). At the effective time of the ESI Merger and pursuant to the terms and conditions of the Merger Agreement, each share of ESI's common stock that was issued and outstanding immediately prior to the effective time of the ESI Merger was converted into the right to receive \$30.00 in cash, without interest and subject to deduction of any required withholding tax. The Company funded the payment of the aggregate consideration with a combination of the Company's available cash on hand and the proceeds from the Company's Term Loan Facility, as defined and as described further in Note 15.

ESI provides laser-based manufacturing systems solutions for the micro-machining industry that enable customers to optimize production. Its market is composed primarily of flexible and rigid printed circuit board ("PCB") processing/fabrication and passive component manufacturing and testing. ESI solutions incorporate specialized laser

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technology and proprietary control software to efficiently process the materials and components that are an integral part of electronic devices and systems.

The purchase price of ESI consisted of the following:

Cash paid for outstanding shares ⁽¹⁾	\$ 1,032.7
Settlement of share-based compensation awards ⁽²⁾	30.6
Total purchase price	1,063.3
Less: cash and cash equivalents acquired	(44.1)
Total purchase price, net of cash and cash equivalents acquired	<u>\$ 1,019.2</u>

⁽¹⁾ Represents cash paid of \$30.00 per share for approximately 34.4 shares of ESI common stock, without interest and subject to a deduction for any required withholding tax.

⁽²⁾ Represents the vested but unissued portion of ESI share-based compensation awards as of the acquisition date of February 1, 2019.

Under the acquisition method of accounting, the total acquisition consideration is allocated to the acquired tangible and intangible assets and assumed liabilities of ESI based on their fair values as of the acquisition date. Any excess of the acquisition consideration over the fair value of assets acquired and liabilities assumed is allocated to goodwill. The Company expects that none of such goodwill and intangible assets will be deductible for tax purposes.

The following table summarizes the allocation of the purchase price to the fair values assigned to assets acquired and liabilities assumed at the date of the ESI Merger:

Current assets (excluding inventory)	\$ 208.0
Inventory	81.7
Intangible assets	316.2
Goodwill	474.0
Property, plant and equipment	65.5
Long-term assets	9.6
Total assets acquired	1,155.0
Current liabilities	51.5
Non-current deferred taxes	33.0
Other long-term liabilities	7.2
Total liabilities assumed	91.7
Fair value of assets acquired and liabilities assumed	1,063.3
Less: Cash and cash equivalents acquired	(44.1)
Total purchase price, net of cash and cash equivalents acquired	<u>\$ 1,019.2</u>

The fair value write-up of acquired finished goods inventory was \$7.6, the amount of which was expensed over the period during which the acquired inventory was sold. For the year ended December 31, 2019, the Company recorded \$7.6 of incremental cost of sales charges associated with the fair value write-up of inventory acquired in the ESI Merger.

The fair value write-up of acquired property, plant and equipment of \$39.2 will be amortized over the estimated useful life of the applicable assets, excluding the fair value write-up in the value of land. Property, plant and equipment was valued at its value-in-use, unless there was a known plan to dispose of the asset.

The acquired intangible assets are being amortized on a straight-line basis, which approximates the economic use of the asset.

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The following table reflects the allocation of the acquired intangible assets and related useful lives:

Completed technology - Laser	\$ 255.7	12 years
Completed technology - Non-Laser	18.3	10 years
Trademarks and trade names	14.4	7 years
Customer relationships	25.4	10 years
Backlog	2.4	1 year
	<u>\$ 316.2</u>	

The fair value of the acquired intangible assets was determined using the income approach. In performing these valuations, the key underlying assumptions used included the appropriate discount rates as well as forecasted revenue growth rates, gross profit and operating margins. Fair value estimates are based on complex series of judgments about future events and uncertainties and rely heavily on estimates and assumptions. The valuations were based on the information that was available as of the acquisition date and the expectations and assumptions that have been deemed reasonable by the Company's management. There are inherent uncertainties and management judgment required in these determinations. This acquisition resulted in a purchase price that exceeded the estimated fair value of tangible and intangible assets, the excess amount of which was allocated to goodwill. The Company believes the amount of goodwill relative to identifiable intangible assets relates to several factors, including broadening its position in key industrial markets to complementary solutions, and leveraging component and systems expertise to provide robust solutions to meet customer evolving technology needs.

The results of this acquisition were included in the Company's consolidated statement of operations beginning on February 1, 2019. The Company's Equipment & Solutions reportable segment was created in conjunction with the ESI Merger.

Certain executives from ESI had severance provisions in their respective ESI employment agreements. The agreements included terms that were accounted for as dual-trigger arrangements. Through the Company's acquisition accounting, the expense relating to these benefits was recognized in the combined entity's financial statements. The Company recorded costs of \$2.7 and \$14.0 in acquisition and integration costs as compensation expense and stock-based compensation expense, respectively, for the year ended December 31, 2019 associated with these severance provisions. The restricted stock units and stock appreciation rights that were eligible for accelerated vesting if the executive exercised his or her rights but were not issued as of each reporting period-end, were excluded from the computation of basic earnings per share and included in the computation of diluted earnings per share for such reporting period.

The Company's consolidated net revenue and earnings for the year ended December 31, 2019 include the following amounts of revenue and earnings of ESI since the acquisition date:

	Year Ended December 31, 2019
Total net revenues	\$ 183.7
Net loss	\$ (33.5)
Net loss per share:	
Basic	\$ (0.61)
Diluted	\$ (0.61)

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Pro Forma Results

The following unaudited pro forma financial information presents the combined results of operations of the Company as if the ESI Merger had occurred on January 1, 2018. The unaudited pro forma financial information is not necessarily indicative of what the Company's condensed consolidated results of operations actually would have been had the acquisition occurred at the beginning of the year. In addition, the unaudited pro forma financial information does not attempt to project the future results of operations of the combined Company.

	Year Ended December 31, 2019
Total net revenues	\$ 1,914.6
Net income	\$ 171.5
Net income per share:	
Basic	\$ 3.14
Diluted	\$ 3.11

The unaudited pro forma financial information above gives effect primarily to the following:

- (1) Incremental amortization and depreciation expense related to the estimated fair value of identifiable intangible assets and property, plant and equipment from the purchase price allocation.
- (2) Revenue and cost of goods sold adjustments as a result of the reduction in deferred revenue and the cost related to their estimated fair value.
- (3) Incremental interest expense related to the Term Loan Facility, as defined in Note 15.
- (4) The exclusion of acquisition costs and inventory step-up amortization.
- (5) The exclusion of debt issuance costs due to the modification of the Term Loan Facility.
- (6) The estimated tax impact of the above adjustments.

6) Revenue from Contracts with Customers

Contract assets as of December 31, 2021 and 2020 were \$4.1 and \$3.7, respectively, and were included in other current assets.

A roll forward of the Company's deferred revenue and customer advances is as follows:

	2021	2020
Beginning balance, January 1 ⁽¹⁾	\$ 36.7	\$ 24.8
Additions to deferred revenue and customer advances	172.5	107.4
Amount of deferred revenue and customer advances recognized in income	(168.9)	(95.5)
Ending balance, December 31 ⁽²⁾	\$ 40.3	\$ 36.7

- (1) Beginning deferred revenue and customer advances as of January 1, 2021 included \$18.3 of current deferred revenue, \$5.6 of long-term deferred revenue and \$12.8 of current customer advances. Beginning deferred revenue and customer advances as of January 1, 2020 included \$12.4 of current deferred revenue, \$3.3 of long-term deferred revenue and \$9.1 of current customer advances.
- (2) Ending deferred revenue and customer advances as of December 31, 2021 included \$16.6 of current deferred revenue, \$2.8 of long-term deferred revenue and \$20.9 of current customer advances. Ending deferred revenue and customer advances as of December 31, 2020 included \$18.3 of current deferred revenue, \$5.6 of long-term deferred revenue and \$12.8 of current customer advances.

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Disaggregation of Revenue

The following table summarizes revenue from contracts with customers:

	Year Ended December 31, 2021			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	\$ 1,629.0	\$ 742.5	\$ 207.1	\$ 2,578.6
Services	232.5	70.9	67.6	371.0
Total net revenues	\$ 1,861.5	\$ 813.4	\$ 274.7	\$ 2,949.6

	Year Ended December 31, 2020			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	\$ 1,222.4	\$ 621.9	\$ 170.5	\$ 2,014.8
Services	183.5	67.7	64.0	315.2
Total net revenues	\$ 1,405.9	\$ 689.6	\$ 234.5	\$ 2,330.0

	Year Ended December 31, 2019			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	\$ 819.1	\$ 663.7	\$ 128.5	\$ 1,611.3
Services	171.4	61.9	55.2	288.5
Total net revenues	\$ 990.5	\$ 725.6	\$ 183.7	\$ 1,899.8

Refer to Note 21 for revenue by reportable segment, geography and groupings of similar products.

7) Investments

The following table shows the gross unrealized gains and (losses) aggregated by investment category for available-for-sale investments:

	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
As of December 31, 2021:				
Short-term investments:				
Available-for-sale investments:				
Time deposits and certificates of deposit	\$ 22.0	\$ —	\$ —	\$ 22.0
Bankers' acceptance drafts	0.5	—	—	0.5
Commercial paper	41.8	—	—	41.8
U.S. treasury obligations	11.5	—	—	11.5
U.S. agency obligations	0.6	—	—	0.6
	\$ 76.4	\$ —	\$ —	\$ 76.4

	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
As of December 31, 2021:				
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	\$ 5.3	\$ 0.9	\$ —	\$ 6.2

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As of December 31, 2020:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Short-term investments:				
Available-for-sale investments:				
Time deposits and certificates of deposit	\$ 0.7	\$ —	\$ —	\$ 0.7
Bankers' acceptance drafts	3.8	—	—	3.8
U.S. treasury obligations	223.2	—	—	223.2
	<u>\$ 227.7</u>	<u>\$ —</u>	<u>\$ —</u>	<u>\$ 227.7</u>

As of December 31, 2020:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	\$ 5.6	\$ 0.9	\$ —	\$ 6.5

The tables above, which show the gross unrealized gains and (losses) aggregated by investment category for available-for-sale investments as of December 31, 2021 and 2020, reflect the inclusion within short-term investments of investments with contractual maturities greater than one year from the date of purchase. Management has the ability, if necessary, to liquidate any of its investments in order to meet the Company's liquidity needs in the next 12 months. Accordingly, those investments with contractual maturities greater than one year from the date of purchase are classified as short-term on the accompanying balance sheets.

Interest income is accrued as earned. Dividend income is recognized as income on the date the security trades "ex-dividend." Realized gains or losses are reflected in income and were not material in 2021, 2020 and 2019.

8) Fair Value Measurements

In accordance with the provisions of fair value accounting, a fair value measurement assumes that the transaction to sell an asset or transfer a liability occurs in the principal market for the asset or liability or, in the absence of a principal market, the most advantageous market for the asset or liability and defines fair value based upon an exit price model.

The fair value measurement guidance establishes a fair value hierarchy, which requires an entity to maximize the use of observable inputs and minimize the use of unobservable inputs when measuring fair value. The guidance describes three levels of inputs that may be used to measure fair value:

- Level 1 Quoted prices in active markets for identical assets or liabilities as of the reporting date. Active markets are those in which transactions for the asset or liability occur in sufficient frequency and volume to provide pricing information on an ongoing basis.
- Level 2 Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities; quoted prices in markets that are not active; or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities. Level 2 assets and liabilities include debt securities with quoted prices that are traded less frequently than exchange-traded instruments or securities or derivative contracts that are valued using a pricing model with inputs that are observable in the market or can be derived principally from or corroborated by observable market data.
- Level 3 Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities. Level 3 assets and liabilities include financial instruments whose value is determined using pricing models, discounted cash flow methodologies, or similar techniques, as well as instruments for which the determination of fair value requires significant management judgment or estimation.

In certain cases, the inputs used to measure fair value may fall into different levels of the fair value hierarchy. In such cases, the Company categorizes such assets and liabilities based on the lowest level input that is significant to the fair value measurement

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in its entirety. The Company's assessment of the significance of a particular input to the fair value measurement in its entirety requires judgment and considers factors specific to the asset.

Assets and liabilities of the Company measured at fair value on a recurring basis as of December 31, 2021, are summarized as follows:

Description	December 31, 2021	Fair Value Measurements at Reporting Date Using		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Cash equivalents:				
Money market funds	\$ 55.4	\$ 55.4	\$ —	\$ —
Commercial paper	0.1	—	0.1	—
U.S. treasury obligations	175.0	—	175.0	—
Available-for-sale securities:				
Time deposits and certificates of deposit	22.0	—	22.0	—
Bankers' acceptance drafts	0.5	—	0.5	—
Commercial paper	41.8	—	41.8	—
U.S. treasury obligations	11.5	—	11.5	—
U.S. agency obligations	0.6	—	0.6	—
Group insurance contracts	6.2	—	6.2	—
Derivatives-foreign exchange forward contracts	3.5	—	3.5	—
Derivatives-foreign currency options	3.4	—	3.4	—
Derivatives-interest rate hedge-non-current	8.7	—	8.7	—
Funds in investments and other assets:				
Israeli pension assets	20.3	—	20.3	—
Deferred compensation plan assets:				
Mutual funds and exchange traded funds	1.6	—	1.6	—
Total assets	\$ 350.6	\$ 55.4	\$ 295.2	\$ —
Liabilities:				
Derivatives – forward exchange contracts	\$ 0.6	\$ —	\$ 0.6	\$ —
Derivatives – interest rate hedge – non-current	5.0	—	5.0	—
Total liabilities	\$ 5.6	\$ —	\$ 5.6	\$ —
Reported as follows:				
Assets:				
Cash and cash equivalents	\$ 230.5	\$ 55.4	\$ 175.1	\$ —
Short-term investments	76.4	—	76.4	—
Other current assets	6.9	—	6.9	—
Total current assets	\$ 313.8	\$ 55.4	\$ 258.4	\$ —
Long-term investments	\$ 6.2	\$ —	\$ 6.2	\$ —
Other assets	30.6	—	30.6	—
Total long-term assets	\$ 36.8	\$ —	\$ 36.8	\$ —
Liabilities:				
Other current liabilities	\$ 0.6	\$ —	\$ 0.6	\$ —
Other liabilities	\$ 5.0	\$ —	\$ 5.0	\$ —

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Assets and liabilities of the Company measured at fair value on a recurring basis as of December 31, 2020, are summarized as follows:

Description	December 31, 2020	Fair Value Measurements at Reporting Date Using		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Cash equivalents:				
Money market funds	\$ 1.3	\$ 1.3	\$ —	\$ —
Commercial paper	0.3	—	0.3	—
U.S. treasury obligations	62.1	—	62.1	—
Available-for-sale securities:				
Time deposits and certificates of deposit	0.7	—	0.7	—
Bankers' acceptance drafts	3.8	—	3.8	—
U.S. treasury obligations	223.2	—	223.2	—
Group insurance contracts	6.5	—	6.5	—
Funds in investments and other assets:				
Israeli pension assets	18.8	—	18.8	—
Deferred compensation plan assets:				
Mutual funds and exchange traded funds	1.7	—	1.7	—
Total assets	\$ 318.4	\$ 1.3	\$ 317.1	\$ —
Liabilities:				
Derivatives – forward exchange contracts	\$ 6.5	\$ —	\$ 6.5	\$ —
Derivatives – interest rate hedge – non-current	14.0	—	14.0	—
Total liabilities	\$ 20.5	\$ —	\$ 20.5	\$ —
Reported as follows:				
Assets:				
Cash and cash equivalents	\$ 63.7	\$ 1.3	\$ 62.4	\$ —
Short-term investments	227.7	—	227.7	—
Total current assets	\$ 291.4	\$ 1.3	\$ 290.1	\$ —
Long-term investments	\$ 6.5	\$ —	\$ 6.5	\$ —
Other assets	20.5	—	20.5	—
Total long-term assets	\$ 27.0	\$ —	\$ 27.0	\$ —
Liabilities:				
Other current liabilities	\$ 6.5	\$ —	\$ 6.5	\$ —
Other liabilities	\$ 14.0	\$ —	\$ 14.0	\$ —

Money Market Funds

Money market funds are cash and cash equivalents and are classified within Level 1 of the fair value hierarchy.

Available-For-Sale Investments

The Company measures its debt and equity investments at fair value. The Company's available-for-sale investments are classified within Level 2 of the fair value hierarchy.

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Israeli Pension Assets

Israeli pension assets represent investments in mutual funds, government securities and other time deposits. These investments are set aside for the retirement benefit of the employees of the Company's Israeli subsidiaries. These funds are classified within Level 2 of the fair value hierarchy.

Derivatives

As a result of the Company's global operating activities, the Company is exposed to market risks from changes in foreign currency exchange rates and variable interest rates, which may adversely affect its operating results and financial position. When deemed appropriate, the Company minimizes its risks from foreign currency exchange rate and interest rate fluctuations through the use of derivative financial instruments. The principal market in which the Company executes its foreign currency contracts, options and interest rate swaps is the institutional market in an over-the-counter environment with a relatively high level of price transparency. The market participants usually are large commercial banks. The foreign exchange forward contracts, options and interest rate hedge are valued using broker quotations, or market transactions and are classified within Level 2 of the fair value hierarchy.

9) Derivatives

The Company enters into derivative instruments for risk management purposes only, including derivatives designated as hedging instruments and those utilized as economic hedges. The Company operates internationally and, in the normal course of business, is exposed to fluctuations in interest rates and foreign exchange rates. These fluctuations can increase the costs of financing, investing and operating the business. The Company has used derivative instruments, such as foreign exchange forward contracts and options, to manage certain foreign currency exposure, and interest rate swaps to manage interest rate exposure.

By nature, all financial instruments involve market and credit risks. The Company enters into derivative instruments with major investment grade financial institutions, for which no collateral is required. The Company has policies to monitor the credit risk of these counterparties. While there can be no assurance, the Company does not anticipate any material non-performance by any of these counterparties.

Foreign Exchange Contracts

The Company hedges a portion of its forecasted foreign currency-denominated intercompany sales of inventory, over a maximum period of eighteen months, using foreign exchange forward contracts accounted for as cash-flow hedges related to British, Euro, Japanese, South Korean and Taiwanese currencies. To the extent these derivatives are effective in off-setting the variability of the hedged cash flows, and otherwise meet the hedge accounting criteria, changes in the derivatives' fair value are not included in current earnings but are included in OCI in stockholders' equity. These changes in fair value will subsequently be reclassified into earnings, as applicable, when the forecasted transaction occurs. To the extent that a previously designated hedging transaction is no longer an effective hedge, any ineffectiveness measured in the hedging relationship is recorded immediately in earnings in the period it occurs. The cash flows resulting from forward exchange contracts are classified in the consolidated statements of cash flows as part of cash flows from operating activities. The Company does not enter into derivative instruments for trading or speculative purposes.

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As of December 31, 2021 and 2020, the Company had outstanding foreign exchange forward contracts with gross notional values of \$240.4 and \$176.2, respectively. The following tables provide a summary of the primary net hedging positions and corresponding fair values held as of December 31, 2021 and 2020:

Currency Hedged (Buy/Sell)	December 31, 2021	
	Gross Notional Value	Fair Value ⁽¹⁾
U.S. dollar/Japanese yen	\$ 60.2	\$ 1.7
U.S. dollar/South Korean won	107.7	1.1
U.S. dollar/Euro	15.1	0.3
U.S. dollar/U.K. pound sterling	10.7	—
U.S. dollar/Taiwan dollar	46.7	(0.1)
Total	<u>\$ 240.4</u>	<u>\$ 3.0</u>

Currency Hedged (Buy/Sell)	December 31, 2020	
	Gross Notional Value	Fair Value ⁽¹⁾
U.S. dollar/Japanese yen	\$ 61.5	\$ (1.1)
U.S. dollar/South Korean won	62.2	(3.1)
U.S. dollar/Euro	13.1	(0.6)
U.S. dollar/U.K. pound sterling	6.1	(0.3)
U.S. dollar/Taiwan dollar	33.3	(1.4)
Total	<u>\$ 176.2</u>	<u>\$ (6.5)</u>

(1) Represents the (payable) receivable amount included in the consolidated balance sheet.

The foreign exchange forward contracts are subject to a master netting agreement with one financial institution. However, the Company has elected to record these contracts on a gross basis in the consolidated balance sheet.

Interest Rate Swap Agreements

The Company entered into various interest rate swap agreements that exchange the variable LIBOR interest rate to a fixed rate to manage the exposure to interest rate fluctuations associated with the variable LIBOR interest rate paid on the outstanding balance of the Term Loan Facility, as defined and described further in Note 15. The table below summarizes the various interest rate hedges entered into by the Company:

Swap	Trade Date	Effective Date	Maturity	Fixed Rate	Notional Amount at Effective Date	Notional Amount	Years Ended December 31,	
							2021	2020
							Fair Value Asset (Liability)	Fair Value (Liability)
1	April 3, 2019	April 5, 2019	March 31, 2023	2.309%	\$ 300.0	\$ 300.0	\$ (5.0)	\$ (12.4)
2	October 29, 2020	October 26, 2021	February 28, 2025	0.485%	\$ 200.0	\$ 200.0	3.9	(0.7)
3	October 29, 2020	March 31, 2022	February 28, 2025	0.623%	\$ 100.0	\$ 100.0	4.8	(0.9)
Total							<u>\$ 3.7</u>	<u>\$ (14.0)</u>

The interest rate swaps are recorded at fair value on the balance sheet and changes in the fair value are recognized in OCI, as these hedges have been determined to be effective. To the extent that these arrangements are no longer effective

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hedges, any ineffectiveness measured in the hedging relationships is recorded immediately in earnings in the period it occurs. The fair value of the interest rate swaps is classified in other assets or non-current liabilities, accordingly, in the consolidated balance sheet.

Currency Option Agreements

In conjunction with financing the proposed acquisition of Atotech Limited (“Atotech”), the Company expects to issue EUR 500.0 in term loan debt. At the expected close, a portion of those proceeds will settle Atotech’s existing EUR 200.0 term loan and the EUR 300.0 balance will be converted into USD in support of the USD purchase price. The Company purchased foreign currency option contracts to fix the conversion of EUR 300.0 into USD as noted below:

Trade Date	Effective Date	Maturity	Fixed Rate	Notional Amount in EUR	Notional Amount in USD	Year Ended December 31, 2021 Fair Value Asset
October 26, 2021	October 26, 2021	January 31, 2022	\$1.1615	\$ 300.0	\$ 348.3	\$ 3.0

The currency swaps are recorded at fair value on the balance sheet and changes in the fair value are recognized immediately in earnings. The fair value asset is classified in other current assets in the consolidated balance sheet. The Company recorded an unrealized gain of \$3.4 in 2021, net of premiums, which is included in other expense, net.

In conjunction with the Photon Control Acquisition, which closed in July 2021, the Company entered into a foreign currency contract to hedge the Canadian dollar purchase price. In 2021, the Company recorded a fair value realized loss of \$10.3, which is included in other expense, net.

The following table provides a summary of the gain (loss) on derivatives designated as cash flow hedging instruments:

Derivatives Designated as Cash Flow Hedging Instruments	Years Ended December 31,		
	2021	2020	2019
Forward exchange contracts:			
Net gain (loss) recognized in OCI, net of tax ⁽¹⁾	\$ 20.0	\$ (10.6)	\$ (10.0)
Net (loss) gain reclassified from OCI into income ⁽²⁾	\$ (1.5)	\$ 1.7	\$ 5.7

⁽¹⁾ Net change in the fair value of the effective portion classified in OCI.

⁽²⁾ Effective portion classified in cost of products. The tax effect of the gains or losses reclassified from accumulated OCI into income is immaterial.

The following table provides a summary of gain (loss) on derivatives not designated as cash flow hedging instruments:

Derivatives Not Designated as Cash Flow Hedging Instruments	Years Ended December 31,		
	2021	2020	2019
Forward exchange contracts:			
Net gain (loss) recognized in income ⁽¹⁾	\$ 4.8	\$ (1.5)	\$ (1.3)

⁽¹⁾ The Company enters into foreign exchange forward contracts to hedge against changes in the balance sheet for certain subsidiaries to mitigate the risk associated with certain foreign currency transactions in the ordinary course of business. These derivatives are not designated as cash flow hedging instruments and gains or losses from these derivatives are recorded immediately in other expense, net.

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10) Inventories

Inventories consist of the following:

	Years Ended December 31,	
	2021	2020
Raw material	\$ 393.8	\$ 321.3
Work-in-process	82.5	76.7
Finished goods	100.4	103.4
Total	<u>\$ 576.7</u>	<u>\$ 501.4</u>

Inventory-related excess and obsolete charges of \$16.2, \$24.8 and \$24.7 were recorded in cost of products and services in the years ended December 31, 2021, 2020 and 2019, respectively.

11) Property, Plant and Equipment

Property, plant and equipment consist of the following:

	Years Ended December 31,	
	2021	2020
Land	\$ 11.9	\$ 12.3
Buildings and building improvements	132.8	120.2
Machinery and equipment	428.1	397.8
Furniture and fixtures, office equipment and software	186.7	187.1
Leasehold improvements	151.7	95.4
Construction in progress	27.2	70.6
	<u>938.4</u>	<u>883.4</u>
Less: accumulated depreciation	613.1	599.1
Total	<u>\$ 325.3</u>	<u>\$ 284.3</u>

Depreciation of property, plant and equipment totaled \$48.8, \$44.0 and \$42.6 for the years ended 2021, 2020 and 2019, respectively.

12) Leases

The Company has various operating leases for real estate and non-real estate items. The non-real estate leases are mainly comprised of automobiles but also include office equipment and other lower-valued items. The Company does not have any finance leases.

The elements of lease expense were as follows:

	Years Ended December 31,	
	2021	2020
Lease cost:		
Operating lease ⁽¹⁾	\$ 27.6	\$ 29.2
Short-term lease	4.5	4.9
Total lease cost	<u>\$ 32.1</u>	<u>\$ 34.1</u>

⁽¹⁾ Operating lease cost includes an immaterial amount of variable expenses, offset by certain sublease rental income.

The weighted average discount rate and the weighted average remaining lease term were 3.0% and 14.2 years, respectively, as of December 31, 2021. The weighted average discount rate and the weighted average remaining lease term were 3.0% and 15 years, respectively, as of December 31, 2020. Operating cash flows used for operating leases for the years

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ended December 31, 2021 and 2020 were \$18.0 and \$13.0, respectively. Operating cash flows used for operating leases for the years ended December 31, 2021 and 2020 were net of \$5.0 and \$10.3, respectively, in tenant improvement allowance receipts.

In 2019, the Company sold two properties in Boulder, Colorado, and three properties in Portland, Oregon, the latter of which were part of sale and leaseback transactions and leased back the buildings over varying terms into 2021. Total net cash proceeds received for these two transactions were \$41.2 and the Company recognized a net gain on the sale of these long-lived assets of \$6.8.

Future lease payments under non-cancelable leases as of December 31, 2021 are detailed as follows:

Year Ending December 31,	Operating Leases
2022	\$ 24.0
2023	22.6
2024	21.0
2025	18.8
2026	16.7
Thereafter	158.1
Total lease payments	261.2
Less: imputed interest	50.6
Total lease liabilities	<u>\$ 210.6</u>

The 2022 lease payment amount of \$24.0 is net of tenant improvement allowances of \$1.3. Amounts presented above do not include payments relating to immaterial leases excluded from the balance sheet as well as leases with terms of less than twelve months.

13) Goodwill and Intangible Assets

Goodwill

The Company's methodology for allocating the purchase price relating to purchase acquisitions is determined through established and generally accepted valuation techniques. Goodwill is measured as the excess of the cost of the acquisition over the sum of the amounts assigned to tangible and identifiable intangible assets acquired less liabilities assumed. The Company assigns assets acquired (including goodwill) and liabilities assumed to one or more reporting units as of the date of acquisition. Typically acquisitions relate to a single reporting unit and thus do not require the allocation of goodwill to multiple reporting units.

Goodwill and purchased intangible assets with indefinite useful lives are not amortized but are reviewed for impairment annually during the fourth quarter of each fiscal year and whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. The process of evaluating the potential impairment of goodwill and intangible assets requires significant judgment. The Company regularly monitors current business conditions and other factors including, but not limited to, adverse industry or economic trends, restructuring actions and lower projections of profitability that may impact future operating results.

Effective January 1, 2021, the Company reassigned goodwill to certain reporting units within the Light & Motion reportable segment, resulting from a reorganization of the composition of reporting units. The goodwill was reassigned to the reporting units affected using the relative fair value approach. The Company also concluded that the fair value of each reporting unit exceeded its respective carrying value.

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The changes in the carrying amount of goodwill and accumulated impairment losses were as follows:

	2021			2020		
	Gross Carrying Amount	Accumulated Impairment Loss	Net	Gross Carrying Amount	Accumulated Impairment Loss	Net
Beginning balance at January 1	\$ 1,211.8	\$ (145.4)	\$ 1,066.4	\$ 1,202.8	\$ (144.3)	\$ 1,058.5
Acquired goodwill ⁽¹⁾	168.0	—	168.0	—	—	—
Impairment of goodwill ⁽²⁾	—	—	—	—	(1.1)	(1.1)
Foreign currency translation	(6.2)	—	(6.2)	9.0	—	9.0
Ending balance at December 31	\$ 1,373.6	\$ (145.4)	\$ 1,228.2	\$ 1,211.8	\$ (145.4)	\$ 1,066.4

⁽¹⁾ During the year ended December 31, 2021, the Company recorded goodwill related to the Photon Control Acquisition.

⁽²⁾ During the year ended December 31, 2020, the Company recorded goodwill impairment charges related to the pending closure of a facility in Europe.

Intangible Assets

The Company's acquired intangible assets are comprised of the following:

As of December 31, 2021	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Completed technology ⁽¹⁾	\$ 556.4	\$ (0.1)	\$ (241.7)	\$ (0.2)	\$ 314.4
Customer relationships ⁽¹⁾	317.6	(1.4)	(124.2)	(0.2)	191.8
Patents, trademarks, trade names and other ⁽¹⁾	122.7	—	(52.5)	(0.4)	69.8
	\$ 996.7	\$ (1.5)	\$ (418.4)	\$ (0.8)	\$ 576.0

⁽¹⁾ During the year ended December 31, 2021, the Company recorded \$121.2 of separately identified intangible assets related to the Photon Control Acquisition, representing \$110.0 in completed technology, \$9.4 in customer relationships and \$1.8 in patents, trademarks, trade names and other.

As of December 31, 2020	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Completed technology	\$ 446.4	\$ (0.1)	\$ (209.8)	\$ (0.1)	\$ 236.4
Customer relationships	308.2	(1.4)	(104.8)	1.7	203.7
Patents, trademarks, trade names and other	120.9	—	(48.6)	(0.2)	72.1
	\$ 875.5	\$ (1.5)	\$ (363.2)	\$ 1.4	\$ 512.2

Aggregate amortization expense related to acquired intangible assets for 2021, 2020 and 2019 was \$55.3, \$55.2 and \$67.4, respectively. Aggregate net amortization expense related to acquired intangible assets for future years is:

Year	Amount
2022	\$ 59.6
2023	58.2
2024	57.3
2025	56.3
2026	52.7
Thereafter	236.0

The Company excluded \$55.9 of indefinite-lived trademarks and trade names that were not subject to amortization from the table above.

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14) Product Warranties

The Company provides for the estimated costs to fulfill customer warranty obligations upon the recognition of the related revenue. While the Company engages in extensive product quality programs and processes, including actively monitoring and evaluating the quality of its component suppliers, the Company's warranty obligation is affected by shipment volume, product failure rates, utilization levels, material usage and supplier warranties on parts delivered to the Company. Should actual product failure rates, utilization levels, material usage, or supplier warranties on parts differ from the Company's estimates, revisions to the estimated warranty liability would be required.

Product warranty activities were as follows:

	Years Ended December 31,	
	2021	2020
Beginning balance	\$ 18.4	\$ 14.9
Provision for product warranties	38.1	28.3
Assumed product warranty liability from Photon Control Acquisition	0.6	—
Direct and other charges to warranty liability	(36.0)	(24.8)
Ending balance ⁽¹⁾	<u>\$ 21.1</u>	<u>\$ 18.4</u>

⁽¹⁾ Short-term product warranties of \$19.7 and long-term product warranties of \$1.4, each as of December 31, 2021, are included within other current liabilities and other non-current liabilities, respectively, within the accompanying consolidated balance sheet. Short-term product warranties of \$15.6 and long-term product warranties of \$2.8, each as of December 31, 2020, are included within other current liabilities and other non-current liabilities, respectively, within the accompanying consolidated balance sheet.

15) Debt

The Company's outstanding debt is as follows:

	December 31, 2021	December 31, 2020
	Short-term debt:	
Term Loan Facility	\$ 9.0	\$ 9.0
Japanese lines of credit and financing facility	—	5.5
	<u>\$ 9.0</u>	<u>\$ 14.5</u>
Long-term debt:		
Term Loan Facility, net ⁽¹⁾	<u>\$ 807.9</u>	<u>\$ 815.0</u>

⁽¹⁾ Net of remaining deferred financing fees, original issuance discount and repricing fees in the aggregate of \$7.5 and \$9.4 as of December 31, 2021 and December 31, 2020, respectively.

The Company recognized interest expense of \$25.4, \$29.1 and \$44.1 for the years ended December 30, 2021, 2020 and 2019, respectively.

Senior Secured Term Loan Credit Facility

In connection with the completion of the acquisition of Newport Corporation ("Newport") in 2016 (the "Newport Merger"), the Company entered into a term loan credit agreement (as amended, the "Term Loan Credit Agreement") with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto, which provided a senior secured term loan credit facility (the "Term Loan Facility") in the original principal amount of \$780.0. The Company has entered into seven amendments to the Term Loan Credit Agreement since 2016, including most recently the May Term Loan Amendment (as defined below). The Term Loan Facility is subject to increase at the Company's option and subject to receipt of lender commitments in accordance with the Term Loan Credit Agreement. The maturity date of the Term Loan

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Facility is February 2, 2026. As of December 31, 2021, borrowings under the Term Loan Facility bear interest per annum at one of the following rates selected by the Company: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the “prime rate” quoted in *The Wall Street Journal*, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00%, and (4) a floor of 1.00%, plus, in each case, an applicable margin of 0.75%; or (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, subject to a LIBOR rate floor of 0.0%, plus an applicable margin of 1.75%. The Company has elected the interest rate as described in clause (b) of the foregoing sentence. The Term Loan Credit Agreement provides that, unless an alternate rate of interest is agreed, all loans will be determined by reference to the base rate if the LIBOR rate cannot be ascertained, if regulators impose material restrictions on the authority of a lender to make LIBOR rate loans, or for other reasons.

In May 2021, the Company entered into an amendment (the “May Term Loan Amendment”) to the Term Loan Credit Agreement. The May Term Loan Amendment amends the Term Loan Facility to, among other things, (i) increase the Company’s ability to incur additional incremental debt facilities to (x) the greater of (1) \$600.0 and (2) 100% of consolidated EBITDA, plus (y) an amount equal to the sum of all voluntary prepayments of term loans under the Term Loan Facility, plus (z) an additional unlimited amount subject to pro forma compliance with a secured leverage ratio test of 3.25:1.00, and (ii) increase the Company’s flexibility under certain debt, lien, investment, restricted payment and disposition baskets. The fees incurred, including certain customary lender consent fees, in connection with the May Term Loan Amendment were immaterial.

The Company is required to make scheduled quarterly amortization payments each equal to 0.25% of the original principal amount of the Term Loan Facility.

As of December 31, 2021, after giving effect to all amendments and repayments prior to such date, the outstanding principal amount of the Term Loan Facility was \$824.4, and the interest rate was 1.8%.

Under the Term Loan Credit Agreement, the Company is required to prepay outstanding term loans, subject to certain exceptions, with portions of its annual excess cash flow as well as with the net cash proceeds of certain of its asset sales, certain casualty and condemnation events and the incurrence or issuance of certain debt.

All obligations under the Term Loan Facility are guaranteed by certain of the Company’s domestic subsidiaries and are secured by substantially all of the Company’s assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

The Term Loan Credit Agreement contains customary representations and warranties, affirmative and negative covenants and provisions relating to events of default. If an event of default occurs, the lenders under the Term Loan Facility will be entitled to take various actions, including the acceleration of amounts due under the Term Loan Facility and all actions generally permitted to be taken by a secured creditor. At December 31, 2021, the Company was in compliance with all covenants under the Term Loan Credit Agreement.

Interest Rate Swap Agreements

The Company entered into various interest rate swap agreements as described further in Note 9 that exchange the variable LIBOR interest rate to a fixed rate in order to manage the exposure to interest rate fluctuations associated with the variable LIBOR interest rate paid on the outstanding balance of the Term Loan Facility.

Senior Secured Asset-Based Revolving Credit Facility

In February 2019, in connection with the completion of the acquisition of Electro Scientific Industries, Inc. (the “ESI Merger”), the Company entered into an asset-based revolving credit agreement with Barclays Bank PLC, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto (the “ABL Credit Agreement”), that provides a senior secured asset-based revolving credit facility of up to \$100.0, subject to a borrowing base limitation (the “ABL Facility”). The Company has entered into two amendments to the ABL Credit Agreement since 2019. As of December 31, 2021, after giving effect to all amendments, the borrowing base

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for the ABL Facility at any time equals the sum of: (a) 85% of certain eligible accounts; plus (b) prior to certain notice and field examination and appraisal requirements, the lesser of (i) 20% of net book value of eligible inventory in the United States and (ii) 30% of the borrowing base, and after the satisfaction of such requirements, the lesser of (i) the lesser of (A) 65% of the lower of cost or market value of certain eligible inventory and (B) 85% of the net orderly liquidation value of certain eligible inventory and (ii) 30% of the borrowing base; minus (c) reserves established by the administrative agent, in each case, subject to additional limitations and examination requirements for eligible accounts and eligible inventory acquired in an acquisition after February 1, 2019. The ABL Facility includes borrowing capacity in the form of letters of credit up to \$25.0. The Company has not borrowed against the ABL Facility to date.

As of December 31, 2021, borrowings under the ABL Facility bear interest at a rate per annum equal to, at the Company's option, any of the following, plus, in each case, an applicable margin: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the "prime rate" quoted in *The Wall Street Journal*, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00% and (4) a floor of 0.00%, plus, in each case, an applicable margin ranging from 0.25% to 0.50%; and (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, with a floor of 0.00%, plus, in each case, an applicable margin ranging from 1.25% to 1.50%. The applicable margin for borrowings thereunder is subject to upward or downward adjustment each fiscal quarter, based on the average historical excess availability during the preceding quarter.

In addition to paying interest on any outstanding principal under the ABL Facility, the Company is required to pay a commitment fee in respect of the unutilized commitments thereunder equal to 0.25% per annum. The Company must also pay customary letter of credit fees and agency fees.

Under the ABL Facility, the Company is required to prepay amounts outstanding under the ABL Facility (1) if amounts outstanding under the ABL Facility exceed the lesser of (a) the commitment amount and (b) the borrowing base, in an amount required to reduce such shortfall, (2) if amounts outstanding under the ABL Facility in any currency other than U.S. dollars exceed the sublimit for such currency, in an amount required to reduce such shortfall, and (3) during any period in which the Company has excess availability less than the greater of (a) 10.0% of the lesser of (x) the commitment amount and (y) the borrowing base (the "Line Cap") and (b) \$8.5 for 3 consecutive business days, until the time when the Company has excess availability equal to or greater than the greater of (A) 10.0% of the Line Cap and (B) \$8.5 for 30 consecutive days, or during the continuance of an event of default, with immediately available funds in its blocked accounts.

There is no scheduled amortization under the ABL Facility. Any principal amount outstanding under the ABL Facility is due and payable in full on the fifth anniversary of the closing date, subject to a springing maturity in the event that term loans under the Term Loan Facility in an aggregate amount of at least \$100.0 have an earlier maturity date than the ABL Facility.

All obligations under the ABL Facility are guaranteed by certain of the Company's domestic subsidiaries and are secured by substantially all of the Company's assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

From the time when the Company has excess availability less than the greater of (a) 10.0% of the Line Cap and (b) \$8.5 until the time when the Company has excess availability equal to or greater than the greater of (a) 10.0% of the Line Cap and (b) \$8.5 for 30 consecutive days, or during the continuance of an event of default, the ABL Credit Agreement requires the Company to maintain a fixed charge coverage ratio, tested on the last day of each fiscal quarter, of at least 1.0 to 1.0.

The ABL Credit Agreement also contains customary representations and warranties, affirmative covenants and provisions relating to events of default. If an event of default occurs, the lenders under the ABL Facility will be entitled to take various actions, including the acceleration of amounts due under the ABL Facility and all actions permitted to be taken by a secured creditor.

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Lines of Credit and Borrowing Arrangements

The Company's Japanese subsidiaries have lines of credit and a financing facility with various financial institutions, many of which generally expire and are renewed at three-month intervals with the remaining having no expiration date. The lines of credit and financing facility provided for aggregate borrowings as of December 31, 2021 of up to an equivalent of \$29.1. There were no borrowings outstanding under these arrangements at December 31, 2021. Total borrowings outstanding under these arrangements were \$5.5 at December 31, 2020.

Contractual maturities of the Company's debt obligations as of December 31, 2021 are as follows:

Year	Amount
2022	\$ 9.0
2023	9.0
2024	9.0
2025	9.0
2026	788.4

16) Income Taxes

A reconciliation of the Company's effective tax rate to the U.S. federal statutory rate is as follows:

	Years Ended December 31,		
	2021	2020	2019
U.S. federal income tax statutory rate	21.0%	21.0%	21.0%
Federal tax credits	(0.7)	(1.5)	(2.9)
State income taxes, net of federal benefit	1.5	1.1	2.3
Effect of foreign operations taxed at various rates	(4.5)	(5.0)	(4.4)
Executive compensation	0.9	1.1	5.8
Gain on intercompany sale of assets	—	—	2.9
Utilization of a capital loss	—	—	(1.2)
Foreign derived intangible income deduction	(1.7)	(1.5)	(3.8)
Global intangible low taxed income, net of foreign tax credits	0.5	0.9	2.6
Revaluation of deferred income taxes	—	—	(1.4)
Stock-based compensation	(0.5)	(0.7)	(0.3)
Deferred tax asset valuation allowance	(0.8)	0.6	0.1
Release of income tax reserves (including interest)	(0.6)	—	(0.8)
Withholding taxes on foreign dividends, net of foreign tax credits	1.5	0.7	0.6
Other	0.4	0.5	0.6
	<u>17.1%</u>	<u>17.2%</u>	<u>21.1%</u>

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The components of income from operations before income taxes and the related provision for income taxes consist of the following:

	Years Ended December 31,		
	2021	2020	2019
Income before income taxes:			
United States	\$ 249.0	\$ 132.0	\$ 2.3
Foreign	416.5	291.0	175.5
	<u>\$ 665.5</u>	<u>\$ 423.0</u>	<u>\$ 177.8</u>
Current taxes:			
United States	\$ 37.8	\$ 29.2	\$ 6.8
State	10.3	6.1	2.0
Foreign	64.8	44.7	32.8
	<u>112.9</u>	<u>80.0</u>	<u>41.6</u>
Deferred taxes:			
United States	4.9	(7.9)	(1.7)
State and Foreign	(3.7)	0.8	(2.5)
	<u>1.2</u>	<u>(7.1)</u>	<u>(4.2)</u>
Provision for income taxes	<u>\$ 114.1</u>	<u>\$ 72.9</u>	<u>\$ 37.4</u>

The significant components of the deferred tax assets and deferred tax liabilities are as follows:

	December 31,	
	2021	2020
Deferred tax assets:		
Carryforward losses and credits	\$ 48.8	\$ 54.2
Inventory and warranty reserves	37.3	32.4
Accrued expenses and other reserves	15.8	14.5
Stock-based compensation	3.5	5.1
Executive supplemental retirement benefits	1.5	1.8
Lease liability	44.7	48.7
Unrealized net loss	—	4.0
Other	1.0	2.7
Total deferred tax assets	<u>\$ 152.6</u>	<u>\$ 163.4</u>
Deferred tax liabilities:		
Acquired intangible assets and goodwill	\$ (136.5)	\$ (116.2)
Depreciation and amortization	(23.3)	(14.5)
Loan costs	(2.0)	(1.8)
Right-of-use asset	(41.0)	(46.4)
Foreign withholding taxes	(6.1)	(3.2)
Unrealized gain	(1.6)	—
Total deferred tax liabilities	<u>(210.5)</u>	<u>(182.1)</u>
Valuation allowance	(26.2)	(30.6)
Net deferred tax liabilities	<u>\$ (84.1)</u>	<u>\$ (49.3)</u>

As of December 31, 2021, the Company had federal, state and foreign gross research and other tax credit carryforwards of \$52.3. Included in the total carryforwards are \$12.7 of credits that can be carried forward indefinitely while the remaining credits expire at various dates through 2037. The Company also had federal, state and foreign gross net operating loss and capital loss carryforwards of \$93.3. Included in the total carryforwards are \$51.7 of losses that can be carried forward indefinitely while the remaining losses expire at various dates through 2039.

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Although the Company believes that its tax positions are consistent with applicable U.S. federal, state and international laws, it maintains certain tax reserves as of December 31, 2021 in the event its tax positions were to be challenged by the applicable tax authority and additional tax assessed upon audit.

A reconciliation of the beginning and ending amount of gross unrecognized tax benefits is as follows:

	Years Ended December 31,		
	2021	2020	2019
Balance at beginning of year	\$ 47.0	\$ 43.5	\$ 32.7
(Decreases) increases for prior years	(0.6)	1.1	9.3
Increases for the current year	2.3	6.8	3.2
Reductions related to expiration of statutes of limitations and audit settlements	(5.6)	(4.4)	(1.7)
Balance at end of year	<u>\$ 43.1</u>	<u>\$ 47.0</u>	<u>\$ 43.5</u>

The net decrease in gross unrecognized tax benefits was primarily attributable to the release of a reserve related to federal research tax credits and the expiration of the statutes of limitations, partially offset by the addition of a reserve related to foreign withholding taxes.

The Company accrues interest and, if applicable, penalties for any uncertain tax positions. Interest and penalties are classified as a component of income tax expense. As of December 31, 2021, 2020 and 2019, the Company accrued interest on unrecognized tax benefits of approximately \$1.0, \$0.7 and \$0.5, respectively.

Over the next 12 months it is reasonably possible that the Company may recognize approximately \$3.6 of previously net unrecognized tax benefits, excluding interest and penalties, related to various U.S. federal, state and foreign tax positions, primarily due to the expiration of statutes of limitations.

The Company is subject to examination by U.S. federal, state and foreign tax authorities. The U.S. federal statute of limitations remains open for tax years 2018 through the present. The statute of limitations for the Company's tax filings in other jurisdictions varies between fiscal years 2015 through present. The Company has certain federal credit carryforwards and state tax loss and credit carryforwards that are open to examination for tax years 2002 through the present. In addition, the 2017 transition tax remains open for examination.

On a quarterly basis, the Company evaluates both positive and negative evidence that affects the realizability of net deferred tax assets and assesses the need for a valuation allowance. The future benefit to be derived from its deferred tax assets is dependent upon its ability to generate sufficient future taxable income to realize the assets.

During 2021, the Company decreased its valuation allowance by \$4.4, primarily related to the release of the valuation allowance on its Austrian entities. During 2020, the Company increased its valuation allowance by \$3.2. This increase was primarily related to certain foreign net operating loss carry-forward amounts. During 2019, the Company increased its valuation allowance by \$9.4. This increase was primarily attributable to the addition of historical valuation allowances for ESI and its subsidiaries which were included as a result of the ESI Merger during the quarter ended March 31, 2019.

No provision has been made for deferred taxes related to remaining historical outside basis differences in certain of the Company's non-US subsidiaries. The Company continues to assert indefinite reinvestment with respect to certain outside basis differences as of December 31, 2021. Determination of the amount of unrecognized deferred tax liability on such outside basis differences is not practicable because the amount of such liability, if any, is dependent upon various circumstances and factors, including availability of tax planning.

Certain of the Company's subsidiaries have obtained tax rate reductions or tax holidays under government-sponsored incentive programs. For example, a Singapore subsidiary of the Company obtained a tax holiday in Singapore. The benefits of the holiday were approximately \$0.4 (\$0.01 per share) in 2021 and \$1.7 (\$0.03 per share) in 2020. The tax holiday in Singapore expired in June 2021 and another tax holiday was granted and expires in June 2026.

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17) Stock-Based Compensation

Employee Stock Purchase Plans

The 2014 ESPP was adopted by the Board of Directors on February 10, 2014 and approved by the Company's stockholders on May 5, 2014. The 2014 ESPP authorizes the issuance of up to an aggregate of 2.5 shares of common stock to participating employees. Offerings under the 2014 ESPP commence on June 1 and December 1 and terminate on November 30 and May 31, respectively. Under the 2014 ESPP, eligible employees can purchase shares of common stock through payroll deductions up to 10% of their compensation, up to a defined maximum annual amount. The price at which an employee's purchase option is exercised for each offering period is the lower of (1) 90% of the closing price on the common stock on the Nasdaq Global Select Market on the day that each offering commences, or (2) 90% of the closing price on the day that the offering terminates. The Company issued 0.1 shares of common stock during each of 2021, 2020 and 2019 to employees who participated in the 2014 ESPP at exercise prices of \$126.00 and \$136.94 per share in 2021, \$95.07 and \$93.77 per share in 2020, and \$64.31 and \$63.78 per share in 2019. As of December 31, 2021, there were 1.6 shares reserved for future issuance under the 2014 ESPP.

Equity Incentive Plans

The Company grants RSUs to employees and directors under the 2014 Stock Incentive Plan (the "2014 Plan"). The 2014 Plan is administered by the Compensation Committee of the Company's Board of Directors. The 2014 Plan is intended to attract and retain employees and directors, and to provide an incentive for these individuals to assist the Company to achieve long-range performance goals and to enable these individuals to participate in the long-term growth of the Company.

The 2014 Plan was adopted by the Board of Directors on February 10, 2014 and was approved by the Company's stockholders on May 5, 2014. Up to 18 shares of common stock (subject to adjustment in the event of stock splits and other similar events) may be issued pursuant to awards granted under the 2014 Plan. The Company may grant options, RSUs, restricted stock, Stock Appreciation Rights ("SARs") and other stock-based awards to employees, officers, directors, consultants and advisors under the 2014 Plan. Any full-value awards granted under the 2014 Plan will be counted against the shares reserved for issuance under the 2014 Plan as 2.4 shares for each share of common stock subject to such award. Any award granted under the 2014 Plan that is not a full-value award (including, without limitation, any option or SAR) will be counted against the shares reserved for issuance under the plan as one share for each one share of common stock subject to such award. "Full-value award" means any RSU, or other stock-based award with a per share price or per unit purchase price lower than 100% of fair market value on the date of grant. To the extent a share that was subject to an award that counted as one share is returned to the 2014 Plan, each applicable share reserve will be credited with one share. To the extent that a share that was subject to an award that counts as 2.4 shares is returned to the 2014 Plan, each applicable share reserve will be credited with 2.4 shares. As of December 31, 2021, there were 12.2 shares reserved for future issuance under the 2014 Plan.

Time-based RSUs granted to employees generally vest 33% per year beginning on the first anniversary of the date of grant. Performance-based RSUs granted to the Company's executive officers in 2021 and 2020 were based on the Company's achievement of Non-GAAP EBITDA for each respective year, defined as GAAP operating income excluding any charges or income not related to the operating performance of the Company plus depreciation and stock compensation expense, set at varying revenue levels. Performance-based RSUs granted to the Company's executive officers in 2019 were based on the Company's achievement of Non-GAAP cash flows from operations, defined as GAAP net income plus depreciation, amortization and non-cash stock-based compensation and excluding any charges or income not related to the operating performance of the Company, set at varying revenue levels. The final number of performance-based RSUs that vest vary based on the level of performance achieved from 0% to 150% of the underlying target shares granted in 2019 and 2020 and from 0% to 200% of the underlying target shares granted in 2021. The performance-based RSUs earned will vest 33% per year beginning on the first anniversary of the date of grant. RSUs granted to certain employees who meet certain retirement eligibility requirements will vest in full upon each such employee's retirement and are expensed immediately. RSUs granted to directors generally vest at the earliest of (1) one day prior to the next annual meeting, (2) 13 months from date of grant, or (3) the effective date of a change in control of the Company.

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The following tables present the activity for RSUs under the 2014 Plan:

	Year Ended December 31, 2021	
	RSUs	Weighted Average Grant Date Fair Value
RSUs — beginning of period	0.6	\$ 93.26
Granted	0.2	\$ 177.71
Vested	(0.3)	\$ 95.95
RSUs — end of period	0.5	\$ 127.93

	Year Ended December 31, 2020	
	RSUs	Weighted Average Grant Date Fair Value
RSUs — beginning of period	1.1	\$ 85.93
Granted	0.3	\$ 98.72
Vested	(0.8)	\$ 85.32
RSUs — end of period	0.6	\$ 93.26

The Company had an immaterial amount of SARs outstanding as of December 31, 2021 and 2020.

Stock-Based Compensation Expense

The Company recognized the full impact of its share-based payment plans in the consolidated statements of operations and comprehensive income. The following table reflects the effect of recording stock-based compensation:

	Years Ended December 31,		
	2021	2020	2019
Stock-based compensation expense by type of award:			
RSUs	\$ 33.8	\$ 27.0	\$ 47.1
Employee stock purchase plan	2.9	2.5	2.1
Total stock-based compensation	36.7	29.5	49.2
Windfall tax effect on stock-based compensation	(4.6)	(2.4)	(2.2)
Net effect on net income	\$ 32.1	\$ 27.1	\$ 47.0
Effect on net earnings per share:			
Basic	\$ 0.58	\$ 0.49	\$ 0.86
Diluted	\$ 0.58	\$ 0.49	\$ 0.85

The pre-tax effect within the consolidated statements of operations and comprehensive income of recording stock-based compensation was as follows:

	Years Ended December 31,		
	2021	2020	2019
Cost of revenues	\$ 3.8	\$ 4.2	\$ 2.8
Research and development expense	4.5	4.0	3.8
Selling, general and administrative expense	28.4	20.4	20.5
Acquisition and integration related expense	—	0.9	21.7
Restructuring related expense	—	—	0.4
Total pre-tax stock-based compensation expense	\$ 36.7	\$ 29.5	\$ 49.2

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Valuation Assumptions

The Company determines the fair value of RSUs based on the closing market price of the Company's common stock on the date of the award and estimates the fair value of employee stock purchase plan rights using the Black-Scholes valuation model. Such values are recognized as expense on a straight-line basis for time-based awards and using the accelerated graded vesting method for performance-based awards, both over the requisite service periods.

The weighted average fair value per share of employee stock purchase plan rights granted in 2021, 2020 and 2019 was \$33.55, \$23.88, and \$16.04, respectively. The fair value of employee stock purchase plan rights was estimated using the Black-Scholes option-pricing model with the following weighted average assumptions:

Employee stock purchase plan rights:	Years Ended December 31,		
	2021	2020	2019
Expected life (years)	0.5	0.5	0.5
Risk-free interest rate	0.1%	0.9%	2.4%
Expected volatility	39.3%	45.4%	38.7%
Expected annual dividends per share	\$ 0.88	\$ 0.80	\$ 0.80

Expected volatilities are based on a combination of implied and historical volatilities of the Company's common stock; the expected life represents the weighted average period of time that options granted are expected to be outstanding giving consideration to vesting schedules and the Company's historical exercise patterns; and the risk-free interest rate is based on the U.S. Treasury yield curve in effect at the time of grant for periods corresponding with the expected life of the option.

The total fair value of RSUs vested during 2021, 2020 and 2019 was approximately \$56.6, \$86.2 and \$68.1, respectively. As of December 31, 2021, the unrecognized compensation cost related to RSUs was approximately \$35.6 and will be recognized over an estimated weighted average amortization period of 1 year.

18) Stockholders' Equity

Stock Repurchase Program

On July 25, 2011, the Company's Board of Directors approved a share repurchase program for the repurchase of up to an aggregate of \$200 of its outstanding common stock from time to time in open market purchases, privately negotiated transactions or through other appropriate means. The timing and quantity of any shares repurchased will depend upon a variety of factors, including business conditions, stock market conditions and business development activities, including, but not limited to, merger and acquisition opportunities. These repurchases may be commenced, suspended or discontinued at any time without prior notice. The Company has repurchased approximately 2.6 shares of common stock for approximately \$127 pursuant to the program since its adoption. During 2021, 2020 and 2019, there were no repurchases of common stock.

Cash Dividends

Holders of the Company's common stock are entitled to receive dividends when they are declared by the Company's Board of Directors. The Company's Board of Directors declared a cash dividend of \$0.20 per share during the first quarter of 2021 and \$0.22 per share during the second, third and fourth quarters of 2021, which totaled \$47.6 or \$0.86 per share. The Company's Board of Directors declared a cash dividend of \$0.20 per share during each quarter of 2020, which totaled \$44.0 or \$0.80 per share.

Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of the Company's Board of Directors.

On February 7, 2022, the Company's Board of Directors declared a quarterly cash dividend of \$0.22 per share to be paid on March 11, 2022 to Stockholders of record as of February 28, 2022.

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19) Employee Benefit Plans

The Company has a 401(k) profit-sharing plan for U.S. employees meeting certain requirements, in which eligible employees may contribute between 1% and 50% of their annual compensation to this plan, and, with respect to employees who are age 50 and older, certain specified additional amounts, limited by an annual maximum amount determined by the Internal Revenue Service. The Company, at its discretion, makes certain matching contributions to this plan based on participating employees' annual contribution to this plan and their total compensation. The Company's contributions were \$7.6, \$7.2 and \$6.9 for 2021, 2020 and 2019, respectively.

The Company also has a small number of defined contribution plans at some of its foreign locations. The Company's contributions were immaterial for 2021, 2020 and 2019.

The Company maintains a bonus plan which provides cash awards to certain employees, at the discretion of the Compensation Committee of the Company's Board of Directors, based upon the Company's operating results. In addition, the Company's foreign locations also have various bonus plans based upon local operating results and employee performance. The total bonus expense was \$75.6, \$66.4 and \$32.2 for 2021, 2020 and 2019, respectively.

The Company provides supplemental retirement benefits for a small number of retired executives. The total cost of these benefits was \$0.1, \$0.3 and \$3.2 for 2021, 2020 and 2019, respectively. The accumulated benefit obligation was \$2.6 and \$2.5 as of December 31, 2021 and 2020, respectively, and was included in other non-current liabilities.

The Company also assumed deferred compensation plans as a result of the Newport Merger and the ESI Merger. Participants in the Newport Deferred Compensation Plan were not permitted to make any new elections beginning with 2018 compensation. Participants in the ESI Deferred Compensation Plan were not permitted to make any new elections beginning with 2020 compensation.

Defined Benefit Pension Plans

The Company has a number of defined benefit pension plans, which cover substantially all of its full-time employees in France, Germany, Israel, Japan and Taiwan. In addition, the Company has certain pension assets and liabilities relating to its former employees in the United Kingdom. The German plan is unfunded, as permitted under the plan and applicable laws.

For financial reporting purposes, the Company obtained actuarial reports supporting the calculation of net periodic pension costs that used a number of actuarial assumptions, including a discount rate for plan obligations, an assumed rate of return on pension plan assets and an assumed rate of compensation increase for employees covered by the various plans. The Company reviewed these actuarial assumptions and concluded they were reasonable based upon management's judgment, considering known trends and uncertainties. Actual results that differ from these assumptions would impact future expense recognition and the cash funding requirements of the Company's pension plans.

The net periodic benefit costs for the plans included the following components:

	Year Ended December 31,	
	2021	2020
Service cost	\$ 1.1	\$ 1.0
Interest cost on projected benefit obligations	0.2	0.4
Expected return on plan assets	(0.1)	(0.1)
Amortization of actuarial net loss	0.7	0.5
	\$ 1.9	\$ 1.8

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The changes in projected benefit obligations and plan assets, as well as the ending balance sheet amounts for the Company's defined benefit plans, were as follows:

	Year Ended December 31,	
	2021	2020
Change in projected benefit obligations:		
Projected benefit obligations, beginning of year	\$ 36.2	\$ 30.1
Service cost	1.1	1.0
Interest cost	0.2	0.4
Contributions by plan participants	—	0.7
Plan amendments	—	(0.2)
Actuarial loss	0.1	3.0
Benefits paid	(1.4)	(1.2)
Currency translation adjustments	(2.2)	2.4
Projected benefit obligations, end of year	<u>\$ 34.0</u>	<u>\$ 36.2</u>
Change in plan assets:		
Fair value of plan assets, beginning of year	\$ 12.9	\$ 11.1
Company contributions	0.7	1.1
(Loss) gain on plan assets	(0.1)	0.6
Benefits paid	(0.6)	(0.5)
Currency translation adjustments	(0.6)	0.6
Fair value of plan assets, end of year	<u>12.3</u>	<u>12.9</u>
Net underfunded status	<u>\$ (21.7)</u>	<u>\$ (23.3)</u>

As of December 31, 2021, the estimated benefit payments for the Company's defined benefit plans for the next 10 years were as follows:

	Estimated benefit payments
2022	\$ 1.1
2023	1.1
2024	1.2
2025	1.6
2026	1.4
2027-2031	8.6
	<u>\$ 15.0</u>

The Company expects to contribute less than \$1.0 to the plans during 2022.

The weighted-average rates used to determine the net periodic benefit costs were as follows:

	December 31, 2021	December 31, 2020
Discount rate	1.0%	1.1%
Rate of increase in salary levels	2.0%	2.2%
Expected long-term rate of return on assets	1.1%	1.2%

In determining the expected long-term rate of return on plan assets, the Company considers the relative weighting of plan assets, the historical performance of total plan assets and individual asset classes, and economic and other indicators of future performance.

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Plan assets were held in the following categories as a percentage of total plan assets:

	December 31, 2021		December 31, 2020	
	Amount	Percentage	Amount	Percentage
Cash	\$ 0.2	1.6%	\$ 0.2	1.3%
Debt securities	5.1	41.5	5.2	40.5
Equity securities	0.6	4.8	0.7	5.6
Other	6.4	52.1	6.8	52.6
	\$ 12.3	100%	\$ 12.9	100%

In general, the Company's asset management objectives include maintaining an adequate level of diversification to reduce interest rate and market risk, while providing adequate liquidity to meet immediate and future benefit payment requirements.

The Company's Israeli plans account for the deferred vested benefits using the shut-down method of accounting, which resulted in assets of \$20.3 and vested benefit obligations of \$23.1 as of December 31, 2021, and assets of \$18.8 and vested benefit obligations of \$21.7 as of December 31, 2020. Under the shut-down method, the liability is calculated as if it were payable as of the balance sheet date, on an undiscounted basis.

Other Pension-Related Assets

As of December 31, 2021 and 2020, the Company had assets with an aggregate market value of \$6.2 and \$6.5, respectively, for its German pension plans. These assets are invested in group insurance contracts through the insurance companies administering these plans, in accordance with applicable pension laws. These group insurance contracts have a guaranteed minimum rate of return ranging from 2.25% to 4.25%, depending on the contract. Because these assets were not separate legal assets of the pension plan, they were not included in the Company's plan assets shown above. However, the Company has designated such assets to pay pension benefits. Such assets are included in other assets in the accompanying consolidated balance sheet.

20) Net Income Per Share

The following is a reconciliation of basic to diluted net income per share:

	Years Ended December 31,		
	2021	2020	2019
Numerator:			
Net income	\$ 551.4	\$ 350.1	\$ 140.4
Denominator:			
Shares used in net income per common share – basic	55.4	55.1	54.7
Effect of dilutive securities	0.3	0.2	0.4
Shares used in net income per common share – diluted	55.7	55.3	55.1
Net income per common share:			
Basic	\$ 9.95	\$ 6.36	\$ 2.57
Diluted	\$ 9.90	\$ 6.33	\$ 2.55

Basic earnings per share ("EPS") is computed by dividing income available to holders of our common stock by the weighted-average number of common shares outstanding during the period. The computation of diluted EPS is similar to the computation of basic EPS except that the denominator is increased to include the number of additional common shares that would have been outstanding (using the treasury stock method) if securities containing potentially dilutive common shares (RSUs) had been converted to such common shares, and if such assumed conversion is dilutive.

In 2021, 2020 and 2019, the potential dilutive effect of the weighted average shares of RSUs that were excluded from the computation of diluted weighted-average shares outstanding, as the shares would have had an anti-dilutive effect on EPS, were immaterial.

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21) Business Segment, Geographic Area, Product Information and Significant Customer Information

The Company is a global provider of instruments, systems, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity for its customers. The Company's products are derived from its core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, vacuum technology, temperature sensing, lasers, photonics, optics, precision motion control, vibration control and laser-based manufacturing systems solutions. The Company also provides services relating to the maintenance and repair of its products, installation services and training. The Company's primary served markets include semiconductor, industrial technologies, life and health sciences, research and defense.

The Company's Chief Operating Decision Maker ("CODM"), which is the Company's Chief Executive Officer, utilizes financial information to make decisions about allocating resources and assessing performance for the entire Company, which is used in the decision-making process to assess performance.

Reportable Segments

The Vacuum & Analysis segment provides a broad range of instruments, components and subsystems which are derived from the Company's core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery and vacuum technology.

The Light & Motion segment provides a broad range of instruments, components and subsystems which are derived from the Company's core competencies in lasers, photonics, optics, temperature sensing, precision motion control and vibration control.

The Equipment & Solutions segment provides a range of products including laser-based systems for PCB manufacturing, which include flexible interconnect PCB processing systems and high-density interconnect solutions for rigid PCB manufacturing and substrate processing and multi-layer ceramic capacitor test systems.

The Company derives its segment results directly from the manner in which results are reported in its management reporting system. The accounting policies that the Company uses to derive reportable segment results are substantially the same as those used for external reporting purposes. The Company groups its similar products within its three reportable segments.

The following table sets forth net revenues by reportable segment:

	Years Ended December 31,		
	2021	2020	2019
Vacuum & Analysis	\$ 1,861.5	\$ 1,405.9	\$ 990.5
Light & Motion	813.4	689.6	725.6
Equipment & Solutions	274.7	234.5	183.7
	<u>\$ 2,949.6</u>	<u>\$ 2,330.0</u>	<u>\$ 1,899.8</u>

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The following table sets forth a reconciliation of segment gross profit to consolidated net income:

	Years Ended December 31,		
	2021	2020	2019
Gross profit by reportable segment:			
Vacuum & Analysis	\$ 867.8	\$ 633.7	\$ 426.4
Light & Motion	384.8	309.8	336.8
Equipment & Solutions	127.6	106.0	67.2
Total gross profit by reportable segment	1,380.2	1,049.5	830.4
Operating expenses:			
Research and development	200.0	173.1	164.1
Selling, general and administrative	385.1	353.1	330.3
Acquisition and integration costs	29.8	3.8	37.3
Restructuring and other	11.1	9.4	7.0
Amortization of intangible assets	55.3	55.2	67.4
Asset impairment	—	2.3	4.7
COVID-19 related net credits	—	(1.2)	—
Fees and expenses related to repricing of Term Loan Facility	—	—	6.6
Gain on sale of long-lived assets	—	—	(6.8)
Income from operations	698.9	453.8	219.8
Interest income	0.6	1.4	5.4
Interest expense	25.4	29.1	44.1
Other expense, net	8.6	3.1	3.3
Income before income taxes	665.5	423.0	177.8
Provision for income taxes	114.1	72.9	37.4
Net income	<u>\$ 551.4</u>	<u>\$ 350.1</u>	<u>\$ 140.4</u>

The following table set forth capital expenditures by reportable segment:

	Years Ended December 31,		
	2021	2020	2019
Vacuum & Analysis	\$ 36.6	\$ 36.0	\$ 34.1
Light & Motion	37.1	32.1	23.0
Equipment & Solutions	13.0	16.8	6.8
Total capital expenditures	\$ 86.7	\$ 84.9	\$ 63.9

The following table sets forth depreciation and amortization by reportable segment:

	Years Ended December 31,		
	2021	2020	2019
Vacuum & Analysis	\$ 22.9	\$ 20.3	\$ 16.8
Light & Motion	46.0	43.2	53.9
Equipment & Solutions	35.2	35.7	39.3
Total depreciation and amortization	\$ 104.1	\$ 99.2	\$ 110.0

Total income tax expense is not presented by reportable segment because the necessary information is not available or used by the CODM.

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The following table sets forth segment assets by reportable segment:

	Accounts Receivable	Inventory	Total
December 31, 2021			
Vacuum & Analysis	\$ 285.4	\$ 338.9	\$ 624.3
Light & Motion	146.2	177.3	323.5
Equipment & Solutions	36.3	61.5	97.8
Corporate, Eliminations & Other	(25.3)	(1.0)	(26.3)
Total segment assets	\$ 442.6	\$ 576.7	\$ 1,019.3

	Accounts Receivable	Inventory	Total
December 31, 2020			
Vacuum & Analysis	\$ 229.1	\$ 273.3	\$ 502.4
Light & Motion	122.6	166.1	288.7
Equipment & Solutions	51.7	63.7	115.4
Corporate, Eliminations & Other	(10.7)	(1.7)	(12.4)
Total segment assets	\$ 392.7	\$ 501.4	\$ 894.1

The following is a reconciliation of segment assets to consolidated total assets:

	December 31,	
	2021	2020
Total segment assets	\$ 1,019.3	\$ 894.1
Cash and cash equivalents and short-term investments	1,042.7	836.0
Other current assets	85.3	74.3
Property, plant and equipment, net	325.3	284.3
Right-of-use assets	184.3	184.4
Goodwill and intangible assets, net	1,804.2	1,578.6
Other assets and long-term assets	79.2	52.1
Consolidated total assets	\$ 4,540.3	\$ 3,903.8

Geographic Area

Information about the Company's operations by geographic region is presented in the tables below. Net revenues from unaffiliated customers are based on the location in which the sale originated. Intercompany sales between geographic areas are at tax transfer prices and have been eliminated from consolidated net revenues.

	Years Ended December 31,		
	2021	2020	2019
Net revenues:			
North America ⁽¹⁾	\$ 1,271.8	\$ 1,058.9	\$ 888.4
South Korea	385.8	278.8	167.7
China	355.1	273.5	178.6
Taiwan	197.7	113.8	95.4
Japan	196.8	163.2	143.1
Other Asia	310.4	242.6	197.3
Europe	232.0	199.2	229.3
	\$ 2,949.6	\$ 2,330.0	\$ 1,899.8

⁽¹⁾ North America includes the United States and an immaterial amount from Canada.

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	December 31,	
	2021	2020
Long-lived assets: ⁽¹⁾		
North America ⁽²⁾	\$ 425.2	\$ 364.0
Asia	105.7	94.8
Europe	35.6	45.1
	<u>\$ 566.5</u>	<u>\$ 503.9</u>

⁽¹⁾ Long-lived assets include property, plant and equipment, net, right-of-use assets, and certain other assets, and exclude goodwill, intangible assets and long-term tax-related accounts. The increase in long-lived assets in North America for 2021 primarily relates to the Photon Control Acquisition.

⁽²⁾ North America includes the United States and an immaterial amount from Canada.

Goodwill associated with each of the Company's reportable segments is as follows:

	December 31,	
	2021	2020
Vacuum & Analysis	\$ 195.2	\$ 196.2
Light & Motion	558.1	395.3
Equipment & Solutions	474.9	474.9
Total goodwill	<u>\$ 1,228.2</u>	<u>\$ 1,066.4</u>

The Company sells products and services to thousands of customers worldwide, in a wide range of end markets. Revenues from its top ten customers accounted for 47%, 44% and 33% of net revenues for 2021, 2020 and 2019, respectively, with the increasing percentages attributable to increasing semiconductor market sales. As a percentage of revenue to the Company's top ten customers, semiconductor market revenue accounted for greater than 90% in each year.

The Company had two customers with net revenues greater than 10% of total net revenues for the years ended December 31, 2021 and 2020, as shown below. No individual customers accounted for greater than 10% of the Company's net revenues in 2019.

	Years Ended December 31,		
	2021	2020	2019
Lam Research Corporation	16%	14%	9%
Applied Materials, Inc.	11%	11%	9%

22) Restructuring and Other

Restructuring

During 2021, the Company recorded restructuring charges of \$7.0, primarily related to severance costs due to a global cost saving initiative, costs related to the pending closure of two facilities in Europe and the movement of the manufacturing of products to low cost regions.

During 2020, the Company recorded restructuring charges of \$2.7, primarily related to costs incurred from the pending closure of a facility in Europe and costs related to the exit of certain product groups.

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The activity related to the Company's restructuring accrual is shown below:

	2021	2020
Balance at January 1	\$ 0.3	\$ 3.7
Charged to expense	7.0	2.7
Payments and adjustments	(4.7)	(6.1)
Balance at December 31	<u>\$ 2.6</u>	<u>\$ 0.3</u>

Other

During 2021, the Company recorded charges of \$2.8 related primarily to duplicate facility costs.

During 2020, the Company recorded charges of \$7.2 related to duplicate facility costs. The Company also received an insurance reimbursement of \$0.5 for costs recorded on a legal settlement from a contractual obligation assumed as part of the Newport Merger.

23) Commitments and Contingencies

In 2016, two putative class actions lawsuit captioned Dixon Chung v. Newport Corp., et al., Case No. A-16-733154-C, and Hubert C. Pincon v. Newport Corp., et al., Case No. A-16-734039-B, were filed in the District Court, Clark County, Nevada on behalf of a putative class of stockholders of Newport for claims related to the merger agreement ("Newport Merger Agreement") between the Company, Newport, and a wholly-owned subsidiary of the Company ("Merger Sub"). The lawsuits named as defendants the Company, Newport, Merger Sub, and certain then current and former members of Newport's board of directors. Both complaints alleged that Newport directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices and by omitting material information from the proxy statement. The complaints also alleged that the Company, Newport and Merger Sub aided and abetted the directors' alleged breaches of their fiduciary duties. The District Court consolidated the actions, and plaintiffs later filed an amended complaint captioned In re Newport Corporation Shareholder Litigation, Case No. A-16-733154-B, in the District Court, Clark County, Nevada, on behalf of a putative class of Newport's stockholders for claims related to the Newport Merger Agreement. The amended complaint alleged Newport's former board of directors breached their fiduciary duties to Newport's stockholders and that the Company, Newport and Merger Sub had aided and abetted these breaches and sought monetary damages, including pre- and post-judgment interest. In June 2017, the District Court granted defendants' motion to dismiss and dismissed the amended complaint against all defendants but granted plaintiffs leave to amend.

On July 27, 2017, plaintiffs filed a second amended complaint containing substantially similar allegations but naming only Newport's former directors as defendants. On August 8, 2017, the District Court dismissed the Company and Newport from the action. The second amended complaint seeks monetary damages, including pre- and post-judgment interest. The District Court granted a motion for class certification on September 27, 2018, appointing Mr. Pincon and Locals 302 and 612 of the International Union of Operating Engineers - Employers Construction Industry Retirement Trust as class representatives. On June 11, 2018, plaintiff Dixon Chung was voluntarily dismissed from the litigation. On August 9, 2019, plaintiffs filed a motion for leave to file a third amended complaint, which was denied on October 10, 2019. On August 23, 2019, defendants filed a motion for summary judgment. On January 23, 2020, the District Court entered its findings of fact, conclusions of law, and order granting defendants' motion for summary judgment. On February 18, 2020, plaintiffs filed a notice of appeal from the District Court's order granting defendants' motion for summary judgment, as well as from the District Court's prior orders granting defendants' motion for a bench trial and denying plaintiffs' motion for leave to file an amended complaint. On November 30, 2020, plaintiffs filed their opening brief in the Nevada Supreme Court in support of their appeal from the District Court's orders. On January 29, 2021, defendants filed their answering brief, and on March 30, 2021, plaintiffs filed their reply brief. The Nevada Supreme Court heard oral argument on December 15, 2021.

The Company is also subject to various legal proceedings and claims that have arisen in the ordinary course of business. In the opinion of management, the ultimate disposition of these matters, and the matters noted above, will not have a material adverse effect on the Company's results of operations, financial condition or cash flows.

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On July 1, 2021, the Company entered into a definitive agreement (as amended from time to time, the “Implementation Agreement”) to acquire Atotech, a leading process chemicals technology company and a market leader in advanced electroplating solutions. Pursuant to the Implementation Agreement, the Company agreed to pay \$16.20 per share in cash and 0.0552 of a share of MKS common stock for each outstanding common share of Atotech. At the time of the announcement of the acquisition, the total value of the aggregate cash and stock consideration was approximately \$5,100. The final value of the consideration will be determined at the time of the closing of the acquisition, which is expected to occur in the first quarter of 2022, subject to the satisfaction of certain closing conditions, including receipt of regulatory approval from China and approval by the Royal Court of Jersey. The Company’s obligations to complete the acquisition are not subject to any financing condition. The Company intends to fund the cash portion of the transaction with a combination of available cash on hand and committed term loan debt financing. In connection with entering into the Implementation Agreement, the Company entered into (a) a commitment letter (the “Initial Commitment Letter”), dated as of July 1, 2021, with JPMorgan Chase Bank, N.A. and Barclays Bank PLC (collectively, the “Initial Commitment Parties”) and (b) joinders to the Initial Commitment Letter to add certain additional lender parties (the “Commitment Letter Joinders” and, together with the Initial Commitment Letter, the “Commitment Letter”) dated as of July 23, 2021, with the Initial Commitment Parties and the additional lenders party thereto (collectively, the “Supplemental Commitment Parties” and, together with the Initial Commitment Parties, the “Commitment Parties”), pursuant to which, subject to the terms and conditions set forth therein, the Commitment Parties committed to provide (i) a senior secured term loan credit facility in an aggregate principal amount of \$5,300 (the “New Term Loan Facility”) and (ii) a senior secured revolving credit facility with aggregate total commitments of \$500 (the “New Revolving Credit Facility”). The New Term Loan Facility and New Revolving Credit Facility would refinance the Term Loan Facility and ABL Facility, respectively, and the New Term Loan Facility would be used to finance a portion of the acquisition and to refinance certain existing indebtedness of Atotech.

On October 22, 2021, the Company completed the syndication of the New Term Loan Facility, comprised of two tranches: a USD 4,700 loan at LIBOR plus 2.25%, a floor of 0.50% and 0.25% of original issue discount, and a Euro tranche of EUR 500 (approximately USD 600) at EURIBOR plus 2.75%, a floor of 0.00% and 0.25% of original issue discount. Subsequent to the syndication, the \$4.7 billion tranche is expected to be modified to reference a term rate based on the Secured Overnight Financing Rate (plus an applicable credit spread adjustment) as the benchmark rate.

The Commitment Parties’ obligations under the Commitment Letter and the closing and initial funding under the New Term Loan Facility are subject to certain customary conditions including, without limitation, the consummation of the acquisition of Atotech in accordance with the Implementation Agreement, the accuracy of specified representations and warranties of the Company and other customary closing conditions.

As of December 31, 2021, the Company has entered into purchase commitments for certain inventory components and other equipment and services used in its normal operations. The majority of the purchase commitments covered by these arrangements are for periods of less than one year and aggregate to approximately \$367.7.

To the extent permitted by Massachusetts law, the Company’s Restated Articles of Organization, as amended, require the Company to indemnify any of its current or former officers or directors or any person who has served or is serving in any capacity with respect to any of the Company’s employee benefit plans. The Company believes that the estimated exposure for these indemnification obligations is currently not material. Accordingly, the Company has no material liabilities recorded for these requirements as of December 31, 2021.

The Company also enters into agreements in the ordinary course of business which include indemnification provisions. Pursuant to these agreements, the Company indemnifies, holds harmless and agrees to reimburse the indemnified party, generally its customers, for losses suffered or incurred by the indemnified party in connection with certain patent or other intellectual property infringement claims, and, in some instances, other claims, by any third party with respect to the Company’s products. The term of these indemnification obligations is generally perpetual after execution of the agreement. The maximum potential amount of future payments the Company could be required to make under these indemnification agreements is, in some instances, not contractually limited. The Company has never incurred costs to defend lawsuits or settle claims related to these indemnification obligations. As a result, the Company believes the estimated fair value of these obligations is minimal. Accordingly, the Company has no liabilities recorded for these obligations as of December 31, 2021.

As part of past acquisitions and divestitures of businesses or assets, the Company has provided a variety of indemnifications to the sellers and purchasers for certain events or occurrences that took place prior to the date of the

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acquisition or divestiture. Typically, certain of the indemnifications expire after a defined period of time following the transaction, but certain indemnifications may survive indefinitely. The maximum potential amount of future payments the Company could be required to make for such obligations is undeterminable at this time. Other than obligations recorded as liabilities at the time of the acquisitions, historically the Company has not made significant payments for these indemnifications. Accordingly, no material liabilities have been recorded for these obligations.

In conjunction with certain asset sales, the Company may provide routine indemnifications whose terms range in duration and often are not explicitly defined. Where appropriate, an obligation for such indemnification is recorded as a liability. Because the amounts of liability under these types of indemnifications are not explicitly stated, the overall maximum amount of the obligation under such indemnifications cannot be reasonably estimated. Other than obligations recorded as liabilities at the time of the asset sale, historically the Company has not made significant payments for these indemnifications.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2021. The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the “Exchange Act”), means controls and other procedures of an issuer that are designed to ensure that information required to be disclosed by the issuer in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by an issuer in the reports that it files or submits under the Exchange Act is accumulated and communicated to the issuer’s management, including its principal executive and principal financial officers, or persons performing similar functions as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of December 31, 2021, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms and is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Management’s Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act as a process designed by, or under the supervision of our Chief Executive Officer and Chief Financial Officer, or persons performing similar functions, and effected by our Board of Directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles and includes those policies and procedures that:

- Pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the Company;

- Provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that our receipts and expenditures of the Company are being made only in accordance with authorization of our management and directors of the Company; and

- Provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision and with the participation of our management including our Chief Executive Officer and Chief Financial Officer, we conducted an assessment of the effectiveness of our internal control over financial reporting as of December 31, 2021. In making this assessment, we used the criteria set forth in the *Internal Control-Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on our assessment, our management concluded that, as of December 31, 2021, our internal control over financial reporting was effective.

We excluded Photon Control, which we acquired in 2021, from our assessment of internal control over financial reporting as of December 31, 2021. Photon Control’s assets and net revenues represented approximately 1% of the Company’s assets and net revenues as of and for the year ended December 31, 2021.

Our internal controls over financial reporting as of December 31, 2021 have been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in its attestation report which appears in Item 8 of this Annual Report on Form 10-K.

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during our fourth fiscal quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. *Other Information*

None.

Item 9C. *Disclosure Regarding Foreign Jurisdictions that Prevent Inspections*

Not applicable.

PART III

Item 10. *Directors, Executive Officers and Corporate Governance*

The information required by this item will be set forth under the captions “Proposal One — Election of Directors,” “Directors,” “Corporate Governance,” “Executive Officers,” “Corporate Governance — Code of Business Conduct and Ethics” and “Corporate Governance — Board of Directors Meetings and Committees of the Board of Directors — Audit Committee” in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

We are also required under Item 405 of Regulation S-K to provide information concerning delinquent filers of reports under Section 16 of the Securities and Exchange Act of 1934, as amended. This information will be set forth under the caption “Delinquent Section 16(a) Reports,” if applicable, in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

Item 11. *Executive Compensation*

The information required by this item will be set forth under the captions “Executive Officers,” “Executive Compensation – Compensation Discussion and Analysis,” “Corporate Governance – Board of Director Meetings and Committees of the Board of Directors – Compensation Committee - Compensation Committee Interlocks and Insider Participation,” “Compensation Committee Report” and “Director Compensation” in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

Item 12. *Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters*

The information required by Item 403 of Regulation S-K will be set forth under the caption “Security Ownership of Certain Beneficial Owners and Management” in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

The information required by Item 201(d) of Regulation S-K will be set forth under the caption “Equity Compensation Plan Information” in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

Item 13. *Certain Relationships and Related Transactions and Director Independence*

The information required by this item will be set forth under the captions “Corporate Governance – Board Independence” and “Corporate Governance – Transactions with Related Persons” in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

Item 14. *Principal Accountant Fees and Services*

The information required by this item will be set forth under the caption “Audit and Financial Accounting Oversight — Principal Accountant Fees and Services” in our definitive proxy statement for the 2022 Annual Meeting of Stockholders, to be filed with the SEC no later than 120 days after the end of our fiscal year, and is incorporated herein by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a) The following documents are filed as a part of this Annual Report on Form 10-K:

1. *Financial Statements.* The following Consolidated Financial Statements are included under Item 8 of this Annual Report on Form 10-K.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Financial Statements:

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2. *Financial Statement Schedules.* The following consolidated financial statement schedule is included in this Annual Report on Form 10-K.

Schedule II – Valuation and Qualifying Accounts

Schedules other than those listed above have been omitted since they are either not required or information is otherwise included.

3. *Exhibits.* The following exhibits are filed as part of this Annual Report on Form 10-K.

Exhibit No.	Title
+2.1(1)	Implementation Agreement, between the Registrant and Atotech Limited, dated as of July 1, 2021
2.2	Letter Agreement, by and among the Registrant, Atotech Limited and Atotech Manufacturing, Inc., dated October 29, 2021
+3.1(2)	Restated Articles of Organization of the Registrant
+3.2(3)	Articles of Amendment to Restated Articles of Organization, as filed with the Secretary of State of Massachusetts on May 18, 2001
+3.3(4)	Articles of Amendment to Restated Articles of Organization, as filed with the Secretary of State of Massachusetts on May 16, 2002
+3.4(5)	Amended and Restated By-Laws of the Registrant
+4.1(6)	Specimen certificate representing the Common Stock
+4.2(6)	Description of Capital Stock Registered Under Section 12 of the Exchange Act
+10.1(7)	Term Loan Credit Agreement, dated April 29, 2016, by and among the Registrant, Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto
+10.2(8)	Amendment No. 1 to Term Loan Credit Agreement, dated as of June 9, 2016, by and among the Registrant, the other loan parties party thereto, Barclays Bank PLC, as administrative agent and collateral agent, and each participating lender party thereto

Exhibit No.	Title
+10.3(9)	Amendment No. 2 to Term Loan Credit Agreement, dated as of December 14, 2016, by and among the Registrant, the other loan parties party thereto, Barclays Bank PLC, as administrative agent and collateral agent, and each participating lender party thereto
+10.4(10)	Amendment No. 3 to Term Loan Credit Agreement, dated as of July 6, 2017, by and among the Registrant, the other loan parties party thereto, Barclays Bank PLC, as administrative agent and collateral agent, and each participating lender party thereto
+10.5(11)	Amendment No. 4 to Term Loan Credit Agreement, dated as of April 11, 2018, by and among the Registrant, the other loan parties party thereto, Barclays Bank PLC, as administrative agent and collateral agent, and each participating lender party thereto
+10.6(12)	Amendment No. 5 to Term Loan Credit Agreement and Amendment to Term Loan Guaranty and Term Loan Security Agreement, dated as of February 1, 2019, by and among the Registrant, the other loan parties party thereto, Barclays Bank PLC, as administrative agent and collateral agent, and each participating lender party thereto
+10.7(13)	Amendment No. 6 to Term Loan Credit Agreement, dated as of September 27, 2019, by and among the Registrant, the other loan parties thereto, Barclays Bank PLC, as administrative agent and collateral agent, and each participating lender party thereto
+10.8(14)	Amendment No. 7 to Term Loan Credit Agreement, dated as of May 6, 2021, by and among the Registrant, the other loan parties party thereto, each lender party thereto and Barclays Bank PLC, as administrative agent
+10.9(12)	ABL Credit Agreement, dated as of February 1, 2019, by and among the Registrant, Barclays Bank PLC, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto
+10.10(15)	Amendment No. 1 to ABL Credit Agreement, dated as of April 26, 2019, by and among the Registrant, Barclays Bank PLC, as administrative agent and collateral agent, the other loan parties party thereto, and each lender party thereto
+10.11(14)	Amendment No. 2 to ABL Credit Agreement, dated as of May 6, 2021, by and among the Registrant, the other loan parties party thereto, each lender party thereto and Barclays Bank PLC, as administrative agent.
+10.12(5)*	2014 Stock Incentive Plan
+10.13(5)*	2014 Employee Stock Purchase Plan
+10.14(5)*	Form of Restricted Stock Unit Agreement for Non-Employee Directors under the 2014 Stock Incentive Plan
+10.15(16)*	Form of Restricted Stock Unit Agreement for Employees under the 2014 Stock Incentive Plan
+10.16(17)*	MKS Instruments, Inc. Management and Key Employee Bonus Plan
+10.17(18)*	Employment Agreement, dated October 22, 2013, between Gerald Colella and the Registrant
+10.18(17)*	Amendment, dated March 27, 2018, to Employment Agreement, dated as of October 22, 2013, between Gerald Colella and the Registrant
+10.19(19)*	Second Amendment, dated October 29, 2018, to Employment Agreement, dated as of October 22, 2013, between Gerald Colella and the Registrant
+10.20(20)*	Newport Corporation's 2011 Stock Incentive Plan
+10.21(20)*	Newport Corporation's Amended and Restated 2011 Stock Incentive Plan
+10.22(20)*	Form of Stock Appreciation Right Award Agreement used under Newport Corporation's 2011 Stock Incentive Plan and Amended and Restated 2011 Stock Incentive Plan
+10.23(20)*	Form of the Registrant's SAR Assumption Agreement for U.S. Employees Relating to Newport Corporation's Amended and Restated 2011 Stock Incentive Plan, 2011 Stock Incentive Plan and 2006 Performance-Based Stock Incentive Plan

Exhibit No.	Title
+10.24(20)*	Form of the Registrant's SAR Assumption Agreement for Employees Outside of the United States Relating to Newport Corporation's Amended and Restated 2011 Stock Incentive Plan, 2011 Stock Incentive Plan and 2006 Performance-Based Stock Incentive Plan
+10.25(21) *	Employment Agreement, dated as of November 18, 2019, between John Lee and the Registrant
+10.26(22)*	Employment Agreement, effective August 1, 2016, between Seth Bagshaw and the Registrant
+10.27(19)*	Amendment, dated October 29, 2018, to Employment Agreement, effective August 1, 2016, by and between Seth Bagshaw and the Registrant
+10.28(15)*	Employment Agreement, effective August 1, 2016, between Kathleen Burke and the Registrant, as amended on October 29, 2018
+10.29(6)*	Employment Agreement, effective September 16, 2019, between James Schreiner and the Registrant
+10.30(23)*	Amendment, dated October 25, 2021, to Employment Agreement, effective September 16, 2019, between James Schreiner and the Registrant
+10.31(16)*	Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan
+10.32(16)*	Form of Restricted Stock Units Award Agreement (with time-based vesting) used under Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan for 2016-2017
+10.33(16)*	Form of Restricted Stock Units Award Agreement (with time-based vesting) used under Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan for 2018
+10.34(16)*	Form of the Registrant's RSU Assumption Agreement (with time-based vesting) for U.S. Employees Relating to Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan
+10.35(16)*	Form of the Registrant's RSU Assumption Agreement (with time-based vesting) for Employees Outside of the United States Relating to Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan
+10.36(24)*	Annual Profit Improvement Bonus Plan
+10.37(25)*	Employment Agreement, effective February 18, 2021, between Mark Gitin, the Registrant and Newport Corporation
+10.38(25)*	Employment Agreement, effective January 1, 2020, between David Henry and the Registrant
+10.39(25)*	Employment Agreement, effective February 17, 2021, between Eric Taranto and the Registrant
+10.40(1)	Lock-Up Agreement, between the Registrant and the Carlyle Shareholders, dated as of July 1, 2021
+10.41(1)	Commitment Letter, by and among the Registrant, JPMorgan Chase Bank, N.A. and Barclays Bank PLC, dated as of July 1, 2021
+10.42(26)*	Management Incentive Plan
21.1	Subsidiaries of the Registrant
23.1	Consent of PricewaterhouseCoopers LLP
31.1	Certification of Principal Executive Officer pursuant to Rule 13a-14(a)/Rule 15d-14(a) of the Securities Exchange Act of 1934
31.2	Certification of Principal Financial Officer pursuant to Rule 13a-14(a)/Rule 15d-14(a) of the Securities Exchange Act of 1934
32.1	Certification of Chief Executive Officer and Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS**	Inline XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.
101.SCH**	Inline XBRL Taxonomy Extension Schema Document
101.CAL**	Inline XBRL Taxonomy Calculation Linkbase

Exhibit No.	Title
101.DEF**	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB**	Inline XBRL Taxonomy Labels Linkbase Document
101.PRE**	Inline XBRL Taxonomy Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted as inline XBRL with applicable taxonomy extension information contained in Exhibits 101)

+ Previously filed

* Management contract or compensatory plan arrangement

** Filed with this Annual Report on Form 10-K for the year ended December 31, 2021 are the following documents formatted in iXBRL (Inline Extensible Business Reporting Language): (i) the Consolidated Balance Sheets; (ii) the Consolidated Statements of Operations and Comprehensive Income; (iii) the Consolidated Statements of Stockholders' Equity; (iv) the Consolidated Statements of Cash Flows; and (v) the Notes to Consolidated Financial Statements.

The following materials from MKS Instruments, Inc.'s Annual Report on Form 10-K for the year ended December 31, 2021, are formatted in XBRL (Extensible Business Reporting Language): (i) the Consolidated Balance Sheets, (ii) the Consolidated Statements of Operations and Comprehensive Income, (iii) the Consolidated Statements of Stockholders' Equity, (iv) the Consolidated Statements of Cash Flows, and (v) Notes to the Consolidated Financial Statements.

- (1) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on July 2, 2021.
- (2) Incorporated by reference to the Registration Statement on Form S-4 (File No. 333-49738), filed with the Securities and Exchange Commission on November 13, 2000.
- (3) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2001 (File No. 000-23621), filed with the Securities and Exchange Commission on August 14, 2001.
- (4) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2002 (File No. 000-23621), filed with the Securities and Exchange Commission on August 13, 2002.
- (5) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on May 6, 2014.
- (6) Incorporated by reference to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 (File No. 000-23621), filed with the Securities and Exchange Commission on February 28, 2020.
- (7) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on April 29, 2016.
- (8) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on June 9, 2016.
- (9) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on December 14, 2016.
- (10) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on July 6, 2017.
- (11) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on April 12, 2018.
- (12) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on February 1, 2019.
- (13) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on October 1, 2019.
- (14) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on May 10, 2021.
- (15) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2019 (File No. 000-23621), filed with the Securities and Exchange Commission on August 7, 2019.
- (16) Incorporated by reference to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2018 (File No. 000-23621), filed with the Securities and Exchange Commission on February 26, 2019.
- (17) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended March 31, 2018 (File No. 000-23621), filed with the Securities and Exchange Commission on May 8, 2018.
- (18) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on October 24, 2013.
- (19) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on November 1, 2018.

- (20) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended March 31, 2016 (File No. 000-23621), filed with the Securities and Exchange Commission on May 6, 2016.
- (21) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on November 20, 2019.
- (22) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2016 (File No. 000-23621), filed with the Securities and Exchange Commission on August 3, 2016.
- (23) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on October 29, 2021.
- (24) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on February 12, 2020.
- (25) Incorporated by reference to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2020 (File No. 000-23621), filed with the Securities and Exchange Commission on February 23, 2021.
- (26) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), with the Securities and Exchange Commission on February 11, 2022.

(b) Exhibits

MKS hereby files as exhibits to our Annual Report on Form 10-K those exhibits listed in Item 15(a) above.

Item 16. *Form 10-K Summary*

Not applicable.

MKS INSTRUMENTS, INC.
SCHEDULE II - VALUATION AND QUALIFYING ACCOUNTS
(in millions)

Description	Balance at Beginning of Year	Additions			Deductions & Write-offs	Balance at End of Year
		Acquisition Beginning Balance	Charged to Costs and Expenses	Charged to Other Accounts		
Allowance for doubtful accounts:						
Years ended December 31,						
2021	\$ 2.0	\$ —	\$ 1.3	\$ —	\$ 0.3	\$ 3.6
2020	\$ 1.8	\$ —	\$ 0.1	\$ —	\$ 0.1	\$ 2.0
2019	\$ 5.2	\$ 0.2	\$ (0.7)	\$ —	\$ (2.9)	\$ 1.8

Description	Balance at Beginning of Year	Additions			Deductions & Write-offs	Balance at End of Year
		Acquisition Beginning Balance	Charged to Costs and Expenses	Charged to Other Accounts		
Allowance for sales returns:						
Years ended December 31,						
2021	\$ 1.8	\$ —	\$ (0.1)	\$ —	\$ (0.1)	\$ 1.6
2020	\$ 1.4	\$ —	\$ 0.3	\$ —	\$ 0.1	\$ 1.8
2019	\$ 1.0	\$ —	\$ 0.2	\$ —	\$ 0.2	\$ 1.4

Description	Balance at Beginning of Year	Additions			Deductions	Balance at End of Year
		Acquisition Beginning Balance	Charged to Costs and Expenses	Charged to Other Accounts		
Valuation allowance on deferred tax asset:						
Years ended December 31,						
2021	\$ 30.6	\$ —	\$ 2.3	\$ —	\$ (6.7)	\$ 26.2
2020	\$ 27.4	\$ —	\$ 4.2	\$ —	\$ (1.0)	\$ 30.6
2019	\$ 17.9	\$ 5.9	\$ 4.9	\$ —	\$ (1.3)	\$ 27.4

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this annual report on Form 10-K for the fiscal year ended December 31, 2021 to be signed on its behalf by the undersigned, thereunto duly authorized on the 28th day of February 2022.

MKS INSTRUMENTS, INC.

By: /s/ John T.C. Lee
John T.C. Lee
President and Chief Executive Officer
(Principal Executive Officer)

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the date indicated.

<u>SIGNATURES</u>	<u>TITLE</u>	<u>DATE</u>
<u>/s/ Gerald G. Colella</u> Gerald G. Colella	Chairman of the Board of Directors	February 28, 2022
<u>/s/ John T.C. Lee</u> John T.C. Lee	President, Chief Executive Officer and Director (Principal Executive Officer)	February 28, 2022
<u>/s/ Seth H. Bagshaw</u> Seth H. Bagshaw	Senior Vice President, Chief Financial Officer and Treasurer (Principal Financial and Accounting Officer)	February 28, 2022
<u>/s/ Rajeev Batra</u> Rajeev Batra	Director	February 28, 2022
<u>/s/ Peter J. Cannone III</u> Peter J. Cannone III	Director	February 28, 2022
<u>/s/ Joseph B. Donahue</u> Joseph B. Donahue	Director	February 28, 2022
<u>/s/ Jacqueline F. Moloney</u> Jacqueline F. Moloney	Director	February 28, 2022
<u>/s/ Elizabeth A. Mora</u> Elizabeth A. Mora	Director	February 28, 2022
<u>/s/ Michelle M. Warner</u> Michelle M. Warner	Director	February 28, 2022

Board of Directors

Gerald G. Colella

Chairman
MKS Instruments, Inc.

Rajeev Batra

President
Siemens Digital Industries U.S.

Peter J. Cannone III

Chairman and Chief Executive Officer
Demand Science Group

Joseph B. Donahue

Former Executive Vice President
and Chief Operating Officer
TE Connectivity Ltd.

John T.C. Lee

President and Chief Executive Officer
MKS Instruments, Inc.

Jacqueline F. Moloney

Chancellor
University of Massachusetts, Lowell

Elizabeth A. Mora

Former Chief Administrative Officer
The Charles Stark Draper Laboratory, Inc.

Michelle M. Warner

Executive Director
CEO Perspectives

Management

John T.C. Lee

President and Chief Executive Officer

Seth H. Bagshaw

Senior Vice President,
Chief Financial Officer and Treasurer

Kathleen F. Burke

Senior Vice President,
General Counsel and Secretary

Mark M. Gitin

Senior Vice President and
General Manager,
Light and Motion Division

David P. Henry

Senior Vice President,
Corporate Marketing,
Project Management Office
and Global Service

Jennifer J. Reilly

Senior Vice President,
Chief Human Resources Officer

James A. Schreiner

Senior Vice President,
Chief Operating Officer

Francis J. Tan

Senior Vice President,
Strategic Development

Eric R. Taranto

Senior Vice President and
General Manager,
Vacuum and Analysis Division

John Williams

Vice President and
General Manager,
Equipment and Solutions Division

Additional Information

Corporate Headquarters

MKS Instruments, Inc.
2 Tech Drive, Suite 201
Andover, MA 01810
Telephone: +1.978.645.5500

Outside Counsel

Wilmer Cutler Pickering Hale and Dorr LLP
Boston, MA

Independent Auditors

PricewaterhouseCoopers LLP
Boston, MA

Stock Listing

Nasdaq Global Select Market
Symbol: MKSI

Transfer Agent

American Stock Transfer &
Trust Company, LLC
6201 15th Avenue
Brooklyn, NY 11219
Telephone: +1.718.921.8124
www.amstock.com

Shareholders may also direct inquiries to:

David Ryzhik
Vice President, Investor Relations
MKS Instruments, Inc.
2 Tech Drive, Suite 201
Andover, MA 01810
Telephone: +1.978.557.5180
www.mksinst.com

Annual Meeting of Shareholders

May 10, 2022, 10:00 a.m. EST
MKS Instruments, Inc.
2 Tech Drive, Suite 201
Andover, MA 01810



MKS Instruments, Inc.
www.mksinst.com

