



MKS INSTRUMENTS, INC.

ANNUAL REPORT 2020



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

Guiding Principles

GROW

Enabling
Sustainable
and Profitable
Growth

WIN

Win
as a
Team

INNOVATE

Innovation
is a Core
Capability

OWN

Own
It!

To Our Shareholders

The year 2020 was full of challenges for all of us—both personally and professionally. But for MKS, I can best characterize 2020 with the following three words: “resilience,” “opportunity” and “growth.”

Let me start with “resilience.” Throughout the COVID-19 pandemic, the safety and well-being of our global workforce has been our highest priority. We have also remained steadfast in delivering on the needs of our customers during this challenging time. Our team worked tirelessly to ensure continuity of operations by swiftly responding to disruptions at our factories and supply chain partners, while adhering to stringent safety protocols. The MKS team demonstrated incredible resilience, determination and teamwork throughout the year.

In terms of “opportunity,” the disruptions we faced did not interrupt our cadence of innovation and this allowed us to take advantage of new opportunities in the markets we serve. In 2020, we were awarded 170 new patents. We also grew new product releases by 48% year-over-year and secured a number of important design wins for both our Semiconductor and Advanced Markets. We also view

“opportunity” through another lens—Corporate Social Responsibility (CSR). Relationships matter, and we build ours on a solid foundation of integrity and trust. How we run our business stems directly from our core values and our stakeholder expectations. Our MKS CSR Management System helps guide how we deliver on our objectives in an ethical and sustainable way for our employees, customers, suppliers and shareholders.

And finally I’ll discuss “growth.” I am extremely proud of the MKS team for delivering outstanding financial results in 2020. Our results would be impressive in any year, but are even more so given the challenges of the pandemic. Revenues for 2020 were a record \$2.3 billion, an increase of 23% from \$1.9 billion in 2019, driven by strong demand from the Semiconductor Market. Revenues from the Semiconductor Market were \$1.4 billion, an increase of 49% compared to 2019, while revenues from Advanced Markets were \$944 million, a decrease of 3% compared to 2019. Net income in 2020 was \$350 million, or \$6.33 per diluted share, compared to net income of \$140 million, or \$2.55 per diluted share, in 2019. We also had record operating cash flow of \$513 million, a 110% increase from the \$245 million



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

reported in 2019. In addition, we returned \$44 million to our shareholders in cash dividends.

MKS continues to be keenly focused on markets and applications where the enduring trends of miniaturization and technical complexity are long-term drivers of value creation. The rise of the data economy increases demand for advanced memory, foundry and logic chips, thus driving long-term growth in semiconductor manufacturing capacity. The increasing complexity of technology transitions in semiconductor manufacturing offers countless opportunities for companies like ours with a broad portfolio of critical technology solutions. And the accelerating need for laser-based precision manufacturing requires our complementary offering of lasers, optics, photonics, and motion solutions in addition to fully integrated systems.

Three core elements form the foundation of our sustainable advantage in these markets and applications. First, we have a broad and differentiated portfolio of products ranging from critical semiconductor subsystems to precision laser systems that we believe is unmatched in the


industries that we serve. Second, we have a unique approach to innovation, led by our collaborative Office of the CTO (OCTO) structure. And third, we embrace our vision of enabling technologies that transform our world, and in doing so, develop deep partnerships with customers that solidify our competitive position.

As we look ahead to 2021, we continue to build on our successes of 2020, focusing on delivering sustainable and profitable growth and creating long-term value for our shareholders. I want to thank our dedicated employees for their resilience, innovation, and teamwork. I could not be prouder of what we accomplished together in 2020 and I am privileged to lead such an extraordinary group of people.


In closing, I want to thank our customers, suppliers, and shareholders for your continued confidence in MKS.



John T.C. Lee
President and Chief Executive Officer



Our results would be impressive in any year, but are even more so given the challenges of the pandemic.



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 the conditions affecting the markets in which MKS operates, including the fluctuations in capital spending in the semiconductor industry and other advanced manufacturing markets, fluctuations in sales to our major customers, the impact of the COVID-19 pandemic on the global economy and financial markets, including any restrictions on MKS' operations and the operations of MKS' customers and suppliers resulting from public health requirements and government mandates, the terms of our Term Loan Facility, competition from larger or more established companies in MKS' markets, MKS' ability to successfully grow its business and particularly the business of Electro Scientific Industries, Inc., which we acquired in February 2019, 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, manufacturing and sourcing risks, volatility of stock price, international operations, financial risk management, and the other factors described in "Risk Factors" in Part I, Item 1A in the Form 10-K for the year ended December 31, 2020 included in this report. 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, 2020

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	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>	Emerging growth company	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/>	Smaller reporting company	<input type="checkbox"/>		

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, 2020 based on the closing price of the registrant's common stock on such date as reported by the Nasdaq Global Select Market: \$6,237,127,049.

Number of shares outstanding of the issuer's common stock, no par value, as of February 16, 2021: 55,222,118

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the definitive Proxy Statement for our 2021 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, 2020, are incorporated by reference into Part III of this Annual Report on Form 10-K.

TABLE OF CONTENTS

Special Note Regarding Forward-Looking Statements	2
Summary of Risk Factors.....	3
PART I	
Item 1. Business	5
Item 1A. Risk Factors	11
Item 1B. Unresolved Staff Comments.....	31
Item 2. Properties	31
Item 3. Legal Proceedings.....	32
Item 4. Mine Safety Disclosures	32
PART II	
Item 5. Market for the Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities	33
Item 6. Reserved	34
Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations	35
Item 7A. Quantitative and Qualitative Disclosures about Market Risk	55
Item 8. Financial Statements and Supplementary Data	56
Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure	105
Item 9A. Controls and Procedures.....	105
Item 9B. Other Information	106
PART III	
Item 10. Directors, Executive Officers and Corporate Governance	107
Item 11. Executive Compensation	107
Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters	107
Item 13. Certain Relationships and Related Transactions and Director Independence	107
Item 14. Principal Accountant Fees and Services.....	107
PART IV	
Item 15. Exhibits and Financial Statement Schedules	108
Item 16. Form 10-K Summary.....	111
SIGNATURES.....	113

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K 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 the conditions affecting the markets in which MKS operates, including the fluctuations in capital spending in the semiconductor industry and other advanced manufacturing markets, fluctuations in sales to our major customers, the impact of the COVID-19 pandemic on the global economy and financial markets, including any restrictions on MKS’ operations and the operations of MKS’ customers and suppliers resulting from public health requirements and government mandates, the terms of our Term Loan Facility, competition from larger or more established companies in MKS’ markets, MKS’ ability to successfully grow its business and particularly the business of Electro Scientific Industries, Inc., which we acquired in February 2019, 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, manufacturing and sourcing risks, volatility of stock price, international operations, financial risk management, and the other factors described in “Risk Factors” in Part 1, Item 1A of this Annual Report on Form 10-K. 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.

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 the COVID-19 Pandemic

- *The COVID-19 pandemic may have a materially adverse effect on our business, financial condition and operating results, as well as on the operations and financial performance of our customers and suppliers. We are unable to predict the extent to which the pandemic and related restrictions will impact our business, operations, financial performance and the achievement of our strategic objectives.*

Risks Related to Operating a Global Business

- *We face significant risks from doing business internationally.*
- *Unfavorable currency exchange rate fluctuations may lead to lower operating margins or may cause us to raise or reduce prices, which could result in reduced sales.*

Risks Related to Our Industries and Markets

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

- *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 our offshore manufacturing locations or 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, operating results, financial condition 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.*

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.*

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, 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, research and defense.

Recent Event

On February 4, 2021, we made a proposal to acquire in a cash and stock transaction Coherent, Inc. (“Coherent”), which had previously announced that it had entered into a definitive agreement with Lumentum Holdings, Inc. (“Lumentum”) pursuant to which Lumentum would acquire Coherent. Under the terms of our proposal to Coherent, if accepted by Coherent, Coherent shareholders would receive \$115 cash and .7473 of a share of our common stock per share of Coherent common stock. We would expect to fund the potential transaction with cash on hand and debt financing. The execution of a definitive merger agreement between Coherent and us would be subject to approval of each party’s board of directors and completion of the transaction would be subject to customary closing conditions, including receipt of required regulatory approvals and approval of our and Coherent’s respective stockholders. Completion of the transaction would not be subject to any financing condition. On February 12, 2021, II-VI Incorporated (“II-VI”) submitted a separate proposal to acquire Coherent. While Coherent has publicly announced that both our proposal and that of II-VI could lead to a transaction that is superior to its pending transaction with Lumentum, it has not yet determined that either proposal is in fact superior. No assurances can be made that Coherent will accept our proposal.

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® products and services include 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® products and services include 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. This strategy

commenced with our acquisition of Newport Corporation (“Newport”) in April 2016 (the “Newport Merger”), and we extended this strategy further with our acquisition of Electro Scientific Industries, Inc. (“ESI”) in February 2019 (the “ESI Merger”).

We believe there are three secular trends benefitting MKS. First is the impact of a world that continues to be increasingly interconnected, resulting in an explosion of data transmission, data storage, and data analytics requirements, which drives continued growth for advanced memory, foundry and logic chip demand. 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, motion, 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 and inspection.

Approximately 59%, 49%, and 55% of our net revenues for the years 2020, 2019 and 2018, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers.

We anticipate that the semiconductor market will continue to account for a substantial portion of our sales. While the semiconductor device manufacturing market is global, major semiconductor capital equipment manufacturers are concentrated in China, Japan, South Korea, Taiwan and the United States.

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, such as flexible and rigid printed circuit board (“PCB”) processing/fabrication, glass coating, laser marking, measurement and scribing, natural gas and oil production, environmental monitoring 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. Industrial technologies manufacturers are located in developed and developing countries across the globe.

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. Our life and health sciences customers are located globally.

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. Major equipment providers and research laboratories are concentrated in China, Europe, Japan, South Korea, Taiwan, and the United States.

Approximately 41%, 51% and 45% of our net revenues in the years 2020, 2019 and 2018, respectively, were from advanced markets.

International Markets

A significant portion of our net revenues are from sales to customers in international markets. For the years 2020, 2019 and 2018, international net revenues accounted for approximately 55%, 53% and 51% of our total net revenues, respectively. A significant portion of our international net revenues were from sales to customers in China, Germany, Israel, Japan and South Korea. We expect that international revenues will continue to account for a significant percentage of total net revenues for the foreseeable future. In particular, we expect that the proportion of our sales to Asian customers will continue to increase, due in large part to our acquisition in February 2019 of Electro Scientific Industries, Inc. (“ESI”), as most of the customers we inherited from the acquisition are located in Asia. Long-lived assets located outside of the United States accounted for approximately 28% and 39% of our total long-lived assets in 2020 and 2019, 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. Long-lived assets located outside of the United States decreased as a percentage of total long-lived assets in 2020 compared to 2019, primarily due to an increase in right-of-use assets from new leases in the United States in 2020.

Reportable Segments, and Product and Service Offerings

We group our product offerings by the following reportable segments: Vacuum & Analysis, Light & Motion and Equipment & Solutions. Global Service represents our service offerings and consists of total services from all three of our reportable segments.

The Vacuum & Analysis 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 Delivery 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, which 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 Light & Motion segment was created in conjunction with the Newport Merger. The Light & Motion segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in lasers, photonics, optics, precision motion control and vibration control. Its products include:

- *Laser Products*, which consist of lasers including ultrafast lasers and amplifiers, fiber lasers, diode-pumped solid-state lasers, high-energy pulsed lasers and tunable lasers.
- *Photonics Products*, which include optical components, lens assemblies and vibration isolation solutions. Our Photonics Products also includes our instruments and motion products, such as high-precision motion stages and controls, hexapods, photonics instruments for measurement and analysis, and production equipment for test and measurement.

The Equipment & Solutions segment was created in conjunction with the ESI Merger. The Equipment & Solutions segment provides a range of laser-based system and test products.

- *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, as well as passive component multilayer ceramic capacitor testing.
- *Multi-layer ceramic capacitor (“MLCC”) test systems*, which include testing of ultra-small form factor MLCCs, used mainly in smartphones and other consumer electronics 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 to thousands of customers worldwide, in a wide range of end markets. Revenues from our top ten customers accounted for approximately 44%, 33% and 41% of net revenues for the years 2020, 2019 and 2018, respectively. Our two largest customers, Lam Research Corporation and Applied Materials, Inc., accounted for approximately 24%, 18% and 23% of net revenues for the years 2020, 2019 and 2018, respectively.

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, 2020, we had approximately 810 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, 2020, we had approximately 770 research and development employees located in facilities around the world. Our research and development expenses were \$173.1 million, \$164.1 million and \$135.7 million for the years 2020, 2019 and 2018, 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

Our manufacturing facilities are located in Austria, China, France, Germany, Israel, Italy, Mexico, Romania, Singapore, South Korea and the United States. Manufacturing activities include the assembly and testing of components and subassemblies, which are integrated into our products. We outsource some of our assembly work. 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, 2020, we had approximately 3,700 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.

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 delivery 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 Ind, 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, 2020, we owned 669 U.S. patents and 1,453 foreign patents that expire at various dates through 2040. As of December 31, 2020, we had 98 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, offer a competitive compensation and benefits program and provide a safe and healthy workplace.

As of December 31, 2020, we had a total workforce of approximately 5,800 individuals across 19 countries, with 26% located in the Asia-Pacific region, 25% located in Europe and the Middle East and 49% located in North America. Of our total workforce, approximately 5,400 were employees and approximately 400 were temporary workers. Of our total workforce, 13% work in research and development, 64% work in operations, manufacturing, service and quality assurance, and 23% 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 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 Board of Directors is comprised of 50% female members and is 25% racially diverse, 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. In addition, our executive team is comprised of 20% female members and is 20% racially diverse. In 2020, as part of our commitment to diversity, equity and inclusion, over 120 of our leaders around the world completed a six-week diversity, equity and inclusion program hosted by a consulting firm recognized as best-in-class in the area of diversity, equity and inclusion capability building. We plan to expand the diversity, equity and inclusion program to our next level of leaders as well as offer diversity, equity and inclusion training for all employees in 2021. We also proactively provide our hiring managers with diverse candidate slates in our employee recruiting process.

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 2020, we introduced a pilot course to develop our focus on employee engagement, change management and leadership excellence, which will be broadly rolled out in 2021. In 2020, our leaders also completed the diversity, equity and inclusion course described above. In addition, we provide financial support for college education and access to online learning for all employees in local languages to help further the careers of our entire workforce.

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 that allows peer-to-peer recognition and recognition by managers; this program will be expanded globally by the end of 2021. In 2020, we also introduced 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 2020 was 6.6%. 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.

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. In May 2020, MKS launched a worldwide survey of its people to better understand how remote workers were doing during the pandemic. The results of this survey have informed our continued response to the COVID-19 pandemic and were shared with all of our employees.

Additional information regarding MKS' activities related to its people and sustainability can be found in our Corporate Social Responsibility Brochure, which is accessible through the Corporate Social Responsibility section of our website at <https://www.mksinst.com/corporate-social-responsibility>. Our Corporate Social Responsibility Brochure 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 the COVID-19 Pandemic

The COVID-19 pandemic may have a materially adverse effect on our business, financial condition and operating results, as well as on the operations and financial performance of our customers and suppliers. We are unable to predict the extent to which the pandemic and related restrictions will impact our business, operations, financial performance and the achievement of our strategic objectives.

The COVID-19 pandemic has subjected, and continues to subject, our operations, financial performance and financial condition to a number of risks, including, but not limited to, those discussed below.

Impact of Governmental Regulatory Actions to Combat the COVID-19 Pandemic

As a result of the COVID-19 pandemic, governmental authorities across the world have implemented and are continuing to implement numerous and constantly evolving mandates to try to contain the virus, including manufacturing restrictions, limits on gatherings, quarantines, shelter-in-place orders, and business shutdowns. Mandates providing for business shutdowns generally exclude certain essential services, and those essential services commonly include critical infrastructure and the businesses that support such critical infrastructure, as well as healthcare-related businesses and defense. These regulatory mandates have impacted and may further impact our workforce and operations, as well as those of our customers and suppliers. While all of our facilities are currently operational, in some cases they have operated at a diminished capacity, as certain portions of our business have not met applicable exclusion requirements, and were temporarily halted. Some customers have had highly limited operations during the pandemic. For example, our research and defense market was negatively impacted in the first half of 2020 by university and research lab closures resulting from COVID-19. Further, some of our facilities and some of our suppliers' facilities have been constricted by government mandates restricting the number or percentage of personnel that are permitted to work at a facility. Although many government mandates have had specific expiration dates, some of those mandates have been extended multiple times or lifted and then re-imposed when new cases of the virus have increased substantially. As a result, there is considerable uncertainty regarding the duration of such government mandates and potential future restrictions, and complexity in ensuring compliance. Restrictions on our manufacturing, support operations or workforce, or similar limitations for our vendors and suppliers, could limit our ability to meet customer demand and could have a material adverse effect on our business, financial condition and operating results.

Impact of the COVID-19 Pandemic on the Global Economy

The COVID-19 pandemic has caused declines in industry and global economic conditions, resulting in adverse regional, and sometimes global, economic conditions. In the event of a widespread recession or other significant downturn in the worldwide economy, demand for our products would likely decline and our business would likely be adversely affected, as our revenue is primarily dependent upon demand from semiconductor manufacturers and other industrial technologies manufacturers, and these markets are largely driven by demand for electronic products, which demand declines in a recession.

Operations-Related Risks

Across all of our business units, we have faced increased operational challenges stemming from the need to protect our employees' health and safety, site closures, workplace disruptions and restrictions on the movement of people, raw materials and goods, both at our own facilities and at the facilities of our customers and suppliers. 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. While orders during the COVID-19 pandemic have been strong, the high volume of orders may be attributable to customers increasing their inventory to reduce their exposure to risks of future supply disruptions, which could result in a sudden and significant decrease in future customer demand for our products. Our failure to anticipate any sudden decrease in order patterns, and reduce our costs accordingly, could result in significant excess inventory, and our business, financial condition and operating results could be harmed. We may also experience customer requests for order delays or cancellations, payment deferrals or other contract modifications, supply chain liquidity issues, and delayed deliveries and other factors related directly and indirectly to the COVID-19 pandemic. In addition, any inability to timely perform our obligations under any contract due to government restrictions, or otherwise as a result of the pandemic, could harm our relationship with customers, result in lost business to unconstrained competitors or expose us to disputes or potential litigation, which could be costly and have an adverse effect on our business. Extended periods of disruption to the economy and global supply chain will have a material adverse impact on our business, financial condition and operation results.

Supply Chain Risks

We have experienced supply chain interruptions as a result of the COVID-19 pandemic. We expect that these interruptions will continue as long as the pandemic is widespread in our suppliers' locations. Certain of our suppliers have faced difficulties maintaining operations in light of government-ordered restrictions and shelter-in-place mandates. If our suppliers or sub-suppliers are unable to maintain their operations or operating restrictions become more severe, we may encounter difficulties obtaining supplies, which may cause us to fail to meet customer demand or require us to pay higher prices for these materials, either of which could harm our business and profitability. For example, some of our key suppliers located in Malaysia and Mexico have experienced capacity restrictions as a result of government mandates limiting employee headcount in order to maintain social distancing, as well as employee absenteeism due to fear of contracting COVID-19. Further, we rely on sole and limited source suppliers for some of our components and subassemblies that are critical to the manufacturing of our products due to unique component designs as well as specialized quality and performance requirements needed to manufacture our products, which increases our exposure to supply chain disruptions of these components.

Additionally, an economic slowdown caused by the COVID-19 pandemic could harm the financial health of our suppliers and sub-suppliers. Although we regularly monitor the financial health of the companies in our supply chain, financial hardship on our suppliers or sub-suppliers or their bankruptcy, liquidation or closure, could disrupt our ability to obtain raw materials or components required to manufacture our products, adversely affecting our operations. Such incidents could also require us to alter our payment terms with certain suppliers to include certain unfavorable terms to us, including prepaying for raw materials, which could negatively impact our cash flow.

Employee Productivity Risks

In response to the COVID-19 pandemic, we have modified our business practices with respect to our employees, including restricting employee travel, requiring employees to telecommute if they can perform their jobs from home, implementing social distancing measures, enhancing sanitary measures in our facilities, implementing shift changes, and cancelling attendance at events and conferences. Many of our suppliers and service providers have made similar modifications. Further, we have required self-isolation for personnel who were, or may have been, exposed to the COVID-19 virus and required full or partial facility closures in order to implement additional sanitary measures, thus reducing our on-site capacity at these facilities for periods of time. There is no certainty that these measures will be sufficient to mitigate the risks posed by the virus, in which case our employees may contract the COVID-19 virus, our ability to perform critical functions could be harmed, and we may be unable to respond to the needs of our global business. With respect to those employees who are now working remotely, the resources available to them may not enable them to maintain the same level of productivity and efficiency, and these and non-remote employees may face additional demands on their time, such as increased responsibilities resulting from school closures or the illness of family members. While we have experienced only limited absenteeism from those employees who are required to be on-site to perform their jobs, absenteeism may increase in the future and may harm our productivity. Further, our increased reliance on remote access to our information systems increases our exposure to potential cybersecurity breaches. We may take further restrictive actions to mitigate the spread of COVID-19 as government authorities require or recommend or as we determine to be in the best interests of our employees, customers, partners and suppliers, which actions may negatively impact our business and results of operations.

Risks Related to Operating a Global Business

We face significant risks from doing business internationally.

Our business is subject to risks inherent in conducting business globally. International revenues account for a significant portion of total net revenues, with a substantial portion of such sales to customers in Asia (especially China, South Korea, Japan, Israel, and Taiwan) and Europe (especially Germany). We expect that international revenues will continue to account for a significant percentage of total net revenues for the foreseeable future, and that in particular, the proportion of our sales to Asian customers will continue to increase. Additionally, we have substantial international manufacturing, sales and administrative operations, with significant facilities and employee populations in Europe and Asia, and a substantial portion of our manufacturing in China, Israel, Mexico and Singapore. Our international operations expose us to various risks, which include:

- adverse changes or instability in the political or economic conditions in countries or regions where we manufacture or sell our products, including currency devaluations, debt defaults, lack of liquidity and recessions;
- challenges of administering our diverse business and product lines globally;
- the actions of government regulatory authorities, including embargoes, executive orders, import and export restrictions, tariffs, currency controls, trade restrictions and trade barriers (including retaliatory actions), license requirements, environmental and other regulatory requirements and other rules and regulations applicable to the manufacture, import and export of our products, all of which are complicated and potentially conflicting, often require significant investments in cost, time and resources for compliance, and may 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 applicable U.S. and international anti-corruption and trade laws by our employees, sales representatives, distributors or other agents;
- longer accounts receivable collection periods and longer payment cycles;
- overlapping, differing or more burdensome tax structures and laws;

- the potential that certain tax benefits may be revoked or reclaimed;
- adverse currency exchange rate fluctuations;
- reduced or inconsistent protection of intellectual property;
- shipping and other logistics complications;
- the imposition of restrictions on currency conversion or the transfer of funds;
- compliance costs and withholding taxes associated with the repatriation of our 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);
- the expropriation of private enterprises;
- complex and burdensome labor laws and practices in countries where we have employees;
- cultural and management style differences;
- changes in labor conditions and difficulties in staffing and managing each of our foreign operations, including, but not limited to, the formation of labor unions; and
- increased risk of exposure to civil unrest, terrorism and military activities.

If we experience any of the risks associated with international business, 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, which would negatively impact our business. Further, many of our employees in Israel are subject to being called for active military duty under emergency circumstances. If a military conflict or war arises, these individuals could be required to serve in the military for extended periods of time, and our operations in Israel could be disrupted by the absence of one or more key employees or a significant number of other employees for a significant period of time. Any such disruption could adversely affect our business.

The U.S. government has taken actions 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, including the suspension of our ability to fill outstanding orders. These actions by the U.S. government have caused us, and may in the future cause us, to lose anticipated revenue from these 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 future 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 these customers and some of our 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 outside of these countries remain at a disadvantage.

Unfavorable currency exchange rate fluctuations may lead to lower operating margins or may cause us to raise or reduce prices, which could result in reduced sales.

A significant portion of our net revenues are from customers in international markets. For the years 2020, 2019 and 2018, international net revenues accounted for approximately 55%, 53% and 51% of our total net revenues, respectively. We also have production facilities where costs are denominated in currencies other than the U.S. dollar. Currency exchange rate fluctuations could have an adverse effect on our net revenues, expenses and operating results and we could experience losses with respect to our hedging activities. Unfavorable currency fluctuations could require us to increase or decrease prices to foreign 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 in international markets when the sales are translated into U.S. dollars. 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 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 against significant currency 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 consumer electronics 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 59%, 49% and 55% of our net revenues for the years 2020, 2019 and 2018, 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 consumer electronics can also have a significant impact on our business, financial condition and operating results. The semiconductor and consumer electronics 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 49% in 2020, sequentially decreased 19% in 2019, and sequentially increased 4% in 2018. 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, as well as manufacturers' capacity utilization, timing of new product introductions and demand for customers' products, inventory levels relative to demand and access to affordable capital. The timing, severity and duration of these market cycles are difficult to predict, and we may not be able to respond effectively to these cycles.

During downturns in the semiconductor and consumer electronics 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, when upturns in these industries occur, 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 that 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 demands for new, improved and disruptive technologies;
- Our inability to 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 products or enhancements to existing 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 our customers to achieve market demand for their products that incorporate our technologies;
- Efforts of our 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 the ability to incur lower costs due to control over sources of components and raw materials;
- 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; and
- Pricing pressure from our 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, such as the semiconductor capital equipment market, where competitors are more likely to seek to maintain or increase market share, reduce inventory or introduce more technologically advanced or lower-cost products.

Certain of these factors could cause existing customers to defer or cancel orders for our products and could cause potential customers to 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. 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. 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.

In addition, these factors could prompt us to agree to pricing concessions or extended payment terms with our customers in connection with expanding into new markets or gaining volume orders, or to improve our customer cost of ownership in highly competitive applications.

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 a number of 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 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 our 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 the sales and operational support for our diverse markets, our business, financial condition and operating results would be harmed.

Risks Related to Our Operations

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. Cyclical industry conditions and the 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 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;
- information technology or infrastructure failures;
- new regulatory requirements; and
- natural disasters or other events beyond our control (such as earthquakes at our facilities in California and Portland, Oregon, floods or storms, wildfires, regional economic downturns, pandemics such as COVID-19, social unrest, political instability, terrorism, or acts of war), particularly where we or our suppliers, subcontractors and contract manufacturers conduct manufacturing.

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 the manufacturing of our products due to unique component designs as well as specialized quality and performance requirements needed to manufacture our products. This reliance involves several risks, including the following:

- the potential 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 resulting from 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 potential inability of our suppliers to develop technologically advanced products to support our growth and development of new products; and
- the potential unavailability of service and/or spare parts for critical capital equipment.

We believe we could obtain and qualify alternative sources for most sole and limited source and international supplier parts; however, the transition time to alternative sources may be long. Seeking alternative sources for these parts could also

require us to redesign our products, resulting in increased costs, likely shipping delays and the potential need to requalify products with our customers, particularly those who have “copy exact” requirements. In such an event, any inability to redesign our products could result in further costs and shipping delays. These 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 current and potential customers and have a material adverse effect on our business and operating results.

Our failure to successfully manage our offshore manufacturing locations or 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 perform offshore to take advantage of cost efficiencies available to us in those or other countries. However, we may not achieve the significant cost savings or other benefits that we anticipate from moving manufacturing and other operations outside of the United States, 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 complete the requalification of 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 are expensive and time-consuming activities, 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 relationship 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 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, operating results, financial condition 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. Several of our products 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. In particular, our Equipment & Solutions Division's products are extremely complex, and have historically had much higher warranty costs as a percentage of net revenues than our other products.

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 the foregoing 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 our information technology systems management and certain accounting functions, to domestic and overseas 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 products delivered or 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. In addition, many of these outsourced service providers, including certain hosted software applications that we use for confidential data storage, employ cloud computing technology for such storage. These providers of cloud computing systems may be susceptible to "cyber incidents," such as intentional cyber-attacks aimed at theft of sensitive data or inadvertent cyber-security compromises, which are outside of our control. 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 44%, 33% and 41% of our net revenues for the years 2020, 2019 and 2018, respectively. Our two largest customers, Lam Research Corporation and Applied Materials, Inc., accounted for approximately 24%, 18% and 23% of net revenues for the years 2020, 2019 and 2018, 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 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 consumer electronics 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 manufacturer (“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 future performance will be 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 San Francisco Bay Area, Orange County, California, China 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 our technical talent is older on average than our peers, and we may have difficulty attracting a sufficient number of younger employees with the necessary skills to replace employees who retire. If we are unable to hire sufficient numbers of employees with the experience and skills we need or to retain and motivate our 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. The acquisitions of Newport in April 2016 and ESI in February 2019 significantly increased our size, including with respect to net revenues, product offerings, and 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 into our organization 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 because of the following significant challenges:

- 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 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;
- 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 be placed at a competitive disadvantage by selling products in markets and geographies that are new to us. In addition, if we are not successful in completing acquisitions that we may pursue in the future, we may be required to re-evaluate our growth strategy. We may incur substantial expenses and devote significant management time and resources in seeking to complete proposed acquisitions that may not generate the financial results that we planned to achieve.

In particular, we continue to experience some significant risks associated with 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.

Further, some very significant customers of our laser and motion products compete with our Equipment & Solutions Division. While our Equipment & Solutions Division is separate from our Light & Motion Division that supplies these laser and motion products, and we have implemented internal measures intended to segregate competitively sensitive information that we receive from these customers from our Equipment & Solutions Division, these customers may nonetheless choose to source their laser and motion products from alternate suppliers, which would result in a potentially significant loss of revenue for our laser and motion business.

In addition, with future acquisitions, we could use substantial portions of our available cash as all or a portion of the purchase price. We could also issue additional securities as consideration for these acquisitions, which could cause significant stockholder dilution, or obtain additional debt financing, which would increase our costs and reduce our future cash flow, 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 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, 2020 was \$833 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. The total principal balance of our ABL Facility at December 31, 2020 was \$0.

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. 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 intends to cease publication of certain LIBOR rates, including the LIBOR rate that we use, on June 30, 2023, although LIBOR may become unavailable before that date. 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, 2020, our goodwill and intangible assets, net, represented approximately \$1,579 million, 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. 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 products. 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 companies. In addition to targeted comprehensive sanctions against specific firms, “Entity List” designations and ‘military end-user’ controls were 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 U.S. origin technologies. These regulations have resulted in additional tariffs on shipments of our products, parts and supplies, loss of business and increased administrative burdens. While we have adjusted our practices to ensure compliance with these regulations, and we will seek to mitigate their impact, there can be no assurances that the current regulations and tariffs, or additional ones, 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. For example, in May 2019, the U.S. Department of Commerce’s Bureau of Industry and Security (“BIS”) added Chinese-based Huawei Technologies Co., Ltd. (“Huawei”) and 68 of its affiliates onto the BIS Entity List, thereby prohibiting the sale of U.S. goods to Huawei, without a license from BIS. In August 2019, it added an additional 46 restricted Huawei affiliates to that list. In May 2020, BIS modified the Foreign Direct Product rule to further restrict Huawei’s ability to source U.S. origin items. The next month, BIS changed the ‘military end-use’ rule, expanding the list of affected product categories, requiring export licenses

in certain situations. In August of 2020, BIS added 38 affiliates of Huawei to the Entity List. In December 2020, Hong Kong lost its favorable trade status, BIS' named 103 specific companies as 'military end users' (mostly in China), and BIS added Semiconductor Manufacturing International Corporation ("SMIC") and ten of its affiliates, along with sixty-six other companies to the Entity List. Accordingly, we have implemented additional monitoring processes and suspended orders from Huawei, SMIC and certain other Chinese-based customers. 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 ("MOFCOM") 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 of the 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, 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, State and Treasury. Export regulations govern exports of our products and technology developed or manufactured in other countries, including, for example, Austria, France, Germany, Israel, Romania and Singapore, and China. 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 “Act”) 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 Act to issue regulations and interpretive guidance. Final regulations have not been issued for certain significant provisions of the Act. In addition, some of the proposed and final regulations that have been issued 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 this Act on our U.S. tax liabilities is based upon our understanding and interpretation of the regulatory guidance that has been issued regarding the Act. A new administration took office in January 2021. The new administration has indicated that it is opposed to and will seek to reverse significant provisions of the Act.

In addition, 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, operating results or financial condition.

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 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 such 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 environmental 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, such 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 business, financial condition and operating results.

From time to time, we may be involved in legal proceedings or claims regarding product performance, product warranty, product certification, product liability, patent infringement, intellectual property rights, antitrust, environmental regulations, securities, contracts, unfair competition, misappropriation of trade secrets, employment, workplace safety, and other matters.

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 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 terms that we accept, 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 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 have alleged, among other things, that the then-current directors of each such acquired company breached their fiduciary duties to their respective shareholders by agreeing to sell such 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 diverts 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. Any such litigation could be protracted and costly, and we could become subject to damages for infringement, or to an injunction preventing us from selling one or more of our products or using one or more of our trademarks. Such claims could also result in the necessity of obtaining a license relating to one or more of our products or current or future technologies, which may not be available on commercially reasonable terms or at all. Any intellectual property litigation 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 typically require us to indemnify the customer in the event of any claim of infringement brought by a third party based on our products. Any 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 such 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 varying interpretations, 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 our commercial relationship with those parties, 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 the intellectual property rights of these other third parties. 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' involvements 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 that are 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 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 of our resources; inhibit our ability to sell our products; 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, claims or investigations.

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 human resources, manufacturing, research and development, supply chain management, sales and accounting. This data includes confidential information, transactional information and intellectual property belonging to us, our customers and our business partners, as well as personally identifiable information. We have experienced, and expect to continue to be subject to, cybersecurity threats and incidents ranging from employee error or misuse to individual attempts to gain unauthorized access to

information systems to sophisticated and targeted measures known as advanced persistent threats, none of which have materially affected our financial condition or operating results to date. While we devote significant resources to network security, data encryption and other measures to protect our systems and information from unauthorized access or misuse, a failure in or a breach of our operational or security systems or infrastructure, or those of our 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, our employees, our customers and other business partners; damage our reputation; cause data privacy issues; decrease the value of our investment in research, development and engineering; cause losses; result in litigation with third parties; result in investigations and/or fines from regulatory bodies; and increase our cybersecurity protection and remediation costs.

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, EU regulations have established a prohibition on the transfer of personally identifiable information from the EU 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 the EU to the United States, these approaches may be reviewed and invalidated by EU courts or regulatory bodies and we may be required to ascertain an alternative legal basis for such transfers. Additionally, we may also face audits or investigations by one or more government agencies relating to our compliance with these regulations that could result in the imposition of penalties or fines, significant expenses in facilitating and responding to the investigations, and overall reputational harm or negative publicity. The costs of compliance with, and other burdens imposed by, these laws, regulations and policies including, restrictions on marketing activities, could have a material adverse effect on our business, financial condition and operating results.

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, 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 international 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 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 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 the 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 these 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. Orders expected to ship in one period could shift to another period due to changes in the timing of our customers' purchase decisions, rescheduled delivery dates requested by our customers, 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 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. All of these risks have a particularly high impact on our Equipment & Solutions Division, which derives substantial revenue from a few significant customers and the sale of a relatively small quantity of products. 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 consumer electronics industries), market seasonality (particularly in the research, defense and consumer electronics industries), levels of government funding available to our customers (particularly in the life and health sciences, 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;
- government 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 the factors discussed above, 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 such 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, 2020:

Country	City	Sq. Ft.	Activity	Reportable Segment	Lease Expires
China	Shenzhen	302,000	Manufacturing and Service	Vacuum & Analysis and Light & Motion	August 31, 2025
	Wuxi	64,505	Manufacturing, Sales, Customer Support, Service and Warehouse	Light & Motion	October 31, 2021
France	(1)	183,000	Manufacturing, Research and Development	Light & Motion	Owned
Israel	Jerusalem	118,000	Manufacturing, Sales and Research and Development	Light & Motion	(2)
Mexico	Nogales	174,700	Manufacturing and Service	Vacuum & Analysis and Light & Motion	(3)
Singapore	Singapore	45,084	Manufacturing and Sales	Equipment & Solutions	(4)
United States	Andover, MA	158,000	Corporate Headquarters, Manufacturing and Research and Development	Vacuum & Analysis	(5)
	Beaverton, OR	113,341	Manufacturing, Office and Warehouse	Equipment & Solutions	November 30, 2040
	Broomfield, CO	107,455	Manufacturing, Research and Development	Vacuum & Analysis	March 31, 2041
	Irvine, CA	233,457	Manufacturing, Research and Development	Light & Motion	(6)
	Portland, OR	136,056	Manufacturing, Office and Warehouse	Equipment & Solutions	(7)
	Milpitas, CA	102,668	Manufacturing, Sales, Customer Support, Service and Research and Development	Light & Motion	December 31, 2040
	Rochester, NY	156,000	Manufacturing, Sales, Customer Support, Service and Research and Development	Vacuum & Analysis	Owned
	Santa Clara, CA	139,500	Manufacturing, Customer Support and Research and Development	Light & Motion	March 31, 2021
	Wilmington, MA	118,000	Manufacturing, Customer Support, Service and Research and Development	Vacuum & Analysis	Owned

- (1) MKS owns two facilities, one in Beaune-la-Rolande with 57,000 square feet and one in Brigueil with 126,000 square feet.
- (2) MKS owns one facility with 70,000 square feet and leases two other facilities with 38,000 square feet and 10,000 square feet, both with a lease expiration date of December 31, 2027.
- (3) MKS leases a facility with 124,200 square feet with a lease expiration date of September 1, 2033 and also leases another facility with 50,500 square feet with a lease expiration date of July 31, 2028.
- (4) MKS leases three separate spaces at the same location, which includes two spaces with 35,229 square feet, each with a lease expiration date of December 31, 2021, and another space with 9,855 square feet with a lease expiration date of December 15, 2024.
- (5) MKS owns one facility with 82,000 square feet and leases another facility with 76,000 square feet with a lease expiration date of November 30, 2026.
- (6) MKS leases a facility with 190,857 square feet with a lease expiration date of February 28, 2037. MKS leases another facility with 42,600 square feet with a lease expiration date of February 28, 2022.
- (7) MKS sold three separate buildings, in 2019, as part of sale and leaseback transactions, and leased back the buildings over varying terms. One building lease expired on May 31, 2020 and the other two building leases have a lease expiration date of May 31, 2021.

In addition to the significant facilities listed above, MKS also provides manufacturing, worldwide sales, 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 16, 2021, we had 78 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 2020, our Board of Directors declared a cash dividend of \$0.20 per share during each quarter, which totaled \$44.0 million or \$0.80 per share. During 2019, our Board of Directors declared a cash dividend of \$0.20 per share during each quarter, which totaled \$43.5 million or \$0.80 per share.

On February 8, 2021, our Board of Directors declared a quarterly cash dividend of \$0.20 per share to be paid on March 5, 2021 to shareholders of record as of February 22, 2021.

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

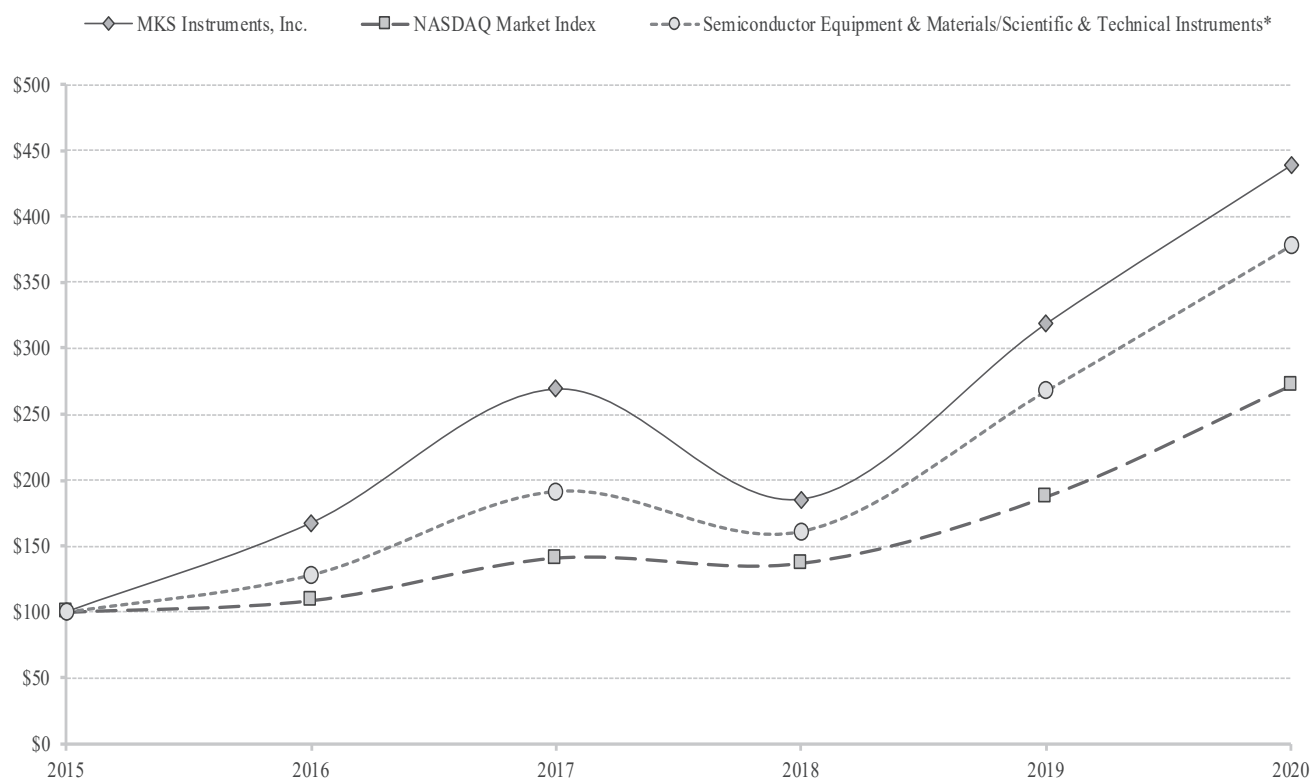
On July 25, 2011, our Board of Directors approved, and on July 27, 2011, we publicly announced a share repurchase program for the repurchase of up to an aggregate of \$200 million of our outstanding common stock from time to time in open market purchases, privately negotiated transactions or through 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 2020 and 2019, the Company did not repurchase any shares of common stock. We have repurchased approximately 2,588,000 shares of common stock for approximately \$127.0 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, 2015, and plotted at the last trading day of each of the fiscal years ended December 31, 2016, 2017, 2018, 2019 and 2020 of MKS' common stock; a peer group index which represents a combination of all companies comprising the Morningstar Semiconductor Equipment & Materials Industry Group Index and Morningstar Scientific & Technical Instruments Industry Group Index, published by Zacks Investment Research, Inc., 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



	2015	2016	2017	2018	2019	2020
MKS Instruments, Inc.	\$ 100.00	\$ 167.65	\$ 269.09	\$ 185.51	\$ 318.93	\$ 439.20
Nasdaq Market Index	\$ 100.00	\$ 108.87	\$ 141.13	\$ 137.12	\$ 187.44	\$ 271.64
Morningstar Semiconductor Equipment & Materials/Scientific & Technical Instruments	\$ 100.00	\$ 128.38	\$ 191.85	\$ 161.39	\$ 267.79	\$ 378.23

* Semiconductor Equipment & Materials and 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 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. This section provides an analysis of our financial results for the year ended December 31, 2020 compared to the year ended December 31, 2019. For the discussion and analysis covering the year ended December 31, 2019 compared to the year ended December 31, 2018, 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, 2019, as filed with the SEC on February 28, 2020.

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, 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, research and defense.

Recent Events

Impact of COVID-19

The World Health Organization formally declared the outbreak of COVID-19 a pandemic in March 2020. We have devoted considerable resources to address the impact of the pandemic on our employees and their families, our customers and our community, as well as on our business, which has had to adapt to changes in our manufacturing capacity, disruptions to our supply chain, fluctuations in demand for our products and services and the imposition of government mandates.

In January 2020, we created a global COVID-19 task force to manage our response to the pandemic, as it had begun to impact our operations in China and in anticipation that it could affect us globally. As described in additional detail in “Human Capital—Health and Safety and Pandemic Response” in Part I, Item 1 of this Annual Report on Form 10-K, we have taken a range of actions to protect our employees and maintain our operations, focusing on the following key areas:

Ensuring the health and safety of our workforce by:

- Expediting social distancing and facility sanitation measures
- Establishing a work-from-home policy and a return-to-work policy
- Implementing and applying key safety precautions

Maintaining continuity of operations by:

- Securing critical components amid disruptions to our supply chain
- Addressing rapid changes in workforce availability to ensure timely response to our customers’ needs
- Harnessing our global services footprint to respond to the repair and maintenance needs of our customers

While our operations and financial performance in certain areas of our business have been negatively impacted by the COVID-19 pandemic, the negative impact on our financial results for year ended December 31, 2020 was minimal due to strong demand for our products from our semiconductor customers. Beginning in late 2020 and continuing into 2021, various countries, including the United States, started providing vaccines for COVID-19. Although this is a positive step in combating the virus, it is unclear if or when the global vaccination rate will reach a point of collective immunity and reduce the transmission rate of the virus. The situation remains dynamic and there remains significant uncertainty as to the length and severity of the pandemic, the continued actions that may be taken by government authorities, the impact on our business and on the business of our customers and suppliers, the long-term economic implications and the other factors identified in “Risk Factors” in Part I, Item 1A of this Annual Report on Form 10-K. We believe the longer the COVID-19 pandemic continues, the greater the adverse impact the pandemic could have on our business, financial condition and operating results. We will continue to evaluate the nature and extent of the impact of the COVID-19 pandemic to our business, financial condition and operating results.

Acquisitions

On February 1, 2019, we completed our acquisition of ESI. 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. We paid the former ESI stockholders aggregate consideration of approximately \$1.03 billion, excluding related transaction fees and expenses, and non-cash consideration related to the exchange of share-based awards of approximately \$31 million for a total purchase consideration of approximately \$1.06 billion. We funded the payment of the aggregate cash consideration with a combination of our available cash on hand and the proceeds from our 2019 Incremental Term Loan Facility, as defined and as described further below.

Segments and Markets

The Vacuum & Analysis 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 Light & Motion segment was created in conjunction with the Newport Merger. The Light & Motion segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in lasers, photonics, optics, precision motion control and vibration control.

The Equipment & Solutions segment was created in conjunction with the ESI Merger. 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 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.

Approximately 59% and 49% of our net revenues for the years 2020 and 2019, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers.

We anticipate that the semiconductor market will continue to account for a substantial portion of our sales. While the semiconductor device manufacturing market is global, major semiconductor capital equipment manufacturers are concentrated in China, Japan, South Korea, Taiwan and the United States.

Net revenues in our semiconductor market increased by \$457.4 million, or 49%, in 2020, compared to 2019, with volume increases in net semiconductor revenues of \$436.2 million and \$23.8 million in the Vacuum & Analysis and Light & Motion segments, respectively. These increases were a function of strong demand for semiconductor capital equipment across memory, foundry and logic manufacturing applications. 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.

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, such as flexible and rigid PCB processing/fabrication, glass coating, laser marking, measurement and scribing, natural gas and oil production, environmental monitoring 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. Industrial technologies manufacturers are located in developed and developing countries across the globe.

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. Our life and health sciences customers are located globally.

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. Major equipment providers and research laboratories are concentrated in China, Europe, Japan, South Korea, Taiwan, and the United States.

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

Net revenues from customers in our advanced markets decreased by \$27.2 million, or 3%, in 2020, compared to 2019, with decreases of \$59.8 million and \$20.8 million from our Light & Motion and Vacuum & Analysis segments, respectively, offset by an increase of \$53.4 million from our Equipment & Solutions segment. Revenues from our research and defense market were adversely affected by COVID-19 related university and research laboratory closures in the first half of 2020. Revenues from our life and health sciences market was impacted by a reduction in elective medical procedures. These decreases were partially offset by an increase in revenues from our industrial technologies market, primarily within the Equipment & Solutions segment.

International Markets

A significant portion of our net revenues is from sales to customers in international markets. International net revenues accounted for approximately 55% and 53% of our total net revenues in 2020 and 2019, respectively. A significant portion of our international net revenues was from China, Germany, Israel, Japan and South Korea. We expect international net revenues will continue to represent a significant percentage of our total net revenues for the foreseeable future. In particular, we expect that the proportion of our sales to Asian customers will continue to increase, due in large part to our acquisition in February 2019 of ESI, as most of the customers we inherited from the acquisition are located in Asia. Long-lived assets located outside of the United States accounted for approximately 28% and 39% of our total long-lived assets in 2020 and 2019, 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. Long-lived assets located outside of the United States decreased as a percentage of total long-lived assets in 2020 compared to 2019, primarily due to an increase in right-of-use assets from new leases in the United States in 2020.

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, pension plan valuations, inventory, warranty costs, stock-based compensation expense, intangible assets, goodwill and other long-lived assets, in-process research and development 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 2020 or 2019.

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, 2020 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 warranty obligations. 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 2020 and 2019.

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 \$24.8 million and \$24.7 million for 2020 and 2019 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, the calculation of net periodic pension costs was based upon 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 plan. All of these assumptions were based upon our judgment, considering all 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 assumed certain stock appreciation rights (“SARs”) as a result of the Newport Merger and the ESI Merger. We also provide 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 SARs and shares issued under our ESPP using the Black-Scholes pricing model, which is affected by our stock price as well as assumptions regarding a number of complex and subjective variables. These variables include our 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 plans. 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.

As part of the Newport Merger in 2016 and the ESI Merger in 2019, we assumed all SARs granted under any Newport equity plan or ESI equity plan, whether vested or unvested, that were outstanding immediately prior to the effective time of the Newport Merger and the ESI Merger. For SARs, the converted number of shares, fair value, vesting schedule and expiration dates are all based on the original grant date information. The stock-based compensation expense reflects the remaining fair value for all unvested SARs as of the acquisition dates, recognized over the remaining time to vest.

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, 2020, we performed our annual impairment assessment of goodwill using a qualitative assessment for all of the reporting units within the Vacuum & Analysis and Light & Motion segments. 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 within these segments. The Equipment & Solutions segment consists of one reporting unit. As of October 31, 2020, we performed our annual impairment assessment of goodwill for this reporting unit using a quantitative assessment and determined that it is more likely than not that the fair value of this reporting unit exceeded its carrying amount.

For the quantitative assessment for the Equipment & Solutions reporting unit, we estimated that the fair value exceeded its carrying value by 10%. The Equipment & Solutions goodwill amount is \$474.3 million and \$474.9 million as of October 31, 2020 and December 31, 2020, respectively. Key assumptions in the goodwill impairment valuation model are forecasted revenues based upon external and internal data, gross margin and operating expense estimates, discount rate and terminal growth rate. A change in any of these key assumptions could result in this reporting unit being impaired in the future.

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,	
	2020	2019
Net revenues:		
Product	86.5%	84.8%
Service	13.5	15.2
Total net revenues	100.0	100.0
Cost of revenues:		
Product	47.5	48.1
Service	7.5	8.2
Total cost of revenues (exclusive of amortization shown separately below)	55.0	56.3
Gross profit	45.0	43.7
Research and development	7.4	8.6
Selling, general and administrative	15.2	17.4
Acquisition and integration costs	0.1	2.0
Restructuring and other	0.4	0.4
Amortization of intangible assets	2.4	3.5
Asset impairment	0.1	0.2
COVID-19 related net credits	(0.1)	—
Fees and expenses related to repricing of Term Loan Facility	—	0.3
Gain on sale of long-lived assets	—	(0.3)
Income from operations	19.5	11.6
Interest income	0.1	0.3
Interest expense	1.3	2.3
Other expense, net	0.1	0.2
Income before income taxes	18.2	9.4
Provision for income taxes	3.1	2.0
Net income	15.1%	7.4%

Year Ended December 31, 2020 compared to 2019

Net Revenues

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Product	\$ 2,014.8	\$ 1,611.3
Service	315.2	288.5
Total net revenues	\$ 2,330.0	\$ 1,899.8

Net product revenues increased \$403.5 million in 2020, compared to 2019, due to an increase of \$437.1 million in net product revenues from our semiconductor customers, primarily due to higher volume increases that were a function of strong demand for semiconductor capital equipment across memory, foundry and logic manufacturing applications, partially offset by a decrease of \$33.6 million in net product revenues from customers in our advanced markets.

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 \$26.7 million in 2020, compared to 2019, due to an increase of \$20.3 million in net service revenues from our semiconductor customers and an increase of \$6.4 million in net service revenues from customers in our advanced markets.

Total international net revenues, including product and service, were \$1.3 billion in 2020 compared to \$1.0 billion for 2019. The increase in 2020 was primarily due to increases in net revenues in China, Germany, Israel, Japan and South Korea.

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

Net Revenues

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Vacuum & Analysis	\$ 1,405.9	\$ 990.5
Light & Motion	689.6	725.6
Equipment & Solutions	234.5	183.7
Total net revenues	<u>\$ 2,330.0</u>	<u>\$ 1,899.8</u>

Net revenues for our Vacuum & Analysis segment increased \$415.4 million in 2020, compared to 2019, due to a volume increase of \$436.2 million from our semiconductor customers, offset by a decrease of \$20.8 million from our advanced market customers, primarily from customers in our industrial technologies market.

Net revenues for our Light & Motion segment decreased \$36.0 million in 2020, compared to 2019, due to a decrease of \$59.8 million from our advanced market customers, primarily from customers in our industrial technologies market, offset by an increase of \$23.8 million from our semiconductor customers.

Net revenues from our Equipment & Solutions segment increased \$50.8 million in 2020, compared to 2019, due to an increase of \$53.4 million from our advanced market customers, primarily from an increase of \$52.9 from customers in our industrial technologies market.

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
	2020	2019	
Product	45.1%	43.3%	1.8%
Service	44.8%	46.0%	(1.3)%
Total gross profit percentage	<u>45.0%</u>	<u>43.7%</u>	<u>1.3%</u>

Gross profit as a percentage of net product revenues increased by 1.8 percentage points in 2020, compared to 2019, primarily due to higher revenue volumes, partially offset by unfavorable product mix and higher variable compensation.

Gross profit as a percentage of net service revenues decreased by 1.3 percentage points in 2020, compared to 2019, primarily due to lower utilization of service technicians and higher variable compensation, partially offset by favorable product mix.

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
	2020	2019	
Vacuum & Analysis	45.1%	43.0%	2.1%
Light & Motion	44.9	46.4	(1.5)
Equipment & Solutions	45.2	36.6	8.6
Total net revenues	<u>45.0%</u>	<u>43.7%</u>	<u>1.3%</u>

Gross profit as a percentage of net revenues for our Vacuum & Analysis segment increased by 2.1 percentage points in 2020, compared to 2019, primarily due to higher revenue volumes, partially offset by higher variable compensation.

Gross profit as a percentage of net revenues for our Light & Motion segment decreased by 1.5 percentage points in 2020, compared to 2019, primarily due to lower revenue volumes, unfavorable product mix and higher variable compensation.

Gross profit as a percentage of net revenues for our Equipment & Solutions segment for 2019, includes the inventory step-up adjustment to fair value from purchase accounting of \$7.6 million related to the ESI Merger. Excluding this adjustment, the gross margin for 2019 would have been 40.7%. The remaining increase in gross margin in 2020 was the result of higher revenue volumes and improved overhead absorption.

Research and Development

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Research and development	\$ 173.1	\$ 164.1

Research and development expenses increased \$9.0 million in 2020, compared to 2019, primarily due to an increase of \$12.1 million in compensation-related costs and \$1.5 million in professional fees, partially offset by a decrease of \$4.1 million in project materials.

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 market 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,	
	2020	2019
Selling, general and administrative	\$ 353.1	\$ 330.3

Selling, general and administrative expenses increased \$22.8 million during 2020, compared to 2019, primarily due to an increase of \$30.3 million in compensation-related costs, of which \$16.9 million was variable compensation, \$3.1 million in information technology costs and \$2.0 million in professional fees, partially offset by decreases of \$9.2 million in travel costs and \$1.5 million of marketing and trade show costs, mainly as a result of the COVID-19 pandemic, and a decrease of \$1.1 million in occupancy costs.

Acquisition and Integration Costs

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Acquisition and integration costs	\$ 3.8	\$ 37.3

Acquisition and integration costs incurred during 2020 and 2019 related to the ESI Merger, which closed on February 1, 2019. In 2020, costs consisted of cash bonus and stock-based compensation for certain ESI executives assisting in the integration process. In 2019, costs consisted primarily of compensation costs for certain executives from ESI who had change in control provisions in their respective ESI employment agreements that were accounted for as dual-trigger arrangements and other stock vesting accelerations and consulting and professional fees associated with the ESI Merger.

Restructuring and other

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Restructuring and other	\$ 9.4	\$ 7.0

In 2020, restructuring and other charges 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.

In 2019, restructuring and other charges primarily consisted of severance costs related to an organization-wide reduction in workforce, the consolidation of service functions in Asia, the movement of certain products to lower cost regions and costs incurred from the closure of a facility in Europe. In addition, we recorded a charge for a legal settlement from a contractual obligation we assumed as part of the Newport Merger.

Amortization of Intangible Assets

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Amortization of intangible assets	\$ 55.2	\$ 67.4

Amortization of intangible assets decreased by \$12.2 million in 2020, compared to 2019, primarily due to certain intangible assets in our Light & Motion segment that became fully amortized.

Asset Impairment

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Asset impairment	\$ 2.3	\$ 4.7

In 2020, we recorded impairment charges related to the pending closure of a facility in Europe, of which \$1.2 million related to the impairment of long-lived assets and \$1.1 million related to the impairment of goodwill.

In 2019, we recorded \$4.7 million of impairment charges related to a minority interest investment in a private company.

COVID-19 Related Net Credits

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
COVID-19 related net credits	\$ (1.2)	\$ —

In 2020, we recorded costs and credits related to the COVID-19 pandemic, which related to U.S. and foreign payroll tax-related credits for maintaining our workforce during the pandemic, offset by costs, which included shift premiums and bonuses.

Fees and Expenses Related to Repricing of Term Loan Facility

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Fees and expenses related to repricing of Term Loan Facility	\$ —	\$ 6.6

In 2019, we recorded fees and expenses related to Amendment No. 6 to our Term Loan Credit Agreement, as defined and as described further below, which included the fifth repricing of our Term Loan Facility, as defined and as described further below, and a consolidation of the two existing tranches into one tranche with a maturity date in February 2026. We also recorded fees and expenses related to Amendment No. 5 to our Term Loan Credit Agreement.

Gain on Sale of Long-Lived Assets

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Gain on sale of long-lived assets	\$ —	\$ (6.8)

In 2019, we recorded a net gain on the sale of two properties in Boulder, Colorado and three properties in Portland, Oregon.

Interest Expense, Net

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Interest expense, net	\$ 27.7	\$ 38.7

Interest expense, net, decreased by \$11.0 million in 2020, compared to 2019, primarily due to lower interest expense as a result of lower interest rates and lower average debt balances as a result of a prepayment of \$50.0 million made during the first quarter of 2020 and regularly scheduled principal payments made during each quarter of 2020.

Other Expense, Net

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Other expense, net	\$ 3.1	\$ 3.3

Other expense, net for 2020 and 2019 primarily related to changes in foreign exchange rates.

Provision for Income Taxes

<i>(Dollars in millions)</i>	Years Ended December 31,	
	2020	2019
Provision for income taxes	\$ 72.9	\$ 37.5

Our effective tax rates for the years 2020 and 2019 were 17.2% and 21.1%, respectively. Our 2020 effective tax rate was lower than the U.S. statutory tax rate, mainly due to the geographic mix of income earned by the international subsidiaries being taxed at rates lower than the U.S. statutory tax rate, the deduction for foreign derived intangible income and research credit offset by the tax effects of non-deductible executive compensation and the global intangible low taxed income inclusion.

Our 2019 effective tax rate was higher than the U.S. statutory tax rate due to the global intangible low taxed income inclusion, the tax effects of non-deductible executive compensation and gain on intercompany sale of assets, offset by the deduction for foreign derived intangible income, the geographic mix of income earned by our international subsidiaries being taxed at rates lower than the U.S. statutory tax rate and the impact of various tax credits.

As of December 31, 2020, the total gross unrecognized tax benefits, which excludes interest and penalties, was \$47.0 million. As of December 31, 2019, the total gross unrecognized tax benefits, which excludes interest and penalties, was \$43.5 million. The net increase was primarily attributable to the addition of a reserve related to executive compensation, partially offset by a release of income tax reserves related to the expiration of statutes of limitations.

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, 2020 and 2019, we accrued interest on unrecognized tax benefits of approximately \$0.7 million and \$0.5 million, respectively.

Over the next 12 months, it is reasonably possible that we may recognize approximately \$4.3 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 2017 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 carry-forwards and state tax loss and credit carry-forwards that are open to examination for tax years 2000 through the present.

In 2020, we recorded a net benefit to income tax expense of \$1.3 million, excluding interest and penalties, due to reserve releases related to the expiration of certain statutes of limitations for previously open tax years. In 2019, we recorded a net benefit to income tax expense of \$1.7 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.

The United Kingdom's withdrawal from the European Union (the "EU") became final on December 31, 2020. Additional withholding taxes on inter-company distributions due to the United Kingdom's departure from the EU are expected to have an impact on tax expense. The amount of the impact cannot be determined, as it relies on the amount of earnings of the affiliated entities and the timing of distributions from those entities.

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.

Liquidity and Capital Resources

Cash, cash equivalents and short-term marketable investments totaled \$836.0 million at December 31, 2020, an increase of \$312.0 million compared to \$524.0 million at December 31, 2019. 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, 2020 consisted of \$431.7 million held in the United States and \$404.3 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 \$513.2 million for 2020 and resulted from net income of \$350.1 million, which included non-cash net charges of \$152.1 million and a decrease in working capital of \$11.0 million. The decrease in working capital consisted of a decrease in other current and non-current assets of \$40.9 million, primarily from the collection of income tax receivables, an increase in income taxes payable of \$21.6 million, an increase in accounts payable of \$21.0 million, an increase in current and non-current accrued compensation of \$19.4 million, primarily due to higher variable compensation, and an increase in other current and non-current liabilities of \$5.1 million, offset by an increase in inventories of \$52.2 million and an increase in trade accounts receivable of \$44.8 million, both of which were the result of increased business levels in 2020.

Net cash provided by operating activities was \$244.5 million for 2019 and resulted from net income of \$140.4 million, which included non-cash net charges of \$192.5 million, offset by an increase in working capital of \$88.4 million. The increase in working capital consisted primarily of an increase in inventories of \$29.3 million, a decrease in accounts payable of \$24.1 million, a decrease in income taxes payable of \$12.4 million, an increase in other current and non-current assets of \$9.8 million, a decrease in other current and non-current liabilities of \$8.4 million and a decrease in current and non-current compensation of \$4.2 million.

Net cash used in investing activities was \$202.4 million for 2020 and was due to net purchases of short-term investments of \$117.5 million and purchases of property, plant and equipment of \$84.9 million, which included the buildout of three newly leased facilities in 2020. Net cash used in investing activities was \$947.2 million for 2019 and was due to the payment of a portion of the purchase price for the ESI Merger of \$988.6 million, net of cash acquired, and purchases of property, plant and equipment of \$63.9 million, offset by net sales and maturities of short-term investments of \$63.2 million and proceeds from the sale of long-lived assets of \$42.1 million.

Net cash used in financing activities was \$121.5 million for 2020 and was primarily due to a repayment of our Term Loan Facility of \$59.0 million, dividend payments made to common stockholders of \$44.0 million and net payments related to tax payments for employee stock awards of \$20.6 million, offset by net short-term borrowings of \$2.3 million.

Net cash provided by financing activities was \$476.2 million for 2019 and was from net proceeds of \$530.7 million, mainly from our 2019 Incremental Term Loan Facility, as defined and as described further below, used to finance the ESI Merger, offset by dividend payments made to common stockholders of \$43.5 million and net payments related to tax payments for employee stock awards of \$11.0 million.

For the year ended December 31, 2020, we paid cash dividends of \$44.0 million in the aggregate or \$0.80 per share. For the year ended December 31, 2019, we paid cash dividends of \$43.5 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 8, 2021, our Board of Directors declared a quarterly cash dividend of \$0.20 per share to be paid on March 5, 2021 to shareholders of record as of February 22, 2021.

Senior Secured Term Loan Credit Facility

In connection with the completion of the Newport Merger, we entered into a term loan credit agreement (the “Term Loan Credit Agreement”) with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto (the “Lenders”), that provided a senior secured term loan credit facility in the original principal amount of \$780.0 million (the “2016 Term Loan Facility”), subject to increase at our option and subject to receipt of lender commitments in accordance with the Term Loan Credit Agreement (the 2016 Term Loan Facility, together with the 2019 Incremental Term Loan Facility and 2019 Term Loan Refinancing Facility (each as defined below), the “Term Loan Facility”). Prior to the effectiveness of Amendment No. 6 (as defined below), the 2016 Term Loan Facility had a maturity date of April 29, 2023. As of December 31, 2020, 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 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 1.75%, plus, in each case, an applicable margin; 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. 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. The 2016 Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

We subsequently entered into four separate repricing amendments to the 2016 Term Loan Facility, which decreased the applicable margin for LIBOR borrowings from 4.0% to 1.75%, with a LIBOR rate floor of 0.75%. As a consequence of the pricing of the 2019 Incremental Term Loan Facility (defined below), the applicable margin for the 2016 Term Loan Facility was increased to 2.00% (from 1.75%) with respect to LIBOR borrowings and 1.00% (from 0.75%) with respect to base rate borrowings.

We incurred \$28.7 million of deferred finance fees, original issue discount and repricing fees related to the term loans under the 2016 Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

On February 1, 2019, in connection with the completion of the ESI Merger, we entered into an amendment (“Amendment No. 5”) to the Term Loan Credit Agreement. Amendment No. 5 provided an additional tranche B-5 term loan commitment in the original principal amount of \$650.0 million (the “2019 Incremental Term Loan Facility”), all of which was drawn down in connection with the closing of the ESI Merger. Pursuant to Amendment No. 5, we also effectuated certain amendments to the Term Loan Credit Agreement which make certain of the negative covenants and other provisions less restrictive. Prior to the effectiveness of Amendment No. 6 (as defined below), the 2019 Incremental Term Loan Facility had a maturity date of February 1, 2026 and bore interest at a rate per annum equal to, at our option, a base rate or LIBOR rate (as described above) plus, in each case, an applicable margin equal to 1.25% with respect to base rate borrowings and 2.25% with respect to LIBOR borrowings. The 2019 Incremental Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

We incurred \$11.4 million of deferred finance fees and original issue discount fees related to the term loans under the 2019 Incremental Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

On September 27, 2019, we entered into an amendment (“Amendment No. 6”) to the Term Loan Credit Agreement. Amendment No. 6 refinanced all existing loans outstanding under the 2016 Term Loan Facility and 2019 Incremental Term Loan Facility (“Existing Term Loans”) for a tranche B-6 term loan commitment in the original principal amount of \$896.8 million (“2019 Term Loan Refinancing Facility”). Each lender of the Existing Term Loans that elected to participate in the 2019 Term Loan Refinancing Facility was deemed to have exchanged the aggregate outstanding principal amount of its Existing Term Loans for an equal aggregate principal amount of tranche B-6 term loans under the 2019 Term Loan Refinancing Facility. On the effective date of Amendment No. 6 and immediately prior to the exchanges described above, we made a voluntary prepayment of \$50.0 million, which was applied to the Existing Term Loans on a pro rata basis.

We incurred \$2.2 million of original issue discount fees related to the term loans under the 2019 Term Loan Refinancing Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

As of December 31, 2020, the remaining balance of deferred finance fees and original issue discount of the Term Loan Facility was \$9.4 million. A portion of the deferred finance fees and original issue discount have been accelerated in connection with the various debt prepayments and extinguishments between 2016 and 2020.

The 2019 Term Loan Refinancing Facility matures on February 2, 2026, and bears interest at a rate per annum equal to, at our option, a base rate or LIBOR rate (as described above) plus, in each case, an applicable margin equal to 0.75% with respect to base rate borrowings and 1.75% with respect to LIBOR borrowings. The 2019 Term Loan Refinancing Facility was issued with original issue discount of 0.25% of the principal amount thereof.

We are required to make scheduled quarterly payments each equal to 0.25% of the original principal amount of the 2019 Term Loan Refinancing Facility with the balance due on February 2, 2026.

As of December 31, 2020, after total principal prepayments of \$575.0 million (which included a \$50.0 million prepayment made during 2020) and regularly scheduled principal payments of \$21.6 million, the total outstanding principal balance of the Term Loan Facility was \$833.4 million and the interest rate was 1.9%.

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 collateralized 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, 2020, we were in compliance with all covenants under the Term Loan Credit Agreement.

Interest Rate Swap Agreements

We enter into various interest rate swap agreements, as described further below 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 2019 Incremental Term Loan Facility.

Senior Secured Asset-Based Revolving Credit Facility

On February 1, 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 \$100.0 million, subject to a borrowing base limitation (the “ABL Facility”). On April 26, 2019, we entered into a First Amendment to the ABL Credit Agreement, which amended the borrowing base calculation for eligible inventory prior to an initial field examination and appraisal requirements. 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 \$25.0 million.

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%; 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%. The initial applicable margin for borrowings under the ABL Facility is 0.50% with respect to base rate borrowings and 1.50% with respect to LIBOR borrowings. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, 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 and (b) \$8.5 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 lesser of (i) the commitment amount and (ii) the borrowing base and (B) \$8.5 million 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. The principal amount outstanding under the ABL Facility is due and payable in full on the fifth anniversary of the closing date.

All obligations under the ABL Facility are guaranteed by certain of our domestic subsidiaries, and are collateralized 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 lesser of (1) the commitment amount and (2) the borrowing base and (b) \$8.5 million, until the time when we have excess availability equal to or greater than the greater of (a) 10.0% of the lesser of (1) the commitment amount and (2) the borrowing base and (b) \$8.5 million for 30 consecutive days, or during the continuance of an event of default, the ABL Credit Agreement requires us to maintain a Fixed Charge Coverage Ratio (as defined in the ABL Credit Agreement) 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. We have not borrowed against the ABL Facility to date.

Lines of Credit and Short-Term Borrowing Arrangements

Our Japanese subsidiaries have lines of credit and a financing facility with various financial institutions, the majority 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, 2020 of up to an equivalent of \$32.5 million U.S. dollars. Total borrowings outstanding under these arrangements were \$5.5 million and \$3.1 million at December 31, 2020 and 2019, respectively.

We have provided financial guarantees for certain unsecured borrowings and have standby letters of credit, some of which do not have fixed expiration dates. At December 31, 2020, our maximum exposure as a result of these financial guarantees and standby letters of credit was approximately \$5.1 million.

Sale of Long-Lived Assets

In August of 2019, we sold two of our buildings in Boulder, Colorado and three of our buildings in Portland, Oregon. Total net cash proceeds received for these two transactions was \$41.2 million and we recognized a net gain on the sale of these long-lived assets of \$6.8 million.

Contractual Obligations

Future contractual obligations as of December 31, 2020 are as follows:

Contractual Obligations (In millions)	Payment Due By Period					
	Total	Less than 1 Year	1-3 years	3-5 years	After 5 years	Other
Operating lease obligations	\$ 203.2	\$ 15.8	\$ 28.6	\$ 25.7	\$ 133.1	\$ —
Purchase obligations ⁽¹⁾	301.0	268.2	19.5	12.4	0.9	—
Pension obligations	45.0	1.0	2.3	2.4	39.3	—
Debt	838.9	14.5	18.0	18.0	788.4	—
Other long-term liabilities reflected on the Balance Sheet under U.S. GAAP ⁽²⁾	122.6	—	14.5	0.4	66.3	41.4
Total	\$ 1,510.7	\$ 299.5	\$ 82.9	\$ 58.9	\$ 1,028.0	\$ 41.4

- ⁽¹⁾ As of December 31, 2020, we have entered into purchase commitments for certain inventory components and other equipment and services used in our normal operations. The majority of these purchase commitments covered by these arrangements are for periods less than one year and aggregate to approximately \$268.2 million.
- ⁽²⁾ The majority of this balance relates to deferred tax liabilities.

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 forward exchange contracts and an interest rate hedge to manage certain foreign currency and interest rate exposures.

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 enter 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 2019 Incremental Term Loan Facility, as described above.

Swap	Trade Date	Effective Date	Maturity	Fixed Rate	Notional Amount at Effective Date	Year Ended	Years Ended December	
						December 31, 2020	31, 2020	2019
						Notional Amount	Fair Value Asset (Liability)	Fair Value Asset (Liability)
1	September 29, 2016	September 30, 2016	September 30, 2020	1.198%	\$ 335.0	\$ —	\$ —	\$ 0.8
2	April 3, 2019	April 5, 2019	March 31, 2023	2.309%	\$ 300.0	\$ 300.0	(12.4)	(6.5)
3	October 29, 2020	October 26, 2021	February 28, 2025	0.485%	\$ 200.0	\$ —	(0.7)	-
4	October 29, 2020	March 31, 2022	February 28, 2025	0.623%	\$ 100.0	\$ —	(0.9)	-
						Total	\$ (14.0)	\$ (5.7)

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.

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 forward exchange 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 forward exchange contracts with notional amounts totaling \$176.2 million outstanding at December 31, 2020 of which \$62.2 million was outstanding to exchange South Korean won to U.S. dollars and \$61.5 million was outstanding to exchange Japanese yen to U.S. dollars. We had forward exchange contracts with notional amounts totaling \$154.7 million outstanding at December 31, 2019 of which \$51.7 million was outstanding to exchange South Korean won to U.S. dollars and \$45.9 million was outstanding to exchange Japanese yen to U.S. dollars.

As of December 31, 2020, 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 2020 and 2019, and totaled a gain of \$1.7 and \$5.7 million, respectively. There were no ineffective portions of the derivatives recorded in 2020 and 2019.

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 losses on these derivatives were immaterial in each of 2020 and 2019. 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.

Off-Balance Sheet Arrangements

We do not have any financial partnerships with unconsolidated entities, such as entities often referred to as structured finance, special purpose entities or variable interest entities, which are often established for the purpose of facilitating off-balance sheet arrangements or for other contractually narrow or limited purposes. Accordingly, we have no off-balance sheet arrangements that have or are reasonably expected to have a current or future effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, capital expenditures or capital resources that are material to investors.

Recently Issued Accounting Pronouncements

In March 2020, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 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 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). We are in the process of evaluating the requirements of these standards and have not yet determined the impact of adoption on our consolidated financial statements.

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 beginning after December 15, 2021, including interim periods within those fiscal years beginning after December 15, 2022. We evaluated the requirements of this ASU and the impact of pending adoption on our consolidated financial statements. We do not expect that the impact of these changes will be material to our financial position, results of operations and cash flows.

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 \$176.2 million outstanding and a net fair value liability of \$6.5 million at December 31, 2020. We had forward exchange contracts with notional amounts totaling \$154.7 million outstanding and a net fair value liability of \$0.2 million at December 31, 2019. The potential fair value loss for a hypothetical 10% adverse change in the currency exchange rate on our forward exchange contracts at December 31, 2020 and 2019 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 the 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 2019 Incremental 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, 2020, we owed \$833.4 million, with \$533.4 million at a variable interest rate of 1.75% plus LIBOR, and \$300.0 million at a fixed interest rate of 2.309%, plus the applicable credit spread, which was 1.75% at December 31, 2020. We performed a sensitivity analysis on the outstanding portion of our debt obligations as of December 31, 2020. Should the current average interest rate increase or decrease by 10%, the resulting annual increase or decrease to interest expense at December 31, 2020 would be immaterial.

From time to time, we have outstanding lines of credit and short-term borrowings with variable interest rates, primarily denominated in Japanese yen. As of December 31, 2020, \$5.5 million was outstanding under these arrangements. These lines of credit have a base interest rate of 1.25% plus a Japanese yen overnight LIBOR rate. A 10% change in interest rates would be immaterial to our operating results.

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, 2020 and 2019, 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, 2020, including the related notes and schedule of valuation and qualifying accounts for each of the three years in the period ended December 31, 2020 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, 2020, 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, 2020 and 2019, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2020 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, 2020, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note 3 to the consolidated financial statements, the Company changed the manner in which it accounts for leasing arrangements in 2019.

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.

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) relates 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.

Goodwill - Quantitative Impairment Assessment - Equipment & Solutions Reporting Unit

As described in Notes 3, 13, and 21 to the consolidated financial statements, the Company's consolidated goodwill balance was \$1,066.4 million as of December 31, 2020, and the goodwill balance for the Equipment & Solutions reportable segment was \$474.9 million, which constitutes the goodwill of the Equipment & Solutions reporting unit. Management 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. In the quantitative assessment, management 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. The estimated fair value of the Company's reporting units are based on discounted cash flow models. Determining fair value requires the exercise of significant judgment, including judgments about discount and terminal growth rates, as well as forecasted revenue, gross profit and operating margins.

The principal considerations for our determination that performing procedures relating to the quantitative goodwill impairment assessment of the Equipment & Solutions reporting unit is a critical audit matter are the significant judgment by management when determining the fair value of the reporting unit, which in turn led to a high degree of auditor judgment, subjectivity, and effort in performing procedures and evaluating audit evidence relating to management's significant assumptions related to the discount and terminal growth rates and forecasted revenue, gross profit and operating margins. 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 management's goodwill impairment assessment, including controls over the significant assumptions used in the valuation of the Equipment & Solutions reporting unit related to the discount and terminal growth rates and forecasted revenue, gross profit and operating margins. These procedures also included, among others, (i) testing management's process for developing the fair value of the reporting unit; (ii) evaluating the appropriateness of the discounted cash flow model; (iii) testing the completeness and accuracy of underlying data used in the model; and (iv) evaluating the reasonableness of management's significant assumptions related to the discount and terminal growth rates and forecasted revenue, gross profit and operating margins. Evaluating management's assumptions related to the forecasted revenue, gross profit and operating margins involved evaluating whether the assumptions used by management were reasonable considering the current and past performance of the reporting unit and industry data. Professionals with specialized skill and knowledge were used to assist in the evaluation of the Company's discounted cash flow model and the reasonableness of the discount and terminal growth rates.

/s/ PricewaterhouseCoopers LLP
Boston, Massachusetts
February 23, 2021

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

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

	December 31,	
	2020	2019
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 608.3	\$ 414.6
Short-term investments	227.7	109.4
Trade accounts receivable, net of allowance for doubtful accounts of \$2.0 and \$1.8 at December 31, 2020 and 2019, respectively	392.7	341.1
Inventories	501.4	462.1
Other current assets	74.3	106.3
Total current assets	1,804.4	1,433.5
Property, plant and equipment, net	284.3	241.9
Right-of-use assets	184.4	64.5
Goodwill	1,066.4	1,058.5
Intangible assets, net	512.2	564.6
Long-term investments	6.5	5.8
Other assets	45.6	47.5
Total assets	\$ 3,903.8	\$ 3,416.3
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Short-term debt	\$ 14.5	\$ 12.1
Accounts payable	110.6	88.4
Accrued compensation	117.9	100.9
Income taxes payable	18.3	15.4
Lease liability	15.8	20.6
Deferred revenue and customer advances	31.2	21.5
Other current liabilities	65.6	58.8
Total current liabilities	373.9	317.7
Long-term debt, net	815.0	871.7
Non-current deferred taxes	59.2	72.4
Non-current accrued compensation	49.5	43.9
Non-current lease liability	187.4	44.8
Other non-current liabilities	57.9	42.5
Total liabilities	1,542.9	1,393.0
Commitments and contingencies (Note 23)		
Stockholders' equity:		
Preferred stock, \$0.01 par value, 2,000,000 shares authorized; none issued and outstanding	—	—
Common stock, no par value, 200,000,000 shares authorized; 55,196,501 and 54,596,183 shares issued and outstanding at December 31, 2020 and 2019, respectively	0.1	0.1
Additional paid-in capital	873.2	864.3
Retained earnings	1,487.3	1,181.2
Accumulated other comprehensive income (loss)	0.3	(22.3)
Total stockholders' equity	2,360.9	2,023.3
Total liabilities and stockholders' equity	\$ 3,903.8	\$ 3,416.3

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,		
	2020	2019	2018
Net Revenues:			
Products	\$ 2,014.8	\$ 1,611.3	\$ 1,835.2
Services	315.2	288.5	239.9
Total net revenues	2,330.0	1,899.8	2,075.1
Cost of revenues:			
Products	1,106.4	913.5	969.3
Services	174.1	155.9	126.3
Total cost of revenues (exclusive of amortization shown separately below)	1,280.5	1,069.4	1,095.6
Gross profit	1,049.5	830.4	979.5
Research and development	173.1	164.1	135.7
Selling, general and administrative	353.1	330.3	298.1
Acquisition and integration costs	3.8	37.3	3.1
Restructuring and other	9.4	7.0	4.6
Amortization of intangible assets	55.2	67.4	43.5
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	0.4
Gain on sale of long-lived assets	—	(6.8)	—
Income from operations	453.8	219.8	494.1
Interest income	1.4	5.4	5.8
Interest expense	29.1	44.1	16.9
Other expense, net	3.1	3.3	2.0
Income before income taxes	423.0	177.8	481.0
Provision for income taxes	72.9	37.4	88.1
Net income	\$ 350.1	\$ 140.4	\$ 392.9
Other comprehensive income, net of tax:			
Changes in value of financial instruments designated as cash flow hedges	\$ (10.6)	\$ (10.0)	\$ 4.9
Foreign currency translation adjustments	34.7	(6.2)	(14.2)
Unrecognized pension (loss) gain	(1.7)	(0.5)	0.2
Unrealized gain on investments	0.2	—	—
Total comprehensive income	\$ 372.7	\$ 123.7	\$ 383.8
Net income per share:			
Basic	\$ 6.36	\$ 2.57	\$ 7.22
Diluted	\$ 6.33	\$ 2.55	\$ 7.14
Weighted average common shares outstanding:			
Basic	55.1	54.7	54.4
Diluted	55.3	55.1	55.0

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

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

	Common Stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income/(Loss)	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2017	54,355,535	\$ 0.1	\$ 789.6	\$ 795.7	\$ 3.5	\$ 1,588.9
Net issuance under stock-based plans	502,150		(11.1)			(11.1)
Stock-based compensation			27.3			27.3
Stock repurchase	(818,131)		(11.9)	(63.1)		(75.0)
Cash dividend (\$0.78 per common share)				(42.4)		(42.4)
Accounting Standards Codification Topic 606 adjustment				1.7		1.7
Comprehensive income (net of tax):						
Net income				392.9		392.9
Other comprehensive loss					(9.1)	(9.1)
Balance at December 31, 2018	54,039,554	0.1	793.9	1,084.8	(5.6)	1,873.2
Net issuance under stock-based plans	556,629		(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	54,596,183	0.1	864.3	1,181.2	(22.3)	2,023.3
Net issuance under stock-based plans	600,318		(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	55,196,501	\$ 0.1	\$ 873.2	\$ 1,487.3	\$ 0.3	\$ 2,360.9

⁽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 12.

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,		
	2020	2019	2018
Cash flows from operating activities:			
Net income	\$ 350.1	\$ 140.4	\$ 392.9
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	99.2	110.0	79.8
Amortization of inventory step-up adjustment to fair value	—	7.6	—
Amortization of debt issuance costs and original issue discount	2.7	7.1	4.7
Stock-based compensation	29.5	49.2	27.3
Provision for excess and obsolete inventory	24.8	24.7	22.3
Provision for doubtful accounts	0.1	(0.7)	1.4
Deferred income taxes	(7.1)	(4.2)	(19.4)
Gain on sale of long-lived asset	—	(6.8)	—
Asset impairment	2.3	4.7	—
Other	0.6	0.9	2.6
Changes in operating assets and liabilities, net of business acquired:			
Trade accounts receivable	(44.8)	(0.1)	(0.5)
Inventories	(52.2)	(29.3)	(73.8)
Income taxes payable	21.6	(12.4)	(11.4)
Other current and non-current assets	40.9	(9.8)	(1.6)
Current and non-current accrued compensation	19.4	(4.2)	(8.6)
Other current and non-current liabilities	5.1	(8.4)	(3.9)
Accounts payable	21.0	(24.2)	2.0
Net cash provided by operating activities	513.2	244.5	413.8
Cash flows (used in) provided by investing activities:			
Acquisition of business, net of cash acquired	—	(988.6)	—
Purchases of investments	(522.4)	(246.3)	(253.6)
Maturities of investments	332.4	142.6	181.7
Sales of investments	72.5	166.9	207.5
Proceeds from sale of assets	—	42.1	—
Purchases of property, plant and equipment	(84.9)	(63.9)	(62.9)
Net cash (used in) provided by investing activities	(202.4)	(947.2)	72.7
Cash flows (used in) provided by financing activities:			
Net proceeds from short and long-term borrowings	27.0	642.2	67.7
Payments of short-term borrowings	(24.7)	(5.4)	(67.2)
Payments of long-term borrowings	(59.1)	(106.1)	(50.0)
Repurchases of common stock	—	—	(75.0)
Net payments related to employee stock awards	(20.7)	(11.0)	(11.1)
Dividend payments	(44.0)	(43.5)	(42.4)
Net cash (used in) provided by financing activities	(121.5)	476.2	(178.0)
Effect of exchange rate changes on cash and cash equivalents	4.4	(3.2)	1.9
Increase (decrease) in cash and cash equivalents	193.7	(229.7)	310.4
Cash and cash equivalents at beginning of period	414.6	644.3	333.9
Cash and cash equivalents at end of period	\$ 608.3	\$ 414.6	\$ 644.3
Supplemental disclosure of cash flow information:			
Cash paid during the period for:			
Interest	\$ 26.3	\$ 39.9	\$ 14.6
Income taxes	\$ 65.6	\$ 35.5	\$ 91.8

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

MKS INSTRUMENTS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in millions, except share and 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, 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.

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 on-going basis, management evaluates its estimates and judgments, including those related to revenue recognition and allowance for doubtful accounts, inventory valuation, warranty costs, stock-based compensation, intangible assets, goodwill, other long-lived assets, in process research and development and other acquisition expenses 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

Leases

The Company adopted Accounting Standards Update (“ASU”) 2016-02, “Leases,” on January 1, 2019 and used the effective date as its date of initial application. As such, the Company did not adjust prior period amounts. The Company also elected to adopt the package of practical expedients upon transition, which permits companies to not reassess lease identification, classification, and initial direct costs for leases that commenced prior to the effective date. The Company implemented internal controls and a lease accounting information system to enable preparation on adoption. Upon adoption, the Company recorded a cumulative effect of initially applying this new standard, resulting in the addition of \$71.0 of right-of-use assets and \$20.2 and \$54.1 of short-term and long-term lease liabilities, respectively. The right-of-use asset is net of the deferred rent liability, prepaid rent and a net favorable lease asset which were re-classified to the right-of-use asset upon adoption of the standard.

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.

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

The Company has existing leases that include variable lease and non-lease components that are not included in the right-of-use asset and lease liability and are reflected as expenses in the periods incurred. Such payments primarily include common area maintenance charges and increases in rent payments that are driven by factors such as future changes in an index (e.g., the Consumer Price Index).

The Company has lease arrangements with lease and non-lease components, has elected to account for the lease and non-lease components as a single lease component, and has allocated all of the contract consideration to the lease component only. The Company has existing net leases in which the non-lease components (e.g. common area maintenance, maintenance and consumables) are paid separately from rent based on actual costs incurred. Therefore, non-lease components are not included in the right-of-use asset and lease liability and are reflected as expenses in the periods incurred.

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 under ASC 606 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 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 2020 or 2019.

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. The time between invoicing and when payment is due is not significant. 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, 2020 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 warranty obligations. 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

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

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 2020, 2019 and 2018.

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, especially its laser 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, 2020 and 2019, as the majority have a duration of less than one year.

Costs to Obtain and Fulfill a Contract

Under ASC 606, 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 revenue, excluding revenue from certain custom products, is recorded at a point in time, while the majority of service revenue 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.

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 2020, 2019 and 2018.

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 employees the opportunity to purchase shares through an employee stock purchase plan. For shares issued under its employee stock purchase plan, the Company has estimated the fair value on the date of grant using the Black-Scholes pricing model, which is affected by the Company's stock price as well as assumptions regarding a number of complex and subjective variables. These variables include the Company's expected stock price volatility over the term of the awards, expected life, risk-free interest rate and expected dividends.

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

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.

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 RSUs and stock appreciation rights ("SARs") 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 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.

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

During 2020, 2019 and 2018, approximately 59%, 49% and 55% of the Company's net revenues, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers. One customer represented 10% or more of the Company's accounts receivable balance as of December 31, 2020. No customers represented 10% or more of the Company's accounts receivable balance as of December 31, 2019.

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 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 three to eighteen years for machinery and equipment, furniture and fixtures and office equipment, which includes enterprise resource planning 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 judgment 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, covenants not to compete 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.

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

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 are 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. 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.

Effective January 1, 2019, 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.

As of October 31, 2020, the Company performed its annual impairment assessment of goodwill by performing a quantitative impairment analysis of its Equipment & Solutions reporting unit and a qualitative analysis for all other reporting units and determined that it is more likely than not that the fair values of the reporting units exceed their carrying amount. For the quantitative assessment for the Equipment & Solutions reporting unit, the Company estimated that the fair value exceeded its carrying value by 10%.

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

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

translated at the average exchange rates prevailing during the year. The resulting translation adjustments are included in accumulated other comprehensive income (loss) 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 \$3.5, \$3.6 and \$2.5 for the years ended December 31, 2020, 2019 and 2018, 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 "Derivatives" 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 the mortality lives of participants. 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.

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 carry-forwards. 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 generally 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 March 2020, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 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,

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

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 is in the process of evaluating the requirements of these standards and has not yet determined the impact of adoption on its consolidated financial statements.

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 beginning after December 15, 2021, including interim periods within those fiscal years beginning after December 15, 2022. The Company evaluated the requirements of this ASU and the impact of pending adoption on the Company’s consolidated financial statements. The Company does not expect that the impact of this ASU will be material to its financial position, results of operations and cash flows.

In August 2018, the FASB issued ASU 2018-15, “Intangibles—Goodwill and Other—Internal-Use Software (Subtopic 350-40): Customer’s Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement that is a Service Contract.” This standard aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The accounting for the service element of a hosting arrangement that is a service contract is not affected by the amendments to this update. This standard is effective for annual periods beginning after December 15, 2019, including interim periods within those fiscal years. The Company adopted this ASU during the first quarter of 2020 and the adoption of this ASU did not have a material impact on its financial position, results of operations and cash flows.

In June 2016, the FASB issued ASU 2016-13, “Financial Instruments—Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments.” This standard introduced the expected credit losses methodology for the measurement of credit losses on financial assets that are not measured at fair value through net income and replaces the former “incurred loss” model with an “expected credit loss” model that requires consideration of a broader range of information to estimate expected credit losses over the lifetime of the asset. There have been several subsequent amendments to this standard. This standard is effective for annual periods beginning after December 15, 2019, including interim periods within those fiscal years. The Company adopted this ASU during the first quarter of 2020 and the adoption of this ASU did not have a material impact on its financial position, results of operations and cash flows.

5) 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.

Some of the Company’s real estate lease agreements include Company options to either extend and/or terminate the lease. The cost of these options is included in the Company’s right-of-use assets and lease liabilities to the extent that such options are reasonably certain of being exercised. Leases with renewal options allow the Company to extend the lease term typically between 1 to 10 years. When determining the lease term, renewal options reasonably certain of being exercised are included in the lease term. When determining if a renewal option is reasonably certain of being exercised, the Company considers several economic factors, including but not limited to, the significance of leasehold improvements made to the property, whether the physical space is difficult to replace, underlying contractual obligations, and specific characteristics unique to the particular lease that would make it reasonably certain that the Company would exercise such an option.

During the twelve months ended December 31, 2020, the Company recorded \$151.5 of additional right-of-use assets of which \$133.6 related to three new leases that commenced during the period and three existing leases that were extended during the period.

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

The Company has existing leases that include variable lease and non-lease components that are not included in the right-of-use asset and lease liability and are reflected as expenses in the periods incurred. Such payments primarily include common area maintenance charges and increases in rent payments that are driven by factors such as future changes in an index (e.g., the Consumer Price Index).

The elements of lease expense were as follows:

	Years Ended December 31,	
	2020	2019
Lease cost:		
Operating lease ⁽¹⁾	\$ 29.2	\$ 23.2
Short-term lease	4.9	4.3
Total lease cost	<u>\$ 34.1</u>	<u>\$ 27.5</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 15 years, respectively, as of December 31, 2020. The weighted average discount rate and the weighted average remaining lease term were 3.8% and 4.9 years, respectively, as of December 31, 2019. Operating cash flows used for operating leases for the twelve months ended December 31, 2020 and 2019 were \$13.0 and \$23.4, respectively. Operating cash flows used for operating leases for the twelve months ended December 31, 2020 was net of \$10.3 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, 2020 are detailed as follows:

Year Ending December 31,	Amount
2021	\$ 21.6
2022	20.4
2023	18.3
2024	17.4
2025	16.6
Thereafter	161.7
Total lease payments	<u>256.0</u>
Less: imputed interest	52.8
Total operating lease liabilities	<u>\$ 203.2</u>

The 2021 payment amount of \$21.6 is net of tenant improvement allowances of \$6.7. Amounts presented above do not include payments relating to immaterial leases excluded from the balance sheet as well as operating leases with terms of less than twelve months.

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

6) Revenue from Contracts with Customers

Contract assets as of December 31, 2020 and 2019 were \$3.7 and \$3.5, respectively, and included in other current assets.

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

	2020	2019
Beginning balance, January 1 ⁽¹⁾	\$ 24.8	\$ 17.5
Deferred revenue and customer advances assumed in ESI Merger	—	4.6
Additions to deferred revenue and customer advances	107.4	77.7
Amount of deferred revenue and customer advances recognized in income	(95.5)	(75.0)
Ending balance, December 31 ⁽²⁾	<u>\$ 36.7</u>	<u>\$ 24.8</u>

(1) 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, 2020 included \$18.3 of current deferred revenue, \$5.6 of long-term deferred revenue and \$12.8 of current customer advances.

Disaggregation of Revenue

The following table summarizes revenue from contracts with customers:

	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	<u>\$ 1,405.9</u>	<u>\$ 689.6</u>	<u>\$ 234.5</u>	<u>\$ 2,330.0</u>

	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	<u>\$ 990.5</u>	<u>\$ 725.6</u>	<u>\$ 183.7</u>	<u>\$ 1,899.8</u>

	Year Ended December 31, 2018			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	\$ 1,080.3	\$ 754.9	\$ —	\$ 1,835.2
Services	180.5	59.4	—	239.9
Total net revenues	<u>\$ 1,260.8</u>	<u>\$ 814.3</u>	<u>\$ —</u>	<u>\$ 2,075.1</u>

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

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

7) Investments

Investments classified as short-term consist of the following:

	Years Ended December 31,	
	2020	2019
Available-for-sale investments:		
Time deposits and certificates of deposit	\$ 0.7	\$ 13.1
Bankers' acceptance drafts	3.8	4.0
Commercial paper	—	61.2
U.S. treasury obligations	223.2	5.0
U.S. agency obligations	—	26.1
	<u>\$ 227.7</u>	<u>\$ 109.4</u>

Investments classified as long-term consist of the following:

	Years Ended December 31,	
	2020	2019
Available-for-sale investments:		
Group insurance contracts	\$ 6.5	\$ 5.8

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

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

As of December 31, 2019:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Short-term investments:				
Available-for-sale investments:				
Time deposits and certificates of deposit	\$ 13.1	\$ —	\$ —	\$ 13.1
Bankers' acceptance drafts	4.0	—	—	4.0
Commercial paper	61.5	—	(0.3)	61.2
U.S. treasury obligations	5.0	—	—	5.0
U.S. agency obligations	26.1	—	—	26.1
	<u>\$ 109.7</u>	<u>\$ —</u>	<u>\$ (0.3)</u>	<u>\$ 109.4</u>

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

As of December 31, 2019:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	\$ 5.2	\$ 0.6	\$ —	\$ 5.8

The tables above, which show the gross unrealized gains and (losses) aggregated by investment category for available-for-sale investments as of December 31, 2020 and 2019, 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.

The Company reviews and evaluates its investments for any indication of possible impairment.

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 2020, 2019 and 2018.

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 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.

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

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 ⁽¹⁾	\$ 63.7	\$ —	\$ 63.7	—
Short-term investments	227.7	—	227.7	—
Other current assets	—	—	—	—
Total current assets	\$ 291.4	—	\$ 291.4	—
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	—

⁽¹⁾ The cash and cash equivalent amounts presented in the table above does not include cash of \$544.6 as of December 31, 2020.

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

Assets and liabilities of the Company measured at fair value on a recurring basis as of December 31, 2019, are summarized as follows:

Description	December 31, 2019	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	\$ 0.6	\$ 0.6	\$ —	\$ —
Time deposits and certificates of deposit	2.2	—	2.2	—
Commercial paper	42.6	—	42.6	—
U.S. treasury obligations	2.7	—	2.7	—
U.S. agency obligations	17.1	—	17.1	—
Available-for-sale securities:				
Time deposits and certificates of deposit	13.1	—	13.1	—
Bankers' acceptance drafts	4.0	—	4.0	—
Commercial paper	61.2	—	61.2	—
U.S. treasury obligations	5.0	—	5.0	—
U.S. agency obligations	26.1	—	26.1	—
Group insurance contracts	5.8	—	5.8	—
Derivatives – forward exchange contracts	1.1	—	1.1	—
Derivatives – interest rate hedge - current	0.8	—	0.8	—
Funds in investments and other assets:				
Israeli pension assets	16.7	—	16.7	—
Deferred compensation plan assets:				
Mutual funds and exchange traded funds	2.0	—	2.0	—
Money market securities	0.5	—	0.5	—
Total assets	\$ 201.5	\$ 0.6	\$ 200.9	\$ —
Liabilities:				
Derivatives – forward exchange contracts	\$ 0.3	\$ —	\$ 0.3	\$ —
Derivatives – interest rate hedge – non-current	6.5	—	6.5	—
Total liabilities	\$ 6.8	\$ —	\$ 6.8	\$ —
Reported as follows:				
Assets:				
Cash and cash equivalents ⁽¹⁾	\$ 65.2	\$ 0.6	\$ 64.6	\$ —
Short-term investments	109.4	—	109.4	—
Other current assets	1.9	—	1.9	—
Total current assets	\$ 176.5	\$ 0.6	\$ 175.9	\$ —
Long-term investments	\$ 5.8	\$ —	\$ 5.8	\$ —
Other assets	19.2	—	19.2	—
Total long-term assets	\$ 25.0	\$ —	\$ 25.0	\$ —
Liabilities:				
Other current liabilities	\$ 0.3	\$ —	\$ 0.3	\$ —
Other liabilities	\$ 6.5	\$ —	\$ 6.5	\$ —

⁽¹⁾ The cash and cash equivalent amounts presented in the table above do not include cash of \$349.4 as of December 31, 2019.

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

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

As of December 31, 2020 and 2019, available-for-sale investments consisted of time deposits and drafts denominated in the Euro currency, certificates of deposit, bankers' acceptance drafts, commercial paper, U.S. treasury obligations, U.S. agency obligations and group insurance contracts.

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.

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 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 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, 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.

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

As of December 31, 2020 and 2019, the Company had outstanding foreign exchange forward contracts with gross notional values of \$176.2 and \$154.7, respectively. The following tables provide a summary of the primary net hedging positions and corresponding fair values held as of December 31, 2020 and December 31, 2019:

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>

Currency Hedged (Buy/Sell)	December 31, 2019	
	Gross Notional Value	Fair Value ⁽¹⁾
U.S. Dollar/Japanese yen	\$ 45.9	\$ —
U.S. Dollar/South Korean won	51.7	0.2
U.S. Dollar/Euro	15.7	0.2
U.S. Dollar/U.K. pound sterling	8.3	(0.2)
U.S. Dollar/Taiwan dollar	33.1	(0.4)
Total	<u>\$ 154.7</u>	<u>\$ (0.2)</u>

⁽¹⁾ Represents the (payable) receivable amount included 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 2019 Incremental Term Loan Facility, as 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	Year Ended	Years Ended December	
						December 31,	31,	
						2020	2020	2019
						Notional Amount	Fair Value Asset (Liability)	Fair Value Asset (Liability)
1	September 29, 2016	September 30, 2016	September 30, 2020	1.198%	\$ 335.0	\$ —	\$ —	\$ 0.8
2	April 3, 2019	April 5, 2019	March 31, 2023	2.309%	\$ 300.0	\$ 300.0	(12.4)	(6.5)
3	October 29, 2020	October 26, 2021	February 28, 2025	0.485%	\$ 200.0	\$ —	(0.7)	-
4	October 29, 2020	March 31, 2022	February 28, 2025	0.623%	\$ 100.0	\$ —	(0.9)	-
Total							<u>\$ (14.0)</u>	<u>\$ (5.7)</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 hedges, any ineffectiveness measured in the hedging relationships is recorded immediately in earnings in the period it occurs.

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

The following table provides a summary of the fair value amounts of the Company's derivative instruments:

Derivatives Designated as Hedging Instruments	Years Ended December 31,	
	2020	2019
Derivative asset:		
Forward exchange contracts ⁽¹⁾	\$ —	\$ 1.1
Interest rate hedge ⁽²⁾	—	0.8
Derivative liability:		
Forward exchange contracts ⁽¹⁾	(6.5)	(1.3)
Interest rate hedge ⁽²⁾	(14.0)	(6.5)
Total net derivative liability designated as hedging instruments	\$ (20.5)	\$ (5.9)

- ⁽¹⁾ The derivative asset related to foreign exchange contracts of \$1.1 is classified in other current assets in the condensed consolidated balance sheet as of December 31, 2019. The derivative liabilities related to foreign exchange contracts of \$6.5 and \$1.3 are classified in other current liabilities in the condensed consolidated balance sheet as of December 31, 2020 and 2019, respectively. These 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 balance sheet.
- ⁽²⁾ The interest rate hedge asset of \$0.8 is classified in other current assets in the consolidated balance sheet as of December 31, 2019. The interest rate hedge liabilities of \$14.0 and \$6.5 are classified in other non-current liabilities in the consolidated balance sheet as of December 31, 2020 and 2019, respectively.

The net amount of existing gains as of December 31, 2020 that is expected to be reclassified from OCI into earnings within the next 12 months is immaterial.

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

Derivatives Designated as Cash Flow Hedging Instruments	Years Ended December 31,		
	2020	2019	2018
Forward exchange contracts:			
Net (loss) gain recognized in OCI, net of tax ⁽¹⁾	\$ (10.6)	\$ (10.0)	\$ 4.9
Net gain reclassified from OCI into income ⁽²⁾	\$ 1.7	\$ 5.7	\$ 3.4

- ⁽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 (loss) gain on derivatives not designated as cash flow hedging instruments:

Derivatives Not Designated as Cash Flow Hedging Instruments	Years Ended December 31,		
	2020	2019	2018
Forward exchange contracts:			
Net (loss) gain recognized in income ⁽¹⁾	\$ (1.5)	\$ (1.3)	\$ 0.1

- ⁽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.

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

10) Inventories

Inventories consist of the following:

	Years Ended December 31,	
	2020	2019
Raw material	\$ 321.3	\$ 288.8
Work-in-process	76.7	79.3
Finished goods	103.4	94.0
Total	\$ 501.4	\$ 462.1

Inventory-related excess and obsolete charges of \$24.8, \$24.7 and \$22.3 were recorded in cost of products and services in the years ended December 31, 2020, 2019 and 2018, respectively.

11) Property, Plant and Equipment

Property, plant and equipment consist of the following:

	Years Ended December 31,	
	2020	2019
Land	\$ 12.3	\$ 11.9
Buildings	120.2	113.3
Machinery and equipment	397.8	396.2
Furniture and fixtures, office equipment and software	187.1	186.7
Leasehold improvements	95.4	80.4
Construction in progress	70.6	46.9
	883.4	835.4
Less: accumulated depreciation	599.1	593.5
Total	\$ 284.3	\$ 241.9

Depreciation of property, plant and equipment totaled \$44.0, \$42.6 and \$36.3 for the years ended 2020, 2019 and 2018, respectively.

12) Acquisition

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 aggregate consideration was \$1,032.7, which excludes related transaction fees and expenses, and non-cash consideration related to the exchange of share-based awards of \$30.6, for a total purchase consideration of \$1,063.3. 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 2019 Incremental 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 technology and proprietary control software to efficiently process the materials and components that are an integral part of electronic devices and systems.

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

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	\$ 1,019.2

⁽¹⁾ Represents cash paid of \$30.00 per share for approximately 34,422,361 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 estimated 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	\$ 1,019.2

The fair value write-up of acquired finished goods inventory was \$7.6, the amount of which will be expensed over the period during which the acquired inventory is 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 is 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.

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

The following table reflects the allocation of the acquired intangible assets and related estimate of 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
	\$ 316.2	

The fair value of the acquired intangibles was determined using the income approach. In performing these valuations, the key underlying assumptions of the discounted cash flows were projected revenues, gross margin expectations and operating cost estimates. 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 (see Note 21).

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)

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

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 each year. In addition, the unaudited pro forma financial information does not attempt to project the future results of operations of the combined Company.

	Years Ended December 31,	
	2019	2018
Total net revenues	\$ 1,914.6	\$ 2,445.7
Net income	\$ 171.5	\$ 424.8
Net income per share:		
Basic	\$ 3.14	\$ 7.81
Diluted	\$ 3.11	\$ 7.72

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 Company's 2019 Incremental Term Loan Facility, as defined in Note 15.
- (4) The exclusion of acquisition costs and inventory step-up amortization for the year ended December 31, 2019 and the addition of these items to the year ended December 31, 2018.
- (5) The exclusion of debt issuance costs due to the modification of the 2019 Incremental Term Loan Facility, as defined in Note 15.
- (6) The estimated tax impact of the above adjustments.

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. If the products obtained in an acquisition are assigned to multiple reporting units, the goodwill is distributed to the respective reporting units as part of the purchase price allocation process.

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.

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

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

	2020			2019		
	Gross Carrying Amount	Accumulated Impairment Loss	Net	Gross Carrying Amount	Accumulated Impairment Loss	Net
Beginning balance at January 1	\$ 1,202.8	\$ (144.3)	\$ 1,058.5	\$ 731.3	\$ (144.3)	\$ 587.0
Acquired goodwill ⁽¹⁾	—	—	—	474.0	—	474.0
Impairment of goodwill ⁽²⁾	—	(1.1)	(1.1)	—	—	—
Foreign currency translation	9.0	—	9.0	(2.5)	—	(2.5)
Ending balance at December 31	\$ 1,211.8	\$ (145.4)	\$ 1,066.4	\$ 1,202.8	\$ (144.3)	\$ 1,058.5

⁽¹⁾ During the twelve months ended December 31, 2019, the Company recorded \$474.0 of goodwill related to the ESI Merger.

⁽²⁾ During the twelve months ended December 31, 2020, the Company recorded \$1.1 of goodwill impairment charges related to the pending closure of a facility in Europe.

Intangible Assets

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

As of December 31, 2020	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
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

As of December 31, 2019	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Customer relationships ⁽¹⁾	308.2	(1.4)	(84.2)	(1.4)	221.2
Patents, trademarks, trade names and other ⁽¹⁾	120.9	—	(45.5)	0.2	75.6
	\$ 875.5	\$ (1.5)	\$ (308.0)	\$ (1.4)	\$ 564.6

⁽¹⁾ During the twelve months ended December 31, 2019, the Company recorded \$316.2 of separately identified intangible assets related to the ESI Merger, of which \$274.0 was completed technology, \$25.4 was customer relationships and \$16.8 was trademarks, trade names and backlog.

Aggregate amortization expense related to acquired intangible assets for the years 2020, 2019 and 2018 was \$55.2, \$67.4 and \$43.5, respectively. Aggregate net amortization expense related to acquired intangible assets for future years is:

Year	Amount
2021	\$ 48.2
2022	45.6
2023	45.2
2024	44.3
2025	43.3
Thereafter	\$ 229.7

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

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

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,	
	2020	2019
Beginning balance	\$ 14.9	\$ 10.4
Assumed product warranty liability from ESI Merger	—	7.2
Provision for product warranties	28.3	17.4
Direct and other charges to warranty liability	(24.8)	(20.1)
Ending balance ⁽¹⁾	<u>\$ 18.4</u>	<u>\$ 14.9</u>

⁽¹⁾ Short-term product warranty of \$15.6 and long-term product warranty 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. Short-term product warranty of \$12.1 and long-term product warranty of \$2.8, each as of December 31, 2019, are included within other current liabilities and other non-current liabilities, respectively, within the accompanying consolidated balance sheet.

15) Debt

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 (the “Term Loan Credit Agreement”) with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto (the “Lenders”), that provided a senior secured term loan credit facility in the original principal amount of \$780.0 (the “2016 Term Loan Facility”), subject to increase at the Company’s option and subject to receipt of lender commitments in accordance with the Term Loan Credit Agreement (the 2016 Term Loan Facility, together with the 2019 Incremental Term Loan Facility and 2019 Term Loan Refinancing Facility (each as defined below), the “Term Loan Facility”). Prior to the effectiveness of Amendment No. 6 (as defined below), the 2016 Term Loan Facility had a maturity date of April 29, 2023. As of December 31, 2020, 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 1.75%, plus, in each case, an applicable margin; 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. 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. The 2016 Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

The Company subsequently entered into four separate repricing amendments to the 2016 Term Loan Facility, which decreased the applicable margin for LIBOR borrowings from 4.0% to 1.75%, with a LIBOR rate floor of 0.75%. As a consequence of the pricing of the 2019 Incremental Term Loan Facility (defined below), the applicable margin for the 2016 Term Loan Facility was increased to 2.00% (from 1.75%) with respect to LIBOR borrowings and 1.00% (from 0.75%) with respect to base rate borrowings.

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

The Company incurred \$28.7 of deferred finance fees, original issue discount and repricing fees related to the term loans under the 2016 Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

On February 1, 2019, in connection with the completion of the ESI Merger, the Company entered into an amendment (“Amendment No. 5”) to the Term Loan Credit Agreement. Amendment No. 5 provided an additional tranche B-5 term loan commitment in the original principal amount of \$650.0 (the “2019 Incremental Term Loan Facility”), all of which was drawn down in connection with the closing of the ESI Merger. Pursuant to Amendment No. 5, the Company also effectuated certain amendments to the Term Loan Credit Agreement which make certain of the negative covenants and other provisions less restrictive. Prior to the effectiveness of Amendment No. 6 (as defined below), the 2019 Incremental Term Loan Facility had a maturity date of February 1, 2026 and bore interest at a rate per annum equal to, at the Company’s option, a base rate or LIBOR rate (as described above) plus, in each case, an applicable margin equal to 1.25% with respect to base rate borrowings and 2.25% with respect to LIBOR borrowings. The 2019 Incremental Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

The Company incurred \$11.4 of deferred finance fees and original issue discount fees related to the term loans under the 2019 Incremental Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

On September 27, 2019, the Company entered into an amendment (“Amendment No. 6”) to the Term Loan Credit Agreement. Amendment No. 6 refinanced all existing loans outstanding under the 2016 Term Loan Facility and 2019 Incremental Term Loan Facility (“Existing Term Loans”) for a tranche B-6 term loan commitment in the original principal amount of \$896.8 (“2019 Term Loan Refinancing Facility”). Each lender of the Existing Term Loans that elected to participate in the 2019 Term Loan Refinancing Facility was deemed to have exchanged the aggregate outstanding principal amount of its Existing Term Loans for an equal aggregate principal amount of tranche B-6 term loans under the 2019 Term Loan Refinancing Facility. On the effective date of Amendment No. 6 and immediately prior to the exchanges described above, the Company made a voluntary prepayment of \$50.0, which was applied to the Existing Term Loans on a pro rata basis.

The Company incurred \$2.2 of original issue discount fees related to the term loans under the 2019 Term Loan Refinancing Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

As of December 31, 2020, the remaining balance of deferred finance fees and original issue discount of the Term Loan Facility was \$9.4. A portion of the deferred finance fees and original issue discount have been accelerated in connection with the various debt prepayments and extinguishments between 2016 and 2020.

The 2019 Term Loan Refinancing Facility matures on February 2, 2026, and bears interest at a rate per annum equal to, at the Company’s option, a base rate or LIBOR rate (as described above) plus, in each case, an applicable margin equal to 0.75% with respect to base rate borrowings and 1.75% with respect to LIBOR borrowings. The 2019 Term Loan Refinancing Facility was issued with original issue discount of 0.25% of the principal amount thereof.

The Company is required to make scheduled quarterly payments each equal to 0.25% of the original principal amount of the 2019 Term Loan Refinancing Facility with the balance due on February 2, 2026.

As of December 31, 2020, after total principal prepayments of \$575.0 (which included a \$50.0 prepayment made during 2020) and regularly scheduled principal payments of \$21.6, the total outstanding principal balance of the Term Loan Facility was \$833.4 and the interest rate was 1.9%.

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 collateralized by substantially all of the Company’s assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

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

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, 2020, 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 to manage the exposure to interest rate fluctuations associated with the variable LIBOR interest rate paid on the outstanding balance of the 2019 Incremental Term Loan Facility.

Senior Secured Asset-Based Revolving Credit Facility

On February 1, 2019, in connection with the completion of 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”). On April 26, 2019, the Company entered into a First Amendment to the ABL Credit Agreement, which amended the borrowing base calculation for eligible inventory prior to an initial field examination and appraisal requirements. 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 \$25.0.

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%; 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%. The initial applicable margin for borrowings under the ABL Facility is 0.50% with respect to base rate borrowings and 1.50% with respect to LIBOR borrowings. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, 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, 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 and (b) \$8.5 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 lesser of (i) the commitment amount and (ii) the borrowing base and (B) \$8.5 million 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. The principal amount outstanding under the ABL Facility is due and payable in full on the fifth anniversary of the closing date.

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

All obligations under the ABL Facility are guaranteed by certain of the Company's domestic subsidiaries and are collateralized 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 lesser of (1) the commitment amount and (2) the borrowing base 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 lesser of (1) the commitment amount and (2) the borrowing base 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 (as defined in the ABL Credit Agreement) 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. The Company has not borrowed against the ABL Facility to date.

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, 2020 of up to an equivalent of \$32.5 U.S. dollars. Total borrowings outstanding under these arrangements were \$5.5 and \$3.1 at December 31, 2020 and 2019, respectively.

	December 31, 2020	December 31, 2019
Short-term debt:		
Japanese lines of credit	\$ 5.4	\$ 2.5
Japanese receivables financing facility	0.1	0.6
Term Loan Facility	9.0	9.0
	<u>\$ 14.5</u>	<u>\$ 12.1</u>
	December 31, 2020	December 31, 2019
Long-term debt:		
Other debt	\$ —	\$ 0.1
Term Loan Facility, net ⁽¹⁾	815.0	871.6
	<u>\$ 815.0</u>	<u>\$ 871.7</u>

⁽¹⁾ Net of deferred financing fees, original issuance discount and re-pricing fee in the aggregate of \$9.4 and \$11.8 as of December 31, 2020 and 2019, respectively.

The Company recognized interest expense of \$29.1, \$44.1 and \$16.9 for the twelve months ended December 31, 2020, 2019 and 2018, respectively.

Contractual maturities of the Company's debt obligations as of December 31, 2020 are as follows:

Year	Amount
2021	\$ 14.5
2022	\$ 9.0
2023	\$ 9.0
2024	\$ 9.0
2025	\$ 9.0
Thereafter	\$ 788.4

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

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,		
	2020	2019	2018
U.S. federal income tax statutory rate	21.0%	21.0%	21.0%
Federal tax credits	(1.5)	(2.9)	(0.7)
State income taxes, net of federal benefit	1.1	2.3	1.3
Effect of foreign operations taxed at various rates	(5.0)	(4.4)	(1.3)
Executive compensation	1.1	5.8	—
Gain on intercompany sale of assets	—	2.9	—
Utilization of a capital loss	—	(1.2)	—
Foreign derived intangible income deduction	(1.5)	(3.8)	(2.1)
Global intangible low taxed income, net of foreign tax credits	0.9	2.6	0.4
Transition tax, net of foreign tax credits	—	—	(0.1)
Revaluation of deferred income taxes	—	(1.4)	(0.3)
Revaluation of prepaid taxes	—	—	1.6
Stock-based compensation	(0.7)	(0.3)	(1.3)
Deferred tax asset valuation allowance	0.6	0.1	—
Release of income tax reserves (including interest)	—	(0.8)	(0.4)
Foreign dividends, net of foreign tax credits	0.7	0.6	(1.0)
Other	0.5	0.6	1.2
	<u>17.2%</u>	<u>21.1%</u>	<u>18.3%</u>

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

	Years Ended December 31,		
	2020	2019	2018
Income before income taxes:			
United States	\$ 132.0	\$ 2.3	\$ 287.3
Foreign	291.0	175.5	193.6
	<u>\$ 423.0</u>	<u>\$ 177.8</u>	<u>\$ 480.9</u>
Current taxes:			
United States	\$ 29.2	\$ 6.8	\$ 41.4
State	6.1	2.0	8.1
Foreign	44.7	32.8	58.0
	<u>80.0</u>	<u>41.6</u>	<u>107.5</u>
Deferred taxes:			
United States	(7.9)	(1.7)	(2.5)
State and Foreign	0.8	(2.5)	(16.9)
	<u>(7.1)</u>	<u>(4.2)</u>	<u>(19.4)</u>
Provision for income taxes	<u>\$ 72.9</u>	<u>\$ 37.4</u>	<u>\$ 88.1</u>

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

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

	Years Ended December 31,	
	2020	2019
Deferred tax assets:		
Carry-forward losses and credits	\$ 54.2	\$ 59.2
Inventory and warranty reserves	32.4	29.7
Accrued expenses and other reserves	14.5	12.6
Stock-based compensation	5.1	8.6
Executive supplemental retirement benefits	1.8	1.6
Lease liability	48.7	15.3
Unrealized net loss	4.0	2.7
Other	2.7	2.3
Total deferred tax assets	\$ 163.4	\$ 132.0
Deferred tax liabilities:		
Acquired intangible assets and goodwill	\$ (116.2)	\$ (128.1)
Depreciation and amortization	(14.5)	(14.1)
Loan costs	(1.8)	(2.3)
Right-of-use asset	(46.4)	(14.4)
Foreign withholding taxes	(3.2)	(5.0)
Total deferred tax liabilities	(182.1)	(163.9)
Valuation allowance	(30.6)	(27.4)
Net deferred tax liabilities	\$ (49.3)	\$ (59.3)

As of December 31, 2020, the Company had federal, state and foreign gross research and other tax credit carry-forwards of \$58.9. Included in the total carry-forward are \$13.7 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 carry-forwards of \$97.0. Included in the total carry-forward are \$50.9 of losses that can be carried forward indefinitely while the remaining losses expire at various dates through 2037.

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, 2020 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,		
	2020	2019	2018
Balance at beginning of year	\$ 43.5	\$ 32.7	\$ 27.3
Increases for prior years	1.1	9.3	0.9
Increases for the current year	6.8	3.2	6.1
Reductions related to expiration of statutes of limitations and audit settlements	(4.4)	(1.7)	(1.6)
Balance at end of year	\$ 47.0	\$ 43.5	\$ 32.7

The net increase in gross unrecognized tax benefits was primarily attributable to the addition of a reserve related to executive compensation, partially offset by a release of income tax reserves related to the expiration of the statutes of limitations.

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, 2020, 2019 and 2018, the Company accrued interest on unrecognized tax benefits of approximately \$0.7, \$0.5 and \$0.6, respectively.

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

Over the next 12 months it is reasonably possible that the Company may recognize approximately \$4.3 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 2017 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 carry-forwards and state tax loss and credit carry-forwards that are open to examination for tax years 2000 through the present.

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 2020, the Company increased its valuation allowance by \$3.3, 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. During 2018, the Company increased its valuation allowance by \$4.3, primarily related to certain tax credit and net operating loss carry-forward amounts.

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, 2020. 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 \$1.7 (\$0.03 per share) in 2020 and \$2.2 (\$0.04 per share) in 2019. The tax holiday in Singapore expires in June 2021.

17) Stock-Based Compensation

Employee Stock Purchase Plans

The 2014 Employee Stock Purchase Plan ("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 2,500,000 shares of common stock to participating employees. Offerings under the 2014 ESPP commence on June 1 and December 1 and terminate, respectively, on November 30 and May 31. 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. During 2020, 2019 and 2018, the Company issued 102,719, 126,407, and 105,672 shares, respectively, of common stock to employees who participated in the 2014 ESPP at exercise prices of \$95.07 and \$93.77 per share in 2020, \$64.31 and \$63.78 per share in 2019, and \$84.11 and \$70.61 per share in 2018. As of, December 31, 2020 there were 1,697,604 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 18,000,000 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,

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

restricted stock, 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, 2020, there were 12,690,974 shares reserved for future issuance under the 2014 Plan.

Time-based RSUs granted to employees in 2020, 2019 and 2018 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 2020 were based on the Company’s achievement of non-GAAP EBITDA for 2020, 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 and 2018 were based on the Company’s achievement of non-GAAP cash flows from operations for the relevant year, 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. 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.

In connection with the completion of the Newport Merger, the Company assumed:

- all RSUs granted under any Newport equity plan that were outstanding immediately prior to the effective time of the Newport Merger, and as to which shares of Newport common stock were not fully distributed in connection with the closing of the Newport Merger (the “Newport RSUs”), and
- all SARs granted under any Newport equity plan, whether vested or unvested, that were outstanding immediately prior to the effective time of the Newport Merger (the “Newport SARs”).

As of the effective time of the Newport Merger, based on a formula provided in the merger agreement, (a) the Newport RSUs were converted automatically into RSUs with respect to 360,674 shares of the Company’s common stock (the “Newport Assumed RSUs”), and (b) the Newport SARs were converted automatically into SARs with respect to 899,851 shares of the Company’s common stock (the “Newport Assumed SARs”).

Included in the total number of Newport Assumed RSUs were 36,599 RSUs for outside directors that were part of the Newport Deferred Compensation Plan (the “Newport DC Plan”), from which 5,561 shares were released in May 2018, 967 shares were released in May 2019 and 976 shares were released in May 2020. As of December 31, 2020, 4,875 Company RSUs remained outstanding under the Newport DC Plan, and an additional 35 shares of the Company’s common stock were added to the Newport DC Plan due to reinvested dividends. As of December 31, 2019, 5,794 Company RSUs remained outstanding under the Newport DC Plan, and an additional 57 shares of the Company’s common stock were added to the Newport DC Plan due to reinvested dividends. These Newport Assumed RSUs will not become issued shares until their respective release dates.

The shares of the Company’s common stock that are subject to the Newport Assumed SARs and the Newport Assumed RSUs are issuable pursuant to the 2014 Plan.

The 1,260,525 shares of the Company’s common stock were issuable pursuant to the Newport Assumed RSUs and the Newport Assumed SARs under the 2014 Plan were registered under the Securities Act of 1933, as amended (“Securities Act”), on a registration statement on Form S-8. These shares did not include the 18,000,000 shares of the Company’s common stock reserved for issuance under the 2014 Plan and previously registered under the Securities Act on a registration statement on Form S-8.

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

In connection with the completion of the ESI Merger, the Company assumed:

- all RSUs that vest based solely on the satisfaction of service conditions, granted under any ESI equity plan, arrangement or agreement (“ESI Plan”) that were outstanding immediately prior to the effective time of the ESI Merger, and as to which shares of ESI common stock were not fully distributed in connection with the closing of the ESI Merger (the “ESI Time-Based RSUs”),
- all RSUs that were granted subject to vesting based on both the achievement of performance goals and the satisfaction of service conditions granted under any ESI Plan that were outstanding immediately prior to the effective time of the ESI Merger (the “ESI Performance-Based RSUs and collectively with the ESI Time-Based RSUs, the “ESI RSUs”), and
- all SARs granted under any ESI Plan, whether vested or unvested, that were outstanding immediately prior to the effective time of the ESI Merger and held by an individual who was a service provider of ESI as of the date on which the effective time of the ESI Merger occurred (the “ESI SARs”).

As of the effective time of the ESI Merger, based on a formula in the merger agreement, (a) such ESI RSUs were converted automatically into RSUs with respect to 736,133 shares of the Company’s common stock (the “ESI Assumed RSUs”), and (b) such ESI SARs were converted automatically into SARs with respect to 12,787 shares of the Company’s common stock (the “ESI Assumed SARs”).

Included in the total number of ESI Assumed RSUs are 326,283 shares of the Company’s common stock for employees and outside directors that are part of the ESI Deferred Compensation plan (the “ESI DC Plan”), from which 300,654 shares were released in January 2020. As of December 31, 2020, 31,458 Company RSUs remained outstanding under the ESI DC Plan, and an additional 203 shares of the Company’s common stock were added to the ESI DC Plan due to reinvested dividends. As of December 31, 2019, 327,328 Company RSUs remained outstanding under the ESI DC Plan, and an additional 3,086 shares of the Company’s common stock were added to the ESI DC Plan due to reinvested dividends. These shares will not become issued shares until their respective release dates.

The shares of the Company’s common stock that are subject to the ESI Assumed RSUs and the ESI Assumed SARs are issuable pursuant to the 2014 Plan.

The 748,920 shares of the Company’s common stock were issuable pursuant to the ESI Assumed RSUs and the ESI Assumed SARs under the 2014 Plan were registered under the Securities Act on a registration statement on Form S-8. These shares did not include the 18,000,000 shares of the Company’s common stock reserved for issuance under the 2014 Plan and the 1,260,525 shares of the Company’s common stock that were issuable in connection with the Newport Merger, all of which shares were previously registered under the Securities Act on a registration statement on Form S-8.

The following table presents the activity for RSUs under the 2014 Plan, including the Newport Assumed RSUs and the ESI Assumed RSUs:

	Year Ended December 31, 2020	
	RSUs	Weighted Average Grant Date Fair Value
RSUs — beginning of period	1,102,533	\$ 85.93
Accrued dividend shares	629	\$ 114.35
Granted	309,435	\$ 98.72
Vested	(737,007)	\$ 85.32
Forfeited or expired	(69,504)	\$ 85.71
RSUs — end of period	<u>606,086</u>	<u>\$ 93.26</u>

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

The following table presents the activity for SARs under the 2014 Plan, including the Newport Assumed SARs and the ESI Assumed SARs:

	Year Ended December 31, 2020	
	Outstanding and Exercisable SARs	Weighted Average Base Value
SARs — beginning of period	108,854	\$ 29.05
Exercised	(55,865)	\$ 27.76
Forfeited or expired	(1,400)	\$ 22.39
SARs — end of period	<u>51,589</u>	<u>\$ 30.64</u>

At December 31, 2020, the Company's outstanding and exercisable SARs, the weighted-average base value, the weighted average remaining contractual life and the aggregate intrinsic value thereof, were as follows:

	Number of Shares	Weighted Average Base Value	Weighted Average Remaining Contractual Life (years)	Aggregate Intrinsic Value
SARs outstanding and exercisable	51,589	\$ 30.64	1.0	\$ 6.2

The Company settles employee RSU vesting and SARs exercises with newly issued shares of the Company's common stock.

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,		
	2020	2019	2018
Stock-based compensation expense by type of award:			
RSUs	\$ 27.0	\$ 47.0	\$ 24.9
SARs	—	0.1	0.1
Employee stock purchase plan	2.5	2.1	2.3
Total stock-based compensation	29.5	49.2	27.3
Windfall tax effect on stock-based compensation	(2.2)	(2.2)	(8.3)
Net effect on net income	<u>\$ 27.3</u>	<u>\$ 47.0</u>	<u>\$ 19.0</u>
Effect on net earnings per share:			
Basic	\$ 0.50	\$ 0.86	\$ 0.35
Diluted	<u>\$ 0.49</u>	<u>\$ 0.85</u>	<u>\$ 0.35</u>

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

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,		
	2020	2019	2018
Cost of revenues	\$ 4.2	\$ 2.8	\$ 3.5
Research and development expense	4.0	3.8	2.8
Selling, general and administrative expense	20.4	20.5	21.0
Acquisition and integration related expense	0.9	21.7	—
Restructuring related expense	—	0.4	—
Total pre-tax stock-based compensation expense	<u>\$ 29.5</u>	<u>\$ 49.2</u>	<u>\$ 27.3</u>

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 SARs and 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 2020, 2019 and 2018 was \$23.88, \$16.04, and \$21.74, 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,		
	2020	2019	2018
Expected life (years)	0.5	0.5	0.5
Risk-free interest rate	0.9%	2.4%	1.8%
Expected volatility	45.4%	38.7%	38.6%
Expected annual dividends per share	\$ 0.80	\$ 0.80	\$ 0.76

Expected volatilities for 2020, 2019 and 2018 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 intrinsic value of SARs exercised and the total fair value of RSUs vested during 2020, 2019 and 2018 was approximately \$86.2, \$68.1 and \$61.6, respectively. As of December 31, 2020, the unrecognized compensation cost related to RSUs and SARs was approximately \$31.5 and will be recognized over an estimated weighted average amortization period of 1.0 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.

During 2020 and 2019, there were no repurchases of common stock. During 2018, the Company repurchased approximately 818,000 shares of its common stock for \$75.0 at an average price of \$91.67 per share.

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

The Company has repurchased approximately 2,588,000 shares of common stock for approximately \$127 pursuant to the program since its adoption.

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. In addition, the Company accrues dividend equivalents on the RSUs the Company assumed in the ESI Merger described in Note 17 above when dividends 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 each quarter of 2020, which totaled \$44.0 or \$0.80 per share. The Company's Board of Directors declared a cash dividend of \$0.20 per share during each quarter of 2019, which totaled \$43.5 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 8, 2021, the Company's Board of Directors declared a quarterly cash dividend of \$0.20 per share to be paid on March 5, 2021 to Stockholders of record as of February 22, 2021.

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 \$7.2, \$6.9 and \$6.1 for 2020, 2019 and 2018, respectively.

The Company maintains a bonus plan which provides cash awards to key 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 \$66.4, \$32.2 and \$38.3 for 2020, 2019 and 2018, respectively.

The Company provides supplemental retirement benefits for a number of retired executives. The total cost of these benefits was \$0.3, \$3.2 and \$4.6 for 2020, 2019 and 2018, respectively. The accumulated benefit obligation was \$2.5 and was included in other non-current liabilities at December 31, 2020. The current accumulated benefit obligation was \$21.3 and was included in other current liabilities and the non-current accumulated benefit obligation was \$2.5 and was included in other non-current liabilities at December 31, 2019. The decrease in the accumulated benefit obligation from 2019 to 2020 was attributed to a large supplemental retirement benefit payment made during 2020 to the Company's former Chief Executive Officer in connection with his retirement.

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

Defined Benefit Pension Plans

As a result of the Newport Merger, the Company assumed all assets and liabilities of Newport's defined benefit pension plans, which cover substantially all of its full-time employees in France, Germany, Israel and Japan. In addition, there are 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.

As a result of the ESI Merger, the Company assumed all assets and liabilities of ESI's defined benefit pension plans, which cover substantially all of its full-time employees in Japan, South Korea and Taiwan.

For financial reporting purposes, the calculation of net periodic pension costs was based upon a number of actuarial assumptions including a discount rate for plan obligations, an assumed rate of return on pension plan assets and an assumed

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

rate of compensation increase for employees covered by the plan. All of these assumptions were based upon management's judgment, considering all 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,	
	2020	2019
Service cost	\$ 1.0	\$ 0.8
Interest cost on projected benefit obligations	0.4	0.5
Expected return on plan assets	(0.1)	(0.1)
Amortization of actuarial net loss	0.5	0.1
	<u>\$ 1.8</u>	<u>\$ 1.3</u>

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,	
	2020	2019
Change in projected benefit obligations:		
Projected benefit obligations, beginning of year	\$ 30.1	\$ 24.9
Assumed in ESI Merger	—	3.5
Service cost	1.0	0.8
Interest cost	0.4	0.5
Contributions by plan participants	0.7	—
Plan amendments	(0.2)	—
Actuarial loss	3.0	2.1
Benefits paid	(1.2)	(1.5)
Currency translation adjustments	2.4	(0.2)
Projected benefit obligations, end of year	<u>\$ 36.2</u>	<u>\$ 30.1</u>
Change in plan assets:		
Fair value of plan assets, beginning of year	\$ 11.1	\$ 7.8
Assumed in ESI Merger	—	1.3
Company contributions	1.1	1.8
Gain on plan assets	0.6	0.6
Benefits paid	(0.5)	(0.5)
Currency translation adjustments	0.6	0.1
Fair value of plan assets, end of year	12.9	11.1
Net underfunded status	<u>\$ (23.3)</u>	<u>\$ (19.0)</u>

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

As of December 31, 2020, the estimated benefit payments for the Company's defined benefit plans for the next 10 years were as follows:

	Estimated benefit payments
2021	\$ 0.9
2022	1.1
2023	1.3
2024	1.1
2025	1.3
2026-2030	8.8
	<u>\$ 14.5</u>

The Company expects to contribute \$0.7 to the plans during 2021.

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

	December 31, 2020	December 31, 2019
Discount rate	1.1%	1.4%
Rate of increase in salary levels	2.2%	2.2%
Expected long-term rate of return on assets	1.2%	2.1%

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.

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

	December 31, 2020		December 31, 2019	
	Amount	Percentage	Amount	Percentage
Cash	\$ 0.2	1.3%	\$ 0.4	3.9%
Debt securities	5.2	40.5	8.1	72.3
Equity securities	0.7	5.6	1.5	13.7
Other	6.8	52.6	1.1	10.1
	<u>\$ 12.9</u>	<u>100%</u>	<u>\$ 11.1</u>	<u>100%</u>

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 \$18.8 and vested benefit obligations of \$21.7 as of December 31, 2020 and assets of \$16.7 and vested benefit obligations of \$19.7 as of December 31, 2019. 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, 2020 and 2019, the Company had assets with an aggregate market value of \$6.5 and \$5.8, 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.

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

20) Net Income Per Share

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

Numerator:	Years Ended December 31,		
	2020	2019	2018
Net income	\$ 350.1	\$ 140.4	\$ 392.9
Denominator:			
Shares used in net income per common share – basic	55,095,000	54,711,000	54,406,000
Effect of dilutive securities	255,000	400,000	586,000
Shares used in net income per common share – diluted	55,350,000	55,111,000	54,992,000
Net income per common share:			
Basic	\$ 6.36	\$ 2.57	\$ 7.22
Diluted	\$ 6.33	\$ 2.55	\$ 7.14

Basic earnings per share (“EPS”) is computed by dividing income available to common stockholders 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 and SARs) had been converted to such common shares, and if such assumed conversion is dilutive.

In 2020, 2019 and 2018, the potential dilutive effect of 2,411, 65,664 and 79,500 weighted average shares, respectively, of RSUs, were excluded from the computation of diluted weighted-average shares outstanding, as the shares would have had an anti-dilutive effect on EPS.

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, 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, 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.

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

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,		
	2020	2019	2018
Vacuum & Analysis	\$ 1,405.9	\$ 990.5	\$ 1,260.8
Light & Motion	689.6	725.6	814.3
Equipment & Solutions	234.5	183.7	—
	<u>\$ 2,330.0</u>	<u>\$ 1,899.8</u>	<u>\$ 2,075.1</u>

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

	Years Ended December 31,		
	2020	2019	2018
Gross profit by reportable segment:			
Vacuum & Analysis	\$ 633.7	\$ 426.4	\$ 577.6
Light & Motion	309.8	336.8	401.9
Equipment & Solutions	106.0	67.2	—
Total gross profit by reportable segment	<u>1,049.5</u>	<u>830.4</u>	<u>979.5</u>
Operating expenses:			
Research and development	173.1	164.1	135.7
Selling, general and administrative	353.1	330.3	298.1
Acquisition and integration costs	3.8	37.3	3.1
Restructuring and other	9.4	7.0	4.6
Amortization of intangible assets	55.2	67.4	43.5
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	0.4
Gain on sale of long-lived assets	—	(6.8)	—
Income from operations	<u>453.8</u>	<u>219.8</u>	<u>494.1</u>
Interest income	1.4	5.4	5.8
Interest expense	29.1	44.1	16.9
Other expense, net	3.1	3.3	2.0
Income before income taxes	<u>423.0</u>	<u>177.8</u>	<u>481.0</u>
Provision for income taxes	72.9	37.4	88.1
Net income	<u>\$ 350.1</u>	<u>\$ 140.4</u>	<u>\$ 392.9</u>

The following table set forth capital expenditures by reportable segment for the years ended December 31, 2020, 2019 and 2018:

	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Capital expenditures:				
December 31, 2020:	\$ 36.0	\$ 32.1	\$ 16.8	\$ 84.9
December 31, 2019:	\$ 34.1	\$ 23.0	\$ 6.8	\$ 63.9
December 31, 2018:	\$ 40.1	\$ 22.8	\$ —	\$ 62.9

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

The following table sets forth depreciation and amortization by reportable segment for the years ended December 31, 2020, 2019 and 2018:

Depreciation and amortization:	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
December 31, 2020:	\$ 20.3	\$ 43.2	\$ 35.7	\$ 99.2
December 31, 2019:	\$ 16.8	\$ 53.9	\$ 39.3	\$ 110.0
December 31, 2018:	\$ 20.8	\$ 59.0	\$ —	\$ 79.8

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

The following table sets forth segment assets by reportable segment:

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

	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Corporate, Eliminations and Other	Total
December 31, 2019:					
Segment assets:					
Accounts receivable	\$ 185.9	\$ 147.2	\$ 40.1	\$ (32.1)	\$ 341.1
Inventory	224.8	163.7	73.5	0.1	462.1
Total segment assets	\$ 410.7	\$ 310.9	\$ 113.6	\$ (32.0)	\$ 803.2

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

	Years Ended December 31,	
	2020	2019
Total segment assets	\$ 894.1	\$ 803.2
Cash and cash equivalents and short-term investments	836.0	524.0
Other current assets	74.3	106.3
Property, plant and equipment, net	284.3	241.9
Right-of-use assets	184.4	64.5
Goodwill and intangible assets, net	1,578.6	1,623.1
Other assets and long-term assets	52.1	53.3
Consolidated total assets	\$ 3,903.8	\$ 3,416.3

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

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,		
	2020	2019	2018
Net revenues:			
United States	\$ 1,058.9	\$ 888.4	\$ 1,022.7
South Korea	278.8	167.7	203.6
China	273.5	178.6	127.7
Other Asia	519.6	435.8	477.1
Europe	199.2	229.3	244.0
	<u>\$ 2,330.0</u>	<u>\$ 1,899.8</u>	<u>\$ 2,075.1</u>

	Years Ended December 31,	
	2020	2019
Long-lived assets: ⁽¹⁾		
United States	\$ 364.0	\$ 208.3
Asia	94.8	89.6
Europe	45.1	41.4
	<u>\$ 503.9</u>	<u>\$ 339.3</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 the United States for 2020 reflects right-of-use assets from new leases, mainly at three locations.

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

	Years Ended December 31,	
	2020	2019
Reportable segment:		
Vacuum & Analysis	\$ 196.2	\$ 196.7
Light & Motion	395.3	388.5
Equipment & Solutions	474.9	473.3
Total goodwill	<u>\$ 1,066.4</u>	<u>\$ 1,058.5</u>

Major Customers

The Company had two customers with net revenues greater than 10% of total net revenues at December 31, 2020 and 2018 as shown below. No individual customers accounted for greater than 10% of the Company's net revenues for 2019.

	Years Ended December 31,		
	2020	2019	2018
Lam Research Corporation	13.5%	8.5%	10.8%
Applied Materials, Inc.	10.6%	9.3%	11.7%

22) Restructuring and Other

Restructuring

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.

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

During 2019, the Company recorded restructuring charges of \$5.5, primarily related to costs incurred from the closure of a facility in Europe and also to severance costs related to an organization-wide reduction in workforce, the consolidation of service functions in Asia and the movement of certain products to low cost regions.

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

	2020	2019
Balance at January 1	\$ 3.7	\$ 2.6
Charged to expense	2.7	5.5
Payments and adjustments	(6.1)	(4.4)
Balance at December 31	<u>\$ 0.3</u>	<u>\$ 3.7</u>

Other

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.

During 2019, the Company recorded a charge of \$1.5 related to 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. The Nevada Supreme Court has not yet reached a decision on the appeal.

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

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.

The Company leases certain of its facilities and machinery and equipment under operating leases expiring in various years through 2184. Refer to Note 5 for a schedule of future lease payments under non-cancelable leases as of December 31, 2020.

As of December 31, 2020, 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 \$268.2.

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, 2020.

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, 2020.

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 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.

24) Subsequent Event (amounts not in millions)

On February 4, 2021, we made a proposal to acquire in a cash and stock transaction Coherent, Inc. ("Coherent"), which had previously announced that it had entered into a definitive agreement with Lumentum Holdings, Inc. ("Lumentum") pursuant to which Lumentum would acquire Coherent. Under the terms of our proposal to Coherent, if accepted by Coherent, Coherent shareholders would receive \$115 cash and .7473 of a share of our common stock per share of Coherent common stock. We would expect to fund the potential transaction with cash on hand and debt financing. The execution of a definitive merger agreement between Coherent and us would be subject to approval of each party's board of directors and completion of the transaction would be subject to customary closing conditions, including receipt of required regulatory approvals and approval of our and Coherent's respective stockholders. Completion of the transaction would not be subject to any financing condition. On February 12, 2021, II-VI Incorporated ("II-VI") submitted a separate proposal to acquire Coherent. While Coherent has publicly announced that both our proposal and that of II-VI could lead to a transaction that is superior to its pending transaction with Lumentum, it has not yet determined that either proposal is in fact superior. No assurances can be made that Coherent will accept our proposal.

MKS Instruments, Inc.
Supplemental Financial Data

	Quarter Ended			
	March 31	June 30	Sept. 30	Dec. 31
(Table in millions, except per share data) (Unaudited)				
2020				
Statement of Operations Data				
Net revenues	\$ 535.7	\$ 544.3	\$ 589.8	\$ 660.2
Gross profit	239.6	246.3	262.0	301.6
Income from operations	89.9	100.8	116.4	146.7
Net income	\$ 69.1	\$ 73.7	\$ 91.7	\$ 115.6
Net income per share:				
Basic	\$ 1.26	\$ 1.34	\$ 1.66	\$ 2.10
Diluted	\$ 1.25	\$ 1.33	\$ 1.66	\$ 2.08
Cash dividends paid per common share	\$ 0.20	\$ 0.20	\$ 0.20	\$ 0.20
2019				
Statement of Operations Data				
Net revenues	\$ 463.6	\$ 474.1	\$ 462.5	\$ 499.7
Gross profit	198.1	211.0	205.0	216.3
Income from operations	23.1	63.9	66.8	66.1
Net income	\$ 12.5	\$ 37.7	\$ 47.4	\$ 42.8
Net income per share:				
Basic	\$ 0.23	\$ 0.69	\$ 0.86	\$ 0.78
Diluted	\$ 0.23	\$ 0.69	\$ 0.86	\$ 0.77
Cash dividends paid per common share	\$ 0.20	\$ 0.20	\$ 0.20	\$ 0.20

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, 2020. 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, 2020, 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, 2020. 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, 2020, our internal control over financial reporting was effective.

Our internal controls over financial reporting as of December 31, 2020 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.

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 2021 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 2021 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 2021 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 2021 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 2021 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 2021 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 2021 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:

Report of Independent Registered Public Accounting Firm	56
Consolidated Balance Sheets at December 31, 2020 and 2019	58
Consolidated Statements of Operations and Comprehensive Income for the years ended December 31, 2020, 2019 and 2018.....	59
Consolidated Statements of Stockholders' Equity for the years ended December 31, 2020, 2019 and 2018	60
Consolidated Statements of Cash Flows for the years ended December 31, 2020, 2019 and 2018	61
Notes to Consolidated Financial Statements	62

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
+3.1(1)	Restated Articles of Organization of the Registrant
+3.2(2)	Articles of Amendment to Restated Articles of Organization, as filed with the Secretary of State of Massachusetts on May 18, 2001
+3.3(3)	Articles of Amendment to Restated Articles of Organization, as filed with the Secretary of State of Massachusetts on May 16, 2002
+3.4(4)	Amended and Restated By-Laws of the Registrant
+4.1(5)	Specimen certificate representing the Common Stock
+4.2(5)	Description of Capital Stock Registered Under Section 12 of the Exchange Act
+10.1(6)	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(7)	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
+10.3(8)	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

Exhibit No.	Title
+10.4(9)	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(10)	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(11)	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(12)	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(11)	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
+10.9(13)	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
+10.10(4)*	2014 Stock Incentive Plan
+10.11(4)*	2014 Employee Stock Purchase Plan
+10.12(4)*	Form of Restricted Stock Unit Agreement for Non-Employee Directors under the 2014 Stock Incentive Plan
+ 10.13(14)*	Form of Restricted Stock Unit Agreement for Employees under the 2014 Stock Incentive Plan
+10.14(15)*	MKS Instruments, Inc. Management and Key Employee Bonus Plan
+10.15(16)*	Employment Agreement, dated as of July 1, 2005, between John Bertucci and the Registrant
+10.16(17)*	Employment Agreement, dated October 22, 2013, between Gerald Colella and the Registrant
+10.17(15)*	Amendment, dated March 27, 2018, to Employment Agreement, dated as of October 22, 2013, between Gerald Colella and the Registrant
+10.18(18)*	Second Amendment, dated October 29, 2018, to Employment Agreement, dated as of October 22, 2013, between Gerald Colella and the Registrant
+10.19(19)*	Newport Corporation's 2011 Stock Incentive Plan
+10.20(19)*	Newport Corporation's Amended and Restated 2011 Stock Incentive Plan
+10.21(19)*	Form of Stock Appreciation Right Award Agreement used under Newport Corporation's 2011 Stock Incentive Plan and Amended and Restated 2011 Stock Incentive Plan
+10.22(19)*	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
+10.23(19)*	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
+10.24(20) *	Employment Agreement, dated as of November 18, 2019, between John Lee and the Registrant
+10.25(21)*	Employment Agreement, effective August 1, 2016, between Seth Bagshaw and the Registrant
+10.26(18)*	Amendment, dated October 29, 2018, to Employment Agreement, effective August 1, 2016, by and between Seth Bagshaw and the Registrant

Exhibit No.	Title
+10.27(13)*	Employment Agreement, effective August 1, 2016, between Kathleen Burke and the Registrant, as amended on October 29, 2018
+10.28(5)*	Employment Agreement, effective September 16, 2019, between James Schreiner and the Registrant
+10.29(14)*	Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan
+10.30(14)*	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
+10.31(14)*	Form of Restricted Stock Units Award Agreement (with time-based vesting) used under Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan for 2018
+10.32(14)*	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
+10.33(14)*	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
+10.34(14)*	Form of the Registrant's RSU Assumption Agreement (with performance-based vesting) for U.S. Employees Relating to Electro Scientific Industries, Inc.'s 2004 Stock Incentive Plan
+10.35(22)*	Annual Profit Improvement Bonus Plan
10.36*	Employment Agreement, effective February 18, 2021, between Mark Gitin, the Registrant and Newport Corporation
10.37*	Employment Agreement, effective January 1, 2020, between David Henry and the Registrant
10.38*	Employment Agreement, effective February 17, 2021, between Eric Taranto and the Registrant
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
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, 2020 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, 2020, 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 Registration Statement on Form S-4 (File No. 333-49738), filed with the Securities and Exchange Commission on November 13, 2000.
 - (2) 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.
 - (3) 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.
 - (4) 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.
 - (5) 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.
 - (6) 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.
 - (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 June 9, 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 December 14, 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 July 6, 2017.
 - (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 April 12, 2018.
 - (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 February 1, 2019.
 - (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 October 1, 2019.
 - (13) 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.
 - (14) 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.
 - (15) 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.
 - (16) 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 5, 2005.
 - (17) 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.
 - (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 November 1, 2018.
 - (19) 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.
 - (20) 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.
 - (21) 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.
 - (22) 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 12, 2020.
- (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

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:						
(in millions)						
Years ended December 31,						
2020	\$ 1.8	\$ —	\$ 0.1	\$ —	\$ 0.1	\$ 2.0
2019	\$ 5.2	\$ 0.2	\$ (0.7)	\$ —	\$ (2.9)	\$ 1.8
2018	\$ 4.1	\$ —	\$ 1.4	\$ —	\$ (0.3)	\$ 5.2

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:						
(in millions)						
Years ended December 31,						
2020	\$ 1.4	\$ —	\$ 0.3	\$ —	\$ 0.1	\$ 1.8
2019	\$ 1.0	\$ —	\$ 0.2	\$ —	\$ 0.2	\$ 1.4
2018	\$ 1.3	\$ —	\$ 0.1	\$ —	\$ (0.4)	\$ 1.0

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:						
(in millions)						
Years ended December 31,						
2020	\$ 27.4	\$ —	\$ 4.2	\$ —	\$ (1.0)	\$ 30.6
2019	\$ 17.9	\$ 5.9	\$ 4.9	\$ —	\$ (1.3)	\$ 27.4
2018	\$ 13.6	\$ —	\$ 4.8	\$ —	\$ (0.5)	\$ 17.9

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, 2020 to be signed on its behalf by the undersigned, thereunto duly authorized on the 22nd day of February 2021.

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 22, 2021
<u>/s/ Jacqueline F. Moloney</u> Jacqueline F. Moloney	Lead Director	February 22, 2021
<u>/s/ John T.C. Lee</u> John T.C. Lee	President, Chief Executive Officer and Director (Principal Executive Officer)	February 22, 2021
<u>/s/ Seth H. Bagshaw</u> Seth H. Bagshaw	Senior Vice President, Chief Financial Officer and Treasurer (Principal Financial and Accounting Officer)	February 22, 2021
<u>/s/ Rajeev Batra</u> Rajeev Batra	Director	February 23, 2021
<u>/s/ Joseph B. Donahue</u> Joseph B. Donahue	Director	February 22, 2021
<u>/s/ Janice K. Henry</u> Janice K. Henry	Director	February 22, 2021
<u>/s/ Elizabeth A. Mora</u> Elizabeth A. Mora	Director	February 23, 2021
<u>/s/ Michelle M. Warner</u> Michelle M. Warner	Director	February 22, 2021

Board of Directors

Gerald G. Colella

Chairman
MKS Instruments, Inc.

Rajeev Batra

President
Siemens Digital Industries U.S.

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

Principal
MMW Advisors, LLC

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 11, 2021, 10:00 a.m. EST
Virtual Meeting



MKS INSTRUMENTS, INC.

WWW.MKSINST.COM

+1.978.645.5500