VEECO INSTRUMENTS INC
Form 10-K
February 25, 2019
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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, 2018

OR

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

Commission file number 0-16244

VEECO INSTRUMENTS INC.

(Exact Name of Registrant as Specified in Its Charter)

Delaware	11-2989601
(State or Other Jurisdiction of Incorporation or Organization)	(I.R.S. Employer Identification No.)

Terminal Drive	
Plainview, New York	11803
(Address of Principal Executive Offices)	(Zip Code)

Registrant's telephone number, including area code:

(516) 677-0200

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

(Title of each class)	(Name of each exchange on which registered)
Common Stock, par value $0.01 per share	The NASDAQ Stock 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 if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of Registrant's knowledge, in definitive proxy or information statements incorporated by references in Part III of this Form 10-K or any amendment to this Form 10-K.

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

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

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

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

The aggregate market value of the common stock held by non-affiliates of the registrant at June 29, 2018 (the last business day of the registrant’s most recently completed second quarter) was $682,511,019 based on the closing price of $14.25 on the NASDAQ Stock Market on that date.

The number of shares of each of the registrant’s classes of common stock outstanding on February 15, 2019 was 48,038,565 shares of common stock, par value $0.01 per share.

DOCUMENTS INCORPORATED BY REFERENCE

Certain portions of the definitive Proxy Statement to be used in connection with the Registrant’s 2019 Annual Meeting of Stockholders are incorporated by reference into Part III of this Form 10-K.

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This Annual Report on Form 10-K ("Form 10-K") contains certain forward-looking information relating to Veeco Instruments Inc. (together with its consolidated subsidiaries, "Veeco," the "Company," "Registrant," "we," "our," or "us," unle the context indicates otherwise) that is based on the beliefs of, and assumptions made by, our management as well as information currently available to management. When used in this Form 10-K, the words "believes," "anticipates," "expects," "estimates," "targets," "plans," "intends," "will," and similar expressions relating to the future are intended to identi forward-looking information. Discussions containing such forward-looking statements may be found in Part I, Items 1 and 3, Part II, Items 7 and 7A hereof, as well as within this Form 10-K generally. This forward-looking information reflects our current views with respect to future events and is subject to certain risks, uncertainties, and assumptions, some of which are described under the caption "Risk Factors" in Part I, Item 1A, and elsewhere in this Form 10-K. Should one or more of these risks or uncertainties occur, or should our assumptions prove incorrect, actual results may vary materially from the forward-looking information described in this Form 10-K as believed, anticipated, expected, estimated, targeted, planned, or similarly identified. We do not undertake any obligation to update any forward-looking statements to reflect future events or circumstances after the date of such statements.

PART I

Item 1. Business

Business Description and Overview

Headquartered in Plainview, New York, we were organized as a Delaware corporation in 1989. We are a leading manufacturer of innovative semiconductor and thin film process equipment which solve an array of challenging materials engineering problems for our customers. Our broad collection of MOCVD (metal organic chemical vapor deposition), MBE (molecular beam epitaxy), lithography, laser annealing, ion beam, and single wafer etch and clean technologies play an integral role in the fabrication of advanced semiconductor devices including Light Emitting Diodes ("LEDs") for solid-state lighting and display, lasers for communications and 3D sensing, and RF filters for mobile phones. We design our systems to optimize technical performance and productivity to achieve superior cost of ownership for our customers. Veeco holds technology leadership positions across our served markets. We have sales and service operations across the Asia-Pacific region, Europe, and North America to directly address our customers' needs and maximize our system uptime.

We are focused on:

- Innovation by providing differentiated semiconductor and thin film process equipment to address our customers' challenging materials engineering problems for current production requirements and next generation product development roadmaps; Investing in focused research and development in markets that we believe provide significant growth opportunities or are at an inflection point, including compound semiconductor, leading edge front-end semiconductor, and advanced packaging;

- Penetrating new markets by leveraging our sales channel and local process applications support teams to build strong strategic relationships with leading customers; Expanding our services portfolio to improve the performance of our systems, reduce our customers' cost of ownership, and improve customer satisfaction; Cross-selling our diverse product portfolio across our broad customer base;

- Improving profitability by optimizing manufacturing costs as we employ a combination of internal and outsourced manufacturing strategies to flex manufacturing capacity through industry investment cycles without compromising quality or performance.

Our products are purchased by semiconductor and thin film process equipment customers in the following four markets: 1) Advanced Packaging, MEMS & RF Filters; 2) LED Lighting, Display & Compound Semiconductor; 3) Front-End Semiconductor; and 4) Scientific & Industrial.

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Markets

Our array of process equipment systems are used in the production of a broad range of microelectronic components, including LEDs, micro-electro mechanical systems (“MEMS”), radio frequency (“RF”) filters and amplifiers, power electronics, thin film magnetic heads (“TFMHs”), laser diodes, 3D NAND, DRAM, logic, and other semiconductor devices. Many of our systems are used to directly deposit precision materials critical to the operation of the device. Some of our systems are involved in the precision removal of critical materials. Still other systems are used in the advanced packaging process flow of microelectronic components such as flip chip, Fan out Wafer Level Packaging (“FOWLP”), and other wafer level packaging approaches used in the modern integration of diverse semiconductor products, especially used in consumer electronics. Some of our customers are interested in purchasing different types of systems from us for different applications in the same process line. In general, our customers purchase our systems to both produce current generation devices in volume and to develop next generation products which deliver more efficient, cost effective, and advanced technological solutions. We operate in several highly cyclical business environments, and our customers’ buying patterns are dependent upon industry trends respective to that particular market. As our products are sold into multiple markets, the following discussion focuses on the trends that most influence our business within each of those markets.

Advanced Packaging, MEMS & RF Filters

Advanced Packaging includes a portfolio of wafer-level assembly technologies that enable improved performance of electronic products, such as smartphones, high end servers, and graphical processors.

Demand for higher performance, increased functionality, smaller form factors, and lower power consumption in mobile devices, consumer electronics, and high performance computing is driving the adoption of advanced packaging technologies. Semiconductor Foundries (“Foundries”), Independent Device Manufacturers (“IDMs”), and Outsourced Semiconductor Assembly and Test (“OSATs”) companies are implementing multiple advanced packaging approaches including FOWLP, recently deployed in high-volume manufacturing, and copper-pillar to enable stacked memory devices. This increasing demand trend in Advanced Packaging is encouraging as our Lithography and Precision Surface Processing (“PSP”) wet etch and clean systems enable several process steps for Advanced Packaging.

MEMS devices are used for an increasing number of applications, including accelerometers for automobile airbags, pressure sensors for medical uses, and gyroscopes for a variety of consumer products, such as gaming consoles and mobile devices.

One of the fastest growing MEMS applications has been RF filters for mobile devices, driven by increasingly complex wireless standards, the proliferation of an increasing number of communication bands, the exponential growth of mobile data, and carrier aggregation. These trends are positive for us, particularly for our PSP products, where our technology is enabling some of the most challenging process steps, as well as our Ion Beam Etch (“IBE”) and MBE systems, which are used to create Bulk Acoustic Wave (“BAW”) and Surface Acoustic Wave (“SAW”) RF filters.

LED Lighting, Display & Compound Semiconductor

The LED industry has experienced multiple growth cycles brought on by the adoption of LED technology using Gallium Nitride (“GaN”) that created a low cost blue LED to produce white light for consumer and commercial applications. The first wave of LED growth was driven by mobile phones, which implemented the use of LED technology for display backlighting. The LED industry experienced its second period of rapid growth as LEDs were adopted for TV display backlighting. The adoption of LEDs for solid state, general lighting gave rise to a third wave of demand. Future growth is anticipated in the compound semiconductor market driven by optical communication and industrial applications requiring laser diodes, 3D sensing and world facing vertical cavity surface emitting lasers (“VCSELs”), micro-LED displays, 5G RF infrastructure adoption, and power electronics.

Our MOCVD technology is at the core of the manufacturing process for GaN-based LEDs. We have benefited with each growth cycle, as LED producers invested in MOCVD process equipment to capture share in these markets. Demand for our equipment has historically been cyclical in nature, influenced by multiple factors, including: macroeconomic

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conditions; prices for LED chips; supply and demand dynamics; competition; and our customers' manufacturing plans. Given the recent competitive trends in China, the general lighting and backlighting markets have become commoditized and we do not expect significant revenue from these markets going forward.

MOCVD technology is also important in the manufacturing of red, orange, and yellow ("ROY") LEDs, which are used increasingly for fine-pitch digital signage and automotive lighting applications. For these applications, our MOCVD technology is used to deposit highly uniform Arsenides and Phosphides ("As/P") films which create amber and red output colors.

The Display market refers to LEDs or micro LEDs used directly for displays. Our MOCVD systems are well suited for the display market.

The Compound Semiconductor market broadly refers to the deposition of GaN or As/P based thin film compounds on a variety of substrates including Silicon, Gallium Arsenide ("GaAs"), Indium Phosphide ("InP"), and Silicon Carbide ("SiC") to enable a variety of power electronics, RF, and photonics devices.

Global demand is increasing for advanced power electronics with greater energy efficiency, a smaller form factor, ability to operate at higher temperatures, faster switching capabilities, and greater reliability. These devices support many applications, including more efficient IT servers, electrical motors, faster charging stations for electric vehicles, wind turbines, and photovoltaic power inverters. While silicon-based transistors are widely used in power electronic devices today, GaN based power electronics developed on MOCVD systems can potentially deliver higher performance (e.g., smaller power supply form factors, higher efficiency, and faster switching speeds). In addition to depositing the critical GaN layer with our MOCVD products, our wet etch and clean products address multiple etch and clean steps required to manufacture these advanced power electronics devices. In recent years, global industry leaders in power electronics have focused on research and development programs to commercialize this new technology. We anticipate device manufacturers will likely begin to transition from development to production of these devices over the next couple of years; we can benefit from this transition as our customers invest in process equipment to support this production ramp-up.

Demand for RF power amplifiers in mobile devices drives the RF device portion of the Compound Semiconductor market. Our GaN and As/P technologies are used to deposit critical thin film layers for the production of RF amplifiers. Our wet etch and clean systems are used for process steps such as metal lift off and photo resist strip for devices such as heterojunction bipolar transistors ("HBTs") used in smartphones. We believe GaN and As/P based devices will enable the evolution of wireless technology to the fifth generation ("5G"). It is expected that the transition to 5G will take several years to become fully adopted.

Examples of important photonics devices are infrared LEDs and VCSELs used for optical data communication, 3D sensing, and world facing applications (augmented reality and automotive light detection and ranging ("LIDAR")). In addition to film deposition, photonics device manufacturers also employ cleaning and etching process steps supported by our wet etch and clean technologies.

Front-End Semiconductor

Front-End Semiconductor refers to early process steps where transistors are formed directly on silicon. There are many different process steps in forming integrated circuits, such as Deposition, Etching, Masking, and Doping, where the microchips are created but still remain on the silicon wafer. Our Laser Spike Annealing systems enable precision doping of materials at a controlled temperature in the semiconductor manufacturing process. Our IBE for front-end semiconductor has been demonstrated in Spin Torque Transfer Magnetic Random Access Memory ("STT-MRAM") applications. STT-MRAM has many benefits over traditional random access memory such as its non-volatility, speed, endurance, and power consumption. Our Ion Beam Deposition ("IBD") products have been adopted for the manufacturing of Extreme Ultraviolet ("EUV") mask blanks. Our ability to precisely deposit high quality films with extremely low particulate levels make our IBD technology ideal for manufacturing defect-free EUV photomask blanks. The front-end semiconductor industry is in the process of adopting EUV lithography to meet leading edge device requirements. Future growth will depend on overall adoption of EUV lithography by IDMs and Foundries. Our

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inspection products are used for shape inspection of 3D topographies in memory and logic applications, which helps our customers improve their lithography and deposition processes.

Scientific & Industrial

The Scientific and Industrial market includes advanced materials research and a broad range of manufacturing applications including high-power fiber lasers, infrared detectors, thin film magnetic heads on hard disk drives (“HDDs”), and optical coatings.

Our MBE systems are used by scientific research organizations and universities to drive new discoveries in the areas of materials science. MBE enables precise epitaxial crystal growth for a very wide variety of materials, which supports the development of new performance materials used for emerging technologies. MBE technology is also used in the manufacturing of specialized, lower volume products such as high-power lasers and infrared sensors. Our fully automated process equipment systems create highly uniform, and high purity GaAs or InP film layers, which are critical to the performance of these devices. Our wet etch and clean systems are also used in the manufacture of infrared sensors.

Our Ion Beam Deposition, Ion Beam Etch, Physical Vapor Deposition (“PVD”), and lapping and dicing tools are used in data storage applications, including HDDs that will continue to provide significant value for mass storage and will remain an important part of large capacity storage applications. This is especially true for data center applications where large volumes of data storage are required to serve an increasingly mobile population. In addition, our IBD tools are used to produce high quality optical films for multiple applications including laser mirrors, optical filters, and anti-reflective coatings. Our tools deposit thin layers of advanced materials on various substrates to alter how light is reflected and transmitted.

Our atomic layer deposition (“ALD”) systems are sold into a variety of Scientific & Industrial market applications including optical, semi/nano-electronics, MEMS, nanostructures, and biomedical.

System Products

Metal Organic Chemical Vapor Deposition Systems

We are a leading supplier of MOCVD systems. MOCVD production systems are used to make GaN-based devices (such as blue and green LEDs) and As/P-based devices (such as ROY LEDs), which are used in television and computer display backlighting, general illumination, large area signage, specialty illumination, power electronics, and many other applications. Our TurboDisc® EPIK® line of MOCVD systems enables cost per wafer savings for our customers with a combined advantage of best operating uptime, low maintenance costs, and best-in-class wafer uniformity and yield. In 2016, we introduced the TurboDisc K475i™ AsP MOCVD system, which offers best-in-class productivity and yields for ROY LEDs, infra-red LEDs, and high-efficiency multi-junction photovoltaic solar cell applications. Our Propel™ PowerGaN™ MOCVD System ("Propel") enables the development of highly-efficient GaN-based power electronic devices that have the potential to accelerate the industry's transition from research and development to high volume production. The Propel system offers 200mm technology and incorporates single-wafer reactor technology for outstanding film uniformity, yield, and device performance.

Advanced Packaging Lithography

We have a leading position in the Advanced Packaging lithography equipment market. The Advanced Packaging market is driven by the need for improved performance, reduced power consumption, and the ability to image smaller geometries for mobile and automotive applications. These applications continue to demand increasingly complex packaging techniques from IDMs, Foundries, and OSATs. Our Advanced Packaging tools are designed to optimize productivity for leading-edge 200mm and 300mm Advanced Packaging applications by enabling extremely reliable, cost-effective, high-volume manufacturing solutions. Our best-in-class yield coupled with outstanding resolution and depth of focus addresses all leading edge requirements for Advanced Packaging applications such as redistribution layers ("RDLs"), Copper Pillar, Micro-Bump, FOWLP, interposers, and TSVs to provide the lowest cost of ownership in the industry.

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Precision Surface Processing Systems (Wet Etch and Clean)

We offer single wafer wet etch and clean, and surface preparation systems which target high growth segments in advanced packaging, MEMS, LEDs, and compound semiconductor markets. The WaferStorm platform is based on PSP's unique ImmJET™ technology, which provides improved performance at a lower cost of ownership than conventional wet bench-only or spray-only approaches. This highly flexible platform targets solvent based cleaning applications that require a significant level of process control and flexibility. The WaferEtch® platform provides highly uniform, selective etching with onboard end point detection for improved process control and yield in bumping applications. In addition, PSP has developed a state-of-the-art solution with the WaferEtch platform to address the requirements of TSV reveal, in which the backside of a wafer is thinned to reveal the copper interconnects. PSP's TSV technology offers a significant cost of ownership reduction compared with dry etch processing by replacing up to four separate process steps.

Laser Annealing Systems

The progression of Moore's law has led semiconductor manufacturers to implement a variety of material and process changes to overcome the technical hurdles related to shrinking of feature sizes in integrated circuits. Along with new materials and smaller dimensions have come new process challenges. One such challenge has been new constraints on thermal annealing processes. One example is the thermal annealing of dopants for activation, in order to form the transistor junction, critical to the function and performance of a complementary metal-oxide semiconductor ("CMOS") logic integrated circuit. In this and other thermal process steps, traditional lamp-based annealing techniques have challenges meeting the thermal budget (time/temperature regime) required by new materials and designs. Our Laser Spike Annealing ("LSA") systems meet the industry demand for millisecond time-scale annealing, heating the wafer up to temperatures just below the silicon melting point over a range of ultra-short timeframes (microseconds to milliseconds), enabling thermal annealing solutions at the 65nm technology node and below. This advanced annealing technology provides solutions to the difficult challenge of fabricating ultra-shallow junctions and highly activated source/drain contacts at these advanced logic nodes. In addition, our proprietary hardware design enables outstanding temperature uniformity across the wafer and die, by minimizing the pattern-density effect, thus reducing absorption variations.

We have also developed a next generation melt anneal technology ("MELT") targeted for annealing advanced logic devices at 7nm and below. As FinFET devices scale below the 10nm node, achieving the performance targets has become a challenge. To continue the roadmap, the industry is looking at new materials and the use of thermal processes that require nanosecond time-scale thermal annealing with temperatures exceeding the melting point. To help address this concern we have developed a unique (and patented) approach to nanosecond-scale thermal annealing. Our design utilizes two lasers; a millisecond laser as a low thermal budget localized preheat and a nanosecond laser "on top" of the millisecond laser to raise the peak temperature to the melt temperature of the material being processed beyond silicon melt. Similar to LSA, the MELT system architecture is targeted to reduce pattern effects and increase the process window. It is believed that nanosecond annealing will be required to meet the device targets at 7nm and below; the initial application being explored by customers is contact annealing aimed to improve reduce source/drain contact resistance, which has become a performance bottleneck at the most advanced FinFET nodes, and as devices continue to scale, we see the application space for our melt product expanding.

Ion Beam Deposition and Etch Systems

Our NEXUS® IBD systems use ion beam technology to deposit precise layers of thin films. IBD systems deposit high purity thin film layers and provide excellent uniformity and repeatability. Our NEXUS IBE systems utilize a charged particle beam consisting of ions to etch precise, complex features. The NEXUS systems may be included on our cluster system platform to allow either parallel or sequential deposition/etch processes. These systems are used primarily by data storage, semiconductor, and telecommunications device manufacturers in the fabrication of discrete and integrated microelectronic devices.

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Our SPECTOR® Ion Beam Sputtering system was developed for high precision optical coatings and offers manufacturers state of the art optical thickness monitoring, improved productivity, and target material utilization, for cutting-edge optical interference coating applications. We also provide a broad array of ion beam sources. These technologies are applicable in the HDD industry as well as for optical coatings and other end markets.

Molecular Beam Epitaxy Systems

Molecular beam epitaxy is the process of precisely depositing epitaxially-aligned atomically-thin crystalline layers, or epilayers, of elemental materials onto a substrate in an ultra-high vacuum environment. We are a leading supplier of MBE systems worldwide.

Our MBE systems, sources, and components are used to develop and manufacture compound semiconductor devices in a wide variety of applications such as high-power fiber lasers, infrared detectors, mobile phones, radar systems, high efficiency solar cells, and basic materials science research. For many compound semiconductors, MBE is the critical step of the fabrication process, ultimately determining device functionality and overall performance. We offer a full complement of MBE systems customized for the specific end application depositing on single 3” substrates up to fully automated production systems that can deposit on seven 6” substrates simultaneously. The GENxplor® MBE system creates high quality epitaxial layers and is ideal for cutting-edge research on a wide variety of materials including GaAs, antimonides, nitrides, and oxides. The GENxcel® MBE system extends the same performance of the GENxplor to 4” diameter substrates.

3D Wafer Inspection Systems

As the semiconductor industry continues its pursuit of increased productivity and performance by shrinking device dimensions along Moore’s law, manufacturers are running into bottlenecks limited by fundamental materials properties and lithographic resolution. The industry has opted for 3D integration schemes to circumvent these limitations (e.g. Vertical NAND, HAR DRAM, Logic FinFET). The high volume manufacturing ramp of these 3D schemes requires low cost, high performance 3D wafer inspection systems. The Superfast 3D Wafer Inspection System is a Coherent Gradient Sensing (“CGS”) based 3D wafer inspection system that enables the wafer fab to inspect the patterned wafer at key processing steps, enabling statistical process control as well as advanced process control (“APC”) for topography, displacement, and stress.

Atomic Layer Deposition and Other Deposition Systems

ALD is a thin-film deposition method in which a film is deposited on a substrate uniformly with precise control down to the atomic scale. Veeco offers a full suite of ALD systems for non-semiconductor front-end production applications across a wide range of markets and applications such as energy, optical, electronics, MEMS, nanostructures, and biomedical. Other deposition systems include Physical Vapor Deposition, Diamond-Like Carbon Deposition, and Chemical Vapor Deposition Systems.

Sales and Service

We sell our products and services worldwide through various strategically located facilities in the United States, Europe, and the Asia-Pacific region. We believe that our customer service organization is a significant factor in our success. We provide service and support on a warranty, service contract, and an individual service-call basis. We believe that offering timely support creates stronger relationships with customers. Revenue from the sales of parts, upgrades, service, and support represented approximately 28%, 27%, and 28% of our net sales for the years ended December 31, 2018, 2017, and 2016, respectively. Parts and upgrade sales represented approximately 23%, 22%, and 22% of our net sales for those years, respectively, and service and support sales were 5%, 5%, and 6% respectively.

Customers

We sell our products to many of the world’s LED, MEMS, OSAT, HDD, and semiconductor manufacturers, as well as research centers and universities. We rely on certain principal customers for a significant portion of our sales. Sales to

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Focus Lighting Tech Co. accounted for more than 10% of our total net sales in 2018; sales to OSRAM Opto Semiconductors accounted for more than 10% of our total net sales for 2017 and 2016. If any principal customer discontinues its relationship with us or suffers economic difficulties, our business prospects, financial condition, and operating results could be materially and adversely affected.

Research and Development

Our research and development functions are focused on the timely creation of new products and enhancements to existing products, both of which are necessary to maintain our competitive position. We collaborate with our customers to align our technology and product roadmaps to customer requirements. Our research and development activities take place at our facilities in San Jose, California; Waltham, Massachusetts; St. Paul, Minnesota; Somerset, New Jersey; Plainview, New York; Horsham, Pennsylvania; and Singapore.

Suppliers

We outsource certain functions to third parties, including the manufacture of several of our systems. While we rely on our outsourcing partners to perform their contracted functions, we maintain some level of internal manufacturing capability for these systems. Refer to Item 1A, "Risk Factors," for a description of risks associated with our reliance on suppliers and outsourcing partners.

Backlog

Our backlog consists of orders for which we received a firm purchase order, a customer-confirmed shipment date within twelve months, and a deposit when required. Our backlog decreased to $288.3 million at December 31, 2018 from $334.3 million at December 31, 2017. During the year ended December 31, 2018, we increased backlog by approximately $2.9 million relating to the adoption of ASC Topic 606, Revenue from Contracts with Customers, while adjusting for a decrease in backlog of approximately $6.0 million relating to orders that no longer met our bookings criteria.

Competition

In each of the markets that we serve, we face competition from established competitors, some of which have greater financial, engineering, and marketing resources than we do, as well as from smaller competitors. In addition, many of our products face competition from alternative technologies, some of which are more established than those used in our products. Significant factors for customer selection of our tools include system performance, accuracy, repeatability, ease of use, reliability, cost of ownership, and technical service and support. None of our competitors compete with us across all of our product lines.

Our principal competitors include: Advanced Micro-Fabrication Equipment (AMEC); Aixtron; Applied Materials; Canon; Grand Plastics Technology Corporation; Leybold Optics; Mattson Technology; Riber; Rudolph Technologies; Scientech; Screen Semiconductor Solutions; and Shanghai Micro Electronics Equipment.

Intellectual Property

Our success depends in part on our proprietary technology, and we have over 800 patents and pending applications in the United States and other countries.

We have patents and exclusive and non-exclusive licenses to patents owned by others covering certain of our products, which we believe provide us with a competitive advantage. We have a policy of seeking patents on inventions concerning new products and improvements as part of our ongoing research, development, and manufacturing activities. We believe that there is no single patent or exclusive or non-exclusive license to patents owned by others that is critical to our operations, as the success of our business depends primarily on the technical expertise, innovation, customer satisfaction, and experience of our employees. Refer to Item 1A, “Risk Factors,” for a description of risks associated with intellectual property.

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Employees

At December 31, 2018 we had 1,043 employees, of which there were 302 in manufacturing and testing, 95 in sales and marketing, 221 in service and product support, 281 in engineering and research and development, and 144 in information technology, general administration, and finance. The success of our future operations depends on our ability to recruit and retain engineers, technicians, and other highly skilled professionals who are in considerable demand. We feel that we have adequate programs in place to attract, motivate, and retain our employees. We monitor industry practices to make sure that our compensation and employee benefits remain competitive. We believe that our employee relations are good. Refer to Item 1A, "Risk Factors," for a description of risks associated with employee retention and recruitment.

Available Information

Our corporate website address is www.veeco.com. All filings we make with the Securities and Exchange Commission ("SEC"), including our Annual Report on Form 10-K, our Quarterly Reports on Form 10-Q, our Current Reports on Form 8-K, our proxy statements and any amendments thereto filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, are available for free in the Investor Relations section of our website as soon as reasonably practicable after they are filed with or furnished to the SEC. The reference to our website address does not constitute inclusion or incorporation by reference of the information contained on our website in this Form 10-K or other filings with the SEC, and the information contained on our website is not part of this document.

Item 1A. Risk Factors

Key Risk Factors That May Impact Future Results

Stockholders should carefully consider the risk factors described below. Any of these factors, many of which are beyond our control, could materially and adversely affect our business, financial condition, operating results, cash flow, and stock price.

Unfavorable market conditions have adversely affected, and may continue to adversely affect, our operating results.

Conditions of the markets in which we operate are volatile and have experienced, and may in the future continue to experience, significant deterioration. Demand for our equipment and services can change depending on several factors, including the nature and timing of technology inflections, the emergence of new technologies and competitors, production capacity and end-user demand, international trade barriers, access to affordable capital, and general economic conditions (including a potentially prolonged U.S. government shutdown). Changing market conditions require that we continuously monitor and reassess our strategic resource allocation decisions. If we fail to properly adapt to changing business environments, we may lack the infrastructure and resources necessary to scale up our businesses to successfully compete during periods of growth, or we may incur excess fixed costs during periods of decreasing demand. Adverse market conditions relative to our products have resulted in, and may continue to result in:

- reduced demand for our products;
- rescheduling and cancellations of orders for our products, resulting in negative backlog adjustments;
- asset impairments, including the impairment of goodwill and other intangible assets;
- increased price competition leading to lower margin for our products;
- increased competition from sellers of used equipment or lower-priced alternatives to our products;
- increased inventory obsolescence;
- disruptions in our supply chain as we reduce our purchasing volumes and limit our contract manufacturing operations;
- higher operating costs as a percentage of revenues; and

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- an increase in uncollectable amounts due from our customers resulting in increased reserves for doubtful accounts and write-offs of accounts receivable.

If the markets in which we participate continue to experience deteriorations or downturns, this could negatively impact our sales and revenue generation, margins, operating expenses, and profitability.

We are exposed to the risks of operating a global business.

Most of our sales are to customers located outside of the United States, and we expect sales from non-U.S. markets to continue to represent a significant portion of our sales in the future. Our non-U.S. sales and operations are subject to risks inherent in conducting business outside the United States, many of which are beyond our control including:

- political and social attitudes, laws, rules, regulations, and policies within countries that favor local companies over U.S. companies, including government-supported efforts to promote the development and growth of local competitors;
- global trade issues and uncertainties with respect to trade policies, including tariffs, trade sanctions, and international trade disputes, and the ability to obtain required import and export licenses;
- differing legal systems and standards of trade which may not honor our intellectual property rights and which may place us at a competitive disadvantage;
- pressures from foreign customers and foreign governments for us to increase our operations and sourcing in the foreign country;
- multiple conflicting and changing governmental laws and regulations, including varying labor laws and tax regulations;
- reliance on various information systems and information technology to conduct our business, making us vulnerable to additional cyberattacks by third parties or breaches due to employee error, misuse, or other causes, that could result in further business disruptions, loss of or damage to our intellectual property and confidential information (and that of our customers and other business partners), reputational harm, transaction errors, processing inefficiencies, or other adverse consequences;
- regional economic downturns, varying foreign government support, and unstable political environments;
- difficulties in managing a global enterprise, including staffing, managing distributors and representatives, and repatriating cash;
- longer sales cycles and difficulties in collecting accounts receivable; and
- different customs and ways of doing business.

These challenges, many of which are associated with sales into the Asia-Pacific region, have had and may continue to have a material adverse effect on our business.

International trade disputes could result in increases in tariffs and other trade restrictions and protectionist measures that could negatively impact our operations.

Particularly in light of the complex relationships among China, Taiwan, Korea, Japan, and the United States, there is risk that political and economic pressures may lead to additional international trade disruptions. Any such disruptions could adversely affect our operations and sales in the Asia-Pacific region and in other countries in which we operate. Tariffs, additional taxes, or trade barriers may increase our manufacturing costs, decrease margins, reduce the competitiveness of our products, and inhibit our ability to sell products or purchase necessary equipment and supplies, which could have a material adverse effect on our results of operations and financial condition. Foreign governments may require, in exchange for access to their markets, the use of local suppliers or the partnering with local companies for manufacturing and development purposes, which may necessitate the sharing of sensitive information and intellectual property rights. Foreign governments may provide special incentives to local customers to purchase from local competitors, even if their products

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are inferior. Many of these challenges are present in China, from which we have historically generated a significant portion of our revenue. These and other measures could adversely impact our revenues, margins, and financial condition.

Disruptions in our information technology systems or data security incidents could result in significant financial, legal, regulatory, business, and reputational harm to us.

We are increasingly dependent on information technology systems and infrastructure, including mobile technologies, to operate our business. In the ordinary course of our business, we collect, store, process and transmit significant amounts of sensitive information, including intellectual property, proprietary business information, personal information, and other confidential information, including that of our customers and other business partners. It is critical that we do so in a secure manner to maintain the confidentiality, integrity, and availability of this sensitive information. We have also outsourced elements of our operations (including elements of our information technology infrastructure) to third parties, and as a result, we manage a number of third-party vendors who have access to our computer networks and our confidential information.

All information systems are subject to disruption, breach, or failure. Potential vulnerabilities can be exploited from inadvertent or intentional actions of our employees, third-party vendors, business partners, or by malicious third parties. Attacks of this nature are increasing in their frequency, levels of persistence, sophistication, and intensity, and are being conducted by sophisticated and organized groups and individuals with a wide range of expertise and motives (including industrial espionage), including organized criminal groups, nation states, and others. In addition to the extraction of sensitive information, attacks could include the deployment of harmful malware, ransomware, or other means which could affect service reliability and threaten the confidentiality, integrity, and availability of information. Significant disruptions in our, or our third-party vendors', information technology systems or other data security incidents could adversely affect our business operations and result in the loss or misappropriation of, and unauthorized access to, sensitive information, which could result in financial, legal, regulatory, business, and reputational harm to us.

On November 1, 2018, we announced the discovery of an attack on our computer system by what appears to be a highly-sophisticated actor. We notified law enforcement of the attack and retained forensic experts to assist with the investigation. It currently remains unclear whether we will be able to determine the extent of the breach or the potential impact on our operations. Also unclear is whether we will be able to identify who is responsible for the attack, or whether we will be able to pursue legal action or other remedies. The attack, including the expenses incurred to address it, may have an adverse effect on our results of operations and financial condition, may result in litigation, and may cause reputational harm. We are continuing to analyze the effects of the incident, along with appropriate remediation to our information technology systems, and this analysis and the related remediation efforts could reveal that other breaches have occurred.

While we are engaged in remediation and have implemented, and are continuing to implement, security measures intended to protect our information technology systems and infrastructure, there can be no assurance that such remediation and security measures will successfully prevent further security incidents. Additional information technology system disruptions, whether from attacks on our technology environment or from computer viruses, natural disasters, terrorism, war or other causes, could result in a material disruption in our business operations, force us to incur significant costs and engage in litigation, harm our reputation, and subject us to liability under laws, regulations, and contractual obligations.

We may be unable to effectively enforce and protect our intellectual property rights.

Our success depends in part upon the protection of our intellectual property rights. We rely primarily on patent, copyright, trademark, and trade secret laws, as well as nondisclosure and confidentiality agreements and other methods, to protect our proprietary information, technologies, processes, and brand identity. We own various U.S. and international patents and have additional pending patent applications relating to certain of our products and technologies. The process of seeking patent protection is lengthy and expensive, and we cannot be certain that pending or future applications will actually result in issued patents or that issued patents will be of sufficient scope or strength to provide meaningful protection or commercial advantage. In addition, our intellectual property rights may be circumvented, invalidated, or rendered obsolete by the rapid pace of technological change, or through efforts by others to reverse engineer our products or design around patents that we own. Policing unauthorized use of our products and technologies is difficult and time consuming and the laws of other countries may not protect our proprietary rights as fully or as readily as U.S. laws. Given these limitations, our success will depend in part upon our ability to innovate ahead of our competitors.

In addition, our outsourcing strategy requires that we share certain portions of our technology with our outsourcing partners, which poses additional risks of infringement and trade secret misappropriation. Infringement of our rights by a third party, possibly for purposes of developing and selling competing products, could result in uncompensated lost market and revenue opportunities. Similar exposure could result in the event that former employees seek to compete with us through their unauthorized use of our intellectual property and proprietary information. We cannot be certain that the protective steps and measures we have taken will prevent the misappropriation or unauthorized use of our proprietary information and technologies, nor can we be certain that applicable intellectual property laws, regulations, and policies will not be changed in a manner detrimental to the sale or use of our products.

Litigation has been required in the past, and may be required in the future, to enforce our intellectual property rights, protect our trade secrets, and to determine the validity and scope of proprietary rights of others. As a result of any such litigation, we could lose our ability to enforce one or more patents, incur substantial costs, and jeopardize relationships with current or prospective customers or suppliers. Any action we take to enforce or defend our intellectual property rights could absorb significant management time and attention, and could otherwise negatively impact our operating results.

We may be subject to claims of intellectual property infringement by others.

We receive communications from time to time from other parties asserting the existence of patent or other rights which they believe cover certain of our products. We also periodically receive notice from customers who believe that we are required to indemnify them for damages they may incur related to infringement claims made against these customers by third parties. Our customary practice is to evaluate such assertions and to consider the available alternatives, including whether to seek a license, if appropriate. However, we cannot ensure that licenses can be obtained or, if obtained, will be on acceptable terms or that costly litigation or other administrative proceedings will not occur. If we are not able to resolve a claim, negotiate a settlement of the matter, obtain necessary licenses on commercially reasonable terms, or successfully prosecute and defend our position, our business, financial condition, and results of operations could be materially and adversely affected.

The price of our common shares is volatile, has declined significantly, and could further decline.

The stock market in general and the market for technology stocks in particular has experienced significant volatility. The trading price of our common shares has declined significantly, and could continue to decline independent of the overall market, and shareholders could lose all or a substantial part of their investment. The market price of our common shares could fluctuate significantly in response to several factors, including among others:

- difficult macroeconomic conditions, international trade disputes, unfavorable geopolitical events, and general stock market uncertainties, such as those occasioned by a global liquidity crisis and a failure of large financial institutions;

- the emergence of competitors and competing technologies;
- receipt of large orders or cancellations of orders for our products;
- issues associated with the performance and reliability of our products;
- actual or anticipated variations in our results of operations;
- announcements of financial developments or technological innovations;
- our failure to meet the performance estimates of investment research analysts;
- changes in recommendations and financial estimates by investment research analysts;
- strategic transactions, such as acquisitions, divestitures, and spin-offs, and the results of our investment decisions;
- the commencement of, and rulings on, litigation and legal proceedings;
- the dilutive impact of our Convertible Senior Notes; and
- the occurrence of major catastrophic events.

As with many technology companies, the price of our common shares has fluctuated significantly in the past and is likely to be volatile in the future. Securities class action litigation is often brought against a company following periods of volatility in the market price of its securities. We have defended security class actions lawsuits in the past, and are currently defending such a lawsuit now. These lawsuits, if and when brought, can result in substantial costs and a diversion of management's attention and resources, which can adversely affect our financial condition, results of operations, and liquidity.

We may be required to take additional impairment charges on assets.

We are required to assess goodwill and indefinite-lived intangible assets annually for impairment, or on an interim basis whenever certain events occur or circumstances change, such as an adverse change in business climate or a decline in the overall industry, that would more likely than not reduce the fair value below its carrying amount. We maintain a single reporting unit, and as such, if our stock price decreases to the point where our fair value, as determined by our adjusted market capitalization, is less than the carrying value of our single reporting unit, this would also indicate a potential impairment, and we may be required to record an impairment charge in that period, which could adversely affect our results of operations. Such an impairment charge was taken by the Company during the fourth quarter of 2018, in the amount of $122.8 million.

As part of our long term strategy, we may pursue future acquisitions of other companies or assets which could potentially increase our assets. We are required to test our long-lived assets, including acquired intangible assets and property, plant, and equipment, for recoverability and impairment whenever there are indicators of impairment such as an adverse change in business climate. Adverse changes in business conditions or worse-than-expected performance by these acquired companies could negatively impact our estimates of future operations and result in impairment charges to these assets. For example, during the second quarter of 2018, we recorded an asset impairment charge of $252.3 million related to the intangible assets acquired as part of our acquisition of Ultratech, Inc. If our assets are further impaired, our financial condition and results of operations could be materially and adversely affected.

We face significant competition.

We face significant competition throughout the world, which may increase as certain markets in which we operate continue to evolve. Some of our competitors have greater financial, engineering, manufacturing, and marketing resources than us. Other competitors are located in regions with lower labor costs and other reduced costs of operation. In addition, our ability to compete in foreign countries against local manufacturers may be hampered by nationalism, social attitudes, laws, regulations, and policies within such countries that favor local companies over U.S. companies or that are otherwise designed to promote the development and growth of local competitors. Furthermore, we face competition from smaller emerging equipment companies whose strategy is to provide a portion of the products and services we offer, with a focused approach on innovative technology for specialized markets. New product introductions or enhancements by us or our competitors could cause a decline in sales or loss of market acceptance of our existing or prior generation products. Increased competitive pressure could also lead to intensified price competition resulting in lower margins.

To remain competitive, we may enter into strategic alliances with customers, suppliers, and other third parties to explore new market opportunities and possible technological advancements. These alliances may require significant investments of capital and other resources and often involve the exchange of sensitive confidential information. The success of these alliances may depend on factors over which we have limited control and will likely require ongoing cooperation and good faith efforts from our strategic partners. Strategic alliances are inherently subject to significant risks, and the inability to effectively manage these risks could materially and adversely affect our business and operating results.

We operate in industries characterized by rapid technological change.

Each of the industries in which we operate is subject to rapid technological change. Our ability to remain competitive depends on our ability to enhance existing products and develop and manufacture new products in a timely and cost effective manner and to accurately predict technology transitions. New product development commitments must be made well in advance of sales, and we must anticipate the future demand for products when selecting which development

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programs to fund and pursue. Our financial results depend on the successful introduction of new products, many of which require the achievement of increasingly stringent technical specifications. We may not be successful in selecting, developing, manufacturing, and marketing new products and new technologies or in enhancing our existing products. Our performance may be adversely affected if we are unable to accurately predict evolving market trends and related customer needs and to effectively allocate our resources among new and existing products and technologies.

We are also exposed to potential risks associated with unexpected product performance issues. Our product designs and manufacturing processes are complex and could contain unexpected product defects, especially when products are first introduced. Unexpected product performance issues could result in significant costs and damages, including increased service and warranty expenses, the need to provide product replacements or modifications, reimbursement for damages caused by our products, product recalls, related litigation, product write-offs, and disposal costs. These costs could be substantial and our reputation could be harmed, resulting in a reduced demand for our products and a negative effect on our business, financial condition, and results of operations.

Our sales to manufacturers are highly dependent on sales of consumer electronics applications, which can experience significant volatility due to seasonal and other factors.

The demand for LEDs, HDDs, semiconductors, and other devices is highly dependent on sales of consumer electronics, such as televisions, computers, tablets, digital video recorders, smartphones, cell phones, and other mobile devices. Manufacturers of LEDs are among our largest customers and account for a substantial portion of our revenue. Factors that could influence the levels of spending on consumer electronic products include consumer confidence, access to credit, volatility in fuel and other energy costs, conditions in the residential real estate and mortgage markets, labor and healthcare costs, and other macroeconomic factors affecting consumer spending behavior. These and other economic factors have had and could continue to have a material adverse effect on the demand for our customers' products and, in turn, on our customers' demand for our products and services. Furthermore, manufacturers of LEDs have in the past overestimated their potential for market share growth. If this growth is overestimated, we may experience cancellations of orders in backlog, rescheduling of customer deliveries, obsolete inventory, and liabilities to our suppliers for products no longer needed.

In addition, the demand for our customers' products can be even more volatile and unpredictable due to the possibility of competing technologies, such as flash memory as an alternative to HDDs. Unpredictable fluctuations in demand for our customers' products or rapid shifts in demand from our customers' products to alternative technologies could materially and adversely impact our future results of operations.

We have a concentrated customer base, located primarily in a limited number of regions, which operate in highly concentrated industries.

Our customer base continues to be highly concentrated. Orders from a relatively limited number of customers have accounted for, and likely will continue to account for, a substantial portion of our net sales, which may lead customers to demand pricing and other terms less favorable to us. Customer consolidation activity involving some of our largest customers could result in an even greater concentration of our sales in the future. Management changes at key customer accounts could result in a loss of future sales due to vendor preferences or other reasons and may introduce new challenges in managing customer relationships.

If a principal customer discontinues its relationship with us or suffers economic setbacks, our business, financial condition, and operating results could be materially and adversely affected. Our ability to increase sales in the future will depend in part upon our ability to obtain orders from new customers and we cannot be certain that we will be successful in these efforts. In addition, because a relatively small number of large manufacturers, many of whom are our customers, dominate the industries in which they operate, it may be especially difficult for us to replace these customers if we lose their business. A significant portion of orders in our backlog are orders from our principal customers.

In addition, a substantial investment is required by customers to install and integrate capital equipment into a production line. As a result, once a manufacturer has selected a particular vendor to supply capital equipment, the manufacturer will often attempt to consolidate its other capital equipment requirements with the same vendor. Accordingly, if a customer

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selects a competitor's product over ours, we could experience difficulty selling to that customer for a significant period of time.

Furthermore, we do not have long-term contracts with our customers. As a result, our agreements with our customers do not provide assurance of future sales, and we are exposed to competitive price pressures on new orders we attempt to obtain.

Our customer base is also highly concentrated in terms of geography, and the majority of our sales are to customers located in a limited number of countries. Dependence upon sales emanating from a limited number of regions increases our risk of exposure to local difficulties and challenges, such as those associated with regional economic downturns, political instability, trade wars and other trade disruptions, fluctuating currency exchange rates, natural disasters, social unrest, pandemics, terrorism, and acts of war. Our reliance upon customer demand arising primarily from a limited number of countries could materially and adversely impact our future results of operations.

The cyclicality of the industries we serve directly affects our business.

Our business depends in large part upon the capital expenditures of manufacturers in the LED, smartphones, data storage, and other device markets. We are subject to the business cycles of these industries, the timing, length, and volatility of which are difficult to predict. These industries have historically been highly cyclical and have experienced significant economic downturns in the last decade. As a capital equipment provider, our revenue depends in large part on the spending patterns of these customers, who often delay expenditures or cancel or reschedule orders in reaction to variations in their businesses or general economic conditions. In downturns, we must be able to quickly and effectively align our costs with prevailing market conditions, as well as motivate and retain key employees. However, because a portion of our costs are fixed, our ability to reduce expenses quickly in response to revenue shortfalls may be limited. Downturns in one or more of these industries have had, and will likely have, a material adverse effect on our business, financial condition, and operating results. Alternatively, during periods of rapid growth, we must be able to acquire and develop sufficient manufacturing capacity to meet customer demand and attract, hire, assimilate, and retain a sufficient number of qualified people. Our net sales and operating results may be negatively affected if our customers experience economic downturns or slowdowns in their businesses.

The timing of our orders, shipments, and revenue recognition may cause our quarterly operating results to fluctuate significantly.

We derive a substantial portion of our net sales in any fiscal period from the sale of a relatively small number of high-priced systems. As a result, the timing of recognition of revenue for a single transaction could have a material effect on our sales and operating results for a particular fiscal period. As is typical in our industry, orders, shipments, and customer acceptances often occur during the last few weeks of a quarter. As a result, a delay of only a week or two can impact which period revenue is reported and can cause volatility in our revenue for a given reporting period. Our quarterly results have fluctuated significantly in the past and we expect this trend to continue. If our orders, shipments, net sales, or operating results in a particular quarter do not meet expectations, our stock price may be adversely affected as well.

Our sales cycle is long and unpredictable.

Historically, we have experienced long and unpredictable sales cycles (the period between our initial contact with a potential customer and the time that we recognize revenue for resulting sales to that customer). Our sales cycle can exceed twelve months. The timing of an order often depends on our customer's capital expenditure budget, over which we have no control. In addition, the time it takes us to build a product to customer specifications typically ranges from three to six months. When coupled with the fluctuating amount of time required for shipment, installation, and final acceptance, our sales cycles often vary widely, and these variations can cause fluctuations in our operating results. As a result of our lengthy sales cycles, we may incur significant research, development, selling, general, and administrative expenses before we generate revenue for these products. We may never generate the anticipated revenue if a customer cancels or otherwise changes its purchase plans, which could have an adverse effect on our business.

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Our backlog is subject to customer cancellation or modification which could result in decreased sales, increased inventory obsolescence, and liabilities to our suppliers for products no longer needed.

Customer purchase orders may be cancelled or rescheduled by the customer, sometimes with limited or no penalties, which may result in increased or unrecoverable costs for the Company. We adjust our backlog for such cancellations, contract modifications, and delivery delays that result in a delivery period in excess of one year, among other items. A downturn in one or more of our businesses could result in an increase in order cancellations and postponements.

We write-off excess and obsolete inventory based on historical trends, future usage forecasts, and other factors including the amount of backlog we have on hand. If our backlog is canceled or modified, our estimates of future product demand may prove to be inaccurate, in which case we may have understated the write-off required for excess and obsolete inventory. In the future, if we determine that our inventory is overvalued, we will be required to recognize associated costs in our financial statements at the time of such determination. In addition, we place orders with our suppliers based on our customers' orders. If our customers cancel their orders with us, we may not be able to cancel our orders with our suppliers. Any such charges could be materially adverse to our results of operations and financial condition.

We may be unable to obtain required export licenses for the sale of our products.

Products which are either manufactured in the United States or based on U.S. technology are subject to the U.S. Export Administration Regulations ("EAR") when exported to and re-exported from international jurisdictions, in addition to the local jurisdiction's export regulations applicable to individual shipments. Currently, our MOCVD, MBE, and certain other systems and products are controlled for export under the EAR. Licenses or proper license exceptions may be required for the shipment of our products to certain customers or countries. Obtaining an export license or determining whether an export license exception exists often requires considerable effort by us and cooperation from the customer, which can add time to the order fulfillment process. We may be unable to obtain required export licenses or unable to qualify for export license exceptions and, as a result, we may be unable to export products to our customers. The administrative processing, potential delay and risk of ultimately not obtaining required export approvals pose a particular disadvantage to us relative to our non-U.S. competitors who are not required to comply with U.S. export controls. Non-compliance with the EAR or other applicable export regulations could result in a wide range of penalties including the denial of export privileges, fines, criminal penalties, and the seizure of commodities. In the event that an export regulatory body determines that any of our shipments violate applicable export regulations, we could be fined significant sums and our export capabilities could be restricted, which could have a material adverse impact on our business.

Our operating results may be adversely affected by tightening credit markets.

As a global company with worldwide operations, we are subject to volatility and adverse consequences associated with economic downturns in different parts of the world. In the event of a downturn, many of our customers may delay or reduce their purchases of our products and services. If negative conditions in the credit markets prevent our customers from obtaining credit or necessary financing, product orders in these channels may decrease, which could result in lower revenue. In addition, we may experience cancellations of orders in backlog, rescheduling of customer deliveries, and attendant pricing pressures. If our suppliers face challenges in obtaining credit, in selling their products, or otherwise in operating their businesses, their ability to continue to supply materials to us may be negatively affected.

In addition, we finance some of our sales through trade credit. In addition to ongoing credit evaluations of our customers' financial condition, we seek to mitigate our credit risk by obtaining deposits and letters of credit on certain of our sales arrangements. We could suffer significant losses if a customer whose accounts receivable we have not secured fails or is otherwise unable to pay us, or if financial institutions providing letters of credit become insolvent. A loss in collections on our accounts receivable would have a negative impact on our financial condition and results of operations.

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Our failure to estimate customer demand accurately could result in inventory obsolescence, liabilities to our suppliers for products no longer needed, and manufacturing interruptions or delays which could affect our ability to meet customer demand.

The success of our business depends in part on our ability to accurately forecast and supply equipment and services that meet the rapidly changing technical and volume requirements of our customers. To meet these demands, we depend on the timely delivery of parts, components, and subassemblies from our suppliers. Uncertain worldwide economic conditions and market instabilities make it difficult for us (and our customers) to accurately forecast future product demand. If actual demand for our products is different than expected, we may purchase more or fewer parts than necessary or incur costs for canceling, postponing, or expediting delivery of parts. If we overestimate the demand for our products, excess inventory could result which could be subject to heavy price discounting, which could become obsolete, and which could subject us to liabilities to our suppliers for products no longer needed. Similarly, we may be harmed in the event that our competitors overestimate the demand for their products and engage in heavy price discounting practices as a result. In addition, the volatility of demand for capital equipment poses risks for companies in our supply chain, including challenges associated with inventory management and fluctuating working capital requirements.

Furthermore, certain key parts may be subject to long lead-times or may be obtainable only from a single supplier or limited group of suppliers, and some sourcing and assembly is provided by suppliers located in countries other than the United States. We may experience significant interruptions in our manufacturing operations, delays in our ability to timely deliver products or services, increased costs, or customer order cancellations as a result of:

- the failure or inability of our suppliers to timely deliver quality parts;
- volatility in the availability and cost of materials;
- difficulties or delays in obtaining required import or export approvals;
- information technology or infrastructure failures;
- natural disasters such as earthquakes, tsunamis, floods, or storms; or
- other causes such as regional economic downturns, international trade disruptions, pandemics, political instability, terrorism, or acts of war, that could result in delayed deliveries, manufacturing inefficiencies, increased costs, or order cancellations.

In addition, in the event of an unanticipated increase in demand for our products, our need to rapidly increase our business and manufacturing capacity may be limited by working capital constraints of our suppliers, which may cause or exacerbate interruptions in our manufacturing and supply chain operations. Any or all of these factors could materially and adversely affect our business, financial condition, and results of operations.

Our failure to successfully manage our outsourcing activities or failure of our outsourcing partners to perform as anticipated could adversely affect our results of operations.

To better align our costs with market conditions, increase the percentage of variable costs relative to total costs, and to increase productivity and operational efficiency, we have outsourced certain functions to third parties, including the manufacture of several of our systems. While we maintain some level of internal manufacturing capability for these systems, we rely on our outsourcing partners to perform their contracted functions to allow us flexibility to adapt to changing market conditions, including periods of significantly diminished order volumes. If our outsourcing partners do not perform as required, or if our outsourcing model does not allow us to realize the intended cost savings and flexibility, our results of operations (and those of our third party providers) may be adversely affected. Disputes and possibly litigation involving third party providers could result and we could suffer damage to our reputation. Dependence on contract manufacturing and outsourcing may also adversely affect our ability to bring new products to market. Although we attempt to select reputable providers, one or more of these providers could fail to perform as we expect. If we do not effectively manage our outsourcing strategy or if third party providers do not perform as anticipated, we may not realize the benefits of productivity improvements and we may experience operational difficulties, increased costs, manufacturing and installation interruptions or delays, inefficiencies in the structure and operation of our supply chain, loss of intellectual property rights,

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quality issues, increased product time-to-market, and an inefficient allocation of our human resources, any or all of which could materially and adversely affect our business, financial condition, and results of operations.

We rely on a limited number of suppliers, some of whom are our sole source for particular components.

Certain of the parts, components, and sub-assemblies included in our products are obtained from a single source or a limited group of suppliers. Our inability to develop alternative sources, as necessary, could result in a prolonged interruption in our ability to supply related products, a failure on our part to meet the demands our customers, and a significant increase in the price of related products, which could adversely affect our business, financial condition, and results of operations.

Our inability to attract, retain, and motivate employees could have a material adverse effect on our business.

Our success depends in part upon our ability to attract, retain, and motivate employees, including those in executive, managerial, engineering and marketing positions, as well as highly skilled and qualified technical personnel. Attracting, retaining, and motivating such qualified personnel may be difficult due to challenging industry conditions, competition for such personnel by other technology companies, consolidations and relocations of operations, and workforce reductions, and there can be no assurance that we will be successful in recruiting or retaining key personnel. We have entered into employment agreements with certain key personnel but our inability to attract, retain, and motivate key personnel could have a material adverse effect on our business, financial condition, and results of operations.

We are exposed to risks associated with business combinations, acquisitions, and strategic investments.

We have completed several significant acquisitions and investments in the past and we will consider new opportunities in the future. Acquisitions and investments involve numerous risks, many of which are unpredictable and beyond our control, including the following:

- difficulties and increased costs in integrating the personnel, operations, technologies, and products of acquired companies;
- diversion of management’s attention and disruption of ongoing businesses;
- the inability to complete proposed transactions as anticipated, resulting in obligations to pay professional and other expenses, including any applicable termination fees;
- potential loss of key employees of acquired companies, especially if a relocation or change in responsibilities is involved;
- difficulties in managing geographically dispersed operations in a cost effective manner;
- the failure to realize expected synergies;

- unknown, underestimated, and undisclosed commitments or liabilities;
- increased amortization expenses relating to intangible assets; and
- other adverse effects on our business, including the potential impairment and write-down of amounts capitalized as intangible assets and goodwill as part of the acquisition, as a result of such matters as technological advancements or worse-than-expected performance by the acquired company.

In addition, if we issue equity securities to pay for an acquisition or investment, the ownership percentage of our then-current shareholders would be reduced and the value of the shares held by these shareholders could be diluted, which could adversely affect the price of our stock. If we use cash to pay for an acquisition or investment, the payment could significantly reduce the cash that would be available to fund our operations, pay our indebtedness, or be used for other purposes, which could have a negative effect on our business.

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We are subject to internal control evaluations and attestation requirements of Section 404 of the Sarbanes-Oxley Act and any delays or difficulties in satisfying these requirements or negative reports concerning our internal controls could adversely affect our future results of operations and our stock price.

Pursuant to Section 404 of the Sarbanes-Oxley Act of 2002, we must include in our Annual Report on Form 10-K a report by management on the effectiveness of our internal control over financial reporting. Ongoing compliance with this requirement is complex, costly, time-consuming, and is subject to significant judgment. If our internal controls are ineffective or if our management does not timely assess the adequacy of such internal controls, our ability to file timely and accurate periodic reports may be impeded. Any delays in filing may cause us to face the following risks and concerns, among others:

- concern on the part of our customers, partners, investors, and employees about our financial condition and filing delay status, including the potential loss of business opportunities;
- significant time and expense required to complete delayed filings and the distraction of our senior management team and board of directors as we work to complete delayed filings;
- investigations by the SEC and other regulatory authorities of the Company and our management;
- limitations on our ability to raise capital or possible violations of existing debt covenants;
- suspension or termination of our stock listing on The NASDAQ Stock Market and the removal of our stock as a component of certain stock market indices; and
- general reputational harm.

Any or all of the foregoing could result in the commencement of stockholder lawsuits against the Company. Any such litigation, as well as any proceedings that could arise as a result of a filing delay and the circumstances which gave rise to it, may be time consuming and expensive, may divert management attention from the conduct of our business, could have a material adverse effect on our business, financial condition, and results of operations, and may expose us to costly indemnification obligations to current or former officers, directors, or other personnel, regardless of the outcome of such matters, which may not be adequately covered by insurance.

Changes in accounting pronouncements or taxation rules or practices may adversely affect our financial results.

Changes in accounting pronouncements or taxation rules or practices can have a significant effect on our reported results. New accounting pronouncements and taxation rules can have a material impact on revenue recognition practices, effective tax rates, results of operations, and our financial condition. On December 22, 2017, President Trump signed into law the statute commonly referred to as the Tax Cuts and Jobs Act (“2017 Tax Act”), which made broad and complex changes to the U.S. tax code. This change could materially affect our financial position and tax attributes carryforward. In addition, varying interpretations of accounting pronouncements or taxation practices, and the questioning of our current or past practices (such as those associated with our transfer pricing), may adversely affect our reported financial results.

Our income taxes may change.

We are subject to income tax on a jurisdictional or legal entity basis and significant judgment is required in certain instances to allocate our taxable income to a jurisdiction and to determine the related income tax expense and benefits. Losses in one jurisdiction generally may not be used to offset profits in other jurisdictions. As a result, changes in the mix of our earnings (or losses) between jurisdictions, among other factors, could alter our overall effective income tax rate, possibly resulting in significant tax rate increases.

We are regularly audited by various tax authorities. Income tax audit assessments or changes in tax laws, regulations, or other interpretations may result in increased tax provisions which could materially affect our operating results in the period or periods in which such determinations are made or changes occur.

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In addition, our effective tax rate could increase if we determine that it is no longer more likely than not that we are able to realize our remaining net deferred tax assets, if we are unable to generate sufficient future taxable income in certain jurisdictions, or if we are otherwise required to increase our valuation allowances against our deferred tax assets.

We have indebtedness in the form of convertible senior notes which could adversely affect our financial position, prevent us from implementing our strategy, and dilute the ownership interest of our existing shareholders.

In January of 2017, we issued $345 million of 2.70% Convertible Senior Notes due 2023 (“Convertible Senior Notes”). The Convertible Senior Notes are convertible into Company common stock at an initial conversion rate of 24.98 shares of Company common stock per $1,000 principal amount of the Convertible Senior Notes. The Company is obligated to repurchase the Convertible Senior Notes upon the occurrence of certain events described in the indenture relating to the Convertible Senior Notes. The degree to which we are leveraged could have negative consequences, including but not limited to the following:

- we may be more vulnerable to economic downturns, less able to withstand competitive pressures, and less flexible in responding to changing business and economic conditions;
- our ability to obtain additional financing in the future for working capital, capital expenditures, acquisitions, general corporate, and other purposes may be limited;
- a substantial portion of our cash flows from operations in the future may be required for the payment of the principal amount of our existing indebtedness when it becomes due; and
- we may elect to make cash payments upon any conversion of the Convertible Senior Notes, which would reduce our cash on hand.

Our ability to meet our payment obligations under the Convertible Senior Notes depends on our ability to generate significant cash flow in the future. This, to some extent, is subject to general economic, financial, competitive, legislative, regulatory, and other factors that are beyond our control. There can be no assurance that our business will generate cash flow from operations, or that additional capital will be available to us, in an amount sufficient for us to meet our debt payment obligations and to fund other liquidity needs. If we are unable to generate sufficient cash flow to service our debt obligations, we may need to refinance or restructure our debt, sell assets, reduce or delay capital investments, or seek to raise additional capital. If we were unable to implement one or more of these alternatives, we may be unable to meet our debt payment obligations, which could have a material adverse effect on our business, results of operations, and financial condition.

Furthermore, if the Convertible Senior Notes are converted into shares of Company common stock, the issuance of additional shares of Company common stock would dilute the ownership interest of our existing shareholders and could have a dilutive effect on our net income per share to the extent that the price of our common stock exceeds the conversion price of the Convertible Senior Notes. In addition, any sales in the public market of our common stock issuable upon conversion of the Convertible Senior Notes could adversely affect prevailing market prices of our common stock.

The accounting method for convertible debt securities that may be settled in cash, such as the Convertible Senior Notes, could have a material effect on our reported financial results.

Under Accounting Standards Codification 470-20, Debt with Conversion and Other Options ("ASC 470-20"), an entity must separately account for the liability and equity components of certain convertible debt instruments (such as the Convertible Senior Notes) that may be settled entirely or partially in cash upon conversion in a manner that reflects the issuer's economic interest cost. The effect of ASC 470-20 on the accounting for the Convertible Senior Notes is that the equity component is required to be included in the additional paid-in capital section of stockholders' equity on our consolidated balance sheet, and the value of the equity component would be treated as original issue discount for purposes of accounting for the debt component of the Convertible Senior Notes. As a result, we will be required to record a greater amount of non-cash interest expense in current periods presented as a result of the amortization of the discounted carrying value of the Convertible Senior Notes to their face amount over the term of the Convertible Senior Notes. We will report lower net income in our financial results because ASC 470-20 will require interest to include both the current period's

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amortization of the debt discount and the instrument’s coupon interest, which could adversely affect our financial results, the trading price of our common stock, and the trading price of the Convertible Senior Notes.

In addition, under certain circumstances convertible debt instruments (such as the Convertible Senior Notes) that may be settled entirely or partly in cash can be accounted for utilizing the treasury stock method, the effect of which is that the shares issuable upon conversion of the Convertible Senior Notes are not included in the calculation of diluted earnings per share except to the extent that the conversion value of the Convertible Senior Notes exceeds their principal amount. Under the treasury stock method, for diluted earnings per share purposes, the transaction is accounted for as if the number of shares of common stock that would be necessary to settle such excess, if we elected to settle such excess in shares, are issued. We cannot be sure that the accounting standards in the future will continue to permit the use of the treasury stock method or that we will continue to expect to settle the principal balance in cash. If we are unable to use the treasury stock method in accounting for the shares issuable upon conversion of the Convertible Senior Notes, our diluted earnings per share could be adversely affected.

We are subject to foreign currency exchange risks.

We are exposed to foreign currency exchange rate risks that are inherent in our anticipated sales, sales and purchase commitments, and assets and liabilities that are denominated in currencies other than the U.S. dollar. Although we attempt to mitigate our exposure to fluctuations in currency exchange rates, hedging activities may not always be available or adequate to mitigate the impact of our exchange rate exposure. Failure to sufficiently hedge or otherwise manage foreign currency risks properly could materially and adversely affect our financial condition, results of operations, and liquidity.

Our previously announced share repurchase program could affect the price of our common stock and increase volatility and may be suspended or terminated at any time, which may result in a decrease in the trading price of our common stock.

Repurchases pursuant to our share repurchase program could affect our stock price and increase its volatility. The existence of a share repurchase program could also cause our stock price to be higher than it would be in the absence of such a program and could potentially reduce the market liquidity for our stock. There can be no assurance that any share repurchases will enhance stockholder value because the market price of our common stock may decline below the levels at which we repurchased shares of common stock. Although our share repurchase program is intended to enhance long term stockholder value, short term stock price fluctuations could reduce the program’s effectiveness. Furthermore, the program does not obligate the Company to repurchase any dollar amount or number of shares of common stock, and may be suspended or discontinued at any time and any suspension or discontinuation could cause the market price of our stock to decline.

We have adopted certain measures that may have anti-takeover effects which may make an acquisition of our Company by another company more difficult.

We have adopted, and may in the future adopt, certain measures that may have the effect of delaying, deferring, or preventing a takeover or other change in control of our Company, which a holder of our common stock might not consider to be in the holder's best interest. These measures include:

- "blank check" preferred stock;
- a classified board of directors; and
- certain other certificate of incorporation and bylaws provisions.

Our board of directors has the authority to issue up to 500,000 shares of preferred stock and to fix the rights (including voting rights), preferences and privileges of these shares ("blank check" preferred). Such preferred stock may have rights, including economic rights, senior to our common stock. As a result, the issuance of the preferred stock could have a material adverse effect on the price of our common stock and could make it more difficult for a third party to acquire a majority of our outstanding common stock.

Our board of directors is divided into three classes with each class serving a staggered three-year term. The existence of a classified board makes it more difficult for our shareholders to change the composition of our board of directors, and therefore the Company’s policies, in a relatively short period of time.

We have adopted certain certificate of incorporation and bylaws provisions which have anti-takeover effects. These include: (a) requiring certain actions to be taken at a meeting of shareholders rather than by written consent, (b) requiring a super-majority of shareholders to approve certain amendments to our bylaws, (c) limiting the maximum number of directors, and (d) providing that directors may be removed only for “cause.” These measures and those described above may have the effect of delaying, deferring, or preventing a takeover or other change in control of our Company that a holder of our common stock might consider to be in the holder’s best interest.

In addition, we are subject to the provisions of Section 203 of the General Corporation Law of the State of Delaware, which prohibits a Delaware corporation from engaging in any business combination, including mergers and asset sales, with an interested stockholder (generally, a 15% or greater stockholder) for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is approved in a prescribed manner. The operation of Section 203 may have anti-takeover effects, which could delay, defer, or prevent a takeover attempt that a holder of our common stock might consider to be in the holder’s best interest.

Despite the above measures, an activist shareholder could undertake action to implement governance, strategic, or other changes to the Company which a holder of our common stock might not consider to be in the holder’s best interest. Such activities could interfere with our ability to execute our strategic plans, be costly and time consuming, disrupt our operations, and divert the attention of management and our employees.

We are exposed to various risks associated with global regulatory requirements.

As a public company with global operations, we are subject to the laws of the United States and multiple foreign jurisdictions, and the rules and regulations of various governing bodies, which may differ among jurisdictions. We are required to comply with legal and regulatory requirements pertaining to such matters as privacy, labor laws, immigration, customs, trade, taxes, corporate governance, conflict minerals and other social responsibility legislation, and antitrust regulations, among others. These laws and regulations, which are ever-evolving and at times complex and inconsistent, impose costs on our business and divert management time and attention from revenue-generating activities. Changes to or ambiguities in these laws and regulations may create uncertainty regarding our compliance requirements. While we intend to invest the required resources to comply with these regulatory requirements, if we are found by a court or regulatory agency to have failed in these efforts, our business, financial condition, and results of operations could be adversely affected.

We may be exposed to liabilities under the Foreign Corrupt Practices Act and other similar laws.

We are subject to the Foreign Corrupt Practices Act of 1977 (“FCPA”) and other laws that prohibit improper payments or offers of payments to foreign government officials, as defined by the statute, for the purpose of obtaining or retaining business. In addition, many of our customers have policies limiting or prohibiting us from providing certain types or amounts of entertainment, meals, or gifts to their employees. It is our policy to implement safeguards to discourage these practices by our employees and representatives. However, our safeguards may prove to be ineffective and our employees, consultants, sales agents, or distributors may engage in conduct for which we may be held responsible. In addition, we may acquire a company that has engaged in unlawful conduct in the past, and be held responsible for this conduct through successor liability principles. Violations of the FCPA or similar laws or similar customer policies may result in severe criminal or civil sanctions or the loss of supplier privileges to a customer and we may be subject to other liabilities, which could negatively affect our business, financial condition, and results of operations.

We are subject to risks of non-compliance with environmental, health, and safety regulations.

We are subject to environmental, health, and safety regulations in connection with our business operations, including but not limited to regulations related to the development, manufacture and use of our products, recycling and disposal of related materials, and the operation and use of our facilities and real property. Failure or inability to comply with existing or future

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environmental and safety regulations, which vary from jurisdiction to jurisdiction, could result in significant remediation liabilities, the imposition of fines, and the suspension or termination of research, development, or use of certain of our products, each of which could have a material adverse effect on our business, financial condition, and results of operations. In addition, some of our operations involve the storage, handling, and use of hazardous materials that may pose a risk of fire, explosion, or environmental release. Such events could result from acts of terrorism, natural disasters, or operational failures and may result in injury or loss of life to our employees and others, local environmental contamination, and property damage. These events might cause a temporary shutdown of an affected facility, or portion thereof, and we could be subject to penalties or claims as a result. Each of these events could have a material adverse effect on our business, financial condition, and results of operations.

We have significant operations in locations which could be materially and adversely impacted in the event of a natural disaster, an act of terrorism, or other significant disruption.

Our operations in the United States, in the Asia-Pacific region, and in other areas could be subject to natural disasters or other significant disruptions, including earthquakes, tsunamis, fires, hurricanes, floods, water shortages, other extreme weather conditions, medical epidemics, power shortages and blackouts, telecommunications failures, and other natural and manmade disasters or disruptions. In the event of such a natural disaster or other disruption, we could experience disruptions or interruptions to our operations and to the operations of our suppliers, distributors, resellers and customers, destruction of facilities and loss of life, all of which could materially increase our costs and expenses and materially and adversely affect our business, financial condition, and results of operations. In addition, various regions of the world in which we do business are subject to the threat of terrorism and acts of war. Any act of terrorism or war that affects the economy or the industries in which we operate could result in significant harm to us, including the loss of life and property, manufacturing and transportation delays, disruptions in our supply chain, the need to comply with enhanced security measures, and other increased costs.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our corporate headquarters and principal research and development, manufacturing, and sales and service facilities are:

Owned Facilities Location	Approximate Size (sq. ft.)	Use
Plainview, NY	80,000	Corporate Headquarters; R&D; Sales & Service; Administration
Somerset, NJ	80,000	R&D; Manufacturing; Sales & Service; Administration
St. Paul, MN	43,000	R&D; Manufacturing; Sales & Service; Administration
Somerset, NJ	38,000	R&D; Sales & Service; Administration

Leased Facilities Location	Approximate Size (sq. ft.)	Use	Lease Expires
San Jose, CA	100,000	R&D; Manufacturing; Sales & Service; Administration	2021
Somerset, NJ	57,000	Warehouse	2022
Horsham, PA	49,000	R&D; Manufacturing; Sales & Service; Administration	2024
Singapore	23,000	R&D; Manufacturing; Sales & Service; Administration	2023
Waltham, MA	19,000	R&D; Sales & Service; Administration	2023
Hsinchu City, Taiwan	13,000	Sales & Service; Administration	2020

In addition to the above, we lease a small office in Malta, New York for sales and service and our foreign sales and service subsidiaries lease office space in China, Germany, Japan, Malaysia, Philippines, South Korea, Thailand, and the United Kingdom. We believe our facilities are adequate to meet our current needs.

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Item 3. Legal Proceedings

On June 8, 2018, an Ultratech shareholder who received Veeco stock as part of the consideration for the Ultratech acquisition filed a purported class action complaint in the Superior Court of the State of California, County of Santa Clara, captioned Wolther v. Maheshwari et al., Case No. 18CV329690, on behalf of himself and others who purchased or acquired shares of Veeco pursuant to the registration statement and prospectus which Veeco filed with the SEC in connection with the Ultratech acquisition (the “Wolther Action”). On August 2 and August 8, 2018, two purported class action complaints substantially similar to the Wolther Action were filed on behalf of different plaintiffs in the same court as the Wolther Action. These cases have been consolidated with the Wolther Action, and a consolidated complaint was filed on December 11, 2018. The consolidated complaint seeks to recover damages and fees under Sections 11, 12, and 15 of the Securities Act of 1933 for, among other things, alleged false/misleading statements in the registration statement and prospectus relating to the Ultratech acquisition, relating primarily to the alleged failure to disclose delays in the advanced packaging business, increased MOCVD competition in China, and an intellectual property dispute. The defendants filed a demurrer on January 10, 2019, asking the court to dismiss the consolidated complaint for failure to state a claim. The demurrer is scheduled to be heard by the court on March 15, 2019. Veeco believes this lawsuit is without merit and intends to vigorously contest this matter.

On December 21, 2018, a purported Veeco stockholder filed a derivative action in the Superior Court of the State of California, County of Santa Clara, captioned Vladimir Gusinsky Revocable Trust v. Peeler, et al., Case No. 18CV339925, on behalf of nominal defendant Veeco. The complaint seeks to assert claims for breach of fiduciary duty, waste of corporate assets, and unjust enrichment against current and former Veeco directors premised on purported misstatements and omissions in the registration statement relating to the Ultratech acquisition. On January 2, 2019, the court ordered this action stayed until the case management conference, which is scheduled for March 15, 2019. Veeco believes this lawsuit is without merit and intends to vigorously contest this matter.

The Company is involved in various other legal proceedings arising in the normal course of business. The Company does not believe that the ultimate resolution of these matters will have a material adverse effect on its consolidated financial position, results of operations, or cash flows.

Item 4. Mine Safety Disclosures

Not Applicable.

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PART II

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

Our common stock is quoted on The NASDAQ Stock Market under the symbol “VECO.” We have not paid dividends on our common stock. The Board of Directors will determine future dividend policy based on our consolidated results of operations, financial condition, capital requirements, and other circumstances.

Issuer Purchases of Equity Securities

During fiscal years 2018, 2017, and 2016, we repurchased 1.0 million shares, 0.2 million shares, and 0.7 million shares of our common stock for $11.3 million, $3.0 million, and $13.1 million, respectively, through our share repurchase programs. On December 11, 2017, our Board of Directors authorized a program to repurchase up to $100 million of the Company’s outstanding common stock to be completed through December 11, 2019, after completion of the previous program on October 28, 2017. We did not purchase any shares during the fourth quarter of 2018. At December 31, 2018, $14.3 million of the $100 million had been utilized. Repurchases may be made from time to time on the open market or in privately negotiated transactions in accordance with applicable federal securities laws. The timing and amount of future repurchases, if any, will depend upon market conditions, SEC regulations, and other factors. The repurchases would be funded using available cash balances and cash generated from operations. The program does not obligate us to acquire any particular amount of common stock and may be modified or suspended at any time at our discretion.

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Stock Performance Graph

ASSUMES $100 INVESTED ON DEC. 31, 2013

ASSUMES DIVIDENDS REINVESTED

FISCAL YEAR ENDING DEC. 31

	2013	2014	2015	2016	2017	2018
Veeco Instruments Inc.	100.00	105.99	62.47	88.57	45.12	22.52
S&P Smallcap 600	100.00	105.76	103.67	131.20	148.56	135.96
RDG MidCap Technology	100.00	93.93	84.05	83.59	87.28	79.60

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Item 6. Selected Financial Data

The information set forth below should be read in conjunction with the "Results of Operations" section included in Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations."

	Year ended December 31,				
	2018	2017 (1)(2)	2016 (1)	2015 (1)	2014 (1)(3)
	(in thousands, except per share data)				
Statement of Operations Data:					
Net sales	$ 542,082	$ 475,686	$ 331,702	$ 477,038	$ 392,873
Operating income (loss)	(415,502)	(71,868)	(120,162)	(23,232)	(79,209)
Net Income (loss)	(407,088)	(51,396)	(122,027)	(31,978)	(66,940)
Basic income (loss) per common share	(8.63)	(1.16)	(3.10)	(0.80)	(1.70)
Diluted income (loss) per common share	(8.63)	(1.16)	(3.10)	(0.80)	(1.70)

(1) Effective January 1, 2018, the Company adopted the new revenue accounting standard ("ASC 606"). The results of operations for 2017 and 2016 have been recast for the new standard, while prior years have not. Refer to Note 1, "Significant Accounting Policies" for additional information.
(2) During the second quarter of 2017, the Company acquired Ultratech. The results of operations of Ultratech have been included in the consolidated financial statements since that date.
(3) During the fourth quarter of 2014, the Company acquired PSP. The results of operations of PSP have been included in the consolidated financial statements since that date.

	December 31,				
	2018	2017 (1)	2016 (1)	2015 (1)	2014 (1)
	(in thousands)				
Balance Sheet Data:					
Cash and cash equivalents	$ 212,273	$ 279,736	$ 277,444	$ 269,232	$ 270,811
Short-term investments	48,189	47,780	66,787	116,050	120,572
Working capital	360,027	372,822	365,374	379,904	387,254
Total assets	900,816	1,387,475	763,988	890,789	929,455
Long-term debt (less current installments)	287,392	275,630	826	1,193	1,533
Total equity	437,775	840,093	601,704	714,615	738,932

(1) Effective January 1, 2018, the Company adopted the new revenue accounting standard ("ASC 606"). The results of operations for 2017 and 2016 have been recast for the new standard, while prior years have not. Refer to Note 1, "Significant Accounting Policies" for additional information.

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

Executive Summary

We are a leading manufacturer of innovative semiconductor and thin film process equipment. Our proven MOCVD, lithography, laser annealing, ion beam, and single wafer etch and clean technologies play an integral role in producing LEDs for solid-state lighting and displays, and in the fabrication of advanced semiconductor devices. With equipment designed to optimize performance, yield, and cost of ownership, we hold technology leadership positions in all these served markets.

We categorize our revenue by the key market segments into which we sell. Our four key markets are: Advanced Packaging, MEMS & RF Filters; LED Lighting, Display & Compound Semiconductor; Front-End Semiconductor; and Scientific & Industrial.

Sales in the Advanced Packaging, MEMS & RF Filter market were driven by Lithography and PSP systems. Advanced Packaging opportunities remained soft in 2018 as mobile supply chains were dealing with excess capacity due to weak mobile device forecasts. While Advanced Packaging has typically been associated with logic devices, recent traction in DRAM packaging with our lithography systems has been encouraging. We remain well positioned for future growth in these markets, supported by trends such as mobile connectivity, automotive electronics, big data processing, and 5G infrastructure deployment, as well as the longer term growth of FOWLP and other Advanced Packaging applications.

Sales in the LED Lighting, Display & Compound Semiconductor market were driven by the continued shipment of MOCVD systems to customers in China for general lighting and backlighting. However, orders for LED systems have softened as customers digest recently added capacity for general lighting and backlighting. Additionally, a more competitive landscape has emerged in China, and as a result of this commoditization, we do not expect sales in this market to be a large portion of our revenue going forward. More recently, we have seen an increase in demand in non general-lighting applications such as 3D sensors, VCSELs, laser diodes, and RF devices. Our broad portfolio of MOCVD and PSP technologies have been developed to support these significant industry trends. Our product mix in the LED market is shifting, and we expect to see an improvement in gross margins in 2019 as the lower gross margin business becomes a smaller portion of our overall business.

Sales in the Front-End Semiconductor market were primarily driven by Laser Annealing systems and IBE systems sold into STT-MRAM applications. We continue to build momentum in the Front-End Semiconductor market with additional orders for our Low Defect Density Ion Beam Deposition ("LDD-IBD") system for Extreme Ultraviolet ("EUV") Mask Blank Production. We believe these orders reflect the ongoing adoption of EUV Lithography for advanced node, front-end semiconductor manufacturing. Additionally, we see strong interest from customers for our laser anneal systems, which are being qualified at an advanced node.

Sales in the Scientific & Industrial market were supported by shipments of Ion Beam systems for data storage applications and optical coatings as well as shipments of MBE systems to universities and laboratories. Demand for our Ion Beam products for Data Storage is being driven by the requirements to improve areal density of magnetic heads for hard disk drive manufacturers as well as an overall projected volume increase of thin film magnetic heads. These two factors taken together are driving additional capacity and equipment upgrades. While equipment demand from each individual market may fluctuate quarter to quarter, the diverse customer base has historically provided a relatively stable revenue stream for the Company.

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Results of Operations

Effective January 1, 2018, we adopted ASC Topic 606, Revenue from Contracts with Customers (“ASC 606”). The results of operations for 2017 and 2016 have been recast for the new standard. Refer to Note 1, “Significant Accounting Policies” for additional information.

Years Ended December 31, 2018 and 2017

The following table presents revenue and expense line items reported in our Consolidated Statements of Operations for 2018 and 2017 and the period-over-period dollar and percentage changes for those line items. Our results of operations are reported as one business segment, represented by our single operating segment.

	For the year ended December 31,						Change		
	2018			2017			Period to Period		
	(dollars in thousands)								
Net sales	$ 542,082	100	%	$ 475,686	100	%	$ 66,396	14	%
Cost of sales	348,363	64	%	299,458	63	%	48,905	16	%
Gross profit	193,719	36	%	176,228	37	%	17,491	10	%
Operating expenses, net:									
Research and development	97,755	18	%	81,987	17	%	15,768	19	%
Selling, general, and administrative	92,060	17	%	100,250	21	%	(8,190)	(8)	%
Amortization of intangible assets	32,351	6	%	35,475	7	%	(3,124)	(9)	%
Restructuring	8,556	2	%	11,851	2	%	(3,295)	(28)	%
Acquisition costs	2,959	1	%	17,786	4	%	(14,827)	(83)	%
Asset impairment	375,172	69	%	1,139	0	%	374,033	*	
Other, net	368	0	%	(392)	(0)	%	760	*	
Total operating expenses, net	609,221	112	%	248,096	52	%	361,125	146	%
Operating income (loss)	(415,502)	(77)	%	(71,868)	(15)	%	(343,634)	*	
Interest income (expense), net	(18,332)	(3)	%	(17,122)	(4)	%	(1,210)	7	%
Income (loss) before income taxes	(433,834)	(80)	%	(88,990)	(19)	%	(344,844)	*	
Income tax expense (benefit)	(26,746)	(5)	%	(37,594)	(8)	%	10,848	(29)	%
Net income (loss)	$ (407,088)	(75)	%	$ (51,396)	(11)	%	$ (355,692)	*	

* Not meaningful

Net Sales

The following is an analysis of sales by market and by region:

	Year ended December 31,						Change		
	2018			2017			Period to Period		
	(dollars in thousands)								
Sales by market									
Advanced Packaging, MEMS & RF Filters	$ 90,775	17	%	$ 67,406	15	%	$ 23,369	35	%
LED Lighting, Display & Compound Semiconductor	249,974	46	%	248,615	52	%	1,359	1	%
Front-End Semiconductor	62,582	12	%	40,319	8	%	22,263	55	%
Scientific & Industrial	138,751	25	%	119,346	25	%	19,405	16	%
Total	$ 542,082	100	%	$ 475,686	100	%	$ 66,396	14	%
Sales by geographic region									
United States	$ 125,659	23	%	$ 93,433	20	%	$ 32,226	34	%
China	194,032	36	%	106,674	22	%	87,358	82	%
EMEA	89,102	16	%	72,979	15	%	16,123	22	%
Rest of World	133,289	25	%	202,600	43	%	(69,311)	(34)	%
Total	$ 542,082	100	%	$ 475,686	100	%	$ 66,396	14	%

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Total sales increased across all market categories for the year ended December 31, 2018 against the comparable prior year period, driven by additional sales from the Ultratech business acquired in May 2017, primarily in the Advanced Packaging, MEMS & RF Filters market. Additionally, sales in the Scientific & Industrial market were driven primarily by shipments of Ion Beam deposition systems for data storage applications as well as optical coatings. Pricing did not have a significant impact on the change in total sales. By geography, sales increased in the United States, China, and EMEA regions, offset by a decrease in the Rest of World region. The most significant increase occurred in the China region, which was largely attributable to the increased sales in the LED Lighting, Display & Compound Semiconductor and Front-End Semiconductor markets. We do not expect significant new orders in China for the LED Lighting, Display & Compound Semiconductor market in the near future. Sales decreased in Rest of World due to a reduction of sales in the LED lighting, Display & Compound Semiconductor market in Malaysia. We expect there will continue to be year-to-year variations in our future sales distribution across markets and geographies.

Gross Profit

In 2018, gross margins decreased compared to 2017 due to a shift in our product mix in the LED market that we saw in the first half of 2018, while gross profit increased due to an increase in sales volume, including the acquisition of Ultratech.

Research and Development

The markets we serve are characterized by continuous technological development and product innovation, and we invest in various research and development initiatives to maintain our competitive advantage and achieve our growth objectives. Research and development expenses increased in 2018 compared to 2017 primarily as a result of the addition of a full year of the acquired Ultratech research and development related projects.

Selling, General, and Administrative

Selling, general, and administrative expenses decreased in 2018 compared to 2017, as increases due to the addition of the acquired Ultratech related selling, general, and administrative costs for a full year were offset by reductions to personnel-related expenses, including a reduction in incentive compensation, and professional fees as a result of our initiative to enhance efficiency and reduce costs.

On November 1, 2018, we announced an attack on our computer systems. Upon learning of the attack, forensic experts were promptly engaged to assist with the investigation. We also notified law enforcement of the incident.

The investigation, which has largely been completed, determined that our computer systems were accessed by what appears to be a highly-sophisticated actor at various times over a period of years. It appears that proprietary and confidential information of the Company and certain personal information of our employees was accessed and may have been compromised as a result of the incident. Based on the evidence available at this time, the extent and impact of the compromise cannot be determined. We notified employees of this incident. We are continuing to analyze the incident, along with appropriate remediation of our computer systems. That analysis and the related remediation efforts could ultimately reveal that additional information was revealed or compromised.

Based on the evidence available at this time, we do not know if or when we will be able to determine the potential impact to us, whether we will be able to identify who is responsible for this attack, or whether we will be able to pursue legal action or other remedies to protect any compromised information or recover damages related to the attack. This attack, including the expenses incurred to address it, may have an adverse effect on our results of operations and/or financial condition. In addition, this attack may have caused the loss or misuse of proprietary and confidential information of us or others, result in litigation and potential liability, damage our reputation, and/or otherwise harm our business.

We take the security of our information, and that relating to our employees, customers, and trading partners, very seriously and have taken steps to prevent a similar incident from occurring in the future. We are continuing to cooperate fully with the investigation by law enforcement.

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Amortization Expense

Amortization expense decreased slightly in 2018 compared to 2017, as increases in amortization expense as a result of the additional intangibles acquired as part of the acquisition of Ultratech were offset by the lower amortization resulting from the impairment of intangible assets of $252.3 million during the second quarter of 2018. We expect to see a decrease in amortization expense in future years as a result of this impairment.

Restructuring Expense

During 2017, we initiated certain restructuring activities related to our efforts to streamline operations, enhance efficiencies, and reduce costs, and we reduced our investments in certain technology development. In addition, during 2017, we began the Ultratech acquisition integration process to enhance efficiencies, resulting in reductions in headcount and other facility costs. During the year ended December 31, 2018, additional accruals were recognized and payments were made related to these restructuring initiatives.

During the second quarter of 2018, we initiated plans to further reduce excess capacity associated with the manufacture and support of our advanced packaging lithography and 3D wafer inspection systems by consolidating these operations into our San Jose, California facility. As a result of this and other cost saving initiatives, we announced headcount reductions of approximately 40 employees and recorded restructuring charges related to these actions of $2.8 million for the year ended December 31, 2018, consisting principally of personnel severance and related costs. We expect the consolidation to be completed in the first quarter of 2019, and expect to incur immaterial additional restructuring costs as this initiative is completed.

During the third quarter of 2018, we initiated additional restructuring activities to further reduce costs, including headcount reductions impacting approximately 35 employees, and recorded restructuring charges related to these actions of $1.2 million, consisting principally of personnel severance and related costs. This initiative was completed by the end of 2018, and we expect it to provide approximately $5 million in annualized savings. Restructuring expense for the year ended December 31, 2018 included non-cash charges of $1.2 million related to accelerated share-based compensation for employee terminations, compared to $1.9 million for the comparable prior year period.

Acquisition Costs

Acquisition costs are non-recurring charges incurred in connection with the acquisition of the Ultratech business, as well as legal and professional fees incurred in connection with certain integration activities. Acquisition costs included $4.2 million of non-cash charges related to accelerated share-based compensation for employee terminations for the year ended December 31, 2017.

Asset Impairment

During the second quarter of 2018, we lowered our projected results for the Ultratech asset group, which were significantly below the projected results at the time of the acquisition. The reduced projections were based on lower than expected unit volume of certain smartphones, which incorporate advanced packaging methods such as FOWLP, and a delay in the adoption of FOWLP advanced packaging by other electronics manufacturers, both of which slowed orders and reduced revenue projections for our advanced packaging lithography systems. In addition, there has been a delay in the build out of 28nm facilities by companies in China who were expected to purchase our LSA systems. Taken together, the reduced projections identified during the second quarter of 2018 required us to assess the Ultratech asset group for impairment. As a result of the analysis, during the second quarter of 2018 we recorded a $252.3 million non-cash intangible asset impairment charge.

Additionally, as a result of a significant decline in our stock price during the fourth quarter of 2018, we concluded it was appropriate to perform an interim goodwill impairment test as of the end of the fourth quarter. The fair value of our reporting unit was determined using an adjusted market capitalization approach, which is calculated by multiplying our stock price by the number of outstanding shares and adding a control premium. The fair value of our reporting unit was determined to be below the carrying value, and we recorded an impairment charge equal to the excess of carrying value over fair value, or $122.8 million, for the year ended December 31, 2018. The valuation of goodwill will continue to be subject to changes in our market capitalization and observable market control premiums. This analysis is sensitive to changes in our stock price and absent other qualitative factors, we may be required to record additional goodwill impairment charges in future periods if the stock price declines and remains depressed for an extended period of time.

Interest Income (Expense)

For the year ended December 31, 2018, we recorded net interest expense of $18.3 million, compared to $17.1 million for the comparable prior period. The increase in net interest expense is primarily attributable to the Convertible Senior Notes issued in January 2017 that were outstanding for the full period in 2018, compared to a partial period in 2017. Included in interest expense for the year ended December 31, 2018 and 2017 were non-cash charges of $11.8 million and $10.4 million, respectively, related to the amortization of debt discount and transaction costs of the Convertible Senior Notes.

Income Taxes

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the “2017 Tax Act”), which made broad and complex changes to the U.S. tax code. In response to the 2017 Tax Act, the SEC staff issued Staff Accounting Bulletin No. 118 (“SAB 118”) which provided guidance on accounting for the tax effects of the 2017 Tax Act, including addressing any uncertainty or diversity of view in applying ASC 740, Income Taxes (“ASC 740”), in the reporting period in which the 2017 Tax Act was enacted. In addition, SAB 118 provided a measurement period that should not extend beyond one year from the 2017 Tax Act enactment date for companies to complete the accounting under ASC 740.

During the year ended December 31, 2017, we recorded an $11.3 million income tax benefit related to the re-measurement of our deferred tax assets and liabilities at the reduced rate of 21 percent and a reduction in our U.S. valuation allowance attributable to indefinite lived intangible assets becoming a source of future taxable income for certain deferred tax assets that are expected to have an indefinite life due to the 2017 Tax Act. During the year ended December 31, 2018, we finalized the accounting for the tax effects of the 2017 Tax Act based on legislative updates currently available and recorded an additional income tax benefit of $1.7 million for alternative minimum tax credits that became refundable in accordance with the 2017 Tax Act. We also reported an increase in deferred tax assets of

$6.8 million as a result of adjustments to tax attributes utilized for one-time transition tax, which was offset by a full valuation allowance.

The 2018 income tax benefit of $26.7 million is comprised of: (i) a $25.2 million income tax benefit related to the impairment of certain intangible assets during the year, (ii) a $1.7 million income tax benefit recorded in connection with the 2017 Tax Act, (iii) a $0.4 million income tax expense related primarily to U.S. tax amortization of our indefinite-lived intangible assets that is not available to offset existing deferred tax assets, as well as state and local income taxes, and (iv) a $0.2 million income tax benefit from non-U.S. operations and non-U.S. withholding taxes recorded as we now expect to repatriate certain foreign earnings as a result of changes in tax laws under the 2017 Tax Act.

The 2017 income tax benefit of $37.6 million is comprised of: (i) a $25.3 million income tax benefit related to domestic losses incurred during the year ended December 31, 2017, as the deferred tax liability created by the issuance of the Convertible Senior Notes and recorded as a component of APIC is treated as a source of income in fiscal 2017, (ii) a $11.3 million income tax benefit recorded in connection with the 2017 Tax Act, and (iii) a $1.0 million income tax benefit from non-U.S. operations primarily attributable to a reduction in uncertain tax positions and the recognition of a deferred tax asset for certain non-U.S. net operating losses generated in prior years that have become realizable on a more-likely-than-not basis, offset by tax expense attributed to the profitable non-U.S. operations, as well as withholding

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taxes recorded as we now expect to repatriate certain foreign earnings as a result of changes in tax laws under the 2017 Tax Act.

Years Ended December 31, 2017 and 2016

The following table presents revenue and expense line items reported in our Consolidated Statements of Operations for 2017 and 2016 and the period-over-period dollar and percentage changes for those line items. Our results of operations are reported as one business segment, represented by our single operating segment.

	For the year ended December 31,				Change	
	2017		2016		Period to Period	
	(dollars in thousands)					
Net sales	$ 475,686	100 %	$ 331,702	100 %	$ 143,984	43 %
Cost of sales	299,458	63 %	198,604	60 %	100,854	51 %
Gross profit	176,228	37 %	133,098	40 %	43,130	32 %
Operating expenses, net:						
Research and development	81,987	17 %	81,016	24 %	971	1 %
Selling, general, and administrative	100,250	21 %	77,642	23 %	22,608	29 %
Amortization of intangible assets	35,475	7 %	19,219	6 %	16,256	85 %
Restructuring	11,851	2 %	5,640	2 %	6,211	110 %
Acquisition costs	17,786	4 %	—	0 %	17,786	*
Asset impairment	1,139	0 %	69,520	21 %	(68,381)	(98) %
Other, net	(392)	0 %	223	0 %	(615)	*
Total operating expenses, net	248,096	52 %	253,260	76 %	(5,164)	(2) %
Operating income (loss)	(71,868)	(15) %	(120,162)	(36) %	48,294	(40) %
Interest income (expense), net	(17,122)	(4) %	958	0 %	(18,080)	*
Income (loss) before income taxes	(88,990)	(19) %	(119,204)	(36) %	30,214	(25) %
Income tax expense (benefit)	(37,594)	(8) %	2,823	1 %	(40,417)	*
Net income (loss)	$ (51,396)	(11) %	$ (122,027)	(37) %	$ 70,631	(58) %

* Not Meaningful

Net Sales

The following is an analysis of sales by market and by region:

	Year ended December 31,						Change		
	2017			2016			Period to Period		
	(dollars in thousands)								
Sales by market									
Advanced Packaging, MEMS & RF Filters	$ 67,406	15	%	$ 67,484	20	%	$ (78)	(0)	%
LED Lighting, Display & Compound Semiconductor	248,615	52	%	145,701	44	%	102,914	71	%
Front-End Semiconductor	40,319	8	%	8,427	3	%	31,892	378	%
Scientific & Industrial	119,346	25	%	110,090	33	%	9,256	8	%
Total	$ 475,686	100	%	$ 331,702	100	%	$ 143,984	43	%
Sales by geographic region									
United States	$ 93,433	20	%	$ 85,582	26	%	$ 7,851	9	%
China	106,674	22	%	84,604	26	%	22,070	26	%
EMEA	72,979	15	%	84,181	25	%	(11,202)	(13)	%
Rest of World	202,600	43	%	77,335	23	%	125,265	162	%
Total	$ 475,686	100	%	$ 331,702	100	%	$ 143,984	43	%

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Total sales increased in 2017 from 2016 due to increased sales in the LED Lighting, Display & Compound Semiconductor, Front-End Semiconductor, and Scientific & Industrial markets, driven by LED industry conditions, as well as additional sales of approximately $65.3 million from the Ultratech business acquired in May 2017, primarily in the Front-End Semiconductor and Advanced Packaging, MEMS & RF Filters markets. Pricing was not a significant driver of the change in total sales. By geography, sales increased in the United States, China, and Rest of World regions, offset by a slight decrease in the EMEA region. The most significant increase occurred in the Rest of World region, which was attributable to the increased sales in the LED Lighting, Display & Compound Semiconductor market in Malaysia, as well as additional sales from the Ultratech business acquired in May 2017. Sales into Malaysia for the year ended December 31, 2017 was approximately $77.2 million, compared to $6.2 million for the year ended December 31, 2016. Sales in China increased principally due to increased sales in the LED Lighting, Display & Compound Semiconductor market. We expect there will continue to be year-to-year variations in our future sales distribution across markets and geographies.

Gross Profit

In 2017, gross profit increased compared to 2016 due to an increase in sales volume, including the acquisition of Ultratech, partially offset by decreased gross margins. Gross margins decreased principally due to the sale of inventory that included a fair value step-up that was recorded in 2017 in connection with the purchase accounting relating to the Ultratech acquisition.

Research and Development

The markets we serve are characterized by continuous technological development and product innovation, and we invest in various research and development initiatives to maintain our competitive advantage and achieve our growth objectives. Research and development expenses remained relatively flat in 2017 compared to 2016, as the addition of the acquired Ultratech related research and development projects was offset by our decision to reduce investments in certain technology, as well as decreases in other personnel-related expenses and professional fees, as a result of our initiative to streamline operations, enhance efficiency, and reduce costs.

Selling, General, and Administrative

Selling, general, and administrative expenses increased primarily due to the addition of the acquired Ultratech related selling, general, and administrative costs, as well as increased professional and legal fees.

Amortization Expense

The increase in amortization expense is a result of the additional intangibles acquired as part of the acquisition of Ultratech, offset by the lower amortization resulting from the impairment of the certain technology assets in the prior year as well as certain other intangible assets becoming fully amortized during 2016.

Restructuring Expense

During 2016, we undertook restructuring activities as part of our initiative to streamline operations, enhance efficiencies, and reduce costs, as well as reducing future investments in certain technology development, which together impacted approximately 75 employees. These activities were substantially completed in 2017. In addition, during 2017, we began the acquisition integration process to enhance efficiencies, resulting in additional employee terminations and other facility closing costs. Restructuring expense for the year ended December 31, 2017 included non-cash charges of $1.9 million related to accelerated share-based compensation for employee terminations.

Acquisition Costs

Acquisition costs are non-recurring charges incurred in connection with the acquisition of the Ultratech business, which included $4.2 million of non-cash charges related to accelerated share-based compensation for employee terminations for the year ended December 31, 2017.

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Asset Impairment

During 2016, we recorded non-cash impairment charges of $57.6 million relating to our decision to reduce investments in certain technologies, $5.7 million relating to our assessments of the fair market value of assets held for sale, and $6.2 million relating to the disposal of certain lab equipment.

Interest Income (Expense)

For the year ended December 31, 2017, we recorded net interest expense of $17.1 million, including non-cash interest expense of $10.4 million, compared with net interest income of $1.0 million in the prior year period. The change primarily relates to the Convertible Senior Notes issued in January 2017.

Income Taxes

The 2017 income tax benefit of $37.6 million is comprised of: (i) a $25.3 million income tax benefit related to domestic losses incurred during the year ended December 31, 2017, as the deferred tax liability created by the issuance of the Convertible Senior Notes and recorded as a component of APIC is treated as a source of income in fiscal 2017, (ii) a $11.3 million income tax benefit recorded in connection with the 2017 Tax Act, and (iii) a $1.0 million income tax benefit from non-U.S. operations primarily attributable to a reduction in uncertain tax positions and the recognition of a deferred tax asset for certain non-U.S. net operating losses generated in prior years that have become realizable on a more-likely-than-not basis, offset by tax expense attributed to the profitable non-U.S. operations, as well as withholding taxes recorded as we now expect to repatriate certain foreign earnings as a result of changes in tax laws under the 2017 Tax Act.

The 2016 income tax expense of $2.8 million is comprised of: (i) a $1.9 million tax expense related primarily to U.S. tax amortization of our indefinite-lived intangible assets that is not available to offset existing deferred tax assets and related valuation allowance, as well as state and local income taxes, (ii) a $0.4 million tax benefit associated with the termination of a pension plan, and (iii) a $1.3 million net tax expense related primarily to our profitable foreign operations. The current period non-U.S. tax expense is attributable to the profitable non-U.S. operations.

Liquidity and Capital Resources

Our cash and cash equivalents, restricted cash, and short-term investments are as follows:

	December 31, 2018	2017
	(in thousands)	
Cash and cash equivalents	$ 212,273	$ 279,736
Restricted cash	809	847
Short-term investments	48,189	47,780
Total	$ 261,271	$ 328,363

A portion of our cash and cash equivalents is held by our subsidiaries throughout the world, frequently in each subsidiary's respective functional currency, which is typically the U.S. dollar. At December 31, 2018 and 2017, cash and cash equivalents of $66.9 million and $214.3 million, respectively, were held outside the United States. As of December 31, 2018, we had $43.3 million of accumulated undistributed earnings generated by our non-U.S. subsidiaries for which the U.S. repatriation tax has been provided and did not require the use of cash due to the use of net operating loss carryforwards. Approximately $8.1 million of undistributed earnings would be subject to foreign withholding taxes if distributed back to the United States. As of December 31, 2018, we have accrued $0.6 million of withholding tax related to the undistributed earnings as we are no longer asserting permanent reinvestment. During the year ended December 31, 2018, we distributed approximately $123.3 million of earnings generated by our non-U.S. subsidiaries back to the United States. As of December 31, 2018, we have accrued, and subsequently paid in January 2019, approximately $1.9 million of withholding tax related to distributions made in 2018. We believe that our projected cash flow from operations, combined with our cash and short term investments, will be sufficient to meet our projected

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working capital requirements, contractual obligations, and other cash flow needs for the next twelve months, including scheduled interest payments on our Convertible Senior Notes due 2023.

A summary of the cash flow activity for the year ended December 31, 2018 and 2017 is as follows:

Cash Flows from Operating Activities

	For the year ended December 31,	
	2018	2017
	(in thousands)	
Net income (loss)	$ (407,088)	$ (51,396)
Non-cash items:		
Depreciation and amortization	49,998	50,095
Non-cash interest expense	11,762	10,446
Deferred income taxes	(27,620)	(35,363)
Share-based compensation expense	16,074	24,396
Asset impairment	375,172	1,139
Provision for bad debts	—	99
Changes in operating assets and liabilities	(56,036)	35,577
Net cash provided by (used in) operating activities	$ (37,738)	$ 34,993

Net cash used in operating activities was $37.7 million for the year ended December 31, 2018 and was due to the net loss of $407.1 million plus a decline in cash flow from operating activities due to changes in operating assets and liabilities of $56.0 million, partially offset by adjustments for non-cash items of $425.4 million. The changes in operating assets and liabilities was largely attributable to decreases in accounts payable and accrued expenses, customer deposits and deferred revenue, and an increase in inventories, partially offset by decreases in accounts receivable, net of contract assets, deferred cost of sales, and prepaid expenses and other current assets. Our changing market and geography focus may impact the future timing of cash flows from operations, as we expect more of our revenues to be derived from markets where customer deposits are not commonly required, as well as geographies where extended payment terms are commonly used.

Net cash provided by operating activities was $35.0 million for the year ended December 31, 2017 and was due to the net loss of $51.4 million offset by adjustments for non-cash items of $50.8 million and an increase in cash flow from operating activities due to changes in operating assets and liabilities of $35.6 million. The changes in operating assets and liabilities, excluding the assets and liabilities assumed from Ultratech, were largely attributable to increases in accounts payable and accrued expenses and customer deposits and deferred revenue, decreases in accounts receivable and contract assets and inventory and deferred cost of sales, partially offset by increases in prepaid expenses and other current assets.

Cash Flows from Investing Activities

	For the year ended December 31,	
	2018	2017
	(in thousands)	
Acquisitions of businesses, net of cash acquired	$ (2,662)	$ (401,828)
Capital expenditures	(12,654)	(24,272)
Changes in investments, net	(2,981)	65,980
Proceeds from held for sale assets	—	2,284
Net cash provided by (used in) investing activities	$ (18,297)	$ (357,836)

The net cash used in investing activities during the year ended December 31, 2018 was attributable to capital expenditures, net change in investments, and net cash used in the final payout related to the acquisition of Ultratech. The net cash used in investing activities in 2017 was primarily attributable to the net cash used in the acquisition of Ultratech as well as capital expenditures, as we made certain investments in our facilities in 2017 in an effort to streamline operations, enhance efficiencies, and reduce costs. This net cash used in investing activities was partially offset by the net changes in investments.

Cash Flows from Financing Activities

	For the year ended December 31,	
	2018	2017
	(in thousands)	
Settlement of equity awards, net of withholding taxes	$ (5)	$ (5,749)
Purchases of common stock	(11,457)	(2,869)
Proceeds from long-term debt borrowings	—	335,752
Repayments of long-term debt	—	(1,194)
Net cash provided by (used in) financing activities	$ (11,462)	$ 325,940

The net cash used in financing activities for the year ended December 31, 2018 was primarily related to the share repurchase program. The cash provided by financing activities for 2017 was primarily related to the net cash proceeds received from the issuance of the Convertible Senior Notes in January 2017.

Convertible Senior Notes

On January 10, 2017, we issued $345.0 million of 2.70% Convertible Senior Notes. We received net proceeds, after deducting underwriting discounts and fees and expenses payable by the Company, of approximately $335.8 million. The Convertible Senior Notes bear interest at a rate of 2.70% per year, payable semiannually in arrears on January 15 and July 15 of each year, commencing on July 15, 2017. The Convertible Senior Notes mature on January 15, 2023, unless earlier purchased by the Company, redeemed, or converted. We believe that we have sufficient capital resources and cash flows from operations to support scheduled interest payments on this debt.

Business Combination

On May 26, 2017, the Company acquired 100% of Ultratech, Inc., a leading supplier of lithography, laser-processing, and inspection systems used to manufacture semiconductor devices and LEDs. The results of Ultratech's operations have been included in the consolidated financial statements since the date of acquisition.

Contractual Obligations and Commitments

We have commitments under certain contractual arrangements to make future payments for goods and services. These contractual arrangements secure the rights to various assets and services to be used in the future in the normal course of business. We expect to fund these contractual arrangements with cash generated from operations in the normal course of business. In addition, we have bank guarantees and letters of credit issued by a financial institution on our behalf as needed. At December 31, 2018, outstanding bank guarantees and letters of credit totaled $6.8 million and unused bank guarantees and letters of credit of $58.9 million were available to be drawn upon.

The following table summarizes our contractual arrangements at December 31, 2018 and the timing and effect that those commitments are expected to have on our liquidity and cash flow in future periods. The effect of unrecognized tax

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benefits, which total $1.5 million at December 31, 2018, have been excluded from the table since we are unable to reasonably estimate the period of potential cash settlement, if any, with the respective tax authorities.

	Payments due by period				
	Total	Less than 1 year	1 – 3 years	3 – 5 years	More than 5 years
	(in thousands)				
Principal payments on long-term debt	$ 345,000	$ —	$ —	$ 345,000	$ —
Cash interest on debt	37,648	9,315	18,630	9,703	—
Operating leases	16,057	5,143	7,488	2,878	548
Purchase commitments(1)	91,466	91,466	—	—	—
Total	$ 490,171	$ 105,924	$ 26,118	$ 357,581	$ 548

(1) Purchase commitments are generally for inventory used in the manufacturing of our products. We generally do not enter into purchase commitments extending beyond one year. At December 31, 2018, we have $12.8 million of offsetting supplier deposits that will be applied against these purchase commitments.

Off-Balance Sheet Arrangements

We do not have any off-balance sheet arrangements that have, or are reasonably likely to have, a current or future material effect on our financial condition, changes in financial condition, expenses, results of operations, liquidity, capital expenditures, or capital resources other than operating leases, bank guarantees, and purchase commitments reflected in the preceding “Contractual Obligations and Commitments” table.

Application of Critical Accounting Policies

Our discussion and analysis of our financial condition and results of operations are based upon our Consolidated Financial Statements, which have been prepared in accordance with accounting principles generally accepted in the United States. The preparation of these financial statements requires a high degree of judgment, either in the application and interpretation of existing accounting literature or in the development of estimates that affect the reported amounts of assets, liabilities, revenues, and expenses. On an ongoing basis, we evaluate our estimates and judgments based on historical experience as well as other factors that we believe to be reasonable under the circumstances. The results of our evaluation form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. These estimates may change in the future if underlying assumptions or factors change, and actual results may differ from these estimates.

We consider the following significant accounting policies to be critical because of their complexity and the high degree of judgment involved in implementing them.

Revenue Recognition

We adopted ASC 606 as of January 1, 2018, using the full retrospective method. Refer to Note 1, “Significant Accounting Policies,” for additional information.

Revenue is recognized upon the transfer of control of the promised product or service to the customer in an amount that reflects the consideration we expect to receive in exchange for such product or service. Our contracts with customers generally do not contain variable consideration. In the rare instances where variable consideration is included, we estimate the amount of variable consideration and determine what portion of that, if any, has a high probability of significant subsequent revenue reversal, and if so, that amount is excluded from the transaction price. Our contracts with customers frequently contain multiple deliverables, such as systems, upgrades, components, spare parts, installation, maintenance, and service plans. Judgment is required to properly identify the performance obligations within a contract and to determine how the revenue should be allocated among the performance obligations. We also evaluate whether multiple transactions with the same customer or related parties should be considered part of a single contract based on an assessment of whether the contracts or agreements are negotiated or executed within a short time frame of each other or if there are indicators that the contracts are negotiated in contemplation of one another.

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When there are separate units of accounting, we allocate revenue to each performance obligation on a relative stand-alone selling price basis. The stand-alone selling prices are determined based on the prices at which we separately sell the systems, upgrades, components, spare parts, installation, maintenance, and service plans. For items that are not sold separately, we estimate stand-alone selling prices generally using an expected cost plus margin approach.

Most of our revenue is recognized at a point in time when the performance obligation is satisfied. We consider many facts when evaluating each of our sales arrangements to determine the timing of revenue recognition, including our contractual obligations and the nature of the customer's post-delivery acceptance provisions. Our system sales arrangements, including certain upgrades, generally include field acceptance provisions that may include functional or mechanical test procedures. For many of these arrangements, a customer source inspection of the system is performed in our facility, test data is sent to the customer documenting that the system is functioning to the agreed upon specifications prior to delivery, or other quality assurance testing is performed internally to ensure system functionality prior to shipment. Historically, such source inspection or test data replicates the field acceptance provisions that are performed at the customer's site prior to final acceptance of the system. When we objectively demonstrate that the criteria specified in the contractual acceptance provisions are achieved prior to delivery either through customer testing or our historical experience of our tools meeting specifications, transfer of control of the product to the customer is considered to have occurred and revenue is recognized upon system delivery since there is no substantive contingency remaining related to the acceptance provisions at that date. For new products, new applications of existing products, or for products with substantive customer acceptance provisions where we cannot objectively demonstrate that the criteria specified in the contractual acceptance provisions have been achieved prior to delivery, revenue and the associated costs are deferred. We recognize such revenue and costs upon obtaining objective evidence that the acceptance provisions can be achieved, assuming all other revenue recognition criteria have been met.

In certain cases our contracts with customers contain a billing retention, typically 10% of the sales price, which is billed by us and payable by the customer when field acceptance provisions are completed. Revenue recognized in advance of the amount that has been billed is recorded as a contract asset on the Consolidated Balance Sheets.

We recognize revenue related to maintenance and service contracts over time based upon the respective contract term. Installation revenue is recognized over time as the installation services are performed. We recognize revenue from the sales of components, spare parts, and specified service engagements at a point in time, which is typically consistent with the time of delivery in accordance with the terms of the applicable sales arrangement.

We may receive customer deposits on system transactions. The timing of the transfer of goods or services related to the deposits is either at the discretion of the customer or expected to be within one year from the deposit receipt. As such, we do not adjust transaction prices for the time value of money. Incremental direct costs incurred related to the acquisition of a customer contract, such as sales commissions, are expensed as incurred since the expected amortization period is one year or less.

We have elected to treat shipping and handling costs as a fulfillment activity, and we include such costs in cost of services when we recognize revenue for the related goods. Taxes assessed by governmental authorities that are collected by us from a customer are excluded from revenue.

Inventory Valuation

Inventories are stated at the lower of cost or net realizable value, with cost determined on a first-in, first-out basis. Each quarter we assess the valuation and recoverability of all inventories: materials (raw materials, spare parts, and service inventory); work-in-process; and finished goods. Obsolete inventory or inventory in excess of our estimated usage requirements is written down to its estimated net realizable value if less than cost. We evaluate usage requirements by analyzing historical and anticipated demand, and anticipated demand is estimated based upon current economic conditions, utilization requirements related to current backlog, current sales trends, and other qualitative factors. Unanticipated changes in demand for our products may require a write down of inventory that could materially affect our operating results.

Goodwill and Intangible Assets

Goodwill is tested for impairment at least annually in the beginning of the fourth quarter of our fiscal year. We may first perform a qualitative assessment of whether it is more likely than not that the reporting unit's fair value is less than its carrying amount, and, if so, we then quantitatively compare the fair value of our reporting unit to its carrying amount. If the fair value of the reporting unit exceeds its carrying amount, goodwill is not impaired. If the carrying amount of the reporting unit exceeds its fair value, we then record an impairment loss equal to the difference, up to the carrying value of goodwill.

We determine the fair value of our reporting unit based on a reconciliation of the aggregate fair value of our reporting unit to our adjusted market capitalization. The adjusted market capitalization is calculated by multiplying the average share price of our common stock for the last ten trading days prior to the measurement date by the number of outstanding common shares and adding a control premium. The control premium is estimated using historical transactions in similar industries.

The carrying values of long-lived assets, including identifiable intangible assets, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. If circumstances require a long-lived asset or asset group be tested for possible impairment, a recoverability test is performed utilizing undiscounted cash flows expected to be generated by that asset or asset group compared to its carrying amount. If the carrying amount of the long-lived asset or asset group is not recoverable on an undiscounted cash flow basis, impairment is recognized to the extent the carrying amount exceeds its fair value. Fair value is determined through various valuation techniques including discounted cash flow models or, when available, quoted market values and third-party appraisals. It is not possible for us to predict the likelihood of any possible future impairments or, if such an impairment were to occur, the magnitude of any impairment.

Intangible assets with finite useful lives, including purchased technology, customer-related intangible assets, patents, trademarks, backlog, and software licenses, are subject to amortization over the expected period of economic benefit to us. We evaluate whether events or circumstances have occurred that warrant a revision to the remaining useful lives of intangible assets. In cases where a revision is deemed appropriate, the remaining carrying amounts of the intangible assets are amortized over the revised remaining useful life.

Intangible assets related to IPR&D projects are considered to be indefinite-lived until the completion or abandonment of the associated R&D efforts. If and when development is complete, the associated assets would be deemed long-lived and would then be amortized based on their respective estimated useful lives at that point in time. Indefinite-lived intangible assets are tested for impairment at least annually in the beginning of the fourth quarter of our fiscal year. In testing indefinite-lived intangible assets for impairment, we may first perform a qualitative assessment of whether it is more likely than not that the fair value of the indefinite-lived intangible asset is less than its carrying amount, and, if so, we then quantitatively compare the fair value of the indefinite-lived intangible asset to its carrying amount. We determine the fair value of our indefinite-lived intangible assets using a discounted cash flow method.

Income Taxes

We estimate our income taxes in each of the jurisdictions in which we operate. Deferred income taxes reflect the net tax effect of temporary differences between the asset and liability balances recognized for financial reporting purposes and the balances used for income tax purposes, as well as the tax effect of carry forwards. We record a valuation allowance to reduce our deferred tax assets to the amount that is more likely than not to be realized. Realization of our net deferred tax assets is dependent on future taxable income.

We recognize the effect of income tax positions for only those positions which are estimated to more likely than not be sustained if challenged. We reflect changes in recognition or measurement in the period in which our change in judgment occurs. We record interest and penalties related to uncertain tax positions in income tax expense. Income taxes related to the global intangible low-taxed income ("GILTI") rules are expensed as incurred.

Recent Accounting Pronouncements

In February 2016, the FASB issued ASU 2016-02: Leases, which, along with subsequent ASUs related to this topic, has been codified as Accounting Standards Codification 842 ("ASC 842"). ASC 842 generally requires operating lessee rights and obligations to be recognized as assets and liabilities on the balance sheet. The new standard, which is effective for us on January 1, 2019, offers a transition option whereby companies can recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption rather than in the earliest period presented. We plan to adopt using this transition method. In addition, ASC 842 provides for a number of optional exemptions in transition. We expect to elect certain exemptions whereby prior conclusions regarding lease identification, lease classification, and initial direct costs are not required to be reassessed under the new standard. We also plan to elect allowable policies whereby we will not separate lease and non-lease components, and we will not recognize an asset or liability for leases with original terms or renewals of one year or less. Upon adoption, we expect to recognize an operating lease liability ranging from $12 million to $16 million based on the present value of remaining minimum rental payments on existing leases, with corresponding assets of approximately the same amount.

We are also evaluating other pronouncements recently issued but not yet adopted. The adoption of these pronouncements is not expected to have a material impact on our consolidated financial statements.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

Interest Rate Risk

Our exposure to market rate risk for changes in interest rates primarily relates to our investment portfolio. We centrally manage our investment portfolios considering investment opportunities and risks, tax consequences, and overall financing strategies. Our investment portfolio includes fixed-income securities with a fair value of approximately $48.2 million at December 31, 2018. These securities are subject to interest rate risk and, based on our investment portfolio at December 31, 2018, a 100 basis point increase in interest rates would result in a decrease in the fair value of the portfolio of $0.2 million. While an increase in interest rates may reduce the fair value of the investment portfolio, we will not realize the losses in the Consolidated Statements of Operations unless the individual fixed-income securities are sold prior to recovery or the loss is determined to be other-than-temporary.

Currency Exchange Risk

We conduct business on a worldwide basis and, as such, a portion of our revenues, earnings, and net investments in foreign affiliates is exposed to changes in currency exchange rates. The economic impact of currency exchange rate movements is complex because such changes are often linked to variability in real growth, inflation, interest rates, governmental actions, and other factors. These changes, if material, could cause us to adjust our financing and operating strategies. Consequently, isolating the effect of changes in currency does not incorporate these other important economic factors.

From time to time, we manage our risks and exposures to currency exchange rates through the use of derivative financial instruments (e.g., forward contracts). We mainly use derivative financial instruments in the context of hedging and generally do not use them for speculative purposes. During fiscal 2018, 2017, and 2016 we did not designate foreign exchange derivatives as hedges. Accordingly, foreign exchange derivatives are recorded in our Consolidated Balance Sheets at fair value and changes in fair value from these contracts are recorded in "Other, net" in our Consolidated Statements of Operations.

Our net sales to customers located outside of the United States represented approximately 77%, 80%, and 74% of our total net sales in 2018, 2017, and 2016, respectively. We expect that net sales to customers outside the United States will continue to represent a large percentage of our total net sales. Our net sales denominated in currencies other than the U.S. dollar represented approximately 1%, 1%, and 4% of total net sales in 2018, 2017, and 2016, respectively.

A 10% change in foreign exchange rates would have an immaterial impact on the consolidated results of operations since most of our sales outside the United States are denominated in U.S. dollars.

Item 8. Financial Statements and Supplementary Data

Our Consolidated Financial Statements are listed in the Index to Consolidated Financial Statements and Financial Statement Schedule filed as part of this Form 10-K.

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

None.

Item 9A. Controls and Procedures

Management’s Report on Internal Control over Financial Reporting

Our principal executive and financial officers have evaluated and concluded that our disclosure controls and procedures are effective as of December 31, 2018. The disclosure controls and procedures are designed to ensure that the information required to be disclosed in this report filed under the Securities Exchange Act of 1934 is recorded, processed, summarized, and reported within the time periods specified in the Securities and Exchange Commission’s rules and forms and is accumulated and communicated to our principal executive and financial officers as appropriate to allow timely decisions regarding required disclosure.

Our principal executive and financial officers are responsible for establishing and maintaining adequate internal control over financial reporting, which is a process designed and put into effect 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. Using the criteria established in the Internal Control — Integrated Framework (2013) published by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”), Management has evaluated, assessed, and concluded that internal control over financial reporting is effective as of December 31, 2018.

KPMG LLP, an independent registered public accounting firm, has audited the consolidated financial statements included in this Annual Report on Form 10-K and, as part of their audit, has issued their report, included herein, on the effectiveness of our internal control over financial reporting.

Changes in Internal Control over Financial Reporting

During the quarter ended December 31, 2018, there were no changes in internal control that have materially affected or are reasonably likely to materially affect internal control over financial reporting.

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Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors

Veeco Instruments Inc.:

Opinion on Internal Control Over Financial Reporting

We have audited Veeco Instruments Inc.'s and subsidiaries (the Company) internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes and financial statement Schedule II — Valuation and Qualifying Accounts (collectively, the consolidated financial statements), and our report dated February 25, 2019 expressed an unqualified opinion on those consolidated financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the 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 audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. 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 audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

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 (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) 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 (3) 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

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inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG LLP

Melville, New York
February 25, 2019

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Item 9B. Other Information

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Information required by this Item that will appear under the headings “Governance,” “Executive Officers,” and “Section 16(a) Beneficial Ownership Reporting Compliance” in the definitive proxy statement to be filed with the SEC relating to our 2019 Annual Meeting of Stockholders is incorporated herein by reference.

We have adopted a Code of Ethics for Senior Officers (the “Code”) which applies to our chief executive officer, principal financial officer, principal accounting officer, and persons performing similar functions. A copy of the Code can be found on our website (www.veeco.com). We intend to disclose on our website the nature of any future amendments to and waivers of the Code that apply to the chief executive officer, principal financial officer, principal accounting officer, or persons performing similar functions. We have also adopted a Code of Business Conduct which applies to all of our employees, including those listed above, as well as to our directors. A copy of the Code of Business Conduct can be found on our website (www.veeco.com). The website address above is intended to be an inactive, textual reference only. None of the material on this website is part of this report.

Item 11. Executive Compensation

Information required by this Item that will appear under the heading “Compensation” in the definitive proxy statement to be filed with the SEC relating to our 2019 Annual Meeting of Stockholders is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

Information required by this Item that will appear under the headings “Security Ownership of Certain Beneficial Owners and Management” and “Equity Compensation Plan Information” in the definitive proxy statement to be filed with the SEC relating to our 2019 Annual Meeting of Stockholders is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence

Information required by this Item that will appear under the headings “Certain Relationships and Related Transactions” and “Independence of Board” in the definitive proxy statement to be filed with the SEC relating to our 2019 Annual Meeting of Stockholders is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services

Information required by this Item that will appear under the heading “Proposal 5 — Ratification of Appointment of KPMG” in the definitive proxy statement to be filed with the SEC relating to our 2019 Annual Meeting of Stockholders is incorporated herein by reference.

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PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) (1) The Registrant's financial statements together with a separate table of contents are annexed hereto

(2) Financial Statement Schedules are listed in the separate table of contents annexed hereto.

(3) Exhibits

Unless otherwise indicated, each of the following exhibits has been previously filed with the Securities and Exchange Commission by the Company under File No. 0-16244.

Exhibit Number	Exhibit Description	Incorporated by Reference Form	Exhibit	Filing Date	Filed or Furnished Herewith
3.1	Amended and Restated Certificate of Incorporation of Veeco dated December 1, 1994, as amended June 2, 1997 and July 25, 1997.	10-Q	3.1	8/14/1997	
3.2	Amendment to Certificate of Incorporation of Veeco dated May 29, 1998.	10-K	3.2	3/14/2001	
3.3	Amendment to Certificate of Incorporation of Veeco dated May 5, 2000.	10-Q	3.1	8/14/2000	
3.4	Certificate of Designation, Preferences, and Rights of Series A Junior Participating Preferred Stock of Veeco dated March 14, 2001.	10-Q	3.1	5/9/2001	
3.5	Amendment to Certificate of Incorporation of Veeco dated May 16, 2002.	10-Q	3.1	10/26/2009	
3.6	Amendment to Certificate of Incorporation of Veeco dated May 18, 2010.	10-K	3.8	2/24/2011	
3.7	Fifth Amended and Restated Bylaws of Veeco effective February 5, 2016.	8-K	3.1	2/10/2016	
4.1	Indenture, dated as of January 18, 2017, by and between Veeco Instruments Inc. and U.S. Bank National Association, as Trustee (relating to the 2.70% Convertible Notes due 2023).	8-K	4.1	1/18/2017	
4.2	First Supplemental Indenture, dated as of January 18, 2017, by and between Veeco Instruments Inc. and U.S. Bank National Association, as Trustee (relating to the 2.70%	8-K	4.2	1/18/2017	

	Convertible Notes due 2023).			
10.1*	Veeco Amended and Restated 2010 Stock Incentive Plan, effective May 14, 2010.	Def 14A	Appendix A	11/4/2013
10.2*	Veeco Amended and Restated 2010 Stock Incentive Plan, effective May 5, 2016.	S-8	10.1	6/2/2016
10.3	Veeco Amended and Restated 2010 Stock Incentive Plan, effective March 3, 2017.	10-Q	10.1	11/3/2017
10.4	Ultratech, Inc. 1993 Stock Option/Stock Issuance Plan (as Amended and Restated as of May 31, 2011).	S-8	10.1	5/26/2017
10.5*	Form of Notice of Performance Share Award and related terms and conditions pursuant to the Veeco 2010 Stock Incentive Plan, effective June 2015.	10-Q	10.1	8/3/2015
10.6*	Form of Notice of Performance Share Award and related terms and conditions pursuant to the Veeco 2010 Stock Incentive Plan, effective June 2016.	10-Q	10.1	11/1/2016

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Exhibit Number	Exhibit Description	Incorporated by Reference Form	Exhibit	Filing Date	Filed or Furnished Herewith
10.7*	Form of Notice of Critical Priorities Performance Share Award and related terms and conditions pursuant to the Veeco 2010 Stock Incentive Plan, effective June 2016.	10-Q	10.2	11/1/2016	
10.8*	Form of Notice of Performance Share Award and related terms and conditions pursuant to the Veeco 2010 Stock Incentive Plan, effective March 2018.	10-Q	10.1	5/7/2018	
10.9*	Form of Notice of Restricted Stock Award and related terms and conditions pursuant to the Veeco 2010 Stock Incentive Plan, effective March 2018.	10-Q	10.2	5/7/2018	
10.10*	Veeco 2013 Inducement Stock Incentive Plan, effective September 26, 2013	10-Q	10.1	11/4/2013	
10.11*	Veeco Instruments Inc. 2016 Employee Stock Purchase Plan.	S-8	10.9	6/2/2016	
10.12	Form of Amended and Restated Indemnification Agreement entered into between Veeco and each of its directors and executive officers (August 2017).	10-Q	10.2	8/3/2017	
10.13*	Veeco Amended and Restated Senior Executive Change in Control Policy, effective as of January 1, 2014.	10-K	10.22	2/28/2014	
10.14*	Letter Agreement dated January 30, 2012 between Veeco and Dr. William J. Miller.	10-K	10.30	2/22/2012	
10.15*	Letter Agreement dated August 29, 2018 between Veeco and Dr. William J. Miller.	8-K	10.2	9/4/2018	
10.16*	Employment Agreement effective as of July 1, 2007 between Veeco and John R. Peeler.	10-Q	10.3	8/7/2007	
10.17*	Amendment effective December 31, 2008 to Employment Agreement between Veeco and John R. Peeler.	10-K	10.38	3/2/2009	
10.18*	Second Amendment effective June 11, 2010 to Employment Agreement between Veeco and John R. Peeler.	10-Q	10.1	7/29/2010	
10.19*	Third Amendment effective April 25, 2012 to Employment Agreement between Veeco and John R. Peeler.	10-Q	10.2	5/9/2012	
10.20*	Amendment dated June 12, 2014 to Employment Agreement between Veeco and John R. Peeler.	10-Q	10.3	7/31/2014	
10.21*	Amendment dated June 12, 2017 to Employment Agreement between Veeco and John R. Peeler.	10-Q	10.1	8/3/2017	
10.22*	Amendment dated August 29, 2018 to Employment Agreement between Veeco and John R. Peeler.	8-K	10.1	9/4/2018	
10.23*	Letter Agreement dated April 8, 2014 between Veeco and Shubham Maheshwari.	10-Q	10.1	7/31/2014	
10.24*	Letter Agreement dated August 29, 2018 between Veeco and Shubham Maheshwari.	8-K	10.3	9/4/2018	

10.25*	Letter Agreement dated January 21, 2004 between Veeco and John P. Kiernan.	10-K	10.38	3/12/2004	
10.26*	Amendment effective June 9, 2006 to Letter Agreement between Veeco and John P. Kiernan.	10-Q	10.3	8/4/2006	
10.27*	Amendment effective December 31, 2008 to Letter Agreement between Veeco and John P. Kiernan.	10-K	10.40	3/2/2009	
21.1	Subsidiaries of the Registrant.				*

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Exhibit Number	Exhibit Description	Incorporated by Reference Form	Exhibit	Filing Date	Filed or Furnished Herewith
23.1	Consent of KPMG LLP.				*
31.1	Certification of Chief Executive Officer pursuant to Rule 13a—14(a) or Rule 15d—14(a) of the Securities and Exchange Act of 1934.				*
31.2	Certification of Chief Financial Officer pursuant to Rule 13a—14(a) or Rule 15d—14(a) of the Securities and Exchange Act of 1934.				*
32.1	Certification of Chief Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes - Oxley Act of 2002.				*
32.2	Certification of 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	XBRL Instance.				**
101.XSD	XBRL Schema.				**
101.PRE	XBRL Presentation.				**
101.CAL	XBRL Calculation.				**
101.DEF	XBRL Definition.				**
101.LAB	XBRL Label.				**

* Indicates a management contract or compensatory plan or arrangement, as required by Item 15(a) (3) of Form 10-K.

** Filed herewith electronically

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SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, on February 25, 2019.

Veeco Instruments Inc.

By: /S/ WILLIAM J. MILLER, Ph.D.
William J. Miller, Ph.D.
Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, this report has been signed below by the following persons on behalf of the Registrant and in the capacities indicated, on February 25, 2019.

Signature	Title
/s/ WILLIAM J. MILLER, Ph.D. William J. Miller, Ph.D.	Chief Executive Officer and Director (principal executive officer)
/s/ SHUBHAM MAHESHWARI Shubham Maheshwari	Executive Vice President, Chief Financial Officer, and Chief Operating Officer (principal financial officer)
/s/ JOHN P. KIERNAN John P. Kiernan	Senior Vice President, Finance, Chief Accounting Officer, and Treasurer (principal accounting officer)
/s/ JOHN R. PEELER John R. Peeler	Executive Chairman
/s/ KATHLEEN A. BAYLESS Kathleen A. Bayless	Director
/s/ RICHARD A. D'AMORE Richard A. D'Amore	Director
/s/ GORDON HUNTER Gordon Hunter	Director
/s/ KEITH D. JACKSON Keith D. Jackson	Director

/s/ PETER J. SIMONE Peter J. Simone	Director
/s/ THOMAS ST. DENNIS Thomas St. Dennis	Director

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Veeco Instruments Inc. and Subsidiaries

Index to Consolidated Financial Statements and Financial Statement Schedule

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors

Veeco Instruments Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Veeco Instruments Inc. and subsidiaries (the Company) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes and financial statement Schedule II — Valuation and Qualifying Accounts (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission, and our report dated February 25, 2019 expressed an unqualified opinion on the effectiveness of the Company's internal control over financial reporting.

Change in Accounting Principle

As discussed in Note 1 to the consolidated financial statements, the Company has retrospectively adopted the new revenue recognition standard, ASC Topic 606, Revenue from Contracts with Customers, as of January 1, 2018.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the 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 audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits 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. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company's auditor since 2015.

Melville, New York

February 25, 2019

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Veeco Instruments Inc. and Subsidiaries

Consolidated Balance Sheets

(in thousands, except share amounts)

	December 31, 2018	December 31, 2017
Assets		
Current assets:		
Cash and cash equivalents	$ 212,273	$ 279,736
Restricted cash	809	847
Short-term investments	48,189	47,780
Accounts receivable, net	66,808	98,866
Contract assets	10,397	160
Inventories	156,311	120,266
Deferred cost of sales	3,072	15,994
Prepaid expenses and other current assets	22,221	33,437
Total current assets	520,080	597,086
Property, plant, and equipment, net	80,284	85,058
Intangible assets, net	85,149	369,843
Goodwill	184,302	307,131
Deferred income taxes	1,869	3,047
Other assets	29,132	25,310
Total assets	$ 900,816	$ 1,387,475
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	$ 39,611	$ 50,318
Accrued expenses and other current liabilities	46,450	58,068
Customer deposits and deferred revenue	72,736	112,032
Income taxes payable	1,256	3,846
Total current liabilities	160,053	224,264
Deferred income taxes	5,690	36,845
Long-term debt	287,392	275,630
Other liabilities	9,906	10,643
Total liabilities	463,041	547,382
Stockholders' equity:		
Preferred stock, $0.01 par value; 500,000 shares authorized; no shares issued and outstanding.	—	—
Common stock, $0.01 par value; 120,000,000 shares authorized; 48,547,417 and 48,229,251 shares issued at December 31, 2018 and December 31, 2017, respectively; 48,024,685 and 48,144,416 shares outstanding at December 31, 2018 and December 31, 2017, respectively.	485	482
Additional paid-in capital	1,061,325	1,051,953
Accumulated deficit	(619,983)	(212,870)

Accumulated other comprehensive income	1,820	1,812
Treasury stock, at cost, 522,732 and 84,835 shares at December 31, 2018 and December 31, 2017, respectively.	(5,872)	(1,284)
Total stockholders' equity	437,775	840,093
Total liabilities and stockholders' equity	$ 900,816	$ 1,387,475

See accompanying Notes to the Consolidated Financial Statements.

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Veeco Instruments Inc. and Subsidiaries

Consolidated Statements of Operations

(in thousands, except per share amounts)

	For the year ended December 31,		
	2018	2017	2016
Net sales	$ 542,082	$ 475,686	$ 331,702
Cost of sales	348,363	299,458	198,604
Gross profit	193,719	176,228	133,098
Operating expenses, net:			
Research and development	97,755	81,987	81,016
Selling, general, and administrative	92,060	100,250	77,642
Amortization of intangible assets	32,351	35,475	19,219
Restructuring	8,556	11,851	5,640
Acquisition costs	2,959	17,786	—
Asset impairment	375,172	1,139	69,520
Other, net	368	(392)	223
Total operating expenses, net	609,221	248,096	253,260
Operating income (loss)	(415,502)	(71,868)	(120,162)
Interest income	3,186	2,335	1,180
Interest expense	(21,518)	(19,457)	(222)
Income (loss) before income taxes	(433,834)	(88,990)	(119,204)
Income tax expense (benefit)	(26,746)	(37,594)	2,823
Net income (loss)	$ (407,088)	$ (51,396)	$ (122,027)
Income (loss) per common share:			
Basic	$ (8.63)	$ (1.16)	$ (3.10)
Diluted	$ (8.63)	$ (1.16)	$ (3.10)
Weighted average number of shares:			
Basic	47,151	44,174	39,340
Diluted	47,151	44,174	39,340

See accompanying Notes to the Consolidated Financial Statements.

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Veeco Instruments Inc. and Subsidiaries

Consolidated Statements of Comprehensive Income (Loss)

(in thousands)

	For the year ended December 31,		
	2018	2017	2016
Net income (loss)	$ (407,088)	$ (51,396)	$ (122,027)
Other comprehensive income (loss), net of tax:			
Available-for-sale securities:			
Change in net unrealized gains or losses	11	(7)	(6)
Reclassification adjustments for net (gains) losses included in net income	—	—	18
Unrealized gain (loss) on available-for-sale securities	11	(7)	12
Minimum pension liability:			
Reclassification adjustments for net (gains) losses included in net income	—	—	866
Net changes related to minimum pension liability	—	—	866
Currency translation adjustments:			
Change in currency translation adjustments	5	42	(19)
Reclassification adjustments for net (gains) losses included in net income	(8)	—	(430)
Net changes related to currency translation adjustments	(3)	42	(449)
Total other comprehensive income (loss), net of tax	8	35	429
Total comprehensive income (loss)	$ (407,080)	$ (51,361)	$ (121,598)

See accompanying Notes to the Consolidated Financial Statements.

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Veeco Instruments Inc. and Subsidiaries

Consolidated Statements of Stockholders' Equity

(in thousands)

	Common Stock		Treasury Stock		Additional Paid-in	Accumulated	Accumulated Other Comprehensive	
	Shares	Amount	Shares	Amount	Capital	Deficit	Income	Total
Balance at December 31, 2015	40,996	410	469	(9,222)	767,137	(45,058)	1,348	$ 714,615
Cumulative effect of change in accounting principle - adoption of ASU 2016-09	—	—	—	—	1,315	(1,315)	—	—
Cumulative effect of change in accounting principle - adoption of ASC 606	—	—	—	—	—	6,926	—	6,926
Net loss	—	—	—	—	—	(122,027)	—	(122,027)
Other comprehensive loss, net of tax	—	—	—	—	—	—	429	429
Share-based compensation expense	—	—	—	—	15,741	—	—	15,741
Net issuance under employee stock plans	(281)	(3)	(1,072)	19,948	(20,890)	—	—	(945)
Purchases of common stock	—	—	730	(13,035)	—	—	—	(13,035)
Balance at December 31, 2016	40,715	407	127	(2,309)	763,303	(161,474)	1,777	601,704
Net loss	—	—	—	—	—	(51,396)	—	(51,396)
Other comprehensive	—	—	—	—	—	—	35	35

income, net of tax								
Share-based compensation expense	—	—	—	—	24,396	—	—	24,396
Net issuance under employee stock plans	313	3	(245)	4,043	(9,795)	—	—	(5,749)
Stock issuance for business acquisition	7,201	72	—	—	228,800	—	—	228,872
Convertible Senior Notes, equity component	—	—	—	—	45,249	—	—	45,249
Purchases of common stock	—	—	203	(3,018)	—	—	—	(3,018)
Balance at December 31, 2017	48,229	482	85	(1,284)	1,051,953	(212,870)	1,812	840,093
Net loss	—	—	—	—	—	(407,088)	—	(407,088)
Other comprehensive income, net of tax	—	—	—	—	—	—	8	8
Share-based compensation expense	—	—	—	—	16,074	—	—	16,074
Net issuance under employee stock plans	318	3	(512)	6,721	(6,702)	(25)	—	(3)
Purchases of common stock	—	—	950	(11,309)	—	—	—	(11,309)
Balance at December 31, 2018	48,547	$ 485	523	$ (5,872)	$ 1,061,325	$ (619,983)	$ 1,820	$ 437,775

See accompanying Notes to the Consolidated Financial Statements.

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Veeco Instruments Inc. and Subsidiaries

Consolidated Statements of Cash Flows

(in thousands)

	For the year ended December 31,		
	2018	2017	2016
Cash Flows from Operating Activities			
Net income (loss)	$ (407,088)	$ (51,396)	$ (122,027)
Adjustments to reconcile net income (loss) to net cash provided by (used in) operating activities:			
Depreciation and amortization	49,998	50,095	32,650
Non-cash interest expense	11,762	10,446	—
Deferred income taxes	(27,620)	(35,363)	997
Share-based compensation expense	16,074	24,396	15,741
Asset impairment	375,172	1,139	69,520
Provision for bad debts	—	99	171
Gain on cumulative translation adjustment	—	—	(430)
Changes in operating assets and liabilities:			
Accounts receivable and contract assets	21,821	10,240	(8,880)
Inventories and deferred cost of sales	(24,678)	6,244	(6,106)
Prepaid expenses and other current assets	11,216	(10,204)	6,726
Accounts payable and accrued expenses	(19,672)	11,308	(24,474)
Customer deposits and deferred revenue	(39,296)	22,446	9,770
Income taxes receivable and payable, net	(4,800)	775	547
Long-term income tax liability	—	(4,877)	—
Other, net	(627)	(355)	1,951
Net cash provided by (used in) operating activities	(37,738)	34,993	(23,844)
Cash Flows from Investing Activities			
Acquisitions of businesses, net of cash acquired	(2,662)	(401,828)	—
Capital expenditures	(12,654)	(24,272)	(11,479)
Proceeds from the sale of investments	90,065	348,927	152,301
Payments for purchases of investments	(93,046)	(282,947)	(103,394)
Proceeds from held for sale assets	—	2,284	9,512
Other	—	—	(230)
Net cash provided by (used in) investing activities	(18,297)	(357,836)	46,710
Cash Flows from Financing Activities			
Proceeds (net of tax withholdings) from option exercises and employee stock purchase plan	3,064	2,992	1,656
Restricted stock tax withholdings	(3,069)	(8,741)	(2,601)
Purchases of common stock	(11,457)	(2,869)	(13,349)
Proceeds from long-term debt borrowings	—	335,752	—
Principal payments on long-term debt	—	(1,194)	(340)
Net cash provided by (used in) financing activities	(11,462)	325,940	(14,634)
Effect of exchange rate changes on cash and cash equivalents	(4)	42	(20)

Net increase (decrease) in cash, cash equivalents, and restricted cash	(67,501)	3,139	8,212
Cash, cash equivalents, and restricted cash - beginning of period	280,583	277,444	269,232
Cash, cash equivalents, and restricted cash - end of period	$ 213,082	$ 280,583	$ 277,444
Supplemental Disclosure of Cash Flow Information			
Interest paid	$ 9,708	$ 4,675	$ 225
Income taxes paid	4,799	1,939	1,669
Non-cash operating and financing activities			
Net transfer of inventory to property, plant and equipment	1,479	(97)	1,827

See accompanying Notes to the Consolidated Financial Statements.

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements

Note 1 — Significant Accounting Policies

(a) Description of Business

Veeco Instruments Inc. (together with its consolidated subsidiaries, "Veeco," or the "Company") operates in a single segment: the development, manufacture, sales, and support of semiconductor and thin film process equipment primarily sold to make electronic devices.

(b) Basis of Presentation

The accompanying audited Consolidated Financial Statements of the Company have been prepared in accordance with United States generally accepted accounting principles ("GAAP"). The Company reports interim quarters on a 13-week basis ending on the last Sunday of each period, which is determined at the start of each year. The Company's fourth quarter always ends on the last day of the calendar year, December 31. During 2018 the interim quarters ended on April 1, July 1, and September 30, and during 2017 the interim quarters ended on April 2, July 2, and October 1. The Company reports these interim quarters as March 31, June 30, and September 30 in its interim consolidated financial statements.

(c) Use of Estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Although these estimates are based on management's knowledge of current events and actions it may undertake in the future, these estimates may ultimately differ from actual results. Significant items subject to such estimates and assumptions include: (i) stand-alone selling prices for the Company's products and services; (ii) allowances for doubtful accounts; (iii) inventory obsolescence; (iv) the useful lives and expected future cash flows of property, plant, and equipment and identifiable intangible assets; (v) the fair value of the Company's reporting unit and related goodwill; (vi) investment valuations and the valuation of derivatives, deferred tax assets, and assets acquired in business combinations; (vii) the recoverability of long-lived assets; (viii) liabilities for product warranty and legal contingencies; (ix) share-based compensation; and (x) income tax uncertainties. Actual results could differ from those estimates.

(d) Principles of Consolidation

The Consolidated Financial Statements include the accounts of the Company and its subsidiaries. Intercompany balances and transactions have been eliminated in consolidation. Companies acquired during each reporting period are reflected in the results of the Company effective from their respective dates of acquisition through the end of the reporting period.

(e) Foreign Currencies

Assets and liabilities of the Company’s foreign subsidiaries that operate using functional currencies other than the U.S. dollar are translated using the exchange rates in effect at the balance sheet date. Results of operations are translated using monthly average exchange rates. Adjustments arising from the translation of the foreign currency financial statements of the Company’s subsidiaries into U.S. dollars, including intercompany transactions of a long-term nature, are reported as currency translation adjustments in “Accumulated other comprehensive income” in the Consolidated Balance Sheets. Foreign currency transaction gains or losses are included in “Other, net” in the Consolidated Statements of Operations.

(f) Revenue Recognition

Revenue is recognized upon the transfer of control of the promised product or service to the customer in an amount that reflects the consideration the Company expects to receive in exchange for such product or service. The Company’s contracts with customers generally do not contain variable consideration. In the rare instances where variable consideration is included, the Company estimates the amount of variable consideration and determines what portion of that, if any, has a high probability of significant subsequent revenue reversal, and if so, that amount is excluded from the transaction price. The Company's contracts with customers frequently contain multiple deliverables, such as systems, upgrades, components, spare parts, installation, maintenance, and service plans. Judgment is required to properly identify the performance obligations within a contract and to determine how the revenue should be allocated among the performance obligations. The Company also evaluates whether multiple transactions with the same customer or related parties should be considered part of a single contract based on an assessment of whether the contracts or agreements are negotiated or executed within a short time frame of each other or if there are indicators that the contracts are negotiated in contemplation of one another.

When there are separate units of accounting, the Company allocates revenue to each performance obligation on a relative stand-alone selling price basis. The stand-alone selling prices are determined based on the prices at which the Company separately sells the systems, upgrades, components, spare parts, installation, maintenance, and service plans. For items that are not sold separately, the Company estimates stand-alone selling prices generally using an expected cost plus margin approach.

Most of the Company's revenue is recognized at a point in time when the performance obligation is satisfied. The Company considers many facts when evaluating each of its sales arrangements to determine the timing of revenue recognition, including its contractual obligations and the nature of the customer's post-delivery acceptance provisions. The Company's system sales arrangements, including certain upgrades, generally include field acceptance provisions that may include functional or mechanical test procedures. For many of these arrangements, a customer source inspection of the system is performed in the Company's facility, test data is sent to the customer documenting that the system is functioning to the agreed upon specifications prior to delivery, or other quality assurance testing is performed internally to ensure system functionality prior to shipment. Historically, such source inspection or test data replicates the field acceptance provisions that are performed at the customer's site prior to final acceptance of the system. When the Company objectively demonstrates that the criteria specified in the contractual acceptance provisions are achieved prior to delivery either through customer testing or the Company's historical experience of its tools meeting specifications, transfer of control of the product to the customer is considered to have occurred and revenue is recognized upon system delivery since there is no substantive contingency remaining related to the acceptance provisions at that date. For new products, new applications of existing products, or for products with substantive customer acceptance provisions where the Company cannot objectively demonstrate that the criteria specified in the contractual acceptance provisions have been achieved prior to delivery, revenue and the associated costs are deferred. The Company recognizes such revenue and costs upon obtaining objective evidence that the acceptance provisions can be achieved, assuming all other revenue recognition criteria have been met.

In certain cases the Company's contracts with customers contain a billing retention, typically 10% of the sales price, which is billed by the Company and payable by the customer when field acceptance provisions are completed. Revenue recognized in advance of the amount that has been billed is recorded as a contract asset on the Consolidated Balance Sheets.

The Company recognizes revenue related to maintenance and service contracts over time based upon the respective contract term. Installation revenue is recognized over time as the installation services are performed. The Company recognizes revenue from the sales of components, spare parts, and specified service engagements at a point in time, which is typically consistent with the time of delivery in accordance with the terms of the applicable sales arrangement.

The Company may receive customer deposits on system transactions. The timing of the transfer of goods or services related to the deposits is either at the discretion of the customer or expected to be within one year from the deposit receipt. As such, the Company does not adjust transaction prices for the time value of money. Incremental direct costs incurred related to the acquisition of a customer contract, such as sales commissions, are expensed as incurred since the expected amortization period is one year or less.

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Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

The Company has elected to treat shipping and handling costs as a fulfillment activity, and the Company includes such costs in cost of services when the Company recognizes revenue for the related goods. Taxes assessed by governmental authorities that are collected by the Company from a customer are excluded from revenue.

(g) Warranty Costs

The Company typically provides standard warranty coverage on its systems for one year from the date of final acceptance by providing labor and parts necessary to repair the systems during the warranty period. The Company accounts for the estimated warranty cost when revenue is recognized on the related system. Warranty cost is included in "Cost of sales" in the Consolidated Statements of Operations. The estimated warranty cost is based on the Company's historical experience with its systems and regional labor costs. The Company calculates the average service hours by region and parts expense per system utilizing actual service records to determine the estimated warranty charge. The Company updates its warranty estimates on a quarterly basis when the actual product performance or field expense differs from original estimates.

(h) Shipping and Handling Costs

Shipping and handling costs are expenses incurred to move, package, and prepare the Company's products for shipment and to move the products to a customer's designated location. These costs are generally comprised of payments to third-party shippers. Shipping and handling costs are included in "Cost of sales" in the Consolidated Statements of Operations.

(i) Research and Development Costs

Research and development costs are expensed as incurred and include charges for the development of new technology and the transition of existing technology into new products or services.

(j) Advertising Expense

The cost of advertising is expensed as incurred and totaled $0.9 million, $0.9 million, and $0.8 million for the years ended December 31, 2018, 2017, and 2016, respectively.

(k) Accounting for Share-Based Compensation

Share-based awards exchanged for employee services are accounted for under the fair value method. Accordingly, share-based compensation cost is measured at the grant date based on the fair value of the award. The expense for awards is recognized over the employee’s requisite service period (generally the vesting period of the award). The Company has elected to treat awards with only service conditions and with graded vesting as one award. Consequently, the total compensation expense is recognized straight-line over the entire vesting period, so long as the compensation cost recognized at any date at least equals the portion of the grant date fair value of the award that is vested at that date.

In addition to stock options, restricted share awards (“RSAs”) and restricted stock units (“RSUs”) with time-based vesting, the Company grants performance share units and awards (“PSUs” and “PSAs”) that have either performance or market conditions. Compensation cost for PSUs and PSAs with performance conditions is recognized over the requisite service period based on the timing and expected level of achievement of the performance targets. A change in the assessment of performance attainment prior to the conclusion of the performance period is recognized in the period of the change in estimate. Compensation cost for PSUs and PSAs with market conditions is recognized over the requisite service period regardless of the expected level of achievement. For all PSUs and PSAs, the number of shares issued to the employee at the conclusion of the service period may vary from the original target based upon the level of attainment of the performance or market conditions.

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

The Company uses the Black-Scholes option-pricing model to compute the estimated fair value of option awards and purchase rights under the Employee Stock Purchase Plan. The Company uses a Monte Carlo simulation to compute the estimated fair value of awards with market conditions. The Black-Scholes model and Monte Carlo simulation include assumptions regarding dividend yields, expected volatility, expected option term, and risk-free interest rates. See Note 15, "Stock Plans," for additional information.

See Note 1(t), "Recently Adopted Accounting Standards," for additional information concerning the Company's adoption of Accounting Standards Update ("ASU") 2016-09: Stock Compensation: Improvements to Employee Share-Based Payment Accounting.

(l) Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred 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 tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities from a change in tax rate is recognized in income in the period that includes the enactment date.

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the "2017 Tax Act"), which made broad and complex changes to the U.S. tax code. In response to the 2017 Tax Act, the SEC staff issued Staff Accounting Bulletin No. 118 ("SAB 118") which provided guidance on accounting for the tax effects of 2017 Tax Act, including addressing any uncertainty or diversity of view in applying ASC 740, Income Taxes ("ASC 740"), in the reporting period in which the 2017 Tax Act was enacted. In addition, SAB 118 provided a measurement period that should not extend beyond one year from the 2017 Tax Act enactment date for companies to complete the accounting under ASC 740. During the year ended December 31, 2018, the Company finalized the accounting for the tax effects of 2017 Tax Act.

In January 2018, the FASB released guidance on the accounting for taxes under the global intangible low-taxed income ("GILTI") provisions of the 2017 Tax Act. The GILTI provisions impose a tax on foreign income in excess of a deemed return on tangible assets of foreign operations. The Company has made a policy election to account for income taxes incurred under GILTI as a period cost.

(m) Concentration of Credit Risk

Financial instruments that potentially subject the Company to concentrations of credit risk consist primarily of cash and cash equivalents, investments, derivative financial instruments used in hedging activities, and accounts receivable. The Company invests in a variety of financial instruments and, by policy, limits the amount of credit exposure with any one financial institution or commercial issuer. The Company has not experienced any material credit losses on its investments.

The Company maintains an allowance reserve for potentially uncollectible accounts for estimated losses resulting from the inability of its customers to make required payments. The Company evaluates its allowance for doubtful accounts based on a combination of factors. In circumstances where specific invoices are deemed to be uncollectible, the Company provides a specific allowance for bad debt against the amount due to reduce the net recognized receivable to the amount reasonably expected to be collected. The Company also provides allowances based on its write-off history. The allowance for doubtful accounts totaled $0.3 million at December 31, 2018 and 2017.

To further mitigate the Company’s exposure to uncollectable accounts, the Company may request certain customers provide a negotiable irrevocable letter of credit drawn on a reputable financial institution. These irrevocable letters of credit are typically issued to mature between zero and 90 days from the date the documentation requirements are met, typically when a system ships or upon receipt of final acceptance from the customer. The Company, at its discretion, may monetize these letters of credit on a non-recourse basis after they become negotiable but before maturity. The fees associated with the monetization are included in “Selling, general, and administrative” in the Consolidated Statements of Operations and were immaterial for the years ended December 31, 2018, 2017, and 2016.

(n) Fair Value of Financial Instruments

The carrying amounts of financial instruments, including cash equivalents, accounts receivable, accounts payable, and accrued expenses reflected in the consolidated financial statements approximate fair value due to their short-term maturities. The fair value of debt for footnote disclosure purposes, including current maturities, if any, is estimated using recently quoted market prices of the instrument, or if not available, a discounted cash flow analysis based on the estimated current incremental borrowing rates for similar types of instruments.

(o) Cash, Cash Equivalents, and Short-Term Investments

All financial instruments purchased with an original maturity of three months or less at the time of purchase are considered cash equivalents. Such items may include liquid money market funds, certificate of deposit and time deposit accounts, U.S. treasuries, government agency securities, and corporate debt. Investments that are classified as cash equivalents are carried at cost, which approximates fair value. The Company’s cash and cash equivalents includes $69.6 million and $76.7 million of cash equivalents at December 31, 2018 and 2017, respectively.

A portion of the Company’s cash and cash equivalents is held by its subsidiaries throughout the world, frequently in each subsidiary’s respective functional currency, which is typically the U.S. dollar. Approximately 32% and 77% of cash and cash equivalents were maintained outside the United States at December 31, 2018 and 2017, respectively.

Marketable debt securities are generally classified as available-for-sale for use in current operations, if required, and are reported at fair value, with unrealized gains and losses, net of tax, presented as a separate component of stockholders’ equity under the caption “Accumulated other comprehensive income.” These securities can include U.S. treasuries, government agency securities, corporate debt, and commercial paper, all with maturities of greater than three months when purchased. All realized gains and losses and unrealized losses resulting from declines in fair value that are other than temporary are included in “Other, net” in the Consolidated Statements of Operations. The specific identification method is used to determine the realized gains and losses on investments.

Non-marketable equity securities are equity securities without readily observable market prices and are included in "Other assets" in the Consolidated Balance Sheets. Non-marketable securities are measured at cost, adjusted for changes in observable prices minus impairment. Changes in fair value are included in "Other, net" in the Consolidated Statements of Operations.

(p) Inventories

Inventories are stated at the lower of cost or net realizable value, with cost determined on a first-in, first-out basis. Each quarter the Company assesses the valuation of all inventories: materials (raw materials, spare parts, and service inventory); work-in-process; and finished goods. Obsolete inventory or inventory in excess of management's estimated usage requirement is written down to its estimated net realizable value if less than cost. Estimates of net realizable value include, but are not limited to, management's forecasts related to the Company's future manufacturing schedules, customer demand, technological and/or market obsolescence, general market conditions, possible alternative uses, and the ultimate realization of excess inventory. If future customer demand or market conditions are less favorable than the Company's projections, additional inventory write-downs may be required and would be reflected in cost of sales in the period the revision is made. Inventory acquired as part of a business combination is recorded at fair value on the date of acquisition. See Note 5, "Business Combinations," for additional information.

(q) Business Combinations

The Company allocates the fair value of the purchase consideration of the Company's acquisitions to the tangible assets, intangible assets, including in-process research and development ("IPR&D"), if any, and liabilities assumed, based on estimated fair values. The excess of the fair value of purchase consideration over the fair values of these identifiable assets and liabilities is recorded as goodwill. Acquisition-related expenses are recognized separately from the business combination and are expensed as incurred. See Note 5, "Business Combinations," for additional information.

(r) Goodwill and Indefinite-Lived Intangible Assets

Goodwill is an asset representing the future economic benefits arising from assets acquired in a business combination that are not individually identified and separately recognized. Goodwill is measured as the excess of the consideration transferred over the net fair value of identifiable assets acquired and liabilities assumed. Intangible assets with indefinite useful lives are measured at their respective fair values on the acquisition date. Intangible assets related to IPR&D projects are considered to be indefinite-lived until the completion or abandonment of the associated R&D efforts. If and when development is complete, the associated assets would be deemed long-lived and would then be amortized based on their respective estimated useful lives at that point in time. Goodwill and indefinite-lived intangibles are not amortized into results of operations but instead are evaluated for impairment. The Company performs the evaluation in the beginning of the fourth quarter of each year or more frequently if impairment indicators arise.

In testing goodwill for impairment, the Company may first perform a qualitative assessment of whether it is more likely than not that the reporting unit's fair value is less than its carrying amount, and, if so, the Company then quantitatively compares the fair value of the reporting unit to its carrying amount. If the fair value exceeds the carrying amount, goodwill is not impaired. If the carrying amount exceeds fair value, the Company then records an impairment loss equal to the difference, up to the carrying value of goodwill.

The Company determines the fair value of its reporting unit based on a reconciliation of the fair value of the reporting unit to the Company's adjusted market capitalization. The adjusted market capitalization is calculated by multiplying the average share price of the Company's common stock for the last ten trading days prior to the measurement date by the number of outstanding common shares and adding a control premium. The control premium is estimated using historical transactions in similar industries.

In testing indefinite-lived intangible assets for impairment, the Company may first perform a qualitative assessment of whether it is more likely than not that the fair value of the indefinite-lived intangible asset is less than its carrying amount, and, if so, the Company then quantitatively compares the fair value of the indefinite-lived intangible asset to its carrying amount. The Company determines the fair value of its indefinite-lived intangible assets using a discounted cash flow method.

(s) Long-Lived Assets

Long-lived intangible assets consist of purchased technology, customer relationships, patents, trademarks and tradenames, and backlog and are initially recorded at fair value. Long-lived intangible assets are amortized over their estimated useful lives in a method reflecting the pattern in which the economic benefits are consumed or straight-lined if such pattern cannot be reliably determined.

Property, plant, and equipment are recorded at cost. Depreciation expense is calculated based on the estimated useful lives of the assets by using the straight-line method. Amortization of leasehold improvements is recognized using the straight-line method over the shorter of the remaining lease term or the estimated useful lives of the improvements.

Long-lived assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. If circumstances require a long-lived asset or asset group be tested for

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possible impairment, a recoverability test is performed utilizing undiscounted cash flows expected to be generated by that asset or asset group compared to its carrying amount. If the carrying amount of the long-lived asset or asset group is not recoverable on an undiscounted cash flow basis, impairment is recognized to the extent the carrying amount exceeds its fair value. Fair value is determined through various valuation techniques including discounted cash flow models or, when available, quoted market values and third-party appraisals.

(t) Recently Adopted Accounting Standards

The Company adopted ASC Topic 606, Revenue from Contracts with Customers ("ASC 606"), as of January 1, 2018, using the full retrospective method. All amounts and disclosures set forth in this Form 10-K reflect these changes. The most significant financial statement impacts of adopting ASC 606 are the elimination of the constraint on revenue associated with the billing retention related to the receipt of customer final acceptance and the identification of installation services as a performance obligation. The elimination of the constraint on revenue related to customer final acceptance, which is usually about 10 percent of a system sale, is now generally recognized at the time the Company transfers control of the system to the customer, which is earlier than under the Company's previous revenue recognition model for certain contracts that were subject to the billing constraint. The performance obligation related to installation services is now recognized as the installation services are performed, which is later than the Company's previous revenue recognition model.

The Company applied ASC 606 retrospectively and elected to use the disclosure exemption in the transition guidance under which the Company does not disclose prior period information regarding the amount of the transaction price allocated to remaining performance obligations. The cumulative effect of the adoption was recognized as a decrease to Accumulated deficit of $6.9 million on January 1, 2016. The following tables summarize the impact of adoption on the Company's previously reported financial position and results of operations:

	December 31, 2017		
	As reported	Adjustments	As adjusted
	(in thousands)		
Balance Sheet			
Contract assets	$ —	$ 160	$ 160
Deferred cost of sales	16,060	(66)	15,994
Deferred income taxes	2,953	94	3,047
Accrued expenses and other current liabilities	60,339	(2,271)	58,068
Customer deposits and deferred revenue	108,953	3,079	112,032

Additional paid-in capital	1,053,079	(1,126)	1,051,953
Accumulated deficit	(213,376)	506	(212,870)

	Year ended December 31,					
	2017			2016		
	As reported	Adjustments	As adjusted	As reported	Adjustments	As adjusted
	(in thousands, except per share amounts)					
Statement of Operations						
Net sales	$ 484,756	$ (9,070)	$ 475,686	$ 332,451	$ (749)	$ 331,702
Cost of sales	300,438	(980)	299,458	199,593	(989)	198,604
Income tax expense (benefit)	(36,107)	(1,487)	(37,594)	2,766	57	2,823
Net income (loss)	(44,793)	(6,603)	(51,396)	(122,210)	183	(122,027)
Diluted earnings (loss) per share	(1.01)	(0.15)	(1.16)	(3.11)	0.01	(3.10)

The Company’s adoption of the standard had no impact to cash provided by or used in operating, investing, or financing activities on the Consolidated Statements of Cash Flows.

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Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

The Company adopted ASU 2016-01, Financial Instruments – Overall, as of January 1, 2018. This ASU requires certain equity investments to be measured at fair value, with changes in fair value recognized in net income. The Company measures equity investments without readily observable market prices at cost, adjusted for changes in observable prices minus impairment. Changes in measurement are included in “Other, net” in the Consolidated Statements of Operations. This ASU has not had a material impact on the consolidated financial statements upon adoption, and the Company will monitor its equity investments each reporting period for changes in observable market prices, if any, which may be material in future periods.

The Company adopted ASU 2016-09: Stock Compensation: Improvements to Employee Share-Based Payment Accounting, as of January 1, 2016. This ASU simplifies several aspects of the accounting for share-based payments. Beginning in 2016, excess tax benefits and deficiencies are recognized as income tax expense or benefit in the income statement in the reporting period incurred. The Company also made an accounting policy election to account for forfeitures when they occur. The ASU transition guidance requires that this election be applied on a modified retrospective basis through a cumulative-effect adjustment to retained earnings as of the beginning of the period in which the ASU is adopted. Accordingly, the Company recorded a $1.3 million charge to the opening accumulated deficit balance as of January 1, 2016, with a corresponding adjustment to additional paid-in capital, resulting in no impact to the opening balance of total stockholders’ equity. In addition, the Company recorded additional deferred tax assets with an equally offsetting valuation allowance of $2.4 million.

(u) Recent Accounting Pronouncements Not Yet Adopted

In February 2016, the FASB issued ASU 2016-02: Leases, which, along with subsequent ASUs related to this topic, has been codified as Accounting Standards Codification 842 (“ASC 842”). ASC 842 generally requires operating lessee rights and obligations to be recognized as assets and liabilities on the balance sheet. The new standard, which is effective for the Company on January 1, 2019, offers a transition option whereby companies can recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption rather than in the earliest period presented. The Company plans to adopt using this transition method. In addition, ASC 842 provides for a number of optional exemptions in transition. The Company expects to elect certain exemptions whereby prior conclusions regarding lease identification, lease classification, and initial direct costs are not required to be reassessed under the new standard. The Company also plans to elect allowable policies whereby the Company will not separate lease and non-lease components, and the Company will not recognize an asset or liability for leases with original terms or renewals of one year or less. Upon adoption, the Company expects to recognize an operating lease liability ranging from $12 million to $16 million based on the present value of remaining minimum rental payments on existing leases, with corresponding assets of approximately the same amount.

The Company is also evaluating other pronouncements recently issued but not yet adopted. The adoption of these pronouncements is not expected to have a material impact on our consolidated financial statements.

Note 2 — Income (Loss) Per Share

The Company considers unvested share-based awards that have non-forfeitable rights to dividends prior to vesting to be participating shares, which are treated as a separate class of security from the Company's common shares for calculating per share data. Therefore, the Company applies the two-class method when calculating income (loss) per share. The two-class method is an earnings allocation formula that determines earnings per share for each class of common stock and participating security according to dividends declared and participation rights in undistributed earnings. However, since the holders of the participating shares are not obligated to fund losses, participating shares are excluded from the calculation of loss per share.

Basic income (loss) per share is calculated by dividing net income (loss) by the weighted average number of shares outstanding during the period under the two-class method. Diluted income per share is calculated by dividing net income

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by the weighted average number of shares used to calculate basic income per share plus the weighted average number of common share equivalents outstanding during the period. The dilutive effect of outstanding options to purchase common stock and non-participating share-based awards is considered in diluted income per share by application of the treasury stock method. The dilutive effect of performance share units is included in diluted income per common share in the periods the performance targets have been achieved. The computations of basic and diluted income (loss) per share for the years ended December 31, 2018, 2017, and 2016 are as follows:

	For the year ended December 31,		
	2018	2017	2016
	(in thousands, except per share amounts)		
Net income (loss)	$ (407,088)	$ (51,396)	$ (122,027)
Net income (loss) per common share:			
Basic	$ (8.63)	$ (1.16)	$ (3.10)
Diluted	$ (8.63)	$ (1.16)	$ (3.10)
Basic weighted average shares outstanding	47,151	44,174	39,340
Effect of potentially dilutive share-based awards	—	—	—
Diluted weighted average shares outstanding	47,151	44,174	39,340
Unvested participating shares excluded from basic weighted average shares outstanding since the securityholders are not obligated to fund losses	20	72	312
Common share equivalents excluded from the diluted weighted average shares outstanding since Veeco incurred a net loss and their effect would be antidilutive	28	239	107
Potentially dilutive non-participating shares excluded from the diluted calculation as their effect would be antidilutive	2,474	1,744	1,896
Maximum potential shares to be issued for settlement of the Convertible Senior Notes excluded from the diluted calculation as their effect would be antidilutive	8,618	8,618	—

Note 3 — Fair Value Measurements

Fair value is the price that would be received for an asset or the amount paid to transfer a liability in an orderly transaction between market participants. The Company is required to classify certain assets and liabilities based on the following fair value hierarchy:

- Level 1: Quoted prices in active markets that are unadjusted and accessible at the measurement date for identical, unrestricted assets or liabilities;

- Level 2: Quoted prices for identical assets and liabilities in markets that are not active, quoted prices for similar assets and liabilities in active markets or financial instruments for which significant inputs are observable, either directly or indirectly; and

- Level 3: Prices or valuations that require inputs that are both significant to the fair value measurement and unobservable.

A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. The Company has evaluated the estimated fair value of financial instruments using available market information and valuations as provided by third-party sources. The use of different market assumptions or estimation methodologies could have a significant effect on the estimated fair value amounts.

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The following table presents the Company's assets that were measured at fair value on a recurring basis at December 31, 2018 and 2017:

	Level 1	Level 2	Level 3	Total
	(in thousands)			
December 31, 2018				
Cash equivalents				
Certificate of deposits and time deposits	$ 65,571	$ —	$ —	$ 65,571
U.S. treasuries	3,990	—	—	3,990
Total	$ 69,561	$ —	$ —	$ 69,561
Short-term investments				
U.S. treasuries	$ 37,184	$ —	$ —	$ 37,184
Corporate debt	—	8,516	—	8,516
Commercial paper	—	2,489	—	2,489
Total	$ 37,184	$ 11,005	$ —	$ 48,189
December 31, 2017				
Cash equivalents				
Certificate of deposits and time deposits	$ 64,249	$ —	$ —	$ 64,249
U.S. treasuries	12,490	—	—	12,490
Total	$ 76,739	$ —	$ —	$ 76,739
Short-term investments				
U.S. treasuries	$ 33,895	$ —	$ —	$ 33,895
Corporate debt	—	10,886	—	10,886
Commercial paper	—	2,999	—	2,999
Total	$ 33,895	$ 13,885	$ —	$ 47,780

The Company's investments classified as Level 1 are based on quoted prices that are available in active markets. The Company's investments classified as Level 2 are valued using observable inputs to quoted market prices, benchmark yields, reported trades, broker/dealer quotes, or alternative pricing sources with reasonable levels of price transparency.

Note 4 — Investments

At December 31, 2018 and 2017 the amortized cost and fair value of marketable securities were as follows:

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
	(in thousands)			
December 31, 2018				
U.S. treasuries	$ 37,191	$ —	$ (7)	$ 37,184
Corporate debt	8,525	—	(9)	8,516
Commercial paper	2,489	—	—	2,489
Total	$ 48,205	$ —	$ (16)	$ 48,189
December 31, 2017				
U.S. treasuries	$ 33,914	$ —	$ (19)	$ 33,895
Corporate debt	10,894	—	(8)	10,886
Commercial paper	2,999	—	—	2,999
Total	$ 47,807	$ —	$ (27)	$ 47,780

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Available-for-sale securities in a loss position at December 31, 2018 and 2017 were as follows:

	December 31, 2018		December 31, 2017	
	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses
	(in thousands)			
U.S. treasuries	$ 37,184	$ (7)	$ 33,895	$ (19)
Corporate debt	8,516	(9)	10,886	(8)
Total	$ 45,700	$ (16)	$ 44,781	$ (27)

At December 31, 2018 and 2017, there were no short-term investments that had been in a continuous loss position for more than 12 months.

The maturities of securities classified as available-for-sale at December 31, 2018 were all due in one year or less. Actual maturities may differ from contractual maturities because borrowers may have the right to call or prepay obligations with or without call or prepayment penalties. The realized gains or losses for the years ended December 31, 2018, 2017, and 2016 were immaterial.

Other Investments

Veeco has an ownership interest of less than 20% in a non-marketable investment, Kateeva, Inc. (“Kateeva”), over which Veeco does not exert significant influence. The carrying value of the investment was $21.0 million at December 31, 2018 and 2017. Additionally, during the year ended December 31, 2018, the Company made a separate non-marketable investment of $3.5 million in another entity. The Company does not exert significant influence over this investment and its ownership interest is less than 20%. Neither equity investment has a readily observable market price, and therefore the Company has elected to measure these investments at cost, adjusted for changes in observable market prices minus impairment. The investments are included in “Other assets” on the Consolidated Balance Sheets. There were no changes in observable market prices for either investment for the year ended December 31, 2018. These investments are subject to periodic impairment reviews; as there are no open-market valuations, the impairment analyses require judgment. The analyses include assessments of the companies’ financial condition, the business outlooks for their products and technologies, their projected results and cash flow, business valuation indications from recent rounds of financing, the likelihood of obtaining subsequent rounds of financing, and the impact of equity preferences held by Veeco relative to other investors. There were no impairment charges recorded for either investment for the years ended December 31, 2018, 2017, or 2016.

Note 5 — Business Combinations

Ultratech

On May 26, 2017, the Company completed its acquisition of Ultratech, Inc. ("Ultratech"). Ultratech develops, manufactures, sells, and supports lithography, laser annealing, and inspection equipment for manufacturers of semiconductor devices, including front-end semiconductor manufacturing and advanced packaging. Ultratech also develops, manufactures, sells, and supports ALD equipment for scientific and industrial applications. Ultratech's customers are primarily located throughout the United States, Europe, China, Japan, Taiwan, Singapore, and Korea. The results of Ultratech's operations have been included in the consolidated financial statements since the date of acquisition.

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Ultratech shareholders received (i) $21.75 per share in cash and (ii) 0.2675 of a share of Veeco common stock for each Ultratech common share outstanding on the acquisition date. The acquisition date fair value of the consideration totaled $633.4 million, net of cash acquired, which consisted of the following:

	Acquisition Date (May 26, 2017) (in thousands)
Cash consideration, net of cash acquired of $229.4 million	$ 404,490
Equity consideration (7.2 million shares issued)	228,643
Replacement equity awards attributable to pre-acquisition service	228
Acquisition date fair value	$ 633,361

Approximately $2.7 million of the cash merger consideration is included in “Accrued expenses and other current liabilities” on the Consolidated Balance Sheets as of December 31, 2017 related to shareholder appraisal proceedings that were subsequently settled and paid during 2018.

The following table summarizes the estimated fair values of the assets acquired and liabilities assumed at the acquisition date:

	Acquisition Date (May 26, 2017) (in thousands)
Short-term investments	$ 47,161
Accounts receivable	45,465
Inventories	59,100
Deferred cost of sales	242
Prepaid expense and other current assets	7,217
Property, plant, and equipment	18,152
Intangible assets	346,940
Other assets	6,442
Total identifiable assets acquired	530,719
Accounts payable	24,291
Accrued expenses and other current liabilities	16,356
Customer deposits and deferred revenue	4,834
Deferred income taxes	32,478

Other liabilities		11,622
Total liabilities assumed		89,581
Net identifiable assets acquired		441,138
Goodwill		192,223
Net assets acquired	$	633,361

The gross contractual value of the acquired accounts receivable was approximately $46.0 million. The fair value of the accounts receivables is the amount expected to be collected by the Company. Goodwill generated from the acquisition is primarily attributable to expected synergies from future growth and strategic advantages provided through the expansion of product offerings as well as assembled workforce and is not expected to be deductible for income tax purposes.

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The classes of intangible assets acquired and the estimated useful life of each class is presented in the table below:

	Acquisition Date (May 26, 2017) Amount (in thousands)	Useful life	
Technology	$ 158,390	9	years
Customer relationships	116,710	12	years
Backlog	3,080	6	months
In-process research and development	43,340	*	
Trademark and tradenames	25,420	7	years
Intangible assets acquired	$ 346,940		

*In-process research and development will be amortized (or impaired) upon completion (or abandonment) of the development project.

The Company determined the estimated fair value of the identifiable intangible assets based on various factors including: cost, discounted cash flow, income method, loss-of-revenue/income method, and relief-from-royalty method in determining the purchase price allocation.

In-process research and development (“IPR&D”) represents the estimated fair values of incomplete Ultratech research and development projects that had not reached the commercialization stage and met the criteria for recognition as IPR&D as of the date of the acquisition. The fair value of IPR&D was determined using an income approach and costs to complete the project and expected commercialization timelines are considered key assumptions. This valuation approach reflected the present value of the projected cash flows that were expected to be generated by the IPR&D less charges representing the contribution of other assets to those cash flows. The value of the IPR&D was determined to be $43.3 million, approximately half of which was related to Ultratech’s lithography technologies and one-third of which was related to Ultratech’s laser annealing technologies.

During the second quarter of 2018, the Company lowered its projected results for the Ultratech asset group and determined that the revised projections were significantly lower than projected results at the time of the acquisition and that these revised projections required the Company to assess the Ultratech asset group for impairment. See Note 6, “Goodwill and Intangible Assets,” for additional information.

For the year ended December 31, 2018 and 2017, acquisition related costs were approximately $3.0 million and $17.8 million, respectively, including non-cash charges of $4.2 million related to accelerated share-based compensation for employee terminations for the year ended December 31, 2017.

The amounts of net sales and income (loss) from operations before income taxes of Ultratech included in the Company’s Consolidated Statement of Operations for the year ended December 31, 2017 are as follows:

	Year ended December 31, 2017 (in thousands)
Net sales	$ 65,280
Loss before income taxes	$ (62,284)

Loss before income taxes of Ultratech for the year ended December 31, 2017 of $62.3 million includes acquisition costs of $17.8 million, release of inventory fair value step-up related to purchase accounting of $9.6 million, amortization expense on intangible assets of $23.9 million, and restructuring charges of $3.3 million.

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The following table presents unaudited pro forma financial information as if the acquisition of Ultratech had occurred on January 1, 2016:

	For the year ended December 31,	
	2017	2016
	(in thousands, except per share amounts)	
Net sales	$ 546,428	$ 525,752
Loss before income taxes	(90,000)	(217,783)
Diluted earnings per share	$ (1.38)	$ (4.67)

The pro-forma results were calculated by combining the audited results of the Company with the stand-alone unaudited results of Ultratech for the pre-acquisition period, and adjusting for the following:

(i) Additional amortization expense related to identified intangible assets valued as part of the purchase price allocation that would have been incurred starting on January 1, 2016.

(ii) Additional depreciation expense for the property, plant, and equipment fair value adjustments that would have been incurred starting on January 1, 2016.

(iii) All acquisition related costs incurred by the Company as well as by Ultratech pre-acquisition have been removed from the year ended December 31, 2017 and included in the year ended December 31, 2016, as such expenses would have been incurred in the first quarter following the acquisition.

(iv) All amortization of inventory step-up has been removed from the year ended December 31, 2017 and recorded in the year ended December 31, 2016, as such costs would have been incurred as the corresponding inventory was sold.

(v) Additional interest expense related to the Convertible Senior Notes (see Note 12, “Debt”) as if they had been issued on January 1, 2016.

(vi) Income tax expense (benefit) was adjusted for the impact of the above adjustments for each period.

(vii) All shares issued in connection with the acquisition were considered outstanding as of January 1, 2016 for purposes of calculating diluted earnings per share.

Note 6 — Goodwill and Intangible Assets

Goodwill represents the future economic benefits arising from assets acquired in a business combination that are not individually identified and separately recognized. The following table presents the changes in goodwill balances during the years indicated:

	Gross carrying amount	Accumulated impairment	Net amount
	(in thousands)		
Balance at December 31, 2016	$ 238,108	$ 123,200	$ 114,908
Acquisition	192,223	—	192,223
Balance at December 31, 2017	430,331	123,200	307,131
Impairment	—	122,829	(122,829)
Balance at December 31, 2018	$ 430,331	$ 246,029	$ 184,302

The Company performs its annual goodwill impairment test at the beginning of the fourth quarter each year. As the Company maintains a single goodwill reporting unit, it determines the fair value of its reporting unit based upon the

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Company's adjusted market capitalization. The adjusted market capitalization is calculated by multiplying the average share price of the Company's common stock for the last ten trading days prior to the measurement date by the number of outstanding common shares and adding a control premium. The control premium is estimated using historical transactions in similar industries. The annual test performed at the beginning of the fourth quarter of fiscal 2017 and 2018 did not result in any potential impairment as the fair value of the reporting unit was determined to exceed the carrying amount of the reporting unit.

As a result of a significant decline in the Company's stock price during the fourth quarter, the Company concluded it was appropriate to perform an interim goodwill impairment test as of the end of the fourth quarter. The fair value of its reporting unit, as calculated using the adjusted market capitalization approach noted above, was determined to be below the carrying value of the reporting unit, and the Company recorded an impairment charge equal to the excess of carrying value over fair value, or $122.8 million, for the year ended December 31, 2018. The impairment charge is included in "Asset impairment" in the Consolidated Statements of Operations. The valuation of goodwill will continue to be subject to changes in the Company's market capitalization and observable market control premiums. This analysis is sensitive to changes in the Company's stock price and absent other qualitative factors, the Company may be required to record additional goodwill impairment charges in future periods if the stock price declines and remains depressed for an extended period of time.

The components of purchased intangible assets were as follows:

		December 31, 2018			December 31, 2017		
	Weighted Average Remaining Amortization Period (in years)	Gross Carrying Amount (in thousands)	Accumulated Amortization and Impairment	Net Amount	Gross Carrying Amount	Accumulated Amortization and Impairment	Net Amount
Technology	6.4	$ 337,218	$ 290,808	$ 46,410	$ 307,588	$ 133,121	$ 174,467
Customer relationships	10.2	164,595	136,126	28,469	164,595	39,336	125,259
In-process R&D	—	13,710	10,530	3,180	43,340	—	43,340
Trademarks and tradenames	5.4	30,910	23,899	7,011	30,910	4,321	26,589
Other	1.3	3,686	3,607	79	3,686	3,498	188

Total	7.3	$ 550,119	$ 464,970	$ 85,149	$ 550,119	$ 180,276	$ 369,843

Other intangible assets primarily consist of patents, licenses, and backlog.

During the second quarter of 2018, the Company lowered its projected results for the Ultratech asset group, which were significantly below the projected results at the time of the acquisition. The reduced projections were based on lower than expected unit volume of certain smartphones, which incorporate advanced packaging methods such as fan-out wafer level packaging ("FOWLP"), and a delay in the adoption of FOWLP advanced packaging by other electronics manufacturers, both of which slowed orders and reduced revenue projections for the Company's advanced packaging lithography systems. In addition, there has been a delay in the build out of 28nm facilities by companies in China who were expected to purchase the Company's Laser Spike Anneal systems. Taken together, the reduced projections identified during the second quarter of 2018 required the Company to assess the Ultratech asset group for impairment. As a result of the analysis, which included projected cash flows that required the use of unobservable inputs, the Company recorded non-cash impairment charges of $216.4 million and $35.9 million related to definite-lived intangible assets and in-process research and development assets, respectively, during the second quarter of 2018. The impairment charge is included in "Asset impairment" in the Consolidated Statement of Operations. Subsequently, certain in-process research and development projects were completed and moved to the "Technology" line in the above table.

During 2016, the Company decided to reduce future investments in certain technologies and, as a result, recorded a non-cash impairment charge of $54.3 million for the related intangible purchased technology. The impairment charge was

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based on projected cash flows that required the use of unobservable inputs and was recorded in "Asset impairment" in the Consolidated Statements of Operations.

Based on the intangible assets recorded at December 31, 2018, and assuming no subsequent additions to or impairment of the underlying assets, the remaining estimated annual amortization expense, excluding in-process R&D, is expected to be as follows:

	Amortization (in thousands)
2019	$ 16,820
2020	15,894
2021	12,772
2022	10,438
2023	8,675
Thereafter	17,370
Total	$ 81,969

Note 7 — Inventories

Inventories are stated at the lower of cost or net realizable value, with cost determined on a first-in, first-out basis. Inventories consist of the following:

	December 31, 2018	2017
	(in thousands)	
Materials	$ 90,816	$ 59,919
Work-in-process	42,354	37,222
Finished goods	23,141	23,125
Total	$ 156,311	$ 120,266

Note 8 — Property, Plant, and Equipment and Assets Held for Sale

Property and equipment, net, consist of the following:

	December 31, 2018	2017	Average Useful Life
	(in thousands)		
Land	$ 5,669	$ 5,669	N/A
Building and improvements	61,124	54,449	10 – 40 years
Machinery and equipment (1)	128,385	126,829	3 – 10 years
Leasehold improvements	9,033	10,073	3 – 7 years
Gross property, plant, and equipment	204,211	197,020	
Less: accumulated depreciation and amortization	123,927	111,962	
Net property, plant, and equipment	$ 80,284	$ 85,058	

(1) Machinery and equipment also includes software, furniture, and fixtures

Depreciation expense was $17.6 million, $14.6 million, and $13.4 million for the years ended December 31, 2018, 2017, and 2016, respectively. During 2016, the Company decided to reduce future investments in certain technologies and, as a result, recorded an impairment charge of $3.3 million of property, plant, and equipment.

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As part of the Company’s efforts to reduce costs, enhance efficiency, and streamline operations, the Company removed certain lab equipment that is no longer required and recorded a non-cash impairment charge of $6.2 million for the year ended December 31, 2016. Additionally, as part of that initiative, the Company listed its two facilities in South Korea for sale. When each facility was reclassified as held for sale, the Company determined that the carrying values of the buildings exceeded their fair market values, less cost to sell, and recorded net impairment charges of $4.5 million for the year ended December 31, 2016. Both facilities were sold before the end of 2016 at prices that approximated the revised carrying values.

Finally, during the year ended December 31, 2016, the Company recorded an impairment charge of approximately $1.2 million related to an owned property in St. Paul, Minnesota. The property was sold during 2017, resulting in an additional impairment charge of $0.7 million for the year ended December 31, 2017. There were no assets held for sale as of December 31, 2018 and 2017. All impairment charges were recorded in “Asset impairment” in the Consolidated Statements of Operations.

Note 9 — Accrued Expenses and Other Liabilities

The components of accrued expenses and other current liabilities were as follows:

	December 31,	
	2018	2017
	(in thousands)	
Payroll and related benefits	$ 20,486	$ 32,996
Warranty	7,852	6,532
Interest	4,321	4,430
Professional fees	2,897	3,942
Merger consideration payable	—	2,662
Sales, use, and other taxes	2,670	2,144
Restructuring liability	2,213	1,520
Other	6,011	3,842
Total	$ 46,450	$ 58,068

Customer deposits and deferred revenue

Customer deposits totaled $28.3 million and $41.5 million at December 31, 2018 and 2017, respectively, which are included in “Customer deposits and deferred revenue” in the Consolidated Balance Sheets. Deferred revenue represents amounts billed, other than deposits, in excess of the revenue that can be recognized on a particular contract at the balance sheet date. Changes in deferred revenue were as follows:

	(in thousands)
Balance - December 31, 2017	$ 70,536
Deferral of revenue	10,251
Recognition of previously deferred revenue	(36,372)
Balance - December 31, 2018	$ 44,415

As of December 31, 2018, the Company has approximately $74.0 million of remaining performance obligations on contracts with an original estimated duration of one year or more, of which approximately 67% is expected to be recognized within one year, with the remaining amounts expected to be recognized between one to three years. The Company has elected to exclude disclosures regarding remaining performance obligations that have an original expected duration of one year or less.

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Notes to Consolidated Financial Statements (Continued)

Other liabilities

As part of the acquisition of Ultratech, the Company assumed an executive non-qualified deferred compensation plan that allowed qualifying executives to defer cash compensation. The plan was frozen at the time of acquisition and no further contributions have been made. At December 31, 2018 and 2017, plan assets approximated $3.2 million and $3.4 million, respectively, representing the cash surrender value of life insurance policies and is included within “Other assets” in the Consolidated Balance Sheets, while plan liabilities approximated $3.5 million and $4.7 million, respectively and is included within “Other liabilities” in the Consolidated Balance Sheets. Other liabilities also included asset retirement obligations of $3.2 million and $3.3 million at December 31, 2018 and 2017, respectively, medical and dental benefits for former executives of $2.2 million at both December 31, 2018 and 2017, and income tax payables of $1.0 million at December 31, 2018.

Note 10 — Restructuring Charges

During 2017, the Company initiated certain restructuring activities related to the Company’s efforts to streamline operations, enhance efficiencies, and reduce costs, as well as reduce the Company’s investments in certain technology development. In addition, during 2017, the Company began the Ultratech acquisition integration process to enhance efficiencies, resulting in reductions in headcount and other facility costs. During the year ended December 31, 2018, additional accruals were recognized and payments were made related to these restructuring initiatives.

During the second quarter of 2018, the Company initiated plans to further reduce excess capacity associated with the manufacture and support of the Company’s advanced packaging lithography and 3D wafer inspection systems by consolidating these operations into its San Jose, California facility. As a result of this and other cost saving initiatives, the Company announced headcount reductions of approximately 40 employees and recorded restructuring charges related to these actions of $2.8 million for the year ended December 31, 2018, consisting principally of personnel severance and related costs. The Company expects the consolidation to be completed in the first quarter of 2019, and expects to incur immaterial additional restructuring costs as this initiative is completed.

During the third quarter of 2018, the Company initiated additional restructuring activities to further reduce costs, including headcount reductions impacting approximately 35 employees and recorded restructuring charges related to these actions of $1.2 million, consisting principally of personnel severance and related costs. This initiative was completed by the end of 2018. Restructuring expense for the year ended December 31, 2018 included non-cash charges of $1.2 million related to accelerated share-based compensation for employee terminations, compared to $1.9

million for the comparable prior year period.

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The following table shows the amounts incurred and paid for restructuring activities during the years ended December 31, 2018, 2017, and 2016 and the remaining accrued balance of restructuring costs at December 31, 2018, which is included in "Accrued expenses and other current liabilities" in the Consolidated Balance Sheets:

	Personnel Severance and Related Costs	Facility Related Costs and Other	Total
	(in thousands)		
Balance - December 31, 2015	$ 824	$ —	$ 824
Provision	4,544	1,098	5,642
Changes in estimate	(2)	—	(2)
Payments	(3,570)	(1,098)	(4,668)
Balance - December 31, 2016	1,796	—	1,796
Provision	4,714	5,257	9,971
Payments	(4,990)	(5,257)	(10,247)
Balance - December 31, 2017	1,520	—	1,520
Provision	4,681	2,714	7,395
Payments	(4,058)	(2,644)	(6,702)
Balance - December 31, 2018	$ 2,143	$ 70	$ 2,213

Note 11 — Commitments and Contingencies

Warranty

The Company typically provides standard warranty coverage on its systems for one year from the date of final acceptance by providing labor and parts necessary to repair the systems during the warranty period. The Company accounts for the estimated warranty cost when revenue is recognized on the related system. Warranty cost is included in "Cost of sales" in the Consolidated Statements of Operations. The estimated warranty cost is based on the Company's historical experience with its systems and regional labor costs. The Company calculates the average service hours by region and parts expense per system utilizing actual service records to determine the estimated warranty charge. The Company updates its warranty estimates on a quarterly basis when the actual product performance or field expense differs from original estimates.

Changes in the Company's product warranty reserves were as follows:

	December 31,		
	2018	2017	2016
	(in thousands)		
Balance, beginning of the year	$ 6,532	$ 4,217	$ 8,159
Warranties issued	6,737	5,817	3,916
Addition from Ultratech acquisition	—	1,889	—
Consumption of reserves	(6,573)	(6,330)	(6,433)
Changes in estimate	1,156	939	(1,425)
Balance, end of the year	$ 7,852	$ 6,532	$ 4,217

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Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

Minimum Lease Commitments

Minimum lease commitments at December 31, 2018 for property and equipment under operating lease agreements (exclusive of renewal options) are payable as follows:

	Operating Leases (in thousands)
Payments due by period:	
2019	$ 5,143
2020	5,056
2021	2,432
2022	1,812
2023	1,066
Thereafter	548
Total	$ 16,057

Lease expense was $6.3 million, $5.3 million, and $2.5 million for the years ended December 31, 2018, 2017, and 2016, respectively. In addition, the Company is obligated under such leases for certain other expenses, including real estate taxes and insurance.

Legal Proceedings

On June 8, 2018, an Ultratech shareholder who received Veeco stock as part of the consideration for the Ultratech acquisition filed a purported class action complaint in the Superior Court of the State of California, County of Santa Clara, captioned Wolther v. Maheshwari et al., Case No. 18CV329690, on behalf of himself and others who purchased or acquired shares of Veeco pursuant to the registration statement and prospectus which Veeco filed with the SEC in connection with the Ultratech acquisition (the “Wolther Action”). On August 2 and August 8, 2018, two purported class action complaints substantially similar to the Wolther Action were filed on behalf of different plaintiffs in the same court as the Wolther Action. These cases have been consolidated with the Wolther Action, and a consolidated complaint was filed on December 11, 2018. The consolidated complaint seeks to recover damages and fees under Sections 11, 12, and 15 of the Securities Act of 1933 for, among other things, alleged false/misleading statements in the registration statement and prospectus relating to the Ultratech acquisition, relating primarily to the alleged failure to disclose delays in the advanced packaging business, increased MOCVD competition in China, and an intellectual property dispute. The defendants filed a demurrer on January 10, 2019, asking the court to dismiss the consolidated complaint for failure to state a claim. The demurrer is scheduled to be heard by the court on March 15, 2019. Veeco believes this lawsuit is without merit and intends to vigorously contest this matter.

On December 21, 2018, a purported Veeco stockholder filed a derivative action in the Superior Court of the State of California, County of Santa Clara, captioned Vladimir Gusinsky Revocable Trust v. Peeler, et al., Case No. 18CV339925, on behalf of nominal defendant Veeco. The complaint seeks to assert claims for breach of fiduciary duty, waste of corporate assets, and unjust enrichment against current and former Veeco directors premised on purported misstatements and omissions in the registration statement relating to the Ultratech acquisition. On January 2, 2019, the court ordered this action stayed until the case management conference, which is scheduled for March 15, 2019. Veeco believes this lawsuit is without merit and intends to vigorously contest this matter.

The Company is involved in various other legal proceedings arising in the normal course of business. The Company does not believe that the ultimate resolution of these matters will have a material adverse effect on its consolidated financial position, results of operations, or cash flows.

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Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

Concentrations of Credit Risk

The Company depends on purchases from its ten largest customers, which accounted for 61% and 67% of net accounts receivable at December 31, 2018 and 2017, respectively.

Customers who accounted for more than 10% of net accounts receivable or net sales are as follows:

	Accounts Receivable		Net Sales For the Year Ended		
	December 31,		December 31,		
Customer	2018	2017	2018	2017	2016
Customer A	*	24 %	*	21 %	14 %
Customer B	22 %	*	*	*	*
Customer C	*	*	12 %	*	*

*Less than 10% of aggregate accounts receivable or net sales

The Company manufactures and sells its products to companies in different geographic locations. Refer to Note 18, “Segment Reporting and Geographic Information,” for additional information. In certain instances, the Company requires deposits from its customers for a portion of the sales price in advance of shipment and performs periodic credit evaluations on its customers. Where appropriate, the Company requires letters of credit on certain non-U.S. sales arrangements. Receivables generally are due within 30 to 90 days from the date of invoice.

Receivable Purchase Agreement

In December 2017, the Company entered into a Receivable Purchase Agreement with a financial institution to sell certain of its trade receivables from customers without recourse, up to $23.0 million at any point in time for a term of one year. Pursuant to this agreement, the Company sold $15.0 million of Receivables during the year ended December 31, 2017 and maintained $8.0 million available under the agreement for additional sales of Receivables as of December 31, 2017. No sales were made under this agreement in 2018, and the agreement was terminated in 2018.

The net sale of accounts receivable, under the agreement is reflected as a reduction of accounts receivable in the Company's Consolidated Balance Sheet at the time of sale and any fees for the sale of trade receivables were not material for the periods presented.

Suppliers

The Company outsources certain functions to third parties, including the manufacture of several of its systems. While the Company relies on its outsourcing partners to perform their contracted functions, the Company maintains some level of internal manufacturing capability for these systems. In addition, certain of the components and sub-assemblies included in the Company's products are obtained from a single source or a limited group of suppliers. The failure of the Company's present outsourcing partners and suppliers to meet their contractual obligations and the Company's inability to make alternative arrangements or resume the manufacture of these systems could have a material adverse effect on the Company's revenues, profitability, cash flows, and relationships with its customers.

The Company had deposits with its suppliers of $12.8 million and $7.6 million at December 31, 2018 and 2017, respectively, that were included in "Prepaid expenses and other current assets" on the Consolidated Balance Sheets.

Purchase Commitments

The Company had purchase commitments of $91.5 million at December 31, 2018, substantially all of which will come due within one year. Purchase commitments are primarily for inventory used in manufacturing products and are partially offset by existing deposits with suppliers.

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

Bank Guarantees

The Company has bank guarantees and letters of credit issued by a financial institution on its behalf as needed. At December 31, 2018, outstanding bank guarantees and letters of credit totaled $6.8 million and unused bank guarantees and letters of credit of $58.9 million were available to be drawn upon.

Other

On November 1, 2018, the Company announced an attack on its computer systems. Upon learning of the attack, forensic experts were promptly engaged to assist with the investigation. The Company also notified law enforcement of the incident.

The investigation, which has largely been completed, determined that the Company's computer systems were accessed by what appears to be a highly-sophisticated actor at various times over a period of years. It appears that proprietary and confidential information of the Company and certain personal information of the Company's employees was accessed and may have been compromised as a result of the incident. Based on the evidence available at this time, the extent and impact of the compromise cannot be determined. The Company notified employees of this incident. The Company is continuing to analyze the incident, along with appropriate remediation of the Company's computer systems. That analysis and the related remediation efforts could ultimately reveal that additional information was revealed or compromised.

Based on the evidence available at this time, the Company does not know if or when it will be able to determine the potential impact to the Company, whether it will be able to identify who is responsible for this attack or whether it will be able to pursue legal action or other remedies to protect any compromised information or recover damages related to the attack. This attack, including the expenses incurred to address it, may have an adverse effect on the Company's results of operations and/or financial condition. In addition, this attack may have caused the loss or misuse of proprietary and confidential information of the Company or others, result in litigation and potential liability, damage the Company's reputation and/or otherwise harm its business.

Note 12 — Debt

Convertible Senior Notes

On January 10, 2017, the Company issued $345.0 million of 2.70% convertible senior unsecured notes (the "Convertible Senior Notes"). The Company received net proceeds, after deducting underwriting discounts and fees and expenses payable by the Company, of approximately $335.8 million. The Convertible Senior Notes bear interest at a rate of 2.70% per year, payable semiannually in arrears on January 15 and July 15 of each year, commencing on July 15, 2017. The Convertible Senior Notes mature on January 15, 2023 (the "Maturity Date"), unless earlier purchased by the Company, redeemed, or converted.

The Convertible Senior Notes are unsecured obligations of Veeco and rank senior in right of payment to any of Veeco's subordinated indebtedness; equal in right of payment to all of Veeco's unsecured indebtedness that is not subordinated; effectively subordinated in right of payment to any of Veeco's secured indebtedness to the extent of the value of the assets securing such indebtedness; and structurally subordinated to all indebtedness and other liabilities (including trade payables) of Veeco's subsidiaries.

The Convertible Senior Notes are convertible into cash, shares of the Company's common stock, or a combination thereof, at the Company's election, upon the satisfaction of specified conditions and during certain periods as described below. The initial conversion rate is 24.9800 shares of the Company's common stock per $1,000 principal amount of Convertible Senior Notes, representing an initial effective conversion price of $40.03 per share of common stock. The conversion rate may be subject to adjustment upon the occurrence of certain specified events as provided in the

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

indenture governing the Convertible Senior Notes, dated January 18, 2017 between the Company and U.S. Bank National Association, as trustee, but will not be adjusted for accrued but unpaid interest.

Holders may convert all or any portion of their notes, in multiples of one thousand dollar principal amount, at their option at any time prior to the close of business on the business day immediately preceding October 15, 2022 only under the following circumstances:

(i) During any calendar quarter (and only during such calendar quarter), if the last reported sale price of the common stock for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price on each applicable trading day;

(ii) During the five consecutive business day period after any five consecutive trading day period (the "measurement period") in which the trading price per one thousand dollar principal amount of Convertible Senior Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of Veeco's common stock and the conversion rate on each such trading day;

(iii) If the Company calls any or all of the Convertible Senior Notes for redemption at any time prior to the close of business on the scheduled trading day immediately preceding the redemption date; or

(iv) Upon the occurrence of specified corporate events.

On or after October 15, 2022, until the close of business on the business day immediately preceding the Maturity Date, holders may convert their notes at any time, regardless of the foregoing circumstances.

Upon conversion by the holders, the Company may elect to settle such conversion in shares of its common stock, cash, or a combination thereof. As a result of its cash conversion option, the Company segregated the liability component of the instrument from the equity component. The liability component was measured by estimating the fair value of a non-convertible debt instrument that is similar in its terms to the Convertible Senior Notes. The calculation of the fair value of the debt component required the use of Level 3 inputs, including utilization of convertible investors' credit assumptions and high yield bond indices. Fair value was estimated through discounting future interest and principal payments, an income approach, due under the Convertible Senior Notes at a discount rate of 7.00%, an interest rate equal to the estimated borrowing rate for similar non-convertible debt. The excess of the aggregate face value of the Convertible Senior Notes over the estimated fair value of the liability component of $72.5 million was recognized as a debt discount and recorded as an increase to additional paid-in capital and will be amortized over the expected life of the Convertible Senior Notes using the effective interest rate method. Amortization of the debt discount is recognized as non-cash interest expense.

The transaction costs of $9.2 million incurred in connection with the issuance of the Convertible Senior Notes were allocated to the liability and equity components based on their relative values. Transaction costs allocated to the liability component are being amortized using the effective interest rate method and recognized as non-cash interest expense over the expected term of the Convertible Senior Notes. Transaction costs allocated to the equity component of $1.9 million reduced the value of the equity component recognized in stockholders' equity.

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Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

The carrying value of the Convertible Senior Notes is as follows:

	December 31, 2018	2017
	(in thousands)	
Principal amount	$ 345,000	$ 345,000
Unamortized debt discount	(52,336)	(63,022)
Unamortized transaction costs	(5,272)	(6,348)
Net carrying value	$ 287,392	$ 275,630

Total interest expense related to the Convertible Senior Notes is as follows:

	For the year ended December 31, 2018	2017
	(in thousands)	
Cash Interest Expense		
Coupon interest expense	$ 9,315	$ 8,901
Non-Cash Interest Expense		
Amortization of debt discount	10,686	9,490
Amortization of transaction costs	1,076	956
Total Interest Expense	$ 21,077	$ 19,347

The Company determined the Convertible Senior Notes is a Level 2 liability in the fair value hierarchy and estimated its fair value as $255.3 million at December 31, 2018.

Note 13 — Derivative Financial Instruments

The Company is exposed to financial market risks arising from changes in currency exchange rates. Changes in currency exchange rate changes could affect the Company’s foreign currency denominated monetary assets and liabilities and forecasted cash flows. The Company entered into monthly forward derivative contracts with the intent of mitigating a portion of this risk. The Company only used derivative financial instruments in the context of hedging and not for speculative purposes and had not designated its foreign exchange derivatives as hedges. Accordingly, changes in fair value from these contracts were recorded as “Other, net” in the Company’s Consolidated Statements of Operations. The Company executed derivative transactions with highly rated financial institutions to mitigate counterparty risk.

The Company did not have any outstanding derivative contracts at December 31, 2018. A summary of the foreign exchange derivatives outstanding on December 31, 2017 is as follows:

	December 31, 2017		
	Fair Value	Maturity Dates	Notional Amount
	(in thousands)		
Foreign currency exchange forwards	$ —	January 2018	$ 622

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Notes to Consolidated Financial Statements (Continued)

The following table shows the gains and (losses) from currency exchange derivatives during the years ended December 31, 2018, 2017, and 2016, which are included in "Other, net" in the Consolidated Statements of Operations as well as the weighted average notional amount of derivatives outstanding for each period:

	Year ended December 31,					
	2018		2017		2016	
	Gains (losses)	Weighted average notional amount	Gains (losses)	Weighted average notional amount	Gains (losses)	Weighted average notional amount
	(in thousands)					
Foreign currency exchange forwards	$ 327	2,869	$ (6)	314	$ 219	7,175

Note 14 — Stockholders' Equity

Accumulated Other Comprehensive Income

The following table presents the changes in the balances of each component of AOCI, net of tax:

	Foreign Currency Translation	Minimum Pension Liability	Unrealized Gains (Losses) on Available for Sale Securities	Total
	(in thousands)			
Balance - December 31, 2015	$ 2,246	$ (866)	$ (32)	$ 1,348
Other comprehensive income (loss), before reclassifications	(19)	—	(6)	(25)
Amounts reclassified from AOCI	(430)	866	18	454

Other comprehensive income (loss)	(449)	866	12	429
Balance - December 31, 2016	1,797	—	(20)	1,777
Other comprehensive income (loss)	42	—	(7)	35
Balance - December 31, 2017	1,839	—	(27)	1,812
Other comprehensive income (loss)	(3)	—	11	8
Balance - December 31, 2018	$ 1,836	$ —	$ (16)	$ 1,820

The Company did not allocate additional tax expense (benefit) to other comprehensive income (loss) for all years presented as the Company is in a full valuation allowance position such that a deferred tax asset related to amounts recognized in other comprehensive income is not regarded as realizable on a more-likely-than-not basis.

During 2016, the Company finalized the process to terminate a defined benefit plan. As a result, the Company reclassified the minimum pension liability of $0.9 million, net of a tax benefit of $0.4 million, from “Accumulated other comprehensive income” in the Consolidated Balance Sheets to “Other, net” in the Consolidated Statements of Operations. Additionally, the Company completed its plan to liquidate one of its subsidiaries in Korea. As a result of this liquidation, a cumulative translation gain of $0.4 million was reclassified from “Accumulated other comprehensive income” to “Other, net” in the Consolidated Statements of Operations.

Preferred Stock

The Board of Directors has authority under the Company’s Certificate of Incorporation to issue shares of preferred stock, par value $0.01, with voting and economic rights to be determined by the Board of Directors. As of December 31, 2018, no preferred shares have been issued.

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

Treasury Stock

The share repurchase program authorized by the Company's Board of Directors in October 2015 expired on October 28, 2017. On December 11, 2017, the Company's Board of Directors authorized a new program to repurchase up to $100 million of the Company's common stock to be completed through December 11, 2019. At December 31, 2018, $14.3 million of the $100 million had been utilized. Repurchases are expected to be made from time to time in the open market or in privately negotiated transactions in accordance with applicable federal securities laws.

The Company records treasury stock purchases under the cost method using the first-in, first-out ("FIFO") method. Upon reissuance of treasury stock, amounts in excess of the acquisition cost are credited to additional paid-in capital. If the Company reissues treasury stock at an amount below its acquisition cost and if additional paid-in capital associated with prior treasury stock transactions is insufficient to cover the difference between the acquisition cost and the reissue price, this difference is charged to accumulated deficit.

Note 15 — Stock Plans

Share-based incentive awards are provided to employees under the terms of the Company's equity incentive compensation plans (the "Plans"), which are administered by the Compensation Committee of the Board of Directors. The 2010 Plan was approved by the Company's shareholders. The Company's employees, non-employee directors, and consultants are eligible to receive awards under the 2010 Stock Incentive Plan (as amended to date, the "2010 Plan"), which can include non-qualified stock options, incentive stock options, restricted share awards ("RSAs"), restricted share units ("RSUs"), performance share awards ("PSAs"), performance share units ("PSUs"), share appreciation rights, dividend equivalent rights, or any combination thereof. The Company settles awards under the Plans with newly issued shares or with shares held in treasury.

In 2013, the Board of Directors granted equity awards to certain employees under the Company's 2013 Inducement Stock Incentive Plan (the "Inducement Plan"). The Company issued 124,500 stock option shares and 87,000 RSUs under this plan. Stock options under this plan vest over a three year period and have a 10-year term, and RSUs under this plan vest over a two or four year period. At December 31, 2013, the Inducement Plan was merged into the 2010 Plan and is considered an inactive plan with no further shares available for grant. At December 31, 2018, there are 2,000 option shares and no RSUs outstanding under the Inducement Plan.

The Company is authorized to issue up to 10.6 million shares under the 2010 Plan, including additional shares authorized under plan amendments approved by shareholders in 2016 and 2013. Option awards are granted with an exercise price equal to the closing price of the Company’s common stock on the trading day prior to the date of grant; option awards generally vest over a three year period and have a seven or ten year term. RSAs and RSUs generally vest over one to five years. Certain option and share awards provide for accelerated vesting if there is a change in control, as defined in the 2010 Plan. At December 31, 2018, there are 1.2 million option shares and 0.9 million RSUs and PSUs outstanding under the 2010 Plan.

During 2016, the Company’s Board of Directors approved the 2016 Employee Stock Purchase Plan (“ESPP”). The Company is authorized to issue up to 750,000 shares under the ESPP. Under the ESPP, substantially all employees in the U.S. may purchase the Company’s common stock through payroll deductions at a price equal to 85 percent of the lower of the fair market value of the Company’s common stock at the beginning or end of each six-month Offer Period, as defined in the ESPP, and subject to certain limits. The ESPP was approved by the Company’s shareholders.

During 2017, in connection with the acquisition of Ultratech, the Company assumed certain restricted stock units (the “Assumed RSUs”) available and outstanding under the Ultratech, Inc. 1993 Stock Option/Stock Issuance Plan, as amended (the “Ultratech Plan”). The Assumed RSUs remain subject to the terms set forth in the award agreement governing the award and the Ultratech Plan, except that the Assumed RSUs relate to shares of Company common stock and the number of restricted stock units was adjusted pursuant to the terms of the acquisition to reflect the difference in

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Notes to Consolidated Financial Statements (Continued)

the value of a share of Company common stock and a share of Ultratech common stock prior to closing the acquisition. The Assumed RSUs were converted into 338,144 restricted stock units of the Company and generally vest over 50 months. After the acquisition and notwithstanding any other provisions of the Ultratech Plan, no further grants will be made under the Ultratech Plan, and the Company is solely maintaining the Ultratech Plan with respect to the Assumed RSUs. At December 31, 2018, there are 30,200 RSUs outstanding under the Ultratech Plan.

Shares Reserved for Future Issuance

At December 31, 2018, the Company has 4.5 million shares reserved to cover exercises of outstanding stock options, vesting of RSUs, and additional grants under the 2010 Plan. At December 31, 2018, the Company has 0.2 million shares reserved to cover future issuances under the ESPP Plan.

Share-Based Compensation

The Company recognized share-based compensation in the following line items in the Consolidated Statements of Operations for the periods indicated:

	For the year ended December 31,		
	2018	2017	2016
	(in thousands)		
Cost of sales	$ 1,885	$ 2,505	$ 1,956
Research and development	3,611	2,957	3,324
Selling, general, and administrative	9,417	12,851	10,433
Restructuring	1,161	1,880	—
Acquisition costs	—	4,203	—
Total	$ 16,074	$ 24,396	$ 15,713

The Company did not realize any tax benefits associated with share-based compensation for the years ended December 31, 2018, 2017, and 2016 due to the full valuation allowance on its U.S. deferred tax assets. See Note 17, “Income Taxes” for additional information. The Company capitalized an immaterial amount of share-based compensation into inventory for the years ended December 31, 2018, 2017, and 2016.

Unrecognized share-based compensation costs at December 31, 2018 are summarized below:

	Unrecognized Share-Based Compensation Costs (in thousands)	Weighted Average Period Expected to be Recognized (in years)
Stock option awards	$ —	—
Restricted stock units	2,466	2.4
Restricted stock awards	19,663	2.6
Performance share units	7,356	2.4
Total unrecognized share-based compensation cost	$ 29,485	2.5

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Notes to Consolidated Financial Statements (Continued)

Stock Option Awards

Stock options are awards issued to employees that entitle the holder to purchase shares of the Company's stock at a fixed price. At December 31, 2018, options outstanding that have vested and are expected to vest are as follows:

	Number of Shares (in thousands)	Weighted Average Exercise Price	Weighted Average Remaining Contractual Life (in years)	Aggregate Intrinsic Value (in thousands)
Vested	1,222	$ 34.80	3.0	—
Expected to vest	—	—	—	—
Total	1,222	34.80	3.0	—

The aggregate intrinsic value represents the difference between the option exercise price and $7.41, the closing price of the Company's common stock on December 31, 2018, the last trading day of the Company's fiscal year as reported on the NASDAQ Stock Market.

Additional information with respect to stock option activity:

	Number of Shares (in thousands)	Weighted Average Exercise Price
Balance - December 31, 2015	2,064	$ 32.91
Granted	—	—
Exercised	(194)	12.18
Expired or forfeited	(294)	34.44
Balance - December 31, 2016	1,576	35.18
Granted	—	—
Exercised	(18)	30.03

Expired or forfeited	(164)	37.47
Balance - December 31, 2017	1,394	34.97
Granted	—	—
Exercised	—	—
Expired or forfeited	(172)	36.21
Balance - December 31, 2018	1,222	34.80

The following table summarizes stock option information at December 31, 2018:

	Options Outstanding				Options Exercisable			
e of Exercise Prices	Shares (in thousands)	Aggregate Intrinsic Value (in thousands)	Weighted Average Remaining Contractual Life (in years)	Weighted Average Exercise Price	Shares (in thousands)	Aggregate Intrinsic Value (in thousands)	Weighted Average Remaining Contractual Life (in years)	We Ave Exe
00 - $30.00	25	$ —	3.6	$ 28.13	25	$ —	3.6	$ 2
01 - $40.00	1,058	—	3.1	32.81	1,058	—	3.1	3
01 - $50.00	12	—	1.7	45.57	12	—	1.7	4
01 - $60.00	127	—	2.4	51.70	127	—	2.4	5
	1,222	$ —	3.0	34.80	1,222	$ —	3.0	3

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Notes to Consolidated Financial Statements (Continued)

The following table summarizes information on options exercised for the periods indicated:

	Year ended December 31,		
	2018	2017	2016
	(in thousands)		
Cash received from options exercised	$ —	$ 431	$ 494
Intrinsic value of options exercised	$ —	$ 51	$ 1,165

RSAs, RSUs, PSAs, PSUs

RSAs are stock awards issued to employees that are subject to specified restrictions and a risk of forfeiture. RSUs are stock awards issued to employees that entitle the holder to receive shares of common stock as the awards vest. PSAs and PSUs are awards that result in an issuance of shares of common stock to employees if certain performance or market conditions are achieved. All of these awards typically vest over one to five years and vesting is subject to the employee's continued service with the Company and, in the case of performance awards, meeting certain performance or market conditions. The fair value of the awards is determined and fixed based on the closing price of the Company’s common stock on the trading day prior to the date of grant, or, in the case of performance awards with market conditions, fair value is determined using a Monte Carlo simulation.

The following table summarizes the equity activity of non-vested restricted shares and performance shares:

	Number of Shares (in thousands)	Weighted Average Grant Date Fair Value
Balance - December 31, 2015	1,398	$ 31.97
Granted	1,166	17.59
Vested	(349)	32.73
Forfeited	(266)	27.31
Balance - December 31, 2016	1,949	23.85
Granted	674	29.22

Performance award adjustments	(25)	20.95
Assumed from Ultratech	338	31.75
Vested	(831)	27.67
Forfeited	(225)	26.29
Balance - December 31, 2017	1,880	25.41
Granted	1,257	17.37
Performance award adjustments	(5)	32.67
Vested	(523)	26.39
Forfeited	(391)	24.66
Balance - December 31, 2018	2,218	20.74

The total fair value of shares that vested during the years ended December 31, 2018, 2017, and 2016 was $9.1 million, $22.3 million, and $7.5 million, respectively. For performance awards, the final number of shares earned will vary depending on the achievement of the actual results relative to the performance or market conditions. Each performance award is included in the table above at the grant date target share amount until the end of the performance period if not previously forfeited.

The fair value of performance awards with market conditions is estimated on the date of grant using a Monte Carlo simulation. Estimates of fair value are not intended to predict actual future events or the value ultimately realized by employees who receive these awards. The weighted average fair value and the assumptions used in calculating such

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

values during fiscal year 2018 for performance awards with market conditions were based on estimates at the date of grant as follows:

	Year ended December 31, 2018	
Weighted average fair value	$ 15.58	
Dividend yield	0	%
Expected volatility factor(1)	49	%
Risk-free interest rate(2)	2.88	%
Expected life (in years)(3)	3.0	

(1) Expected volatility is measured using historical daily price changes of the Company's stock over the respective expected term.
(2) The risk-free rate for periods within the contractual term is based on the U.S. Treasury yield curve in effect at the time of grant.
(3) The expected life is the number of years the Company estimates that the awards will be outstanding prior to exercise.

Employee Stock Purchase Plan

For the years ended December 31, 2018, 2017, and 2016 the Company received cash proceeds of $3.1 million, $2.6 million, and $1.2 million, and issued shares of 332,096, 163,000, and 83,000, respectively, under the ESPP Plan. The weighted average estimated values of employee purchase rights as well as the weighted average assumptions that were used in calculating such values during fiscal years 2018, 2017, and 2016 were based on estimates at the date of grant as follows:

	Year ended December 31,					
	2018		2017		2016	
Weighted average fair value	$ 4.94		$ 7.09		$ 4.45	
Dividend yield	0	%	0	%	0	%
Expected volatility factor(1)	62	%	36	%	43	%
Risk-free interest rate(2)	1.81	%	0.99	%	0.35	%
Expected life (in years)(3)	0.5		0.5		0.5	

(1) Expected volatility is measured using historical daily price changes of the Company's stock over the respective expected term.

(2) The risk-free rate for periods within the contractual term is based on the U.S. Treasury yield curve in effect at the time of grant.
(3) The expected life is the number of years the Company estimates that the purchase rights will be outstanding prior to exercise.

Note 16 — Retirement Plans

The Company maintains a defined contribution plan for the benefit of its U.S. employees. The plan is intended to be tax qualified and contains a qualified cash or deferred arrangement as described under Section 401(k) of the Internal Revenue Code. Eligible participants may elect to contribute a percentage of their base compensation, and the Company may make matching contributions, generally equal to fifty cents for every dollar employees contribute, up to the lesser of three percent of the employee's eligible compensation or three percent of the maximum the employee is permitted to contribute under then current Internal Revenue Code limitations. Generally, the plan calls for vesting in the Company contributions over the initial five years of a participant's employment. In addition, the Company assumed Ultratech's 401(k) plan as a result of the merger, and Ultratech's plan was merged into the Company's existing plan effective January 1, 2018. The Company provided employer contributions associated with these plans of approximately $3.0 million, $2.7 million, and $2.6 million for the years ended December 31, 2018, 2017, and 2016, respectively.

During 2016, the Company finalized the process to terminate a defined benefit plan it had acquired in the year 2000. The plan had been frozen as of September 30, 1991, and no further benefits had been accrued by participants since that date. In connection with the termination, responsibility for the payment of benefits under the plan was transferred to an insurance company. As a result, the Company reclassified the minimum pension liability of $0.9 million, net of a tax

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Notes to Consolidated Financial Statements (Continued)

benefit of $0.4 million, from "Accumulated other comprehensive income" in the Consolidated Balance Sheets to "Other, net" in the Consolidated Statements of Operations.

Note 17 — Income Taxes

The amounts of income (loss) before income taxes attributable to domestic and foreign operations were as follows:

	Year ended December 31,		
	2018	2017	2016
	(in thousands)		
Domestic	$ (286,561)	$ (101,573)	$ (123,089)
Foreign	(147,273)	12,583	3,885
Total	$ (433,834)	$ (88,990)	$ (119,204)

Significant components of the expense (benefit) for income taxes consisted of the following:

	Year ended December 31,		
	2018	2017	2016
	(in thousands)		
Current:			
Federal	$ (1,682)	$ —	$ —
Foreign	2,518	(2,246)	1,937
State and local	38	15	(111)
Total current expense (benefit) for income taxes	874	(2,231)	1,826
Deferred:			
Federal	205	(35,912)	1,459
Foreign	(27,932)	1,291	(589)
State and local	107	(742)	127
Total deferred expense (benefit) for income taxes	(27,620)	(35,363)	997
Total expense (benefit) for income taxes	$ (26,746)	$ (37,594)	$ 2,823

The income tax expense was reconciled to the tax expense computed at the U.S. federal statutory tax rate as follows:

	Year ended December 31,		
	2018	2017	2016
	(in thousands)		
Income tax expense (benefit) at U.S. statutory rates	$ (91,105)	$ (31,147)	$ (41,722)
State taxes, net of U.S. federal impact	(2,848)	(2,523)	(1,963)
Effect of international operations	11,847	10,158	8,798
Research and development tax credit	(2,230)	620	(801)
Net change in valuation allowance	7,747	1,883	50,544
Change in accrual for unrecognized tax benefits	2,868	(4,772)	(1,700)
Subsidiary liquidation	—	—	(12,435)
Share-based compensation	1,848	99	2,133
Effect of 2017 Tax Act	(1,690)	(11,344)	—
Asset impairment	46,872	—	—
Other	(55)	(568)	(31)
Total expense (benefit) for income taxes	$ (26,746)	$ (37,594)	$ 2,823

The Company recognized the income tax effects of the 2017 Tax Act in its 2017 financial statements in accordance with SAB 118, which provided SEC staff guidance for the application of ASC 740 in the reporting period in which the 2017 Tax Act was signed into law. As such, the Company's 2017 financial results included provisional amounts for specific

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Notes to Consolidated Financial Statements (Continued)

income tax effects of the 2017 Tax Act for which the accounting under ASC 740 was incomplete but for which a reasonable estimate could be determined. During the year ended December 31, 2018, the Company finalized the accounting for the tax effects of 2017 Tax Act based on legislative updates currently available and recorded an additional income tax benefit of $1.7 million for alternative minimum tax credits that became refundable in accordance with the 2017 Tax Act. The Company also reported an increase in deferred tax assets of $6.8 million as a result of adjustments to tax attributes utilized for one-time transition tax, which was offset by a full valuation allowance.

The most significant impacts of the 2017 Tax Act on the Company's federal income taxes for the year ended December 31, 2017 were as follows:

Reduction of the U.S. Corporate Income Tax Rate

The Company measures deferred tax assets and liabilities using enacted tax rates that will apply in the years in which the temporary differences are expected to be recovered or paid. Accordingly, the Company's deferred tax assets and liabilities were re-measured as of December 22, 2017 to reflect the reduction in the U.S. corporate income tax rate from 35 percent to 21 percent. The Company recorded an income tax benefit of $4.8 million for the year ended December 31, 2017, as the net deferred tax assets were reduced by $25.6 million with a corresponding valuation allowance reduction of $30.4 million.

One-Time Transition Tax on Foreign Earnings

As of December 31, 2017, the Company had $180.1 million of foreign earnings that was subject to the one-time transition tax. The Company used its 2017 and carryforward net operating losses to offset the impact of the transition tax. As the Company maintains a full valuation allowance against its U.S. deferred tax assets, the Company did not record an income tax expense related to the transition tax for the year ended December 31, 2017.

Valuation Allowance

The 2017 Tax Act modified the Net Operating Loss ("NOL") provisions to provide for an indefinite carryforward of NOLs arising in tax years beginning after December 31, 2017. The 2017 Tax Act also limits the amount of NOL deductions that can be used in any one year to 80 percent of the taxpayer’s taxable income, effective with respect to NOLs arising in tax years beginning after December 31, 2017. The Company recognized an income tax benefit of $6.5 million for the year ended December 31, 2017 related to a reduction in the Company’s valuation allowance as a result of the Company scheduling out the reversals of its net deferred tax assets which resulted in tax amortization on indefinite-lived intangible assets becoming available to offset existing deferred tax assets that are now expected to have an indefinite life.

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Notes to Consolidated Financial Statements (Continued)

Deferred income taxes reflect the effect of temporary differences between the carrying amounts of assets and liabilities recognized for financial reporting purposes and the amounts recognized for tax purposes. The tax effects of the temporary differences were as follows:

	December 31, 2018	2017
	(in thousands)	
Deferred tax assets:		
Inventory valuation	$ 8,943	$ 8,007
Net operating losses	67,787	73,458
Credit carry forwards	52,592	34,966
Warranty and installation accruals	1,695	1,690
Share-based compensation	6,981	7,385
Other	2,182	1,832
Total deferred tax assets	140,180	127,338
Valuation allowance	(114,955)	(100,456)
Net deferred tax assets	25,225	26,882
Deferred tax liabilities:		
Purchased intangible assets	15,401	45,807
Convertible Senior Notes	11,265	13,534
Depreciation	2,380	1,339
Total deferred tax liabilities	29,046	60,680
Net deferred taxes	$ (3,821)	$ (33,798)

The Company is no longer permanently reinvesting future earnings from certain foreign jurisdictions and has accrued for foreign tax withholdings of $0.6 million on its unremitted earnings as of December 31, 2018.

At December 31, 2018, the Company had U.S. federal NOL carryforwards of approximately $281.4 million, of which $16.0 million has an indefinite carryforward period, with the remaining expiring in varying amounts between 2024 and 2037, if not utilized. In connection with the Ultratech acquisition, $119.0 million of historical NOL carryforwards were acquired, which are subject to an annual limitation. The Company has $3.5 million of capital loss carryforwards that expire in 2021. At December 31, 2018, the Company had U.S. federal research and development credits of $28.3 million that will expire between 2019 and 2038. The Ultratech acquisition resulted in the carryover of $11.4 million of research and development credit carryforwards, which are subject to an annual limitation. The Company also has $9.4 million of foreign tax credits that expire in 2027. Additionally, the Company has state and local NOL carryforwards of approximately $147.6 million (a net deferred tax asset of $9.0 million, net of federal tax benefits and before the valuation allowance) that will expire between 2019 and 2038. Finally, the Company has state credits of $27.4 million, some of which are indefinite and others that will expire between 2019 and 2033.

The Company makes assessments to estimate if sufficient taxable income will be generated in the future to use existing deferred tax assets. As of December 31, 2018, the Company continued to have a cumulative three year loss with respect to its U.S. operations. As such, the Company has recorded a valuation allowance against its U.S. deferred tax assets. During 2018, the Company’s valuation allowance increased by approximately $14.5 million, including an increase of $6.8 million as a result of adjustments to tax attributes utilized for one-time transition tax.

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Notes to Consolidated Financial Statements (Continued)

A roll-forward of the Company's uncertain tax positions for all U.S. federal, state, and foreign tax jurisdictions was as follows:

	December 31,		
	2018	2017	2016
	(in thousands)		
Balance at beginning of year	$ 8,269	$ 7,452	$ 9,152
Additions for tax positions related to current year	2,154	511	1,038
Additions for tax positions related to prior years	1,721	3	233
Reductions for tax positions related to prior years	(934)	(4,877)	(2,826)
Reductions due to the lapse of the statute of limitations	(26)	(122)	(39)
Settlements	(47)	(287)	(106)
Additions for business combination	—	5,589	—
Balance at end of year	$ 11,137	$ 8,269	$ 7,452

If the amount of unrecognized tax benefits at December 31, 2018 were recognized, the Company's income tax provision would decrease by $1.5 million. The gross amount of interest and penalties accrued in income tax payable in the Consolidated Balance Sheets was approximately $0.3 million at both December 31, 2018 and 2017.

The Company, or one of its subsidiaries, files income tax returns in the United States federal jurisdiction, and various state, local, and foreign jurisdictions. All material consolidated federal income tax matters have been concluded for years through 2015 subject to subsequent utilization of NOLs generated in such years. All material state and local income tax matters have been reviewed through 2012. The majority of the Company's foreign jurisdictions have been reviewed through 2015. The Company's major foreign jurisdictions' statutes of limitation remain open with respect to the tax years 2017 for China, 2015 through 2017 for Germany and Singapore, and 2017 for Taiwan. The Company does not anticipate that its uncertain tax position will change significantly within the next twelve months subject to the completion of the ongoing tax audits and any resultant settlement.

Note 18 — Segment Reporting and Geographic Information

The Company operates and measures its results in one operating segment and therefore has one reportable segment: the development, manufacture, sales, and support of semiconductor and thin film process equipment primarily sold to make electronic devices. The Company's Chief Operating Decision Maker, the Chief Executive Officer, evaluates performance of the Company and makes decisions regarding the allocation of resources based on total Company results.

Sales by market is as follows:

	For the year ended December 31,		
	2018	2017	2016
	(in thousands)		
Sales by end-market			
Advanced Packaging, MEMS & RF Filters	$ 90,775	$ 67,406	$ 67,484
LED Lighting, Display & Compound Semiconductor	249,974	248,615	145,701
Front-End Semiconductor	62,582	40,319	8,427
Scientific & Industrial	138,751	119,346	110,090
Total	$ 542,082	$ 475,686	$ 331,702

The Company's significant operations outside the United States include sales and service offices in China, Europe, and Rest of World. For geographic reporting, sales are attributed to the location in which the customer facility is located.

Veeco Instruments Inc. and Subsidiaries

Notes to Consolidated Financial Statements (Continued)

Sales and long-lived tangible assets by geographic region are as follows:

	Net Sales to Unaffiliated Customers			Long-lived Tangible Assets		
	2018	2017	2016	2018	2017	2016
	(in thousands)					
United States	$ 125,659	$ 93,433	$ 85,582	$ 78,503	$ 81,046	$ 60,012
China	194,032	106,674	84,604	81	64	219
EMEA(1)	89,102	72,979	84,181	205	231	93
Rest of World	133,289	202,600	77,335	1,495	3,717	322
Total	$ 542,082	$ 475,686	$ 331,702	$ 80,284	$ 85,058	$ 60,646

(1) EMEA consists of Europe, the Middle East, and Africa

Note 19 — Selected Quarterly Financial Information (unaudited)

The following table presents selected unaudited financial data for each fiscal quarter of 2018 and 2017. Although unaudited, this information has been prepared on a basis consistent with the Company’s audited Consolidated Financial Statements and, in the opinion of management, reflects all adjustments (consisting only of normal recurring adjustments) that are considered necessary for a fair presentation of this information in accordance with GAAP. Such quarterly results are not necessarily indicative of future results of operations.

	Fiscal 2018				Fiscal 2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	(in thousands, except per share amounts)							
Net sales	$ 158,574	$ 157,779	$ 126,757	$ 98,972	$ 94,499	$ 112,218	$ 129,308	$ 139,661
Gross profit	56,680	55,395	46,385	35,259	34,500	35,847	50,529	55,352
Net income (loss)	(15,827)	(237,634)	(8,953)	(144,674)	1,640	(20,817)	(23,740)	(8,479)
Basic income (loss) per common	(0.34)	(5.02)	(0.19)	(3.11)	0.04	(0.49)	(0.51)	(0.18)

share								
Diluted income (loss) per common share	(0.34)	(5.02)	(0.19)	(3.11)	0.04	(0.49)	(0.51)	(0.18)

Acquisition of Ultratech

During the second quarter of 2017, the Company acquired Ultratech. The results of operations of Ultratech have been included in the consolidated financial statements since the date of acquisition. Refer to Note 5, "Business Combinations," for additional information.

Asset Impairments

During the second quarter of 2018, the Company recorded non-cash impairment charges related to the Ultratech asset group of $216.4 million and $35.9 million for definite-lived intangible assets and in-process research and development assets, respectively. Additionally, during the fourth quarter of 2018, the Company recorded a non-cash goodwill impairment charge of $122.8 million. Refer to Note 6, "Goodwill and Intangible Assets," for additional information.

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Schedule II — Valuation and Qualifying Accounts

Deducted from asset accounts:	Balance at Beginning of Period (in thousands)	Additions Charged (Credited) to Costs and Expenses	Charged to Other Accounts	Deductions	Balance at End of Period
Year ended December 31, 2018					
Allowance for doubtful accounts	$ 270	$ —	$ —	$ —	$ 270
Valuation allowance in net deferred tax assets	100,456	14,499	—	—	114,955
	$ 100,726	$ 14,499	$ —	$ —	$ 115,225
Year ended December 31, 2017					
Allowance for doubtful accounts	$ 286	$ 99	$ —	$ (115)	$ 270
Valuation allowance in net deferred tax assets	104,744	(49,589)	45,301	—	100,456
	$ 105,030	$ (49,490)	$ 45,301	$ (115)	$ 100,726
Year ended December 31, 2016					
Allowance for doubtful accounts	$ 206	$ 171	$ —	$ (91)	$ 286
Valuation allowance in net deferred tax assets	54,200	50,544	—	—	104,744
	$ 54,406	$ 50,715	$ —	$ (91)	$ 105,030