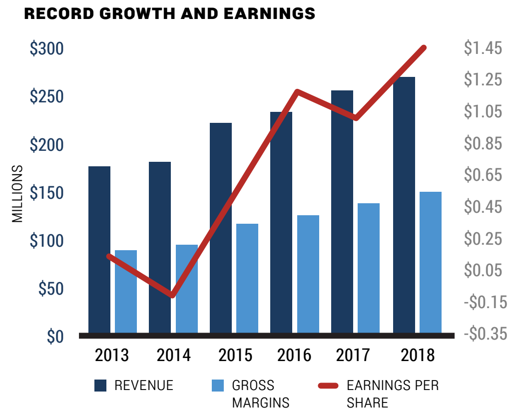
2018 ANNUAL REPORT

RUDOLPH
TECHNOLOGIES

2019 PROXY

DEAR **SHAREHOLDERS**

Rudolph completed its fourth consecutive record year in 2018, with revenue growing 7% year-over-year to $274 million. In addition, the Company had record earnings of $1.40 per share, which was a 21% increase over recent peak earnings of $1.16 per share in 2016. Gross margin improved to 54% on the strength of our software and metrology systems, and our cash and marketable securities remained strong at $175 million after a $21 million stock repurchase in the fourth quarter. We achieved this financial performance while maintaining our focus on future challenges by increasing R&D in technologies to grow market share and expand our available markets. We accomplished both objectives in 2018 with the release of three new products.



In the third quarter we introduced the powerful next-generation of the Dragonfly platform, our Dragonfly™ G2 system with over 50% greater throughput. This system is designed to improve quality control by delivering faster and more accurate 2D and 3D metrology data along with our patented Clearfind™ Technology. Combining this tool with our Discover® software suite of analytics not only delivers higher quality data, but can also identify root causes and process variations. These advanced analytics also helped to propel the software group to 14% year-over-year growth with 13 new fabs installing Discover software to fully analyze and optimize their process development.

To expand our addressable markets in the fourth quarter we launched the NovusEdge™ macro inspection system. This product was quickly adopted by leading bare wafer manufacturers representing 70% of the market and resulted in a backlog of over $13 million. Similarly, with the release of our StepFAST™ Solution we helped create a larger opportunity in the nascent fan-out panel market by enabling panel level processing over a broader set of applications. Our solution combines Rudolph's Firefly™ and JetStep® systems along with Discover analytics to deliver 2X the productivity and increased yields so that customers can begin ramping a wider range of products. The latest research from TechSearch International forecasts high double-digit growth through 2022 as they believe panel packaging is key to enabling increased functionality through system-in-package architectures for both mobile and advanced computing applications.

The industry's recent growth cycle began several years ago with mobile phones generating vast amounts of data, cloud computing growth to store and process that data, followed by advanced computing to enable the demand for deep learning of that data. Future growth will be driven by mega-trends, such as autonomous driving, artificial intelligence and virtual reality. These trends create new growth opportunities, even during uncertain times, that will perpetuate long into the future. What is exciting for the Rudolph stakeholders is that we are playing an increasingly more important role in this growth cycle.

None of our success would be possible without the passion and dedication from our employees. Their commitment to our core values is evident in every interaction within the Company, and within our communities. In closing, I want to thank our customers, loyal shareholders, dedicated employees, and valued suppliers for their continued commitment to Rudolph in 2019, and beyond.

Sincerely,

Michael Plisinski
CHIEF EXECUTIVE OFFICER & DIRECTOR

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**

For the transition period from to

Commission File No. 001-36226

RUDOLPH TECHNOLOGIES, INC.

(Exact name of registrant as specified in its charter)

Delaware	**22-3531208**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification Number)**

16 Jonspin Road, Wilmington, MA 01887
(Address of principal executive offices) (Zip Code)

Registrant's telephone number, including area code: (978) 253-6200

SECURITIES REGISTERED PURSUANT TO SECTION 12(b) OF THE ACT:

Title of Each Class	Name of Exchange on Which Registered
Common Stock, $0.001 par value per share (including attached Series A Junior Participating Preferred Stock Purchase Rights)	**New York Stock Exchange (NYSE)**

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 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 is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference 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, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.:

Large accelerated filer	☒	Accelerated filer	☐
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 voting stock held by non-affiliates of the registrant based on the closing price of the registrant's stock price on June 30, 2018 of $29.60 was approximately $926,907,335.

The registrant had 30,907,380 shares of Common Stock outstanding as of January 23, 2019.

DOCUMENTS INCORPORATED BY REFERENCE

Items 10, 11, 12, 13 and 14 of Part III of this Annual Report on Form 10-K incorporate by reference information from the definitive proxy statement for the registrant's annual meeting of stockholders scheduled to be held on May 15, 2019.

TABLE OF CONTENTS

FORWARD-LOOKING STATEMENTS

Certain statements in this Annual Report on Form 10-K of Rudolph Technologies, Inc. (the "Company" or "Rudolph") are forward-looking statements, including those concerning our business momentum and future growth, acceptance of our products and services, our ability to deliver both products and services consistent with our customers' demands and expectations and to strengthen our market position, our expectations of the semiconductor market outlook, future revenue, gross profits, research and development and engineering expenses, selling, general and administrative expenses, product introductions, technology development, manufacturing practices, cash requirements, our dependence on certain significant customers and anticipated trends and developments in and management plans for our business and the markets in which we operate, our anticipated revenue as a result of acquisitions, and our ability to be successful in managing our cost structure and cash expenditures. The statements contained in this Annual Report on Form 10-K that are not purely historical are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended (the "Securities Act"), Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements may be identified by words such as, but not limited to, "anticipate," "believe," "expect," "intend," "plan," "should," "may," "could," "will" and words or phrases of similar meaning, as they relate to our management or us.

The forward-looking statements contained herein reflect our expectations with respect to future events and are subject to certain risks, uncertainties and assumptions. Actual results may differ materially from those included in such forward-looking statements for a number of reasons including, but not limited to, the following: variations in the level of orders which can be affected by general economic conditions, seasonality and growth rates in the semiconductor manufacturing industry and in the markets served by our customers, the global economic and political climates, difficulties or delays in product functionality or performance, the delivery performance of sole source vendors, the timing of future product releases, failure to respond adequately to either changes in technology or customer preferences, changes in pricing by us or our competitors, our ability to manage growth, changes in management, risk of nonpayment of accounts receivable, changes in budgeted costs, our ability to leverage our resources to improve our position in our core markets, our ability to weather difficult economic environments, our ability to open new market opportunities and target high-margin markets, the strength/weakness of the back-end and/or front-end semiconductor market segments, our ability to successfully integrate acquired businesses into our business and fully realize, or realize within the expected time frame, the expected combination benefits from the acquisitions, and the "Risk Factors" set forth in Item 1A. You should carefully review the cautionary statements and "Risk Factors" contained in this Annual Report on Form 10-K. You should also review any additional disclosures and cautionary statements and "Risk Factors" we include from time to time in our quarterly reports on Form 10-Q, current reports on Form 8-K and other filings we make with the Securities and Exchange Commission (the "SEC"). The forward-looking statements reflect our position as of the date of this report and we undertake no obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

PART I

Item 1. Business.

General

Rudolph Technologies, Inc. is a worldwide leader in the design, development, manufacture and support of process control tools that perform macro defect inspections and metrology, lithography systems, and process control analytical software used by semiconductor and advanced packaging device manufacturers. Rudolph's proprietary products offer comprehensive solutions for all phases/segments of the semiconductor fabrication process. Our products that provide critical yield-enhancing information, which is used by microelectronic device manufacturers to drive down costs and to decrease the time to market of their devices. We provide process and yield management solutions used in bare silicon wafer production and wafer processing facilities, often referred to as "front-end" manufacturing and device packaging and test facilities, (or "back-end" manufacturing), respectively through a portfolio of standalone systems for macro-defect inspection, packaging lithography, probe card test and analysis, as well as transparent and opaque thin film measurements. All Rudolph systems feature sophisticated software and production-worthy automation. In addition, our advanced process control software portfolio includes powerful solutions for standalone tools, groups of tools, factory-wide, and enterprise-wide suites to enhance productivity and achieve significant cost savings. Rudolph's systems are backed by worldwide customer service and applications support.

Rudolph continues to drive the technological innovation of its inspection and metrology products to deliver solutions that address the demanding needs across the front-end and back-end processes of semiconductor manufacturing. In 2018, Rudolph introduced two newly configured macro defect inspection tools, the second generation Dragonfly™G2 system and the NovusEdge™ tool for bare wafer inspection. The Dragonfly G2 systems use high-resolution, two-dimensional (2D) inspection technology for front-end and back-end applications as well as high-resolution three-dimensional (3D) inspection and metrology. Rudolph's Clearfind™ technology is a patented option available for enhancing the detection of defects that often escape conventional illumination techniques by revealing organic materials, thereby reducing a source of yield-robbing interconnect failures that can occur within advanced packages. The Dragonfly G2 system is a high-speed multi-dimensional tool that also features TrueBump™ technology to accurately measure the height of millions of micro bumps that may be deposited on a wafer in order to make electrical connections. This critical dimension must be accurately controlled to assure that eventual connections are reliably created. The new NovusEdge system provides macro level quality measurements for manufacturers of bare silicon wafers that are supplied to semiconductor manufacturers for subsequent processing. Certain defects, such as backside particles and hairline cracks on the edge of the wafer, were previously considered minor flaws. However, the latest extreme ultra-violet ("EUV") lithography systems are extremely sensitive to backside particles and manufacturing of large integrated circuit chips can have significant yield losses when edge cracks propagate into the chips near the wafer's edge. The NovusEdge system is able to detect and classify wafers so that the wafer suppliers can assure their customers of the proper quality levels needed for subsequent processing and chip type.

These newly released products supplement Rudolph's established product portfolio of extensive 2D and 3D process control solutions for a variety of device types of advanced packaging, such as second generation high bandwidth memory ("HBM2") devices, double data rate Dynamic Random Access Memory ("DRAM") (DDR4 and DDR5), 3D Not And ("NAND") memory, advanced packaging for radio frequency ("RF") modules, Complimentary Metaloxide Semiconductor ("CMOS") image sensors, Microelectromechanical Systems ("MEMs"), etc. that are used in smartphones, wearable devices, tablets and personal computers, automotive, Internet of Things ("IoT") and others. The need for more process monitoring and control continues to increase for semiconductor and related industries as the required levels of quality and reliability continue to rise. Predictive analytics can lower maintenance costs, rate of scrap wafers, unscheduled tool downtime and material costs. Rudolph's established fault detection and classification software, which is also incorporated into tools manufactured by others companies, allows customers to seamlessly turn equipment data into actionable operational information. This collaboration is designed to enhance etch and deposition tool performance.

Industry Trends

Advanced Packaging refers to a variety of technologies that enable the miniaturization of electronic products, such as portable consumer devices, including smartphones, watches, and tablets. In electronics manufacturing, integrated circuit packaging is the final stage of semiconductor device fabrication, in which a single circuit made from semiconducting material (a die or chip) is encased in a molded package that provides external connections to a printed circuit board and also prevents physical damage to the chip and corrosion. Advanced Packaging refers loosely to the conductors and other structures that often interconnect multiple die, feed them with electric power and create signal paths to and from the PC board, dissipate their heat, and protect them from damage. Today, the drive to pack more functions into a small space and reduce their power requirements demands that chip packages do much more than ever before to combine multiple functions into a single molded package.

One example of the technology used in Advanced Packaging is the 3D integration of semiconductors and other devices. The technology involves stacking individual die in one integrated package. Through-silicon vias (“TSVs”) are vertical copper interconnects that are embedded from the bottom surface of a die to the top surface, which allows power and communication to be shared among the individually stacked components. This offers the advantages of shorter signal paths and, in turn, reduced power consumption, enhanced bandwidths, integration of heterogeneous components such as memory and logic chips, and smaller surface area. The processes required for 3D integration vary from one manufacturer to another and many continue to be optimized for yield and to ensure the functioning of individual stacked chips.

Fan-out wafer level packages are another advanced packaging technology using copper pillars/bumps to vertically connect a wide variety of stacked die for 2.5D, and 3D integration techniques and are considered the next disruptive technology for several reasons. First, fan-out wafer level packages significantly reduce the space needed inside an electronic device, such as a smartphone, by combining multiple chips/functions into a single package, often called a system in a package (“SIP”). Next, it improves the system’s performance by reducing power and signal conductor lengths, which previously were routed from package to package through a printed circuit (“PC”) board. Using thin redistribution layers to “fan out” power and signal connections to the larger contacts on the PC board eliminates the need for a ceramic or laminated substrate, which accounts for 35 percent of the packaging cost. Lastly, the technology is currently considered the preferred vehicle for next generation uses, such as system in package, and package on package formats. As a result of the small overall form factor, fan-out wafer level packages provide the functionality needed in high-end mobile and wearable products.

The current and projected adoption of smart mobile devices with designed-in capability to enable multiple functions in a single device continues to grow. In reality, there are no longer single function devices, but instead, a combined single device provides multiple functions such as phone, GPS, camera, and internet browser. Aided by a myriad of available “apps,” the potential uses seem endless. As a result, these added functions in mobile products are driving semiconductor advanced packaging and display manufacturers to implement next-generation technologies, such as 5G communications, to meet these requirements. These technology shifts encompass multiple high-value process steps that are creating opportunities for Rudolph solutions.

Panel Manufacturing. The current process to manufacture advanced packaging involves attaching known good die to a 300mm wafer, used as a temporary carrier when adding components such as redistribution layers (“RDLs”) and copper pillars. SIP packages can often contain side-by-side die, meaning the package can be large and limit the number of packages being placed on a reconstituted wafer. In order to meet the growing demand at reduced average selling prices, manufacturers are looking to scalable technology. Advanced packaging facilities looking to improve Cost of Ownership (“COOs”) and increase productivity are transitioning from 300mm wafers to large rectangular panels, which can be as large as 600mm x 600mm. This larger size enables companies manufacturing large area packages to increase the number of devices being processed at each step as they are no longer limited to operating within the constraints of a round wafer. By responding to market opportunities and addressing the stringent demands of customers’ technical roadmaps, we believe that Rudolph is optimally positioned to capitalize on the emerging market of high volume panel manufacturing. For example, the JetStep® S lithography system, having emerged from the flat panel display market, is readily capable of processing RDLs on both glass and organic laminate panels in the semiconductor advanced packaging market. The Firefly™S Series, designed for high resolution inspection, can provide location information to the JetStep S tool for each die, which greatly improves lithography throughput using Rudolph's exclusive StepFast™ process. It also delivers a combination of defect detection and substrate flexibility in a single platform. It reduces capital investment requirements and provides a reliable pathway to transition from wafer to panel-based processes.

Technology

We believe that our expertise in engineering and our continued investment in research and development enable us to rapidly develop new technologies and products in order to quickly respond to emerging industry trends and competitive challenges. The breadth of our technology enables us to offer a diverse combination of process and process control solutions. Unique features have been designed into our lithography systems to meet our customers' changing process requirements. Our metrology and inspection technologies provide process control for the majority of wafers processed today in a semiconductor wafer fab. In front-end processes, thin film metrology and defect detection and classification technologies allow yield enhancement for critical processes such as photolithography, diffusion, etch, CMP and outgoing quality control. Within the final manufacturing (back-end) processes, our 2D/3D advanced macro defect inspection provides our customers with critical quality assurance and process information. Defects may be created during probing, bumping, dicing, assembly processes (RDLs, TSVs, copper pillars, etc.) or general handling and can have a major impact on device and process quality. Lastly, we turn all of the data gathered into useful knowledge for our customers to make yield-enhancing decisions, which lower their cost of goods sold ("COGS") and improve their margins.

Process Control Business

Macro Defect Inspection. Chip manufacturers deploy advanced macro defect inspection throughout the production line to monitor key process steps, gather process-enhancing information and ultimately, lower manufacturing costs. Field-established tools such as the F30™ and NSX® inspection systems are found in the wafer fab (front-end) and packaging (back-end) facilities around the world. These high-speed tools incorporate features such as wafer-less recipe creation, tool-to-tool correlation and multiple inspection resolutions. In addition to wafer frontside inspection, Rudolph's NovusEdge system allows wafer edge and backside inspection in one integrated platform to enhance productivity and continuously improve fab yield. Using Discover® yield management software, the vast amounts of data gathered through automated inspection can be analyzed and classified to determine trends and locate root causes that directly affect yield.

All-Surface Inspection. All-surface refers to inspection of the wafer frontside, edge, and backside as well as back-end die. The edge inspection process focuses on the area near the wafer edge, an area that poses difficulty for traditional wafer frontside inspection technology due to its varied topography and process variation. Edge bevel inspection looks for defects on the side edge of a wafer. Edge bead removal and edge exclusion metrology involve a topside surface measurement required exclusively in the photolithography process, primarily to determine if wafers have been properly aligned for the edge exclusion region. The primary reason for wafer backside inspection is to determine if contamination has been created that may spread throughout the wafer fab. For instance, it is critical that the wafer backside be free of defects prior to the photolithography process to prevent focus and exposure problems on the wafer frontside.

Residue Detection. Residue is difficult or impossible to see with conventional bright field or dark field imaging techniques using white light. Residue contaminants, such as residual photo resist, are often the root cause of field failures, which occur after the material has been exposed to normal operating conditions for extended periods. Rudolph's established Clearfind™ technology highlights residue on bumps and bond pads or RDL vias so that they are easy to detect. On metals, it eliminates the high-contrast graininess seen under conventional illumination, resulting in an obvious defect signal against a featureless background. This same graininess in conventional imaging can also cause false positives, which are especially costly at this stage of the process where secondary inspections must be initiated to verify real defects and allow the false defects to continue through packaging. Finally, Clearfind technology readily detects shorts and opens in metal lines when inspected with an underlying organic layer.

Automated Defect Classification and Pattern Analysis. Automating the defect detection and classification process is best done by a system that can mimic, or even extend, the response of the human eye, but at a much higher speed, with higher resolution and more consistency. To do this, our systems capture full-color whole wafer images using simultaneous dark and bright field illumination. The resulting bright and dark field images are compared to those from an "ideal" wafer having no defects. When a difference is detected, its image is broken down into mathematical vectors that allow rapid and accurate comparison with a library of known classified defects stored in the tool's database. Patented and proprietary enhancements of this approach enable very fast and highly repeatable image classification. The system is pre-programmed with an extensive library of local, global, and color defects and can also store a virtually unlimited amount of new defect classes. This allows customers to define defects based on their existing defect classification system, provides more reliable automated rework decisions and enables more accurate statistical process control data. Reviewing defects off-line enables automated inspection systems to maintain their utilization for high throughput inspection. Using defect image files captured by automated inspection systems, operators are able to view high-resolution defect images to determine defects that cause catastrophic failure of a device, known as killer defects. Combining the review process with classifying defects enables faster analysis by grouping defects found together as one larger defect, a scratch for example, and defects of similar types across a wafer lot to be grouped based on size, repeating defects, and other user-defined specifications.

Yield Analysis. Using wafer maps, charts and graphs, the massive amounts of data gathered through automated inspection can be analyzed to determine trends across bumps, die, wafers and lots. This analysis may determine where a process variation or deviation has occurred, allowing process engineers to make corrections or enhancements to increase yields. Defect data analysis is performed to identify, analyze and locate the source of defects and other manufacturing process excursions. Using either a single wafer map or a composite map created from multiple wafer maps, this analysis enables identification of defect patterns and distribution. When combined with inspection data from strategically-placed inspection points, this analysis may pinpoint the source of the defects so corrective action can be taken.

Optical Acoustic Metrology. Optical acoustic metrology involves the use of ultra-fast laser induced sonar for metal and opaque thin film measurement. This technology sends ultrasonic waves into multi-layer opaque films and then analyzes the resulting reflected acoustic waves (echoes) to simultaneously determine the thickness of each individual layer in complex multi-layer metal film stacks. The reflected signal's amplitude and phase can be used to detect film properties, missing layers and interlayer problems. Since different phenomena affect amplitude and phase uniquely, a variety of process critical interlayer problems can be detected in a single measurement. The use of optical acoustics to measure multi-layer metal and opaque films was pioneered by scientists at Brown University ("Brown") in collaboration with engineers at Rudolph. The proprietary optical acoustic technology in our PULSE Technology™ systems measures the thickness of single or multi-layer opaque films, with a huge range of less than 40 Angstroms to greater than five microns. It provides these measurements at a rate of up to 70 wafers per hour within one to two percent accuracy and typically greater than 99 percent repeatability. This range of thicknesses covers the majority of thick and thin metal films projected by the International Roadmap for Semiconductors. Our non-contact, non-destructive optical acoustic technology and small spot size enable our PULSE Technology systems to measure film properties directly on product wafers.

Opaque Film Metrology. The *Meta*PULSE® systems allow customers to simultaneously measure the thickness and other properties of up to six metal or non-metallic opaque film layers without physically contacting product wafers in a non-destructive manner. PULSE Technology uses an ultra-fast laser to generate acoustic waves that pass down through a stack of opaque films such as those used in copper or aluminum interconnect processes, as well as the hard mask layer in 3D NAND chips, sending back to the surface a reflected signal (echo) that indicates film thickness, density, and other process critical parameters. We believe we are a leader in providing systems that can measure opaque thin-film stacks non-destructively with the speed and accuracy semiconductor device manufacturers demand in order to achieve high yields with the latest fabrication processes. The technology is ideal for characterizing copper interconnect structures. The *Meta*PULSE systems, used initially for fast and accurate measurements of metal interconnect in front-end wafer fabs, have now been chosen by back-end manufacturers to perform system measurements in new process applications such as RF filters and modules, driven by the need for on-product metrology as feature sizes decrease and pattern densities increase.

Ellipsometry. Ellipsometry is a non-contact, non-destructive optical technique for transparent thin film measurement. We have been an industry leader in ellipsometry technology for the last three decades. We hold patents on several ellipsometry technologies, including our proprietary technique that uses four lasers for multiple-angle of incidence, multiple wavelength ellipsometry. Laser ellipsometry technology enables our transparent film systems to provide the increasingly higher level of accuracy needed as thinner films and newer materials are introduced for future generations of semiconductor devices. We extended this same optical technology to characterize the scatterometry signal from patterned surfaces, allowing measurement of critical dimensions.

Reflectometry. For applications requiring broader spectral coverage, some of our ellipsometry tools are also equipped with a reflectometer. Reflectometry uses a white or ultraviolet light source to determine the properties of transparent thin films by analyzing the wavelength and intensity of light reflected from the surface of a wafer. This optical information is processed with software algorithms to determine film thickness and other material properties. By combining data from both the laser ellipsometer and broad spectrum reflectometer, it is possible to characterize films and film stacks that cannot be adequately analyzed by either method individually.

Transparent Film Metrology. Rudolph's patented transparent film technology uses up to four lasers operating simultaneously at multiple angles and multiple wavelengths, providing powerful analysis and measurement capabilities. Unlike the white-light sources used in spectroscopic ellipsometers, laser light sources make our metrology tools inherently stable, increase measurement speed and accuracy, and reduce maintenance costs by minimizing the time required to re-qualify a light source when it is replaced. Rudolph's S3000SX™ System is targeted for transparent films in advanced semiconductor fabrication applications at the 28nm node and below. The S3000™ product family uses Rudolph's proprietary Focused Beam Ellipsometry ("FBE") and newly-designed Small Site Measurement Optics ("SSMO") to measure the thickness of single layer and multi-layer films on product wafers, including device area at site sizes as small as 30x30 nanometers.

Probe Card Test and Analysis. The combination of fast 3D-OCM (optical comparative metrology) technology with improved testing accuracy and repeatability is designed to reduce total test time for even the most advanced large area probe cards. The 3D capabilities enable users to analyze probe marks and probe tips in a rapid and information-rich format.

Lithography Business

Step and Repeat Technology. Rudolph steppers use projection optics to expose circuit patterns from a mask or reticle onto a substrate to expose images with optimal fidelity. These systems employ light from a mercury arc lamp that is transmitted through a mask or reticle containing display circuit patterns. Substrates are aligned on the system and the mask is imaged through a projection lens onto photoresist material coated on the substrate. The substrate is then moved, or "stepped," to a second position to expose an adjacent area. Images can be "stitched" together precisely to form larger circuit patterns without any noticeable change in circuit performance. The system repeats the step and exposure process until the entire substrate is patterned. Once the exposure process has been completed, the substrate is developed with an alkali solution to reveal the underlying material. The imaged photoresist serves as a stencil barrier that allows for the processing of the underlying metal or insulating layers. The substrates then continue through the etching, stripping and deposition processes until multi-layer circuits are completed.

Advanced Packaging Lithography Systems. In order to deal with increased input/output ("I/O") resulting from devices with enhanced functionality, power distribution efficiency, and higher frequency, integrated device manufacturers ("IDMs") and outsourced semiconductor assembly and test ("OSATs") facilities must incorporate lithography capabilities to create RDLs for their advanced packaging technologies. However, the associated substrates and processes are significantly different than those used in front-end wafer processing. For advanced packaging, the lithography system must perform in a completely different application, with significantly different operating parameters. For example, most packaging is an additive process, while wafer processing is subtractive, and thick films, rather than thin films, are used to enable the creation of features. In order for equipment to effectively function in this environment, it must overcome these challenges. Rudolph's JetStep Systems have been specifically designed to meet these challenges head on. The JetStep W Series is designed for wafers and other round substrates while the JetStep S Series is designed for rectangular substrates (panels). Both systems boast a large printable field, which when combined with user-selectable wavelength options, maximizes throughput while not limiting resolution when needed. High-fidelity optics are able to image the fine features required while at the same time achieving superior depth of field to minimize non-flatness that is typical for advanced packaging applications. On-the-fly auto focus and an innovative reticle management system improve yield and utilization. These features result in a revolutionary lithography system specifically designed to meet advanced packaging challenges.

Flat Panel Display ("FPD"*) Lithography*. A critical aspect of any leading mobile device is the display. The display serves as the window to the user. Therefore, it must effectively present graphics from a variety of apps, such as detailed maps, high resolution photos, and streaming video in order to provide an enhanced user experience. To accomplish this, the display's thin film transistor ("TFT") backplane, which controls the individual pixels, must operate at a high frequency and not limit the pixel resolution. As a result, the transistors must have high mobility and only use a small portion of the pixel aperture. The backplane is manufactured on a sheet of glass; like the packaging substrate, it is non-flat and tends to distort further during processing. Additionally, the displays are getting larger. Manufacturers are looking to utilize larger glass substrates, making throughput a challenge for the lithography equipment. To overcome this, Rudolph's JetStep G Series uses high-fidelity optics and the largest printable stepper field available, enabling more displays per exposure. This feature, combined with on-the-fly auto-focus and magnification compensation, maximizes throughput and yield. Finally, our patented grid stage allows the system to be easily configurable to meet the customer desired substrate size.

Integrated Software Solutions

Process Control Software. We provide a wide range of advanced process control solutions, all designed to improve factory profitability, including run-to-run control, fault detection, classification and tool automation. Rudolph is a leading provider of Process Control Software in the semiconductor industry. Advanced process control ("APC") employs software to automatically detect or predict tool failure (fault detection) as well as calculate recipe settings for a process that will drive the yielded output to meet and exceed the target, despite variations in the incoming material and minor instabilities within the process equipment. Process control software enables the factory to increase capacity and yield while decreasing rework and scrap. It enables reduced production costs by lowering consumables, process engineering time and manufacturing cycle time.

Yield Management Software. Semiconductor manufacturers use yield management software ("YMS") to obtain valuable process yield and equipment productivity information. The data necessary to generate productivity information comes from many different sources throughout the wafer fab: inspection and metrology systems, tool sensors, tool recipes, electrical tests and the fab environment. As the complexity and cost of manufacturing processes increase, the value of faster, better analysis to support critical manufacturing decisions grows. As a result, customers are demanding robust yield management systems that can analyze large, complex data sets quickly and effectively. Rudolph's fully-integrated YMS are designed to analyze data from disparate sources and multiple sites to maximize productivity across the entire value chain.

Products

Rudolph markets and sells products to major analog, logic, memory, RF, CMOS Image Sensors, MEMs, and flat panel display manufacturers. These customers are IDMs, OSAT manufacturers, and foundries that are producing wafers and packages for fabless design companies. Our customers rely on us for versatile inspection, lithography and metrology systems as well as process control software solutions. These products are designed for high-volume production facilities and offer automated wafer handling for 200mm and 300mm configurations and panel handling up to 720 x 930mm. Our systems operate at high throughput in an ultra-clean operating mode with high reliability.

PROCESS CONTROL SYSTEMS				
			Location of Process	
Product	**First Introduced**	**Functionality**	**Front-end**	**Back-end**
Dragonfly™G2 Inspection System	2018	— 2D/3D Advanced Packaging inspection and metrology	X	X
NovusEdge™ Wafer Inspection System	2018	— Bare wafer edge and backside inspection	X	
Dragonfly™ Inspection System	2016	— 2D/3D inspection and metrology	X	X
Firefly™ Inspection Series	2016	— Sub-micron defect and residue inspection	X	X
AWX™ Series	2011	— Unpatterned wafer inspection and process monitoring system	X	X
F30™ Inspection Module	2011	— Front-side macro defect inspection system	X	
Explorer® Inspection Platform	2009	— Handling platform that supports a family of multi surface inspection tools, using one or more inspection modules	X	
B30™ Inspection Module	2003	— Defect inspection module for the wafer’s backside	X	X
E30™ Inspection Module	2003	— Defect inspection module for the wafer’s edge	X	X
PrecisionWoRx® System	2008	— Probe card test and analysis system		X
S3000™ System	2006	— Transparent thin film metrology system	X	
MetaPULSE® System	1997	— Opaque (metal) thin film metrology system	X	X
NSX® Inspection System	1997	— 2D/3D wafer, die and bump inspection system		X

LITHOGRAPHY SYSTEMS				
			Location of Process	
Product	**First Introduced**	**Functionality**	**Front-end**	**Back-end**
JetStep® S Lithography System	2013	— 2x reduction step and repeat system for advanced packaging lithography on square or rectangular substrates up to Gen 3.5 size		X
JetStep® W Lithography System	2012	— 2x reduction step and repeat system for advanced packaging applications on wafers or round substrates		X
JetStep® G45 FPD Lithography System	2007	— Step and repeat lithography printer for Gen 4.5 substrates	X	
JetStep® G35 FPD Lithography System	2006	— Step and repeat lithography printer for Gen 3.5 substrates	X	

INTEGRATED SOFTWARE SOLUTIONS				
			Location of Process	
Product	**First Introduce**	**Functionality**	**Front-end**	**Back-end**
Equipment Sentinel™ Software	2015	— Fault detection and classification software	X	X
Discover® Software	2007	— Tool-centric yield management system	X	X
TrueADC® Enterprise Software	2007	— Automatic defect classification software	X	X
Process Sentinel® Software	2006	— Fab-wide spatial process control system	X	
Yield Optimizer™ Software	2006	— Yield enhancement model software	X	
Discover® Enterprise Software	2005	— Fabwide yield management system	X	X
GateWay™ Software	2003	— Data collection and facilitation to FDC software	X	X

INTEGRATED SOFTWARE SOLUTIONS				
			Location of Process	
Product	**First Introduce**	**Functionality**	**Front-end**	**Back-end**
ProcessWORKS® Software	1998	— Run-to-run process control software	X	
RecipeWORKS™ Software	1998	— Factory-level client-server based recipe management system	X	X
AutoShell® Software	1998	— Equipment and factory automation software	X	X
Genesis® Software	1997	— Off-line yield management system	X	
ControlWORKS® Software	1994	— Advanced equipment control software	X	

Customers

Over 150 microelectronic device manufacturers have purchased Rudolph tools and software for installation at multiple sites. We support a diverse customer base in terms of both geographic location and type of device manufactured. Our customers are located in 20 countries. See Note 14 to our consolidated financial statements in this Annual Report on Form 10-K for information concerning our geographic information.

In 2018, sales to SK Hynix Inc. accounted for 12.2% of our revenue. No individual end user customer accounted for more than 10% of our revenue in 2017 and 2016. We do not have purchase contracts with any of our customers that obligate them to continue to purchase our products.

Research and Development

The markets for equipment and systems for manufacturing semiconductor devices and for performing macro-defect inspection, advanced packaging lithography and thin film transparent and opaque process control metrology are characterized by continuous technological development and product innovations. We believe that the rapid and ongoing development of new products and enhancements to existing products is critical to our success. Accordingly, we devote a significant portion of our technical, management and financial resources to research and development programs. As of December 31, 2018, we employed 199 engineering personnel.

Our research and development expenditures in 2018, 2017 and 2016 were $49.1 million, $47.0 million and $45.0 million, respectively. We expect to continue our strong commitment to new product development and will continue to allocate significant resources to these efforts in the future.

Sales, Customer Service and Application Support

We maintain an extensive network of direct sales, customer service and application support offices in the United States, Europe and Asia.

We provide our customers with comprehensive support before, during and after the delivery of our products. For example, in order to facilitate the smooth integration of our tools into our customers' operations, we often assign dedicated, site-specific field service and applications engineers to provide long-term support at selected customer sites. We also provide comprehensive service and applications training for customers at our training facilities in Bloomington, Minnesota and Budd Lake, New Jersey and at customer locations. In addition, we maintain a group of highly skilled applications scientists at strategically located facilities throughout the world and at selected customer locations. As of December 31, 2018, we employed 282 sales and marketing, service and applications support personnel.

Manufacturing

Our principal manufacturing activities include assembly, final test and calibration. These activities are conducted in our manufacturing facilities in Bloomington, Minnesota and Wilmington, Massachusetts. Our core manufacturing competencies include electrical, optical and mechanical assembly and testing, as well as the management of new product transitions. While we use standard components and subassemblies wherever possible, most mechanical parts, metal fabrications and critical components used in our products are engineered and manufactured to our specifications. We continue to rely on subcontractors and turnkey suppliers to fabricate components, build assemblies and perform other non-core activities in a cost-effective manner. As of December 31, 2018, we employed 94 manufacturing personnel.

We rely on a number of limited source suppliers for certain parts and subassemblies. This reliance creates a potential inability to obtain an adequate supply of required components, and reduced control over pricing and time of delivery of components. An inability to obtain adequate supplies would require us to seek alternative sources of supply or might require us to redesign our systems to accommodate different components or subassemblies. To date, we have not experienced any significant delivery delays. However, if we were forced to seek alternative sources of supply, manufacture such components or subassemblies internally, or redesign our products, this could prevent us from shipping our products to our customers on a timely basis, which could have a material adverse effect on our operations.

Intellectual Property

We have a policy of seeking patents on inventions governing new products or technologies as part of our ongoing research, development, and manufacturing activities. As of December 31, 2018, we have been granted, or hold exclusive licenses to, 276 U.S. and foreign patents. The patents we own, jointly own or exclusively license have expiration dates ranging from 2019 to 2036. We also have 56 pending regular and provisional applications in the U.S. and other countries. Our patents and applications principally cover various aspects of macro-defect detection and classification, transparent thin film measurement, altered material characterization, lithography techniques and automation.

We have been granted patent licenses by organizations such as Brown and the University of Colorado. These licenses are subject to rights retained by these organizations and, where applicable the United States government, for their own non-commercial uses. These patents relate to opto-acoustic metrology technology that underlies our opaque film products such as the MetaPULSE product family. The terms of these licenses are equal to the lives of the patents. We pay royalties to Brown and the University of Colorado based upon a percentage of our revenue from the sale of systems that incorporate the licensed technology. We continue to work with Brown and the University of Colorado on the development of advancements in relevant technical areas. We also continue to pursue intellectual property protection, including exclusive licenses to this technology. Note that third party licensees may terminate a license if we fail to pay royalties or if we materially breach our license agreements with those third parties.

Our pending patents may never be issued, and even if they are, these patents, our existing patents and the patents we license may not provide sufficiently broad protection to protect our proprietary rights, or they may prove to be unenforceable. To protect our proprietary rights, we also rely on a combination of copyrights, trademarks, trade secret laws, contractual provisions and licenses. There can be no assurance that any patents issued to or licensed by us will not be challenged, invalidated or circumvented or that the rights granted thereunder will provide us with a competitive advantage.

The laws of some foreign countries do not protect our proprietary rights to the same degree as do the laws of the United States, and many U.S. companies have encountered substantial infringement problems in protecting their proprietary rights against infringement in such countries, some of which are countries in which we have sold and continue to sell products. There is a risk that our means of protecting our proprietary rights may not be adequate. For example, our competitors may independently develop similar technology or duplicate our products. If we fail to adequately protect our intellectual property, it would be easier for our competitors to sell competing products.

Competition

The market for semiconductor capital equipment is highly competitive. We face substantial competition from established companies in each of the markets that we serve. We principally compete with KLA Corporation, Camtek and Veeco Instruments. We compete to a lesser extent with companies such as Nanometrics, Nova Measuring Instruments and Nikon. Each of our products also competes with products that use different metrology and inspection techniques. Some of our competitors have greater financial, engineering, manufacturing and marketing resources, broader product offerings and service capabilities and larger installed customer bases than we do.

Significant competitive factors in the market for inspection and metrology systems include system performance, ease of use, reliability, cost of ownership, technical support and customer relationships. We believe that, while price and delivery are important competitive factors, the customers' overriding requirement is for a product that meets their technical capabilities. To remain competitive, we believe we will need to maintain a high level of investment in research and development and process applications. No assurances can be given that we will continue to be competitive in the future.

Backlog

We schedule production of our systems based upon order backlog and informal customer forecasts. We use the term "backlog" to refer to only those orders to which the customer has been assigned a purchase order number and for which delivery is anticipated within 12 months. Because shipment dates may be changed and customers may cancel or delay orders with little or no penalty, our backlog as of any particular date may not be a reliable indicator of actual sales for any succeeding period. At December 31, 2018, we had a backlog of approximately $62.7 million compared with a backlog of approximately $87.8 million at December 31, 2017.

Employees

As of December 31, 2018, we had 651 employees. Our employees are not represented by any collective bargaining agreements, and we have never experienced a work stoppage. We believe our employee relations are good.

Available Information

We were incorporated in Delaware in 1999. The Internet website address of Rudolph Technologies, Inc. is http://www.rudolphtech.com. The information on our website is not incorporated into this Annual Report. The Company's Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q and Current Reports on Form 8-K (and any amendments to those reports) are made available free of charge, on or through our Internet website, as soon as reasonably practicable after such material is electronically filed with or furnished to the SEC. All filings we make with the SEC are also available free of charge via EDGAR through the SEC's website at http://www.sec.gov.

We also make available, free of charge, through the investors page on our corporate website, Rudolph Technologies' corporate summary, Code of Business Conduct and Ethics and Financial Code of Ethics, charters of the committees of our Board of Directors, as well as other information and materials, including information about how to contact our Board of Directors, its committees and their members. To find this information and obtain copies, visit our website at http://www.rudolphtech.com.

Item 1A. Risk Factors.

Risks Related to Rudolph

Our operating results have varied, and will likely continue to vary significantly from quarter to quarter in the future, causing volatility in our stock price.

Our quarterly operating results have varied in the past and will likely continue to vary significantly from quarter to quarter in the future, causing volatility in our stock price. Some of the factors that may influence our operating results and subject our stock to extreme price and volume fluctuations include:

- changes in customer demand for our systems, which is influenced by economic conditions in the semiconductor device industry, demand for products that use semiconductors, market acceptance of our systems and products of our customers and changes in our product offerings;
- seasonal variations in customer demand;
- the timing, cancellation or delay of customer orders, shipments and acceptance;
- a significant portion of our revenue may be derived from the sale of a relatively small number of systems; accordingly, a small change in the number of systems we sell may cause significant changes in our operating results;
- product development costs, including increased research, development, engineering and marketing expenses associated with our introduction of new products and product enhancements; and
- the levels of our fixed expenses, including research and development costs associated with product development, relative to our revenue levels.

In light of these factors and the cyclical nature of the semiconductor industry, we expect to continue to experience significant fluctuations in quarterly and annual operating results. Moreover, many of our expenses are fixed in the short-term which, together with the need for continued investment in research and development, marketing and customer support, limits our ability to reduce expenses quickly. As a result, declines in net sales could harm our business and the price of our common stock could substantially decline.

Our largest customers account for a substantial portion of our revenue, and our revenue and cash flows could decline considerably if one or more of these customers were to purchase significantly fewer of our systems or delay or cancel a large order.

Sales to end user customers that individually represent at least five percent of our revenue typically account for, in the aggregate, a considerable amount of our revenue. We operate in the highly concentrated, capital-intensive semiconductor device manufacturing industry. Historically, a substantial portion of our revenue in each quarter and year has been derived from sales to relatively few customers, and this trend is expected to continue. If any of our key customers were to purchase significantly fewer of our systems in the future, or if they delay or cancel a large order, our revenue and cash flows could meaningfully decline. We expect that we will continue to depend on a small number of large customers for a sizable portion of our revenue. In addition, as large semiconductor device manufacturers seek to establish closer relationships with their suppliers, we expect that our customer base will become even more concentrated.

Our customers may be unable to pay us for our products and services.

Our customers include some companies that may, from time to time, encounter financial difficulties. If a customer’s financial difficulties become severe, the customer may be unwilling or unable to pay our invoices in the ordinary course of business, which could adversely affect collections of both our accounts receivable balance and unbilled services. The bankruptcy of a customer with a substantial account balance owed to us could have a material adverse effect on our financial condition and results of operations. In addition, if a customer declares bankruptcy after paying us certain invoices, a court may determine that we are not properly entitled to that payment and may require repayment of some or all of the amount we received, which could adversely affect our financial condition and results of operations.

Variations in the amount of time it takes for us to sell our systems may cause fluctuations in our operating results, which could cause our stock price to decline.

Variations in the length of our sales cycles could cause our revenue and cash flows, and consequently, our business, financial condition, operating results and cash flows to fluctuate widely from period to period. This variation could cause our stock price to decline. Our customers generally take a long time to evaluate our inspection and/or film metrology systems and many people are involved in the evaluation process. We expend significant resources educating and providing information to our prospective customers regarding the uses and benefits of our systems in the semiconductor fabrication process. The length of time it takes for us to make a sale depends upon many factors, including, but not limited to:

- the efforts of our sales force;
- the complexity of the customer's fabrication processes;
- the internal technical capabilities and sophistication of the customer;
- the customer's budgetary constraints; and
- the quality and sophistication of the customer's current metrology, inspection or lithography equipment.

Because of the number of factors influencing the sales process, the period between our initial contact with a customer and the time when we recognize revenue from that customer and receive payment, if ever, varies widely in length. Our sales cycles, including the time it takes for us to build a product to customer specifications after receiving an order to the time we recognize revenue, typically range from six to twenty-four months. Sometimes our sales cycles can be much longer, particularly with customers in Japan. During these cycles, we commit substantial resources to our sales efforts in advance of receiving any revenue, and we may never receive any revenue from a customer despite our sales efforts. If we do make a sale, our customers often purchase only one of our systems, the performance of which they then evaluate for a lengthy period before purchasing any more of our systems. The number of additional products a customer purchases, if any, depends on many factors, including the customer's capacity requirements. The period between a customer's initial purchase and any subsequent purchases can vary from six months to a year or longer, and variations in the length of this period could cause further fluctuations in our operating results and, possibly, in our stock price.

Most of our revenue has been derived from customers outside of the United States, subjecting us to operational, financial and political risks, such as unexpected changes in regulatory requirements, tariffs, political and economic instability, outbreaks of hostilities, and difficulties in managing foreign sales representatives and foreign branch operations, as well as risks associated with foreign currency fluctuations.

Due to the significant level of our international sales, we are subject to a number of material risks, including:

Compliance with foreign laws. Our business is subject to risks inherent in doing business internationally, including compliance with, inconsistencies among, and unexpected changes in, a wide variety of foreign laws and regulatory environments with which we are not familiar, including, among other issues, with respect to employees, protection of our intellectual property, and a wide variety of operational regulations and trade and export controls under domestic, foreign, and international law.

Unexpected changes in regulatory requirements including tariffs and other market barriers. The semiconductor device industry is a high-visibility industry in many of the European and Asian countries in which we sell our products. Because the governments of these countries have provided extensive financial support to our semiconductor device manufacturing customers in these countries, we believe that our customers could be disproportionately affected by any trade embargoes, excise taxes, tariffs or other restrictions imposed by their governments on trade with United States companies such as ourselves, particularly with respect to the ongoing trade negotiations between the United States and China. If the United States and China do not reach agreement on a trade policy, tariffs imposed by China may result in lower sales to customers in China as the costs of our products become more expensive to such customers. In addition, tariffs imposed by the United States will increase the cost of raw materials that we import from China. Any restrictions of these types could result in a reduction in our sales to customers in these countries.

Political and economic instability. We are subject to various global risks related to political and economic instabilities in countries in which we derive sales. If terrorist activities, armed conflict, civil or military unrest or political instability occurs outside of the U.S., these events may result in reduced demand for our products. There is considerable political instability in Taiwan related to its disputes with China and in South Korea related to its disputes with North Korea. In addition, several Asian countries, particularly Japan, have experienced significant economic instability. An outbreak of hostilities or other political upheaval in China, Taiwan or South Korea, or an economic downturn in Japan or other countries, would likely harm the operations of our customers in these countries. The effect of these types of events on our revenue and cash flows could be material because we derive substantial revenue from sales to semiconductor device foundries in Taiwan such as Taiwan Semiconductor Manufacturing Company Ltd., from memory chip manufacturers in South Korea such as Samsung Electronics Co., Ltd., and from semiconductor device manufacturers in Japan such as Toshiba Corporation.

Difficulties in staffing and managing foreign branch operations. During periods of tension between the governments of the United States and certain other countries, it is often difficult for United States companies such as ourselves to staff and manage operations in such countries. Language and other cultural differences may also inhibit our sales and marketing efforts and create internal communication problems among our U.S. and foreign research and development teams, increasing the difficulty of managing multiple remote locations performing various development, quality assurance, and yield ramp analysis projects.

Currency fluctuations as compared to the U.S. Dollar. A substantial portion of our international sales are denominated in U.S. dollars. As a result, if the dollar rises in value in relation to foreign currencies, our systems will become more expensive to customers outside the United States and less competitive with systems produced by competitors outside the United States. These conditions could negatively impact our international sales. Foreign sales also expose us to collection risk in the event it becomes more expensive for our foreign customers to convert their local currencies into U.S. dollars. Additionally, in the event a larger portion of our revenue becomes denominated in foreign currencies, we would be subject to a potentially significant exchange rate risk.

If we deliver systems with defects, our credibility will be harmed and the sales and market acceptance of our systems will decrease.

Our systems are complex and have occasionally contained errors, defects and bugs when introduced. Defects may be created during probing, bumping, dicing or general handling, and can have a major impact on device and process quality. When this occurs, our credibility and the market acceptance and sales of our systems could be harmed. Further, if our systems contain errors, defects or bugs, computer viruses or malicious code as a result of cyber-attacks to our computer networks, we may be required to expend significant capital and resources to alleviate these problems. Defects could also lead to product liability as a result of product liability lawsuits against us or against our customers. We have agreed to indemnify our customers under certain circumstances against liability arising from defects in our systems. Our product liability insurance policy currently provides $2.0 million of aggregate coverage, with an overall umbrella limit of $20.0 million. In the event of a successful product liability claim, we could be obligated to pay damages significantly in excess of our product liability insurance limits.

If we are not successful in developing new and enhanced products for the semiconductor device manufacturing industry, we will lose sales and market share to our competitors.

We operate in an industry that is highly competitive and subject to evolving industry standards, rapid technological changes, rapid changes in consumer demands and the rapid introduction of new, higher performance systems with shorter product life cycles. To be competitive in our demanding market, we must continually design, develop and introduce in a timely manner new lithography, inspection and metrology process control systems that meet the performance and price demands of semiconductor device manufacturers. We must also continue to refine our current systems so that they remain competitive. We expect to continue to make significant investments in our research and development activities. We may experience difficulties or delays in our development efforts with respect to new systems, and we may not ultimately be successful in our product enhancement efforts to improve and advance products or in responding effectively to technological change, as not all research and development activities result in viable commercial products. In addition, we cannot provide assurance that we will be able to develop new products for the most opportunistic new markets and applications. Any significant delay in releasing new systems could cause our products to become obsolete, adversely affect our reputation, give a competitor a first-to-market advantage or cause a competitor to achieve greater market share.

If new products developed by us do not gain general market acceptance, we will be unable to generate revenue and recover our research and development costs.

Inspection, lithography and metrology product development is inherently risky because it is difficult to foresee developments in semiconductor device manufacturing technology, coordinate technical personnel, and identify and eliminate system design flaws. Further, our products are complex and often the applications to our customers' businesses are unique. Any new systems we introduce may not achieve or sustain a significant degree of market acceptance and sales.

We expect to spend a significant amount of time and resources developing new systems and refining our existing systems. In light of the long product development cycles inherent in our industry, these expenditures will be made well in advance of the prospect of deriving revenue from the sale of those systems. Our ability to commercially introduce and successfully market new systems are subject to a wide variety of challenges during the development cycle, including start-up bugs, design defects, and other matters that could delay introduction of these systems. In addition, since our customers are not obligated by long-term contracts to purchase our systems, our anticipated product orders may not materialize, or orders that are placed may be canceled. As a result, if we do not achieve market acceptance of new products, we may be unable to generate sufficient revenue and cash flow to recover our research and development costs and our market share, revenue, operating results or stock price would be negatively impacted.

Even if we are able to develop new products that gain market acceptance, sales of these new products could impair our ability to sell existing products.

Competition from our new systems could have a negative effect on sales of our existing systems and the prices that we could charge for these systems. We may also divert sales and marketing resources from our current systems in order to successfully launch and promote our new or next generation systems. This diversion of resources could have a further negative effect on sales of our current systems and the value of inventory.

If our relationships with our large customers deteriorate, our product development activities could be adversely affected.

The success of our product development efforts depends on our ability to anticipate market trends and the price, performance and functionality requirements of semiconductor device manufacturers. In order to anticipate these trends and ensure that critical development projects proceed in a coordinated manner, we must continue to collaborate closely with our largest customers. Our relationships with these and other customers provide us with access to valuable information regarding trends in the semiconductor device industry, which enables us to better plan our product development activities. If our current relationships with our large customers are impaired, or if we are unable to develop similar collaborative relationships with important customers in the future, our product development activities could be adversely affected.

Our ability to reduce costs is limited by our ongoing need to invest in research and development and to provide customer support activities.

Our industry is characterized by the need for continual investment in research and development as well as customer service and support. As a result, our operating results could be materially affected if operating costs associated with our research and development as well as customer support activities increase in the future or we are unable to reduce those activities.

We may fail to adequately protect our intellectual property and, therefore, lose our competitive advantage.

Our future success and competitive position depend in part upon our ability to obtain and maintain proprietary technology for our principal product families, and we rely, in part, on patent and trade secret law and confidentiality agreements to protect that technology. If we fail to adequately protect our intellectual property, it will give our competitors a significant advantage. We own or have licensed a number of patents relating to our transparent and opaque thin film metrology, lithography and macro-defect inspection systems, and have filed applications for additional patents. Any of our pending patent applications may be rejected, and we may be unable to develop additional proprietary technology that is patentable in the future.

In addition, the patents that we do own or that have been issued or licensed to us may not provide us with competitive advantages and may be challenged by third parties. Further, third parties may also design around these patents. In addition to patent protection, we rely upon trade secret protection for our confidential and proprietary information and technology. We routinely enter into confidentiality agreements with our employees and other third parties. Even though these agreements are in place, there can be no assurances that trade secrets and proprietary information will not be disclosed, that others will not independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets, or that we can fully protect our trade secrets and proprietary information. Violations by others of our confidentiality agreements and the loss of employees who have specialized knowledge and expertise could harm our competitive position and cause our sales and operating results to decline as a result of increased competition. Costly and time-consuming litigation might be necessary to enforce and determine the scope of our proprietary rights, and failure to obtain or maintain trade secret protection might adversely affect our ability to continue our research or bring products to market.

Protection of our intellectual property rights, or the efforts of third parties to enforce their own intellectual property rights against us, may result in costly and time-consuming litigation, substantial damages, lost product sales and/or the loss of important intellectual property rights.

We may be required to initiate litigation in order to enforce any patents issued to or licensed by us or to determine the scope or validity of a third party's patent or other proprietary rights. Any litigation, regardless of outcome, could be expensive and time consuming and could subject us to significant liabilities or require us to re-engineer our products or obtain expensive licenses from third parties. There can be no assurance that any patents issued to or licensed by us will not be challenged, invalidated or circumvented, or that the rights granted thereunder will provide us with a competitive advantage.

In addition, our commercial success depends in part on our ability to avoid infringing or misappropriating patents or other proprietary rights owned by third parties. From time to time, we may receive communications from third parties asserting that our products or systems infringe, or may infringe, on the proprietary rights of these third parties. These claims of infringement may lead to protracted and costly litigation, which could require us to pay substantial damages or have the sale of our products or systems stopped by an injunction. Infringement claims could also cause product or system delays or require us to redesign our products or systems, and these delays could result in the loss of substantial revenue. We may also be required to obtain a license from the third party or cease activities utilizing the third party's proprietary rights. We may not be able to enter into such a license or such a license may not be available on commercially reasonable terms. Accordingly, the loss of important intellectual property rights could hinder our ability to sell our systems or to make the sale of these systems more expensive.

Our efforts to protect our intellectual property may be less effective in certain foreign countries where intellectual property rights are not as well protected as in the United States.

The laws of some foreign countries do not protect our proprietary rights to as great an extent as do the laws of the United States, and many U.S. companies have encountered substantial problems in protecting their proprietary rights against infringement abroad. For example, Taiwan is not a signatory of the Patent Cooperation Treaty, which is designed to specify rules and methods for defending intellectual property internationally. The publication of a patent in Taiwan prior to the filing of a patent in Taiwan would invalidate the ability of a company to obtain a patent in Taiwan. Similarly, in contrast to the United States where the contents of patents remain confidential during the patent application process, in Taiwan, the contents of a patent are published upon filing, which provides competitors an advance view of the contents of a patent application prior to the establishment of patent rights. Consequently, there is a risk that we may be unable to adequately protect our proprietary rights in certain foreign countries. If this occurs, it would be easier for our competitors to develop and sell competing products in these countries.

Some of our current and potential competitors have significantly greater resources than we do, and increased competition could impair sales of our products or cause us to reduce our prices.

The market for semiconductor capital equipment is highly competitive. We face substantial competition from established companies in each of the markets we serve. We principally compete with KLA Corporation, Camtek and Veeco Instruments. We compete to a lesser extent with companies such as Nanometrics, Nova Measuring Instruments and Nikon. Each of our products also competes with products that use different metrology, inspection or lithography techniques. Some of our competitors have greater financial, engineering, manufacturing and marketing resources, broader product offerings and service capabilities and larger installed customer bases than we do. As a result, these competitors may be able to respond more quickly to new or emerging technologies or market developments by devoting greater resources to the development, promotion and sale of products, which, in turn, could impair sales of our products. Further, there may be significant merger and acquisition activity among our competitors and potential competitors, which, in turn, may provide them with a competitive advantage over us by enabling them to rapidly expand their product offerings and service capabilities to meet a broader range of customer needs.

Many of our customers and potential customers in the semiconductor device manufacturing industry are large companies that require global support and service for their semiconductor capital equipment. We believe that our global support and service infrastructure is sufficient to meet the needs of our customers and potential customers. However, some of our competitors have more extensive infrastructures than we do, which could place us at a disadvantage when competing for the business of global semiconductor device manufacturers. Many of our competitors are investing heavily in the development of new systems that will compete directly with our systems. We have, from time to time, selectively reduced prices on our systems in order to protect our market share, and competitive pressures may necessitate further price reductions. We expect our competitors in each product area to continue to improve the design and performance of their products and to introduce new products with competitive prices and performance characteristics. These product introductions would likely require us to decrease the prices of our systems and increase the level of discounts that we grant our customers. Price reductions or lost sales as a result of these competitive pressures would reduce our total revenue and could adversely impact our financial results.

Because of the high cost of switching equipment vendors in our markets, it is sometimes difficult for us to win new customers from our competitors even if our systems are superior to theirs.

We believe that once a semiconductor device manufacturer has selected one vendor's capital equipment for a production-line application, the manufacturer generally relies upon that capital equipment and, to the extent possible, subsequent generations of the same vendor's equipment for the life of the application. Once a vendor's equipment has been installed in a production line application, a semiconductor device manufacturer must often make substantial technical modifications and may experience production-line downtime in order to switch to another vendor's equipment. Accordingly, unless our systems offer performance or cost advantages that outweigh a customer's expense of switching to our systems, it will be difficult for us to achieve significant sales to that manufacturer once it has selected another vendor's capital equipment for an application.

We must attract and retain experienced senior executives and other key personnel with knowledge of semiconductor device manufacturing and inspection, metrology or lithography equipment and related software to help support our future growth, and competition for such personnel in our industry is high.

Our success depends, to a significant degree, upon the continued contributions of our key executive management, engineering, sales and marketing, customer support, finance and manufacturing personnel. The loss of any of these key personnel through resignations, retirement or other circumstances, each of whom would be extremely difficult to replace, could harm our business and operating results. Although we have employment and noncompetition agreements with key members of our senior management team, these individuals or other key employees may still leave us, which could have a material adverse effect on our business. We do not have key person life insurance on any of our executives. In addition, to support our future growth, we will need to attract and retain additional qualified employees. Competition for such personnel in our industry is intense, and we may not be successful in attracting and retaining qualified employees.

We obtain some of the components and subassemblies included in our systems from a limited group of suppliers, and the partial or complete loss of one of these suppliers could cause production delays and a substantial loss of revenue.

We obtain some of the components and subassemblies included in our systems from a limited group of suppliers and do not have long-term contracts with many of our suppliers. Our dependence on limited source suppliers of components and our lack of long-term contracts with many of our suppliers expose us to several risks, including a potential inability to obtain an adequate supply of components, price increases, late deliveries and poor component quality. Disruption or termination of the supply of these components could delay shipments of our systems, damage our customer relationships and reduce our sales. From time to time in the past, we have experienced temporary difficulties in receiving shipments from our suppliers. The lead-time required for shipments of some of our components can be as long as six months. In addition, the lead time required to qualify new suppliers for lasers and certain optics could be as long as a year, and the lead time required to qualify new suppliers of other components could be as long as nine months. If we are unable to accurately predict our component needs, or if our component supply is disrupted, we may miss market opportunities by not being able to meet the demand for our systems. Further, a significant increase in the price of one or more of these components or subassemblies could seriously harm our results of operations and cash flows.

Any prolonged disruption in the operations of our manufacturing facility could have a material adverse effect on our revenue.

Our manufacturing processes are highly complex and require sophisticated and costly equipment and a specially designed facility. As a result, any prolonged disruption in the operations of our manufacturing facility, whether due to technical or labor difficulties, or destruction, or damage as a result of a fire or any other reason, could seriously harm our ability to satisfy our customer order deadlines. If we cannot timely deliver our systems, our results from operations and cash flows could be materially and adversely affected.

Our business is subject to cybersecurity risks.

Information technology systems are increasingly threatened by cybersecurity risks and cyber incidents or attacks. Cybersecurity attacks could include, but are not limited to, malicious software, viruses, attempts to gain unauthorized access, whether through malfeasance or error, either from within or outside of our organization, to our data or that of our customers or our customers' customers which may be in our possession, and the unauthorized release, corruption or loss of the data, loss of the intellectual property, theft of the proprietary or licensed technology, whether ours, that of our customers or their customers, loss or damage to our data delivery systems, other electronic security breaches that could lead to disruptions in our critical systems, and increased costs to prevent, respond to or mitigate cybersecurity events. It is possible that our business, financial and other systems could be compromised, which might not be noticed for some period of time. Although we utilize various procedures and controls to mitigate our exposure to such risk, cybersecurity attacks are evolving and unpredictable and we cannot guarantee that any risk prevention measures implemented will be successful. The occurrence of such an attack could lead to financial losses and have a material adverse effect on our reputation, business, financial condition and results of operations.

Failure to adjust our orders for parts and subcomponents in an accurate and timely manner in response to changing market conditions or customer acceptance of our products could adversely affect our financial position and results of operations.

Our earnings could be negatively affected and our inventory levels could materially increase if we are unable to predict our inventory needs in an accurate and timely manner and adjust our orders for parts and subcomponents in the event that our needs increase or decrease materially due to unexpected increases or decreases in demand for our products. Any material increase in our inventories could result in an adverse effect on our financial position, while any material decrease in our ability to procure needed inventories could result in an inability to supply customer demand for our products, thus adversely affecting our revenue.

Our ability to fulfill our backlog may have an effect on our long term ability to procure contracts and fulfill current contracts.

Our ability to fulfill our backlog may be limited by our ability to devote sufficient financial and human capital resources and may be limited by available material supplies. If we do not fulfill our backlog in a timely manner, we may experience delays in product delivery, which would postpone receipt of revenue from those delayed deliveries. Additionally, if we are consistently unable to fulfill our backlog, this may be a disincentive to customers to award large contracts to us in the future until they are comfortable that we can effectively manage our backlog.

We may choose to acquire new and complementary businesses, products or technologies instead of developing them ourselves, and we may be unable to complete these acquisitions or may not be able to successfully integrate an acquired business in a cost-effective and non-disruptive manner.

Our success depends on our ability to continually enhance and broaden our product offerings in response to changing technologies, customer demands and competitive pressures. To this end, we have, from time to time, engaged in the process of identifying, analyzing and negotiating possible acquisition transactions, and, from time to time, acquiring one or more businesses, and we expect to continue to do so in the future. We may choose to acquire new and complementary businesses, products, technologies and/or services instead of developing them ourselves. We may, however, face competition for acquisition targets from larger and more established companies with greater financial resources, making it more difficult for us to complete acquisitions. We cannot provide any assurance that we will be successful in consummating future acquisitions on favorable terms or that we will realize the benefits that we anticipate from one or more acquisitions that we consummate. Integrating any business, product, technology or service into our current operations could be expensive and time-consuming and/or disrupt our ongoing business. Further, there are numerous risks associated with acquisitions and potential acquisitions, including, but not limited to:

- diversion of management's attention from day-to-day operational matters and current products and customers;
- lack of synergy or the inability to successfully integrate the new business or to realize expected synergies;
- failure to commercialize the new technology or business;
- failure to meet the expected performance of the new technology or business;
- failure to retain key employees and customer or supplier relationships;

- lower-than-expected market opportunities or market acceptance of any new products; and
- unexpected reduction of sales of existing products as a result of the introduction of new products.

Our inability to consummate one or more acquisitions on favorable terms, or our failure to realize the intended benefits from one or more acquisitions, could have a material adverse effect on our business, liquidity, financial position and/or results of operations, including as a result of our incurrence of indebtedness and related interest expense and our assumption of unforeseen contingent liabilities. We might need to raise additional funds through public or private equity or debt financings to finance any acquisition. In that event, we could be forced to obtain financing on terms that are not favorable to us and, in the case of equity financing, that result in dilution to our stockholders. In addition, any impairment of goodwill or other intangible assets, amortization of intangible assets, write-down of other assets or charges resulting from the costs of acquisitions and purchase accounting could harm our business and operating results.

If we cannot effectively manage growth, our business may suffer.

Over the long-term, we intend to grow our business by increasing our sales efforts and completing strategic acquisitions. To effectively manage growth, we must, among other things:

- engage, train and manage a larger sales force and additional service personnel;
- expand the geographic coverage of our sales force;
- expand our information systems;
- identify and successfully integrate acquired businesses into our operations; and
- administer appropriate financial and administrative control procedures.

Growth of our business will likely place a significant strain on our management, financial, operational, technical, sales and administrative resources. Any failure to effectively manage our growth may cause our business to suffer and our stock price to decline.

Changes in tax rates or tax liabilities could affect results.

As a global company, we are subject to taxation in the United States and various other countries. Significant judgment is required to determine and estimate worldwide tax liabilities. Our future annual and quarterly tax rates could be affected by numerous factors, including changes in the (1) applicable tax laws; (2) composition of earnings in countries with differing tax rates; or (3) recoverability of our deferred tax assets and liabilities. In addition, we are subject to regular examination of our income tax returns by the Internal Revenue Service and other tax authorities. We regularly assess the likelihood of favorable or unfavorable outcomes resulting from these examinations to determine the adequacy of our provision for income taxes. Although we believe our tax estimates are reasonable, there can be no assurance that any final determination will not be materially different from the treatment reflected in our historical income tax provisions and accruals, which could materially and adversely affect our results of operations.

The Organization for Economic Co-operation and Development (“OECD”), released guidance covering various topics, including country-by-country reporting, definitional changes to permanent establishment and Base Erosion and Profit Shifting (“BEPS”), an initiative that aims to standardize and modernize global tax policy. Depending on the final form of guidance adopted by OECD members and legislation ultimately enacted, if any, there may be significant consequences for us due to our international business activities.

Turmoil or fluctuations in the credit markets and the financial services industry may negatively impact our business, results of operations, financial condition or liquidity.

In the past, global credit markets and the financial services industry have experienced a period of unprecedented turmoil and upheaval characterized by the tightening of the credit markets, the weakening of the global economy and an unprecedented level of intervention from the United States and other governments. Adverse economic conditions, such as sustained periods of economic uncertainty or a crisis in the financial markets may have a material adverse effect on our liquidity and financial condition if our ability to obtain credit from the capital financial markets, or from trade creditors was impaired. In addition, a worsening economy or an economic crisis could also adversely impact our customers’ ability to finance the purchase of systems from us or our suppliers' ability to provide us with product, either of which may negatively impact our business and results of operations.

Risks Related to the Semiconductor Industry

Cyclicality in the semiconductor device industry has led to substantial decreases in demand for our systems and may, from time to time, continue to do so.

Our operating results are subject to significant variation due to the cyclical nature of the semiconductor device industry. Our business depends upon the capital expenditures of semiconductor device manufacturers, which, in turn, depend upon the current and anticipated market demand for semiconductors and products using semiconductors. The timing, length and severity of the up-and-down cycles in the semiconductor equipment industry are difficult to predict. In recent years, the industry has experienced significant downturns, generally in connection with declines in economic conditions. This cyclical nature of the industry in which we operate affects our ability to accurately predict future revenue and, thus, future expense levels. When cyclical fluctuations result in lower than expected revenue levels, operating results may be adversely affected and cost reduction measures may be necessary in order for us to remain competitive and financially sound. During a down cycle, we must be in a position to adjust our cost and expense structure to prevailing market conditions and to continue to motivate and retain our key employees. In addition, during periods of rapid growth, we must be able to increase manufacturing capacity and personnel to meet customer demand. We can provide no assurance that these objectives can be met in a timely manner in response to industry cycles. If we fail to respond to industry cycles, our business could be seriously harmed.

Our future rate of growth is highly dependent on the development and growth of the market for microelectronic device inspection, lithography and metrology equipment.

We target our products to address the needs of microelectronic device manufacturers for defect inspection, metrology and lithography. If for any reason the market for microelectronic device inspection, lithography or metrology equipment fails to grow in the long term, we may be unable to maintain current revenue levels in the short term and maintain our historical growth in the long term. Growth in the inspection market is dependent to a large extent upon microelectronic manufacturers replacing manual inspection with automated inspection technology. Growth in the metrology market is dependent to a large extent upon new chip designs and capacity expansion of microelectronic manufacturers. Growth in the lithography market is dependent on the development of cost-effective packaging with high fine pitch RDLs, ultimately migrating to multi-die, large, form-factor packages. There can be no assurance that manufacturers will undertake these actions at the rate we expect.

Risks Related to our Stock

Provisions of our charter documents and of Delaware law could discourage potential acquisition proposals and/or delay, deter or prevent a change in control of our company.

Provisions of our certificate of incorporation and by-laws may inhibit changes in control of our company not approved by our Board of Directors. These provisions also limit the circumstances in which a premium can be paid for our common stock and in which a proxy contest for control of our board may be initiated. These provisions provide for:

- a prohibition on stockholder actions through written consent;
- a requirement that special meetings of stockholders be called only by our chief executive officer or Board of Directors;
- advance notice requirements for stockholder proposals and director nominations by stockholders;
- limitations on the ability of stockholders to amend, alter or repeal our by-laws; and
- the authority of our board to issue, without stockholder approval, preferred stock with such terms as the board may determine; and
- The authority of our board, without stockholder approval, to adopt a stockholder rights plan.

We are also entitled to avail ourselves of the protections of Section 203 of the Delaware General Corporation Law, which could inhibit changes in control of the Company.

Our stock price is volatile.

The market price of our common stock has fluctuated widely. From the beginning of 2014 through the end of 2018, our stock price fluctuated between a high of $34.55 per share and a low of $8.10 per share. Consequently, the current market price of our common stock may not be indicative of future market prices, and we may be unable to sustain or increase the value of an investment in our common stock. Factors affecting our stock price may include:

- variations in operating results from quarter to quarter;
- changes in earnings estimates by analysts or our failure to meet analysts' expectations;
- changes in the market price per share of our public company customers;
- market conditions in the semiconductor and other industries into which we sell products;
- general economic conditions;
- political changes, hostilities or natural disasters such as hurricanes and floods;
- low trading volume of our common stock; and
- the number of firms making a market in our common stock.

In addition, the stock market has experienced periods of significant price and volume fluctuations. These fluctuations have particularly affected the market prices of the securities of high technology companies like ours. Any such market fluctuations in the future could adversely affect the market price of our common stock.

There are various risks related to the legal and regulatory environments in which we perform our operations and conduct our business that may expose us to risk.

We are faced with various risks that may be associated with our compliance with existing, new, different, inconsistent or conflicting laws, regulations and rules enacted by governments and/or their regulatory agencies in the countries in which we operate as well as rules and policies implemented at our customer sites. These laws, regulations, rules and policies could relate to any of an array of issues including, but not limited to, environmental, tax, intellectual property, trade secrets, product liability, contracts, antitrust, employment, securities, import/export and unfair competition. In the event that we fail to comply with or violate U.S. or foreign laws or regulations or customer policies, we could be subject to civil or criminal claims or proceedings that may result in monetary fines, penalties or other costs against us or our employees, which may adversely affect our operating results, financial condition, customer relations and ability to conduct our business.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Our principal executive office building is located at 16 Jonspin Road in Wilmington, Massachusetts. We own and lease facilities for corporate, engineering, manufacturing, sales and service related purposes in the United States and six other countries - China, Japan, South Korea, Singapore, Taiwan and Scotland. The following table indicates the location, the general purpose and the square footage of our principal facilities. The expiration years of the leases covering the leased facilities are also indicated.

Location	Facility Purpose	Approximate Square Footage	Lease Expiration Year, Unless Owned
Wilmington, Massachusetts	Corporate, Engineering, Manufacturing and Service	50,000	2027
Budd Lake, New Jersey	Corporate, Engineering and Service	49,000	2023
Bloomington, Minnesota	Engineering, Manufacturing and Service	98,500	2029
Richardson, Texas	Engineering	21,000	Owned
Bohemia, New York	Engineering	6,000	2019
Snoqualmie, Washington	Engineering and Service	20,500	2020
Tianjin, China	Engineering	5,000	2019
Hsin-Chu, Taiwan	Sales and Service	10,500	2019
Takatsu, Japan	Sales and Service	4,000	2019
Sungnam-si, South Korea	Sales and Service	9,000	2021
Shanghai, China	Sales and Service	2,500	2020
Singapore	Sales and Service	2,500	2019
Scotland, United Kingdom	Sales and Service	1,000	2020

We also lease office space for other smaller sales and service offices in several locations throughout the world.

We believe that our existing facilities and capital equipment are adequate to meet our current requirements and that suitable additional or substitute space is available on commercially reasonable terms if needed.

Item 3. Legal Proceedings.

From time to time, we are subject to ordinary routine litigation incidental to our business. As of December 31, 2018, there are no legal proceedings pending or threatened against us that management believes are likely to have a material adverse effect on our consolidated financial position or otherwise.

Item 4. Mine Safety Disclosures.

None.

PART II

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

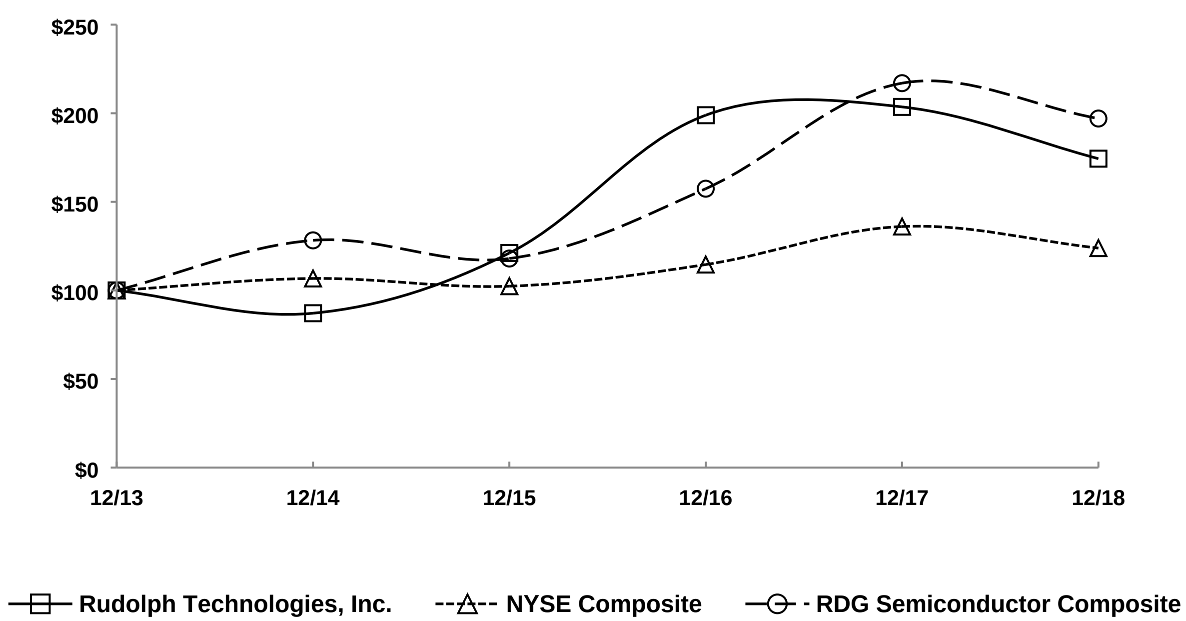
Our common stock is traded on the New York Stock Exchange ("NYSE") under the symbol "RTEC." Set forth below is a line graph comparing the annual percentage change in the cumulative return to the stockholders of the Company's common stock with the cumulative return of the NYSE Composite Index and the Research Data Group ("RDG") Semiconductor Composite Index for the period commencing on December 31, 2013 and ending on December 31, 2018.

The information contained in the performance graph shall not be deemed to be "soliciting material" or to be "filed" with the SEC, nor shall such information be incorporated by reference into any future filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference into such filing.

The graph assumes that $100 was invested on December 31, 2013 in the Company's common stock in each index, and that all dividends were reinvested. No cash dividends have been declared or paid on the Company's common stock. Stockholder returns over the indicated period should not be considered indicative of future stockholder returns.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*

Among Rudolph Technologies, Inc., the NYSE Composite Index
and the RDG Semiconductor Composite Index



*$100 invested on 12/31/13 in stock or index, including reinvestment of dividends.
Fiscal year ending December 31.

	12/13	12/14	12/15	12/16	12/17	12/18
RTEC	100.0	87.1	121.1	198.9	203.6	174.4
NYSE Composite	100.0	106.8	102.4	114.6	136.1	123.9
RDG Semiconductor Composite	100.0	128.3	118.0	157.4	217.0	197.0

As of January 23, 2019, there were 56 stockholders of record of our common stock and approximately 8,482 beneficial stockholders.

We have never declared or paid a cash dividend on our common stock and currently do not anticipate paying any cash dividends in the foreseeable future. We currently intend to retain our earnings, if any, for the development of our business and the share repurchase of our common stock. The declaration of any future dividends by us is within the discretion of our Board of Directors and will be dependent on our earnings, financial condition and capital requirements as well as any other factors deemed relevant by our Board of Directors.

In October 2018, the Board of Directors approved a new share repurchase authorization, which allows us to repurchase up to $40 million worth of shares of our common stock. The authorization provides for repurchases to be made in the open market or through negotiated transactions from time to time. The share repurchase authorization has no expiration date and may be discontinued at any time. In addition, during the fourth quarter of 2018, we completed the purchase of the remaining shares available under the prior 3.0 million share repurchase authorization. During the twelve months ended December 31, 2018, we repurchased 1.1 million shares of common stock under our two share repurchase authorizations and those shares were subsequently retired. At December 31, 2018, there were $33.2 million available for future share repurchases. For further information, see Note 16 in the accompanying Notes to the Consolidated Financial Statements.

In addition to the our share repurchase program, we withhold common stock shares associated with net share settlements to cover tax withholding obligations upon the vesting of restricted stock unit awards and stock option exercises under the Company's equity incentive program. During the three and twelve months ended December 31, 2018, we withheld 45.5 thousand and 81.8 thousand shares through net share settlements, respectively. For the three and twelve month periods ended December 31, 2018, net share settlements cost $0.9 million and $1.9 million, respectively. Please refer to Note 10 of the Notes to Consolidated Financial Statements for further discussion regarding our equity incentive plan.

The following table provides details of common stock purchased during the three month period ended December 31, 2018 (in thousands, except per share data):

Period	Total Number of Shares Purchased (1)	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Program	Maximum Approximate Dollar Value of Shares that May Yet Be Purchased Under the Program
October 1, 2018 to October 31, 2018	710	$ 20.12	709	$ 40,000
November 1, 2018 to November 30, 2018	126	$ 20.12	82	$ 38,380
December 1, 2018 to December 31, 2018	269	$ 19.16	268	$ 33,239
Three Months Ended December 31, 2018	1,105		1,059	

[1] Includes shares withheld through net share settlements.

Item 6. Selected Financial Data.

The following selected financial data should be read in conjunction with our Consolidated Financial Statements and the related Notes thereto appearing elsewhere in this Annual Report on Form 10-K, and under Item 7. "Management's Discussion and Analysis of Financial Condition and Results of Operations." The balance sheet data as of December 31, 2018 and 2017 and the statement of operations data for the years ended December 31, 2018, 2017 and 2016 set forth below were derived from our audited consolidated financial statements included elsewhere in this Form 10-K. The balance sheet data as of 2016, 2015 and 2014, and the statement of operations data for the years ended December 31, 2015 and 2014 were derived from our audited consolidated financial statements not included herein.

	Year Ended December 31,				
	2018	2017	2016	2015	2014
	(In thousands, except per share data)				
Statement of Operations Data:					
Revenue	$ 273,784	$ 255,098	$ 232,780	$ 221,690	$ 181,218
Cost of revenue	125,505	120,503	109,229	102,284	85,730
Gross profit	148,279	134,595	123,551	119,406	95,488
Operating expenses:					
Research and development	49,053	46,986	44,964	41,233	40,576
Selling, general and administrative	46,608	39,381	38,562	43,235	53,799
Amortization	1,534	1,940	2,320	2,145	2,422
Patent litigation income	—	(13,000)	(14,643)	—	—
Total operating expenses	97,195	75,307	71,203	86,613	96,797
Operating income (loss)	51,084	59,288	52,348	32,793	(1,309)
Interest (income) expense, net	(2,206)	(971)	2,834	5,688	5,317
Other (income) expense, net	(56)	457	(354)	293	65
Income (loss) before provision (benefit) for income taxes	53,346	59,802	49,868	26,812	(6,691)
Provision (benefit) for income taxes	8,250	26,893	12,916	8,856	(2,051)
Net income (loss)	$ 45,096	$ 32,909	$ 36,952	$ 17,956	$ (4,640)
Earnings (loss) per share:					
Basic	$ 1.42	$ 1.05	$ 1.19	$ 0.57	$ (0.14)
Diluted	$ 1.40	$ 1.02	$ 1.16	$ 0.56	$ (0.14)
Weighted average shares outstanding:					
Basic	31,671	31,491	31,128	31,408	33,124
Diluted	32,200	32,162	31,790	32,166	33,124

	December 31,				
	2018	2017	2016	2015 (1)	2014 (1)(2)(3)
Balance Sheet Data:					
Cash and cash equivalents	$ 112,388	$ 67,770	$ 37,859	$ 44,554	$ 43,114
Marketable securities	62,684	109,589	87,872	116,924	113,871
Working capital	305,916	279,775	226,668	197,266	245,707
Total assets	418,040	385,922	338,699	379,563	365,944
Convertible senior notes	—	—	—	57,846	54,080
Accumulated deficit	(6,773)	(51,869)	(84,706)	(121,658)	(139,614)
Total stockholders' equity	361,888	333,154	293,735	270,678	267,328

(1) Effective in the first quarter of 2016, the Company adopted Accounting Standards Update (ASU) No. 2015-03, "Interest - Imputation of Interest (Subtopic 835-30), Simplifying the Presentation of Debt Issuance Costs," which requires entities to present debt issuance costs related to a debt liability as a direct deduction from the carrying amount of that debt liability on the balance sheet as opposed to being presented as a deferred charge. Prior to adoption, the Company reported the unamortized debt issuance costs in "Other Assets" on the Consolidated Balance Sheets.

(2) Effective December 31, 2015, we early adopted provisions prescribed by the Financial Account Standards Board (FASB) in ASU No. 2015-17, "Income Taxes (Topic 740), Balance Sheet Classification of Deferred Taxes." Consequently, we reclassified net current deferred income tax assets to net long term deferred income tax assets for each period presented.

(3) Working capital data for 2014 reflects reclassifications of a portion of deferred revenue to other non-current liabilities.

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

Overview

We are a worldwide leader in the design, development, manufacture and support of process control tools that perform macro-defect inspections and metrology, lithography systems, and process control analytical software used by semiconductor and advanced packaging device manufacturers. We deliver comprehensive solutions throughout the semiconductor fabrication process with our families of proprietary products that provide critical yield-enhancing information, enabling microelectronic device manufacturers to drive down costs and time to market of their devices. We provide process and yield management solutions used in both wafer processing facilities, often referred to as "front-end" and device packaging and test facilities, or "back-end" manufacturing, through a portfolio of standalone systems for macro-defect inspection, lithography, probe card test and analysis, and transparent and opaque thin film measurements. All of our systems feature sophisticated software and production-worthy automation. In addition, our advanced process control software portfolio includes powerful solutions for standalone tools, groups of tools, or factory-wide suites to enhance productivity and achieve significant cost savings. Our systems are backed by worldwide customer service and applications support.

Our business is affected by the annual spending patterns of our customers on semiconductor capital equipment. The amount that our customers devote to capital equipment spending depends on a number of factors, including general worldwide economic conditions as well as other economic drivers such as personal computers, mobile devices, data centers, artificial intelligence and automotive sales. Current forecasts by industry analysts for the semiconductor device manufacturing industry project capital equipment spending to be down approximately 15%-18% for 2019 as compared to 2018. Our revenue and profitability tend to follow the trends of certain segments within the semiconductor market.

Historically, a significant portion of our revenue in each quarter and year has been derived from sales to relatively few customers, and we expect this trend to continue. For the years ended December 31, 2018, 2017 and 2016, aggregate sales to customers that individually represented at least five percent of our revenue accounted for 18.3%, 27.2%, and 34.5% of our revenue, respectively.

We do not have purchase contracts with any of our customers that obligate them to continue to purchase our products, and they could cease purchasing products from us at any time. A delay in purchase or cancellation by any of our large customers could cause quarterly revenue to vary significantly. In addition, during a given quarter, a significant portion of our revenue may be derived from the sale of a relatively small number of systems. The following table presents the average selling price range for our systems in 2018.

System	Average Selling Price Per System
Process control	$250,000 to $2.6 million
Lithography steppers	$2.6 million to $8.5 million

A significant portion of our revenue is derived from customers outside of the United States. A substantial portion of our international sales are denominated in U.S dollars. We expect that revenue generated from customers outside of the United States will continue to account for a significant percentage of our revenue.

The sales cycle for our systems typically ranges from six to twenty-four months and can be longer when our customers are evaluating new technology. Due to the length of these cycles, we invest significantly in research and development and sales and marketing in advance of generating revenue related to these investments.

Results of Operations

The following table sets forth, for the periods indicated, our results of operations as percentages of our revenue. Our results of operations are reported as one business segment.

	Year Ended December 31,		
	2018	2017	2016
Revenue	100.0%	100.0%	100.0%
Cost of revenue	45.8%	47.2%	46.9%
Gross profit	54.2%	52.8%	53.1%
Operating expenses:			
Research and development	17.9%	18.4%	19.3%
Selling, general and administrative	17.0%	15.4%	16.6%
Amortization	0.6%	0.8%	1.0%
Patent litigation income	—%	(5.1)%	(6.3)%
Total operating expenses	35.5%	29.5%	30.6%
Operating income	18.7%	23.3%	22.5%
Interest (income) expense, net	(0.8)%	(0.4)%	1.2%
Other expense (income), net	—%	0.2%	(0.2)%
Income before provision for income taxes	19.5%	23.5%	21.5%
Provision for income taxes	3.0%	10.6%	5.6%
Net income	16.5%	12.9%	15.9%

Results of Operations for 2018, 2017 and 2016

Revenue. Our revenue is derived from the sale of our systems, services, spare parts and software licensing. Our revenue was $273.8 million, $255.1 million and $232.8 million for the years ended December 31, 2018, 2017 and 2016, respectively. This represents an increase of 7.3% from 2017 to 2018 and an increase of 9.6% from 2016 to 2017. The increase in revenue from 2017 to 2018 was due to an increase in capital spending by front-end memory manufacturers. The increase in revenue from 2016 to 2017 was due to a significant increase in capital spending by front-end memory manufacturers, as well as continued strength in capital spending by back-end foundry and Advanced Packaging customers in the OSAT markets.

The following table lists, for the periods indicated, the different sources of our revenue in dollars (thousands) and as percentages of our total revenue:

	Year Ended December 31,					
	2018		2017		2016	
Systems and Software:						
Process control	$190,098	70%	$177,177	70%	$146,652	63%
Lithography	14,975	5%	14,234	5%	18,949	8%
Software licensing, support and maintenance	29,168	11%	25,473	10%	29,795	13%
Parts	28,658	10%	27,143	11%	25,343	11%
Services	10,885	4%	11,071	4%	12,041	5%
Total revenue	$273,784	100%	$255,098	100%	$232,780	100%

Total systems and software revenue increased for the year ended December 31, 2018 as compared to the year ended December 31, 2017 due to increased demand for our products in front-end process control systems. The year-over-year increases in process control systems revenue totaled $12.9 million, primarily due to higher metrology system sales in the 2018 period. Lithography system revenue increased $0.7 million, primarily due to the shipment of a JetStep G system offset by lower shipments of our JetStep W systems in 2018. Licensing revenue from software increased $3.7 million primarily due to an increase in revenue from our process control and yield management software. The average selling price of similarly configured systems has been consistent and, therefore, did not have a material impact on our revenue for the same period. Systems revenue generated by our latest product releases and major enhancements in each of our product families amounted to 74% of total revenue for 2018 compared to 70% of total revenue for 2017. The year-over-year increase in parts and services revenue in absolute dollars from 2017 to 2018 was primarily due to increased spending by our customers on repairs of existing systems. Parts and services revenue is generated from part sales, maintenance service contracts, system upgrades, as well as time and material billable service calls.

Total systems and software revenue increased for the year ended December 31, 2017 as compared to the year ended December 31, 2016 due to increased demand for our products in both front-end and back-end process control systems. The year-over-year increases in process control systems revenue totaled $30.5 million, which was partially offset by decreases in lithography systems and software revenue of $4.7 million and $4.3 million, respectively. The increase in systems revenue was attributed to a greater number of process control units sold, which was partially offset by fewer lithography units sold. Licensing revenue from software decreased $4.3 million primarily due to a decrease in revenue from our process control software. The average selling price of similarly configured systems has been consistent and, therefore, did not have a material impact on our revenue for the same period. Systems revenue generated by our latest product releases and major enhancements in each of our product families amounted to 70% of total revenue for 2017 compared to 72% of total revenue for 2016. The year-over-year increase in parts and services revenue in absolute dollars from 2016 to 2017 was primarily due to increased spending by our customers on repairs of existing systems. Parts and services revenue is generated from part sales, maintenance service contracts, system upgrades, as well as time and material billable service calls.

Deferred revenue of $6.8 million was recorded in the Consolidated Balance Sheets under the Caption "Current liabilities" and $1.3 million was recorded under the caption "Other non-current liabilities" at December 31, 2018. Deferred revenue primarily consisted of $5.6 million for deferred maintenance agreements and $2.5 million for outstanding deliverables. At December 31, 2017, deferred revenue of $6.2 million was recorded under the caption "Current liabilities" and $1.0 million was recorded under the caption "Other non-current liabilities". Deferred maintenance agreements of $4.7 million and outstanding deliverables of $2.5 million were the two main components of deferred revenue at December 31, 2017.

Gross Profit. Our gross profit has been and will continue to be affected by a variety of factors, including manufacturing efficiencies, provision for excess and obsolete inventory, pricing by competitors or suppliers, new product introductions, production volume, customization and reconfiguration of systems, international and domestic sales mix, system and software product mix, and parts and services margins. Our gross profit was $148.3 million, $134.6 million and $123.6 million for the years ended December 31, 2018, 2017 and 2016, respectively. Our gross profit represented 54.2%, 52.8% and 53.1% for the years ended December 31, 2018, 2017 and 2016, respectively. The increase in gross profit as a percentage of revenue from 2017 to 2018 was primarily due to a change in our systems and software product sales mix and the sale of a lithography system that had previously been partially written down. The decrease in gross profit as a percentage of revenue from 2016 to 2017 was primarily due to a change in our systems and software product sales mix.

Operating Expenses

Our operating expenses consist of:

- *<u>Research and Development</u>.* The process control defect inspection and metrology, advanced packaging lithography, and data analysis systems and software market is characterized by continuous technological development and product innovations. We believe that the rapid and ongoing development of new products and enhancements of existing products, including the transition to copper and low-k dielectrics, wafer level packaging, the continuous shrinkage in critical dimensions, and the evolution of ultra-thin gate process control is critical to our success. Accordingly, we devote a significant portion of our technical, management and financial resources to research and development programs. Research and development expenditures consist primarily of salaries and related expenses of employees engaged in research, design and development activities. They also include consulting fees, the cost of related supplies and legal costs to defend our patents. Our research and development expenses were $49.1 million, $47.0 million and $45.0 million in 2018, 2017 and 2016, respectively. The year-over-year dollar increase from 2017 to 2018 was primarily due to increased compensation and development initiatives. These costs were partially offset by decreased litigation expenses. The year-over-year dollar increase from 2016 to 2017 was primarily due to increased compensation and project costs. We continue to maintain our commitment to investing in new product development and enhancement to existing products.

- *<u>Selling, General and Administrative</u>.* Selling, general and administrative expenses are primarily comprised of salaries and related costs for sales, marketing, and general administrative personnel, as well as commissions and other non-personnel related expenses. Our selling, general and administrative expenses were $46.6 million, $39.4 million and $38.6 million in 2018, 2017 and 2016, respectively. The year-over-year dollar increase from 2017 to 2018 was primarily due to compensation costs resulting from headcount and salary increases. In addition, the year-over-year increase was partially due to an increase in sales commissions and a loss recorded for the misappropriation of payroll taxes by a third party accountant. The year-over-year dollar increase from 2016 to 2017 was primarily due to an increase in compensation costs.

- *Amortization of Identifiable Intangible Assets*. Amortization of identifiable intangible assets was $1.5 million, $1.9 million and $2.3 million in 2018, 2017 and 2016, respectively. The year-over-year decreases in amortization expense from 2017 to 2018 and from 2016 to 2017 were due to certain intangible assets becoming fully amortized during these periods.

- *Patent Litigation Income*. During the twelve months ended December 31, 2018, there was no patent litigation income. During the twelve months ended December 31, 2017, we recorded income and received cash of $13.0 million from a comprehensive settlement regarding a patent infringement litigation with Camtek. We received $13.0 million in the fourth quarter of 2017 and subsequently remitted $2.3 million of withholding tax to the Israel Tax Authority associated with the settlement and the prior year patent litigation judgment. During the twelve months ended December 31, 2016, we recorded income and received cash from a patent litigation judgment of $14.6 million in conjunction with the final court ruling in the patent infringement litigation case against Camtek with the expiration of all opportunities to appeal.

Interest income (expense), net. In 2018 and 2017, net interest income was $2.2 million and $1.0 million, respectively. In 2016, net interest expense was $2.8 million. The increase in net interest income from 2017 to 2018 was due to higher interest earned on our marketable securities. The change in interest income (expense), net from 2016 to 2017, was primarily due to the redemption of the Senior Convertible Notes in July 2016.

Income taxes. The following table provides details of income tax (dollars in millions):

	Year Ended December 31,		
	2018	**2017**	**2016**
Income before income taxes	$ 53.3	$ 59.8	$ 49.9
Provision for income taxes	$ 8.3	$ 26.9	$ 12.9
Effective tax rate	15.5%	45.0%	25.9%

The income tax provision differs from the federal statutory income tax rate of 21% for 2018 primarily due to Foreign Derived Intangible Income Deduction (“FDII”) from the Tax Act of $2.2 million, tax benefits for research and development credits of $2.3 million, offset by a Section 162(m) limitation on the deductibility of executive compensation of $0.5 million and additional ASC 740-10 tax reserves of $0.6 million.

The income tax provision differs from the federal statutory income tax rate of 35% for 2017 primarily due to new regulations resulting from Public law No. 115-97, known as the Tax Cuts and Jobs Act (“Tax Act”) of $9.5 million, offset by tax benefits for research and development credits of $1.6 million, section 199 manufacturing deduction of $1.6 million and excess tax benefits on vesting of restricted stock of $1.6 million.

The income tax provision differs from the federal statutory income tax rate of 35% for 2016, primarily due to research and development credits of $0.7 million, section 199 manufacturing deduction of $1.2 million, the foreign taxes net of federal benefit of $1.6 million and deferred tax true-ups of $1.7 million from prior periods.

The Tax Act, which was enacted and signed into law on December 22, 2017, reduced the U.S. federal corporate tax rate from 35% to 21%, effective January 1, 2018. Also on December 22, 2017, the SEC issued Staff Accounting Bulletin No. 118 (“SAB 118”), which provides guidance on accounting for tax effects of the Tax Act. SAB 118 provides a measurement period of up to one year from the enactment date to complete the accounting. Any adjustments during this measurement period will be included in net earnings from continuing operations as an adjustment to income tax expense in the reporting period when such adjustments are determined. Based on the information available and current interpretation of the rules, we estimated the impact of the reduction in the corporate tax rate and remeasurement of certain deferred tax assets and liabilities. The provisional amount recorded in the fourth quarter of 2017 related to the remeasurement of our deferred tax balance resulted in additional income tax expense of $8.0 million. During the fourth quarter of 2018, we completed the accounting for such revaluation and recorded an additional $0.8 million in tax expense. Despite the completion of our accounting for the Tax Act under SAB 118, many aspects of the law remain unclear and we expect ongoing guidance to be issued at both the federal and state levels. We will continue to monitor and assess the impact of any new developments. The prior year provisional impact and current year finalization of the Tax Act summarized below, which is included as a component of the provision from income taxes is further described in Note 12 in the accompanying Notes to the Consolidated Financial Statements (dollars in millions).

	Year Ended December 31,	
	2018	2017
Re-measurement of U.S. deferred tax assets and liabilities	$ —	$ 8.0
Transition tax on non-U.S. subsidiaries' earnings	0.1	1.5
Foreign tax credits applied against transition tax	—	(1.5)
Valuation allowance for unused foreign tax credits	0.7	1.5
Total impact of the Tax Act on the provision for income taxes	$ 0.8	$ 9.5

Our future effective income tax rate depends on various factors, such as future impacts of the Tax Act, possible further tax legislation, the geographic composition of our pre-tax income, the amount of our pre-tax income as business activities fluctuate, non-deductible expenses incurred in connection with acquisitions and research and development credits as a percentage of aggregate pre-tax income.

Liquidity and Capital Resources

At December 31, 2018, we had $175.1 million of cash, cash equivalents and marketable securities and $305.9 million in working capital. At December 31, 2017, our cash, cash equivalents and marketable securities totaled $177.4 million, while working capital amounted to $279.8 million.

Typically, during periods of revenue growth, changes in accounts receivable and inventories represent a use of cash as we incur costs and expend cash in advance of receiving cash from our customers. Similarly, during periods of declining revenue, changes in accounts receivable and inventories represent a source of cash as inventory purchases decline and revenue from prior periods are collected.

Net cash and cash equivalents provided by operating activities for the years ended December 31, 2018, 2017 and 2016 totaled $35.1 million, $64.2 million and $47.4 million, respectively. During the year ended December 31, 2018, cash provided by operating activities was primarily due to net income, adjusted to exclude the effect of non-cash charges, of $64.3 million, an increase in accounts payable of $3.5 million, a decrease in income taxes of $1.1 million, a decrease in account receivable of $0.7 million and an increase in deferred revenue of $0.5 million, which were partially offset by an increase in inventories of $31.5 million, an increase in prepaid expenses and other assets of $3.1 million and a decrease in other liabilities of $0.4 million. The increase in inventories of $31.5 million was primarily due to increased sales projections of our latest products and new product initiatives.

During the year ended December 31, 2017, cash provided by operating activities was primarily due to net income, adjusted to exclude the effect of non-cash charges, of $65.9 million, an increase in other liabilities of $6.4 million, an increase in accounts payable of $3.2 million and a decrease in account receivable of $0.4 million, which were partially offset by an increase in income taxes of $4.7 million, an increase in inventory of $4.2 million, an increase in prepaid expenses and other assets of $1.7 million and a decrease in deferred revenue of $1.1 million.

During the year ended December 31, 2016, cash provided by operating activities was primarily due to net income, adjusted to exclude the effect of non-cash charges, of $57.7 million, a decrease in inventories of $4.0 million, a decrease in prepaid expenses and other assets of $2.0 million, an increase in accounts payable of $1.2 million and an increase in deferred revenue of $0.9 million, which were partially offset by an increase in accounts receivable of $9.3 million, a decrease in other liabilities of $6.1 million, and a net increase in income tax receivable of $3.0 million.

Net cash and cash equivalents provided by investing activities for the years ended December 31, 2018 and 2016 was $33.8 and $24.5 million, respectively. Net cash and cash equivalents used in investing activities for the year ended December 31, 2017 totaled $32.5 million. During the year ended December 31, 2018, net cash provided by investing activities included proceeds from sales of marketable securities of $186.3 million, which was partially offset by purchases of marketable securities of $140.0 million, purchases of property, plant and equipment of $7.5 million, and cash advanced on a convertible note receivable of $5.0 million. During the year ended December 31, 2017, net cash used in investing activities included purchases of marketable securities of $164.7 million, purchases of property, plant and equipment of $10.2 million, and purchase of intangible assets of $1.0 million, which were partially offset by proceeds from sales of marketable securities of $143.3 million. During the year ended December 31, 2016, net cash provided by investing activities included proceeds from sales of marketable securities of $175.5 million and proceeds from sale of property, plant and equipment of $1.2 million, which were partially offset by purchases of marketable securities of $146.9 million, purchases of property, plant and equipment of $3.3 million, and purchase of intangible assets of $2.0 million.

Net cash used in financing activities was $23.9 million, $2.6 million and $78.9 million in 2018, 2017 and 2016, respectively. During the year ended December 31, 2018, financing activities used cash to purchase shares of our common stock under share repurchase authorizations of $21.1 million, pay taxes related to shares withheld for share based compensation plans of $1.9 million and pay contingent consideration for acquired business of $1.5 million. These uses of cash were partially offset by proceeds from sales of shares through employee stock plans of $0.6 million. During the year ended December 31, 2017, financing activities included the redemption of stock warrants of $1.0 million, tax payments related to shares withheld for share-based compensation plans of $1.4 million and payment of contingent consideration for acquired businesses of $0.8 million, which were partially offset by proceeds from sales of shares through employee stock plans of $0.6 million. During the year ended December 31, 2016, financing activities included the redemption of senior convertible debt of $60.0 million, redemption of stock warrants of $9.5 million, purchase of shares under the share repurchase authorization of $8.0 million, tax payments related to shares withheld for share based compensation plans of $1.6 million and payment of contingent consideration for acquired business of $0.6 million, which were partially offset by proceeds from sales of shares through employee stock plans of $0.9 million.

From time to time, we evaluate whether to acquire new or complementary businesses, products and/or technologies. We may fund all of or a portion of the price of these investments or acquisitions in cash, stock, or a combination of cash and stock.

We entered into a convertible loan agreement with Simax Precision Technologies Limited (“Simax”) on May 31, 2018. Simax may borrow up to $15 million in multiple promissory notes from us, subject to limitations. We expect to be a supplier of lithography modules to Simax which is focused on the manufacture, sale and service of lithography systems. As of December 31, 2018, Simax has borrowed $5 million from us under the convertible loan agreement. See Note 6 in the accompanying Notes to the Consolidated Financial Statements included in this Form 10-K for further information.

In October 2018, the Board of Directors approved a new share repurchase authorization, which allows us to repurchase up to $40 million worth of shares of our common stock. The authorization provides for repurchases to be made in the open market or through negotiated transactions from time to time. The share repurchase authorization has no expiration date and may be discontinued at any time. In addition, during the fourth quarter of 2018, we completed the purchase of the remaining shares available under the prior 3.0 million share repurchase authorization. During the twelve months ended December 31, 2018, we repurchased 1.1 million shares of common stock under our two share repurchase authorizations and those shares were subsequently retired. At December 31, 2018, there were $33.2 million available for future share repurchases. For further information, see Note 16 in the accompanying Notes to the Consolidated Financial Statements.

We have a credit agreement with a bank that provides for a line of credit that is secured by the marketable securities we have with the bank. We are permitted to borrow up to 70% of the value of eligible securities held at the time the line of credit is accessed. As of December 31, 2018, the available line of credit was approximately $93.9 million with an available interest rate of 4.0%. The credit agreement is available to us until such time that either party terminates the arrangement at its discretion. To date, we have not utilized the line of credit.

Our future capital requirements will depend on many factors, including the timing and amount of our revenue and our investment decisions, which will affect our ability to generate additional cash. We expect that our existing cash, cash equivalents, marketable securities and availability under our line of credit will be sufficient to meet our anticipated cash requirements for working capital, capital expenditures and other cash needs for the next 12 months following the filing of this Form 10-K. Thereafter, if cash generated from operations and financing activities is insufficient to satisfy our working capital requirements, we may seek additional funding through bank borrowings, sales of securities or other means. There can be no assurance that we will be able to raise any such capital on terms acceptable to us or at all.

Contractual Obligations

The following table summarizes our significant contractual obligations at December 31, 2018, and the effect such obligations are expected to have on our liquidity and cash flows in future periods. This table excludes the liability for unrecognized tax benefits that totaled approximately $5.5 million at December 31, 2018. We are currently unable to provide a reasonably reliable estimate of the amount or periods when cash settlement of this liability may occur.

	Payments due by period				
	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
Operating lease obligations	$ 19,337	$ 3,170	$ 4,908	$ 3,775	$ 7,484
Open and committed purchase orders	71,752	50,015	21,737	—	—
Total	$ 90,799	$ 52,997	$ 26,557	$ 3,761	$ 7,484

Off-Balance Sheet Arrangements

The Company does not have any significant off-balance sheet arrangements that have or are reasonably likely to have a material effect on our financial condition, results of operations or liquidity and capital resources.

Critical Accounting Policies

Management's 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. We review the accounting policies we use in reporting our financial results on a regular basis. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, revenue and expenses and related disclosure of contingent assets and liabilities. On an ongoing basis, we evaluate our estimates, including those related to revenue recognition, accounts receivable, inventories, business acquisitions, intangible assets, share-based payments, income taxes and warranty obligations. We base our estimates on historical experience and on various other assumptions that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Results may differ from these estimates due to actual outcomes being different from those on which we based our assumptions. These estimates and judgments are regularly reviewed by management on an ongoing basis at the end of each quarter prior to the public release of our financial results. We believe the following critical accounting policies affect our more significant judgments and estimates used in the preparation of our consolidated financial statements.

Revenue Recognition. Effective January 1, 2018, we adopted the requirements of ASU No. 2014-09, "Revenue from Contracts with Customers (Topic 606)." For additional information on the new standard and the impact to our results of operations, refer to Impact of Recent Accounting Pronouncements below and Note 2 of the Notes to the Consolidated Financial Statements.

Revenue is recognized when control of the promised goods or services are transferred to our customers in an amount that reflects the consideration we expect to be entitled to receive in exchange for those goods or services. We account for a contract when it has approval and commitment from both parties, the rights of the parties and payment terms are identified, the contract has commercial substance and collectability of consideration is probable.

We account for shipping and handling activities as the fulfillment of a promise to transfer goods to the customer and therefore record these activities under the caption "Cost of revenue." Sales tax and any other taxes collected concurrent with revenue producing activities are excluded from revenue. Incidental items that are immaterial in the context of the contract are recognized as expense.

Contracts with customers may include multiple performance obligations. For such arrangements, we allocate revenue to each performance obligation based on its relative standalone selling price. We generally determine standalone selling prices based on the prices charged to customers or the expected cost plus margin.

Revenue from systems is recognized when we transfer control of the product to our customer. To indicate transfer of control, we must have a present right to payment, legal title must have passed to the customer and the customer must have the significant risks and rewards of ownership. We generally transfer control for system sales when the customer or the customer's agent picks up the system at our facility. Payment for the majority of our systems have 80-90% of the invoice amount due within 30 days and the remaining amount due upon completion of installation, recalibration and qualification by the customer. We provide an assurance warranty on our systems for a period of twelve to fifteen months against defects in material and workmanship. We provide for the estimated cost of product warranties at the time revenue is recognized.

Depending on the terms of the systems arrangement, we may also defer the recognition of a portion of the consideration expected to be received because we have to satisfy a future obligation (e.g., installation, training and extended warranties). We use an observable price to determine the standalone selling price for separate performance obligations or a cost plus margin approach when one is not available.

Revenue from software licenses is recognized upfront at the point in time when the software is made available to the customer. Software licenses provide the customer with limited rights to use the software. Revenue from licensing support and maintenance is recognized as the support and maintenance are provided, which is over the contract period. Payment for software licensing, support and maintenance is generally due in 30 days.

Revenue from parts is recognized when we transfer control of the product, which typically occurs when we ship the product from our facilities to the customer. Payment for parts is generally due in 30 days.

Revenue from services primarily consists of service contracts, which provide additional maintenance coverage beyond our assurance warranty on our products, service labor, consulting and training. Revenue from service contracts is recognized ratably over the term of the service contract. Revenue from service labor, consulting and training is recognized as services are performed. Payment for services is generally due in 30 days.

We record contract liabilities when the customer has been billed in advance of completing our performance obligations. These amounts are recorded as deferred revenue in the Consolidated Balance Sheets.

Excess and Obsolete Inventory. We maintain reserves for our excess and obsolete inventory equal to the difference between the cost of inventory and the estimated market value based upon assumptions about future product life-cycles, product demand and market conditions. If actual product life-cycles, product demand and market conditions are less favorable than those originally projected by management, additional inventory write-downs may be required.

Long-Lived Assets and Acquired Intangible Assets. We periodically review long-lived assets, other than goodwill, for impairment whenever changes in events or circumstances indicate that the carrying amount of an asset may not be recoverable. Assumptions and estimates used in the determination of impairment losses, such as future cash flows and disposition costs, may affect the carrying value of long-lived assets and the impairment of such long-lived assets, if any, could have a material effect on our consolidated financial statements. No such indicators were noted in 2018, 2017 or 2016.

Accounting for Income Taxes. As part of the process of preparing our consolidated financial statements, we are required to estimate our actual current tax exposure together with our temporary differences resulting from differing treatment of items for tax and accounting purposes. These temporary differences result in deferred tax assets and liabilities, which are included within our consolidated balance sheet. We must then assess the likelihood that our deferred tax assets will be recovered from future taxable income and to the extent we believe that recovery is not likely, we must establish a valuation allowance. Significant management judgment is required in determining our provision for income taxes and any valuation allowance recorded against our deferred tax assets. The need for a valuation allowance is based on our estimates of taxable income by jurisdiction in which we operate and the period over which our deferred taxes will be recoverable. In the event that actual results differ from these estimates or we adjust these estimates in future periods, we may need to adjust the valuation allowance, which could materially impact our financial position and results of operations. At December 31, 2018 and 2017, we had recorded valuation allowances of $3.2 million and $2.4 million on certain of our deferred tax assets to reflect the deferred tax assets at the net amount that is more likely than not to be realized. We evaluated the realizability of the deferred tax assets based on positive earnings as well as the projected earnings in future years and believe it is more likely than not that the substantial majority of our deferred tax asset will be realized in the future years. We will continue to monitor the realizability of the deferred tax assets and evaluate the valuation allowance.

We recognize liabilities for uncertain tax positions based on a two-step process. The first step requires us to determine if the weight of available evidence indicates that the tax position has met the threshold for recognition; therefore, we must evaluate whether it is more likely than not that the position will be sustained on audit, including resolution of any related appeals or litigation processes. The second step requires us to measure the tax benefit of the tax position taken, or expected to be taken, in an income tax return as the largest amount that is more than 50% likely of being realized when effectively settled. This measurement step is inherently difficult and requires subjective estimations of such amounts to determine the probability of various possible outcomes. We reevaluate the uncertain tax positions each quarter based on factors including, but not limited to, changes in facts or circumstances, changes in tax law, effectively settled issues, and new audit activity. Such a change in recognition or measurement could result in the recognition of a tax benefit or an additional charge to the tax provision in the period.

Although we believe the measurement of our liabilities for uncertain tax positions is reasonable, no assurance can be given that the final outcome of these matters will not be different than what is reflected in the historical income tax provisions and accruals. If additional taxes are assessed as a result of an audit or litigation, it could have a material effect on our income tax provision and net income in the period or periods for which that determination is made.

Impact of Recent Accounting Pronouncements

Recently Adopted

Effective January 1, 2018, we adopted ASU No. 2016-16, "Income Tax (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory." This ASU, which is part of the simplification initiative of the FASB, is intended to reduce the complexity of U.S. GAAP and diversity in practice related to the tax consequences of certain types of intra-entity asset transfers, particularly those involving intellectual property. The adoption of ASU No. 2016-16 did not have any impact on our consolidated financial position, results of operations, and cash flows.

Effective January 1, 2018, we adopted ASU No. 2016-15, "Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments." This ASU provides guidance on statement of cash flows presentation for eight specific cash flow issues where diversity in practice exists. We retrospectively adopted ASU No. 2018-15 resulting in a reclassification related to contingent consideration payments made after a business combination. The reclassification of $0.2 million from cash flows from financing activities to cash flows from operating activities is reflected in our Consolidated Statement of Cash Flows for the twelve month ended December 31, 2017. Adoption of additional guidance under ASU No. 2016-15 did not have a material impact on our consolidated financial position, results of operations, and cash flows.

Effective January 1, 2018, we adopted ASU No. 2014-09, "Revenue from Contracts with Customers (Topic 606)," which supersedes nearly all existing revenue recognition guidance. The core principle of this ASU is that revenue should be recognized to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. As a result of the adoption of ASU No. 2014-09, we changed our accounting policy for revenue recognition. Refer to Note 2 of the Notes to the Consolidated Financial Statements, "Summary of Significant Accounting Policies" for further information.

Recently Issued

In August 2018, the FASB issued ASU No. 2018-13, "Fair Value Measurement (Topic 820): Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement." This ASU is part of the FASB's larger disclosure framework project intended to improve the effectiveness of financial statement footnote disclosure. ASU No. 2018-13 modifies required fair value disclosures related primarily to level 3 investments. This ASU is effective for annual periods beginning after December 15, 2019 and interim periods within those annual periods. The adoption of ASU No. 2018-13 is not expected to have a material effect on our consolidated financial position, results of operations, and cash flows.

In June 2018, the FASB issued ASU No. 2018-07, "Compensation – Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting." This ASU expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. An entity should apply the requirements of Topic 718 to nonemployee awards except for specific guidance on inputs to an option pricing model and the attribution of cost. The ASU is effective for the fiscal years beginning after December 15, 2018, including interim periods within that fiscal year. The adoption of ASU No. 2018-07 is not expected to have a material effect on our consolidated financial position, results of operations, and cash flows.

In February 2018, the FASB issued ASU No. 2018-02, "Income Statement – Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income." The new guidance allows companies to reclassify stranded tax effects resulting from the Tax Act from accumulated other comprehensive income to retained earnings. The guidance also requires certain new disclosures regardless of a company's election. The standard is effective for annual periods beginning after December 15, 2018 and for interim periods within those annual periods, with earlier adoption permitted. The adoption of ASU No. 2018-02 is not expected to have a material effect on our consolidated financial position, results of operations, and cash flows.

In May 2017, the FASB issued ASU No. 2017-09, "Compensation - Stock Compensation (Topic 718): Scope of Modification Accounting." This ASU amends the scope of modification accounting for share-based payment arrangements and provides guidance on the types of changes to the terms or conditions of share-based payment awards to which an entity would be required to apply modification accounting under Accounting Standards Codification ("ASC") 718. The ASU is effective for the fiscal years beginning after December 15, 2019 and for interim periods within those fiscal years. The adoption of ASU No. 2017-09 is not expected to have a material effect on our consolidated financial position, results of operations, and cash flows, if any.

In January 2017, the FASB issued ASU No. 2017-04, "Intangibles – Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment." This ASU eliminates Step 2 from the goodwill impairment test. Accordingly, if the carrying amount of a reporting unit exceeds its fair value, an impairment loss will be recognized in an amount equal to the excess, limited to the total amount of goodwill allocated to the reporting unit. The ASU is effective for the fiscal years beginning after December 15, 2019 and for interim periods within those fiscal years. We are currently evaluating the effect the adoption of ASU No. 2017-04 will have on our consolidated financial position, results of operations, and cash flows, if any.

In June 2016, the FASB issued ASU No. 2016-13, “Financial Instruments – Credit Losses (Topic 326),” which introduces new guidance for the accounting for credit losses on instruments within its scope. Given the breadth of that scope, this ASU will impact both financial services and non-financial services entities. The standard is effective for fiscal years beginning after December 15, 2020. We are currently evaluating the effect the adoption of ASU No. 2016-13 will have on our consolidated financial position, results of operations, and cash flows, if any.

In February 2016, the FASB issued ASU No. 2016-02, “Leases (Topic 842).” ASU 2016-02 requires that lessees recognize virtually all of their leases on the balance sheet, by recording a right-of-use asset and lease liability. The provisions of this guidance are effective for annual periods beginning after December 31, 2018, and for interim periods therein. We expect to adopt ASU No. 2016-02 upon its effective date of January 1, 2019 using the modified retrospective method and we will also elect the package of practical expedients. We anticipate the impact of adoption will be an increase to long-term assets and total liabilities of $14 million to $15 million as of January 1, 2019.

Recently issued accounting guidance not discussed above is not applicable or did not have, or is not expected to have, a material impact to the Company.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

Interest Rate and Credit Market Risk

We are exposed to changes in interest rates and market liquidity including our investments in certain available-for-sale securities. Our available-for-sale securities consist of fixed and variable rate income investments, such as municipal notes, municipal bonds and corporate bonds. We continually monitor our exposure to changes in interest rates, market liquidity and credit ratings of issuers for our available-for-sale securities. It is possible that we are at risk if interest rates, market liquidity or credit ratings of issuers change in an unfavorable direction. The magnitude of any gain or loss will be a function of the difference between the fixed or variable rate of the financial instrument and the market rate, and our financial condition and results of operations could be materially affected. Based on a sensitivity analysis performed on our financial investments held as of December 31, 2018, an immediate adverse change of 10% in interest rates (e.g. 3.00% to 3.30%) would result in an immaterial decrease in the fair value of our available-for-sale debt securities and would not have a material impact on our consolidated financial position, results of operations or cash flows.

Foreign Currency Risk

A substantial portion of our systems and software sales are denominated in U.S. dollars with the exception of Japan. As a result, we have relatively little exposure to foreign currency exchange risk with respect to these sales. Substantially all of our sales in Japan are denominated in Japanese yen. From time to time, we may enter into forward exchange contracts to economically hedge a portion, but not all, of the existing and anticipated foreign currency denominated transactions expected to occur within 12 months. The change in fair value of the forward exchange contracts is recognized under the caption “Other (income) expense” in the Consolidated Statements of Operations for each reporting period. As of December 31, 2018 and 2017, we had twenty-seven and thirty-one outstanding forward contracts with a total notional contract value of $6.7 million and $8.4 million, respectively. We do not use derivative financial instruments for trading or speculative purposes.

We have branch operations in Taiwan, Singapore and South Korea and wholly-owned subsidiaries in Europe, Japan and China. Our international subsidiaries and branches operate primarily using local functional currencies. Our exposure to foreign currency exchange rate fluctuations arise from intercompany balances between our U.S. headquarters and that of our foreign owned entities. Our intercompany balances are denominated in U.S. dollars. Since each foreign entity’s functional currency is generally denominated in its local currency, there is exposure to foreign exchange risk when the foreign entity’s intercompany balance is remeasured at a reporting date, resulting in transaction gains or losses. The intercompany balance, exposed to foreign currency risk, as of December 31, 2018 was approximately $20.7 million. A hypothetical change of 10% in the relative value of the U.S. dollar versus local functional currencies could result in approximately $2.4 million in foreign currency exchange losses / (gains) which would be recorded as non-operating expense under the caption “Other (income) expense” in our Consolidated Statements of Operations. We cannot accurately predict future exchange rates or the overall impact of future exchange rate fluctuations on our business, results of operations and consolidated financial condition.

Item 8. Financial Statements and Supplementary Data.

The consolidated financial statements and related information required by this Item are set forth on the pages indicated in Item 15(a) of this Annual Report on Form 10-K.

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

None.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

We maintain disclosure controls and procedures that are designed to ensure that information we are required to disclose in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time period specified in SEC rules and forms. These controls and procedures are also designed to ensure that such information is accumulated and communicated to our management, including our principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure. In designing and evaluating disclosure controls and procedures, we have recognized that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives. Management is required to apply judgment in evaluating its controls and procedures.

We performed an evaluation under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, to assess the effectiveness of the design and operation of our disclosure controls and procedures under the Exchange Act as of December 31, 2018. Based on that evaluation, our management, including our principal executive officer and principal financial officer, concluded that our disclosure controls and procedures were effective as of December 31, 2018 at the reasonable assurance level.

Management's Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). 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 accounting principles generally accepted in the United States of America. Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in *Internal Control — Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) ("COSO"). Based on our evaluation, our management concluded that our internal control over financial reporting was effective as of December 31, 2018.

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

Attestation Report of the Registered Public Accounting Firm

Our consolidated financial statements as of and for the year ended December 31, 2018 have been audited by Ernst & Young LLP, our independent registered public accounting firm, in accordance with the standards of the Public Company Accounting Oversight Board (United States). Ernst & Young LLP has also audited our internal control over financial reporting as of December 31, 2018, as stated in its attestation report included elsewhere in this Annual Report on Form 10-K.

Changes in Internal Control over Financial Reporting

There have been no changes in the Company's internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act) that occurred during the Company's quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, its internal control over financial reporting.

Item 9B. Other Information.

None.

PART III

Certain information required by Part III is omitted from this Annual Report on Form 10-K because we expect to file a definitive proxy statement within one hundred twenty (120) days after the end of our fiscal year pursuant to Regulation 14A (the "Proxy Statement") for our Annual Meeting of Stockholders currently scheduled for May 15, 2019, and the information included in the Proxy Statement is incorporated herein by reference.

Item 10. Directors, Executive Officers and Corporate Governance.

The information required by this Item with respect to directors and executive officers is included under the headings "Proposal One: Election of Directors," "Executive Officers" and "Corporate Governance Principles and Practices" in the Proxy Statement, which is incorporated herein by reference. Information regarding compliance with Section 16 of the Exchange Act is incorporated by reference to the information under the heading "Section 16(a) Beneficial Ownership Reporting Compliance" in the Proxy Statement.

Code of Ethics. We have adopted a code of ethics that applies to our principal executive officer, principal financial officer and controller. This code of ethics is posted on our internet website address at http://www.rudolphtech.com. We will post on our website any amendment to or waiver from a provision of our code of ethics as may be required, and within the time period specified, by applicable SEC rules.

Item 11. Executive Compensation.

The information required by this Item is included under the headings "Executive Compensation," "Compensation of Directors," "Compensation Committee Report on Executive Compensation," "Stock Ownership/Retention Guidelines for Directors" and "Compensation Committee Interlocks and Insider Participation" in the Proxy Statement, which is incorporated herein by reference.

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

The information required by this Item is included under the headings "Security Ownership" and "Equity Compensation Plan Information" in the Proxy Statement, which is incorporated herein by reference.

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

The information required by this Item is included under the headings "Related Persons Transactions Policy" and "Board Independence" in the Proxy Statement, which is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services.

The information required by this Item is included under the heading "Proposal 3: Ratification of Appointment of Independent Registered Public Accounting Firm" in the Proxy Statement, which is incorporated herein by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedule.

(a) The following documents are filed as part of this Annual Report on Form 10-K:

1. Financial Statements

The consolidated financial statements and consolidated financial statement information required by this Item are included on pages F-1 through F-9 of this report. The Reports of Independent Registered Public Accounting Firm appear on pages F-2 through F-3 of this report.

2. Financial Statement Schedule

See Index to financial statements on page F-1 of this report.

3. Exhibits

Exhibits are as set forth in the “Exhibit Index”, provided below. Where so indicated, exhibits, which were previously filed, are incorporated by reference.

Exhibit No.	Description
3.1	Restated Certificate of Incorporation of Registrant, as amended (Conformed Version) (incorporated by reference to Exhibit 3.1 to the Registrant’s Quarterly Report on Form 10-Q(SEC File No. 000-27965) filed on August 2, 2013).
3.2	Restated Bylaws of Registrant as amended, filed with this report.
10.1+	License Agreement, dated June 28, 1995, between the Registrant and Brown University Research Foundation (incorporated by reference to Exhibit 10.1 to the Registrant’s Registration Statement on Form S-1, as amended (SEC File No. 333-86821), filed on September 9, 1999).
10.2*	Form of Indemnification Agreement (incorporated by reference to Exhibit 10.3 to the Registrant’s Registration Statement on Form S-1/A, as amended (SEC File No. 333-86821) filed on October 14, 1999).
10.3*	Management Agreement, dated as of July 24, 2000 by and between Rudolph Technologies, Inc. and Steven R. Roth as restated and amended on July 29, 2014 (incorporated by reference to Exhibit 10.2 to the Registrant’s Quarterly Report on Form 10-Q (SEC File No. 001-36226) filed on August 6, 2014).
10.4*	Employment Agreement, dated as of November 9, 2015, by and between Rudolph Technologies, Inc. and Michael Plisinski (incorporated by reference to Exhibit 10.1 to the Registrant’s Current Report on Form 8-K (SEC File No. 001-36226) filed on November 9, 2015). *
10.5*	Executive Change of Control Agreement, dated February 7, 2014, by and between Rudolph Technologies, Inc. and Richard Rogoff (incorporated by reference to Exhibit 10.10 to the Registrant’s Annual Report on Form 10-K (SEC File No. 001-36226) filed on February 20, 2015.

+ Confidential treatment has been granted with respect to portions of this exhibit.
* Management contract, compensatory plan or arrangement.

Exhibit No.	Description
10.6*	Executive Change of Control Agreement, dated August 20, 2009, by and between Rudolph Technologies, Inc. and Robert A. Koch (incorporated by reference to Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q (SEC File No. 000-27965) filed on November 06, 2009).
10.7*	Rudolph Technologies, Inc. 2009 Stock Plan (incorporated by reference to Appendix A of the Registrant's revised Proxy Statement on Form DEFR14A (SEC File No. 000-27965) filed on May 8, 2009).
10.8*	Amended form of Employee Restricted Stock Unit Purchase Agreement pursuant to the Rudolph Technologies, Inc. 2009 Stock Plan (incorporated by reference to Exhibit 10.12 to the Registrant's Current Report on Form 10-Q (SEC File No. 001-36226), filed on August 3, 2017).
10.9	Confirmation of Issuer Warrant Transaction, dated July 19, 2011, by and between Rudolph Technologies, Inc. and Credit Suisse International (incorporated by reference to Exhibit 10.4 to the Registrant's Current Report on Form 8-K (SEC File No. 000-27965) filed on July 25, 2011).
10.10	Amendment to Confirmation of Issuer Warrant Transaction, dated July 22, 2011, by and between Rudolph Technologies, Inc. and Credit Suisse International (incorporated by reference to Exhibit 10.5 to the Registrant's Current Report on Form 8-K (SEC File No. 000-27965) filed on July 25, 2011).
10.11	Rudolph Technologies, Inc. 2018 Stock Plan (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, (SEC File No. 001-36226) filed on May 16, 2018).
10.12	Form of Employee Performance Stock Unit Purchase Agreement pursuant to the Rudolph Technologies, Inc. 2018 Stock Plan (incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q (SEC File No. 333-224969) filed on August 2, 2018).
10.13	Form of Employee Stock Option Agreement pursuant to the Rudolph Technologies, Inc. 2018 Stock Plan (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q (SEC File No. 001-36226) filed on August 2, 2018).
10.14	Rudolph Technologies, Inc. 2018 Employee Stock Purchase Plan (incorporated by reference to Exhibit 10.2 to the Registrant's Registration Statement on Form S-8, (SEC File No. 001-36226) filed on May 16, 2018.
21.1	Subsidiaries.
23.1	Consent of Ernst & Young LLP, Independent Registered Public Accounting Firm.
31.1	Rule 13a-14(a) Certification of Chief Executive Officer of the Registrant pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Rule 13a-14(a) Certification of Chief Financial Officer of the Registrant pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1	Certification of the 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 the 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 Document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	XBRL Taxonomy Extension Label Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

* Management contract, compensatory plan or arrangement.

RUDOLPH TECHNOLOGIES, INC.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS AND FINANCIAL STATEMENT SCHEDULE

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Rudolph Technologies, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Rudolph Technologies, Inc. (the Company) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and financial statement schedule listed in the Index at Item 15(a) (collectively referred to as the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the 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 issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 15, 2019 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company’s 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 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 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 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 financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company’s auditor since 2008.

Iselin, New Jersey
February 15, 2019

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Rudolph Technologies, Inc.

Opinion on Internal Control over Financial Reporting

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

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, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and financial statement schedule listed in the Index at Item 15(a) and our report dated February 15, 2019 expressed an unqualified opinion thereon.

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 included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and 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 inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP

Iselin, New Jersey
February 15, 2019

RUDOLPH TECHNOLOGIES, INC.

CONSOLIDATED BALANCE SHEETS
(In thousands, except per share data)

	December 31, 2018	December 31, 2017
ASSETS		
Current Assets:		
Cash and cash equivalents	$ 112,388	$ 67,770
Marketable securities	62,684	109,589
Accounts receivable, less allowance of $691 in 2018 and $460 in 2017	64,194	65,283
Inventories	96,820	67,521
Income taxes receivable	6,111	7,220
Prepaid expenses and other current assets	8,710	4,699
Total current assets	350,907	322,082
Property, plant and equipment, net	18,874	17,342
Goodwill	22,495	22,495
Identifiable intangible assets, net	7,448	8,632
Deferred income taxes	12,810	14,879
Other assets	5,506	492
Total assets	$ 418,040	$ 385,922
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 16,981	$ 13,471
Accrued liabilities:		
Payroll and related expenses	10,648	10,408
Royalties	611	494
Warranty	2,441	2,427
Deferred revenue	6,767	6,223
Other current liabilities	7,543	9,284
Total current liabilities	44,991	42,307
Other non-current liabilities	11,161	10,461
Total liabilities	56,152	52,768
Commitments and contingencies (Note 9)		
Stockholders' equity:		
Preferred stock, $0.001 par value, 5,000 shares authorized, no shares issued and outstanding at December 31, 2018 and 2017	—	—
Common stock, $0.001 par value, 100,000 shares authorized, 30,906 and 31,604 issued and outstanding at December 31, 2018 and 2017, respectively.	31	32
Additional paid-in capital	369,893	386,196
Accumulated other comprehensive loss	(1,263)	(1,205)
Accumulated deficit	(6,773)	(51,869)
Total stockholders' equity	361,888	333,154
Total liabilities and stockholders' equity	$ 418,040	$ 385,922

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

RUDOLPH TECHNOLOGIES, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except per share data)

	Year Ended December 31		
	2018	2017	2016
Revenue	$ 273,784	$ 255,098	$ 232,780
Cost of revenue	125,505	120,503	109,229
Gross profit	148,279	134,595	123,551
Operating expenses:			
Research and development	49,053	46,986	44,964
Selling, general and administrative	46,608	39,381	38,562
Amortization	1,534	1,940	2,320
Patent litigation income	—	(13,000)	(14,643)
Total operating expenses	97,195	75,307	71,203
Operating income	51,084	59,288	52,348
Interest (income) expense, net	(2,206)	(971)	2,834
Other expense (income), net	(56)	457	(354)
Income before provision for income taxes	53,346	59,802	49,868
Provision for income taxes	8,250	26,893	12,916
Net income	$ 45,096	$ 32,909	$ 36,952
Earnings per share:			
Basic	$ 1.42	$ 1.05	$ 1.19
Diluted	$ 1.40	$ 1.02	$ 1.16
Weighted average number of shares outstanding:			
Basic	31,671	31,491	31,128
Diluted	32,200	32,162	31,790

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

RUDOLPH TECHNOLOGIES, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(In thousands)

	Year Ended December 31,		
	2018	2017	2016
Net income	$ 45,096	$ 32,909	$ 36,952
Other comprehensive income (loss):			
Change in net unrealized gains (losses) on investments, net of Tax	136	(89)	(37)
Change in currency translation adjustments	(194)	1,663	(119)
Total comprehensive income	$ 45,038	$ 34,483	$ 36,796

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

RUDOLPH TECHNOLOGIES, INC.

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
For the years ended December 31, 2018, 2017 and 2016
(In thousands)

	Common Stock		Additional Paid-in	Accumulated Other Comprehensive	Accumulated	
	Shares	Amount	Capital	Loss	Deficit	Total
Balance at December 31, 2015	30,949	$ 31	$ 394,928	$ (2,623)	$ (121,658)	$ 270,678
Issuance of shares through share-based compensation plans, net	713	—	850	—	—	850
Repurchase of common stock	(615)	—	(8,044)	—	—	(8,044)
Net income	—	—	—	—	36,952	36,952
Share-based compensation	—	—	4,775	—	—	4,775
Tax benefit for share-based compensation Plans	—	—	792	—	—	792
Share-based compensation plan withholdings	—	—	(1,587)	—	—	(1,587)
Redemption of stock warrants	80	—	(10,525)	—	—	(10,525)
Currency translation	—	—	—	(119)	—	(119)
Unrealized loss on investments	—	—	—	(37)	—	(37)
Balance at December 31, 2016	31,127	31	381,189	(2,779)	(84,706)	293,735
Issuance of shares through share-based compensation plans, net	375	1	623	—	—	624
Net income	—	—	—	—	32,909	32,909
Share-based compensation	—	—	5,670	—	—	5,670
Cumulative effect of a change in accounting for share-based compensation	—	—	72	—	(72)	—
Share-based compensation plan withholdings	—	—	(1,358)	—	—	(1,358)
Redemption of stock warrants	102	—	—	—	—	—
Currency translation	—	—	—	1,663	—	1,663
Unrealized loss on investments	—	—	—	(89)	—	(89)
Balance at December 31, 2017	31,604	32	386,196	(1,205)	(51,869)	333,154
Issuance of shares through share-based compensation plans, net	363	—	624	—	—	624
Repurchase of common stock	(1,061)	(1)	(21,068)	—	—	(21,069)
Net income	—	—	—	—	45,096	45,096
Share-based compensation	—	—	6,062	—	—	6,062
Share-based compensation plan withholdings	—	—	(1,921)	—	—	(1,921)
Currency translation	—	—	—	(194)	—	(194)
Unrealized gain on investments	—	—	—	136	—	136
Balance at December 31, 2018	30,906	$ 31	$ 369,893	$ (1,263)	$ (6,773)	$ 361,888

The accompanying notes are an integral part of these consolidated financial statements

RUDOLPH TECHNOLOGIES, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended December 31,		
	2018	**2017**	**2016**
Cash flows from operating activities:			
Net income	$ 45,096	$ 32,909	$ 36,952
Adjustments to reconcile net income to net cash and cash equivalents provided by operating activities:			
Depreciation	4,848	3,990	3,677
Amortization of convertible note discount and issuance costs	—	—	2,154
Amortization of intangibles	1,534	1,940	2,320
Foreign currency exchange loss	255	457	592
Gain on disposal of property, plant and equipment	—	—	(946)
Change in fair value of contingent consideration	1,010	133	170
Share-based compensation	6,062	5,670	4,775
Provision for doubtful accounts and inventory valuation	3,335	3,608	2,971
Deferred income taxes	2,163	17,207	5,011
Change in operating assets and liabilities:			
Accounts receivable	706	430	(9,279)
Income taxes	1,056	(4,727)	(3,021)
Inventories	(31,545)	(4,218)	4,003
Prepaid expenses and other assets	(3,101)	(1,686)	2,038
Accounts payable	3,512	3,198	1,169
Deferred revenue	545	(1,122)	896
Other liabilities	(382)	6,382	(6,057)
Net cash and cash equivalents provided by operating activities	35,094	64,171	47,425
Cash flows from investing activities:			
Purchases of marketable securities	(140,018)	(164,661)	(146,865)
Proceeds from sales of marketable securities	186,332	143,349	175,460
Purchases of property, plant and equipment	(7,542)	(10,210)	(3,291)
Cash advance on convertible note receivable	(5,000)	—	—
Purchase of intangible assets	—	(1,000)	(2,000)
Proceeds from sale of property, plant & equipment	—	—	1,165
Net cash and cash equivalents provided by (used in) investing activities	33,772	(32,522)	24,469
Cash flows from financing activities:			
Payment of senior convertible debt	—	—	(60,000)
Redemption of stock warrants	—	(1,025)	(9,500)
Purchases of common stock	(21,069)	—	(8,044)
Tax payments related to shares withheld for share-based compensation plans	(1,921)	(1,358)	(1,587)
Payment of contingent consideration for acquired business	(1,543)	(792)	(622)
Issuance of shares through share-based compensation plans	624	623	850
Net cash and cash equivalents used in financing activities	(23,909)	(2,552)	(78,903)
Effect of exchange rate changes on cash and cash equivalents	(339)	814	314
Net increase (decrease) in cash and cash equivalents	44,618	29,911	(6,695)
Cash and cash equivalents at beginning of year	67,770	37,859	44,554
Cash and cash equivalents at end of year	$ 112,388	$ 67,770	$ 37,859
Supplemental disclosure of cash flow information:			
Income taxes paid, net	$ 4,301	$ 14,605	$ 10,980
Interest paid	$ —	$ —	$ 2,250
Litigation settlement received	$ —	$ 13,000	$ 14,643

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

1. Organization and Nature of Operations:

Rudolph Technologies, Inc. is a worldwide leader in the design, development, manufacture and support of process control tools that perform macro-defect inspections and metrology, lithography systems, and process control analytical software used by semiconductor and advanced packaging device manufacturers. The Company has branch sales and service offices in South Korea, Taiwan and Singapore and wholly-owned sales and service subsidiaries in the United States, Europe, Japan and China. The Company operates in a single reportable segment and is a provider of process characterization equipment and software for wafer fabs and advanced packaging facilities.

2. Summary of Significant Accounting Policies:

A. Consolidation:

The consolidated financial statements reflect the accounts of the Company and its wholly-owned subsidiaries. All intercompany accounts and transactions have been eliminated.

B. Revenue Recognition:

Adoption of ASC Topic 606, "Revenue from Contracts with Customers"

On January 1, 2018, the Company adopted Topic 606 using the modified retrospective method applied to those contracts which were not completed as of January 1, 2018. Results for reporting periods beginning after January 1, 2018 are presented under Topic 606, while comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods. The Company did not record a cumulative impact due to the adoption of Topic 606.

Revenue Recognition

Revenue is recognized when control of the promised goods or services are transferred to the Company's customers in an amount that reflects the consideration the Company expects to be entitled to receive in exchange for those goods or services. The Company accounts for a contract when it has approval and commitment from both parties, the rights of the parties and payment terms are identified, the contract has commercial substance and collectability of consideration is probable.

The Company has elected to account for shipping and handling activities as the fulfillment of a promise to transfer goods to the customer and therefore records these activities under the caption "Cost of revenue." Sales tax and any other taxes collected concurrent with revenue producing activities are excluded from revenue. Incidental items that are immaterial in the context of the contract are recognized as expense. These accounting policy elections are consistent with the manner in which the Company has historically recorded these items.

Contracts with customers may include multiple performance obligations. For such arrangements, the Company allocates revenue to each performance obligation based on its relative standalone selling price. The Company generally determines standalone selling prices based on the prices charged to customers or the expected cost plus margin.

(In thousands, except per share data)

Disaggregated Revenue

The following table presents the Company's revenue disaggregated by revenue source:

	Year Ended December 31,		
	2018	2017	2016
Systems	$ 205,073	$ 191,411	$ 165,601
Software licensing, support and maintenance	29,168	25,473	29,795
Parts	28,658	27,143	25,343
Services	10,885	11,071	12,041
Total revenue	$ 273,784	$ 255,098	$ 232,780

The following table represents a disaggregation of revenue by timing of revenue:

	Year Ended December 31,
	2018
Point-in-time	$ 257,124
Over-time	16,660
Total revenue	$ 273,784

See Note 14 of the Notes to the Consolidated Financial Statements for additional discussion of the Company's disaggregated revenue in detail.

Systems Revenue

Revenue from systems is recognized when the Company transfers control of the product to the customer. To indicate transfer of control, the Company must have a present right to payment, legal title must have passed to the customer and the customer must have the significant risks and rewards of ownership. The Company generally transfers control for system sales when the customer or the customer's agent picks up the system at the Company's facility. Payment for the majority of the Company's systems have 80-90% of the invoice amount due within 30 days and the remaining amount due upon completion of installation, recalibration and qualification by the customer. The Company provides an assurance warranty on its systems for a period of twelve to fifteen months against defects in material and workmanship. The Company provides for the estimated cost of product warranties at the time revenue is recognized.

Depending on the terms of the systems arrangement, the Company may also defer the recognition of a portion of the consideration expected to be received because the Company has to satisfy a future obligation (e.g., installation, training and extended warranties). The Company uses an observable price to determine the standalone selling price for separate performance obligations or a cost plus margin approach when one is not available.

Software Licensing, Support and Maintenance Revenue

Revenue from software licenses provides the customer with a right to use the software as it exists when made available to the customer. Revenue from software licenses are recognized upfront at the point in time when the software is made available to the customer. Revenue from licensing support and maintenance is recognized as the support and maintenance are provided, which is over the contract period. Payment for software licensing, support and maintenance is generally due in 30 days.

Parts Revenue

Revenue from parts is recognized when the Company transfers control of the product, which typically occurs when the Company ships the product from its facilities to the customer. Payment for parts is generally due in 30 days.

Services Revenue

Revenue from services primarily consists of service contracts, which provide additional maintenance coverage beyond the Company's assurance warranty on its products, service labor, consulting and training. Revenue from service contracts is recognized ratably over the term of the service contract. Revenue from service labor, consulting and training is recognized as services are performed. Payment for services is generally due in 30 days.

Contract Liabilities

The Company records contract liabilities when the customer has been billed in advance of the Company completing its performance obligations. These amounts are recorded as deferred revenue in the Consolidated Balance Sheets.

Changes in deferred revenue were as follows:

	Year Ended December 31, 2018
Balance, beginning of the period	$ 7,206
Deferral of revenue	19,326
Recognition of deferred revenue	(18,452)
Balance, ending of the period	$ 8,080

Practical Expedients

The Company generally expenses sales commissions when incurred because the amortization period is one year or less. These costs are recorded within selling, general and administrative expenses.

The Company does not adjust the amount of consideration for the effects of a significant financing component as the payment terms are generally one year or less.

The Company does not disclose the value of remaining performance obligations for contracts with an original expected length of one year or less and contracts for which the Company recognizes revenue in the amount to which it has the right to invoice.

C. Estimates:

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities as of the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Significant estimates made by management include the allowance for doubtful accounts, excess and obsolete inventory, fair value of assets acquired and liabilities assumed in a business combination (including contingent consideration), recoverability and useful lives of property, plant and equipment and identifiable intangible assets, recoverability of goodwill, recoverability of deferred tax assets, liabilities for product warranty, contingencies, including litigation reserves and share-based payments and liabilities for tax uncertainties. Actual results could differ from those estimates.

D. Cash and Cash Equivalents:

Cash and cash equivalents include cash and highly liquid debt instruments with original maturities of three months or less when purchased.

E. Marketable Securities:

The Company determined that all of its investment securities are to be classified as available-for-sale. Available-for-sale debt securities are carried at fair value, with the unrealized gains and losses reported in stockholders' equity under the caption "Accumulated other comprehensive loss." Realized gains and losses and, interest and dividends on available-for-sale securities are included in interest income and other, net. Available-for-sale securities are classified as current assets regardless of their maturity date if they are available for use in current operations. The Company reviews its investment portfolio to identify and evaluate investments that have indications of possible impairment. Factors considered in determining whether a loss is other-than-temporary include the length of time and extent to which fair value has been less than the cost basis, credit quality and the Company's ability and intent to hold the investment for a period of time sufficient to allow for any anticipated recovery in market value. When a decline in fair value is determined to be other-than-temporary, unrealized losses on available-for-sale securities are charged against earnings. The specific identification method is used to determine the gains and losses on marketable securities.

For additional information on the Company's marketable securities, see Note 4 of Notes to the Consolidated Financial Statements.

F. Allowance for Doubtful Accounts:

The Company evaluates the collectability of accounts receivable based on a combination of factors. Where the Company is aware of circumstances that may impair a specific customer's ability to meet its financial obligation, the Company records a specific allowance against amounts due, thereby reducing the net recognized receivable to the amount management reasonably believes will be collected. For all other customers, the Company recognizes allowances for doubtful accounts based on the length of time the receivables are outstanding, industry and geographic concentrations, the current business environment and historical experience.

G. Inventories:

Inventories are stated at the lower of cost or net realizable value. Net realizable value is the estimated selling prices in the ordinary course of business, less predictable costs of completion, disposal and transportation. Cost is generally determined on a first-in, first-out basis, and includes material, labor and manufacturing overhead costs. The Company reviews and sets standard costs as needed, but at a minimum, on an annual basis, at current manufacturing costs in order to approximate actual costs.

The Company evaluates inventories for excess quantities and obsolescence. The Company establishes inventory reserves when conditions exist that suggest that inventory may be in excess of anticipated demand or is obsolete based upon assumptions about historical and future demand for the Company's products and market conditions. In addition, inventories are evaluated for potential obsolescence due to the effect of known and anticipated engineering design changes. Once a reserve has been established, it is maintained until the item to which it relates is scrapped or sold.

H. Property, Plant and Equipment:

Property, plant and equipment are stated at cost. Depreciation of property, plant and equipment is computed using the straight-line method over the estimated useful lives of the assets, which are fifteen years for buildings, four to seven years for machinery and equipment, seven years for furniture and fixtures, and three years for computer equipment. Leasehold improvements are amortized using the straight-line method over the lesser of the lease term or the estimated useful life of the related asset. Repairs and maintenance costs are expensed as incurred and major renewals and betterments are capitalized.

I. Impairment of Long-Lived Assets:

Long-lived assets, such as property, plant, and equipment, and identifiable acquired intangible assets with definite useful lives, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to estimated undiscounted future cash flows expected to be generated by the asset. If the carrying amount of an asset exceeds its estimated future cash flows, an impairment charge is recognized in the amount by which the carrying amount of the asset exceeds the fair value of the asset, which is generally based on discounted cash flows.

J. Goodwill and Intangible Assets:

Intangible assets with finite useful lives are amortized using the straight-line method over their estimated useful lives. Goodwill and intangible assets with indefinite useful lives are not amortized but are tested for impairment at least annually and when there are indications of impairment. Goodwill impairment is deemed to exist if the net book value of a reporting unit exceeds its estimated fair value. The Company has the option to first assess qualitative factors to determine whether the existence of events or circumstances leads to a determination that it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If the Company elects this option and after assessing the totality of events or circumstances, the Company determines that it is not likely that the fair value of its reporting unit is less than its carrying amount, then performing the two-step impairment test is unnecessary. The Company has not elected this option to date. The Company estimates the fair value of its reporting unit using the market value of its common stock at October 31 multiplied by the number of outstanding common shares (market capitalization) and an implied control premium as if it were to be acquired by a single stockholder. The Company also obtains information on completed sales of similar companies in the related industry to estimate the implied control premium for the Company. If the results of the initial market capitalization test produce results that are below the reporting unit carrying value, the Company will also consider if the market capitalization is temporarily low and, if so, we may also perform a discounted cash flow test. The Company tested for goodwill impairment on October 31, 2018. No impairments were noted.

For additional information on the Company's goodwill and purchased intangible assets, see Note 5 of Notes to the Consolidated Financial Statements.

K. Concentration of Credit Risk:

Financial instruments, which potentially subject the Company to concentrations of credit risk, consist primarily of accounts receivable, cash and cash equivalents and marketable securities. The Company performs ongoing credit evaluations of its customers and generally does not require collateral for sales on credit. The Company maintains allowances for potential credit losses. The Company maintains cash and cash equivalents and marketable securities with higher credit quality issuers and monitors the amount of credit exposure to any one issuer.

L. Warranties:

The Company generally provides a warranty on its products for a period of twelve to fifteen months against defects in material and workmanship. The Company provides for the estimated cost of product warranties at the time revenue is recognized.

M. Income Taxes:

The Company accounts for income taxes using the asset and liability approach for deferred taxes which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been recognized in the Company's consolidated financial statements or tax returns. A valuation allowance is recorded to reduce a deferred tax asset to that portion which more likely than not will be realized. The Company does not record tax expense impact for foreign withholding taxes and outside basis differences on the undistributed earnings of its foreign operations as it is the Company's intention to permanently re-invest undistributed earnings.

For additional information on the Company's income taxes, see Note 12 of Notes to the Consolidated Financial Statements.

N. Translation of Foreign Currencies:

The Company has branch operations in Taiwan, Singapore and South Korea and wholly-owned subsidiaries in the United States, Europe, Japan and China. Its international subsidiaries and branches operate primarily through the use of local functional currencies. A substantial portion of the Company's international systems sales are denominated in U.S. dollars with the exception of Japan. Consequently, we have relatively little exposure to foreign currency exchange risk with respect to these sales.

Assets and liabilities are translated at exchange rates in effect at the balance sheet date, and income and expense accounts and cash flow items are translated at average monthly exchange rates during the period. Net exchange gains or losses resulting from the translation of foreign financial statements and the effect of exchange rates on intercompany transactions of a long-term investment nature are recorded directly as a separate component of stockholders' equity under the caption, "Accumulated other comprehensive loss." Any foreign currency gains or losses related to transactions are included in operating results. The Company had accumulated exchange losses resulting from the translation of foreign operation financial statements of $1,273 and $1,079 as of December 31, 2018 and 2017, respectively.

(In thousands, except per share data)

O. Share-based Compensation:

Share-based awards are measured based on the grant-date fair value of the award and recognized over the period from the service inception date through the date the employee is no longer required to provide service to earn the award. Effective upon the Company's adoption of Accounting Standards Update ("ASU") No. 2016-09, "Improvements to Employee Share-Based Payment Accounting" on January 1, 2017, forfeitures are accounted for as they occur. Prior to the adoption of ASU No. 2016-09, expected forfeitures were included in determining share-based compensation expense.

For additional information on the Company's share-based compensation plans, see Note 10 of Notes to the Consolidated Financial Statements.

P. Research and Development Costs:

Expenditures for research and development are expensed as incurred.

Q. *Fair Value of Financial Instruments:*

The carrying amounts of the Company's financial instruments, including cash and cash equivalents, accounts receivable, accounts payable and accrued liabilities, approximate fair value due to their short maturities. The estimated fair value of these obligations is based, primarily, on a market approach, comparing the Company's interest rates to those rates the Company believes it would reasonably receive upon re-entry into the market. Judgment is required to estimate the fair value using available market information and appropriate valuation methods.

For additional information on the Company's fair value of financial instruments, see Note 3 of Notes to the Consolidated Financial Statements.

R. *Derivative Instruments and Hedging Activities:*

The Company, when it considers it to be appropriate, enters into forward contracts to hedge the economic exposures arising from foreign currency denominated transactions. At December 31, 2018 and 2017, these contracts included the future sale of Japanese Yen to purchase U.S. dollars. The foreign currency forward contracts were entered into by the Company's Japanese subsidiary to hedge a portion of certain intercompany obligations. The forward contracts are not designated as hedges for accounting purposes and therefore, the change in fair value is recorded in selling, general and administrative expenses in the Consolidated Statements of Operations. The Company records its forward contracts at fair value in either prepaid expenses and other current assets or other current liabilities in the Consolidated Balance Sheets.

The dollar equivalent of the U.S. dollar forward contracts and related fair values as of December 31, 2018 and 2017 were as follows:

	December 31,	
	2018	**2017**
Notional amount	6,746	8,417
Fair value of asset (liability)	(32)	45

During the year ended December 31, 2018, the Company recognized a loss of $81 on maturities of forward contracts. For the years ended December 31, 2017 and 2016, the Company recorded gains of $105 and $417 on maturities of forward contracts, respectively. The aggregate notional amounts of matured contracts were $8,465, $9,582 and $6,641 for 2018, 2017 and 2016, respectively.

S. *Contingencies and Litigation*

The Company is subject to the possibility of losses from various contingencies, including certain legal proceedings, lawsuits and other claims. The Company accrues for a loss contingency when it concludes that the likelihood of a loss is probable and the amount of the loss can be reasonably estimated. If the Company concludes that loss contingencies that could be material to any one of its financial statements are not probable, but are reasonably possible, or are probable, but cannot be estimated, then the Company discloses the nature of the loss contingencies, together with an estimate of the range of possible loss or a statement that such loss is not reasonably estimable. The Company expenses as incurred the costs of defending legal claims against the Company. The Company does not recognize gain contingencies until realized. See Note 9 of the Notes to the Consolidated Financial Statements, “Commitments and Contingencies” for a detailed description.

T. *Recent Accounting Pronouncements:*

Recently Adopted

Effective January 1, 2018, the Company adopted ASU No. 2016-16, “Income Tax (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory.” This ASU, which is part of the simplification initiative of the Financial Accounting Standards Board (“FASB”), is intended to reduce the complexity of U.S. GAAP and diversity in practice related to the tax consequences of certain types of intra-entity asset transfers, particularly those involving intellectual property. The adoption of ASU No. 2016-16 did not have any impact on the Company’s consolidated financial position, results of operations, and cash flows.

Effective January 1, 2018, the Company adopted ASU No. 2016-15, “Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments.” This ASU provides guidance on statement of cash flows presentation for eight specific cash flow issues where diversity in practice exists. The Company retrospectively adopted ASU No. 2018-15 resulting in a reclassification related to contingent consideration payments made after a business combination. The reclassification of $0.2 million from cash flows from financing activities to cash flows from operating activities is reflected in the Consolidated Statement of Cash Flows for the twelve month period ended December 31, 2017. Adoption of additional guidance under ASU No. 2016-15 did not have a material impact on the Company’s consolidated financial position, results of operations, and cash flows.

Effective January 1, 2018, the Company adopted ASU No. 2014-09, “Revenue from Contracts with Customers (Topic 606),” which supersedes nearly all existing revenue recognition guidance. The core principle of this ASU is that revenue should be recognized to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. As a result of the adoption of ASU No. 2014-09, the Company changed its accounting policy for revenue recognition. Refer to Item B of this Note to the Consolidated Financial Statements, “Summary of Significant Accounting Policies” for further information.

Recently Issued

In August 2018, the FASB issued ASU No. 2018-13, “Fair Value Measurement (Topic 820): Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement.” This ASU is part of the FASB’s larger disclosure framework project intended to improve the effectiveness of financial statement footnote disclosure. ASU No. 2018-13 modifies required fair value disclosures related primarily to level 3 investments. This ASU is effective for annual periods beginning after December 15, 2019 and interim periods within those annual periods. The adoption of ASU No. 2018-13 is not expected to have a material effect on the Company’s consolidated financial position, results of operations, and cash flows.

In June 2018, the FASB issued ASU No. 2018-07, “Compensation – Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting.” This ASU expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. An entity should apply the requirements of Topic 718 to nonemployee awards except for specific guidance on inputs to an option pricing model and the attribution of cost. The ASU is effective for the fiscal years beginning after December 15, 2018, including interim periods within that fiscal year. The adoption of ASU No. 2018-07 is not expected to have a material effect on the Company’s consolidated financial position, results of operations, and cash flows.

In February 2018, the FASB issued ASU No. 2018-02, “Income Statement – Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income.” The new guidance allows companies to reclassify stranded tax effects resulting from the Tax Cuts and Jobs Act (the "Tax Act") from accumulated other comprehensive income to retained earnings. The guidance also requires certain new disclosures regardless of a company's election. The standard is effective for annual periods beginning after December 15, 2018 and for interim periods within those annual periods, with earlier adoption permitted. The adoption of ASU No. 2018-02 is not expected to have a material effect on the Company's consolidated financial position, results of operations, and cash flows.

In May 2017, the FASB issued ASU No. 2017-09, "Compensation - Stock Compensation (Topic 718): Scope of Modification Accounting." This ASU amends the scope of modification accounting for share-based payment arrangements and provides guidance on the types of changes to the terms or conditions of share-based payment awards to which an entity would be required to apply modification accounting under Accounting Standards Codification ("ASC") 718. The ASU is effective for the fiscal years beginning after December 15, 2019 and for interim periods within those fiscal years. The adoption of ASU No. 2017-09 is not expected to have a material effect on the Company's consolidated financial position, results of operations, and cash flows, if any.

In January 2017, the FASB issued ASU No. 2017-04, "Intangibles – Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment." This ASU eliminates Step 2 from the goodwill impairment test. Accordingly, if the carrying amount of a reporting unit exceeds its fair value, an impairment loss will be recognized in an amount equal to the excess, limited to the total amount of goodwill allocated to the reporting unit. The ASU is effective for the fiscal years beginning after December 15, 2019 and for interim periods within those fiscal years. The Company is currently evaluating the effect the adoption of ASU No. 2017-04 will have on its consolidated financial position, results of operations, and cash flows, if any.

In June 2016, the FASB issued ASU No. 2016-13, "Financial Instruments – Credit Losses (Topic 326)," which introduces new guidance for the accounting for credit losses on instruments within its scope. Given the breadth of that scope, this ASU will impact both financial services and non-financial services entities. The standard is effective for fiscal years beginning after December 15, 2020. The Company is currently evaluating the effect the adoption of ASU No. 2016-13 will have on its consolidated financial position, results of operations, and cash flows, if any.

In February 2016, the FASB issued ASU No. 2016-02, "Leases (Topic 842)." ASU No. 2016-02 requires that lessees recognize virtually all of their leases on the balance sheet, by recording a right-of-use asset and lease liability. The provisions of this guidance are effective for annual periods beginning after December 31, 2018, and for interim periods therein. The Company expects to adopt ASU No. 2016-02 upon its effective date of January 1, 2019 using the modified retrospective method and the Company will also elect the package of practical expedients. The Company anticipates the impact of adoption will be an increase to long-term assets and total liabilities of $14,000 to $15,000 as of January 1, 2019.

Recently issued accounting guidance not discussed above is not applicable or did not have, or is not expected to have, a material impact to the Company.

3. Fair Value Measurements:

The Company applies a three-level valuation hierarchy for fair value measurements. This hierarchy prioritizes the inputs into three broad levels. Level 1 inputs are quoted prices (unadjusted) in active markets for identical assets or liabilities. Level 2 inputs are quoted prices for similar assets and liabilities in active markets or inputs that are observable for the asset or liability, either directly or indirectly through market corroboration, for substantially the full term of the asset or liability. Level 3 inputs are unobservable inputs based on management's assumptions used to measure assets and liabilities at fair value. A financial asset's or liability's fair value measurement classification within the hierarchy is determined based on the lowest level input that is significant to the fair value measurement.

(In thousands, except per share data)

The following tables provide the assets and liabilities carried at fair value measured on a recurring basis at December 31, 2018 and December 31, 2017:

	Fair Value Measurements Using			
	Carrying Value	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
December 31, 2018				
Assets:				
Available-for-sale debt securities:				
Municipal notes and bonds	$ 62,684	$ —	$ 62,684	$ —
Total assets	$ 62,684	$ —	$ 62,684	$ —
Liabilities:				
Contingent consideration – acquisitions	$ 2,060	$ —	$ —	$ 2,060
Foreign currency forward contracts	32	—	32	—
Total liabilities	$ 2,092	$ —	$ 32	$ 2,060
December 31, 2017				
Assets:				
Available-for-sale debt securities:				
Municipal notes and bonds	$ 109,589	$ —	$ 109,589	$ —
Foreign currency forward contracts	45	—	45	—
Total assets	$ 109,634	$ —	$ 109,634	$ —
Liabilities:				
Contingent consideration – acquisitions	$ 2,593	$ —	$ —	$ 2,593
Total liabilities	$ 2,593	$ —	$ —	$ 2,593

The Company's available-for-sale debt securities 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. The foreign currency forward contracts are primarily measured based on the foreign currency spot and forward rates quoted by the banks or foreign currency dealers. Investment prices are obtained from third party pricing providers, which model prices utilizing the above observable inputs, for each asset class.

Level 3 liabilities consisted of contingent consideration related to an acquisition for which the Company uses a discounted cash flow model to value these liabilities. The Level 3 assumptions used in the discounted cash flow model for the contingent consideration included projected revenue, timing of cash flows and estimates of discount rates of 9.2% and 8.6% for the years ended December 31, 2018 and 2017, respectively. A significant decrease in the projected revenue or increase in discount rates could result in a significantly lower fair value measurement for the contingent consideration.

(In thousands, except per share data)

This table presents a reconciliation of all liabilities measured at fair value on a recurring basis using significant unobservable inputs (Level 3) for the year ended December 31, 2018:

	Fair Value Measurements Using Significant Unobservable Inputs (Level 3)
Balance at December 31, 2017	$ 2,593
Total loss due to remeasurement included in selling, general and administrative expense	1,010
Additions	—
Payments	(1,543)
Transfer into (out of) Level 3	—
Balance at December 31, 2018	$ 2,060

See Note 4 for additional discussion regarding the fair value of the Company's marketable securities.

Fair Value of Other Financial Instruments

The carrying value of cash and cash equivalents, accounts receivable, accounts payable and accrued liabilities approximates fair value because of the short-term maturity of these instruments. The estimated fair value of these obligations is based, primarily, on a market approach, comparing the Company's interest rates to those rates the Company believes it would reasonably receive upon re-entry into the market. Judgment is required to estimate the fair value using available market information and appropriate valuation methods.

The carrying amount of the convertible notes receivable approximates fair value based on current interest rates for instruments with similar characteristics. Convertible notes receivable are initially recognized at fair value. The Company does not subsequently adjust the fair value of these convertible notes receivable unless it is determined that the convertible note receivable is impaired. The Company considers the issuer's financial condition, payment history, and other relevant factors when assessing the collectability of the convertible note and to reserve the portion of such convertible note for which collection does not appear likely. Interest income is recognized as earned.

4. Marketable Securities:

The Company has evaluated its investment policies and determined that all of its marketable securities, which are comprised of debt securities, are to be classified as available-for-sale. The Company's available-for-sale debt securities are carried at fair value, with the unrealized gains and losses reported in Stockholders' equity under the caption "Accumulated other comprehensive loss." Realized gains and losses on available-for-sale securities are included in "Other expense (income)" on the Consolidated Statements of Operations. The Company records other-than-temporary impairment charges for its available-for-sale debt securities when it intends to sell the securities, it is more-likely-than not that it will be required to sell the securities before a recovery, or when it does not expect to recover the entire amortized cost basis of the securities. The cost of securities sold is based on the specific identification method.

The Company has determined that the gross unrealized losses on its marketable securities at December 31, 2018 and 2017 are temporary in nature. The Company reviews its investment portfolio to identify and evaluate marketable securities that have indications of possible impairment. Factors considered in determining whether a loss is other-than-temporary include the length of time and extent to which fair value has been less than the cost basis, credit quality and the Company's ability and intent to hold the securities for a period of time sufficient to allow for any anticipated recovery in market value.

(In thousands, except per share data)

At December 31, 2018 and 2017, marketable securities are categorized as follows:

	Amortized Cost	Gross Unrealized Holding Gains	Gross Unrealized Holding Losses	Fair Value
December 31, 2018				
Municipal notes and bonds	$ 62,681	$ 43	$ 40	$ 62,684
Total marketable securities	$ 62,681	$ 43	$ 40	$ 62,684
December 31, 2017				
Municipal notes and bonds	$ 109,750	$ —	$ 161	$ 109,589
Total marketable securities	$ 109,750	$ —	$ 161	$ 109,589

The amortized cost and estimated fair value of marketable securities classified by the maturity date listed on the security, regardless of the Consolidated Balance Sheet classification, is as follows at December 31, 2018 and 2017:

	December 31, 2018		December 31, 2017	
	Amortized Cost	Fair Value	Amortized Cost	Fair Value
Due within one year	$ 47,767	$ 47,732	$ 104,742	$ 104,605
Due after one through five years	14,914	14,952	5,008	4,984
Due after five through ten years	—	—	—	—
Due after ten years	—	—	—	—
Total marketable securities	$ 62,681	$ 62,684	$ 109,750	$ 109,589

The following table summarizes the estimated fair value and gross unrealized holding losses of marketable securities, aggregated by investment instrument and period of time in an unrealized loss position, at December 31, 2018 and 2017.

	In Unrealized Loss Position For Less Than 12 Months		In Unrealized Loss Position For Greater Than 12 Months	
	Fair Value	Gross Unrealized Losses	Fair Value	Gross Unrealized Losses
December 31, 2018				
Municipal notes and bonds	$ 27,952	$ 30	$ 4,671	$ 10
Total marketable securities	$ 27,952	$ 30	$ 4,671	$ 10
December 31, 2017				
Municipal notes and bonds	$ 98,805	$ 161	$ —	$ —
Total marketable securities	$ 98,805	$ 161	$ —	$ —

See Note 3 for additional discussion regarding the fair value of the Company’s marketable securities.

5. Goodwill and Purchased Intangible Assets:

Goodwill

The gross amount of goodwill at both December 31, 2018 and 2017 was $215,367. Reflecting an impairment charge of $192,872 in 2008, the carrying amount of goodwill totaled $22,495 and remained unchanged over both the years ended December 31, 2018 and 2017.

Purchased Intangible Assets

Purchased intangible assets as of December 31, 2018 and 2017 are as follows:

(In thousands, except per share data)

	Gross Carrying Amount	Accumulated Amortization	Net
December 31, 2018			
Finite-lived intangibles:			
Developed technology	$ 66,177	$ 59,692	$ 6,485
Customer and distributor relationships	9,560	9,082	478
Trade names	4,361	3,876	485
Total identifiable intangible assets	$ 80,098	$ 72,650	$ 7,448
December 31, 2017			
Finite-lived intangibles:			
Developed technology	$ 65,827	$ 58,522	$ 7,305
Customer and distributor relationships	9,560	8,818	742
Trade names	4,361	3,776	585
Total identifiable intangible assets	$ 79,748	$ 71,116	$ 8,632

Intangible asset amortization expense amounted to $1,534, $1,940 and $2,320 for the years ended December 31, 2018, 2017 and 2016, respectively. Assuming no change in the gross carrying value of identifiable intangible assets and estimated lives, estimated amortization expenses are $1,548 for 2019, $1,346 for 2020, $598 for 2021, $532 for 2022, and $515 for 2023.

6. Convertible Note Receivable:

The Company entered into a convertible loan agreement with Simax Precision Technologies Limited (“Simax”) on May 31, 2018. Simax may borrow from the Company up to $15,000 in multiple promissory notes. The Company expects to be a supplier of lithography modules to Simax which is focused on the manufacture, sale and service of lithography systems.

The convertible notes will bear a rate of interest of 4.25% per annum payable on a semi-annual basis. The convertible notes provide the Company with the option to convert the outstanding indebtedness into equity. If the Company does not elect to exercise its option to convert the notes, Simax will repay the principal amount outstanding and any outstanding interest in equal installments beginning on the fifth anniversary of the loan date and continuing on a quarterly basis over the next three years.

As of December 31, 2018, the Convertible notes receivable balance was $5,000 with accrued interest of $41.

7. Balance Sheet Details:

Inventories

Inventories are comprised of the following:

	December 31, 2018	December 31, 2017
Materials	$ 61,025	$ 39,765
Work-in-process	21,910	20,923
Finished goods	13,885	6,833
Total inventories	$ 96,820	$ 67,521

The Company has established reserves of $11,678 and $13,035 at December 31, 2018 and 2017, respectively, for slow moving and obsolete inventory. During 2018, the Company recorded a net charge in cost of revenue of $3,042 for the write-down of inventory for excess parts, for older product lines and for parts that were rendered obsolete by design and engineering advancements. In 2018, the Company disposed of $4,398 of inventory. During 2017, the Company recorded a net charge in cost of revenue of $3,833 for the write-down of inventory for excess parts, for older product lines and for parts that were rendered obsolete by design and engineering advancements. In 2017, the Company disposed of $1,343 of inventory.

(In thousands, except per share data)

Property, Plant and Equipment

Property, plant and equipment, net, is comprised of the following:

	December 31,	
	2018	2017
Land and building	$ 2,584	$ 2,584
Machinery and equipment	29,097	29,870
Furniture and fixtures	3,226	3,201
Computer equipment and software	7,906	5,444
Leasehold improvements	9,448	9,472
	52,261	50,571
Accumulated depreciation	(33,387)	(33,229)
Total property, plant and equipment, net	$ 18,874	$ 17,342

Depreciation expense amounted to $4,848, $3,990 and $3,677 for the years ended December 31, 2018, 2017 and 2016, respectively.

Other assets

Other assets is comprised of the following:

	December 31,	
	2018	2017
Convertible note receivable	$ 5,000	$ —
Other	506	492
Total other assets	$ 5,506	$ 492

Other current liabilities

Other current liabilities is comprised of the following:

	December 31,	
	2018	2017
Contingent consideration – acquisitions	$ 1,422	$ 634
Customer deposits	1,135	5,561
Accrued inventory	1,103	384
Intangible asset acquisition - Stella Alliance	150	100
Deferred rent	75	151
Other	3,658	2,454
Total other current liabilities	$ 7,543	$ 9,284

(In thousands, except per share data)

Other non-current liabilities

Other non-current liabilities is comprised of the following:

	December 31,	
	2018	2017
Unrecognized tax benefits (including interest)	$ 5,409	$ 4,660
Contingent consideration – acquisitions	638	1,959
Deferred revenue	1,314	983
Deferred rent	1,405	750
Other	2,395	2,109
Total non-current liabilities	$ 11,161	$ 10,461

8. Debt Obligations:

On July 25, 2011, the Company issued $60,000 aggregate principal amount of 3.75% Convertible Senior Notes due 2016 (the “Notes”) at par. The Notes were issued pursuant to an indenture, dated as of July 25, 2011, between the Company and Bank of New York Mellon Trust Company, N.A., as Trustee, which included a form of Note. The Notes provided for the payment of interest semi-annually in arrears on January 15 and July 15 of each year, beginning January 15, 2012, at an annual rate of 3.75%. Concurrently with the issuance of the Notes, the Company purchased a convertible note hedge and sold a warrant. Each of the convertible note hedge and warrant transactions were entered into with an affiliate of the initial purchaser of the Notes.

On July 15, 2016, the Company redeemed all of its outstanding 3.75% Convertible Senior Notes with an aggregate principle amount of $60,000. Under the terms of the indenture, holders of the Notes were paid cash up to the aggregate principal amount of the notes and were issued shares of common stock for the remainder of the conversion, with any fractional shares paid in cash. The conversion resulted in the issuance of 540 shares of common stock of the Company to the bondholders, but resulted in no dilution to Rudolph shareholders as these shares were covered by the convertible note hedge that was entered into by the Company in 2011 at the time of issuance of the Notes.

The sale of the warrant gave the holder the right to purchase 4,634 shares of the Company’s common stock at a strike price of $17.00 per share. The warrant has a series of daily expiration dates beginning in October 2016 and ending in January 2017. From October 13, 2016 to December 31, 2016, the holder exercised 4,248 warrants, which settled for 80 shares of the Company’s common stock and $10,525 payable in cash, of which $9,500 was paid as of December 31, 2016 and $1,025 was paid in January 2017, at a weighted average stock price of $19.82 per share. The remaining 386 warrants were exercised in January 2017 by the holder for 102 shares of the Company’s common stock at a weighted average stock price of $23.13 per share.

The following table presents the amount of interest cost recognized relating to the Notes during the years ended December 31, 2018, 2017 and 2016.

	December 31,		
	2018	2017	2016
Contractual interest coupon	$ —	$ —	$ 1,186
Amortization of interest discount	—	—	1,893
Amortization of debt issuance costs	—	—	261
Total interest cost recognized	$ —	$ —	$ 3,340

9. Commitments and Contingencies:

Intellectual Property Indemnification Obligations

The Company has entered into agreements with customers that include limited intellectual property indemnification obligations that are customary in the industry. These guarantees generally require the Company to compensate the other party for certain damages and costs incurred as a result of third party intellectual property claims arising from these transactions. The nature of the intellectual property indemnification obligations prevents the Company from making a reasonable estimate of the maximum potential amount it could be required to pay to its customers. Historically, the Company has not made any indemnification payments under such agreements and no amount has been accrued in the accompanying consolidated financial statements with respect to these indemnification guarantees.

(In thousands, except per share data)

Warranty Reserves

The Company generally provides a warranty on its products for a period of 12 to 15 months against defects in material and workmanship. The Company estimates the costs that may be incurred during the warranty period and records a liability in the amount of such costs at the time revenue is recognized. The Company's estimate is based primarily on historical experience. The Company periodically assesses the adequacy of its recorded warranty liabilities and adjusts the amounts as necessary. Settlements of warranty reserves are generally associated with sales that occurred during the 12 to 15 months prior to the year-end and warranty accruals are related to sales during the same year.

Changes in the Company's warranty reserves are as follows:

	Year Ended December 31,		
	2018	2017	2016
Balance, beginning of the period	$ 2,427	$ 1,788	$ 1,894
Accruals	3,486	3,464	2,405
Usage	(3,472)	(2,825)	(2,511)
Balance, end of the period	$ 2,441	$ 2,427	$ 1,788

Legal Matters

From time to time, the Company is subject to legal proceedings and claims in the ordinary course of business. As of December 31, 2018, there are no legal proceedings pending or threatened against the Company that management believes are likely to have a material adverse effect on the Company's consolidated financial position or otherwise.

Lease Agreements

The Company rents space for its corporate headquarters, manufacturing and service operations and sales offices, which expire through 2029. Total rent expense for these facilities amounted to $3,311, $3,292 and $3,296 for the years ended December 31, 2018, 2017 and 2016, respectively.

The Company also leases certain equipment pursuant to operating leases, which expire through 2023. Rent expense related to these leases amounted to $98, $111 and $99 for the years ended December 31, 2018, 2017 and 2016, respectively.

Total future minimum lease payments under noncancelable operating leases as of December 31, 2018 amounted to $3,170 for 2019, $2,801 for 2020, $2,107 for 2021, $2,051 for 2022, $1,725 for 2023 and $7,484 for all periods thereafter.

Royalty Agreements

Under various licensing agreements, the Company is obligated to pay royalties based on net sales of products sold. There are no minimum annual royalty payments. Royalty expense amounted to $1,904, $1,117 and $586 for the years ended December 31, 2018, 2017 and 2016, respectively.

Open and Committed Purchase Orders

The Company has open and committed purchase orders of $71,752 as of December 31, 2018.

(In thousands, except per share data)

Line of Credit

The Company has a credit agreement with a bank that provides for a line of credit which is secured by the marketable securities the Company has with the bank. The Company is permitted to borrow up to 70% of the value of eligible securities held at the time the line of credit is accessed. The available line of credit as of December 31, 2018 was approximately $93,920 with an available interest rate of 4.0%. The credit agreement is available to the Company until such time that either party terminates the arrangement at their discretion. The Company has not utilized the line of credit to date.

10. Share-Based Compensation and Employee Benefit Plans:

Share-Based Compensation Plans

The Company's share-based compensation plans are intended to attract and retain employees and to provide an incentive for them to assist the Company to achieve long-range performance goals and to enable them to participate in long-term growth of the Company. The Company settles restricted stock unit awards and stock option exercises with newly issued common shares.

The Company established the 2018 Stock Plan (the "2018 Plan") effective May 16, 2018. The 2018 Plan provides for the grant of 3,240 stock awards and stock options to employees, directors and consultants at an exercise price equal to or greater than the fair market value of the common stock on the date of grant. Shares of common stock available for future grants from a previous stock plan totaled 128 and were carried forward into the allocated balance of the 2018 Plan. Restricted stock units granted under the 2018 Plan typically vest over a three to five-year period for employees and one year for directors; however, other vesting periods are allowable under the 2018 Plan. Restricted stock units granted to employees have time based or performance based vesting. If options were to be granted under the 2018 Plan, they would typically grade vest over a five-year period and expire ten years from the date of grant. As of December 31, 2018, there were shares of common stock available for issuance pursuant to future grants under the 2018 Plan totaling 3,332.

The Company established the 2009 Stock Plan (the "2009 Plan") effective November 1, 2009. The 2009 Plan provided for the grant of 3,300 stock options and other stock awards to employees, directors and consultants at an exercise price equal to or greater than the fair market value of the common stock on the date of grant. Shares of common stock available for future grants from a previous stock plan totaled 2,558 and were carried forward into the allocated balance of the 2009 Plan. Options granted under the 2009 Plan typically grade vested over a five-year period and expire ten years from the date of grant. Restricted stock units granted under the 2009 Plan typically vest over a three to five-year period for employees and one year for directors; however, other vesting periods are allowable under the 2009 Plan. Restricted stock units granted to employees have time based or performance based vesting. In the second quarter of 2018, the 2009 Plan was terminated and therefore as of December 31, 2018, there were no shares of common stock available for issuance pursuant to future grants under the 2009 Plan. As of December 31, 2017, there were 2,049 shares of common stock available for issuance pursuant to future grants under the 2009 Plan.

The following table reflects share-based compensation expense by type of award:

	Year Ended December 31,		
	2018	2017	2016
Share-based compensation expense:			
Restricted stock units, including all performance and market based awards	$ 6,062	$ 5,433	$ 4,457
Stock options	—	237	318
Total share-based compensation	6,062	5,670	4,775
Tax effect on share-based compensation	1,362	2,052	1,743
Net effect on net income	$ 4,700	$ 3,618	$ 3,032
Effect on earnings per share:			
Basic	$ (0.15)	$ (0.11)	$ (0.10)
Diluted	$ (0.15)	$ (0.11)	$ (0.10)

(In thousands, except per share data)

Restricted Stock Unit Activity

A summary of the Company's restricted stock unit activity with respect to the years ended December 31, 2016, 2017 and 2018 follows:

	Number of Shares	Weighted Average Grant Date Fair Value
Nonvested at December 31, 2015	1,169	$ 11.40
Granted	429	$ 13.20
Vested	(413)	$ 10.80
Forfeited	(49)	$ 11.14
Nonvested at December 31, 2016	1,136	$ 12.30
Granted	280	$ 22.70
Vested	(321)	$ 11.90
Forfeited	(81)	$ 13.78
Nonvested at December 31, 2017	1,014	$ 14.88
Granted	283	$ 27.99
Vested	(404)	$ 14.26
Forfeited	(99)	$ 17.79
Nonvested at December 31, 2018	794	$ 19.51

Included in the number of shares granted in the table directly above are market performance-based restricted stock units ("MPRSUs") granted to executives in the first quarters of 2018 and 2017. The MPRSUs cliff vest at the end of the three years period and have a maximum potential to vest at 200% based on TSR performance. The related share-based compensation expense is determined based on the estimated fair value of the underlying shares on the date of grant and is recognized straight-line over the vesting term.

The following table provides details of the MPRSUs granted during the twelve month periods ended December 31, 2018 and 2017:

	Year Ended December 31, 2018	Year Ended December 31, 2017
Granted	53	38
Maximum vest potential shares	105	76
Estimated fair value per share	$ 30.76	$ 25.30

As of December 31, 2018, there was $9,517 of total unrecognized compensation cost related to restricted stock units granted under the plans. That cost is expected to be recognized over a weighted average period of 2.1 years.

(In thousands, except per share data)

Stock Option Activity

A summary of the Company's stock option activity with respect to the years ended December 31, 2016, 2017 and 2018 follows:

	Shares	Weighted Average Exercise Price Per Share	Weighted Average Remaining Contractual Term (years)	Aggregate Intrinsic Value
Outstanding at December 31, 2015	490	$ 9.46		
Granted	—	—		
Exercised	(231)	7.76		
Expired	(44)	14.74		
Forfeited	—	—		
Outstanding at December 31, 2016	215	10.19		
Granted	—	—		
Exercised	(142)	9.14		
Expired	—	—		
Forfeited	—	—		
Outstanding at December 31, 2017	73	$ 12.22		
Granted	—	—		
Exercised	(26)			
Expired	—	—		
Forfeited	—	—		
Outstanding at December 31, 2018	47	$ 12.22	4.0	$ 384
Vested or expected to vest at December 31, 2018	47	$ 12.22	4.0	$ 384
Exercisable at December 31, 2018	47	$ 12.22	4.0	$ 384

The total intrinsic value of the stock options exercised during 2018, 2017 and 2016 was $384, $853 and $1,312, respectively. All options outstanding and exercisable at December 31, 2018 had an exercise price of $12.22. As of December 31, 2018, there was no unrecognized compensation cost related to stock options granted under the plans.

Non-Employee Stock Options

At December 31, 2018 and 2017, the fair value of outstanding stock options to non-employees was $126 and $268, respectively.

Employee Stock Purchase Plan

The Company established an Employee Stock Purchase Plan (the "ESPP") effective November 1, 2018. The Company's prior employee stock purchase plan, effective November 1, 2009 was terminated in the fourth quarter of 2018. Under the terms of the ESPP, eligible employees may have up to 15% of eligible compensation deducted from their pay and applied to the purchase of shares of Company common stock. The price the employee must pay for each share of stock will be 95% of the fair market value of Company common stock at the end of the applicable six-month purchase period. The ESPP is intended to qualify under Section 423 of the Internal Revenue Code and is a non-compensatory plan as defined by FASB ASC 718, "Stock Compensation." No stock-based compensation expense attributable to employee stock purchase plan was recorded for the years ended December 31, 2018, 2017 and 2016. Through the Company's employee stock purchase plans, employees purchased 13, 11 and 15 shares during the twelve months ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018 and 2017, there were 1,500 and 2,251 shares available for issuance under the Company's employee stock purchase plans, respectively.

(In thousands, except per share data)

401(k) Savings Plan

The Company has a 401(k) savings plan that allows employees to contribute up to 100% of their annual compensation to the Plan on a pre-tax or after tax basis, limited to a maximum annual amount as set periodically by the Internal Revenue Service. The plan provides a 50% match of all employee contributions up to 6 percent of the employee's salary. Company matching contributions to the plan totaled $1,118, $1,047 and $1,017 for the years ended December 31, 2018, 2017 and 2016, respectively.

Profit Sharing Program

The Company has a profit sharing program, wherein a percentage of pre-tax profits, at the discretion of the Board of Directors, is provided to all employees who have completed a stipulated employment period. The Company did not make contributions to this program for the years ended December 31, 2018, 2017 and 2016.

11. Other Expense (Income), Net:

Other expense (income), net is comprised of the following:

	Year Ended December 31,		
	2018	2017	2016
Foreign currency exchange losses (gains), net	$ 255	$ 457	$ 592
Gain on casualty insurance claim	(302)	—	—
Other	(9)	—	(946)
Total other expense (income), net	$ (56)	$ 457	$ (354)

12. Income Taxes:

The components of income tax expense are as follows:

	Year Ended December 31,		
	2018	2017	2016
Current:			
Federal	$ 4,423	$ 6,020	$ 6,084
State	1,038	507	983
Foreign	626	3,159	838
	6,087	9,686	7,905
Deferred:			
Federal	1,961	17,034	4,765
State	(73)	643	184
Foreign	275	(470)	62
	2,163	17,207	5,011
Total income tax expense	$ 8,250	$ 26,893	$ 12,916

The income before tax is comprised of the following:

	Year Ended December 31,		
	2018	2017	2016
Domestic operations	$ 49,089	$ 57,079	$ 47,599
Foreign operations	$ 4,257	$ 2,723	$ 2,269

(In thousands, except per share data)

The provision for income taxes differs from the amount of income tax determined by applying the applicable U.S. federal income tax rate of 21% for the year ended December 31, 2018, and 35% for years ended December 31, 2017 and 2016 to income before provision for income taxes as follows:

	Year Ended December 31,		
	2018	2017	2016
Federal income tax provision at statutory rate	$ 11,203	$ 20,931	$ 17,454
State taxes, net of federal effect	747	573	822
Foreign taxes, net of federal effect	17	(238)	(1,613)
Domestic manufacturing benefit	—	(1,569)	(1,244)
FDII Deduction, related to the Tax Act	(2,217)	—	—
GILTI income net of S250 deduction, related to the Tax Act	113	—	—
Section 162(m)	526	—	—
Research tax credit	(2,298)	(1,559)	(692)
Deferred tax true-up	57	41	(1,644)
Remeasurement of deferred tax balances, related to the Tax Act	(33)	8,020	—
Transition tax on foreign earnings, related to the Tax Act	138	(106)	—
Other	(3)	800	(167)
Provision for income taxes	$ 8,250	$ 26,893	$ 12,916
Effective tax rate	15%	45%	26%

The U.S. government enacted the Tax Act on December 22, 2017. The Tax Act makes broad and complex changes to the U.S. tax code that affected 2017, including, but not limited to, (1) requiring a one-time transition tax on certain unrepatriated earnings of foreign subsidiaries that is payable over eight years and (2) bonus depreciation that will allow for full expensing of qualified property. The Tax Act also establishes new tax laws that affected 2018, including, but not limited to, (1) reduction of the U.S. federal corporate tax rate; (2) the creation of the Base Erosion and Anti-Abuse ("BEAT"), a new minimum tax; (3) a general elimination of U.S. federal income taxes on dividends from foreign subsidiaries; (4) a new provision designed to tax Global Intangible Low-Taxed Income ("GILTI"), which allows for the possibility of using foreign tax credits and a deduction of up to 50 percent to offset the income tax liability (subject to some limitations); (5) the repeal of the domestic production activity deduction; (6) limitations on the deductibility of certain executive compensation; (7) limitations on the use of foreign tax credits to reduce the U.S. income tax liability; and (8) a new provision designed to allow a benefit for the foreign-derived intangible income ("FDII"). In 2018 we evaluated the effects and have determined what accounting policies needed to change and we have calculated the impact of the above provisions.

At December 31, 2018, the Company has completed its accounting for the tax effects of enactment of the Tax Act and, therefore, recorded final adjustments as follows:

- Reduction of U.S. federal corporate tax rate: The Tax Act reduces the corporate tax rate to 21 percent, effective January 1, 2018. For certain of its deferred tax assets and deferred tax liabilities, the Company has recorded a provisional decrease of $8.0 million, respectively, with a corresponding net adjustment to deferred income tax expense of $8.0 million for the year ended December 31, 2017. During the fourth quarter of 2018, the Company completed the accounting for such revaluation and determined that no adjustment was required. Despite the completion of the Company's accounting for the Tax Act under SAB 118, many aspects of the law remain unclear and the Company expects ongoing guidance to be issued at both the federal and state levels. The Company will continue to monitor and assess the impact of any new developments.

- Transition tax: The transition tax is a tax on previously deferred earnings and profits ("E&P") of certain of its foreign subsidiaries. To determine the amount of the transition tax, the Company must determine, in addition to other factors, the amount of post-1986 E&P of the relevant subsidiaries, as well as the amount of non-U.S. income taxes paid on such earnings. The Company was able to make a reasonable estimate of the transition tax in the prior year ended on December

(In thousands, except per share data)

31, 2017 and recorded a provisional transition tax obligation of $1.5 million with a corresponding adjustment to current income tax expense. The Company also computed a Section 78 foreign tax credit from the post-1986 E&P of the relevant subsidiaries that resulted in a current income tax benefit of $1.5 million. An additional $0.1 million was expensed in the third quarter of 2018 due to finalization of the prior year provisional Tax Act calculations.

- Valuation allowances: The Company, as of December 31, 2017, had to assess whether its valuation allowance analyses are affected by various aspects of the Tax Act. Since, as discussed herein, the Company has recorded provisional amounts related to certain portions of the Tax Act, any corresponding determination of the need for or change in a valuation allowance is also provisional. The Company concluded that with all the facts that are available at this point in time that that a full valuation allowance on all carry forward foreign tax credits were needed. The Company recorded the valuation allowance as of December 31, 2017 in the amount of $1.5 million with a corresponding adjustment to current income tax expense. Per the completion of the analysis in 2018, the Company concluded that a full valuation allowance of the foreign tax credits is still required against such deferred tax assets. As of December 31, 2018, the Company's foreign tax credit carry forwards have a full valuation allowance recorded in the amount of $2.2 million.

Deferred tax assets and liabilities are comprised of the following:

	December 31,	
	2018	2017
Research and development credit carryforward	$ 198	$ 216
Reserves and accruals not currently deductible	1,969	1,883
Deferred revenue	1,201	1,075
Domestic net operating loss carryforwards	832	892
Foreign net operating loss and credit carryforwards	3,146	2,551
Intangibles	4,402	5,388
Share-based compensation	1,259	1,500
Inventory obsolescence reserve	2,774	3,260
Other	810	1,135
Gross deferred tax assets	16,591	17,900
Valuation allowance for deferred tax assets	(3,172)	(2,447)
Deferred tax assets after valuation allowance	13,419	15,453
Gross deferred tax liabilities	(609)	(574)
Net deferred tax assets	$ 12,810	$ 14,879

At December 31, 2018 and 2017, the Company had recorded valuation allowances of $3,172 and $2,447, respectively, on certain of the Company's deferred tax assets to reflect the deferred tax assets at the net amount that is more likely than not to be realized. The Company recorded a full valuation allowance on all foreign tax credits as of December 31, 2018 in the amount of $2,155, as well as increases to China net operating loss valuation allowance in the amount of $112 based on current year utilization and offset by write-downs of expired net operating losses.

In assessing the realizability of deferred tax assets, the Company uses a more likely than not standard. If it is determined that it is more-likely-than-not that deferred tax assets will not be realized, a valuation allowance must be established against the deferred tax assets. The ultimate realization of the assets is dependent on the generation of future taxable income during the periods in which the associated temporary differences become deductible. Management considers the scheduled reversal of deferred income tax liabilities, projected future taxable income and tax planning strategies when making this assessment. In making the determination that it is more likely than not that the Company's deferred tax assets will be realized as of December 31, 2018, the Company relied primarily on projected future taxable income.

At December 31, 2018, the Company had federal, state and foreign net operating loss carryforwards of $497, $205 and $990, respectively. The federal, state and foreign net operating loss carryforwards expire on various dates through December 31, 2032, December 31, 2032 and December 31, 2026, respectively. At December 31, 2018, the Company had federal and state research & development credits and foreign tax credit carryforwards of $0, $318 and $2,155, respectively. The state research & development credits are set to expire at various dates through December 21, 2024. The foreign tax credit is set to expire at various dates through December 31, 2028.

(In thousands, except per share data)

A provision has not been made at December 31, 2018 for U.S. nor foreign withholding taxes recorded on approximately $7,914 of undistributed earnings of the Company's foreign subsidiaries in Europe and Japan nor on any additional outside basis differences inherent in these entities because it is the present intention of management to permanently reinvest these undistributed earnings. The estimated amount of additional tax would not be expected to have a significant impact on the Company's results of operations.

The total amount of unrecognized tax benefits are as follows:

	December 31,		
	2018	2017	2016
Balance, beginning of the period	$ 4,880	$ 4,827	$ 5,236
Gross increases—tax positions in prior period	496	171	118
Gross decreases—tax positions in prior period	(61)	(362)	(735)
Gross increases—current-period tax positions	213	244	208
Lapse of statute of limitations	—	—	—
Balance, end of the period	$ 5,528	$ 4,880	$ 4,827

Included in the Company's unrecognized tax benefit ending balance at December 31, 2018 and 2017 are unrecognized tax benefits of $4,995 and $4,403, respectively, which would be reflected as an adjustment to income tax expense if recognized. The year over year increase from 2017 to 2018 is primarily due to additional unrecognized tax benefits related to federal tax exposures. It is reasonably possible that certain amounts of unrecognized tax benefits may reverse in the next 12 months; however, the Company does not expect such reversals to have a significant impact on its results of operations or financial position.

The Company recognizes accrued interest and penalties related to unrecognized tax benefits in income tax expense. During the years ended December 31, 2018, 2017 and 2016, the Company recognized approximately $199, $246 and $76, respectively, in interest and penalties expense associated with uncertain tax positions. As of December 31, 2018 and 2017, the Company had accrued interest and penalties expense related to unrecognized tax benefits of $1,445 and $1,190, respectively.

The Company is subject to U.S. federal income tax as well as income tax in multiple state and foreign jurisdictions. The Company files U.S. federal, U.S. state and foreign tax returns. For U.S. federal tax purposes, the Company is generally no longer subject to tax examinations for years 2014 and prior. For U.S. state tax returns, the Company is generally no longer subject to tax examinations for years 2013 and prior. For foreign tax purposes, the Company is generally no longer subject to examination for tax periods 2013 and prior. Certain carryforward tax attributes generated in prior years remain subject to examination and adjustment. The Company believes that adequate amounts have been reserved for any adjustments that may ultimately result from any future examinations of these years.

In the normal course of business, the Company is subject to tax audits in various jurisdictions, and such jurisdictions may assess additional income taxes or other taxes against it. Although the Company believes its tax estimates are reasonable, the final determination of tax audits and any related litigation could be materially different from the Company' s historical income tax provisions and accruals. The results of an audit or litigation could have a material adverse effect on the Company' s results of operations or cash flows in the period or periods for which that determination is made.

13. Accumulated Other Comprehensive Loss:

Comprehensive income includes net income, foreign currency translation adjustments, and net unrealized gains and losses on available-for-sale debt securities. See the Consolidated Statements of Comprehensive Income for the effect of the components of comprehensive income on the Company's net income.

(In thousands, except per share data)

The components of accumulated other comprehensive loss, net of tax, are as follows:

	Foreign currency translation adjustments	Net unrealized (gains) losses on marketable securities	Accumulated other comprehensive loss (income)
Balance at December 31, 2016	$ 2,742	$ 37	$ 2,779
Net current period other comprehensive income	(1,663)	89	(1,574)
Reclassifications	—	—	—
Balance at December 31, 2017	1,079	126	1,205
Net current period other comprehensive loss	194	(136)	58
Reclassifications	—	—	—
Balance at December 31, 2018	$ 1,273	$ (10)	$ 1,263

14. Segment Reporting and Geographic Information:

The Company is engaged in the design, development, manufacture and support of high-performance control metrology, defect inspection, advanced packaging lithography and data analysis systems used by microelectronics device manufacturers. The Company and its subsidiaries currently operate in a single operating segment: the design, development, manufacture and support of high-performance process control defect inspection and metrology, advanced packaging lithography and process control software systems used by microelectronics device manufacturers. Therefore the Company has one reportable segment. The Company's chief operating decision maker is the Chief Executive Officer (the "CEO"). The CEO allocates resources and assesses performance of the business and other activities at the reportable segment level.

The following table lists the different sources of revenue:

	Year Ended December 31,					
	2018		2017		2016	
Systems and Software:						
Process control	$190,098	70%	$177,177	70%	$146,652	63%
Lithography	14,975	5%	14,234	5%	18,949	8%
Software licensing, support and maintenance	29,168	11%	25,473	10%	29,795	13%
Parts	28,658	10%	27,143	11%	25,343	11%
Services	10,885	4%	11,071	4%	12,041	5%
Total revenue	$273,784	100%	$255,098	100%	$232,780	100%

(In thousands, except per share data)

The Company's significant operations outside the United States include sales, service and application offices in Europe and Asia. For geographical revenue reporting, revenue is attributed to the geographic location in which the product is shipped. Revenue by geographic region is as follows:

	Year Ended December 31,		
	2018	2017	2016
Revenue from third parties:			
United States	$ 43,944	$ 36,104	$ 30,876
Taiwan	45,312	63,079	68,211
South Korea	51,750	44,180	15,556
Singapore	14,371	12,775	35,517
Austria	719	2,601	2,049
Japan	22,361	18,943	11,875
Germany	14,913	15,580	9,759
China	63,243	35,925	33,720
Other Europe	11,541	21,167	18,720
Other Asia	5,630	4,744	6,497
Total revenue	$ 273,784	$ 255,098	$ 232,780

In 2018, sales to SK Hynix Inc. accounted for 12.2% of the Company's revenue. No individual end user customer accounted for more than 10% of the Company's revenue in 2017 and 2016. The Company does not have purchase contracts with any of its customers that obligate them to continue to purchase its products.

At December 31, 2018 and 2017, no individual customer accounted for more than 10% of net accounts receivable.

Substantially all of the Company's long-lived assets are located within the United States of America.

15. Earnings Per Share:

Basic earnings per share is calculated using the weighted average number of shares of common stock outstanding during the period. Diluted earnings per share is computed in the same manner and also gives effect to all dilutive common stock equivalent shares outstanding during the period. Potential common shares that would have the effect of increasing diluted earnings per share are considered to be anti-dilutive. In accordance with U.S. GAAP, these shares were not included in calculating diluted earnings per share.

For the year ended December 31, 2018, the weighted average number of restricted stock units and stock options excluded from the computation of diluted earnings per share were 52 and 0, respectively. For the year ended December 31, 2017, the weighted average number of restricted stock units and stock options excluded from the computation of diluted earnings per share were 8 and 0, respectively. For the year ended December 31, 2016, the weighted average number of restricted stock units and stock options excluded from the computation of diluted earnings per share were 0 and 39, respectively.

For the years ended December 31, 2017 and 2016, diluted earnings per share-weighted average shares outstanding included the effect resulting from assumed conversion of the Notes and warrants.

(In thousands, except per share data)

The Company's basic and diluted earnings per share amounts are as follows:

	December 31, 2018	2017	2016
Numerator:			
Net income	$ 45,096	$ 32,909	$ 36,952
Denominator:			
Basic earnings per share - weighted average shares outstanding	31,671	31,491	31,128
Effect of potential dilutive securities:			
Restricted stock units and stock options - dilutive shares	529	670	467
Convertible senior notes - dilutive shares	—	—	103
Warrants - dilutive shares	—	1	92
Diluted earnings per share - weighted average shares outstanding	32,200	32,162	31,790
Earnings per share:			
Basic	$ 1.42	$ 1.05	$ 1.19
Diluted	$ 1.40	$ 1.02	$ 1.16

16. Shares Repurchase Authorization:

In October 2018, the Board of Directors approved a new share repurchase authorization, which allows the Company to repurchase up to $ 40,000 worth of shares of its common stock. The authorization provides for repurchases to be made in the open market or through negotiated transactions from time to time. The share repurchase authorization has no expiration date and may be discontinued at any time. In addition, during the fourth quarter of 2018, the Company completed the purchase of the remaining shares available under the prior 3,000 share repurchase authorization. During the twelve months ended December 31, 2018, the Company repurchased 1,061 shares of common stock under its two share repurchase authorizations and those shares were subsequently retired. At December 31, 2018, there were $33,239 available for future share repurchases.

The following table summarizes the Company's stock repurchases for December 31, 2018, 2017 and 2016:

	Year Ended December 31, 2018	2017	2016
Shares of common stock repurchased	1,061	—	615
Cost of stock repurchased	$ 21,069	$ -	$ 8,044
Average price paid per share	$ 19.86	$ -	$ 13.07

17. Quarterly Consolidated Financial Data (unaudited):

The following tables present certain unaudited consolidated quarterly financial information for the years ended December 31, 2018 and 2017. In the opinion of the Company's management, this quarterly information has been prepared on the same basis as the consolidated financial statements and includes all adjustments (consisting only of normal recurring adjustments) necessary to present fairly the information for the periods presented. The results of operations for any quarter are not necessarily indicative of results for the full year or for any future period.

(In thousands, except per share data)

Year-over-year quarterly comparisons of the Company's results of operations may not be meaningful, as the sequential quarterly comparisons set forth below tend to reflect the cyclical activity of the semiconductor industry as a whole. Other quarterly fluctuations in expenses are related directly to sales activity and volume and may also reflect the timing of operating expenses incurred throughout the year, and changes in tax rates.

	Quarters Ended				
	March 31, 2018	June 30, 2018	September 30, 2018	December 31, 2018	Total
Revenue	$ 73,096	$ 77,476	$ 60,432	$ 62,780	$ 273,784
Gross profit	42,421	41,736	31,454	32,668	148,279
Income before income taxes	17,674	17,290	8,368	10,014	53,346
Net income	15,130	14,697	7,187	8,082	45,096
Income per share:					
Basic	$ 0.48	$ 0.46	$ 0.23	$ 0.26	$ 1.42
Diluted	$ 0.47	$ 0.45	$ 0.22	$ 0.26	$ 1.40
Weighted average number of shares outstanding:					
Basic	31,662	31,859	31,901	31,268	31,671
Diluted	32,317	32,437	32,408	31,645	32,200

	Quarters Ended				
	March 31, 2017	June 30, 2017	September 30, 2017	December 31, 2017	Total
Revenue	$ 60,679	$ 67,418	$ 66,920	$ 60,081	$ 255,098
Gross profit	31,868	35,456	35,145	32,126	134,595
Income before income taxes	9,607	12,752	25,663	11,780	59,802
Net income (loss)	7,151	9,193	17,369	(804)	32,909
Income (loss) per share:					
Basic	$ 0.23	$ 0.29	$ 0.55	$ (0.03)	$ 1.05
Diluted	$ 0.22	$ 0.29	$ 0.54	$ (0.03)	$ 1.02
Weighted average number of shares outstanding:					
Basic	31,290	31,501	31,571	31,597	31,491
Diluted	32,058	32,146	32,170	31,597	32,162

RUDOLPH TECHNOLOGIES, INC. AND SUBSIDIARIES

SCHEDULE OF VALUATION AND QUALIFYING ACCOUNTS
(In thousands)

Column A	Column B	Column C		Column D	Column E
Description	**Balance at Beginning of Period**	**Charged to (Recovery of) Costs and Expense**	**Charged to Other Accounts (net)**	**Deductions**	**Balance at End of Period**
Year 2018:					
Allowance for doubtful accounts	$ 460	$ 293	$ —	$ 62	$ 691
Deferred tax valuation allowance	2,447	725	—	—	3,172
Year 2017:					
Allowance for doubtful accounts	$ 680	$ (222)	$ —	$ (2)	$ 460
Deferred tax valuation allowance	1,924	626	(103)	—	2,447
Year 2016:					
Allowance for doubtful accounts	$ 713	$ 5	$ —	$ 38	$ 680
Deferred tax valuation allowance	2,205	71	(352)	—	1,924

SIGNATURES

PURSUANT TO THE REQUIREMENTS OF SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934, THE REGISTRANT HAS DULY CAUSED THIS REPORT TO BE SIGNED ON ITS BEHALF BY THE UNDERSIGNED, THEREUNTO DULY AUTHORIZED.

Rudolph Technologies, Inc.
(Registrant)

By: /s/ Michael P. Plisinski
Michael P. Plisinski
Chief Executive Officer

Date: February 15, 2019

PURSUANT TO THE REQUIREMENTS OF THE SECURITIES EXCHANGE ACT OF 1934, THIS REPORT HAS BEEN SIGNED BELOW BY THE FOLLOWING PERSONS ON BEHALF OF THE REGISTRANT AND IN THE CAPACITIES AND ON THE DATES INDICATED.

Signature	Title	Date
/s/ Michael P. Plisinski **Michael P. Plisinski**	Chief Executive Officer (Principal Executive Officer)	February 15, 2019
/s/ Steven R. Roth **Steven R. Roth**	Senior Vice President, Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	February 15, 2019
/s/ Jeffrey A. Aukerman **Jeffrey A. Aukerman**	Director	February 15, 2019
/s/ Leo Berlinghieri **Leo Berlinghieri**	Director	February 15, 2019
/s/ Daniel H. Berry **Daniel H. Berry**	Director	February 15, 2019
/s/ Vita A Cassese **Vita A. Cassese**	Director	February 15, 2019
/s/ Thomas G. Greig **Thomas G. Greig**	Director	February 15, 2019
/s/ David B. Miller **David B. Miller**	Director	February 15, 2019
/s/ John R. Whitten **John R. Whitten**	Director	February 15, 2019

Exhibit 21.1

SUBSIDIARIES

Name	Jurisdiction
Rudolph Technologies Europe, B.V.	Netherlands
Rudolph Technologies Japan KK	Japan
Rudolph Technologies (Shanghai) Trading Co., Ltd.	China
Rudolph Technologies Germany GmbH	Germany
Azores Asia Limited	Hong Kong

Exhibit 31.1

Rule 13a-14(a) Certification of Chief Executive Officer
Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002

I, Michael P. Plisinski, certify that:

1. I have reviewed this annual report on Form 10-K of Rudolph Technologies, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

   c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 15, 2019

By: /s/ MICHAEL P. PLISINSKI
Michael P. Plisinski
Chairman and Chief Executive Officer

Exhibit 31.2

Rule 13a-14(a) Certification of Chief Financial Officer
Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002

I, Steven R. Roth, certify that:

1. I have reviewed this annual report on Form 10-K of Rudolph Technologies, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

   c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 15, 2019

By: /s/ STEVEN R. ROTH
Steven R. Roth
Senior Vice President and Chief Financial Officer

Exhibit 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

I, Michael P. Plisinski, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes- Oxley Act of 2002, that the Annual Report of Rudolph Technologies, Inc. on Form 10-K for the year ended December 31, 2018 fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934 and that the information contained in the Annual Report on Form 10-K fairly presents in all material respects the financial condition and results of operations of Rudolph Technologies, Inc.

Date: February 15, 2019

By: /s/ MICHAEL P. PLISINSKI
Michael P. Plisinski
Chairman and Chief Executive Officer

Exhibit 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

I, Steven R. Roth, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes- Oxley Act of 2002, that the Annual Report of Rudolph Technologies, Inc. on Form 10-K for the year ended December 31, 2018 fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934 and that the information contained in the Annual Report on Form 10-K fairly presents in all material respects the financial condition and results of operations of Rudolph Technologies, Inc.

Date: February 15, 2019

By: /s/ STEVEN R. ROTH
Steven R. Roth
Senior Vice President and Chief Financial Officer

[THIS PAGE INTENTIONALLY LEFT BLANK]

RUDOLPH
TECHNOLOGIES

April 2, 2019

From the Chairman's Desk,

The Board of Directors of Rudolph Technologies is committed to increasing shareholder value while positioning the Company for long-term sustainable growth in the fast-paced electronics industry. This industry has produced dramatic and exciting technologies that enhance lives all over the world every day while next generation developments promise to be even more exiting! These developments require the kind of high value solutions for which Rudolph Technologies is known. We seek to strengthen our offerings by investing in research and development for our existing markets in semiconductor manufacturing, while exploring potential adjacent markets and acquisition opportunities for new technologies.

Growth in revenue and profitability are directly linked to increasing shareholder value. We can achieve this growth by driving higher yields and lower manufacturing costs for our customers. We accomplish this by leveraging a deep understanding of our customers' challenges with leading-edge innovation and quality products and services. We believe our customers see our innovation and execution excellence as indicators that we are the best partner for collaboration to help them reach their continuously higher yield and performance targets.

Our employees are the core strength of Rudolph Technologies, providing inspiration for new solutions and product innovation, while working to ensure the quality of products and services that are provided every day. Furthermore, our customer-facing organization interacts with Rudolph Technologies' customer base and exemplifies the core values of our Company. As we continue to grow, there will be increasing demands on our people and we look forward to enhancing and strengthening our existing organization with capable and talented employees who will help us develop new technologies, expand into new markets, and better serve our customers in order to realize this growth. Using the Company's core values in their daily routine, the people of Rudolph Technologies have made us what we are and will drive us to even greater success!

The Board of Directors takes our role as stewards of our stockholders' investments seriously and we are dedicated to making Rudolph Technologies the best that it can be.

Sincerely,

David B. Miller
Chairman of the Board

Forward Looking Statements

This proxy statement contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995 (the “Act”) which include Rudolph Technologies’ business momentum and future growth; the benefit to customers of Rudolph Technologies’ products and customer service; Rudolph Technologies’ ability to both deliver products and services consistent with our customers’ demands and expectations and strengthen its market position; as well as other matters that are not purely historical data. Rudolph Technologies wishes to take advantage of the “safe harbor” provided for by the Act and cautions that actual results may differ materially from those projected as a result of various factors, including risks and uncertainties, many of which are beyond Rudolph Technologies’ control. Such factors include, but are not limited to, the Company’s ability to leverage its resources to improve its position in its core markets; its ability to weather difficult economic environments; its ability to open new market opportunities and target high-margin markets; the strength/weakness of the back-end and/or front-end semiconductor market segments; and fluctuations in customer capital spending. Additional information and considerations regarding the risks faced by Rudolph Technologies are available in the Company’s Form 10-K report for the year ended December 31, 2018 and other filings with the Securities and Exchange Commission. As the forward-looking statements are based on Rudolph Technologies’ current expectations, the Company cannot guarantee any related future results, levels of activity, performance or achievements. Rudolph Technologies does not assume any obligation to update the forward-looking information contained in this proxy statement.

RUDOLPH
TECHNOLOGIES

NOTICE OF 2019 ANNUAL MEETING OF STOCKHOLDERS

Date:	Wednesday, May 15, 2019
Time:	10:00 a.m., Eastern Time
Place:	Company principal executive offices located at 16 Jonspin Road, Wilmington, Massachusetts, 01887
Record Date:	Only stockholders of record at the close of business on March 18, 2019 are entitled to vote at the meeting and any adjournment or postponement thereof for which no new record date is set.
Items of Business:	1. To elect the three Class II directors named herein to serve for three-year terms expiring upon the 2022 Annual Meeting of Stockholders or until their successors are duly elected and qualified;
	2. To approve, on an advisory (non-binding) basis, the compensation of our named executive officers as disclosed in this proxy statement;
	3. To ratify the appointment of Ernst & Young LLP as our independent registered public accounting firm for the year ending December 31, 2019; and
	4. To transact such other business as may properly come before the meeting and any adjournment or postponement thereof.

These items of business are described more fully in the accompanying proxy statement. This year we will be providing access to our proxy materials via the internet in accordance with the Securities and Exchange Commission's "Notice and Access" rules. On or about April 2, 2019, we will be mailing our Notice of Internet Availability of Proxy Materials to our stockholders, which contains instructions for our stockholders' use of this process, including how to access our 2019 proxy statement and 2018 annual report to stockholders and how to vote online. In addition, the Notice of Internet Availability of Proxy materials contains instructions on how you may receive a paper copy of the 2019 proxy statement and 2018 annual report to stockholders.

Your vote is important. Regardless of whether you plan to participate in the Annual Meeting, we hope you will follow the instructions you received to vote your shares as soon as possible. Voting will ensure you are represented at the Annual Meeting, regardless of whether you attend the Annual Meeting. You may cast your vote via the internet, by mail or during the Annual Meeting. If you receive a paper copy of the proxy card by mail, you may also mark, sign, date, and return the proxy card promptly in the accompanying postage-prepaid envelope.

IMPORTANT NOTICE REGARDING THE AVAILABILITY OF PROXY MATERIALS FOR THE ANNUAL MEETING OF STOCKHOLDERS TO BE HELD MAY 15, 2019:

This notice, the proxy statement, and the 2018 Annual Report to Stockholders are available at:

https://www.rudolphtech.com/writable/files/2018ar_2019proxy.pdf

FOR THE BOARD OF DIRECTORS

Steven R. Roth
Secretary

Wilmington, Massachusetts
April 2, 2019

PROXY SUMMARY

This summary highlights information contained elsewhere in the proxy statement. This summary does not contain all of the information that you should consider, and you should read the entire proxy statement carefully before voting.

Stockholder Voting Matters

Voting Matter		Board Vote Recommendation	Page Reference for more information
Proposal 1:	Election of Directors	FOR each nominee	15
Proposal 2:	Advisory Vote on Named Executive Officer Compensation	FOR	25
Proposal 3:	Ratification of Appointment of Independent Registered Public Accounting Firm for the Fiscal Year Ending December 31, 2109	FOR	26

Corporate Governance Highlights

Snapshot Of Board Composition

The following table presents a snapshot of the expected composition of the Rudolph Technologies Board of Directors immediately following the 2019 Annual Meeting, assuming the election of all nominees named in the proxy statement.

Board Characteristic	Rudolph Technologies
Total Number of Directors	8
Percentage of Independent Directors	87.5%
Average Age of Directors (years)	64.3
Average Tenure of Directors (years)	9.0
Separate Chairman and CEO roles	Yes
Independent Chairman	Yes
Audit Committee Financial Experts	2

Snapshot Of Board Governance And Compensation Policies

The following table presents a snapshot of the Rudolph Technologies Board Governance and Compensation Policies currently in effect.

Policy	Rudolph Technologies
Majority Voting for All Directors	Yes
Regular Executive Sessions of Independent Directors	Yes
Annual Board, Committee and Director Evaluations	Yes
Risk Oversight by Full Board and Committees	Yes
Independent Audit, Compensation and Nominating & Governance Committees	Yes
Code of Business Conduct and Ethics for Employees and Directors	Yes
Financial Code of Ethics	Yes
Stock Ownership Requirements for CEO & Directors	3x annual compensation
Stock Ownership Requirements for other NEOs	1x base salary
Stock Ownership Requirements for other executives	Specified number of shares
Anti-Hedging, Anti-Short Sale & Anti-Pledging Policy	Yes
Compensation Clawback Policy	Yes
No Future Tax Gross-Up Provisions	Yes
No Poison Pill	Yes
Stock Buyback Program	Yes
Double Trigger Change-in-Control Provisions for Executives	Yes
Retirement Age of 75 Years for Director Nomination/Appointment	Yes

Snapshot Of Board Governance And Compensation Policies Newly Implemented Or Adjusted In Past Year

The following presents a snapshot of the Rudolph Technologies Board Governance and Compensation Policies that were newly implemented or adjusted in the past year.

- Further refinement and enhancement to the Board’s assessment process in the ongoing effort to improve Board performance and stockholder return.
- In January 2018:
    - Daniel H. Berry resigned his position as Chairman of the Compensation Committee;
    - David B. Miller was elected as the new Chairman of the Compensation Committee;
    - Compensation Committee membership was revised to include David B. Miller, Jeffery A. Aukerman and Thomas G. Greig; and
    - Nominating & Governance Committee membership was revised to include Leo Berlinghieri, John R. Whitten and Daniel H. Berry.
- In July 2018:
    - Vita A. Cassese was appointed to the Board of Directors. Ms. Cassese was designated as a member of both the Audit Committee and the Compensation Committee;
    - John R. Whitten resigned his position as Chairman of the Audit Committee but continues to serve as a member of this Committee; and
    - Jeffrey A. Aukerman was elected as the new Chairman of the Audit Committee.
- In August 2018:
    - Thomas G. Greig resigned as Chairman of the Board of Directors; and
    - David B. Miller was appointed the new non-executive Chairman of the Board of Directors.
- The Company’s peer group for executive compensation for 2019 was revised as follows:
    - Electro Scientific Industries, Inc. and Xcerra Corporation were removed due to each being acquired by another company.
- The Company’s TSR peer group for executive long-term equity compensation was revised for 2019 as follows:
    - Electro Scientific Industries, Inc. and Xcerra Corporation were removed due to each being acquired by another company.
    - CyberOptics Corporation, Photronics, Inc. and Ultra Clean Holdings Inc. were added to the 2019 TSR peer group.

RUDOLPH
TECHNOLOGIES

PROXY STATEMENT

The proxy detailed herein is solicited on behalf of the Board of Directors (the “Board” or “Board of Directors”) of Rudolph Technologies, Inc. (“Rudolph Technologies”, the “Company”, “we”, “us” or “our”) for use at the 2019 Annual Meeting of Stockholders to be held May 15, 2019 at 10:00 a.m. local time (the “Annual Meeting”), or at any adjournment or postponement thereof, for the purposes set forth herein and in the accompanying Notice of Annual Meeting of Stockholders. The Annual Meeting will be held at the Company’s principal executive offices, located at 16 Jonspin Road, Wilmington, Massachusetts 01887. The Company’s telephone number is (978) 253-6200.

On or about Tuesday, April 2, 2019, we will furnish a Notice of Internet Availability of Proxy Materials (“Notice”) to our stockholders containing instructions on how to access the proxy materials online at:

https://www.rudolphtech.com/writable/files/2018ar_2019proxy.pdf

Instructions on how to vote online and to request a printed copy of the proxy materials may be found in the Notice. If you received a Notice by mail, you will not receive a paper copy of the proxy materials, unless you request such materials by following the instructions contained in the Notice. Your vote is important, regardless of the extent of your holdings.

QUESTIONS AND ANSWERS ABOUT THE ANNUAL MEETING

What Is The Purpose Of The Annual Meeting?

At the Annual Meeting, stockholders will be asked to vote upon the matters set forth in the accompanying Notice of Annual Meeting, including:

- the election of directors;
- an advisory resolution on named executive officer compensation;
- the ratification of the appointment of our independent registered public accounting firm for 2019,

all of which is more fully described herein.

Will Other Matters Be Voted On At The Annual Meeting?

We are not currently aware of any other matters to be presented at the Annual Meeting other than those described in this proxy statement. If any other matters not described in the proxy statement are properly presented at the meeting, any proxies received by us will be voted in the discretion of the proxy holders.

Who Is Entitled To Vote?

If you were a stockholder of record as of the close of business on March 18, 2019, which is referred to in this proxy statement as the “record date,” you are entitled to receive notice of the Annual Meeting and to vote the shares of common stock that you held as of the close of business on the record date. Each stockholder is entitled to one (1) vote for each share of common stock held by such stockholder on the record date.

May I Attend The Meeting?

All stockholders of record as of the record date may attend the Annual Meeting.

To gain admission, you will need valid picture identification and proof that you are a stockholder of record of the Company as of the record date, or if you are a beneficial holder, proof from your bank, broker or other record holder of your shares that you are the beneficial owner of such shares. To obtain directions to attend the Annual Meeting and vote in person, please contact Investor Relations at 978-253-6200.

What Constitutes A Quorum?

The required quorum for the transaction of business at the Annual Meeting is a majority of the outstanding shares of Common Stock of the Company, $0.001 par value per share ("Common Stock"), present in person or by proxy and entitled to vote at the Annual Meeting. On the record date, 30,933,820 shares of the Company's Common Stock were issued and outstanding. Abstentions and broker non-votes will be counted to determine whether there is a quorum present. If a quorum is not present, the Annual Meeting may be adjourned or postponed to a later date.

What Are "Broker Non-Votes"?

A broker non-vote occurs when a bank, broker or other registered holder of record holds shares for a beneficial owner, but is not empowered to vote on a particular proposal on behalf of such beneficial owner because the proposal is considered "non-routine" and the beneficial owner has not provided voting instructions on that proposal. The election of directors and the advisory vote on named executive officer compensation are treated as "non-routine" proposals. This means that if a brokerage firm holds your shares on your behalf, those shares will not be voted with respect to any of these proposals unless you provide instructions to that firm by voting your proxy. See below under "What Is the Vote Required for Election of Directors?" and "What Is the Vote Required for the Approval of Proposals Other Than Director Elections?" for a discussion of the impact of broker non-votes on each of the proposals that will be presented at the Annual Meeting. **In order to ensure that any shares held on your behalf by a bank, broker or other registered holder of record are voted in accordance with your wishes, we encourage you to provide instructions to that firm or organization by voting your proxy.**

Who Bears The Cost Of Soliciting Proxies?

The Company will bear the cost of soliciting proxies. In addition, the Company may reimburse brokerage firms and other persons representing beneficial owners of shares for their expenses in forwarding solicitation material to such beneficial owners. Solicitation of proxies by mail may be supplemented by telephone, facsimile, e-mail or other electronic means or personal solicitation by directors, officers or regular employees of the Company. No additional compensation will be paid to such persons for such services. We do not currently plan to hire a proxy solicitor to help us solicit proxies from stockholders, brokers, bank nominees or other institutions, although we reserve the right to do so.

Why Did I Receive A "Notice Of Internet Availability Of Proxy Materials" But No Proxy Materials?

We are distributing the Company's proxy materials to stockholders of record via the internet in accordance with the "Notice and Access" approach permitted by rules of the Securities and Exchange Commission ("SEC"). This approach benefits the environment, while providing a timely and convenient method of accessing the materials and voting. On or about April 2, 2019, the Company will begin mailing the Notice to participating stockholders. The Notice includes instructions on how to receive a paper copy of the proxy materials and the Company's 2018 Annual Report, if you prefer.

How Do I Go About Voting?

Voting For Shares Registered Directly In The Name Of The Stockholder

If you hold shares in your name as a holder of record, you are considered the "stockholder of record" with respect to those shares. You can vote your shares online by following the instructions on the Notice. You may opt to vote your shares by requesting a full set of proxy materials be mailed to you and completing and returning the proxy in the postage-paid envelope provided. Stockholders of record may also vote in person at the Annual Meeting. If you are a stockholder of record with shares registered in your name, you can vote by one of the following methods:

- **Via the Internet** - To vote by internet, go to www.voteproxy.com and follow the instructions on the secure website. The deadline for voting via the internet is 11:59 p.m. (EDT) on May 14, 2019.
- **By Mail** – Stockholders who receive a paper proxy card may elect to vote by mail and should complete, sign and date their proxy card and mail it in the pre-addressed postage-paid envelope that accompanies the delivery of paper proxy cards. Proxy cards submitted by mail must be received by the time of the annual meeting in order for your shares to be voted.

Further instructions on how to vote online or by mail are contained in the Notice. Even if you plan to attend the meeting, we recommend that you vote your shares in advance so that your vote will be counted if you later decide not to attend the meeting. Each stockholder of record is entitled to one (1) vote for each share of Common Stock owned by such stockholder on all matters presented at the Annual Meeting. Stockholders do not have the right to cumulate their votes in the election of directors.

If you return a signed and dated proxy but do not indicate how the shares are to be voted, those shares will be voted in accordance with Rudolph Technologies' Board of Director's recommendations. A valid proxy also authorizes the individuals named as proxies to vote your shares in their discretion on any other matters, which, although not described in the proxy statement, are properly presented for action at our Annual Meeting. If you indicate on your proxy that you wish to "abstain" from voting on an item, your shares will not be voted on that item.

Voting By Proxy For Shares Registered In Street Name

If your shares are held in a stock brokerage account or by a bank or other holder of record, you are considered the "beneficial owner" of shares held in "street name." In that case, you may receive a separate voting instruction form, or you may need to contact your broker, bank, or other stockholder of record to determine whether you will be able to vote electronically via the internet. As the beneficial owner, you have the right to direct your broker, bank or other holder of record on how to vote your shares by submitting voting instructions to such person in accordance with the directions outlined in your proxy. To be clear, beneficial owners must obtain a legal proxy from the broker, bank or other holder of record authorizing the beneficial holder to vote such shares at the meeting.

May I Revoke My Proxy Instructions?

Any proxy given pursuant to this solicitation may be revoked by the person giving it at any time before it is voted. If you are a stockholder of record, you may change your vote after submitting your proxy by:

- delivering a written notice of revocation or a duly executed proxy bearing a later date to the Secretary of the Company at the Company's principal executive offices prior to the meeting, if you voted by mail;
- submitting a timely and valid later vote online at www.voteproxy.com, if you voted online; or
- attending the meeting and voting in person.

If you are a beneficial owner of shares, please contact your bank, broker or other holder of record for specific instructions on how to change or revoke your vote.

What Is The Vote Required For Election Of Directors?

Each director is elected by the vote of the majority of the votes cast. This means that in order for a director nominee to be elected to our Board of Directors, the number of votes cast "for" a director's election must exceed the number of votes cast "against" that director's election (with "abstentions" and "broker non-votes" not counted as a vote cast either "for" or "against" that director's election, although abstentions and broker non-votes count for quorum purposes). Our Bylaws provide for a majority-voting standard for uncontested elections and provide that any incumbent director nominee in an uncontested election who does not receive an affirmative majority of votes cast must promptly tender such director's resignation to our Board of Directors. Further information regarding the process that will be followed if such an event occurs can be located under the heading "Proposal 1 — Election of Directors."

What Is The Vote Required For The Approval Of Proposals Other Than Director Elections?

The proposal to approve, on an advisory basis, the compensation of our named executive officers and the proposal to ratify the appointment of Ernst & Young LLP as our independent registered public accounting firm for the year ending December 31, 2019 require the affirmative vote, in person or by proxy, of a majority of the shares present in person or represented by proxy at the meeting and entitled to vote on the matter to constitute approval of these proposals. For such proposals, abstentions are counted for quorum purposes, but in effect count as negative votes, because they are shares represented in person or by proxy that are not voted in the affirmative. Broker non-votes are counted for quorum purposes but are not counted as part of the vote total and have no effect on the outcome of those proposals.

What Is Householding?

The Company has adopted a procedure approved by the SEC called "householding." Under this procedure, when multiple stockholders of record share the same address, we may deliver only one (1) Notice to that address unless we have received contrary instructions from one or more of those stockholders. The same procedure applies to brokers and other nominees holding shares of our stock in "street name" for more than one (1) beneficial owner with the same address.

If a stockholder holds shares of stock in multiple accounts (e.g., with our transfer agent and/or banks, brokers or other registered stockholder), we may be unable to use the householding procedures and, therefore, that stockholder may receive multiple copies of the Notice. You should follow the instructions on each Notice that you receive in order to vote the shares you hold in different accounts.

A stockholder that shares an address with another stockholder, who has received only one (1) Notice may write or call us as specified below:

(i) To request a separate copy of such materials, which will be promptly mailed without charge; and
(ii) To request that separate copies of these materials be sent to his or her home for future meetings.

Conversely, a stockholder of record who shares the same address with another stockholder of record may write or call us as specified below to request that a single set of the proxy and proxy statement be delivered to that address. Such stockholder requests may be made to our Investor Relations Department either via phone at 978-253-6200 or by mail directed to:

Investor Relations Department
Rudolph Technologies, Inc.
16 Jonspin Road
Wilmington, Massachusetts 01887

If you are a beneficial owner of shares held in street name, please contact your bank, broker or other holder of record regarding such requests.

What Are The Deadlines For Submission Of Stockholder Proposals For 2020 Annual Meeting?

Stockholders of the Company are entitled to present proposals for consideration at forthcoming stockholder meetings provided that they comply with the proxy rules promulgated by the SEC, if applicable, and the Bylaws of the Company. Stockholders wishing to present a proposal at the Company's 2020 Annual Stockholder Meeting must submit such proposal in writing to the Company no later than December 4, 2019 in accordance with Rule 14a-8 under the Securities Exchange Act of 1934, as amended ("Exchange Act"), if they wish for it to be eligible for inclusion in the proxy statement and form of proxy relating to that meeting. In addition, under the Company's Bylaws, a stockholder wishing to nominate a director or make a proposal at the 2020 Annual Stockholder Meeting outside of Exchange Act Rule 14a-8 must submit such nomination or proposal in writing to the Company no earlier than January 16, 2020 and no later than February 15, 2020. The Nominating & Governance Committee will also consider qualified director nominees recommended by stockholders. Our process for receiving and evaluating Board member nominations from our stockholders is described below under the caption "Nominating & Governance Committee."

CORPORATE GOVERNANCE PRINCIPLES AND PRACTICES

Rudolph Technologies is committed to sound and effective corporate governance practices. Having such principles is essential to running our business efficiently and to maintaining our integrity in the marketplace. The major components of our corporate governance practices are described below.

Board Leadership Structure

Our Company management is led by Michael P. Plisinski, who has served as our CEO since November 2015, and David B. Miller, who is an independent director and has served as the Chairman of the Board of Directors since August 2018. Prior to that, Thomas G. Greig served as Chairman of the Board from April 2016 to August 2018. Our Board of Directors is currently comprised of one (1) non-independent director, Mr. Plisinski, and seven (7) directors each of whom has been affirmatively determined by our Board of Directors to meet the criteria for independence established by the SEC and the New York Stock Exchange ("NYSE"). The independent directors meet periodically in executive session chaired by the Chairman without the CEO or other management present. Furthermore, each director is encouraged to suggest items for the Board agenda and to raise at any Board meeting subjects that are not on the agenda for that meeting.

In accordance with our sound and effective corporate governance practice, the roles of CEO and Chairman of the Board, as cited above, are held by separate individuals, with the independent Chairman of the Board being designated by the Board. The Board of Directors believes that at the current time the designation of an independent Chairman of the Board facilitates the functioning of the Board of Directors, while leaving the CEO responsible for setting the strategic direction for the Company and for the day-to-day leadership and performance of the Company. The independent Chairman of the Board:

- Presides at all meetings of the stockholders and the Board of Directors at which he or she is present;
- Establishes the agenda for each Board of Directors meeting;
- Sets the schedule and annual agenda, to the extent foreseeable;
- Calls and prepares the agenda for and presides over separate executive sessions of the independent directors;
- Acts as a liaison between the independent directors and the Company's management;
- Serves as a point of communications with stockholders; and
- Performs such other powers and duties as may from time to time be assigned by the Board of Directors or as may be prescribed by the Company's Bylaws.

Board Meetings

The Board of Directors of the Company held a total of five (5) meetings during 2018. None of our incumbent directors attended fewer than 80% of the meetings of the Board of Directors and the standing committees upon which such directors served during 2018. While the Company does not currently have a formal policy regarding the attendance of directors at the Annual Meeting of stockholders, directors are encouraged to attend. All members of the Board of Directors serving at the time attended the 2018 Annual Meeting of Stockholders.

Board Independence

The Board of Directors makes an annual determination as to the independence of each of our Board members under the current standards for "independence" established by the NYSE and the SEC. The Board has determined that all of the nominees for election as directors and current members of our Board, including Jeffrey A. Aukerman, Daniel H. Berry, Leo Berlinghieri, Vita A. Cassese, David B. Miller, Thomas G. Greig and John R. Whitten, are independent under the NYSE Corporate Governance Rules with the exception of Michael P. Plisinski, our Chief Executive Officer. During 2018, none of the independent members of our Board were a party to any transactions, relationships or arrangements that were considered by the Board to impair his or her independence. On four (4) occasions during 2018, our Board met in executive sessions in which the independent Board members were solely present.

Oversight Of Risk

Our Audit Committee is responsible for overseeing risk management and, on at least an annual basis, reviews and discusses with management policies and systems pursuant to which management addresses risk, including risks associated with our audit, financial reporting, internal control, disclosure control, cybersecurity, legal and regulatory compliance, and investment policies. Our Audit Committee regularly reviews with our Board any issues that arise in connection with such topics and, in accordance with our Summary of Corporate Governance Guidelines, our full Board regularly engages in discussions of risk management to assess major risks facing our Company and review options for the mitigation of such risks. Each of our Board committees also considers the risk within its area of responsibilities. For example, our Compensation Committee periodically reviews enterprise risks to ensure that our compensation programs do not encourage excessive risk-taking and our Nominating & Governance Committee oversees risks related to governance issues, such as succession planning, and serves as the contact point for employees to report corporate compliance issues. As a result of the foregoing, we believe that our CEO, together with the Chairman of our Audit Committee and our full Board of Directors provide effective oversight of the Company's risk management function.

Board Committees

The Board has three standing committees with separate chairs - the Audit, Compensation, and Nominating & Governance Committees. Each of the Board committees is comprised solely of independent directors. The Audit Committee, Compensation Committee and Nominating & Governance Committee have each adopted a written charter that sets forth the specific responsibilities and qualifications for membership to the respective committees. The charters of each of these committees are available on our website at https://investors.rudolphtech.com/board-of-directors-committees.

In 2018, the composition of and number of meetings held by the Company's Board Committees were as follows:

Rudolph Technologies Board Committee	Committee Chairman	Full Year Committee Members[1]	Partial Year Committee Members[2]	# of Meetings held in 2018
Audit Committee	Jeffrey A. Aukerman	John R. Whitten David B. Miller	Vita A. Cassese	9
Nominating & Governance Committee	Leo Berlinghieri	John R. Whitten	Daniel H. Berry Thomas G. Greig	9
Compensation Committee	David B. Miller	Jeffrey A. Aukerman	Daniel H. Berry Vita A. Cassese Thomas G. Greig	5

1 Each full year member of the respective committees attended all of the committee's meetings held in 2018.

2 For partial year members of the committees attendance in 2018 was as follows:

- Ms. Cassese was appointed to the Board in July 2018. Thereafter, in 2018 she attended all Committee meetings for which she was a member (Audit – 3 meetings; Compensation – 1 meeting).
- Mr. Berry moved from the Compensation Committee to the Nominating & Governance Committee in January 2018. He attended all Committee meetings for which he was a member (Compensation - 1 meeting; Nominating & Governance - 8 meetings)
- Mr. Greig moved from the Nominating & Governance Committee to the Compensation Committee in January 2018. He attended all Committee meetings for which he was a member (Nominating & Governance - 1 meeting; Compensation - 4 meetings)

In January 2018, Mr. Berry resigned as Chairman of the Compensation Committee. Thereafter, Mr. Miller was elected as Chairman of the Compensation Committee. In July 2018, Mr. Whitten resigned as Chairman of the Audit Committee. Thereafter, Mr. Aukerman was elected as Chairman of the Audit Committee.

Audit Committee

The Audit Committee assists the Board in fulfilling its responsibilities for general oversight of the integrity of our financial statements, our accounting policies and procedures and our compliance with legal and regulatory requirements. Among its functions, the Audit Committee is responsible, among other things, for:

- The appointment, compensation, retention and oversight of the Company's independent registered public accounting firm;
- The approval of services performed by the Company's independent registered public accounting firm;
- Reviewing the responsibilities, functions and performance of the Company's internal audit function;

- Reviewing the scope and results of internal audits and ongoing assessments of the Company’s risk management processes; and
- Evaluating the Company’s system of internal control over financial reporting and disclosure controls and procedures.

The report of our Audit Committee is found below under the caption “Audit Committee Report.”

The Board has determined that each of the Audit Committee members meet the Audit Committee membership requirements set forth by the NYSE and the SEC, including that they be “independent.” Furthermore, the Board has determined that (i) each of Mr. Whitten and Mr. Aukerman qualify as an “Audit Committee Financial Expert” as that term is defined under SEC rules and (ii) that both Mr. Whitten and Mr. Aukerman are “independent,” as that term is defined under NYSE listing standards.

Compensation Committee

The Compensation Committee is responsible for the establishment of the policies upon which compensation of and incentives for the Company’s executive officers will be based, the review and recommendation for approval by the independent members of the Board of the compensation of the Company’s executive officers, and the administration of the Company’s equity compensation plans.

In general, the Compensation Committee is responsible for reviewing and recommending for approval by the independent members of the Board of Directors the Company’s compensation policies and practices, including executive salary levels and variable compensation programs, both cash-based and equity-based. With respect to the compensation of the Company’s CEO, the Compensation Committee reviews and recommends for approval by the independent members of the Board the various elements of the CEO’s compensation. With respect to other executive officers, including each of our NEOs, the Compensation Committee reviews the CEO recommendations for compensation for such individuals presented to the Compensation Committee by the CEO and the reasons thereof and, in its discretion, may modify the compensation packages for any such individuals.

In accordance with its charter, the Compensation Committee may form and delegate its authority to subcommittees when appropriate. Further, the Compensation Committee has the authority to retain, and to terminate, any compensation consultant or other advisors to assist in the evaluation of director, CEO or executive compensation or other matters within the scope of the Compensation Committee’s responsibilities and is directly responsible for the appointment, compensation and oversight of such consultants and other advisors, including their fees and other retention terms. From time to time, the Compensation Committee engages the services of such outside compensation consultants to provide advice on compensation plans and issues related to the Company’s executive and non-executive employees. In 2018, the Compensation Committee engaged Pay Governance LLC to provide other ad hoc assistance to the Compensation Committee. Pay Governance LLC provided no services to management. The Compensation Committee also has authority to obtain advice and assistance from internal or external legal, accounting and other advisors.

The Board has determined that each of the Compensation Committee members meet the Compensation Committee membership requirements set forth by the NYSE and the SEC, including that they be “independent”.

For further discussion of the Compensation Committee and its processes and procedures, please refer to the “Compensation Program Objectives, Design and Practices” section in the Compensation Discussion and Analysis below.

Nominating & Governance Committee

The responsibilities of the Nominating & Governance Committee include identifying prospective director nominees and recommending to the Board director nominees for the next Annual Meeting of stockholders and replacements of a director in the event of a vacancy on the Board. The Nominating & Governance Committee also recommends to the Board the appointment of directors to Board Committees and is charged with developing and recommending to the Board the governance principles applicable to the Company. Further, the Nominating & Governance Committee, together with our CEO, is responsible for overseeing our Company’s management succession planning.

The Nominating & Governance Committee also oversees the annual evaluation of the Board, the Committees of the Board and the individual directors. Typically, this evaluation is performed during the first quarter by each of the directors and reflects an assessment of the Board, the Committees of the Board and for each individual director in the prior year. Among other topics, the evaluation in general assesses:

- For both the Board and the Committees:
    - Their structure and composition;
    - The format and content of meetings; and
    - The effectiveness of the Board/Committees.
- For each individual director:
    - Their performance and approach to their directorship;
    - Their understanding of their role as a director;
    - Their understanding of critical aspects of the Company's business, products and strategy; and
    - Their skills, experience and ongoing training.

In addition, the Board reviews the issues faced during the past year, assesses its response and makes determinations whether additional resources or approaches might be applied to further optimize the handling of the issues. The goal of the evaluation is to identify and address any performance issues at the Board, committee or individual level, should they exist, identify potential gaps in the boardroom and to assure the maintenance of an appropriate mix of director skills and qualifications. Upon completion of the evaluation, the Nominating & Governance Committee provides feedback to the Board, the committees and the individual directors regarding the results of the evaluation and raises any issues that have been identified which may need to be addressed.

The Board has determined that each of the Nominating & Governance Committee members meets the Nominating & Governance Committee membership requirements, including the independence requirements of the NYSE.

Other Committees

Our Board of Directors may from time to time establish other special or standing committees to facilitate the management of the Company or to discharge specific duties delegated to the committee by the full Board of Directors.

Compensation Committee Interlocks And Insider Participation

In 2018, no member serving on the Compensation Committee at any time during the year (David B. Miller, Jeffrey A. Aukerman, Vita A. Cassese, Thomas G. Greig and Daniel H. Berry) had any form of interlocking relationship as described in Item 407(e)(4) of Regulation S-K. Further, no member of the Compensation Committee as constituted in 2019 (David B. Miller, Jeffrey A. Aukerman, Vita A. Cassese, and Thomas G. Greig) has any form of interlocking relationship as described in Item 407(e)(4) of Regulation S-K as of the date of this proxy statement.

Board Membership Criteria And Nominee Identification

The Nominating & Governance Committee of the Board determines the required selection criteria and qualifications of director nominees based upon the needs of the Company at the time nominees are considered. These criteria include the following specific, minimum qualifications that the Nominating & Governance Committee believes must be met by a nominee to be recommended by the Committee for a position on the Board:

- The candidate must possess the ability to apply good business judgment;
- The candidate must be in a position to properly exercise his or her duties of loyalty and care;
- The candidate must exhibit proven leadership capabilities, high integrity and experience with a high level of responsibilities within his or her chosen field; and
- The candidate must have the ability to grasp complex principles of business, finance, international transactions and semiconductor inspection, metrology, lithography and related software technologies.

The Nominating & Governance Committee has not adopted a formal diversity policy with regard to the selection of director nominees. Diversity is one of the factors that the Nominating & Governance Committee considers in identifying nominees for director. In selecting director nominees, the Nominating & Governance Committee considers, among other factors:

- The competencies and skills that the candidate possesses and the candidate's areas of qualification and expertise that would enhance the composition of the Board; and
- How the candidate would contribute to the Board's overall balance of expertise, perspectives, backgrounds and experiences in substantive matters pertaining to the Company's business.

In its identification of director nominees, the Nominating & Governance Committee will consider how the candidate would contribute to the Board's overall balance of diversity of expertise, perspectives, backgrounds and experiences in substantive matters pertaining to the Company's business. When current Board members are considered for nomination for reelection, the Nominating & Governance Committee also takes into consideration their prior contributions to and performance on the Board and their record of attendance.

The Nominating & Governance Committee will consider the above criteria for nominees identified by the Nominating & Governance Committee itself, by stockholders, or through some other source. The Nominating & Governance Committee uses the same process for evaluating all nominees, regardless of the original source of nomination. The Nominating & Governance Committee may use the services of a third party search firm to assist in the identification or evaluation of Board member candidates.

Consideration Of Director Nominees

The Nominating & Governance Committee has a formal policy with regard to consideration of director candidates recommended by the Company's stockholders, which may be found on our website at:

https://investors.rudolphtech.com/corporate-governance/director-candidates-policy-and-procedure

In accordance with the policy, the Nominating & Governance Committee will consider recommendations for candidates to the Board of Directors from stockholders of the Company holding no less than 1% of the Company's securities for at least twelve (12) months prior to the date of the submission of the recommendation. Stockholders wishing to recommend persons for consideration by the Nominating & Governance Committee as nominees for election to the Company's Board of Directors can do so by writing to the Office of the General Counsel of the Company at its principal executive offices giving:

- Candidate's name, age, business address and residence address;
- Candidate's detailed biographical data and qualifications including his/her principal occupation and employment history;
- The class and number of shares of the Company which are beneficially owned by the candidate;
- The candidate's written consent to being named as a nominee and to serving as a director, if elected;
- Information regarding any relationship between the candidate and the Company in the last three (3) years;
- Any other information relating to the candidate that is required by law to be disclosed in solicitations of proxies for election of directors;
- The name and address of the recommending or nominating stockholder;
- The class and number of shares of the Company which are beneficially owned by the recommending or nominating stockholder;
- A description of all arrangements or understandings between such stockholder and each nominee and any other person or persons (naming such person or persons) relating to the nomination; and
- Any other information specified under Section 2.5 of the Company's Bylaws regarding advance notice.

Corporate Governance Guidelines

Our Board of Directors adopted Corporate Governance Guidelines, a copy of which is available on our website at https://investors.rudolphtech.com/corporate-governance.

Codes Of Ethics

We have adopted a Code of Business Conduct and Ethics (applicable to all employees, executive officers and directors) and a Financial Code of Ethics (applicable to our financial officers, including our CEO and Chief Financial Officer ("CFO")) that set forth principles to guide all employees, executive officers and directors and establish procedures for reporting any violations of these principles. Copies of these codes may be found on our website at:

https://investors.rudolphtech.com/corporate-governance/code-of-business-conduct-and-ethics

https://investors.rudolphtech.com/corporate-governance/financial-code-of-ethics

or may be requested by writing to:

Rudolph Technologies, Inc.
Attention: Investor Relations
16 Jonspin Road
Wilmington, Massachusetts 01887

The Company will disclose any amendment to its codes of ethics or waiver of a provision of its codes of ethics applicable to its officers or directors, including the name of the officer or director to whom the waiver was granted, on our website at www.rudolphtech.com, on the Investors page.

Related Persons Transactions Policy

There have been no "related person transactions" since the beginning of 2018 to present, nor are there any currently proposed "related person transactions," involving any director, director nominee or executive officer of the Company, any known 5% stockholder of the Company or any immediate family member of any of the foregoing persons (which are referred to together as "related persons"). A "related person transaction" generally means a transaction involving more than $120,000 in which the Company (including any of its subsidiaries) is a participant and in which a related person has a direct or indirect material interest.

The Board has adopted policies addressing the Company's procedures with respect to the review, approval and ratification of "related person transactions" that are required to be disclosed pursuant to Item 404(a) of Regulation S-K. Our related person practices and policies ensure that our directors, officers and employees are proactively screened from any conflicts of interests interfering with their obligations to the Company. Our policies are included in our corporate governance documents, including our Code of Business Conduct and Ethics, Audit Committee Charter and Summary of Corporate Governance Policies, each of which is available at the Investors section of our website located at https://investors.rudolphtech.com/.

- Pursuant to our Code of Business Conduct and Ethics, our directors, officers and employees are required to avoid any actual or apparent conflicts of interest (other than conflicts of interest that have received appropriate approval as described below), which includes taking actions or having interests that may interfere with the objective or efficient performance of such person's duties to the Company or that may result in such person receiving improper personal benefits as a result of their position with the Company.
- Pursuant to our Summary of Corporate Governance Policies, if a director becomes involved in any activity or interest that may result in an actual or potential conflict (or the appearance of a conflict) with the interests of the Company, that director is required to disclose such information promptly to the Board, which will determine an appropriate resolution on a case-by-case basis. This policy further reflects that all directors must recuse themselves from any discussion or decision affecting their personal, business or professional interests. Similarly, our Board will determine the appropriate resolution of any actual or potential conflict of interest involving our CEO and our CEO will determine the appropriate resolution of any conflict of interest issue involving any other officer of the Company. When necessary and appropriate, resolution of such issues may require consideration of the matter by the Audit Committee.
- Pursuant to both the Board's Summary of Corporate Governance Policies and the Audit Committee Charter, the Audit Committee, which consists entirely of independent directors, will review any proposed transaction in which the Company or its subsidiaries are to participate if the amount involved in the transaction exceeds $120,000 and we are aware that any related person may have a direct or indirect material interest in the transaction. The Audit Committee will consider the facts and circumstances and will approve or ratify a proposed transaction if the Audit Committee considers it appropriate and believes that such transaction will serve the long-term interests of our stockholders. The Compensation Committee of the Board reviews and approves compensation decisions for Board members and our executive officers (and such other employees of the Company as directed by the Board) pursuant to the Compensation Committee Charter.

Communications With The Board Of Directors

We have a formal policy regarding communications with the Board of Directors, which is found on our website at:

https://investors.rudolphtech.com/corporate-governance/stockholder-communications-policy

Stockholders and other interested parties may communicate with the Chairman of the Nominating & Governance Committee by writing to:

Chairman of the Nominating & Governance Committee
c/o Rudolph Technologies, Inc.
Office of the General Counsel
550 Clark Drive
P.O. Box 860
Budd Lake, New Jersey 07828

and such communications will be forwarded to the Board of Directors to the extent appropriate. Prior to forwarding any communication, the Chairman of the Nominating & Governance Committee will review it and, in his or her discretion, will not forward a communication deemed to be of a commercial nature or otherwise inappropriate for review by the Board of Directors. Stockholders and other interested parties who would like their submission directed to a member or members of the Board of Directors, including the independent members of the Board, may so specify, and the communication will be forwarded to such specific directors, as appropriate.

PROPOSAL 1

ELECTION OF DIRECTORS

Nominees

The authorized number of directors is currently established at eight (8). The Company's Certificate of Incorporation provides that the directors be divided into three classes, with the classes serving for staggered, three-year terms. Currently, there are two (2) directors in Class I and three (3) directors in both Class II and Class III. The status of the respective terms for the classes are as follows:

Class of Director	Election Status	End of Term
Class I	Elected in 2018	2021*
Class II	Nominated for Election in 2019	2022*
Class III	Elected in 2017	2020*

* or until their successors have been duly elected and qualified

At the Annual Meeting, Class II directors will be elected to hold office for a three (3) year term expiring at the 2022 Annual Meeting of stockholders or until their respective successor is duly elected and qualified or until the director's earlier death, resignation or removal. Based on the recommendation of the Nominating & Governance Committee, the three (3) Class II director nominees approved by the Board for inclusion in this proxy statement are:

Daniel H. Berry   Vita A. Cassese   Thomas G. Greig

Each nominee is currently serving as a director of Rudolph Technologies. In making its recommendations, the Nominating & Governance Committee considered a number of factors, including its criteria for Board membership, which include the minimum qualifications that must be possessed by a director candidate in order to be nominated for a position on our Board. Each nominee has indicated that he or she will serve if elected. Unless otherwise instructed, the proxy holders will vote the proxies received by them for the Company's three (3) nominees. In the event that any nominee of the Company becomes unable or unavailable to serve as a director at the time of the Annual Meeting (which we do not anticipate), the proxy holders will vote the proxies for any substitute nominee who is designated by the current Board of Directors to fill the vacancy. Alternatively, the Board of Directors, in its discretion, may elect to reduce the number of directors serving on the Board.

Board Composition And Refreshment

A priority of the Nominating & Governance Committee and the Board as a whole is making certain that the composition of the Board reflects the desired professional experience, skills and backgrounds in order to present an array of viewpoints and perspectives and effectively represent the long-term interests of stockholders. Further, the Board recognizes the importance of Board refreshment in order to continue to achieve an appropriate balance of tenure, turnover, diversity and skills on the Board. To this end, in 2018, the Board engaged in an extensive search to add an additional new member to the Board and upon the conclusion of these efforts appointed Vita A. Cassese to the Board in July 2018. Ms. Cassese is included as a candidate for election this year. The Board believes that the new insights and ideas contributed by Ms. Cassese will be essential to our Board and its strategy and complement the valuable experience and familiarity that longer-serving directors bring to the Company.

Vote Required

Pursuant to the Company's Bylaws, our directors are elected by the affirmative vote of the majority of the votes cast (provided, however, that if the number of nominees exceeds the number of directors to be elected, directors will be elected by a plurality voting standard). In order for a director in an uncontested election to be elected, the number of shares cast "for" his/her election must exceed the number of votes cast "against" his/her election (with "abstentions" and "broker non-votes" not counted as a vote cast either "for" or "against" that director's election). If a nominee who is an incumbent director is not elected, our Bylaws provide that such director must promptly tender a resignation to the Board. Our Nominating & Governance Committee would then make a recommendation to the Board on whether to accept or reject the tendered resignation, or whether other action should be taken. Within ninety (90) days after the date of the certification of the election results, our Board will act on any such tendered resignation and publicly disclose (in a press release, a filing with the SEC or other broadly disseminated means of communication) its decision regarding the tendered resignation and the rationale behind the decision.

Information About The Nominees And Continuing Directors

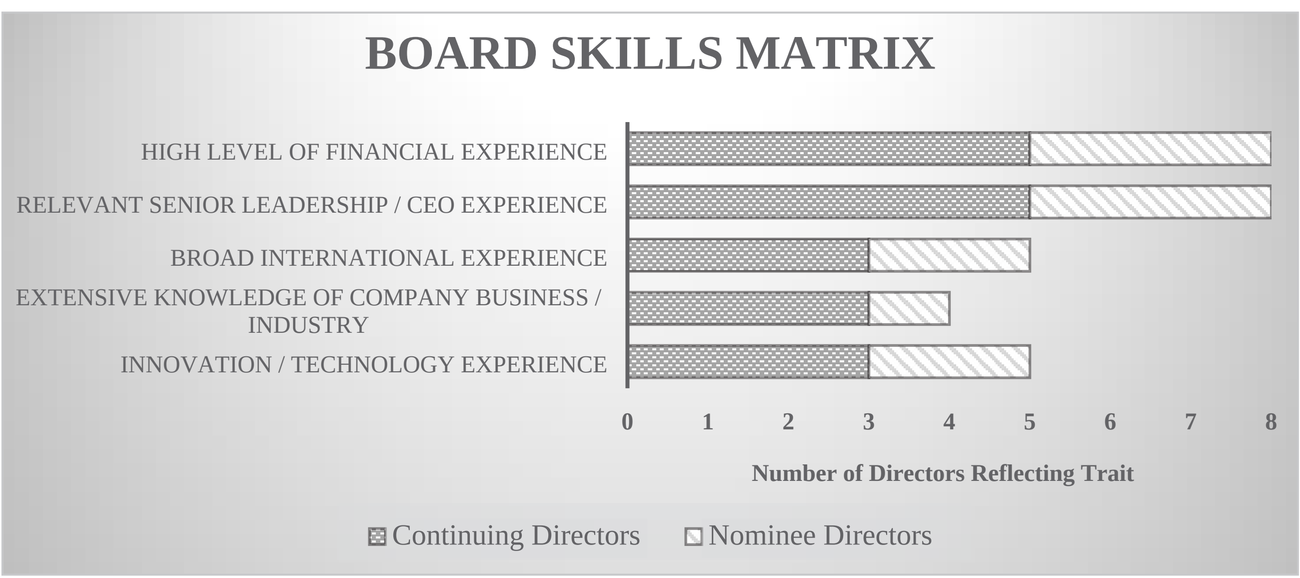
Our Board and its Nominating & Governance Committee believe that all of the directors and nominees are highly qualified and have demonstrated leadership skills and have experience and judgment in areas that are relevant to our business. We believe that their ability to challenge and stimulate management and their dedication to the affairs of the Company collectively serve the interests of the Company and its stockholders.

The three (3) Class II nominees for director and the current Class I and Class III directors with unexpired terms are set forth below. All information is as of the record date.

Name	Position	Board Tenure
Nominee Class II Directors:		
Daniel H. Berry	Operating Partner, Riverside Partners, LLC	20.42 years
Vita A. Cassese	Chief Executive Officer, Mardon Management Advisors	0.67 years
Thomas G. Greig	Former Senior Managing Director, Liberty Capital Partners, Inc.	16.17 years
Continuing Class I Directors:		
Leo Berlinghieri	Former Chief Executive Officer and President, MKS Instruments, Inc.	10.50 years
Michael P. Plisinski	Chief Executive Officer, Rudolph Technologies, Inc.	3.33 years
Continuing Class III Directors:		
Jeffrey A. Aukerman	Former Partner, Deloitte & Touche LLP	4.25 years
David B. Miller	Former President, DuPont Electronics & Communications	3.67 years
John R. Whitten	Former Chief Financial Officer, Vice President and Treasurer, Applied Industrial Technologies, Inc.	12.67 years

Except as discussed below, each nominee or incumbent director has been engaged in the principal occupation set forth above during the past five (5) years. There are no family relationships between any directors or executive officers of the Company. The Company is unaware of any arrangements or understandings among Class II nominees for director, current Class I and Class III directors and any other person(s) pursuant to which a Class II nominee was approved by the Board or a current Class I and Class III director was elected.

The following reflects additional information regarding the background and qualifications of our directors, including the experience and skills that support the Board's determination that each director should serve on our Board.



NOMINEES FOR CLASS II DIRECTORS

Daniel H. Berry

Director Since:	October 1998
Age:	73
Independent Status:	Independent Director
Board Committee(s):	Compensation (Chairman/Member through January 2018); Nominating & Governance (beginning in January 2018)
Other Boards Served:	R&D Altanova (Since 2015) Thinklogical, LLC (2012-2017) New York University - Tandon School of Engineering (1999-2016) NDS Surgical Imaging, LLC (2009-2011) IZI Medical Products, LLC (2009-2011) Applied Precision, Inc. (2004-2007)

Since January 2002, Mr. Berry has been an Operating Partner of Riverside Partners, LLC, a private equity investment firm. From September 2010 to August 2011, Mr. Berry served as Chief Executive Officer of NDS Surgical Imaging, LLC, a supplier to the medical imaging industry. From July 2004 to August 2007, Mr. Berry also served as Executive Vice President of Applied Precision, formerly a Riverside portfolio company. He was employed by Ultratech Stepper, Inc. (presently Ultratech, Inc.), an equipment supplier to the semiconductor industry, from 1990 to 2001 in various positions including President and Chief Operating Officer from May 1999 to November 2001. Prior to this, Mr. Berry held positions at General Signal, Perkin Elmer and Bell Laboratories. Mr. Berry holds a B.S. in Electrical Engineering from the Polytechnic Institute of Brooklyn.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Substantial financial experience gained both as Operating Partner with Riverside Partners, LLC and in serving in executive management roles with various companies such as NDS Surgical Imaging, LLC, Ultratech, Inc. and Applied Precision, among others.

Relevant Senior Leadership / CEO Experience

- Served as Chief Executive Officer for NDS Surgical Imaging and, within the semiconductor industry, as President and Chief Operating Officer of Ultratech, Inc. and as Executive Vice President of Applied Precision. Further, he has served as an Operating Partner of Riverside Partners, LLC for over seventeen (17) years.

Broad International Exposure

- Roles with global companies including Bell Laboratories, Perkin Elmer, General Signal, Applied Precision, NDS Surgical Imaging and Ultratech including executive management of Asian and European organizations provide broad and deep experience in international business and customer relations.

Extensive Knowledge of Company Business/Industry

- Over forty-five (45) years of employment experience within an array of fields in the semiconductor industry including both lithography and probe card test and analysis.

Innovation/Technology Experience

- Expansive scope of technological and innovative experience from over forty-five (45) years of semiconductor industry employment.

Vita A. Cassese

Director Since:	July 2018
Age:	69
Independent Status:	Independent Director
Board Committee(s):	Audit, Compensation
Other Boards Served:	Loftware, Inc. (since 2014) Medical Knowledge Group (since 2015) Interactive Health, Inc. (since 2017) Zitter Health Insights (2015-2019) Context Matters, Inc. (2016-2017) Decision Resources Group, Inc. (2010-2012) College of Mount Saint Vincent Board (Trustee) (since 2007)

Ms. Cassese currently serves as the CEO of Mardon Management Advisors, a technology and analytics advisory firm. Ms. Cassese has over 30 years of experience in operating and strategic management roles at Pfizer, Inc., Ms. Cassese's last held position at Pfizer, Inc. was chief information officer of its Worldwide Pharmaceuticals Group. Ms. Cassese serves as a mentor for the Masters in Technology program at Columbia University and has been a guest lecturer at New York University's Stern School of Business, MIT Sloan School of Business, and Boston University. Ms. Cassese earned a B.A. in Mathematics from the College of Mount Saint Vincent and an MBA from New York University's Stern School of Business.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Substantial financial experience gained in serving in executive management roles with Pfizer, Inc. and as chief information officer of Pfizer's Worldwide Pharmaceuticals Group.

Relevant Senior Leadership / CEO Experience

- Serves as Chief Executive Officer of Mardon Management Advisors. Additional experience as Vice President, Business Development, Strategy and Innovation for Pfizer, Inc. and CIO for Pfizer Worldwide Pharmaceuticals.

Broad International Exposure

- Roles with Pfizer included management of nearly 2,000 employees in 44 countries as well as serving on the company's Worldwide Pharmaceuticals Executive Leadership Team responsible for long-term international business strategy.

Innovation/Technology Experience

- Extensive innovation and technology experience derived from over 30 years of operations experience, service on multiple technical advisory boards and leadership of a technology and analytics advisory firm.

Thomas G. Greig, III

Director Since:	January 2003
Age:	71
Independent Status:	Independent Director
Board Committee(s):	Nominating & Governance (through January 2018); Compensation (beginning in January 2018)
Other Boards Served:	Black Box Corporation (1999-2019)

Mr. Greig served as the Company's independent Chairman from April 2016 to August 2018. He served as the Company's independent Lead Director from January 2013 through March 2016.

Mr. Greig was employed by Liberty Capital Partners, Inc., a private equity investment firm, from July 1998 to June 2016 and last held the position of Senior Managing Director. From December 1985 to July 1998, Mr. Greig was a Managing Director of Donaldson, Lufkin, & Jenrette, Inc., an investment-banking firm. Mr. Greig holds a B.S. in Engineering from Princeton University, an M.S.E. in Electrical Engineering from New York University and an M.B.A. from Harvard University Graduate School of Business Administration.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Wide-ranging acquisition and financial background as a result of his affiliation with Liberty Capital Partners, Inc., a private equity investment firm, for over nineteen (19) years and Donaldson, Lufkin, & Jenrette, Inc., an investment banking firm, for over twelve (12) years.

Relevant Senior Leadership / CEO Experience

- Served as in senior management roles for over 30 years, both as Senior Managing Director of Liberty Capital Partners, Inc. and as Managing Director of Donaldson, Lufkin, & Jenrette, Inc.

The Company's Board of Directors unanimously recommends voting "FOR" each of the nominees set forth above.

CONTINUING CLASS I DIRECTORS

Leo Berlinghieri

Director Since:	September 2008
Age:	65
Independent Status:	Independent Director
Board Committee(s):	Nominating & Governance (Chairman)
Other Boards Served:	Unipower, LLC (Since 2017) MKS Instruments, Inc. (2005-2013) Massachusetts High Technology Council, Inc. (2006-2013)

From July 2005 to December 2013, Mr. Berlinghieri served as Chief Executive Officer and President of MKS Instruments, Inc., a critical subsystem and instrument provider to the semiconductor industry. From April 2004 to July 2005, Mr. Berlinghieri served as President and Chief Operating Officer and prior to that served as Vice President and Chief Operating Officer from July 2003 to April 2004 for MKS Instruments, Inc.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Substantial financial experience gained in roles as Chief Executive Officer, President and Vice President and Chief Operating Office with MKS Instruments, Inc.

Relevant Senior Leadership / CEO Experience

- Served for over eight (8) years as Chief Executive Officer and President of MKS Instruments, Inc. Additional prior experience as Vice President and Chief Operating Officer of the company, among other senior management roles.

Broad International Exposure

- Gained extensive international experience in various roles with MKS Instruments, including Chief Executive Officer, Chief Operating Officer and Vice President of Global Sales and Service.

Extensive Knowledge of Company Business/Industry

- Over thirty-three (33) years of experience in the semiconductor industry, including eight (8) years at the helm of MKS Instruments, Inc. a public corporation. Also served on the SEMI North America Advisory Board (NAAB) including as its chairman in 2009.

Innovation/Technology Experience

- Broad array of technological experience with MKS Instruments, Inc., including roles in manufacturing, customer support, and sales all in addition to his roles as Chief Executive Officer and Chief Operating Officer.

Michael P. Plisinski

Director Since:	November 2015
Age:	49
Independent Status:	Non-Independent Director
Board Committee(s):	None
Other Boards Served:	None

Mr. Plisinski has served as the Company’s Chief Executive Officer since November 2015. Prior to his appointment as our CEO, Mr. Plisinski served as our Executive Vice President and Chief Operating Officer from October 2014 to November 2015 and as Vice President and General Manager, Data Analysis and Review Business Unit from February 2006 when the Company merged with August Technology Corporation until October 2014. From February 2004 to February 2006, Mr. Plisinski served as August Technology’s Vice President of Engineering and, from July 2003 to February 2004, as its Director of Strategic

Marketing for review and analysis products. Mr. Plisinski joined August Technology as part of the acquisition of Counterpoint Solutions, a supplier of optical review and automated metrology equipment to the semiconductor industry, where he was both sole founder and President from June 1999 to July 2003. Mr. Plisinski has a B.S. in Computer Science from the University of Massachusetts and has completed the Advanced Management Program from Harvard Business School.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Substantial financial experience gained in roles as Chief Executive Officer, Chief Operating Officer and Vice President, General Manager with the Company.

Relevant Senior Leadership / CEO Experience

- Serving as Chief Executive Officer of Rudolph Technologies with prior experience as Chief Operating Officer and Vice President, General Manager of the Company’s Data Analysis and Review Business Unit, among other senior management positions.

Broad International Exposure

- Extensive experience working with Rudolph Technologies Asian and European customers through the various roles held within the Company.

Extensive Knowledge of Company Business/Industry

- Over fifteen (15) years of dedicated experience with Rudolph Technologies and additional four (4) years as founder of an optical review and automated metrology start-up company, each serving the semiconductor industry.

Innovation/Technology Experience

- Technological and innovative experience includes leadership roles in both engineering and software development while with Rudolph Technologies. Prior entrepreneurial experience in the founding of optical review and automated metrology equipment company, Counterpoint Solutions.

CONTINUING CLASS III DIRECTORS

Jeffrey A. Aukerman

Director Since:	December 2014
Age:	53
Independent Status:	Independent Director
Board Committee(s):	Audit (Chairman beginning in July 2018), Compensation
Other Boards Served:	Advisory Council to the Lariccia School of Accounting & Finance at Youngstown State University (since 2012)

Mr. Aukerman is a certified public accountant and has extensive public accounting and consulting experience, serving many public and private equity sponsored public reporting companies in the manufacturing, distribution and services industries. From July 1987 to May 2014, Mr. Aukerman was employed by Deloitte & Touche LLP, which, together with its affiliates, is an audit, consulting, tax and advisory services firm, and served as an audit partner for the most recent fifteen (15) years. He also served in various capacities for the firm, including as an audit function professional practice director for the Cleveland, Ohio office and a regional leader of internal control subject matter specialists. Mr. Aukerman graduated magna cum laude with a B.S.B.A. in Accounting from Youngstown State University.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Twenty-seven (27) years of extensive experience with a wide range of financial reporting, accounting, risk management, and compliance matters at Deloitte & Touche LLP.

Relevant Senior Leadership / CEO Experience

- Served as Partner at Deloitte & Touche LLP.

David B. Miller

Director Since:	July 2015
Age:	62
Independent Status:	Independent Director
Board Committee(s):	Audit, Compensation (Chairman beginning in January 2018)
Other Boards Served:	President, University of Virginia School of Engineering & Applied Science Foundation (since 2011); Merrimac Industries, Inc. (2002-2008) SEMI International (2011-2015) North Carolina Chamber of Commerce (2010-2015)

Mr. Miller has served as the Company's non-executive Chairman since August 2018. From June 1981 to November 2015, Mr. Miller served in various positions, most recently as President, with DuPont Electronics & Communications, an electronic materials company. Mr. Miller holds a B.S. in Electrical Engineering from the University of Virginia.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Substantial financial experience gained in role with DuPont Electronics & Communications including as President of the company. Oversight of complex financial transactions, profit and loss responsibility and investor relations during prior operations and leadership roles with this company.

Relevant Senior Leadership / CEO Experience

- Served as President of DuPont Electronics & Communications.

Broad International Exposure

- Served as President of DuPont Electronics & Communications, a global electronic materials company. Served several joint venture boards in the U.S. and Asia while with DuPont Electronics & Communications as well as the board of SEMI International. Resided in Tokyo, Japan for three (3) years.

Extensive Knowledge of Company Business/Industry

- Forty (40) years of experience within the electronics industry including six (6) years at the helm of DuPont Electronics & Communications, which in addition to other markets, served the semiconductor industry.

Innovation/Technology Experience

- Significant experience and leadership roles with DuPont Electronics & Communications, overseeing the company's technology advancement, breadth of process expertise and ongoing innovation.

John R. Whitten

Director Since:	July 2006
Age:	72
Independent Status:	Independent Director
Board Committee(s):	Audit (Chairman through July 2018), Nominating & Governance
Other Boards Served:	American Century Investments (since 2008)

From November 1995 to December 2003, Mr. Whitten served as Chief Financial Officer, Vice President and Treasurer of Applied Industrial Technologies, Inc., a global supply distributor of customized industrial, fluid power, and flow control products and provider of engineering design and systems integration services. Prior to this, Mr. Whitten served this company as its Chief Accounting Officer for over 10 years. Mr. Whitten is a C.P.A. and holds a B.B.A. in Accounting from Cleveland State University.

Specific Qualifications, Attributes, Skills and Experience

High Level of Financial Experience

- Has public accounting firm experience and served for eight (8) years as Chief Financial Officer, Vice President and Treasurer of Applied Industrial Technologies, Inc. Currently serving as Audit Committee Chairman for the Board of American Century Investments, a registered investment company that oversees sixty-eight (68) mutual fund portfolios with over $100 billion of assets under management.

Relevant Senior Leadership / CEO Experience

- Served as Chief Financial Officer, Vice President and Treasurer of Applied Industrial Technologies, Inc.

Compensation Of Directors

Directors who are employees of the Company receive no compensation for their services as members of the Board of Directors. Director compensation is a mix of cash and equity-based compensation, which is largely comprised of the equity component to align with the Company's long-term performance and stockholder interests. To enhance this alignment further, the Board increased the stock holding requirements for all outside directors and the CEO as discussed below.

The components of the compensation for directors who are not employees of the Company are as follows:

Board Compensation Element	Amount/Value
Annual Retainer	$70,000 [1]
Annual Equity Grant (Restricted Stock Units (RSUs))	$100,000 [2]
Committee Chairmanship	$15,000 [1]
Board Chairmanship	$40,000 [1]
Initial Equity Grant (Restricted Stock Units (RSUs))	$100,000 [3]

1 Paid in quarterly installments at the middle of each quarter

2 Awarded at second quarter Board meeting in an amount of shares calculated by dividing amount by the Company Common Stock closing stock price on the date of grant, rounded to the nearest 100 shares.

3 Awarded as of the first Board meeting following election or appointment and calculated in the same manner as the annual equity grant above but prorated by the number of quarters between such first meeting and the date on which the next annual equity grant is scheduled to be awarded.

Any initial equity grants and/or annual equity grants typically vest on the first anniversary of the grant date. All 2018 equity awards were granted under and subject to the terms of the Rudolph Technologies, Inc. 2018 Stock Plan.

In 2018, directors were not paid to serve on the committees of the Board of Directors with the exception of those directors serving as committee chairs during 2018. Mr. Berlinghieri (Nominating & Governance Committee Chairman), Mr. Whitten (Audit Committee Chairman through July 2018), Mr. Aukerman (Audit Committee Chairman beginning in July 2018), Mr. Berry (Compensation Committee Chairman through January 2018) and Mr. Miller (Compensation Committee Chairman beginning in January 2018), each received cash compensation in 2018 for their services as Committee Chairmen consistent with that cited in the table above. From time to time, directors may be compensated for work performed as members of special subcommittees of the Board of Directors. Notwithstanding the foregoing, no fees were paid to directors for special subcommittee work in 2018.

In 2018, Mr. Greig received the above referenced annual retainer for the independent Chairman of the Board as compensation for his service in this role through August 2018. Thereafter, Mr. Miller received the above referenced annual retainer for the independent Chairman of the Board as compensation for his service in this role for the remainder of 2018.

For the year ended December 31, 2018, the directors, excluding the directors who are named executive officers, received total compensation indicated in the table below. There were no option awards, non-equity incentive plan compensation, or pension and nonqualified deferred compensation earnings granted to such directors. They did not earn any type of compensation during the year other than what is disclosed in the following table:

Name	Fees Earned or Paid in Cash	Stock Awards (1)	All Other Compensation	Total
Jeffery A. Aukerman	$77,500	$100,595	$0	$178,095
Leo Berlinghieri	$85,000	$100,595	$0	$185,595
Daniel H. Berry	$71,250	$100,595	$0	$171,845
Vita A. Cassese	$17,500	$74,412	$0	$91,912
Thomas G. Greig	$100,000	$100,595	$0	$200,595
David B. Miller	$93,750	$100,595	$0	$194,345
John R. Whitten	$77,500	$100,595	$0	$178,095

(1) Represents the grant date fair value for each share-based compensation award granted during the year, calculated in accordance with FASB ASC Topic 718. The assumptions used in determining the grant date fair value of these awards are set forth in Note 9 to our consolidated financial statements, which are included in our Annual Report on Form 10-K for the fiscal year ended December 31, 2018 filed with the SEC. As of December 31, 2018, our directors had the following stock awards outstanding: Mr. Aukerman – 3,100 RSUs; Mr. Berlinghieri – 3,100 RSUs; Mr. Berry – 3,100 RSUs; Ms. Cassese – 3,900 RSUs; Mr. Greig – 3,100 RSUs; Mr. Miller – 3,100 RSUs; and Mr. Whitten – 3,100 RSUs.

Stock Ownership/Retention Guidelines For Directors

The Company has established guidelines related to stock ownership and retention for its outside directors. Currently, the guidelines require that each non-employee director of the Company own shares of Company Common Stock valued at a minimum of three (3) times the amount of the director's total cash compensation which includes the annual cash retainer as well as any additional fee paid to those individuals who are Committee Chairs, Lead Director or Chairman of the Board. For a new director the stock holding requirement is to be attained within three (3) years of his or her initial election or appointment to the Board.

PROPOSAL 2

ADVISORY VOTE ON EXECUTIVE COMPENSATION

The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, or the Dodd-Frank Act, enables our stockholders to vote to approve, on an advisory (non-binding) basis, the compensation of our named executive officers as disclosed in this proxy statement in accordance with SEC rules. Consistent with the recommendation of the Board of Directors and the preference of our stockholders as reflected in the non-binding advisory vote on the frequency of future advisory votes on named executive officer compensation held at the 2017 Annual Meeting of Stockholders, the Company currently holds an annual "say on pay" vote.

Our executive compensation arrangements are designed to enhance stockholder value on an annual and long-term basis. Through the use of base pay as well as annual and long-term incentives, we seek to compensate our named executive officers for their contributions to our profitability and success. Please read the Compensation Discussion and Analysis beginning on page 30 of this proxy statement and the tabular and additional narrative disclosures on executive compensation beginning on page 52 of this proxy statement for additional details about our executive compensation arrangements, including information about the fiscal year 2018 compensation of our named executive officers.

This advisory vote addresses the overall compensation of our named executive officers as well as our philosophy and policies regarding executive compensation practices as described in this proxy statement. We are asking our stockholders to indicate their support for our compensation arrangements as described in this proxy statement.

For the reasons discussed above, the Board recommends that stockholders vote in favor of the following resolution:

> "**RESOLVED,** that the Company's stockholders APPROVE, on an advisory basis, the compensation paid to the Company's named executive officers, as disclosed in this proxy statement pursuant to Item 402 of Regulation S-K, including the Compensation Discussion and Analysis, compensation tables and narrative discussion and other related tables and disclosures."

Because your vote is advisory, it will not be binding upon or overrule any decisions of the Board, nor will it create any additional fiduciary duty on the part of the Board. This advisory vote is not intended to address any specific item of compensation, but rather the overall compensation of our named executive officers and our compensation philosophy, policies and practices described in this proxy statement, and does not seek to have the Board or Compensation Committee take any specific action. However, the Board and the Compensation Committee value the view expressed by our stockholders in their vote on this proposal and will take into account the outcome of the vote when considering executive compensation matters in the future.

Vote Required

The affirmative vote, in person or by proxy, of a majority of the shares present or represented at the meeting and entitled to vote will be required to approve, on an advisory (non-binding) basis, the compensation of our named executive officers as disclosed in this proxy statement.

The Board recommends a vote "FOR" the approval of the compensation of the named executive officers as disclosed in this proxy statement pursuant to Item 402 of Regulation S-K as required by Section 14A(a)(1) of the Exchange Act.

PROPOSAL 3

RATIFICATION OF APPOINTMENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Although ratification by stockholders is not required by law, the Board of Directors is submitting the Audit Committee's selection of Ernst & Young LLP ("E&Y") as the Company's independent registered public accounting firm for fiscal year 2019 for ratification as a matter of good corporate governance and recommends that the stockholders vote for ratification of such appointment. In the event of a negative vote on such ratification, the Board of Directors will reconsider its selection. Even if the selection is ratified, the Audit Committee may appoint a new independent registered public accounting firm at any time during the year if the Audit Committee believes that such a change would be in the best interests of the Company and its stockholders. Representatives of E&Y, the independent registered public accounting firm presented herein, will be in attendance at the Annual Meeting and will have the opportunity to make a statement, if they desire to do so, and to respond to appropriate questions.

Independent Registered Public Accounting Firm Selection Process

Ernst & Young LLP has served as the Company's independent registered public accounting firm since March 2008. During this time, the firm has demonstrated:

- A high degree of independence and professionalism in their audit engagement with the Company;
- A solid record of partner and professional staff continuity;
- A knowledge of current and emerging accounting and auditing issues affecting the Company;
- A deep and ongoing understanding of the Company's business model and industry; and
- A readiness to assist the Company and the audit committee in keeping up-to-date with the latest accounting and auditing pronouncements and their application to the Company's business.

In making its selection of an independent registered public accounting firm, the Audit Committee assesses, among other factors:

- The performance of the independent registered public accounting firm in the prior year;
- The anticipated needs of the Company and ability of the accounting firm to address them in the coming year;
- The proposed fees for the coming year; and
- The potential impact of changing auditors for the coming year.

Ultimately, the decision of the independent registered public accounting firm is made with the best interest of the Company and its stockholders in mind.

Factors Used To Assess Independent Registered Public Accounting Firm Quality

Members of the Audit Committee have experience in dealing with audits of other public companies as well as experience with other accounting firms. After receiving proposals and presentations from a number of firms in 2008, the Audit Committee's basis for the selection of E&Y as the Company's independent registered public accounting firm included, among other considerations, E&Y's breadth of services and international footprint as well as expense considerations. On an ongoing basis, E&Y has been responsive, reliable and professional in their dealings with the Audit Committee and have appropriately assisted the Committee in its oversight of the Company's financial processes and financial statements. In addition, E&Y makes available to the Company specialists within their firm to assist in the audit when consultation on specific and unique issues arise. These processes appear to be effective in assisting E&Y with their audit engagement.

As a part of the Audit Committee's review of E&Y's qualifications, E&Y provides the Company with the firm-wide comments from the Public Company Accounting Oversight Board (PCAOB) regarding this Board's examinations of E&Y for the prior year. E&Y also updates the Company with the quality improvements that the firm has made as a result of the PCAOB comments as well as other changes to their quality and risk assessment processes.

Audit Committee's Involvement In The Lead Partner Selection

In keeping with their independence policy, E&Y employs a regular schedule of rotation of the both the lead engagement partner ("Lead Partner") and the support staff. This rotation provides for sufficient overlap of the new Lead Partner with the outgoing Lead Partner. This process allows for the members of the Audit Committee and the Company management to become familiar with the new Lead Partner and new staff and to introduce them to the Company's business. Prior to the new Lead Partner's full engagement, the Audit Committee and Company management meet with E&Y to review and offer feedback on the industry experience, financial acumen and anticipated fit of the new Lead Partner with the Company.

Policy On Audit Committee Pre-Approval Of Audit And Permissible Non-Audit Services Of Independent Registered Public Accounting Firm

The Audit Committee pre-approves all audit and permissible non-audit services provided by the Company's independent registered public accounting firm. These services may include audit services, audit-related services, tax and other services. Pre-approval is generally provided for up to one (1) year, and any pre-approval is detailed as to the particular service or category of services and is generally subject to a specific budget. The independent registered public accounting firm and management are required to periodically report to the Audit Committee regarding the extent of services provided by the independent registered public accounting firm in accordance with this pre-approval and the fees for the services performed to date. The Audit Committee may also pre-approve particular services on a case-by-case basis. During 2018, all services provided by Ernst & Young LLP were pre-approved by the Audit Committee in accordance with this policy.

Fees Billed To The Company By Ernst & Young LLP For 2018 And 2017

For the years ended December 31, 2018 and 2017, aggregate fees for professional services rendered by our independent registered public accounting firm, Ernst & Young LLP, in the following categories were as follows:

Fees	**2018**	**2017**
Audit	$1,066,402	$1,160,779
Audit Related	31,500	31,500
Tax	47,620	111,250
All Other	2,000	1,995
Total	**$1,147,522**	**$1,305,524**

Audit Fees

Audit fees for the years ended December 31, 2018 and 2017 were for the audit of the Company's annual financial statements and a review of those financial statements included in the Company's quarterly reports on Form 10-Q and may include services that are normally provided by the independent registered public accounting firm in connection with regulatory filings or engagements including any comfort letters and consents for financings and filings made with the SEC.

Audit Related Fees

Audit related fees for the years ended December 31, 2018 and 2017 were for assurance and related services that are reasonably related to the performance of the audit or review of the Company's annual financial statements and are not reported under "Audit Fees," specifically fees for employee benefit plan audits.

Tax Fees

Tax fees may include fees for tax compliance, tax planning and tax advice. Tax fees for the years ended December 31, 2018 and 2017 were for tax advice.

All Other Fees

All other fees would consist of fees for products and services other than the services described above. For the years ended December 31, 2018 and 2017, all other fees included payments for an accounting and auditing information tool.

Negotiation of the annual independent registered public accounting firm fees is the responsibility of the Audit Committee with the support of the Company's CFO. All of the fees listed in the chart above were pre-approved by the Audit Committee, which concluded that the provisions of such services by Ernst & Young LLP were compatible with the maintenance of that firm's independence in the conduct of its audit functions.

Vote Required

The affirmative vote, in person or by proxy, of a majority of the shares present or represented at the meeting and entitled to vote will be required to ratify Ernst & Young LLP as the Company's independent registered public accounting firm for the year ending December 31, 2019.

The Company's Board of Directors unanimously recommends voting "FOR" the ratification of the appointment of Ernst & Young LLP as the Company's independent registered public accounting firm for the year ending December 31, 2019.

AUDIT COMMITTEE REPORT

The following is the Audit Committee's report submitted to the Board of Directors for the year ended December 31, 2018.

The Audit Committee of the Board of Directors has:

- reviewed and discussed with management and with Ernst & Young LLP, the Company's independent registered public accounting firm, together and separately, the Company's audited consolidated financial statements contained in its Annual Report on Form 10-K for the year ended December 31, 2018;
- discussed with Ernst & Young LLP, the matters required to be discussed by Statement on Auditing Standards No. 1301, Communications with Audit Committees;
- received the written disclosures and the letter from Ernst & Young LLP required by applicable requirements of the Public Company Accounting Oversight Board regarding the independent registered public accounting firm's communications with the Audit Committee concerning independence, and has discussed with Ernst & Young LLP its independence; and
- discussed and reviewed with the Company's manager - internal audit ("Mgr-IA") and Ernst & Young LLP, with and without management present, the Company's work in complying with the requirements of Section 404 under the Sarbanes-Oxley Act of 2002 regarding internal controls over financial reporting. In connection therewith, the Audit Committee also discussed with the Mgr-IA, with and without other members of management present, management's assessment of the effectiveness of internal controls over financial reporting as of December 31, 2018. The Audit Committee also discussed Ernst & Young LLP's audit report on internal controls over financial reporting as of December 31, 2018 with management and Ernst & Young LLP.

Based on the foregoing review and discussions, the Audit Committee recommended to the Board of Directors that the audited financial statements be included in the Company's Annual Report on Form 10-K for the year ended December 31, 2018.

THE AUDIT COMMITTEE

Jeffrey A. Aukerman (Chairman)
Vita A. Cassese
David B. Miller
John R. Whitten

EXECUTIVE COMPENSATION

COMPENSATION DISCUSSION AND ANALYSIS

This Compensation Discussion and Analysis contains a discussion of the material elements of compensation awarded to, earned by, or paid to the Company's "Named Executive Officers" listed in the table below ("NEOs"), including our principal executive officer, the principal financial officer, and the next three most highly compensated executives of the Company in 2018.

Rudolph Technologies' Named Executive Officers (NEOs)	
Name	**Title**
Michael Plisinski	**Chief Executive Officer**
Steven Roth	**Senior Vice President, Finance and Administration and Chief Financial Officer**
Robert Koch	**Vice President and General Counsel**
Richard Rogoff	**Vice President and General Manager, Lithography Systems Group**
Elvino da Silveira	**Vice President, Business Development**

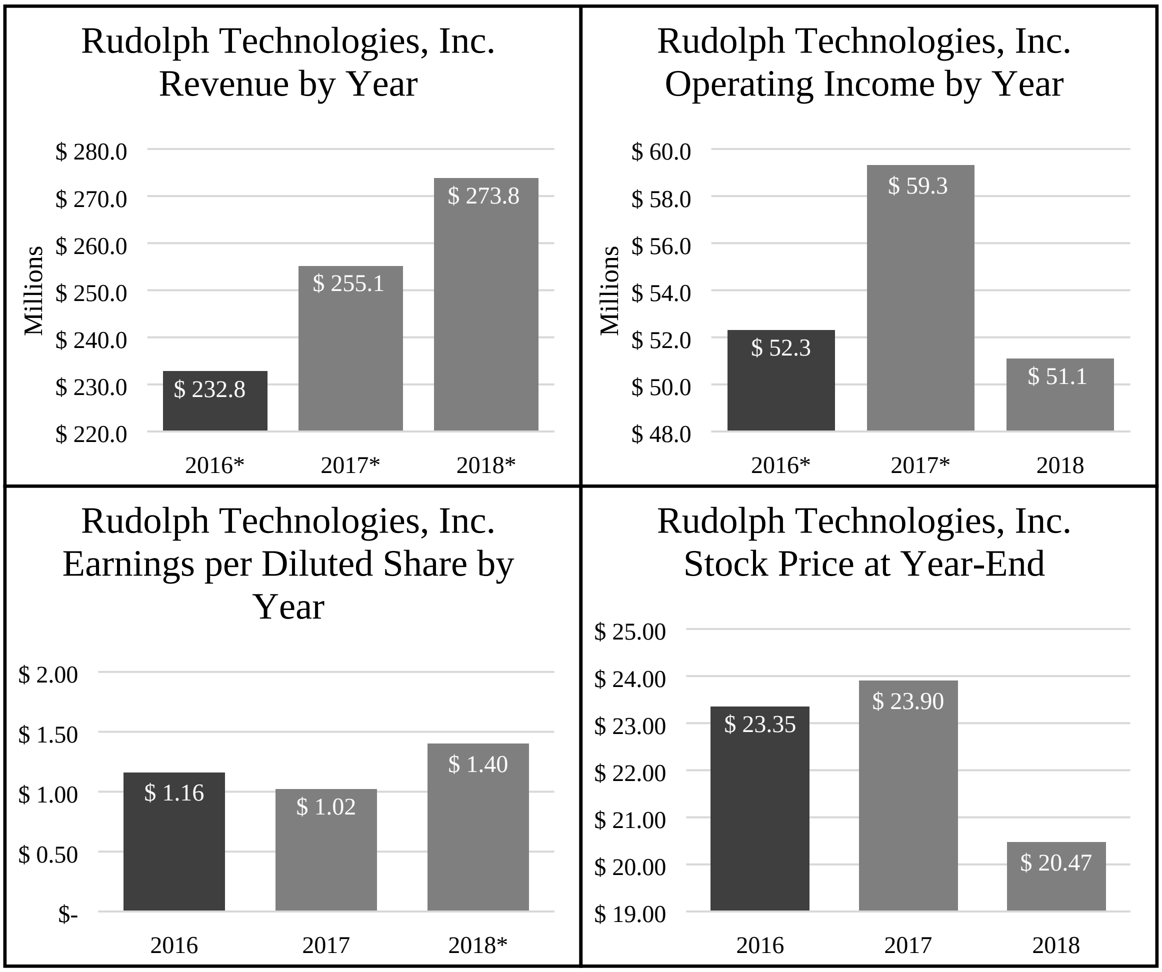
EXECUTIVE SUMMARY

Our Business

We are a global leader in the design, development, manufacture and support of defect inspection, lithography, process control metrology, and process control software used by semiconductor and advanced packaging device manufacturers worldwide. We also provide services relating to the maintenance and repair of our products, installation services and training. Semiconductor capital equipment is our primary served market.

2018 Financial Highlights

In 2018, for the first time in the Company's public company history, the Company realized its fourth consecutive year of record sales. In addition, the Company maintained its operating income performance consistent with the two prior years. Both of these achievements helped to drive strong financial performance in 2018. The following reflects some of our financial accomplishments in 2018 as compared to 2017 and 2016:



*Record Year

Results Of Our 2018 Stockholder Vote On Executive Compensation

Our Board recognizes the fundamental interest our stockholders have in the compensation of our executive officers. At our 2018 Annual Meeting, 96% of stockholders present at the meeting voted in favor of our advisory vote on executive compensation. Our stockholders also responded favorably to our 2018 Stock Plan, which was approved by stockholder vote on May 16, 2018.

COMPENSATION PROGRAM OBJECTIVES, DESIGN AND PRACTICES

Our Compensation Philosophy And Principles

Rewarding continuous improvement in financial and operating results and the creation of stockholder value are key attributes of our compensation philosophy, which serves as the framework for the Company's executive compensation program. The Compensation Committee of the Board of Directors of the Company (referred to as the "Committee" or the "Compensation Committee") has developed a set of core objectives and principles that it has used to develop the executive compensation program. The specific objectives of our executive compensation program are to:

- Attract, retain, and motivate executive talent;
- Align compensation with Company and individual performance; and
- Foster an ownership mentality that aligns our executives' interests with stockholder interests.

Consistent with the foregoing, the Compensation Committee believes that the most effective executive compensation program is one that is designed to reward the achievement of specific strategic and operating goals of the Company on both an annual and a long-term basis, and which aligns our executives' interests with those of our stockholders. The Compensation Committee evaluates both performance and compensation to ensure that the Company maintains its ability to attract and retain superior employees in key positions. Based on that evaluation, the Compensation Committee designs the compensation provided to key employees to remain competitive relative to the compensation paid to similarly situated executives at competitor companies. The Compensation Committee believes executive compensation packages provided by the Company to its executives, including the NEOs, should include base salary, annual cash incentive opportunities, select perquisites and stock-based compensation, including equity incentive opportunities which rewards performance as measured against pre-established goals.

The following principles support the objectives and design of the compensation program:

- The compensation program is designed to be fair and competitive, from an internal and external perspective, taking into account the role, unique qualifications and distinct responsibilities of each executive;
- A substantial portion of an executive's compensation is designed to be at risk and linked to the achievement of both corporate and individual goals and changes in stockholder value;
- A retirement provision which is designed to provide financial stability following employment but will not be the focal point of why executives choose to work for the Company;
- The use of select, limited perquisites and other executive benefits are designed to serve a business purpose; and
- All compensation program elements taken as a whole are designed to help focus executives to achieve the Company's financial and strategic goals.

To underscore the importance of "pay-for-performance" in our compensation philosophy and our Company's culture, the Compensation Committee has developed incentive arrangements based on performance standards established at levels which the Committee believes, at target achievement, will incentivize our executives to meet or exceed industry performance. The incentive component of the Company's executive compensation program, also referred to as the Key Executive Incentive Compensation Plan, rewards executives for achieving specific corporate, business unit and individual goals as well as strategic and operational measures depending on the executive involved.

Our long-term incentive program includes grants of performance-based stock units ("PSUs") which are earned based on the achievement of Total Shareholder Return ("TSR") performance relative to peers over a three (3) year period. Our long-term incentive program also includes service-based RSUs, which vest in equal annual increments over time. All grants are currently made under the stockholder approved Rudolph Technologies, Inc. 2018 Stock Plan and shares earned and vested are subject to the Company's stock ownership and retention guidelines.

The Company strives to promote an ownership mentality among its key leadership and the Board of Directors, in part through the guidelines described below under the heading "Stock Ownership/Retention Guidelines." We believe this "skin in the game" approach further mitigates the incentive to take on unnecessary risks. To that end, a stock ownership requirement for independent directors has been established such that the minimum number of shares to be held by each director is equivalent in value of three (3) times their respective total annual cash compensation. For the CEO, the stock ownership requirement reflects a minimum share ownership equivalent in value to three (3) times the CEO's year-end base salary. As for the NEO's, the stock ownership requirement reflects a minimum share ownership equal to the NEO's current year-end base salary. In further support of this approach, our Board of Directors previously established an anti-pledging and anti-hedging policy to ensure that personal interests relating to the stock holdings of officers and directors do not conflict with their duties to the Company.

NEO Compensation Elements

Our executive compensation program is generally comprised of four parts, each intended to address different objectives: base salary, annual cash performance incentives, long-term equity incentives, which generally are in the form of both performance-based vesting and service-based vesting RSU grants, and limited perquisites.

The table below highlights the foregoing key elements of our executive compensation structure.

NEO Compensation Elements

Element	Form	Description
Base Salary	**Fixed Cash Compensation**	Competitive cash compensation that takes into consideration the scope and complexity of the role, individual qualifications, experience, and internal value to the Company.
Annual Cash Incentive Plan	**Annual Performance-Based Cash Compensation**	Annual cash incentive contingent on meeting performance criteria related to corporate, business unit/department, and individual performance objectives.
Long-Term Equity Incentive Program	**Performance- and Time-Based Restricted Stock Units**	A set percentage of PSUs that are earned based on TSR performance relative to peers, with remaining percentage of the RSUs vesting incrementally over a fixed period.
Executive Perquisites	**Monthly car allowance** **Income tax preparation** **Airline club membership**	Limited perquisites, consistent with market practice, that promote efficient use of executives' time and attract and retain executive talent.

The Compensation Committee aligns the Key Executive Incentive Compensation Plan, which encompasses our annual cash incentive plan and long-term incentive equity program, with the Company's performance relative to pre-established performance goals based on the Company's stated financial objectives, historical performance, and anticipated market and economic conditions for the performance period.

In adopting this design, the Compensation Committee considered a number of parameters, including the advice of its independent compensation consultant, comparable practices within the industry and the desire to achieve the goals underlying the compensation program. The Compensation Committee believes that as a result of this program the Company has been able to attract, retain and motivate executives and reward the achievement of strategic, operational and financial goals, thereby enhancing stockholder value.

Our Compensation Practices

The Compensation Committee has adopted the following practices and policies with respect to the Company's executive compensation program:

What We Do	
Committee Independence	The Compensation Committee consists of independent directors and reserves time at each meeting to meet in executive session without management present.
Independent Compensation Consultant	The Compensation Committee has engaged its own independent compensation consultant and annually assesses the consultant's performance, independence, and whether any potential conflicts of interest exist.
Independent Legal Advisor	The Compensation Committee has engaged its own independent legal advisor specializing in corporate compensation issues, as necessary.
CEO Goal Setting and Performance Evaluation	The Compensation Committee, with the input of the full Board, engages in formal goal setting and performance evaluation processes with the CEO.
Peer Group	The Compensation Committee has established formal criteria for the selection of peer group companies used as a competitive reference point with respect to executive and director compensation, program design and practices, and financial and stock performance.
Share Ownership Guidelines	The Company maintains rigorous share ownership guidelines, which apply to executives and directors, and serve as a risk-mitigating feature within our compensation structure.
Double Trigger Change-in-Control	The Company has entered into employment agreements with senior executives, including the CEO, that contain change-in-control severance protection. Executives are entitled to severance in the event of both a change-in-control of the Company and a qualifying termination of employment ("double trigger").
Clawback Policy	The Company has adopted a policy that provides for the recovery or adjustment of amounts previously awarded or paid to a NEO in the event that financial results or other performance measures on which the award or payment were determined are restated or adjusted.
What We Don't Do	
Anti-Hedging and Pledging Policies	The Company's insider trading policy prohibits hedging transactions related to our Common Stock. Additionally, under the Company's anti-pledging policy, non-employee directors and executive officers are prohibited from making any new pledges of Company securities as collateral for a loan, or otherwise making a new transfer of Company securities to a margin account.
Tax Gross-Ups on Perquisites or Severance	The Company does not provide any tax gross-up payments to cover personal income taxes on perquisites or severance benefits related to a change-in-control.

Compensation Consultant

From time to time, the Compensation Committee has engaged the services of outside compensation consultants to provide advice on compensation plans and issues related to the Company's executive and non-executive employees. In 2018, the Committee again engaged Pay Governance LLC, an independent executive compensation consulting firm, to provide advice on the Company's executive compensation arrangements. Pay Governance LLC does not provide any services other than those related to compensation consulting and does not provide any services to Company management. The Committee has determined that Pay Governance LLC is independent within the meaning of the Compensation Committee Charter and NYSE listing standards, and the work of Pay Governance LLC for the Committee does not raise any conflicts of interest.

Independent Legal Counsel

The Compensation Committee has engaged, as necessary, the services of independent outside legal counsel for compensation issues. No independent counsel was engaged for compensation issues in 2018.

Role Of Executives In Establishing Compensation

The Compensation Committee makes all determinations regarding executive compensation subject to approval by the independent members of the Board. On an annual basis, the Committee evaluates our CEO's performance in light of the goals and objectives established for measuring his or her performance at the beginning of the previous fiscal year. The results of this evaluation guide the Committee in setting our CEO's salary, cash incentive award opportunity and equity compensation. The CEO does not participate in the Compensation Committee's or Board's deliberations regarding his or her compensation.

With regard to compensation for executives other than the CEO, the Committee seeks input from the CEO. Each year, the CEO is responsible for establishing proposed personal and corporate objectives for each of the Company's other executives, including our other NEOs. These objectives, subject to the approval of the Compensation Committee, are reviewed and agreed upon by the CEO with the executive. In addition, as part of the annual performance review of the Company's executives, the CEO assesses the performance of his or her direct reports and recommends any merit increase to be proposed for each individual. These recommendations are compiled by the CEO into executive compensation plans which include any proposed merit increases, each executive's personal and corporate objectives, proposed annual incentive award opportunities (expressed as a percentage of their base salary) and equity grant proposals, and are submitted to the Compensation Committee for review and consideration for approval. At the Compensation Committee meeting during which the executive compensation plans are reviewed, the CEO attends the initial session to present the proposed plans and to answer questions. Thereafter, the Compensation Committee meets without the CEO present to review, discuss and recommend for approval all executive compensation plans, subject to any modifications made by the Committee. The Committee then recommends such compensation packages to the independent members of the Board of Directors for approval.

Compensation Committee Activity

During 2018, the Compensation Committee met five (5) times. As discussed above, in early 2018 the Company's CEO met with the Compensation Committee to present the proposed compensation plans for each of the Company's executives as well as the proposed incentive award opportunities under the 2018 Employee Cash Bonus Program for certain non-executive employees. At each of its meetings held during 2018, the Compensation Committee met in executive session, without the presence of the CEO or any other Company executives, to review the relevant compensation matters.

In 2018, the Compensation Committee took a number of actions. These included reviewing and recommending for approval by the independent members of the Board:

- the annual compensation of the Company's CEO for 2018;
- annual compensation for each of our other executive officers for 2018;
- the Key Executive Incentive Compensation Plan and Employee Cash Bonus Programs for 2018; and
- the service-based and performance-based equity incentive awards and related performance targets for the Company's executives for 2018.

In reviewing and setting the annual compensation for each executive of the Company, the Compensation Committee considered the amounts payable under each of the elements of their respective compensation plans, including base salary, annual cash incentive awards, equity grants and perquisites. The Committee took into consideration both the Company's internal pay equity as well as the competitive environment within which the Company operates. In each instance, the Committee determined that the base salary and annual and long-term incentive award opportunities for the individual executives were at an acceptable level for 2018 and that the perquisites were appropriate for the related positions.

In late 2018, the Compensation Committee, reviewed our annual- and long-term incentive programs for 2019. At this time, measures were again selected that were determined to be consistent with advancing the interests of the Company's stockholders and aligning and supporting the Company's business strategy.

Based on the foregoing, in early 2019, the Compensation Committee met and took a number of actions. These included the review and recommendation for approval by the independent members of the Board of:

- the annual compensation of the Company's CEO for 2019;
- the annual compensation for each of our other executive officers for 2019;
- the Key Executive Incentive Compensation Plan and Employee Cash Bonus Programs for 2019; and
- the service-based and performance-based equity incentive awards and related performance targets for the Company's executives for 2019.

Peer Companies

In order to meet its objective of maintaining competitive executive compensation packages, the Committee obtains third-party compensation information from time to time and reviews executive compensation programs of comparable, publicly held, high technology companies.

The Committee has engaged independent compensation consultants at various times in the development and evaluation of its compensation programs. To the extent that independent compensation consultants are not engaged to consult with the Committee with respect to compensation for a position or time period, the Committee obtains market compensation information using internal resources at the Company. The Committee reviews data related to compensation levels and programs of other similar companies prior to making its decisions, but only considers such information in a general manner in order to obtain a better understanding of the current compensation practices within our industry. In the fall of 2012 and through 2019, the Committee engaged Pay Governance LLC to provide peer group data and perform an assessment of compensation levels provided to executives.

Data representing company proxy disclosures and industry compensation surveys was used in conducting this assessment. The peer group of industry related companies that was developed was based generally on the following criteria:

- Semiconductor equipment industry (publicly traded companies);
- Revenues of approximately $500 million or less;
- Market capitalization of less than $1 billion; and
- Competitors for business and employee talent.

Since the initially establishing a compensation peer group with advice of our compensation consultant, our list of peer companies has evolved. Companies have been removed over time due to being acquired or a re-evaluation of the fit with the Company's peer group criteria, while other companies have been added. The peer group for the 2019 and 2018 review (which was used to make decisions regarding the respective year's compensation), as approved by the Committee, consisted of the following companies.

Companies Included In Compensation Peer Group For 2019		
Advanced Energy Industries, Inc.	Cohu, Inc.	Maxwell Technologies, Inc.
Amtech Systems, Inc. (1)	DSP Group, Inc.	Nanometrics Incorporated
Axcelis Technologies Inc.	EMCORE Corporation	Sigma Designs, Inc.
Brooks Automation Inc.	FormFactor Inc.	Veeco Instruments, Inc.
Companies Included In Compensation Peer Group For 2018 But Excluded For 2019		
Electro Scientific Industries, Inc. (1)	Xcerra Corporation (1)	

(1) Removed in 2019 due to being acquired by another company.

The pay practices of the foregoing peer group were analyzed for base salary and short-term and long-term incentives. Periodically, peer groups are used to evaluate other programs such as executive retirement, perquisites and severance policies. Our peer group data is supplemented by broader technology industry data from compensation surveys to further facilitate the evaluation of compensation levels and design. Compensation levels are generally developed at the low (25th percentile), middle (50th percentile) and high (75th percentile) end of the market for each pay element (base salary and short-term and long-term incentives) and for total compensation.

While the Committee considers market data for each pay element and in total, the Committee does not specifically target any particular market compensation level. Instead, the Committee uses its discretion in setting the compensation levels as appropriate.

2018 AND 2019 ELEMENTS OF OUR COMPENSATION PLANS

Compensation Program Design

The compensation program provided to the Company's executive officers is generally comprised of four parts, each intended to address different objectives: base salary, annual cash performance incentive awards, long-term incentives that generally are in the form of both performance-based stock units and service-vesting RSU grants, and limited perquisites. Executives are also entitled to participate in benefit programs available to all Company employees, such as our ESPP and 401(k) Plan. This design was adopted for executives by the Committee taking into consideration a number of parameters including the independent compensation consultant's advice, comparable practices within the industry and the desire to achieve the goals underlying the compensation program. The Committee believes that as a result of this program the Company can attract, retain and motivate employees and reward the achievement of strategic operational and financial goals, thereby enhancing stockholder value.

Annually, the Committee reviews the elements of the compensation package as well as the overall package afforded to the executives. At this time, the Committee, in its discretion, can recommend adjustments to the elements of the program to the independent members of the Board of Directors for review and approval. This review would typically be performed coincident with the evaluation of the individual executive's performance in relation to their Key Executive Incentive Compensation Plan goals, salary adjustment and equity grants, if any, as discussed below.

The Committee and Board believe that each of the elements as well as the entire compensation package for Company executives is appropriate for the Company given its performance, industry, current challenges and environment.

Based on the objectives discussed in the foregoing section, the Committee seeks to structure our equity and cash incentive compensation program to motivate executives to achieve the business goals set by the Company and reward the executives for achieving such goals, which we believe aligns the financial incentives of our executives with the interests of our stockholders. The Committee primarily uses salary, perquisites and other executive benefits as a means for providing base compensation to employees for their knowledge and experience and for fulfilling their basic job responsibilities.

In establishing these components of the executive compensation package, it is the Committee's intention to set total executive compensation at a sufficient level to attract and retain a strong motivated leadership team, while remaining reasonable and in line with stockholder perception of overall fairness of executive compensation.

Base salary levels for executive officers of the Company have been generally established at or near the start of each year. The Company's annual executive cash incentive bonuses are administered through its Key Executive Incentive Compensation Plan. The plan provides guidelines for the calculation of annual non-equity incentive-based compensation, subject to the Committee's oversight and the Company's and executive's achievement of corporate and individual goals. Generally, at its first meeting each year, the Committee determines final bonuses for executive officers earned in the preceding year based on each individual's performance and the performance of the Company through its audited financial statements, and also reviews the incentive program to be established for the current year and approves the group of executives eligible to participate in the plan for that year.

Each of the Company's executives, including our NEOs, is eligible to receive equity compensation, which has recently been in the form of PSU and RSU grants under the Company's stockholder approved 2018 Stock Plan. All full-time and part-time employees are eligible for equity grants. The Committee believes that through the Company's broad-based equity compensation plan, the economic interests of all employees, including the executives, are more closely aligned with those of our stockholders. It is also believed that this approach will allow the Company to use equity as an incentive in a balanced manner that supports the recruitment and retention of top talent.

The Committee generally recommends for approval by the independent members of the Board the grant of equity awards at the first regularly scheduled meeting of the Board or upon completion of the Committee's review and approval process. The Committee and the Board do not generally grant equity awards at other times during the year, other than in the case of a new hire, promotion or other exceptional circumstances.

Impact Of Performance On Compensation

The performance of the Company and of the executive has a direct impact on the compensation received by such executive from the Company. On an annual basis, the CEO reviews the performance and compensation for the Company's executives to determine any potential salary adjustment for each individual. This assessment takes into consideration a number of factors, including the Company's profitability; the performance of applicable business units; the executive's individual performance and measurable contribution to the Company's success; and pay levels of similar positions with comparable companies in the industry and within similar technology industries.

In addition, both Company and individual performance are assessed by the CEO when proposing to the Committee any annual cash incentive payout to the NEOs (other than the CEO) under the annual cash incentive component of their Key Executive Incentive Compensation Plan. The plan includes various incentive level opportunities based on the executive's accountability and impact on Company operations, with target award opportunities that are established as a percentage of base salary. Typically, these targets range from 30% to 100% of base salary for the executives in the plan. For our NEOs, 2018 and 2019 target annual cash bonus opportunities were set as follows:

Name	Target Annual Cash Incentive Percentage	
	2019	2018
Michael P. Plisinski	100.0%	100.0%
Steven R. Roth	60.0%	60.0%
Robert A. Koch	40.0%	35.0%
Richard Rogoff	45.0%	45.0%
Elvino da Silveira	40.0%	40.0%

Under the annual cash incentive component of our Key Executive Incentive Compensation Plan, payout is based upon achievement of corporate and personal objectives with no payout unless the Company meets the threshold level of at least one of the Board approved corporate financial targets established as part of the plan. Personal objectives are awarded only upon clear achievement of the associated goal. Failure to meet the personal objectives thereby has a negative impact on the ultimate bonus payout.

In addition to a review of the prior year's objectives, the CEO and each executive also confer to propose new individual performance targets for the executives (including the NEOs, other than the CEO) for the current year, which are combined with the corporate targets into an annual cash incentive opportunity proposal. The personal targets that are established are designed to result in additional incremental value to the Company if they are achieved. These personal performance targets in 2018 included goals related to additional corporate and/or business unit financial measures, operational measures and activities, transactional activities, and marketing initiatives, depending on the executive involved. The target level of the corporate component to the bonus goals was set based on the Company's financial budget established by the Board at the beginning of the year. The determination of these goals is made annually to meet the changing nature of the Company's business.

Upon completion of the prior year's results and prior to implementation of the current year's proposed Key Executive Incentive Compensation Plan, the results for each participating executive employee are submitted to, and reviewed by, the Compensation Committee, which considers the CEO's recommendations for executives other than the CEO and determines the final bonus earned by each executive based on Company and individual performance. The Compensation Committee then establishes the Company and individual metrics applicable to the current year's Key Executive Incentive Compensation Plan. Thereafter, the Committee's recommendations are presented to the independent members of the Board for approval of the achieved incentive payment, if any, and of the new plan for the current year. If, during the year, there are changes to the Key Executive Incentive Compensation Plan that are proposed, such changes are presented to the Compensation Committee for its consideration. The Compensation Committee may exercise discretion in relation to its recommendation to the independent members of the Board regarding an individual's award under the Key Executive Incentive Compensation Plan based upon its review.

An executive's role, responsibilities, individual performance and contribution to the Company are factors considered in determining the size of any discretionary equity grant that may be recommended by the Compensation Committee to the independent members of the Board of Directors for approval as long-term incentive to the individual.

Based upon the foregoing, the compensation that an executive may realize in the course of a year can be impacted by the positive or negative performance of such individual as well as Company performance. We intend for an individual's compensation under the Key Executive Incentive Compensation Plan to be proportionate to the Company's and his or her performance against established goals. Similarly, equity awards that are performance-based are intended to be proportionate to the Company's performance under goals established for the Company. This review and evaluation are more subjective when applied to salary adjustments. In this case, an executive's performance is evaluated by taking into consideration the executive's contribution to the Company, the significance of the individual's achievements in relation to the overall corporate goals and mission, and the executive's effectiveness in his or her role within the Company and then weighed against the performance of other executives. Industry norms and reference to comparative company data are considered to the extent appropriate. Thus, there is no precise, objective formula that is applied in determining salary adjustments.

Compensation Plan Design And Decisions For 2018 And 2019

For 2018, the Compensation Committee conducted a review of our compensation programs and determined that the 2018 NEO compensation plan would retain the same four basic elements as the prior year's plan as these align our programs with our current business strategy and include the pay for performance aspect of our executive compensation program. Taking into account the Company's 2017 performance and outlook for 2018, each NEO's performance and responsibilities, and current market compensation rates for each NEO position, among other criteria, the Compensation Committee recommended, and the Board approved the updated program and compensation plan structure for our NEOs as detailed below.

Further, for 2019, the Committee determined that the 2019 NEO compensation plan would retain the same four basic elements as the 2018 plan. Taking into account the Company's 2018 performance and outlook for 2019, each NEO's performance and responsibilities, and current market compensation rates for each NEO position, among other criteria, the Compensation Committee recommended, and the Board approved the program and compensation plan structure for our NEOs also as detailed below.

Base Salary

The Company provides executives and other employees with base salary to compensate them for services rendered during the fiscal year. Base salaries for executive officers are established considering a number of factors, including the executive's:

- Individual performance;
- Unique qualifications;
- Role and responsibilities;
- Measurable contribution to the Company's profitability and success; and
- The base salary levels of similar positions with comparable companies in the industry.

The Compensation Committee supports the compensation philosophy of moderation for elements such as base salary and perquisites and other executive benefits. As noted above, under "Impact of Performance on Compensation," base salary decisions are made as part of the Company's formal annual review process and are influenced by the performance of the Company and the individual.

The CEO's recommendations for salary adjustments (other than his or her own) are reviewed and modified as deemed appropriate by the Compensation Committee and presented to the independent members of the Board for approval.

Base Salary For 2018

The Compensation Committee approved a 9.4% increase to the CEO's base salary and increases ranging from 2.0% to 3.0% for the base salaries of each of our other NEOs for 2018. The CEO's increase was approved in order to bring the CEO's base salary within the median of the Company's 2018 Compensation Peer Group, as defined above in the "Peer Companies" section. There were no increases due to promotions for any NEO in 2018.

Base Salary For 2019

For 2019, the Compensation Committee approved a 3.0% increase to the CEO's base salary and increases ranging from 2.0% to 3.0% for the base salaries of each of our other NEOs.

Annual Cash Incentive Compensation

An executive's annual cash incentive award under the Key Executive Incentive Compensation Plan generally depends on the financial performance of the Company relative to profit, revenue and other financial targets and the executive's individual performance. The incentive opportunity is generally set at a higher percentage for more senior officers, with the result that such officers have a higher percentage of their potential total cash compensation at risk. All executive employees, including all of our NEOs, participate in the Company's Key Executive Incentive Compensation Plan, if and when established, which is designed to generate additional incentive for maximizing the employee's performance in realizing the corporate strategic and financial goals and mission.

The Compensation Committee may, but is not required to, establish a Key Executive Incentive Compensation Plan for any given year.

When implemented, an executive may earn an annual incentive award due to success as it relates to the executive's individual goals, as long as the Company's financial performance meets at least the threshold level of at least one of the corporate financial performance goals.

Upon completion of the year, the individual's and the Company's results with respect to the performance targets are then assessed and presented to the Committee. The Committee reviews the proposed payouts and suggests changes to the extent it deems such action necessary. Key Executive Incentive Compensation Plan awards are paid out following completion of the annual audit by the Company's independent registered public accounting firm. This generally occurs in the first quarter of each year.

Annual Cash Incentive Plan For 2018

Consistent with prior years, the annual cash incentive component of the 2018 Key Executive Incentive Compensation Plan ("2018 Plan") included corporate goals, business unit or department goals (if applicable) and personal goals. The 2018 Plan was established such that each NEO's potential cash award was subject to the achievement of 2018 corporate financial objectives relating to corporate revenue and non-GAAP operating income ("Corporate Goals"). Earning of the potential cash award under the 2018 Plan would begin upon achieving 80% of the corporate revenue target and/or 70% of the corporate non-GAAP operating income target. As in prior years, had the Company not reached either of the corporate revenue or non-GAAP operating income threshold levels, then no payout whatsoever under the 2018 Plan would have been earned by the executives.

For those NEOs who were associated with a particular Company business unit or department, a portion of their cash bonus potential was allocated to business unit/department financial performance goals. In 2018, these goals were the achievement of 2018 business unit revenue and non-GAAP operating income objectives ("Business Unit Goals"). Earning of the potential cash award apportioned to the Business Unit Goals would begin upon achieving 85% of the business unit revenue target and/or 85% of the business unit non-GAAP operating income target.

The final component of the 2018 Plan was the inclusion of personal performance goals that were specific to the individual NEO. The NEO personal performance goals in 2018 included targets related to senior management planning, additional corporate financial measures, operational measures and activities, product development measures or marketing initiatives, depending on the executive involved. Cash bonuses arising from the personal performance goals were drafted to be awarded on an "each or nothing" basis.

Provided that either of the Corporate Goal performance thresholds was met, then the cash incentive component of the 2018 Plan was designed and administered as follows:

- Cash bonuses arising from the Corporate Goals and the Business Unit Goals were awarded starting at a 50% level at the respective goal threshold and increasing linearly up to the 2018 Plan target amounts.
- If the 2018 Plan target was exceeded in either or both Corporate Goal categories, then the cash payout would increase as follows:
  - Corporate Revenue: From 100% to 120% of target, additional cash compensation would be earned linearly up to 200% of this target.
  - Non-GAAP Operating Income: From 100% to 130% of target, additional cash compensation would be earned linearly up to 200% of this target.
- Upon achieving either of the Corporate Goals, the Business Unit Goals, if applicable, and personal performance goals could be earned in full.
- No further cash payout would be realized if either of the Business Unit Goals was exceeded.

The targets established in 2018 for the Corporate Goals, Business Unit Goals and Personal Goals were of comparable difficulty compared to prior years.

For 2018, the target cash incentive percentages remained unchanged for each of the NEOs as compared to the prior year. Additionally, of the NEOs, only Mr. Rogoff had a portion of his potential cash bonus allocated to Business Unit Goals in 2018.

In each year the Company has offered the Key Executive Incentive Compensation Plan, the corporate targets have been established at levels in excess of the overall industry projections in order that the Company drive to outperform the industry. In 2017, the Company achieved 102.2% of the corporate revenue and 113.0% of the non-GAAP operating income goals. The Company achieved the following performance results (dollars in millions) in 2018:

Performance Measure	Threshold	Target	Maximum	Actual Performance Achieved	Actual Performance Achieved as Percentage of Target
Corporate Revenue	$236.6	$295.8	$355.0	$273.8	81.4%
Non-GAAP Operating Income (1)	$49.1	$70.2	$91.3	$58.7	72.7%

(1) This non-GAAP financial measure excludes the impact of amortization of intangibles and share-based compensation expenses.

The following tables reflect the 2018 Plan performance component percentages at target and based on actual achievement for each NEO for 2018:

	Corporate Target Variable Components		Business Unit / Department Target Fixed Components		
Name	Revenue	Non-GAAP Operating Income	Revenue / Gross Margin	Operating Income / Market Share	Personal Goals
Michael P. Plisinski	35%	35%	n/a	n/a	30%
Steven R. Roth	35%	35%	n/a	n/a	30%
Robert A. Koch	35%	35%	n/a	n/a	30%
Richard Rogoff (1)	15%	15%	20%	20%	30%
Elvino da Silveira	35%	35%	n/a	n/a	30%

(1) Mr. Rogoff's Business Unit Target Variable Components were Business Unit Revenue and Business Unit Operating Income.

	Corporate Achieved Variable Components		Business Unit / Department Achieved Fixed Components			
Name	Revenue	Non-GAAP Operating Income	Revenue / Gross Margin	Operating Income / Market Share	Personal Goals	Total Achieved
Michael P. Plisinski	28.5%	25.4%	n/a	n/a	22.0%	75.9%
Steven R. Roth	28.5%	25.4%	n/a	n/a	27.5%	81.4%
Robert A. Koch	28.5%	25.4%	n/a	n/a	22.0%	75.9%
Richard Rogoff	12.2%	10.9%	0%	0%	18.0%	41.1%
Elvino da Silveira	28.5%	25.4%	n/a	n/a	10.0%	63.9%

In 2018, while the Company exceeded the threshold levels of the corporate revenue and non-GAAP operating income financial performance goals established under our annual and long-term incentive program, our NEOs did not meet all of their individual metrics established under our annual incentive program. As a result, our NEOs earned cash bonus awards for 2018 under our annual cash incentive program below target levels. Actual amounts paid to our NEOs under our 2018 annual cash incentive component of the 2018 Plan are reported below in the Non-Equity Incentive Plan Compensation column of our Summary Compensation Table.

Annual Cash Incentive Plan For 2019

For 2019, the Compensation Committee adopted an annual cash incentive plan as part of the NEO compensation program that was consistent with the 2018 plan. As in 2018, the 2019 cash incentive component is structured such that each NEO's potential cash award is subject to the achievement of 2019 corporate financial objectives relating to corporate revenue and corporate non-GAAP operating income. The financial goal targets established for 2019 are of comparable difficulty as compared to prior years. Further, the performance ranges for each metric are consistent with those utilized in 2018 including a payout level for threshold performance at 50% of target and the same target level to achieve the maximum payout by exceeding the corporate performance objectives for each of the corporate financial metrics. As in the past, the cash bonus payout is contingent on meeting at least one of the 2019 corporate revenue or corporate non-GAAP operating income goals. Should the Company not reach the threshold level for either the 2019 corporate revenue or corporate non-GAAP operating income goal, then no payout under the plan will be made to executives.

Each 2019 Key Executive Incentive Compensation Plan ("2019 Plan") is again divided into up to three (3) components: Corporate Goals, Business Unit Goals (if applicable) and personal performance goals. Provided that either of the Corporate Goal thresholds is met, the cash bonus potential of the 2019 Plan may again be realized. The annual cash incentive component of the 2019 Plan was designed and shall be administered in the same manner as described above under "Annual Cash Incentive Plan for 2018".

As in 2018, only executives associated with a particular Company business unit or department had a portion of their cash bonus potential allocated to Business Unit Goals in 2019.

The personal performance goals for the NEOs in 2019 include individual targets that, depending upon the executive, may relate to any of the following: corporate leadership development, additional corporate financial measures, operational measures and activities, product development measures, intellectual property initiatives and strategic business projects.

The following table reflects a comparison of the structure of the annual cash incentive components of the 2018 and 2019 Plans.

Key Executive Incentive Compensation Plan - Annual Cash Incentive Provisions	**2018**	**2019**
Payout if both financial metric thresholds are not reached	0%	0%
Corporate revenue threshold	80%	80%
Corporate non-GAAP operating income threshold	70%	70%
Payout upon attaining corporate financial metrics' threshold levels	50%	50%
Payout upon attaining corporate financial metrics' target goals	100%	100%
Payout upon attaining corporate financial metrics' maximum goals	200%	200%
Corporate revenue metric upside performance range	100%-120%	100%-120%
Corporate non-GAAP operating income metric upside performance range	100%-130%	100%-130%
Business unit/department goal payout	Variable	Variable
Personal goal payout	Fixed	Fixed

Long-Term Equity Incentive Plan

The Compensation Committee currently administers the Company's 2018 Stock Plan, which was approved by stockholder vote on May 16, 2018.

Employees and members of management, including the Company's NEOs, generally receive annual equity grants (collectively, "Grants") at or about the time of their performance reviews each year from a pool of shares established under the 2018 Stock Plan. The Company's long-term incentive compensation program seeks to align the executives' interests with the Company's stockholders by rewarding successes in stockholder returns. Additionally, the Committee desires to foster an ownership mentality among executives by providing stock-based incentives as a portion of compensation.

Over the past several years, the Committee has annually awarded executives with grants of performance-based and service-based RSUs.

The purpose of the Grant program is to provide incentive to executives and other key employees of the Company to work to maximize long-term return to the Company's stockholders. The number of Grants awarded to each executive officer is initially determined on a discretionary rather than formula basis by the Compensation Committee.

In awarding Grants to the executive officers, the CEO (except in connection with his or her own Grants) and the Committee consider a number of subjective factors, including the executive's position and responsibilities at the Company, the executive's individual performance, the number of Grants held (if any) and other factors that they may deem relevant.

Long-Term Equity Incentive Program For 2018

The long-term equity incentive component of the 2018 Plan was divided between PSU grants and service-based RSU grants. For 2018, the Compensation Committee established the portion of our NEOs' long-term incentive awards granted in the form of PSUs at 50% and the portion of our long-term incentive awards granted in the form of service-vesting RSUs at 50%, reflecting our commitment to pay-for-performance.

Performance-Based Stock Units: Under the 2018 Plan, TSR was employed with the long-term equity incentive program associated with the PSUs. TSR combines price appreciation and dividends paid to show the total return to a stockholder as an annualized percentage, thus directly linking executive pay to stock price changes. The period of measurement for this long-term equity incentive element was established at three (3) years. This design of performance incentive was implemented to align our NEOs' incentive compensation with an appropriate measure of the Company's long-term performance while also employing a metric that is believed to be important to stockholders.

In order to implement the TSR measure a performance peer group was established ("TSR Peers"). The formation of the TSR Peers took into consideration each of the companies in the Company's compensation peer group currently projected to be standalone operations in three (3) years and supplements them with additional industry-specific companies in order to produce a broader, yet relevant, base of comparative TSR performance companies. The TSR Peers for the 2018 Plan was initially set-up to as a comparison to a performance peer group consisting of eighteen (18) companies of which ten (10) companies are from the Company's 2018 compensation peer group and an additional eight (8) companies are from within the Company's industry. During 2018, two (2) companies in both the 2018 compensation peer group and the TSR Peers were acquired and no longer qualify as comparative companies under the TSR (Electro Scientific Industries, Inc. and Xcerra Corporation). The sixteen (16) TSR peer group companies for the long-term equity incentive component of the 2018 Plan currently are as follows:

2018 Long-Term Equity Incentive Program - Peer Group Companies		
Advanced Energy Industries, Inc.	Cohu, Inc.	Nanometrics Incorporated
Applied Materials, Inc.	FormFactor, Inc.	PDF Solutions, Inc.
ASML Holding N.V.	KLA Corporation	Teradyne, Inc.
Axcelis Technologies, Inc.	Kulicke & Soffa Industries, Inc.	Veeco Instruments, Inc.
Brooks Automation, Inc.	Lam Research Corporation	
Camtek Ltd.	MKS Instruments, Inc.	

- The performance and standards to earn the PSU equity awards are as follows:

TSR Performance Relative to Peers	**RSUs Earned as % of Target**
Below 30th Percentile	0%
30th Percentile	50%
55th Percentile	100%
80th Percentile and above	200%

- The PSU award payout will be calculated on a straight-line basis between the 30th & 55th and the 55th & 80th percentile levels referenced above.

- A negative TSR cap was instituted which limits any PSUs earned to target level if the Company's TSR is negative over the performance period and our TSR ranks above the target performance level.
- Earned PSUs are not subject to additional service-based vesting conditions.

Service Vesting Restricted Stock Units: For 2018, fifty percent (50%) of each NEO's equity grant was comprised of time-based RSUs. Each service-based RSU award is subject solely to service-based vesting in equal annual increments over a three (3) year vesting period.

For 2018, the Compensation Committee recommended and the independent members of the Board approved adjustments to the long-term incentive grant values provided to our CEO and other NEOs that ranged from +0.0% to +41.8% when compared to values granted the prior year. As discussed above, PSUs granted in early 2018 are subject to a measure of the Company's relative TSR measured over the three-year performance period; thus, determination of the final TSR results shall take place in February of 2021. At such time, any PSUs earned based on our TSR performance relative to the specified peer companies will fully vest.

Long-Term Equity Incentive Program For 2019

The long-term equity incentive component of the 2019 Plan continues to be divided between PSU grants and service-based RSU grants. Consistent with that which was implemented in 2018, the Compensation Committee determined to maintain the portion of our NEOs' long-term incentive awards granted in the form of PSUs and service-vesting RSUs each at 50%.

In 2019, the Committee granted equity awards to our NEOs with the dollar value allocated to each NEO and the structure of the long-term equity incentive component determined in a similar manner as that implemented in 2018 and discussed above. As implemented in 2018, the 2019 performance-based long-term equity incentive of our NEO compensation program is based on the metric of TSR. The following parameters are included in the design of the long-term equity incentive program in 2019:

Performance-Based Stock Units: For 2019, fifty percent (50%) of each NEO's equity grant is comprised of PSUs. The relative TSR plan design includes the following features:

- The performance period will cover a three-year period (2019 through 2022, for awards granted in early 2019).
- Performance will be assessed using TSR, which measures growth in stock price, plus any dividends paid, during the performance period.
- TSR performance will be compared to the same TSR Peers as utilized in 2018, based on the same rationale established for these benchmark companies, with the addition of three (3) companies, CyberOptics Corporation, Photronics, Inc. and Ultra Clean Holdings Inc. to replace the two that were acquired in 2018. Thus, the 2019 TSR Peers shall be:

2019 Long-Term Equity Incentive Program - Peer Group Companies		
Advanced Energy Industries, Inc.	CyberOptics Corporation	PDF Solutions, Inc.
Applied Materials, Inc.	FormFactor, Inc.	Photronics, Inc.
ASML Holding N.V.	KLA Corporation	Teradyne, Inc.
Axcelis Technologies, Inc.	Kulicke & Soffa Industries, Inc.	Ultra Clean Holdings Inc.
Brooks Automation, Inc.	Lam Research Corporation	Veeco Instruments, Inc.
Camtek Ltd.	MKS Instruments, Inc.	
Cohu, Inc.	Nanometrics Incorporated	

- The performance and standards to earn the PSU equity awards are unchanged from 2018.
- The PSU award payout will be calculated on a straight-line basis between the 30th & 55th and the 55th & 80th percentile levels referenced above.
- A negative TSR cap has been instituted which limits any PSUs earned to target level if the Company's TSR is negative over the performance period and our TSR ranks above the target performance level.
- Earned PSUs are not subject to additional service-based vesting conditions.

Service Vesting Restricted Stock Units: For 2019, fifty percent (50%) of each NEO's equity grant is comprised of time-based RSUs. The time required for the RSUs to fully vest is three (3) years from the date of grant. As a result, each service-based RSU award is subject solely to service-based vesting in equal annual increments over the three (3) year vesting period.

The following table reflects a comparison of the structure of the long-term equity incentive components of the 2018 and 2019 Plans.

Key Executive Incentive Compensation Plan - Long-Term Equity Incentive Provisions	**2018**	**2019**
Performance-based / Service-based grant breakout	50%-50%	50%-50%
Service-based grant vesting period	33.3% annually over 3 years	33.3% annually over 3 years
Performance-based grant evaluation period	3 years	3 years
Performance-based grant metric(s)	TSR	TSR
Performance-based grant vesting period	100% upon earning	100% upon earning
Performance threshold for earning grant	30^{th} TSR percentile	30^{th} TSR percentile
Percent of grant earned at threshold	50%	50%
Measure at which 100% of grant is earned	55^{th} TSR percentile	55^{th} TSR percentile
Maximum grant upside	200%	200%
Measure at which maximum upside of grant is earned	80^{th} TSR percentile	80^{th} TSR percentile

Personal Benefits And Perquisites

Benefits

All employees of the Company, including its executives, are eligible to participate in the following benefit plans and programs ("Benefit Package"):

- Health and dental insurance;
- Elective vision care program;
- Life insurance and accidental death and dismemberment coverage;
- 401(k) savings plan;
- Short- and long-term disability insurance with supplemental income continuation;
- Health care and dependent care flexible spending account programs;
- Employee assistance program (EAP);
- Tuition reimbursement plan;
- Employee stock purchase plan;
- Employee referral bonus program; and
- Length of service awards.

The Company, in its discretion, may offer to reimburse the expenses that an employee incurs as a result of the Company requiring the individual to relocate their primary residence for employment purposes.
The Committee believes that these benefits are consistent with industry practice and are important in recruiting and retaining qualified employees.

Perquisites

In addition to the above Benefit Package, executive employees, including NEOs, receive the following:

- A monthly car allowance;
- Company-paid tax preparation services; and
- Company-paid membership in one (1) airline executive club.

The foregoing perquisites were determined based on a review of comparable company offerings performed by the Company and the Committee's compensation consultant and are evaluated annually as part of the compensation review. The Committee believes that these benefits are reasonable and consistent with the Company's overall compensation program and better enable the Company to attract and retain superior employees for key positions.

Executive Perquisites For 2018

In 2018, executive base perquisites provided to the NEOs included a monthly car allowance, income tax preparation fee payment and airline club membership. These perquisites remained unchanged from those provided to the NEOs in the prior year.

Executive Perquisites For 2019

In 2019, executive base perquisites, including a monthly car allowance, income tax preparation fee payment and airline club membership remained unchanged from that provided to the NEOs in 2018.

Retirement Provision For Equity Awards

As part of their review of the overall compensation program for all Company employees, including the NEOs, the Compensation Committee determined that the implementation of a retirement provision related to equity awards would continue to incentivize individuals as they near the end of their employment with the Company. Previously, upon retirement of an employee any equity grants that had not vested were forfeited. Thus, any incentive realized through the service-vesting schedule for Company equity grants was diminished. As a result, the Compensation Committee assessed various retirement provision alternatives and recommended to the Board, and the Board approved, the following retirement provision:

- An employee is "retirement eligible" if they achieve a combination of age plus years of service with the Company totaling 70, with a base minimum age of 58 years old and a minimum service requirement of five years.
- Retirement under the provision then would occur when an employee has become retirement eligible and has formally notified the Company of his/her intention to retire from the employ of the Company on a date certain and does so retire or as otherwise approved by the Compensation Committee.
- Upon such retirement by the employee, any equity awards granted in 2017 and onward shall vest based on:
    - The vesting schedule established for time-based equity awards; or
    - The actual performance results for performance-based equity awards.
- For clarity, in the event of an employee's retirement under the provision, there will be no acceleration of an award's vesting schedule or forfeiture of unvested awards granted in or after 2017.

Employee Stock Purchase Plan

The Company has maintained an Employee Stock Purchase Plan since 1999. The Company's 2018 Employee Stock Purchase Plan was approved by stockholders in 2018 and is currently administered by the Compensation Committee.

Under the terms of our current and prior Employee Stock Purchase Plans, eligible employees may elect to have up to fifteen percent (15%) of eligible compensation deducted from their base salary and applied to the purchase of shares of Company Common Stock. The price the employee pays for each share of stock is ninety-five percent (95%) of the fair market value of the Company Common Stock at the end of the applicable six-month purchase period. The Employee Stock Purchase Plan qualifies as a non-compensatory plan under Code Section 423.

The Company does not offer a non-qualified deferred compensation plan.

CORPORATE AND GOVERNANCE POLICIES

Employment And Change-In-Control Agreements

While the Company utilizes employment agreements on a limited basis, we currently maintain employment agreements or arrangements with each of our NEOs.

In 2000, the Company entered into a management agreement with Mr. Roth, effective as of July 24, 2000. Mr. Roth previously had employment agreements with the Company when it was a private entity, and, at the time of the Company's initial public offering, his agreement was redrafted to reflect terms believed to be appropriate for such officer's service in his capacity with a publicly held corporation.

Upon the appointment of Mr. Plisinski to the position of CEO, he entered into a new employment agreement with the Company. This agreement superseded the executive employment agreement that Mr. Plisinski had entered into with August Technology Corporation which was assumed by the Company upon its merger with August Technology in 2006.

Mr. Plisinski's employment agreement provides for a term of two (2) years with automatic renewals for additional two-year terms and Mr. Roth's agreement provides for a term of one (1) year with automatic renewals for additional one-year terms, unless the Company or the applicable executive delivers a notice of non-renewal to the other party. Mr. Plisinski's agreement prohibits him from competing with the Company in any way or soliciting its employees during his term of employment and for two (2) years after termination of his employment. Mr. Roth's agreement prohibits him from competing with the Company in any way or soliciting its employees during his term of employment and for one (1) year after termination of his employment.

Certain of our executive officers are also entitled to payments upon a qualifying termination of employment following a Change-in-Control event. The Committee believes that providing severance in a Change-in-Control situation is beneficial to stockholders so that executives may remain objectively neutral when evaluating a transaction that may be beneficial to stockholders yet could negatively impact the continued employment of the executive. As a result, in August 2009, the Compensation Committee further authorized the Company to enter into a Change-in-Control Agreement with Mr. Koch and other Company executives and authorized amendment to the management agreement of Mr. Roth to include comparable Change-in-Control terms. In February 2014, the Company entered into a Change-in-Control Agreement with Mr. Rogoff and Mr. da Silveira with comparable Change-in-Control terms. Further, Mr. Plisinski's employment agreement also contains Change-in-Control terms.

See "Potential Payments Upon Termination of Employment or Change-in-Control" below for a description of these arrangements and potential payments that the NEOs would have been entitled to receive upon applicable hypothetical termination scenarios as of December 31, 2018.

Other Elements Of Post-Termination Compensation

The Company does not have a practice of providing retirement benefits, including any supplemental executive retirement plans (SERP), to its executives, other than through its 401(k) plan and the retirement provision for equity grants effective in 2017. The Company retains the discretion to utilize the offer of severance and/or change-in-control protection as an incentive in its hiring and retention of executives.

Non-Solicitation And Non-Competition Policy

The Company maintains a policy of entering into an agreement with each of its new executives, which contains both non-solicitation and non-competition provisions. The non-solicitation provisions apply for one (1) year after termination of the individual's employment while the non-competition provisions are in effect during the individual's employment and generally for one (1) year thereafter. Each of the Company's executives has entered into these covenants with the Company, except Mr. Plisinski, whose non-solicitation and non-competition provisions are in place during, and extend for two (2) years after the end of, his employment with the Company. In each case, these covenants have been implemented to protect the confidential information, goodwill and other assets of the Company. For those individuals with employment agreements, should a breach of the non-solicitation or non-competition terms of their agreements occur, this could give rise to the Company declaring a breach under the agreement and terminating all severance payments thereunder.

General Termination Benefits

Upon termination of an executive’s employment with the Company, the individual is entitled to receive his or her base salary earned through the termination date, along with a payout for all accrued but unused vacation time earned though such date. Thereafter, further cash compensation to the executives is discontinued, except to the extent that severance or change-in-control payments are required to be made in accordance with individual or Company severance protection arrangements. Certain executives with the Company who have entered into employment agreements are entitled to elect to continue group health or other group benefits as allowed by COBRA with continued Company co-payments for agreed post-termination periods. The Company retains the right to offer severance and/or payment of COBRA benefits to any individual who is terminated from the Company at its discretion.

Stock Ownership/Retention Guidelines

The Company has established guidelines related to stock ownership and retention for its executives and its outside directors to further align the interest of the executives and non-employee directors with the interests of stockholders, to have a stake in the long-term financial future of the Company and to further promote the Company’s commitment to sound corporate governance while allowing them to prudently manage their personal financial affairs.

In 2005, the Board established the Company’s initial stock ownership policy. Since that time, the policy has been periodically amended such that the stock ownership and retention levels currently in effect are the following:

Company Role	Company Common Stock Holding Requirement	Effective Date
Non-Employee Directors	3x value of total cash compensation (1)	Within 3 years of initial election to Board
CEO	3x value of CEO’s base annual salary	Within 3 years of hire/promotion
CFO, COO, Business Unit GM, VP Worldwide Sales, General Counsel	1x value of executive’s base annual salary	Within 3 years of hire/promotion
VP reporting directly to CEO (excluding above)	5,000 shares	Within 1 year of date of hire/promotion
VP not reporting directly to CEO	2,500 shares	Within 1 year of date of hire/promotion

(1) Includes annual cash retainer and any fee paid for service as a Committee Chair, Lead Director or Chairman.

In assessing compliance with the foregoing guidelines, the Company takes into consideration only the ownership of Common Stock in the Company. To that end, unearned PSUs, unvested service based RSUs and vested or unvested stock options do not qualify as shares for purposes of compliance with the Company’s stock ownership and retention guidelines.

Compliance with the Company’s stock ownership and retention guidelines is reviewed annually by the Nominating & Governance Committee. At their last review on January 22, 2019, the Nominating & Governance Committee determined that all executives and directors who were with the Company and acting in their executive/director capacities for periods in excess of one (1) year were in compliance with the ownership requirements or would be upon the first quarter 2019 vesting of RSU grants. Should any individual in the future not own the minimum number of required shares after notice by the Nominating & Governance Committee, additional action, including possible removal from the executive role or a determination to not nominate the director for election, would be considered by the Board.

The Nominating & Governance Committee has scheduled its review of the Company’s stock ownership and retention guidelines for its January 2020 meeting and at this annual review will evaluate the appropriateness of the foregoing stock ownership levels for 2020 based in part on the trailing three-year weighted average of the Company’s stock price at the time of the evaluation, as well as other considerations such as market conditions and comparable practices within the industry.

Prohibition On Hedging And Pledging Of Company Stock

In order to ensure that our executives, including our NEOs, bear the full risk of the Company's stock ownership, our insider trading policy prohibits hedging transactions related to our Common Stock. Additionally, under the Company's anti-pledging policy, non-employee directors and executive officers are prohibited from making any new pledges of Company securities as collateral for a loan, or otherwise making a new transfer of Company securities to a margin account, provided that non-employee directors may pledge their securities when obligated to do so to realize the consummation of potential mergers, acquisitions and similar transactions with which the Company may be involved from time to time.

Adjustments Or Recovery Of Prior Compensation

The Company adopted a policy which provides for the recovery or adjustment of amounts previously awarded or paid to a NEO in the event that financial results or other performance measures on which an award or payment were determined are to be restated or adjusted. In addition, if the Company is required to restate its financial results due to material noncompliance with any financial reporting requirements as a result of misconduct, the Sarbanes-Oxley Act of 2002 requires the CEO and CFO to disgorge:

- Any bonus or other incentive-based or equity-based compensation received from the Company during the 12-month period following the first public issuance of the non-compliant financial reporting document; and
- Any profits realized from the sale of Company stock during that 12-month period.

In addition, Section 954 of the Dodd-Frank Wall Street Reform and Consumer Protection Act requires the SEC to direct the national securities exchanges to prohibit the listing of any security of an issuer that does not develop and implement a clawback policy. The SEC has not finalized its rules related to these clawback policies. Once the final rules are in place, the Company will adjust its policy, as necessary, to comply with SEC regulations.

Compensation Program Risk Assessment

In 2017, the Compensation Committee engaged the compensation consultant to conduct a comprehensive review of our executive compensation program and practices including an assessment of whether possible compensation design features may have the potential to incentivize the NEOs to take risks that are reasonably likely to have a material adverse effect on the Company. The compensation risk assessment covered potential risks and risk mitigating features in each of the following areas: compensation philosophy and pay mix; performance measures used in incentive plans; goal setting and payout leverage and caps; calculation and verification of performance outcomes for incentive payments; and other features. Based on this compensation risk assessment framework, the Committee evaluated our current executive compensation policies, practices and programs and believes they do not create risks that are reasonably likely to have a material adverse effect on the Company.

IRS Limits On Deductibility Of Compensation

Prior to the 2018 tax year, Section 162(m) of the IRC limited the tax deductibility of annual compensation paid to any publicly held corporation's CEO and three other highest compensated officers excluding the CFO, to the extent that the officer's compensation (other than qualified performance-based compensation) exceeded $1 million. Although the Compensation Committee considers deductibility issues when approving executive compensation elements, the Committee believes that the other compensation objectives, such as attracting, retaining and providing appropriate incentives to executives, are important and can supersede the goal of maintaining deductibility. Consequently, the Compensation Committee generally makes compensation decisions without regard to deductibility, as the Committee believes it has appropriately structured its compensation programs to provide incentives to our executives to increase Company return and stockholder value. Recent changes in the tax laws eliminated the "performance-based" exception, and the limitation on deductibility has been expanded to include all named executive officers. As a result, beginning in 2018, the Company may no longer deduct compensation paid to our named executive officers in excess of $1 million.

CONCLUSION

In reviewing its compensation programs, the Company has concluded that each element of compensation as well as the total compensation opportunities for its NEOs and its other executive officers are reasonable, appropriate and in the interests of the Company and its stockholders. The Company believes that this compensation program appropriately satisfies the Company's goals of establishing a compensation package that attracts and retains a strong motivated leadership team, aligns the financial incentives of the executives with the interests of the stockholders, and rewards the achievement of specific annual, long-term and strategic goals of the Company. The Company believes that the compensation program which has been established and is reflected herein has enabled it to recruit and secure a talented and motivated leadership team by which the Company drives toward the ultimate objective of improving stockholder value.

COMPENSATION COMMITTEE REPORT ON EXECUTIVE COMPENSATION

We, the Compensation Committee of the Board of Directors, have reviewed and discussed the Compensation Discussion and Analysis ("CD&A") within the Executive Compensation section of this proxy statement with the management of the Company. Based on such review and discussions, we have recommended to the Board of Directors that the CD&A be included as part of this proxy statement.

THE COMPENSATION COMMITTEE

David B. Miller (Chairman)
Jeffrey A. Aukerman
Vita A. Cassese
Thomas G. Greig

Summary Compensation Table

The table below sets forth information for the years ended December 31, 2018, 2017 and 2016 concerning the compensation of the CEO, the CFO and the three other most highly compensated NEOs:

Name and Principal Position	Year	Salary ($)	Stock Awards ($)(1)	Option Awards ($)	Non-Equity Incentive Plan Compensation ($)(2)	All Other Compensation ($)(3)	Total ($)
Michael P. Plisinski	2018	$516,346	$1,256,384	—	$398,639	$19,864	$2,191,233
Chief Executive Officer	2017	$476,539	$910,659	—	$505,413	$8,964	$1,901,575
	2016	$450,000	$650,005	—	$426,555	$8,814	$1,535,374
Steven R. Roth	2018	$351,121	$445,449	—	$172,520	$9,114	$978,204
Senior Vice President, Finance and	2017	$341,658	$289,537	—	$204,852	$8,964	$845,011
Administration and Chief Financial Officer	2016	$331,707	$199,992	—	$197,279	$8,814	$737,792
Robert A. Koch	2018	$288,180	$209,023	—	$77,017	$9,043	$583,263
Vice President and General Counsel	2017	$280,432	$136,875	—	$103,696	$8,900	$529,903
	2016	$272,264	$102,489	—	$80,963	$8,814	$464,530
Richard Rogoff	2018	$294,279	$140,495	—	$54,652	$9,114	$498,540
Vice President and General Manager	2017	$288,600	$129,485	—	$68,111	$31,314	$517,510
Lithography Systems Group	2016	$280,194	$122,996	—	$65,130	$8,814	$477,134
Elvino da Silveira	2018	$271,652	$135,930	—	$69,864	$9,114	$486,560
Vice President, Business Development	2017	$264,259	$107,907	—	$101,069	$8,964	$482,199
	2016	$255,879	$102,489	—	$40,654	$8,814	$407,836

(1) Amounts reflect the grant date fair value for each share-based compensation award granted to the executive officer during the covered year, calculated in accordance with FASB ASC Topic 718. The assumptions used in determining the grant date fair values of awards are set forth in Note 9 to our consolidated financial statements, which are included in our Annual Report on Form 10-K filed with the SEC on February 15, 2019. For 2018, the amount reported for each NEO includes the grant date fair value attributable to the 2018 awards of (i) time-based RSUs and (ii) PSUs, assuming that the performance conditions were satisfied at target at the time of grant. The grant date fair value attributable to the 2018 PSUs assuming maximum performance achievement is as follows: Mr. Plisinski, $1,412,745; Mr. Roth, $500,896; Mr. Koch, $235,068; Mr. Rogoff, $157,983; and Mr. da Silveira, $152,877. The actual amounts earned will be determined following the end of the three (3) year performance period (February 8, 2018 – February 8, 2021.

(2) Represents annual cash performance bonus awards under the Key Executive Incentive Compensation Plan earned for 2018, 2017 and 2016, respectively.

(3) The table below details the components of this column for 2018.

Name	Year	Matching Contribution to 401(k)	Insurance (1)	Perquisites	Severance Compensation	Total "All Other Compensation"
Michael P. Plisinski	2018	$8,250	$864	$10,750	—	$19,864
Steven R. Roth	2018	$8,250	$864	— (2)	—	$9,114
Robert A. Koch	2018	$8,179	$864	— (2)	—	$9,043
Richard Rogoff	2018	$8,250	$864	— (2)	—	$9,114
Elvino da Silveira	2018	$8,250	$864	— (2)	—	$9,114

(1) Insurance is the premium associated with coverage under the group term life insurance and accidental death and dismemberment insurance plans provided by the Company to its employees. Coverage is equal to the lesser of two (2) times salary or $450,000.

(2) Value of aggregate perquisites and benefits for each NEO except Mr. Plisinski is less than $10,000, and therefore, perquisites for these individuals are not required to be disclosed in accordance with SEC rules.

Grants of Plan-Based Awards in 2018

The following table sets forth information with respect to non-equity and equity incentive plan awards granted during 2018 to the Named Executive Officers.

Name	Grant Date	Estimated Future Payouts Under Non-Equity Incentive Plan Awards ($) (1)			Estimated Future Payouts Under Equity Incentive Plan Awards (#) (2)			All Other Stock Awards: Number of Shares of Stocks or Units (#) (3)	Grant Date Fair Value of Stock and Option Awards ($)
		Threshold	Target	Maximum	Threshold	Target	Maximum		
Michael P. Plisinski	2/8/2018	$91,875	$525,000	$1,050,000					
	2/8/2018				11,482	22,964	45,928		$706,373
	2/8/2018							22,965	$550,012
Steven R. Roth	2/8/2018	$37,076	$211,860	$423,720					
	2/8/2018				4,071	8,142	16,284		$250,448
	2/8/2018							8,142	$195,001
Robert A. Koch	2/8/2018	$17,750	$101,430	$202,860					
	2/8/2018				1,911	3,821	7,642		$117,534
	2/8/2018							3,820	$91,489
Richard Rogoff	2/8/2018	$9,970	$132,930	$265,860					
	2/8/2018				1,284	2,568	5,136		$78,992
	2/8/2018							2,568	$61,504
Elvino da Silveira	2/8/2018	$19,124	$109,280	$218,560					
	2/8/2018				1,243	2,485	4,970		$76,439
	2/8/2018							2,484	$59,492

(1) The amounts reported in these columns represent the annual cash incentive opportunities under the Company's Key Executive Incentive Compensation Plan for each of our Named Executive Officers for the 2018 performance period. The metrics against which performance was measured under this plan, as well as other details regarding the plan, are discussed above in the Compensation Discussion and Analysis under "Annual Cash Incentive Compensation." The amounts actually earned by our Named Executive Officers under the plan are reflected in the "Non-Equity Incentive Plan Compensation" column of the Summary Compensation Table above.

(2) The amounts reported in these columns represent the award opportunities under the Company's 2018 PSU program. The metrics against which performance was measured under this program, as well as other details regarding the plan, are discussed above in the Compensation Discussion and Analysis under the heading "Long-Term Equity Incentive Plan." This award was granted under the Company's 2018 Stock Plan. These performance period for these awards is three years and the final determination of the award ultimately earned will be made in 2021.

(3) The amounts reported in this column represent the awards of RSUs which are subject to service-based vesting conditions, as discussed above in the Compensation Discussion and Analysis under the heading "Long-Term Equity Incentive Plan." This award was granted under the Company's 2018 Stock Plan. These RSUs vest in 33.3% increments on each of the first three (3) anniversaries of the grant date.

Outstanding Equity Awards At 2018 Year-End

The following table sets forth information with respect to outstanding equity awards held by the Named Executive Officers at December 31, 2018.

Name	Grant Date (1)	Stock Awards			
		Number of Shares or Units of Stock That Have Not Vested (#)(2)	Market Value of Units of Stock That Have Not Vested ($)(3)	Equity Incentive Plan Awards: Number of Unearned Shares, Units or Other Rights That Have Not Vested (#) (4)	Equity Incentive Plan Awards: Market or Payout Value of Unearned Shares, Units or Other Rights That Have Not Vested ($) (5)
Michael P. Plisinski	1/31/2014	2,812	$57,562		
	10/1/2014	1,406	$28,781		
	1/28/2015	17,600	$360,272		
	1/27/2016	31,734	$649,595		
	2/6/2017	15,480	$316,876	15,481	$316,896
	2/8/2018	22,965	$470,094	22,964	$470,073
Steven R. Roth	1/31/2014	2,250	$46,058		
	1/28/2015	6,600	$135,102		
	1/27/2016	9,763	$199,849		
	2/6/2017	4,922	$100,753	4,922	$100,753
	2/8/2018	8,142	$166,667	8,142	$166,667
Robert A. Koch	1/31/2014	1,875	$38,381		
	1/28/2015	4,400	$90,068		
	1/27/2016	5,002	$102,391		
	2/6/2017	2,326	$47,613	2,327	$47,634
	2/8/2018	3,820	$78,195	3,821	$78,216
Richard Rogoff	1/31/2014	2,250	$46,058		
	1/28/2015	5,280	$108,082		
	1/27/2016	6,004	$122,902		
	2/6/2017	2,201	$45,054	2,201	$45,054
	2/8/2018	2,568	$52,567	2,568	$52,567
Elvino da Silveira	1/31/2014	1,875	$38,381		
	1/28/2015	4,400	$90,068		
	1/27/2016	5,002	$102,391		
	2/6/2017	1,834	$37,542	1,834	$37,542
	2/8/2018	2,484	$50,847	2,485	$50,868

(1) For better understanding of this table, we have included an additional column showing the grant date of stock options and restricted stock units.

(2) Amount includes (i) service-based RSU awards and (ii) PSU awards that have been earned and remain subject to service-based vesting requirements. PSUs and RSUs vest in accordance with the schedule below:

Grant Date	Grant Type	Vesting
1/31/2014	Service-based RSU	1/5th per year on the anniversary of the grant date
1/31/2014	Earned PSU	1/5th on February 20, 2015 and 1/5th per year on the anniversary of the grant date
10/1/2014	Service-based RSU & earned performance-based PSU	1/5th per year on the anniversary of the grant date
1/28/2015	Service-based RSU	1/5th per year on the anniversary of the grant date
1/28/2015	Earned PSU	1/5th on February 19, 2016 and 1/5th per year on the anniversary of the grant date
1/27/2016	Service-based RSU	1/5th per year on the anniversary of the grant date
1/27/2016	Earned PSU	1/5th on February 16, 2017 and 1/5th per year on the anniversary of the grant date
2/6/2017	Service-based RSU	1/3rd per year on the anniversary of the grant date
2/6/2017	PSU	100% of final performance determination on third anniversary of the grant date following end of three (3) year performance period (February 6, 2017 – February 6, 2020) based on TSR performance relative to peer companies
2/8/2018	Service-based RSU	1/3rd per year on the anniversary of the grant date
2/8/2018	PSU	100% of final performance determination on third anniversary of the grant date following end of three (3) year performance period (February 8, 2018 – February 8, 2021) based on TSR performance relative to peer companies

(3) Based on the Company's common stock closing price of $20.47 per share on December 31, 2018.

(4) PSUs granted in 2017 and 2018 are reported in this table at target. The actual number of PSUs earned will be determined based on performance achievement measured over the three (3) year performance period, and any earned PSUs will vest on February 6, 2020 and February 8, 2021, respectively.

Option Exercises And Stock Vested In 2018

The following table sets forth information with respect to the exercise of stock options and vesting of RSUs by the NEOs during the year ended December 31, 2018:

	Option Awards		Stock Awards	
Name	Number of Shares Acquired on Exercise (#)	Value Realized on Exercise ($)	Number of Shares Acquired on Vesting (#)	Value Realized on Vesting ($)(1)
Michael P. Plisinski	—	$ —	133,554	$2,950,435
Steven R. Roth	—	$ —	12,774	$338,759
Robert A. Koch	—	$ —	7,795	$206,854
Richard Rogoff	—	$ —	8,993	$232,981
Elvino da Silveira	10,000	$324,500	6,662	$177,531

(1) The aggregate dollar amount realized is based on the fair market value of the shares upon vesting.

Pension And Nonqualified Deferred Compensation

The Company does not have a defined benefit pension program, nor does it offer non-qualified deferred compensation.

Potential Payments Upon Termination Of Employment Or Change-In-Control

This section (including the following tables) summarizes each NEO's estimated payments and other benefits that would be received by the NEO or the NEO's estate if his or her employment had terminated on December 31, 2018, under the hypothetical circumstances set forth below.

Each of our NEOs would be entitled to certain termination payments upon his or her death or Disability, his or her involuntary termination without Cause, or his or her voluntary termination with Good Reason as described below. Although the definitions of each of these terms is specific to the NEO's employment agreement or change-in-control agreement with the Company, the terms generally have the following meanings:

- "Disability" generally means that the executive, due to physical or mental impairment, is unable to perform his or her duties to the Company for a specified period of time.
- "Cause" generally means that the executive engaged in a crime or other serious act involving moral turpitude; materially breached an agreement between him or her and the Company; or otherwise materially breached his or her obligations to the Company.
- A voluntary termination for "Good Reason" generally means, depending on the particular executive's agreement, that the executive's duties, responsibilities or status with the Company or its successor are materially reduced; his or her primary place of work is moved to a location outside a predetermined radius; in particular cases, certain reduction in compensation; or the Company materially breaches the terms of his or her agreement with the Company or any successor fails to assume the executive's change-in-control agreement.

NEO Employment Agreements

Mr. Plisinski

Mr. Plisinski's employment agreement provides for the following:

- In the event of any termination of Mr. Plisinski's employment, he is entitled to payment of all base salary due and owing through the termination date and an amount equal to all earned but unused vacation through the termination date.
- In the event Mr. Plisinski's employment is terminated due to his death, his estate would be entitled to:
  - Payment of his then-current base salary as if his employment had continued for three (3) months following his death;
  - Continued co-payment for a period of six (6) months following his death of amounts due under COBRA for continuation of Company's group health and other group benefits for his covered dependents, if the covered dependents so elect;
  - Payment of his annual incentive case bonus based on actual performance achievement, prorated for the time employed preceding his death, to be paid out with the Company's annual incentive plan payouts; and
  - Immediate vesting of stock options and SARs, and immediate vesting of RSU awards granted after his appointment as CEO which by their terms would vest within twelve (12) months after death and, if a performance award, based on actual performance achievement for such performance period completed within twelve (12) months after death.

- In the event Mr. Plisinski's employment is terminated due to his Disability, he would be entitled to:
  - Payment of his then-current base salary through the end of the month of such termination;
  - Continued co-payment for a maximum period of six (6) months following his Disability of amounts due under COBRA for continuation of Company's group health and other group benefits, if he or his covered dependents, as appropriate, so elects;
  - Payment of his annual incentive case bonus based on actual performance achievement, prorated for the time employed preceding his termination, to be paid out with the Company's annual incentive plan payouts; and
  - Immediate vesting of stock options and SARs, and immediate vesting of RSU awards granted after his appointment as CEO which by their terms would vest within twelve (12) months after termination for disability and, if a performance award, based on actual performance achievement for such performance period completed within twelve (12) months after termination.

- In the event Mr. Plisinski's employment is terminated by the Company without Cause or Mr. Plisinski terminates his employment for Good Reason, he would be entitled to:
  - Payment of two (2) times his then-current base salary for a period of twenty-four (24) months;
  - Continued co-payment for a period of up to eighteen (18) months of amounts due under COBRA for continuation of Company's group health and other group benefits, if he so elects; and
  - Vesting of any equity incentive awards outstanding as of the termination date that, by their terms:
    (1) represent either unvested shares which were earned based on a completed performance period under a performance-based award granted on or after the employment agreement effective date and which as of the termination date are then subject to time-based vesting only, or shares under such an equity incentive award granted on or after the employment agreement effective date which will be earned under a performance-based award based on actual achievement under a performance period which has been completed on or prior to the termination date but as to which performance period the actual number of shares earned against the award performance goals has not yet been determined by the Company; and
    (2) would have become vested based solely on the passage of time within the twelve (12) month period immediately following the termination date had Mr. Plisinski continued in employment with the Company.
- If, within eighteen (18) months following the occurrence of a Change-in-Control[1], Mr. Plisinski's employment is terminated for any reason other than for Cause or Mr. Plisinski terminates his employment for Good Reason, he would be entitled to:
  - Payment of two (2) times the sum of his then-current base salary and target annual cash bonus for a period of twenty-four (24) months;
  - Continued co-payment by Company for a period of up to eighteen (18) months of amounts due under COBRA for continuation of Company's group health and other group benefits, if he so elects; and
  - Immediate vesting of all unvested stock options, SARs and all unvested and outstanding performance-based (at target) and service-based RSUs and other equity awards.

---

[1] For Mr. Plisinski, a "Change-in-Control" would generally be considered to have occurred if:

- a merger or consolidation of the Company or an acquisition by the Company involving the issuance of its securities as consideration for the acquired business results in the stockholders of the Company following such transactions having less than fifty percent (50%) of combined voting power of the surviving entity;
- any person or persons becomes the beneficial owner of thirty percent (30%) or more of our outstanding shares;
- all or substantially all assets of the Company are disposed of pursuant to a plan of liquidation of the Company;
- all or substantially all of our assets are sold; or
- during any twelve (12) month consecutive period the individuals who presently make up our Board or who become members of our Board with the approval of at least a majority of our existing Board cease to constitute at least a majority of the Board; provided any transaction or event described above will not constitute a change-in-control under the agreement unless it qualifies as a "change-in-control" under Section 409A of the Internal Revenue Code.

◦ To the extent that change-in-control termination payments made to Mr. Plisinski under his agreement are subject to the excise tax imposed by Section 4999 of the Internal Revenue Code, Mr. Plisinski would either have to pay the excise tax or have his benefits reduced so that no portion of his termination payments were subject to the excise tax.

◦ In order to receive these termination or change-in-control termination payments, Mr. Plisinski would be required to sign a general release of all known and unknown claims that he may have against the Company.

◦ As part of his employment agreement, Mr. Plisinski is subject to non-solicitation and non-competition restrictions that limit his ability to compete with the Company during the term of the agreement and for a period of two (2) years following his resignation or termination for any reason.

The following table reflects the potential payments to Mr. Plisinski in the event of his termination or his termination following a change-in-control:

Potential Payments To Mr. Plisinski Upon Termination Or Change-In-Control				
	Cash Severance			
Termination Circumstance as of 12/31/2018	**Base Salary**	**Management Incentive Bonus**	**Value of Accelerated Unvested Equity**	**Benefits Continuation**
By the Company without cause	$1,050,000 (2x salary)	$ -	$1,112,770	$36,265
Executive resignation for good reason	$1,050,000 (2x salary)	$ -	$1,112,770	$36,265
Death	$131,250 (3 months salary)	$398,639 (1x bonus)	$798,146	$12,088
Disability	$ -	$398,639 (1x bonus)	$798,146	$12,088
Within 18 months following sale or change-in-control:				
By the Company without cause	$1,050,000 (2x salary)	$797,278 (2x bonus)	$2,670,148	$36,265
By the executive with good reason	$1,050,000 (2x salary)	$797,278 (2x bonus)	$2,670,148	$36,265

Mr. Roth

Mr. Roth's employment agreement provides for the following:

- In the event Mr. Roth's employment is terminated as a result of his death or Disability, he or his estate would be entitled to:
  ◦ Payment of all base salary due and owing through the termination date and amount equal to all earned but unused vacation through the termination date;
  ◦ Payment of an amount equal to Mr. Roth's bonus as was paid or payable for the most recent completed bonus period; and
  ◦ Accelerated vesting of all outstanding and unvested stock options, performance-based and service-based RSUs or other equity awards.
- In the event Mr. Roth's employment is terminated without Cause or Mr. Roth terminates his employment for Good Reason, he would be entitled to:
  ◦ Payment of all base salary due and owing through the termination date and an amount equal to all earned but unused vacation through the termination date;
  ◦ Payment for over a period of one (1) year of one (1) times Mr. Roth's:
    * Then-current base salary; and
    * Bonus as was paid or payable for the most recent completed bonus period;

    - Accelerated vesting of all unvested stock options and all unvested and outstanding performance based and service-based RSUs and other equity awards.
- If, within one (1) year following the occurrence of a change-in-control[2], Mr. Roth's employment is terminated for any reason other than for Cause or Mr. Roth terminates his employment for Good Reason, he would be entitled to:
    - Payment of all base salary due and owing through the termination date and including an amount equal to all earned but unused vacation through the termination date;
    - Payment over a period of one (1) year of one (1) times Mr. Roth's:
        * Then-current base salary; and
        * Bonus as was paid for the most recent completed bonus period;
    - Accelerated vesting of all unvested stock options and all unvested and outstanding performance-based and service-based RSUs and other equity awards; and
    - Maintenance of Mr. Roth's and his dependents' health care benefit coverage to the same extent provided for by and with the same Company/Executive payment contribution percentages under Company's group plans at the time of termination. Such coverage shall extend for a term of one (1) year from the Termination Date unless he becomes covered as an insured under another employer's or spousal health care plan.
- To the extent that termination or change-in-control payments made to Mr. Roth under his agreement are subject to the excise tax imposed by Section 4999 of the Internal Revenue Code, Mr. Roth would either have to pay the excise tax or have his benefits reduced so that no portion of his termination payments were subject to the excise tax.
- In order to receive these termination or change-in-control payments, Mr. Roth would be required to sign a general release of all known and unknown claim the he may have against the Company.
- As part of his employment agreement, Mr. Roth is subject to non-competition and non-solicitation restrictions that limit his ability to compete with the Company during the term of the Agreement and for a period of one (1) year following his resignation or termination for any reason.

---

[2] For Mr. Roth, a "Change-in-Control" would generally be considered to have occurred if:

- any person or persons becomes the beneficial owner of twenty-five percent (25) or more of our outstanding voting shares;
- during any two (2) consecutive year period individuals who presently make up our Board or who become members of our Board with the approval of at least two-thirds of our existing Board (other than a new director who assumes office in connection with an actual or threatened election contest) cease to be at least a majority of the Board;
- a merger or consolidation of the Company is consummated with another entity (unless outstanding voting securities of the Company immediately prior to the termination would continue to represent more than fifty-one percent (51%) of the combined voting power of the surviving entity and had the power to elect as least a majority of the board of the surviving entity);
- our stockholders approve a plan of liquidation of the company or an agreement for the sale of all or substantially all of our assets; or
- any other event occurs of a nature that would be required to be reported as a "change-in-control" under Schedule 14A of the Exchange Act, provided any transaction or event described above will not constitute a change-in-control under the agreement unless it qualifies as a "change-in-control" under Section 409A of the Internal Revenue Code.

The following table reflects the potential payments to Mr. Roth in the event of his termination or his termination following a change-in-control:

Potential Payments To Mr. Roth Upon Termination Or Change-In-Control				
	Cash Severance		Value of Accelerated Unvested Equity	Benefits Continuation
Termination Circumstance as of 12/31/2018	Base Salary	Management Incentive Bonus		
By the Company without cause	$353,100 (1x salary)	$172,520 (1x bonus)	$915,848	$ -
Executive resignation for good reason	$353,100 (1x salary)	$172,520 (1x bonus)	$915,848	$ -
Death	$ -	$172,520 (1x bonus)	$915,848	$ -
Disability	$ -	$172,520 (1x bonus)	$915,848	$ -
Within 12 months following sale or change-in-control:				
By the Company without cause	$353,100 (1x salary)	$172,520 (1x bonus)	$915,848	$24,177
By the executive with good reason	$353,100 (1x salary)	$172,520 (1x bonus)	$915,848	$24,177

Messrs. Koch, Rogoff and da Silveira

The executive change-in-control agreements for Messrs. Koch, Rogoff and da Silveira provide for the following:

- In the event Mr. Koch's, Mr. Rogoff's or Mr. da Silveira's employment is terminated as a result of his death or "Disability", the executive or his estate would be entitled to:
  - Payment of all base salary due and owing through the termination date and an amount equal to all earned but unused vacation through the termination date; and
  - Accelerated vesting of all unvested stock options and all unvested and outstanding performance-based and service-based RSUs and other equity awards.

- If, within one (1) year following the occurrence of a change-in-control[3], Mr. Koch's, Mr. Rogoff's or Mr. da Silveira's employment is terminated for any reason other than for Good Cause or Mr. Rogoff, Mr. Koch or Mr. da Silveira terminates his employment for Good Reason, the executive would be entitled to:
  - Payment of all base salary due and owing through the termination date and an amount equal to all earned but unused vacation through the termination date;
  - Payment of his then-current base salary for a period of twelve (12) months (paid over a period of twelve (12) months);
  - Accelerated vesting of all unvested stock options and all unvested and outstanding performance-based and service-based RSUs and other equity awards; and
  - Maintenance of his and his dependent's health care benefit coverage to the same extent provided for by and with the same Company/Executive payment contribution percentages under Company's group plans at the time of

[3] For Messrs. Koch, Rogoff and da Silveira, a "Change-in-Control" would generally be considered to have occurred if:

- any person or persons becomes the beneficial owner of fifty percent (50%) or more of our outstanding voting shares;
- during any twelve (12) month period a majority of the Board is replaced by directors whose appointment or election is not endorsed by a majority of the members of the Board prior to the date of the appointment or election; or
- there is a change in the ownership of Company assets that occurs with a person or group over a twelve (12) month period if the subject assets have a total gross fair market value equal to or more than forty percent (40%) of the total gross fair market value of all of the assets of Company immediately prior to such acquisition or acquisitions (subject to certain exceptions), provided any transaction or event described above will not constitute a change-in-control under the agreement unless it qualifies as a "change-in-control" under Section 409A of the Internal Revenue Code.

termination. Such coverage shall extend for a term of one (1) year from the termination date unless he becomes covered as an insured under another employer's or spousal health care plan.

- To the extent that change-in-control termination payments made to Mr. Koch, Mr. Rogoff or Mr. da Silveira are subject to the excise tax imposed by Section 4999 of the Internal Revenue Code, Mr. Koch, Mr. Rogoff or Mr. da Silveira would either have to pay the excise tax or have his benefits reduced so that no portion of his termination payments were subject to the excise tax.
- In order to receive these change-in-control termination payments, Mr. Koch, Mr. Rogoff or Mr. da Silveira would be required to sign a general release of all known and unknown claims that he may have against the Company.

Each of Mr. Koch, Mr. Rogoff or Mr. da Silveira, have entered into a separate agreement upon employment with the Company that subjects the executive to non-competition and non-solicitation restrictions, which limit his ability to compete with the Company during his employment and for a period of one (1) year following his resignation or termination for any reason.

The following table reflects the potential payments to Mr. Koch in the event of his termination or his termination following a change-in-control:

Potential Payments To Mr. Koch Upon Termination Or Change-In-Control			
Termination Circumstance as of 12/31/2018	**Cash Severance (Base Salary)**	**Value of Accelerated Unvested Equity**	**Benefits Continuation**
Death	$ -	$482,498	$ -
Disability	$ -	$482,498	$ -
Within 12 months following sale or change-in-control:			
By the Company without cause	$289,800 (1x salary)	$482,498	$20,099
By the executive with good reason	$289,800 (1x salary)	$482,498	$20,099

The following table reflects the potential payments to Mr. Rogoff in the event of his termination or his termination following a change-in-control:

Potential Payments To Mr. Rogoff Upon Termination Or Change-In-Control			
Termination Circumstance as of 12/31/2018	**Cash Severance (Base Salary)**	**Value of Accelerated Unvested Equity**	**Benefits Continuation**
Death	$ -	$472,284	$ -
Disability	$ -	$472,284	$ -
Within 12 months following sale or change-in-control:			
By the Company without cause	$295,400 (1x salary)	$472,284	$20,099
By the executive with good reason	$295,400 (1x salary)	$472,284	$20,099

The following table reflects the potential payments to Mr. da Silveira in the event of his termination or his termination following a change-in-control:

Potential Payments To Mr. da Silveira Upon Termination Or Change-In-Control			
Termination Circumstance as of 12/31/2018	**Cash Severance (Base Salary)**	**Value of Accelerated Unvested Equity**	**Benefits Continuation**
Death	$ -	$407,640	$ -
Disability	$ -	$407,640	$ -
Within 12 months following sale or change-in-control:			
By the Company without cause	$273,200 (1x salary)	$407,640	$ -
By the executive with good reason	$273,200 (1x salary)	$407,640	$ -

Executive Officers

Set forth below is certain information regarding the executive officers of the Company and their ages as of March 31, 2019. Information relating to Michael P. Plisinski is set forth above under the caption "PROPOSAL 1 — ELECTION OF DIRECTORS — Continuing Class I Directors." The Company is unaware of any arrangements or understandings between the executive officers of the Company and other person(s) pursuant to which an executive officer was or is to be selected.

Named Executive Officers (NEOs)

Steven R. Roth Senior Vice President, Finance and Administration and Chief Financial Officer Age: 58

- Mr. Roth has served the Company in his current role since February 2002.
- Prior Experience:
    - September 1996 to February 2002: Vice President, Finance and Administration and Chief Financial Officer of the Company.
    - August 1991 to August 1996: Director of Corporate Finance for Bell Communications Research, a former research and development company which served the telecommunications industry.
- Mr. Roth is a C.P.A. and holds a B.S. in Accounting from Villanova University.

Robert A. Koch Vice President & General Counsel Age: 57

- Mr. Koch has served the Company in his current role since May 2003.
- Prior Experience:
    - April 1986 to May 2003: In-house counsel, last serving as Director of Legal Affairs for Howmedica Osteonics Corp., the orthopaedic implant subsidiary of Stryker Corporation.
- Mr. Koch holds a B.S. in Chemical Engineering and a M.S. in Biomedical Engineering, both from Rutgers University. Mr. Koch earned his J.D. from Rutgers School of Law - Newark in 1991 and is admitted to practice in New Jersey and New York.

Richard B. Rogoff Vice President and General Manager, Lithography Systems Group Age: 52

- Mr. Rogoff has served the Company in his current role since October 2013.
- Prior Experience:
    - July 2007 to October 2013: Vice President, Optics Business Unit of ASML Holding NV, a supplier of lithography systems to the semiconductor industry.
    - March 2004 to July 2007: Vice President of European Sales and Worldwide Account Support of ASML Holding NV.
    - Other prior roles included various executive, operational and engineering positions with ASML Holding NV since 1990.
- Mr. Rogoff has a Bachelor of Science in Microelectronic Engineering from Rochester Institute of Technology and an M.B.A. from INSEAD Business School.

Elvino da Silveira Vice President, Business Development Age: 59

- Mr. da Silveira has served the Company in his current role since August 2017.
- Prior Experience:
    - November 2015 to July 2017: Vice President, Marketing and Product Management of the Company.
    - December 2012 to October 2015: Vice President and General Manager of the Display Products Lithography Business Unit and Chief Technical Officer of the Lithography Systems Group of the Company.
    - March 1999 to December 2012: President and Chief Executive Officer of Azores Corporation (from Azores inception to its acquisition by the Company).
    - Other prior roles included various senior management roles with the latest being Vice President of Operations and Worldwide Customer Support for MRS Technology, Inc., a former manufacturer of capital equipment for the flat panel display industry.
- Mr. da Silveira holds a B.S. in Mechanical Engineering from Northeastern University.

Other Executive Officers

Reza Asgari General Manager, Americas and Emerging Solutions Age: 60

- Mr. Asgari has served the Company in his current role since September 2018.
- Prior Experience:
  - June 2016 to September 2018: Regional Sales General Manager for the Americas
  - November 2014 to June 2016: Director, US Sales
  - January 2008 to November 2014: Product Manager
  - February 2005 to January 2008: Vice President of Sales and Marketing, RVSI Inspection, LLC.
  - Other prior roles included Director of Business Development, Asia with Robotic Vision Systems Inc.
- Mr. Asgari holds a B.S. and M.S. in Mechanical Engineering from Louisiana State University, Agricultural and Mechanical College.

Cleon Chan Vice President, Global Field Operations Age: 51

- Mr. Chan has served the Company in his current role since August 2017.
- Prior Experience:
  - February 2015 to July 2017: Vice President, Asia Operations of the Company.
  - November 2011 to January 2015: General Manager for Strategic Sales and Marketing for Asia for Applied Materials, Inc.
  - January 2002 to November 2011: General Manger for Asia Strategic Marketing and South East Asia Operations for Varian Semiconductor Equipment Associates, Inc., a supplier of Ion Implanter systems.
  - Other prior roles included General Manager for the semiconductor equipment division of STEAG Electronic Systems AG, for Asia-Pacific Operations. This division of STEAG Electronic Systems merged with Mattson Technology Inc. in January 2001.
- Mr. Chan received a B.Eng. in Electronics and Electrical Engineering from National University of Singapore and M.B.A. from University of Dubuque.

Alex Chow Vice President, Advance Packaging Strategic Marketing Age: 42

- Mr. Chow has served the Company in his current role since January 2018.
- Prior Experience:
  - May 2015 to January 2018: Vice President of Product Marketing for Ultratech, Inc., a semiconductor lithography, laser annealing and inspection equipment manufacturer.
  - January 2010 through May 2015: Director of Product Marketing for Ultratech, Inc., a semiconductor lithography, laser annealing and inspection equipment manufacturer.
  - Other prior roles included Manager for Product Marketing, Field Applications Operations for Ultratech, Inc., and Senior Applications Engineer of Suss Microtec.
- Mr. Chow received a M.S. in Materials Science and Engineering from the University of Maryland College Park. Mr. Chow completed an Executive Education Program of Strategy in Competitive Market at University of California Berkeley.

Michael J. Colgan Vice President, Research and Development, Process Control Group Age: 56

- Dr. Colgan has served the Company in his current role since January 2016.
- Prior Experience:
  - January 2013 to December 2015: Vice President and General Manager of the Metrology Business Unit of the Company.
  - January 2011 to December 2012: Director of Operations, Metrology Business Unit of the Company.
  - Other prior roles included Director of Engineering, Metrology Business Unit as well as various engineering management and staff positions at the Company since 1999.
- Dr. Colgan holds a B.S. in Physics from Catholic University, a Ph.D. in Physics from Rutgers University and an M.B.A. from University of Scranton.

Leonard LaBua Vice President and General Manager, Integrated Solutions Group Age: 57

- Mr. LaBua has served the Company in his current role since August 2018.
- Prior Experience:
  - October 2017 to August 2018: Acting General Manager for the Integrated Solutions Group
  - March 2013 to September 2017: Director of Customer Solutions
  - Other prior roles included Sr. Manager Analysis Applications and Applications Manager at the Company since 2006
  - Mr. LaBua also previously held positions with several other corporations including IBM, KLA-Tencor, and ADE Corporation.
- Mr. LaBua holds a B.S. in Chemical Engineering from Worcester Polytechnic Institute and a M.S. in Computer Science from Marist College.

Anthony Nazzaro Vice President, Worldwide Customer Support Age: 58

- Mr. Nazzaro has served the Company in his current role since April 2018.
- Prior Experience:
  - August 2017 to March 2018: Director, Worldwide Customer Support of the Company.
  - December 2016 to July 2017: Director Technical Support of the Company.
  - January 2015 to December 2016: President, FosterWorth, Inc., a company specializing in business expense reduction services.
  - September 2011 to October 2014: Senior Director Customer Support, ASML Holding N.V., a semiconductor equipment manufacturer.
- Mr. Nazzaro has over 30 years of customer service leadership experience in large and small organizations ranging in complexity from component manufacturers to leading edge front-end capital equipment suppliers for the semiconductor industry.

George Murray Vice President, Operations Age: 51

- Mr. Murray has served the Company in his current role since December 2018.
- Prior Experience:
  - September 2017 to June 2018: Served as the Chief Operating Officer at Wurth Adams.
  - Over 15 years' consulting and executive experience in global operations management of multiple site operations in four industries: RFID/Embedded Technology, Industrial Automation, Electronic Assembly, and Automotive.
- Mr. Murray holds a B.S. in Business Management and an M.B.A. from University of Phoenix, a Mini-Masters in Project Management from St. Thomas, as well as a Black Belt in Lean Six Sigma from Lean Enterprise.
- Mr. Murray is a U.S. Army Veteran having served in Ft. Campbell, KY, Germany, Iraq, Kuwait and Saudi Arabia.

Nicholas Ward Vice President, Software Field Services Age: 59

- Mr. Ward has served the Company in his current role since July 2018.
- Prior Experience:
  - 2016 to 2018: Mr. Ward served as Senior Director of Marketing and Operations in the Software product business unit at PDF Solutions.
  - 1999 to 2016: Mr. Ward held various technical and leadership positions within the software product groups at Applied Materials.
- Mr. Ward holds a Postgraduate Diploma in Computing for Commerce and Industry from the Open University in the UK.

CEO Pay Ratio

As required by Section 953(b) of the Dodd-Frank Wall Street Reform and Consumer Protection Act, and Item 402(u) of Regulation S-K, we are providing the following information about the relationship of the annual total compensation of our employees and the annual total compensation of Michael P. Plisinski, our CEO, during 2018.

For fiscal 2018, our last completed fiscal year:

- The median of the annual total compensation of all employees of our Company (other than our CEO), was $91,106; and
- The annual total compensation of our CEO, as reported in the Summary Compensation Table included in this Proxy Statement, was $2,191,233.

Based on this information, the ratio of the annual total compensation of our CEO to the median employee's annual total compensation is 24 to 1.

Because there was no change in our employee population or compensation arrangements in the past year that we believe would significantly impact the pay ratio disclosure, we used the same median employee identified in 2017 for our 2018 pay ratio.

This pay ratio is a reasonable estimate calculated in good faith, in a manner consistent with Item 402(u) of Regulation S-K, based on our payroll and employment records and the methodology described below. The Securities and Exchange Commission ("SEC") rules for identifying the "median employee" and calculating the pay ratio based on that employee's annual total compensation allow companies to adopt a variety of methodologies, to apply certain exclusions, and to make reasonable estimates and assumptions that reflect their compensation practices. As such, the pay ratios reported by other companies may not be comparable to the pay ratio set forth above, as other companies may have different employment and compensation practices and may utilize different methodologies, exclusions, estimates and assumptions in calculating their own pay ratios.

To identify the employee with the median of the annual total compensation of all our employees that is used for the years ended 2017, 2018 and 2019, we used the following methodology and made the following material assumptions, adjustments and estimates:

- We determined that as of December 31, 2017, our employee population consisted of approximately 592 individuals located in the U.S. and in countries in Europe and Asia. This population consisted of our full-time, part-time and temporary employees. We excluded a limited number of temporary agency employees and independent contractors, who are employees of, and whose compensation is determined by third parties unaffiliated with the Company and as such are not considered our employees for the purposes of the pay ratio calculation.
- To identify the "median employee" from our employee population, we used a consistently applied compensation measure which included annual salary as reflected in our payroll records, as well as stock awards and non-equity incentive plan compensation earned in 2017, which was our measurement period. We applied a foreign currency to U.S. dollar exchange rate to the compensation paid in foreign currency and we did not make any cost-of-living adjustments. We selected this compensation measure because it is readily available in our existing payroll records and because it is a reasonable proxy for total compensation for purposes of determining the "median employee."

For the "median employee" identified in 2017, we calculated the elements of such employee's compensation for 2018 in accordance with the requirements of Item 402(c)(2)(x) of Regulation S-K. The median employee's annual total compensation of $91,106 includes salary, stock awards and non-equity incentive plan compensation, as well as Company matching contributions to the 401(k) employee savings plan, and the cost of Company paid premiums associated with coverage under the group term life insurance and accidental death and dismemberment insurance plan. With respect to the annual total compensation of our CEO, we used the amount reported in the "Total" column of the Summary Compensation Table included in this proxy statement. Any estimates and assumptions used to calculate total annual compensation are described in footnotes to the Summary Compensation Table.

SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS

The following table sets forth certain information with respect to beneficial ownership of the Company's Common Stock as of March 18, 2019 (except as otherwise indicated), by:

(i) each individual or group known by the Company to own beneficially more than five percent (5%) of the Common Stock;

(ii) each of the Named Executive Officers;

(iii) each of the Company's directors and director nominees; and

(iv) all directors, director nominees and executive officers as a group.

Except as indicated in the footnotes to this table, the persons named in the table have sole voting and investment power with respect to all shares of Common Stock shown as beneficially owned by them, subject to community property laws where applicable.

Name and Address of Beneficial Owner	Amount and Nature of Beneficial Ownership(1)	Percent of Class(2)
BlackRock, Inc. (3) *55 East 52nd Street, New York, NY 10055*	4,686,359	15.1%
Dimensional Fund Advisors, LP (4) *Building One, 6300 Bee Cave Road, Austin, TX 78746*	2,687,523	8.7%
The Vanguard Group (5) *100 Vanguard Boulevard, Malvern, PA 19355*	1,998,910	6.5%
Michael P. Plisinski	258,247	*
Steven R. Roth	41,805	*
Richard Rogoff	20,122	*
Robert A. Koch	41,958	*
Elvino da Silveira	23,955	*
Jeffrey A. Aukerman (6)	25,446	*
Leo Berlinghieri	19,000	*
Daniel H. Berry	20,600	*
Vita A. Cassese	—	*
Thomas G. Greig	137,100	*
David B. Miller	17,300	*
John R. Whitten	29,000	*
All directors and executive officers as a group (twenty (20) persons)	689,406	2.2%

* Less than 1%

(1) Includes 23,970 shares subject to restricted stock units vesting within 60 days of March 18, 2019 for all directors and executive officers as a group.

(2) Applicable percentage ownership is based on 30,933,820 shares of Common Stock outstanding as of March 18, 2019. Beneficial ownership of shares is determined in accordance with the rules of the SEC and generally includes shares as to which a person holds sole or shared voting or investment power. Shares of Common Stock subject to RSUs which will vest, within sixty (60) days of March 18, 2019 are deemed to be beneficially owned by the person holding such RSUs for the purpose of computing the percentage ownership of such person but are not treated as outstanding for the purpose of computing the percentage ownership of any other person. Unless otherwise noted, the address for the stockholders named in this table is c/o Rudolph Technologies, Inc., 16 Jonspin Road, Wilmington, Massachusetts 01887.

(3) Information provided herein is based on the Schedule 13G/A that was filed by BlackRock, Inc. on January 31, 2019.

(4) Information provided herein is based on the Schedule 13G/A that was filed by Dimensional Fund Advisors LP on February 8, 2019.

(5) Information provided herein is based on the Schedule 13G/A that was filed by The Vanguard Group on February 12, 2019.

(6) Includes shares held by Aukerman Investments LLC.

EQUITY COMPENSATION PLAN INFORMATION

The following table sets forth, as of December 31, 2018, certain information related to our equity compensation plans.

Plan Category	(a) Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants and Rights (1)	(b) Weighted-Average Exercise Price of Outstanding Options, Warrants and Rights	(c) Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column (a)) (2)
Equity compensation plans approved by security holders	840,518	$0.68	4,831,621
Equity compensation plans not approved by security holders	n/a	n/a	n/a
Total	840,518	$0.68	4,831,621

(1) Includes 794,018 shares issuable upon vesting of outstanding restricted stock units.
(2) As of December 31, 2018, there were 3,331,621 of these shares were available under the 2018 Stock Plan. As of December 31, 2018, there were 1,500,000 shares available under the 2018 Employee Stock Purchase Plan.

SECTION 16(a) BENEFICIAL OWNERSHIP REPORTING COMPLIANCE

Section 16(a) of the Securities Exchange Act of 1934 requires the Company's executive officers, directors and persons who own more than ten percent (10%) of a registered class of the Company's equity securities to file an initial report of ownership on Form 3 and changes in ownership on Form 4 or Form 5 with the SEC. Such persons are also required by SEC rules to furnish the Company with copies of all Section 16(a) forms they file. Based solely on its review of Section 16 filings made with the SEC, the copies of such forms received by it, or written representations from certain reporting persons, the Company believes that, during the year ended December 31, 2018 and through the record date of March 18, 2019, all officers, directors and greater than ten percent (10%) beneficial owners complied with all Section 16(a) filing requirements, except the following:

- Alex Chow filed one Form 4 on January 26, 2018 with respect to one equity grant on January 22, 2018.
- Michael Colgan, Elvino da Silveira, Steven Gardner, Michael Goodrich, Robert Koch, Michael Plisinski, Richard Rogoff and Steven Roth each filed on Form 4 on February 5, 2018 with respect to withholding of shares upon the vesting of equity grants on January 31, 2018.

OTHER MATTERS

The Company knows of no other matters to be submitted to the Annual Meeting. If any other matters properly come before the Annual Meeting, it is the intention of the persons named in the enclosed Proxy to vote the shares they represent as the Board of Directors may recommend.

ADDITIONAL INFORMATION

Stockholders may obtain a copy of the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2018, including financial statements and schedules included in the Annual Report on Form 10-K, without charge, by visiting the Company's website at https://investors.rudolphtech.com or by writing to:

Michael Sheaffer, Sr. Director, Investor Relations & Market Research
16 Jonspin Road
Wilmington, Massachusetts 01887

Upon written request to the Company, at the above address for Investor Relations, the exhibits set forth on the exhibit index of the Company's Annual Report on Form 10-K will be made available at reasonable charge (which will be limited to our reasonable expenses in furnishing such exhibits).

BY ORDER OF THE BOARD OF DIRECTORS

Steven R. Roth
Secretary

Dated: April 2, 2019

ANNUAL MEETING OF STOCKHOLDERS OF

RUDOLPH TECHNOLOGIES, INC.

May 15, 2019

GO GREEN

e-Consent makes it easy to go paperless. With e-Consent, you can quickly access your proxy material, statements and other eligible documents online, while reducing costs, clutter and paper waste. Enroll today via www.astfinancial.com for online access.

NOTICE OF INTERNET AVAILABILITY OF PROXY MATERIAL:
The Notice of Meeting, Proxy Statement, 2018 Annual Report and Proxy Card are available at https://www.rudolphtech.com/writable/files/2018ar_2019proxy.pdf

Please sign, date and mail your proxy card in the envelope provided as soon as possible.

↓ Please detach along perforated line and mail in the envelope provided. ↓

00033303000000000000 9 051519

THE BOARD OF DIRECTORS RECOMMENDS THAT YOU VOTE "FOR" ALL NOMINEES LISTED IN PROPOSAL 1 AND "FOR" PROPOSALS 2 AND 3.
PLEASE SIGN, DATE AND RETURN PROMPTLY IN THE ENCLOSED ENVELOPE. PLEASE MARK YOUR VOTE IN BLUE OR BLACK INK AS SHOWN HERE ☒

	FOR	AGAINST	ABSTAIN
1. ELECTION OF DIRECTORS:			
Daniel H. Berry	☐	☐	☐
Vita A. Cassese	☐	☐	☐
Thomas G. Greig	☐	☐	☐
2. TO APPROVE, ON AN ADVISORY (NON-BINDING) BASIS, THE COMPENSATION OF OUR NAMED EXECUTIVE OFFICERS AS DISCLOSED IN THE PROXY STATEMENT.	☐	☐	☐
3. TO RATIFY THE APPOINTMENT OF ERNST & YOUNG LLP AS OUR INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM FOR THE YEAR ENDING DECEMBER 31, 2019.	☐	☐	☐

4. IN THEIR DISCRETION, THE PROXIES ARE AUTHORIZED TO VOTE UPON SUCH OTHER BUSINESS AS MAY PROPERLY BE BROUGHT BEFORE THE MEETING OR ANY ADJOURNMENT THEREOF.

This proxy, when properly executed, will be voted in the manner described herein by the undersigned. If no direction is made, this proxy will be voted FOR all nominees listed, FOR Items 2 and 3 and according to the discretion of the proxy holders on any other matter that may properly come before the Annual Meeting of Stockholders.

To change the address on your account, please check the box at right and indicate your new address in the address space above. Please note that changes to the registered name(s) on the account may not be submitted via this method. ☐

Signature of Stockholder ____________ Date: ______ Signature of Stockholder ____________ Date: ______

Note: Please sign exactly as your name or names appear on this Proxy. When shares are held jointly, each holder should sign. When signing as executor, administrator, attorney, trustee or guardian, please give full title as such. If the signer is a corporation, please sign full corporate name by duly authorized officer, giving full title as such. If signer is a partnership, please sign in partnership name by authorized person.

RUDOLPH TECHNOLOGIES, INC.

PROXY

THIS PROXY IS SOLICITED ON BEHALF OF THE BOARD OF DIRECTORS OF RUDOLPH TECHNOLOGIES, INC.

The undersigned hereby constitutes and appoints Jeffrey A. Aukerman and Leo Berlinghieri, or either of them, as and for his or her proxies, each with the power to appoint such proxy's substitute, and hereby authorizes them, or either of them, to vote all of the shares of Common Stock of Rudolph Technologies, Inc. held of record by the undersigned on March 18, 2019, at the Annual Meeting of Stockholders of Rudolph Technologies, Inc. to be held on Wednesday, May 15, 2019 and at any and all adjournments or postponements thereof as follows:

(Continued and to be signed on the reverse side.)

ANNUAL MEETING OF STOCKHOLDERS OF

RUDOLPH TECHNOLOGIES, INC.

May 15, 2019

PROXY VOTING INSTRUCTIONS

INTERNET - Access "**www.voteproxy.com**" and follow the on-screen instructions or scan the QR code with your smartphone. Have your proxy card available when you access the web page.

Vote online until 11:59 PM EST the day before the meeting.

MAIL - Sign, date and mail your proxy card in the envelope provided as soon as possible.

IN PERSON - You may vote your shares in person by attending the Annual Meeting.

GO GREEN - e-Consent makes it easy to go paperless. With e-Consent, you can quickly access your proxy material, statements and other eligible documents online, while reducing costs, clutter and paper waste. Enroll today via www.astfinancial.com for online access.

QR CODE

COMPANY NUMBER	
ACCOUNT NUMBER	

NOTICE OF INTERNET AVAILABILITY OF PROXY MATERIAL: The Notice of Meeting, Proxy Statement, 2018 Annual Report and Proxy Card are available at https://www.rudolphtech.com/writable/files/2018ar_2019proxy.pdf

Please detach along perforated line and mail in the envelope provided IF you are not voting via telephone or the Internet.

00033303000000000000 9 051519

THE BOARD OF DIRECTORS RECOMMENDS THAT YOU VOTE "FOR" ALL NOMINEES LISTED IN PROPOSAL 1 AND "FOR" PROPOSALS 2 AND 3.
PLEASE SIGN, DATE AND RETURN PROMPTLY IN THE ENCLOSED ENVELOPE. PLEASE MARK YOUR VOTE IN BLUE OR BLACK INK AS SHOWN HERE ☒

	FOR	AGAINST	ABSTAIN
1. ELECTION OF DIRECTORS:			
Daniel H. Berry	☐	☐	☐
Vita A. Cassese	☐	☐	☐
Thomas G. Greig	☐	☐	☐
2. TO APPROVE, ON AN ADVISORY (NON-BINDING) BASIS, THE COMPENSATION OF OUR NAMED EXECUTIVE OFFICERS AS DISCLOSED IN THE PROXY STATEMENT.	☐	☐	☐
3. TO RATIFY THE APPOINTMENT OF ERNST & YOUNG LLP AS OUR INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM FOR THE YEAR ENDING DECEMBER 31, 2019.	☐	☐	☐

4. IN THEIR DISCRETION, THE PROXIES ARE AUTHORIZED TO VOTE UPON SUCH OTHER BUSINESS AS MAY PROPERLY BE BROUGHT BEFORE THE MEETING OR ANY ADJOURNMENT THEREOF.

This proxy, when properly executed, will be voted in the manner described herein by the undersigned. If no direction is made, this proxy will be voted FOR all nominees listed, FOR Items 2 and 3 and according to the discretion of the proxy holders on any other matter that may properly come before the Annual Meeting of Stockholders.

To change the address on your account, please check the box at right and indicate your new address in the address space above. Please note that changes to the registered name(s) on the account may not be submitted via this method. ☐

Signature of Stockholder ____________ Date: ______ Signature of Stockholder ____________ Date: ______

Note: Please sign exactly as your name or names appear on this Proxy. When shares are held jointly, each holder should sign. When signing as executor, administrator, attorney, trustee or guardian, please give full title as such. If the signer is a corporation, please sign full corporate name by duly authorized officer, giving full title as such. If signer is a partnership, please sign in partnership name by authorized person.

Important Notice of Availability of Proxy Materials for the Stockholder Meeting of

RUDOLPH TECHNOLOGIES, INC.

To Be Held On:

May 15, 2019

COMPANY NUMBER	
ACCOUNT NUMBER	
CONTROL NUMBER	

This communication presents only an overview of the more complete proxy materials that are available to you on the internet. We encourage you to access and review all of the important information contained in the proxy materials before voting.

If you want to receive a paper or e-mail copy of the proxy materials you must request one. There is no charge to you for requesting a copy. To facilitate timely delivery please make the request as instructed below before May 5, 2019.

Please visit https://www.rudolphtech.com/writable/files/2018ar_2019proxy.pdf, where the following materials are available for view:

- Annual Report on Form 10-K
- Notice of Annual Meeting of Stockholders
- Proxy Statement
- Form of Electronic Proxy Card

TO REQUEST MATERIAL: **TELEPHONE: 888-Proxy-NA (888-776-9962), 718-921-8562 (for international callers)**

E-MAIL: info@astfinancial.com

WEBSITE: https://us.astfinancial.com/OnlineProxyVoting/ProxyVoting/RequestMaterials

TO VOTE:

QR CODE

ONLINE: To access your online proxy card, please visit **www.voteproxy.com** and follow the on-screen instructions or scan the QR code with your smartphone. You may enter your voting instructions at www.voteproxy.com up until 11:59 PM Eastern Time the day before the meeting date.

IN PERSON: You may vote your shares in person by attending the Annual Meeting.

MAIL: You may request a card by following the instructions above.

Please note that you cannot use this notice to vote by mail.

1. ELECTION OF DIRECTORS:
   Daniel H. Berry

   Vita A. Cassese

   Thomas G. Greig
2. TO APPROVE, ON AN ADVISORY (NON-BINDING) BASIS, THE COMPENSATION OF OUR NAMED EXECUTIVE OFFICERS AS DISCLOSED IN THE PROXY STATEMENT.
3. TO RATIFY THE APPOINTMENT OF ERNST & YOUNG LLP AS OUR INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM FOR THE YEAR ENDING DECEMBER 31, 2019.
4. IN THEIR DISCRETION, THE PROXIES ARE AUTHORIZED TO VOTE UPON SUCH OTHER BUSINESS AS MAY PROPERLY BE BROUGHT BEFORE THE MEETING OR ANY ADJOURNMENT THEREOF.

*** Exercise Your *Right* to Vote ***

Important Notice Regarding the Availability of Proxy Materials for the Shareholder Meeting to Be Held on May 15, 2019

RUDOLPH TECHNOLOGIES, INC.

BROKER
LOGO
HERE

Return Address Line 1
Return Address Line 2
Return Address Line 3
51 MERCEDES WAY
EDGEWOOD NY 11717

Investor Address Line 1
Investor Address Line 2
Investor Address Line 3
Investor Address Line 4
Investor Address Line 5
John Sample
1234 ANYWHERE STREET
ANY CITY, ON A1A 1A1

1 OF 2
12
15

Meeting Information

Meeting Type: Annual Meeting
For holders as of: March 18, 2019
Date: May 15, 2019 **Time:** 10:00 AM EDT
Location: 16 Jonspin Road
Wilmington, MA 01887

B
A
R
C
O
D
E

You are receiving this communication because you hold shares in the above named company.

This is not a ballot. You cannot use this notice to vote these shares. This communication presents only an overview of the more complete proxy materials that are available to you on the Internet. You may view the proxy materials online at *www.proxyvote.com* or easily request a paper copy (see reverse side).

We encourage you to access and review all of the important information contained in the proxy materials before voting.

See the reverse side of this notice to obtain proxy materials and voting instructions.

Broadridge Internal Use Only

Job #
Envelope #
Sequence #
\# of # Sequence #

0000414044_1 R1.0.1.18

— Before You Vote —

How to Access the Proxy Materials

Proxy Materials Available to VIEW or RECEIVE:

1. Combined Document

How to View Online:

Have the information that is printed in the box marked by the arrow → XXXX XXXX XXXX XXXX (located on the following page) and visit: *www.proxyvote.com.*

How to Request and Receive a PAPER or E-MAIL Copy:

If you want to receive a paper or e-mail copy of these documents, you must request one. There is NO charge for requesting a copy. Please choose one of the following methods to make your request:

1) *BY INTERNET*: www.proxyvote.com
2) *BY TELEPHONE*: 1-800-579-1639
3) *BY E-MAIL**: sendmaterial@proxyvote.com

* If requesting materials by e-mail, please send a blank e-mail with the information that is printed in the box marked by the arrow → XXXX XXXX XXXX XXXX (located on the following page) in the subject line.

Requests, instructions and other inquiries sent to this e-mail address will NOT be forwarded to your investment advisor. Please make the request as instructed above on or before May 05, 2019 to facilitate timely delivery.

— How To Vote —

Please Choose One of the Following Voting Methods

Vote In Person: If you choose to vote these shares in person at the meeting, you must request a "*legal proxy.*" To do so, please follow the instructions at *www.proxyvote.com* or request a paper copy of the materials, which will contain the appropriate instructions. Many shareholder meetings have attendance requirements including, but not limited to, the possession of an attendance ticket issued by the entity holding the meeting. Please check the meeting materials for any special requirements for meeting attendance.

Vote By Internet: To vote now by Internet, go to *www.proxyvote.com.* Have the information that is printed in the box marked by the arrow → XXXX XXXX XXXX XXXX available and follow the instructions.

Vote By Mail: You can vote by mail by requesting a paper copy of the materials, which will include a voting instruction form.

Internal Use Only

0000414044_2 R1.0.1.18

Voting items

The Board of Directors recommends you vote FOR the following proposal(s):

1. Election of Directors

Nominees

1A Daniel H. Berry

1B Vita A. Cassese

1C Thomas G. Greig

The Board of Directors recommends you vote FOR the following proposal(s):

2 TO APPROVE, ON AN ADVISORY (NON-BINDING) BASIS, THE COMPENSATION OF OUR NAMED EXECUTIVE OFFICERS AS DISCLOSED IN THE PROXY STATEMENT.

3 TO RATIFY THE APPOINTMENT OF ERNST & YOUNG LLP AS OUR INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM FOR THE YEAR ENDING DECEMBER 31, 2019.

NOTE: IN THEIR DISCRETION, THE PROXIES ARE AUTHORIZED TO VOTE UPON SUCH OTHER BUSINESS AS MAY PROPERLY BE BROUGHT BEFORE THE MEETING OR ANY ADJOURNMENT THEREOF.

BARCODE

→ 0000 0000 0000 0000

Broadridge Internal Use Only
xxxxxxxxxx
xxxxxxxxxx
Cusip
Job #
Envelope #
Sequence #
of # Sequence

0000414044_3 R1.0.1.18

Reserved for Broadridge Internal Control Information

Voting Instructions

THIS SPACE RESERVED FOR LANGUAGE PERTAINING TO
BANKS AND BROKERS
AS REQUIRED BY THE NEW YORK STOCK EXCHANGE

0000414044_4 R1.0.1.18

THIS SPACE RESERVED FOR SIGNATURES IF APPLICABLE

Broadridge Internal Use Only

Job #
Envelope #
Sequence #
of # Sequence

SHAREHOLDER INFORMATION

LOCATIONS

CORPORATE HEADQUARTERS
Rudolph Technologies, Inc.
16 Jonspin Road
Wilmington, Massachusetts
01887
Phone: 978 253 6200
www.rudolphtech.com

OTHER OFFICES
Rudolph Technologies Process Control Group
Bloomington, Minnesota
Budd Lake, New Jersey
Richardson, Texas

Rudolph Technologies Emerging Solutions Business Group
Snoqualmie, Washington

Rudolph Technologies Integrated Solutions Group
Wilmington, Massachusetts
Richardson, Texas
Tianjin, China

Rudolph Technologies Lithography Systems Group
Wilmington, Massachusetts

Rudolph Technologies Europe B.V.
Scotland, United Kingdom

Rudolph Technologies Japan KK
Takatsu, Japan

Rudolph Technologies (Shanghai) Trading Co. Ltd.
Shanghai, China

Rudolph Technologies Korea
Sungnam-si, South Korea

Rudolph Technologies Singapore
Singapore

Rudolph Technologies Taiwan
Hsin-Chu City, Taiwan

INVESTOR INFORMATION

General Shareholder and Investor Questions may be directed to:
Michael Sheaffer
Senior Director,
Corporate Communications
Rudolph Technologies, Inc.
16 Jonspin Road
Wilmington, Massachusetts
01887
investors@rudolphtech.com

Independent Registered Public Accounting Firm
Ernst & Young, LLP
Iselin, New Jersey

Registrar and Transfer Agent
AST
6201 15th Avenue
Brooklyn, New York 11219
Phone: 800 937 5449
www.astfinancial.com

Stock Symbol
Common Stock is traded on the New York Stock Exchange under the symbol, RTEC.

Annual Meeting
Stockholders are invited to attend the Annual Meeting at 10:00 AM on Wednesday, May 15, 2019 at our corporate headquarters, located at 16 Jonspin Road Wilmington, Massachusetts 01887

Form 10-K
The Annual Report on Form 10-K filed with the Securities and Exchange Commission is available without charge upon written request to Investor Relations at our corporate headquarters address.

BOARD OF DIRECTORS

David B. Miller
Chairman of the Board
Former President
DuPont Electronics & Communications

Michael P. Plisinski
Chief Executive Officer

Jeffrey A. Aukerman
Former Partner
Deloitte & Touche, LLP

Leo Berlinghieri
Former Chief Executive Officer and President,
MKS Instruments, Inc.

Daniel H. Berry
Operating Partner
Riverside Partners, LLC

Thomas G. Greig
Former Senior Managing Director
Liberty Capital Partners, Inc.

Vita A. Cassese
Chief Executive Officer,
Mardon Management Advisors

John R. Whitten
Former Chief Financial Officer,
Vice President and Treasurer
Applied Industrial Technologies, Inc.

EXECUTIVE OFFICERS

Michael P. Plisinski
Chief Executive Officer

Steven R. Roth
Senior Vice President, Finance and Administration and
Chief Financial Officer

NYSE | RTEC

RUDOLPH TECHNOLOGIES, INC
16 JONSPIN ROAD
WILMINGTON MA 01887

978 253 6200

RUDOLPHTECH.COM