

BROOKS AUTOMATION INC
Form 10-K
November 29, 2018
Table of Contents

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 fiscal year ended September 30, 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 Number: 0 25434

Brooks Automation, Inc.

(Exact name of Registrant as Specified in Its Charter)

Delaware	04 3040660
(State or Other Jurisdiction of	(I.R.S. Employer
Incorporation or Organization)	Identification No.)
15 Elizabeth Drive	
Chelmsford, Massachusetts	01824
(Address of Principal Executive Offices)	(Zip Code)

978 262 2400

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(Registrant's telephone number, including area code)

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

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, \$0.01 par value	The Nasdaq Stock Market LLC

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 15(d) of the Securities Exchange Act of 1934. Yes No

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

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

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10 K or any amendment to the 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. (Check one):

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 Exchange Act Rule 12b 2). Yes

No

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The aggregate market value of the registrant's Common Stock, \$0.01 par value, held by non-affiliates of the registrant as of March 31, 2018, was approximately \$1,303,513,402 based on the closing price per share of \$27.08 on that date on the Nasdaq Stock Market. As of March 31, 2018, 70,539,856 shares of the registrant's Common Stock, \$0.01 par value, were outstanding. As of November 15, 2018, 71,776,483 shares of the registrant's Common Stock, \$0.01, par value, were outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement involving the election of directors, which is expected to be filed within 120 days after the end of the registrant's fiscal year, are incorporated by reference in Part III of this Report.

Table of Contents

BROOKS AUTOMATION, INC.

TABLE OF CONTENTS

	PAGE NUMBER
<u>PART I</u>	
<u>Item 1. Business</u>	3
<u>Item 1A. Risk Factors</u>	13
<u>Item 1B. Unresolved Staff Comments</u>	24
<u>Item 2. Properties</u>	24
<u>Item 3. Legal Proceedings</u>	25
<u>Item 4. Mine Safety Disclosures</u>	25
<u>PART II</u>	
<u>Item 5. Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities</u>	26
<u>Item 6. Selected Financial Data</u>	28
<u>Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations</u>	29
<u>Item 7A. Quantitative and Qualitative Disclosures About Market Risk</u>	48
<u>Item 8. Financial Statements and Supplementary Data</u>	49
<u>Item 9. Changes In and Disagreements With Accountants on Financial Accounting and Financial Disclosure</u>	104
<u>Item 9A. Controls and Procedures</u>	104
<u>Item 9B. Other Information</u>	105
<u>PART III</u>	
<u>Item 10. Directors, Executive Officers and Corporate Governance</u>	105
<u>Item 11. Executive Compensation</u>	105
<u>Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters</u>	105
<u>Item 13. Certain Relationships and Related Transactions, and Director Independence</u>	105
<u>Item 14. Principal Accountant Fees and Services</u>	105
<u>PART IV</u>	
<u>Item 15. Exhibits and Financial Schedules</u>	106
<u>SIGNATURES</u>	110

Table of Contents

Information Relating to Forward-Looking Statements

Certain statements in this Form 10 K constitute forward-looking statements, which are subject to the safe harbor provisions created by the Private Securities Litigation Reform Act of 1995. Certain, but not all, of the forward-looking statements in this report are specifically identified as forward-looking, by use of phrases and words such as “we believe,” “we estimate,” “we expect,” “may,” “should,” “could,” “intend,” “likely,” and other future-oriented terms. The identification of certain statements as “forward-looking” is not intended to mean that other statements not specifically identified are not forward-looking. Forward-looking statements include, but are not limited to, statements that relate to our future revenue, margin, costs, earnings, product development, demand, acceptance and market share, competitiveness, market opportunities and performance, levels of research and development, or R&D, the success of our marketing, sales and service efforts, outsourced activities and operating expenses, anticipated manufacturing, customer and technical requirements, the ongoing viability of the solutions that we offer and our customers’ success, tax expenses, our management’s plans and objectives for our current and future operations and business focus, the expected benefits and other statements relating to our divestitures and acquisitions, the levels of customer spending, general economic conditions, the sufficiency of financial resources to support future operations, and capital expenditures. Such statements are based on current expectations and are subject to risks, uncertainties, and changes in condition, significance, value and effect, including without limitation those discussed within Item 1 A, “Risk Factors” and elsewhere in this report and other documents we file from time to time with the Securities and Exchange Commission, or SEC, such as our quarterly reports on Form 10 Q and our current reports on Form 8 K. Such risks, uncertainties and changes in condition, significance, value and effect could cause our actual results, performance or achievements to differ materially from those expressed in this report and in ways we cannot readily foresee. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date hereof and are based on information currently and reasonably known to us. We do not undertake any obligation to release the results of any revisions to these forward-looking statements, which may be made to reflect events or circumstances that occur after the date of this report or to reflect the occurrence or effect of anticipated or unanticipated events. Precautionary statements made herein should be read as being applicable to all related forward-looking statements wherever they appear in this report.

Unless the context indicates otherwise, references in this report to "we", "us", "our" and other similar references mean Brooks Automation, Inc. and its consolidated subsidiaries.

PART I

Item 1. Business

Overview

We are headquartered in Chelmsford, Massachusetts and have operations in North America, Asia, and Europe. Today we serve two distinct and unrelated markets; the semiconductor capital equipment market and the life sciences sample management market. We believe our leadership positions and our global support capability in each of these markets make us a valued business partner to the largest semiconductor capital equipment device makers, and pharmaceutical and life science research institutions in the world. Our offerings are also applied to other adjacent technology and industrial markets. We provide customer support services for our products globally. In total, we employ approximately 1,550 regular full-time employees worldwide and have sales in more than 50 countries.

Since our founding in 1978, we have been a leading partner to the global semiconductor manufacturing markets. In our early days of our business, we developed and marketed automated handling equipment for semiconductor manufacturers. Since then, we have expanded our products and services through product development initiatives and acquisitions, and we are now recognized as a leading provider of vacuum robots, vacuum automation systems, wafer

carrier contamination control systems, and reticle storage solutions to the global semiconductor capital equipment industry. Over the last three fiscal years, we acquired one company to support the semiconductor market: Tec-Sem Group AG, a Switzerland-based manufacturer of semiconductor fabrication automation equipment with a focus on reticle storage management, which we acquired in April 2018. Prior to fiscal year 2016, we made several acquisitions to support our business in the semiconductor market, some of which are described further in the Notes to our Consolidated Financial Statements included elsewhere in this Form 10-K. We have invested in research and development initiatives to advance the offerings acquired in these acquisitions, as well as vacuum automation and services offerings. Our

Table of Contents

business supporting the semiconductor capital equipment and adjacent markets provided approximately 69% of our revenue in fiscal year 2018.

In the fourth quarter of fiscal year 2018, we entered into a definitive agreement to sell our semiconductor cryogenics business to Edwards Vacuum LLC (a member of the Atlas Copco Group) for approximately \$675.0 million in cash subject to customary adjustments. We originally acquired the cryogenics business in 2005 as part of the acquisition of Helix Technology Corporation. The closing of our sale of the cryogenics business is subject to various closing conditions and regulatory approvals. As part of this sale, we will transfer our intellectual property, or IP, for our cryogenics pump products, but not our IP related to our semiconductor automation or life sciences businesses. The semiconductor cryogenics business has been classified as discontinued operations and, unless otherwise noted, the description of our business in this report relates solely to our continuing operations and does not include the operations of our semiconductor cryogenics business.

We have served the life sciences sample management market since 2011. The original strategic linkage between this business and our semiconductor business was our ability to leverage our core technology competencies in automation and cryogenics. In life sciences, we applied these competencies to provide automated ultra-cold freezer systems and then to expand into a portfolio of products and services to assist customers in efficiently managing the end-to-end “cold chain of custody” of their compound and biological samples. Today, we are a leading provider of the life sciences sample management solutions for automated cold sample stores, off-site storage services, and consumables and instruments. We are also a provider of software offerings which enable or enhance our customers’ visibility into their sample inventories, and laboratory services at our storage service locations, both of which are expected to help our customers accelerate their research and development efforts. Taken together, we believe our life sciences product and services offerings allow our customers to maintain a complete “cold chain of custody” and related workflow solutions for their samples. Our business supporting the life science sample management market provided approximately 31% of our revenue in fiscal year 2018.

Our life sciences sample management product and service solutions portfolio are a result of strategic acquisitions and internal research and development initiatives. Our competencies in automation and cryogenics provided us a differentiated capability to advance the product set with higher functioning automation, automation-ready consumables, and management of samples and automation in ultra-cold environments. We leveraged the storage solutions acquired before 2013 and our expertise and developed and commercialized a full line of advanced automated ultra-cold freezer offerings. The Twinbank™ platform was launched in 2014 and sells under two primary offerings, the SampleStore™ II which provides -20°C high volume storage for chemical compounds and the BioStore™ II which provides -80°C high volume storage for biological samples. In 2016, we launched the BioStore™ III Cryo, a smaller, automated, liquid nitrogen-cooled freezer that operates at temperatures as low as -196°C for automated storage of the most temperature sensitive of biological samples. We also expanded our consumables and instruments offerings with development of new products, and have successfully commercialized BioStudies, a bioinformatics software platform that enables customers to manage sample collections and development efforts distributed across the globe.

In the last three fiscal years, we have completed six acquisitions of companies or assets to expand and enhance our life science offerings. These include three companies providing off-site storage and sample management services.

- In November of 2015, we acquired BioStorage Technologies, Inc., a full-service outsourcing sample management business, supporting customers in the United States, Europe, and Asia with an integrated solution for off-site storage services, transportation services, laboratory services and software-based inventory management.
- In July 2017, we acquired assets and liabilities of Pacific Bio-Material Management, Inc. and Novare, LLC, two companies with operations in California and New York, respectively, providing off-site storage, transportation, and management services for biological samples.

- In April 2018, we acquired BioSpeciMan Corporation, a Canada-based provider of off-site storage services for biological sample materials.

4

Table of Contents

The recent acquisitions in life sciences also added cryogenic temperature management products, software products and consumable products to our portfolio.

- In November 2016, we completed the acquisition of Cool Lab, LLC, a subsidiary of BioCision, LLC, a provider of cryogenic product solutions that assist in managing temperature stability of biological samples in a laboratory environment.
- In August 2017, we acquired certain assets and liabilities from RURO, Inc related to FreezerPro®, a web-based software platform which aids customers in their sample management needs and became the exclusive distributor of BiobankPro®, a software system that manages sample processing and storage while providing a single location for research and clinical data and related analysis.
- In October 2017, we acquired 4titude Limited, a U.K.-based manufacturer of scientific consumables used in a variety of genomic analytical applications.

On September 26, 2018, we entered into a definitive agreement to acquire GENEWIZ Group, or GENEWIZ, a leading provider of genomic services, based in New Jersey with operations throughout the United States, Asia, and Europe. We completed this acquisition on November 15, 2018. Please refer to Note 23, "Subsequent Events" to our Consolidated Financial Statements included under "Item 8, Financial Statements and Supplementary Data" of this Form 10-K.

Through the acquisitions described above, we have expanded product offerings, accelerated product development cycles, broadened our installed base and added customer relationships to our business. We have also divested certain products that did not hold leadership positions in our core markets. As such, we use acquisitions and divestitures to strengthen our portfolio and achieve increased growth and profitability. For further information on our acquisitions and equity investments, please refer to Note 4, "Acquisitions," and Note 8, "Equity Method and Other Investments," to our Consolidated Financial Statements included under "Item 8, Financial Statements and Supplementary Data" of this Form 10 K.

We believe the life science sample management market is generally more stable than the semiconductor capital equipment market and we expect that it will grow more quickly than our semiconductor business as a result of the expanding need for storage and retention of compound and biological samples. In the life science market, revenue streams from storage services are more predictable than the sale of automated freezers and other equipment. As we have expanded our life science offerings of consumables, infrastructure services and storage services, we have seen these more stable revenue streams increase to account for approximately 56% of our Brooks Life Sciences segment revenue in fiscal year 2018.

Segments

We have two operating and reportable segments consisting of Brooks Semiconductor Solutions Group segment and Brooks Life Sciences segment. For further information on our operating segments, please refer to Note 20, "Segment and Geographic Information" to our Consolidated Financial Statements included under "Item 8, Financial Statements and Supplementary Data" of this Form 10 K.

Table of Contents

Brooks Semiconductor Solutions Group Segment

Brooks Semiconductor Solutions Group is a leader in mission-critical wafer automation and contamination controls solutions and services that are designed to improve throughput, yield, and cost of ownership of complex processing equipment, or tools, in semiconductor fabrication plants, or fabs. Our product offerings include vacuum and atmospheric robots, turnkey vacuum and atmospheric wafer handling systems, as well as wafer carrier clean and reticle storage systems. We also capture the complete life cycle of value through a global service network of expert application and field engineers who are located close to our customers. Our services include rapid refurbishment of robots to stringent specifications, upgrades to improve equipment productivity, and proactive monitoring and diagnostics for predictive risk management and improved up-time of the installed base.

Markets and Customers

The demand for semiconductors and semiconductor manufacturing equipment is cyclical, resulting in periodic expansions and contractions of this market. While the services element of our semiconductor business is generally more stable, the cyclical nature of the capital equipment business causes sales from products to vary quarterly based on short-term market demands. It is not unusual for these variations in sales to be up or down 10% to 20% in sequential quarters.

The principal markets served by the Brooks Semiconductor Solutions Group segment include the following:

- Semiconductor capital equipment market

Each year, the global semiconductor industry makes significant capital investments in equipment to keep up with advancements in semiconductor technology, to add manufacturing capacity and to improve productivity within existing fabs. We are recognized as a market leader in three critical sub-segments: vacuum automation for wafer handling; contamination control; and automation for advanced packaging. As discussed above, the global semiconductor capital equipment industry is cyclical, but we believe that it possesses a long-term growth profile driven by the demand for increasingly sophisticated consumer electronics, automotive and smart appliance products, growth in data centers, the expansion of the Internet-of-Things which increasingly connects various appliances and devices to servers, and mobile platforms. The demand for higher performance, lower power consumption and reduced size for all of these products is enabled by advancements in the technology and processes used for the manufacturing of the devices. We believe this trend continues to provide market opportunities for the Brooks Semiconductor Solutions Group to be a valued partner in providing vacuum automation, carrier contamination control and automation for advanced packaging to support the industry's needs.

We have been a long-term partner to device manufacturers and original equipment manufacturers, or OEMs, who are the providers of tools to fabs. We maintain collaborative relationships with our customers for the innovative design of solutions that enable our customers to have a valued wafer process advantage and improved cost of ownership in the fab. Our global network of technical specialists provides extensive support to our customers in all regions, including the key semiconductor markets in Korea, Taiwan, China, Japan, Europe and the United States.

The production of advanced semiconductor chips requires many complex and logistically challenging manufacturing activities. Silicon wafers must go through hundreds of process steps in order to create billions of microscopic transistors and connect them in both horizontal and vertical layers to produce a functioning integrated circuit, or IC. These initial fabrication steps, which are referred to in the industry as front-end processes, are repeated many times on a single wafer to create the desired pattern on the silicon wafer. Up to 50% of these processes are performed in tools that operate under vacuum conditions, such as removing, depositing, or measuring materials on wafer surfaces. As the complexity of semiconductors has increased, the number of process steps that occur in a vacuum environment have also increased, resulting in a greater need for vacuum automation technology solutions.

The increase in packing density of components in mobile devices has led the industry to devise new advanced packaging techniques for chip interconnectivity using what is called wafer level packaging, or WLP. This advanced packaging technology is a process of combining multiple wafers together prior to cutting them into pieces and then forming them onto a packaging substrate where they are ultimately divided into the multitude of chips. The recent

Table of Contents

increased adoption of WLP has increased the need for a contaminant free and high purity manufacturing environment, resulting in higher demand for our semiconductor offerings tailored to handle full wafer forms.

In addition to the more complex automation challenges brought by technology shifts in device and packaging structures, there is also an increased demand for wafer carrier devices that provide safe and clean transport of wafers between tools during the manufacturing process. Large scale semiconductor fabs may use thousands of these carriers. There is also growing demand for wafer carrier cleaning and conditioning tools used to remove microscopic particles, organic compounds and water that are attracted to the inside surface of the carrier. Automated cleaning and conditioning of the carrier devices are also in demand by customers looking to improve yields. Similarly, as Lithography also requires cleaner controlled environments, our reticles solutions provide contamination control for highly valued reticles or masks that are used in printing the technological features onto the wafer.

· Adjacent capital equipment markets

There are a few adjacent and capital equipment markets that use manufacturing processes similar to the semiconductor manufacturing industry. These markets include microelectromechanical devices, or MEMs, light-emitting diodes, or LEDs, Organic Light Emitting Diodes, or OLEDs, and touch screen technology. These markets and semiconductor capital equipment market share common customers and utilize similar technology applications. For example, LEDs are manufactured using vacuum systems and handling processes similar to those used in semiconductor manufacturing.

We believe the desire for efficient, higher throughput and extremely clean manufacturing for semiconductor wafer fabs, the chip packaging process and other industrial or high performance electronic-based products and processes have created a substantial market for us in the following offerings: (i) substrate handling automation, which is related to moving the wafers in a semiconductor fab, (ii) tool automation, which moves wafers from station-to-station, (iii) vacuum systems technology to create and sustain the clean environment necessary for fabricating various products, and (iv) automated contamination control systems to clean and condition wafer carriers.

Product and Service Offerings

The principal offerings of the Brooks Semiconductor Solutions Group segment consist of: (i) wafer handling robotics and systems and (ii) semiconductor contamination control solutions. The segment also provides support services, including repair, diagnostic and installation, as well as spare parts and productivity enhancement upgrades to enhance tool productivity.

Wafer handling robotics and systems offerings - include vacuum robots, atmospheric robotic modules, and tool automation systems that provide precision handling and clean wafer environments. In the semiconductor industry, wafer handling robotics represents a critical technology in the highly complex production tools in the world's most advanced wafer fabs. A typical customer tool is designed and built around a process chamber and uses automation technology to move wafers in and out of the chamber. We specialize in developing and building the automated handling systems and the vacuum technologies used in these tools. We provide individual components within an OEM customer system and complete integrated handling systems. We provide automation products that are used for both atmospheric pressure and vacuum-based tools and are designed to improve performance and productivity of the manufacturing process.

Contamination control solutions - include automated cleaning and inspection systems for wafer carriers, reticle pod cleaners, and stockers, which are automated systems that store wafers or reticles. Our products are used to remove critical airborne contamination within the workflow of the manufacturing process. Our solutions contribute to improving yields, productivity and process stability in the manufacturing process which requires an ultra-clean manufacturing environment.

Within the semiconductor industry, we sell our products and services to the world's major semiconductor chip makers and OEMs, who provide process tools to the IC makers for the manufacture of chips. Our customers outside the semiconductor industry are broadly diversified. We have major customers in North America, Europe and Asia. Although we ship much of our equipment OEMs in the United States, a large percentage of these OEM tools are ultimately

7

Table of Contents

installed in semiconductor fabs that are outside of North America. We also provide support services to leading OEMs, fabs and foundries across the globe.

Brooks Life Sciences Segment

Brooks Life Sciences is a global leader of comprehensive sample management solutions, providing life science and bioscience customers with complete end-to-end “cold chain of custody” solutions to advance scientific research and support drug development. Our sample management solutions are focused on providing customers with the highest level of sample quality, security, availability, intelligence and integrity throughout the life cycle of samples. Our solutions include automated ultra-cold storage systems, off-site storage services, transport services, laboratory services, consumables and instruments. We also provide informatics solutions that manage samples throughout our customers’ research discovery and development work flows.

As referenced above, we completed the acquisition of GENEWIZ Group on November 15, 2018, subsequent to the end of our fiscal year 2018. GENEWIZ is a leading global provider of genomic analysis and gene synthesis services. We believe GENEWIZ’s solutions will significantly expand our offerings to our existing sample management customers. GENEWIZ has been in business since 1999 and provides analysis of millions of samples collected by researchers in pharmaceutical, academic, government, and clinical areas.

Life Science Market

Brooks Life Sciences serves a broad range of end markets within the life sciences industry to address a confluence of life science industry trends, such as technology, information management and new sophisticated tools and applications. With the advent of biologics and personalized medicine, biological samples have become critical assets to the success of drug and therapy pipelines, and the proper management and protection of these samples has gained increased importance to our customers. We believe this trend has created a sizable market opportunity for Brooks Life Sciences to provide comprehensive sample management solutions.

We believe that the total addressable market for sample management solutions is currently expanding as a result of an increasing number of samples being stored globally. The market is fragmented, so we are initially focused on marketing our products and services within biopharma, which encompasses drug discovery research and development along with related clinical research, to government and commercially-sponsored biobanks, as well as to healthcare and academic research institutions. Together, this presents a significant addressable market for our comprehensive sample management solutions.

Brooks Life Sciences currently serves more than 1200 customers around the globe with sample management solutions, including a majority of the top 20 global bio-pharmaceutical companies. Due to the comprehensive nature of our sample management solutions that include automated ultra-cold storage management systems, consumables and instruments, as well as services and informatics, we are continuing to expand our customer base and geographic reach to increase our revenue streams and to deliver consistent growth over the long-term. GENEWIZ has more than 4000 customers globally, which includes many of our sample management customers.

Product and Service Offerings

The principal offerings of the Brooks Life Sciences segment include the following:

Automated cold storage systems – provides stand-alone systems that can store up to two million samples each in temperature ranges from +4°C to -196°C. Our systems provide high throughput capability and optimized storage of multi-format tubes and plates, and increased storage capacity while maintaining consistent temperature profiles across

stored samples. We also provide support services for our installed base of storage systems.

Sample management services - includes a complete range of services consisting of on-site and off-site sample storage, cold chain logistics, sample transport and collection relocation, bio-processing solutions (inclusive of sample preparation, and genomic and cell culture analysis), disaster recovery and business continuity, as well as project management and consulting.

8

Table of Contents

Consumables and Instruments - includes a complete range of unique consumables, including multiple formats of racks, tubes, caps, plates and foils, which support storage of samples prior to placing them in ultra-cold storage environment. A comprehensive range of instruments used for labeling, bar coding, capping, de-capping, auditing, sealing, peeling, and piercing tubes and plates complement our consumables. Our newly acquired 4titude offerings include a range of products aimed at the genomic sample preparation and services market for polymerase chain reactions, or PCR, & sequencing, imaging, plate sealing, liquid handling, forensic and next generation sequencing, or NGS, sample processing.

Informatics - provides sample intelligence software solutions and integration of customer technology. Our informatics suite also provides laboratory work flow scheduling for life science tools and instrument work cells, sample inventory and logistics, environmental and temperature monitoring, clinical trial and consent management, as well as planning, data management, virtualization, and visualization of sample collections marketed under the brands of FreezerPro®, BioBankPro® and BioStudies™.

Genomic Services - provides gene sequencing analysis and gene synthesis, a service which enables the fast expanding research of gene-based healthcare discoveries and therapies through our acquisition of GENEWIZ. GENEWIZ is a full-service provider of genomic services, with offerings including Sanger sequencing, gene synthesis, molecular biology, high throughput and NGS sequencing, bioinformatics, and good laboratory practices, or GLP, regulatory services.

Sales, Marketing and Customer Support

We market and sell the majority of our semiconductor products and services in Asia, Europe, the Middle East and North America through our direct sales organization. The sales process for our products is often multilevel, involving a team comprised of individuals from sales, marketing, engineering, operations and senior management. In many cases we assign a team to a customer and that team engages the customer at different levels of its organization to facilitate planning, provide product customization when required, and ensure open communication and support.

The majority of our life sciences sales are completed through our direct Brooks Life Sciences sales force, particularly our store systems and services. In addition, we supplement the sale of consumables and instruments through distributors that reach a broad range of customers. In regions with emerging life science industries such as China, India and the Middle East, we leverage local distributors to assist with the sales process for store systems. The sales process for our larger sample management systems may take 6 to 18 months to complete and it involves a team typically comprised of individuals from sales, marketing, engineering and senior management.

We typically provide product warranties for a period of one to two years depending on the product type.

Our marketing activities include participation in trade shows, delivery of seminars, participation in industry forums, distribution of sales literature and white papers, publication of press releases and articles in business and industry publications. We maintain sales and service centers in Asia, Europe, the Middle East and North America to enhance support and communication with our customers. These facilities, together with our headquarters, house local support capabilities and demonstration equipment for our customers to evaluate. We encourage customers to discuss features and applications of our demonstration equipment with our engineers who are located at these facilities.

Competition

Brooks Semiconductor Solutions Group segment operates in a variety of market segments of varying breadth with differing competitors and competitive dynamics. The semiconductor and adjacent technology markets, as well as process equipment manufacturing industries, are highly competitive and characterized by continual changes and technology improvements. A significant portion of equipment automation is still done by the OEMs themselves. Our competitors among merchant vacuum robot automation suppliers include primarily Japanese companies, such as Daihen Corporation, Daikin Industries, Ltd., Sumitomo Heavy Industries, and Rorze Corporation. Atmospheric tool automation is typically less demanding technologically, has fewer barriers to entry and has a larger field of competitors. We compete directly with other equipment automation suppliers of atmospheric modules and systems, such as Hirata Corporation, Kawasaki

Table of Contents

Heavy Industries, Ltd., Genmark Automation, Inc., Rorze Corporation, Sankyo Seisakusho Co., Ltd., TDK Corporation and Sinfonia Technology Co., Ltd.

We believe our customers will purchase our equipment, automation products and vacuum subsystems as long as our products continue to provide the necessary throughput, reliability, contamination control and accuracy at an acceptable price. We believe our semiconductor offerings are competitive with respect to all of these factors. We cannot guarantee, however, that we will be successful in selling our products to OEMs who currently satisfy a portion of their automation needs in-house or from other independent suppliers, regardless of the performance or price of our products.

Given the breadth of Brooks Life Sciences sample management solutions, there are no direct competitors for the comprehensive set of automation, consumables, instruments, services and informatics solutions we provide to our customers. However, each of the business lines within the Life Sciences business has unique competitors. This would include Hamilton Company and Liconic AG for automation systems, Thermo-Fisher for consumables and services, LabCorp and Covance for services, as well as BGI, Integrated DNA Technologies, Eurofins and GenScript for genomic services.

Research and Development

Our research and development efforts are focused on developing new products and enhancing the functionality, degree of integration, reliability and performance of our existing products. Our engineering, marketing, operations and management personnel leverage their close collaborative relationships with their counterparts in customer organizations in an effort to proactively identify market demands that helps us refocus our research and development investment to match our customers' demands. With the rapid pace of change that characterizes the markets we serve, it is essential for us to provide high-performance, reliable products in order to maintain our leadership position in both our Brooks Semiconductor Solutions Group and Brooks Life Sciences businesses.

Our research and development spending were \$46.9 million, \$39.9 million and \$44.2 million during fiscal years 2018, 2017 and 2016, respectively.

We invest in research and development initiatives within our Brooks Semiconductor Solutions Group segment to maintain continued leadership positions in the markets we serve. We have recently launched our newest Vacuum Automation platform, MagnaTran LEAP™, for the advanced technologies related to manufacturing 10 nanometer design rule semiconductor chips. MagnaTran LEAP is well positioned to deliver clean, accurate and fast wafer transport for the fast growing Deposition and Etch market.

We have developed and continue to develop automated biological sample storage solutions for operating in ultra-low temperature environments within the Brooks Life Sciences segment. We have developed the Twin-bank platform, including an expansion of the product range for a smaller, more space-efficient automated storage system marketed under the brands of SampleStore™ SE and BioStore™ SE and introduced the BioStore™ III Cryo automated cryogenic sample management system which offer sample automation, cold chain management and improved security and accessibility while maintaining sample protection within the storage environment.

Manufacturing and Service

Our manufacturing operations include product assembly, integration and testing. We implement quality assurance procedures that include standard design practices, reliability testing and analysis, supplier and component selection procedures, vendor controls, manufacturing process controls, and service processes that ensure high-quality performance of our products. Our major manufacturing facilities are located in Chelmsford, Massachusetts;

Yongin-City, South Korea; and Manchester, United Kingdom. Our manufacturing operations are designed to provide high quality, low cost, differentiated products to our customers in short lead times through responsive and flexible processes and sourcing strategies. We utilize lean manufacturing techniques for a large portion of our manufacturing, including manufacture of assemblies that we have outsourced to competitive regions, including Asia. We expect to continue to broaden our sourcing of certain portions of our manufacturing process to ensure we continue to provide high quality products at competitive costs. We also believe the continued sourcing of portions of our manufacturing processes in these regions allows us to better serve our customers who have operations in these regions.

Table of Contents

We have service and support locations close to our customers to provide rapid response to their service needs. Our principal service and support locations include Chelmsford, Massachusetts; Fremont, California; Chu Bei City, Taiwan; Yongin-City, South Korea; Yokohama, Japan; Shanghai, China; Singapore; Manchester, United Kingdom; and Kiryat-Gat, Israel. Our Brooks Life Sciences segment provides sample management storage and transportation services in Indianapolis, Indiana; Fresno, California; El Segundo, California; Torrance, California; Bronx, New York; Germany, China, and Singapore.

Patents and Proprietary Rights

We rely on patents, trade secret laws, confidentiality procedures, copyrights, trademarks and licensing agreements to protect our technology. Due to the rapid technological change that characterizes the life sciences, semiconductor, adjacent technology markets and related process equipment industries, we believe that the improvement of existing technology, reliance upon trade secrets, unpatented proprietary know-how and the development of new products may be as important as patent protection in establishing and maintaining a competitive advantage. Our policy is to require all employees to enter into proprietary information and nondisclosure agreements to protect trade secrets and know-how. We cannot guarantee that these efforts will meaningfully protect our trade secrets.

As of September 30, 2018, we owned approximately 365 issued U.S. patents, with various corresponding patents issued in foreign jurisdictions. We also had approximately 90 pending U.S. patent applications, with foreign counterparts of certain of these applications having been filed or which may be filed at the appropriate time. Our patents will expire at various dates through 2036.

Backlog

Backlog for the Brooks Semiconductor Solutions Group segment offerings totaled approximately \$124 million as of September 30, 2018 as compared to approximately \$86 million at September 30, 2017. Backlog for the Brooks Semiconductor Solutions Group segment includes all purchase orders for which our customers have scheduled delivery, regardless of the expected delivery date, and consists principally of orders for products and service agreements. Substantially all of this backlog consists of orders scheduled to be delivered within the next 12 months.

Backlog for the Brooks Life Sciences segment offerings totaled \$273 million as of September 30, 2018 as compared to approximately \$250 million at September 30, 2017. Backlog for the Brooks Life Sciences segment includes all purchase orders for which customers have scheduled delivery, regardless of the expected delivery date, and consists of orders for products and service agreements. In addition, it includes estimated revenue for future services related to our BioStorage business for which contracts have been secured. Final revenue realized will vary based on volumes, prices, duration, and other factors. Storage contracts vary in length of time, with some being short term and some indefinite. We include the estimated value for time periods in the contract up to a maximum of 5 years.

Geographic Information

Our top 10 customers accounted for approximately 34% of our consolidated revenue in fiscal year 2018. No customers accounted for more than 10% of our consolidated revenue for fiscal year 2018.

Net revenue for the fiscal years ended September 30, 2018, 2017 and 2016 based upon the source of the order by geographic area is as follows (in thousands):

Year Ended September 30,		
2018	2017	2016

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North America	\$ 233,243	\$ 174,432	\$ 157,426
Asia / Pacific/ Other	262,706	255,825	196,117
Europe:			
United Kingdom	51,690	37,283	31,342
Rest of Europe	83,921	59,959	49,127
	\$ 631,560	\$ 527,499	\$ 434,012

Table of Contents

The majority of our net revenue in North America is generated in the United States which amounted to \$232.7 million, \$172.9 million and \$156.9 million, respectively, during fiscal years ended September 30, 2018, 2017 and 2016.

The geographic location of an OEM is not indicative of where our products will eventually be used. The geographic area for our orders is determined by the onward sale of an OEM system which incorporates our sub-systems and/or components.

Property, plant and equipment by geographic area as of September 30, 2018 and 2017 are as follows (in thousands):

	September 30,	
	2018	2017
North America	\$ 50,614	\$ 50,908
Asia / Pacific/ Other	492	547
Europe:		
United Kingdom	5,494	2,848
Rest of Europe	3,388	2,678
	\$ 59,988	\$ 56,981

Property, plant and equipment located in the United States amounted to \$50.5 million and \$50.7 million, respectively, at September 30, 2018 and 2017.

Environmental Matters

We are subject to federal, state, local environmental laws and regulations, and the environmental laws and regulations of the foreign national and local jurisdictions in which we have manufacturing facilities. We believe we are materially in compliance with all such laws and regulations.

Compliance with foreign, federal, state, and local laws and regulations has not had, and is not expected to have, an adverse effect on our capital expenditures, competitive position, financial condition or results of operations.

Employees

At September 30, 2018, we had 1,548 full time employees. In addition, we employ part time workers and contractors. We consider our relationships with our employees to be good.

Available Information

We file annual, quarterly, and current reports, proxy statements, and other documents with the SEC, under the Securities Exchange Act of 1934, as amended, or the Exchange Act. The public may read and copy any materials that we file with the SEC at the SEC's Public Reference Room at 100 F Street, NE, Washington, DC 20549. The public may obtain information on the operation of the Public Reference Room by calling the SEC at 1 800 SEC 0330. Also, the SEC maintains an Internet website that contains reports, proxy and information statements, and other information regarding issuers, including Brooks Automation, Inc., that file electronically with the SEC. The public can obtain any documents that we file with the SEC at www.sec.gov.

Our internet website address is <http://www.brooks.com>. Through our website, we make available, free of charge, our annual reports on Form 10 K, quarterly reports on Form 10 Q, current reports on Form 8 K and any amendments to those reports, as soon as reasonably practicable after such materials are electronically filed, or furnished to, the SEC. These SEC reports can be accessed through the investors section of our website. The information found on our website is not part of this or any other report we file with or furnish to the SEC.

Table of Contents

Item 1A. Risk Factors

Factors That May Affect Future Results

You should carefully consider the risks described below and the other information in this report before deciding to invest in shares of our common stock. These are the risks and uncertainties we believe are most important for you to consider. Additional risks and uncertainties not presently known to us, which we currently deem immaterial or which are similar to those faced by other companies in our industry or business in general, may also impair our business operations. If any of the following risks or uncertainties actually occurs, our business, financial condition and operating results would likely suffer. In that event, the market price of our common stock could decline and you could lose all or part of your investment.

Risks Relating to Our Industry

Due in part to the cyclical nature of the semiconductor manufacturing industry and related industries, as well as due to volatility in worldwide capital and equity markets, we have previously incurred operating losses and may have future losses.

Our business is largely dependent on capital expenditures in the semiconductor manufacturing industry and other businesses employing similar manufacturing technologies. The semiconductor manufacturing industry in turn depends on current and anticipated demand for integrated circuits and the products that use them. In recent years, these businesses have experienced unpredictable and volatile business cycles due in large part to rapid changes in demand and manufacturing capacity for semiconductors, and these cycles have had an impact on our business, sometimes causing declines in revenue and operating losses. We could experience future operating losses during an industry downturn. If an industry downturn continues for an extended period of time, our business could be materially harmed. Conversely, in periods of rapidly increasing demand, we could have insufficient inventory and manufacturing capacity to meet our customers' needs on a timely basis, which could result in the loss of customers and various other expenses that could reduce gross margins and profitability.

We face competition which may lead to price pressure and otherwise adversely affect our sales.

We face competition throughout the world in each of our product and service areas, including from the competitors discussed in Part I, Item 1, "Business - Competition" as well as from internal automation capabilities at larger OEMs. Many of our competitors have substantial engineering, manufacturing, marketing and customer support capabilities. In addition, strategic initiatives in China to encourage local semiconductor manufacturing and supply chain could increase competition from domestic equipment manufacturers in China. We expect our competitors to continue to improve the performance of their current products and services and to introduce new products, services and technologies that could adversely affect sales of our current and future products and services. New products, services and technologies developed by our competitors or more efficient production of their products or provisions of their services could require us to make significant price reductions or decide not to compete for certain orders. If we fail to respond adequately to pricing pressures or fail to develop products with improved performance or better quality services with respect to the other factors on which we compete, we could lose customers or orders. If we are unable to compete effectively, our business and prospects could be materially harmed.

Risks Relating to Our Operations

Our operating results could fluctuate significantly, which could negatively impact our business.

Our revenue, operating margins and other operating results could fluctuate significantly from quarter to quarter depending upon a variety of factors, including:

- demand for our products as a result of the cyclical nature of the semiconductor manufacturing industry and the markets upon which the industry depends or otherwise;
- changes in the timing and terms of product orders by our customers as a result of our customer concentration or otherwise;

Table of Contents

- changes in the demand for the mix of products and services that we offer;
- timing and market acceptance of our new product and services introductions;
- delays or problems in the planned introduction of new products or services, or in the performance of any such products following delivery to customers or the quality of such services;
- new products, services or technological innovations by our competitors, which can, among other things, render our products less competitive due to the rapid technological changes in the markets in which we provide products and services;
- the timing and related costs of any acquisitions, divestitures or other strategic transactions;
- our ability to reduce our costs in response to decreased demand for our products and services;
- our ability to accurately estimate customer demand, including the accuracy of demand forecasts used by us;
- disruptions in our manufacturing process or in the supply of components to us;
- write-offs for excess or obsolete inventory;
- competitive pricing pressures; and
- increased amount of investment into the infrastructure to support our growth, including capital equipment, research and development, as well as selling and marketing initiatives to support continuous product innovation, technological capability enhancements and sales efforts. The timing of revenue generation coupled with the increased amount of investment may result in operating losses.

As a result of these risks, we believe that reference to past performance for comparisons of our revenue and operating results may not be meaningful, and that these comparisons may not be an accurate indicator of our future performance.

If we do not continue to introduce new products and services that reflect advances in technology in a timely and effective manner, our products and services may become obsolete and our operating results will suffer.

Our success is dependent on our ability to respond to the technological changes present in the markets we serve. The success of our product development and introduction of products to market depends on our ability to:

- identify and define new market opportunities, products and services in accurate manner;
- obtain market acceptance of our products and services;
- innovate, develop and commercialize new technologies and applications in a timely manner;
- adjust to changing market conditions;
- differentiate our offerings from our competitors' offerings;
- obtain and maintain intellectual property rights where necessary;
- continue to develop a comprehensive, integrated product and service strategy;
- price our products and services appropriately; and
- design our products to high standards of manufacturability so that they meet customer requirements.

Table of Contents

If we cannot succeed in responding in a timely manner to technological and/or market changes or if the new products and services that we introduce do not achieve market acceptance, our competitive position would diminish which could materially harm our business and our prospects.

The global nature of our business exposes us to multiple risks.

During fiscal years ended September 30, 2018 and 2017, approximately 63% and 67% of our revenue was derived from sales outside of North America. We expect that international sales, including increased sales in Asia, will continue to account for a significant portion of our revenue. We maintain a global footprint of sales, service and repair operations. As a result of our international operations, we are exposed to many risks and uncertainties, including:

- longer sales-cycles and time to collection;
- tariff and international trade barriers;
- fewer or less certain legal protections for intellectual property and contract rights abroad;
- different and changing legal and regulatory requirements in the jurisdictions in which we operate;
 - government currency control and restrictions on repatriation of earnings;
 - fluctuations in foreign currency exchange and interest rates, particularly in Asia and Europe; and
- political and economic instability, changes, hostilities and other disruptions in regions where we operate.

Negative developments in any of these areas in one or more countries could result in a reduction in demand for our products, the cancellation or delay of orders already placed, threats to our intellectual property, difficulty in collecting receivables, and a higher cost of doing business, any of which could materially harm our business and profitability.

Our business could be materially harmed if we fail to adequately integrate the operations of the businesses that we have acquired or may acquire.

We have made in the past, and may make in the future, acquisitions or significant investments in businesses with complementary products, services and/or technologies. Our acquisitions present numerous risks, including:

- difficulties in integrating the operations, technologies, products and personnel of the acquired companies and realizing the anticipated synergies of the combined businesses;
- defining and executing a comprehensive product strategy;
- managing the risks of entering markets or types of businesses in which we have limited or no direct experience;
- the potential loss of key employees, customers and strategic partners of ours or of acquired companies;
- unanticipated problems or latent liabilities, such as problems with the quality of the installed base of the target company's products or infringement of another company's intellectual property by a target company's activities or products;
 - problems associated with compliance with the acquired company's existing contracts;
- difficulties in managing geographically dispersed operations; and
- the diversion of management's attention from normal daily operations of the business.

If we acquire a new business, we may expend significant funds, incur additional debt or issue additional securities, which may negatively affect our operations and be dilutive to our stockholders. In periods following an acquisition, we

Table of Contents

will be required to evaluate goodwill and acquisition-related intangible assets for impairment. If such assets are found to be impaired, they will be written down to estimated fair value, with a charge against earnings. The failure to adequately address these risks or the impairment of any assets could materially harm our business and financial results.

The announcement and pendency of the sale of our semiconductor cryogenics business to Atlas Copco could have an adverse effect on our stock price and/or our business, results of operations, financial condition and prospects.

The announcement and pendency of the sale of our semiconductor cryogenics business to Edwards Vacuum LLC (a member of the Atlas Copco Group) pursuant to the asset purchase agreement we entered into on August 27, 2018 could disrupt our business in the following ways, among others:

- customers may determine to delay or defer purchase decisions with regard to our cryogenics products or terminate and/or attempt to renegotiate their relationships with us as a result of the pending sale, whether pursuant to the terms of their existing agreements with us or otherwise;
- investors and customers may perceive that the loss of annual revenue generated by our cryogenics business, which was \$196.1 million in fiscal year 2018, will negatively impact our growth potential, regardless of the impact our acquisition of GENEWIZ may have on our revenue and results of operations; and
- the attention of our management may be directed toward the completion of the pending sale and related matters, and their focus may be diverted from the day-to-day business operations of our company, including from other opportunities that might otherwise be beneficial to us.

Should any of these matters occur, they could adversely affect our stock price or harm our business, results of operations, financial condition and prospects.

Obtaining required approvals necessary to satisfy the conditions to the completion of the sale of our semiconductor cryogenics business may delay or prevent completion of the pending sale.

The completion of the sale of our semiconductor cryogenics business to Atlas Copco is conditioned upon the approval of the Committee on Foreign Investment in the United States (CFIUS). We intend to pursue all required approvals in accordance with the terms of the asset purchase agreement. No assurance, however, can be given that the required approvals will be obtained and, even if all such approvals are obtained, no assurance can be given as to the terms, conditions and timing of the approvals or that the approvals will satisfy the terms of the asset purchase agreement.

Inability to complete the sale of our semiconductor cryogenics business could negatively impact our business, financial condition, results of operations or our stock price.

The completion of the sale of our semiconductor cryogenics business to Atlas Copco is subject to a number of conditions, including, among others, clearance under the HSR Act, approval of CFIUS, the receipt of any required third party consents and there not having been a material adverse effect with respect to such business, and there can be no assurance that the conditions to the completion of the pending sale will be satisfied. The asset purchase agreement may also be terminated by us and Atlas Copco in certain specified circumstances, including if the sale has not been consummated by April 15, 2019. While the potential sale is pending and if the pending sale is not completed, we will be subject to several risks, including:

- the current trading price of our common stock may reflect a market assumption that the sale will be completed;
- we expect to incur substantial transaction costs in connection with the pending sale whether or not it is completed;

Table of Contents

- under the asset purchase agreement, we are subject to certain restrictions on the conduct of our business prior to the completion of the pending sale, which restrictions could adversely affect our ability to realize certain of our business strategies or take advantage of certain business opportunities;
- we may be limited in our ability to repay our \$350.0 million senior secured incremental term loan facility under our Credit Agreement, dated as of October 4, 2017, used to fund a portion of the cash purchase price of our acquisition of GENEWIZ on November 15, 2018; and
- The negative perception of investors and customers of our semiconductor cryogenics business if the sale is not consummated and our inability to operate the business in the same manner as before the announcement of the proposed sale.

Any of these risks could have a material adverse effect on our business, financial condition, results of operations and stock price.

Expanding within current markets introduces new competitors and commercial risks.

A key part of our growth strategy is to continue expanding within the life sciences sample management market. As part of this strategy, we expect to diversify our product sales and service revenue by leveraging our core technologies, which requires investments and resources which may not be available as needed. We cannot guarantee that we will be successful in leveraging our capabilities into the life sciences sample management market to meet all the needs of new customers and to compete favorably. Because a significant portion of our growth potential may be dependent on our ability to increase sales within the life science sample management market, our inability to successfully expand within such market may adversely impact future financial results.

Changes in key personnel could impair our ability to execute our business strategy.

The continuing service of our executive officers and essential engineering, technical and management personnel, together with our ability to attract and retain such personnel, is an important factor in our continuing ability to execute our strategy. There is substantial competition to attract such employees and the loss of any such key employees could have a material adverse effect on our business and operating results. The same could be true if we were to experience a high turnover rate among engineering and technical personnel and we were unable to replace them.

Our failure to protect our intellectual property could adversely affect our future operations.

Our ability to compete is significantly affected by our ability to protect our intellectual property. We rely upon patents, trade secret laws, confidentiality procedures, copyrights, trademarks and licensing agreements to protect our technology. Existing trade secret, trademark and copyright laws offer only limited protection. Our success depends in part on our ability to obtain and enforce patent protection for our products both in the United States and in other countries. We own numerous U.S. and foreign patents, and we intend to file additional applications, as appropriate, for patents covering our products and technology. Any issued patents owned by or licensed to us may be challenged, invalidated or circumvented, and the rights under these patents may not provide us with competitive advantages. In addition, the laws of some countries in which our products are or may be developed, manufactured or sold may not fully protect our products. Due to the rapid technological change that characterizes the semiconductor and adjacent technology markets, we believe that the improvement of existing technology, reliance upon trade secrets and unpatented proprietary know-how and the development of new products may be as important as patent protection in establishing and maintaining competitive advantage. To protect trade secrets and know-how, it is our policy to require all technical and management personnel to enter into nondisclosure agreements.

We cannot guarantee that the steps we have taken to protect our intellectual property will be adequate to prevent the misappropriation of our technology. Other companies could independently develop similar or superior technology without violating our intellectual property rights. In the future, it may be necessary to engage in litigation or like activities to enforce our intellectual property rights, to protect our trade secrets or to determine the validity and scope of proprietary rights of others, including our customers. This could require us to incur significant expenses and to divert the efforts and attention of our management and technical personnel from our business operations.

Table of Contents

The expiration of our patents over time could lead to an increase of competition and a decline in our revenue.

One of our main competitive strengths is our technology, and we are dependent on our patent rights and other intellectual property rights to maintain our competitive position. Our current patents will expire from time to time through 2035 which could result in increased competition and declines in product and service revenue.

We may be subject to claims of infringement of third-party intellectual property rights, or demands that we license third-party technology, which could result in significant expense and prevent us from using our technology.

There has been substantial litigation regarding patent and other intellectual property rights in the semiconductor-related industries. We have in the past been, and may in the future be, notified that we may be infringing intellectual property rights possessed by third parties. We cannot guarantee that infringement claims by third parties or other claims for indemnification by customers or end-users of our products resulting from infringement claims will not be asserted in the future or that such assertions, whether or not proven to be true, will not materially and adversely affect our business, financial condition and results of operations.

We cannot predict the extent to which we might be required to seek licenses or alter our products so that they no longer infringe the rights of others. We also cannot guarantee that licenses will be available or the terms of any licenses we may be required to obtain will be reasonable. Similarly, changing our products or processes to avoid infringing the rights of others may be costly or impractical and could detract from the value of our products. If a judgment of infringement were obtained against us, we could be required to pay substantial damages and a court could issue an order preventing us from selling one or more of our products. Further, the cost and diversion of management attention brought about by such litigation could be substantial, even if we were to prevail. Any of these events could result in significant expense to us and may materially harm our business and our prospects.

Unexpected events could disrupt our sample storage operations and adversely affect our reputation and results of operations.

Unexpected events, including fires or explosions at our facilities, natural disasters, such as tornadoes, hurricanes and earthquakes, war or terrorist activities, unplanned power outages, supply disruptions and failure of equipment or systems, could adversely affect our reputation and results of operations. Our Brooks Life Sciences' service customers rely on us to securely store and timely retrieve and transport their critical samples, and these events could result in service disruptions, physical damage to one or more key storage facilities and the customer samples stored in those facilities, the temporary closure of one or more key operating facilities or the temporary disruption of service, each of which could negatively impact our reputation and results of operations. Our primary storage facility is located in Indianapolis, Indiana, an area of the United States that can be prone to tornado and other severe weather events.

If our manufacturing sites were to experience a significant disruption in operations, our business could be materially harmed, while the failure to estimate customer demand accurately could result in excess or obsolete inventory.

We have a limited number of manufacturing facilities for our products and we have moved portions of our manufacturing to third parties, including some in lesser developed countries. If the operations at any one of these facilities were disrupted as a result of a natural disaster, fire, power or other utility outage, work stoppage or other similar event, our business could be seriously harmed because we may be unable to manufacture and ship products and parts to our customers in a timely fashion. The impact of any disruption at one of our facilities may be exacerbated if the disruption occurs at a time when we need to rapidly increase our manufacturing capabilities to meet increased demand or expedited shipment schedules.

Moreover, if actual demand for our products is different than expected, we may purchase more/fewer component parts than necessary or incur costs for canceling, postponing or expediting delivery of such parts. If we purchase inventory in anticipation of customer demand that does not materialize, or if our customers reduce or delay orders, we may incur excess inventory charges. Any or all of these factors could materially and adversely affect our business, financial condition and results of operations.

Table of Contents

Our business could be materially harmed if one or more key suppliers fail to continuously deliver key components of acceptable cost and quality.

We currently obtain many of our key components on an as-needed, purchase order basis from numerous suppliers. In some cases we have only a single source of supply for key components and materials used in the manufacturing of our products. Further, we are increasing our sourcing of products in Asia, and particularly in China, and we do not have a previous history of dealing with many of these suppliers. Our inability to obtain components or materials in required quantities or of acceptable cost and quality and with the necessary continuity of supply could result in delays or reductions in product shipments to our customers. In addition, if a supplier or sub-supplier suffers a production stoppage or delay for any reason, including natural disasters such as the tsunamis that affected Japan and Thailand, this could result in a delay or reduction in our product shipments to our customers. Any of these contingencies could cause us to lose customers, result in delayed or lost revenue and otherwise materially harm our business.

Our business could be adversely affected by a decline in the availability of raw materials.

We are dependent on the availability of certain key raw materials and natural resources used in our products and various manufacturing processes, and we rely on third parties to supply us with these materials in a cost-effective and timely manner. Our access to raw materials may be adversely affected if our suppliers' operations were disrupted as a result of limited or delayed access to key raw materials and natural resources which may result in increased cost of these items. While most of the raw materials used in our products and various manufacturing processes are commercially available, we rely in some cases on materials that have a limited supply and are considered rare Earth elements, such as helium. If the supply of these elements is drastically reduced, it may lead to price increases which could result in higher costs of our products and corresponding revenue declines and have a material adverse impact on our business, financial condition and results of operations.

Our outsource providers may fail to perform as we expect.

Outsource providers have played and will continue to play a key role in our manufacturing operations and in many of our transactional and administrative functions, such as information technology and facilities management. Although we attempt to select reputable providers and secure their performance on terms documented in written contracts, it is possible that one or more of these providers could fail to perform as we expect and such failure could have an adverse impact on our business.

Our business relies on certain critical information systems and a failure or breach of such a system could harm our business and results of operations and, in the event of unauthorized access to a customer's data or our data, incur significant legal and financial exposure and liabilities.

We maintain and rely upon certain critical information systems for the effective operation of our business. These information systems include telecommunications, the internet, our corporate intranet, various computer hardware and software applications, network communications and e-mail. These information systems may be owned and maintained by us, our outsource providers or third parties such as vendors and contractors. These information systems are subject to attacks, failures, and access denials from a number of potential sources including viruses, destructive or inadequate code, power failures, and physical damage to computers, hard drives, communication lines and networking equipment. To the extent that these information systems are under our control, we have implemented security procedures, such as virus protection software and emergency recovery processes, to mitigate the outlined risks. However, security procedures for information systems cannot be guaranteed to be failsafe and our inability to use or access these information systems at critical points in time, or unauthorized releases of confidential information, could unfavorably impact the timely and efficient operation of our business.

Confidential information stored on these information systems could also be compromised. If a third party gains unauthorized access to our data, including any information regarding our customers, such security breach could expose us to a risk of loss of this information, loss of business, litigation and possible liability. These security measures may be breached as a result of third-party action, including intentional misconduct by computer hackers, employee error, malfeasance or otherwise. Additionally, third parties may fraudulently attempt to induce employees or customers into disclosing sensitive information such as user names, passwords or other information in order to gain access to our

Table of Contents

customers' data or our data, including our intellectual property and other confidential business information, or our information technology systems. Because the techniques used to obtain unauthorized access, or to sabotage systems, change frequently and generally are not recognized until launched against a target, we may be unable to anticipate these techniques or to implement adequate preventative measures. Any security breach could result in a loss of confidence by our customers, damage our reputation, disrupt our business, lead to legal liability and negatively impact our future sales.

Our goodwill and intangible assets may become impaired.

As of September 30, 2018, we had \$255.9 million of goodwill and \$100.0 million in net intangible assets as a result of our acquisitions. We periodically review our goodwill and the estimated useful lives of our identifiable intangible assets, taking into consideration any events or circumstances that might result in either a diminished fair value, or for intangible assets, a revised useful life. These events and circumstances include significant changes in the business climate, legal factors, operating performance indicators, advances in technology and competition. Any impairment or revised useful life could have a material and adverse effect on our financial position and results of operations, and could harm the trading price of our common stock.

Changes in tax rates or tax regulation could affect results of operations.

As a global company, we are subject to taxation in the United States and various other countries. Significant judgment is required to determine and estimate worldwide tax liabilities. Our future annual and quarterly effective tax rates could be affected by numerous factors, including changes in the: applicable tax laws; composition of pre-tax income in countries with differing tax rates; and/or establishment of a valuation allowance against deferred tax assets based on the assessment of their realizability prior to expiration. In addition, we are subject to regular examination by the Internal Revenue Service and state, local and foreign tax authorities. We regularly assess the likelihood of favorable or unfavorable outcomes resulting from these examinations to determine the adequacy of our provision for income taxes. Although we believe our tax estimates are reasonable, 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 financial condition and results of operations.

The implementation of tariffs and export controls on our products may have a material impact on our business.

Our global business operations and supply chain may be disrupted by the additional tariffs imposed on our products.

As of July 6, 2018, the United States imposed a 25% tariff on a list of products that included certain parts and components made in China and imported into the United States for incorporation with our products. We are implementing operational changes that should mitigate the impact of the 25% tariff on our imports into the United States from China. As a result of these operational changes, we do not expect that the increase in these tariffs will have a significant impact on our business, supply chain, operations or financial results. However, if the United States increases the amount of these tariffs or adds additional items to the list of products subject to tariff, tariffs could materially adversely affect our business, financial results and operations.

In addition to the increased tariffs imposed by the United States, China has implemented additional retaliatory tariffs on products made in the United States. While these tariffs currently do not materially impact us, if China increases its tariffs or places additional tariffs or other nations impose tariffs on our products, it could materially adversely affect our business, financial results and operations.

We are subject to numerous governmental regulations.

We are subject to federal, state, local and foreign regulations, including environmental regulations and regulations relating to the design and operation of our products and control systems. We might incur significant costs as we seek to ensure that our products meet safety and emissions standards, many of which vary across the states and countries in which our products are used. In the past, we have invested significant resources to redesign our products to comply with these directives. Compliance with future regulations, directives, and standards could require us to modify or redesign

Table of Contents

some products, make capital expenditures, or incur substantial costs. If we do not comply with current or future regulations, directives, and standards:

- we could be subject to fines;
- our production or shipments could be suspended; and
- we could be prohibited from offering particular products in specified markets.

Any of these events could materially and adversely affect our business, financial condition and results of operations.

Regulations and customer demands related to conflict minerals may adversely affect us.

The Dodd-Frank Wall Street Reform and Consumer Protection Act imposes disclosure requirements regarding the use in components of our products of “conflict minerals” mined from the Democratic Republic of Congo and adjoining countries, whether the components of our products are manufactured by us or third parties. This requirement could affect the pricing, sourcing and availability of minerals used in the manufacture of components we use in our products. In addition, there are additional costs associated with complying with the disclosure requirements and customer requests, such as costs related to our due diligence to determine the source of any conflict minerals used in our products. We may face difficulties in satisfying customers who may require that all of the components of our products are certified as conflict mineral free and/or free of numerous other hazardous materials.

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

Currency exchange rate fluctuations could have an adverse effect on our sales and results of operations and we could experience losses with respect to forward exchange contracts into which we may enter. Unfavorable currency fluctuations could require us to increase prices to foreign customers, which could result in lower net sales by us to such customers. Alternatively, if we do not adjust the prices for our products in response to unfavorable currency fluctuations, our results of operations could be materially and adversely affected. In addition, most sales made by our foreign subsidiaries are denominated in the currency of the country in which these products are sold and the currency they receive in payment for such sales could be less valuable as compared to the U.S. dollar at the time of receipt as a result of exchange rate fluctuations. From time to time, we enter into forward exchange contracts to reduce currency exposure. However, we cannot be certain that our efforts will be adequate to protect us against significant currency fluctuations or that such efforts will not expose us to additional exchange rate risks, which could materially and adversely affect our results of operations.

Risk related to the referendum of the United Kingdom’s membership in the European Union

In June 2016, a majority of voters in the United Kingdom voted “for” the Referendum of the United Kingdom’s Membership in the European Union, referred to as Brexit, approving the exit of the United Kingdom from the European Union, which triggered volatility in exchange rate fluctuations of the U.S. dollar against foreign currencies in which we conduct our business. We may experience volatility in exchange rates as the United Kingdom negotiates its exit from the European Union. As described in Item 7A, “Quantitative and Qualitative Disclosures About Market Risk”, of this Form 10 K, most of our foreign currency denominated transactions are conducted in Euros, British Pounds and a variety of Asian currencies. Sales in currencies other than the U.S. dollar were approximately 34% and 38%, respectively, of our total sales during fiscal years 2018 and 2017. If a dollar strengthens, our revenue denominated in foreign currencies may be adversely affected when translated into U.S. dollars.

The announcement of Brexit has also created global economic uncertainty, which may cause our customers to closely monitor their costs and reduce their spending on our products and services. The effects of Brexit depend on any agreements the United Kingdom makes to retain access to European Union markets either during a transitional period

or more permanently. The measures could potentially disrupt the markets we serve and may cause us to lose customers and employees. In addition, Brexit could lead to legal uncertainty and potentially divergent national laws and regulations as the United Kingdom determines which E.U. laws to replace or replicate. Any of these effects of Brexit, among others, could adversely affect our business, results of operations and financial condition.

Table of Contents

Our indebtedness may adversely affect our ability to operate our business, generate cash flows and make payments on such indebtedness

On October 4, 2017, we entered into a \$200.0 million Senior Secured Term Loan Facility, or term loan, with Morgan Stanley Senior Funding, Inc., JPMorgan Chase Bank, N.A. and Wells Fargo Securities, LLC. The term loan matures and becomes fully payable on October 4, 2024. We would be required to redeem the term loan at the principal amount then outstanding upon occurrence of certain events, as described in the term loan agreement. For further information on this transaction, please refer to Note 11, "Debt" to our Consolidated Financial Statements included in Item 8 "Financial Statements and Supplementary Data" of this Form 10 K.

Our ability to pay interest and repay the principal for our indebtedness is dependent upon our ability to manage our business operations and maintain sufficient liquidity to service such debt. The loan borrowings are subject to variable interest rates which create exposure to interest rate risk. Interest rate increases may result in higher cost of servicing the loan and reduce our profitability and cash flows. The terms of our debt covenants could limit our ability to raise additional funds and the manner in which we conduct our business. We have the ability to refinance the term loan and obtain additional indebtedness as long as we maintain a certain level of liquidity and earnings, as specified in the loan agreement. If our liquidity and earnings are reduced below a certain level, we will have limited ability to service the term loan and obtain additional debt financing. Our failure to comply with these restrictive covenants could also result in an event of default which, if not cured or waived, could result in the acceleration of all or a portion of our indebtedness. Accordingly, a default would have a material adverse effect on our business and our lender would have the right to exercise its rights and remedies to collect, which would include the right to foreclose on our assets.

Risks Relating to Our Customers

Because we rely on a limited number of customers for a large portion of our revenue, the loss of one or more of these customers could materially harm our business.

We receive a significant portion of our revenue in each fiscal period from a relatively limited number of customers, and that trend is likely to continue. Sales to our ten largest customers accounted for approximately 34%, 35% and 35%, respectively, of our total revenue in the fiscal years ended September 30, 2018, 2017 and 2016. The loss of one or more of these major customers, a significant decrease in orders from one of these customers, or the inability of one or more customers to make payments to us when they are due could materially affect our revenue, business and reputation. In addition, there has been and may continue to be significant consolidation among some of our largest OEM customers, which could lead to increased pressure to reduce the price of our products and/or decreased market share of our products with the combined companies.

Because of the lengthy sales cycles of many of our products, we may incur significant expenses before we generate any revenue related to those products.

Our customers may need several months to test and evaluate our products. This increases the possibility that a customer may decide to cancel an order or change its plans, which could reduce or eliminate our sales to that customer. The impact of this risk can be magnified during the periods in which we introduce a number of new products, as has been the case in recent years. As a result of this lengthy sales cycle, we may incur significant research and development expenses, and selling, general and administrative expenses before we generate the related revenue for these products, and we may never generate the anticipated revenue if our customer cancels an order or changes its plans.

In addition, many of our products will not be sold directly to the end-user but will be components of other products manufactured by OEMs. As a result, we rely on OEMs to select our products from among alternative offerings to be incorporated into their equipment at the design stage; so-called design-ins. The OEMs' decisions often precede the generation of volume sales, if any, by a year or more. Moreover, if we are unable to achieve these design-ins from an OEM, we would have difficulty selling our products to that OEM because changing suppliers after design-ins involves significant cost, time, effort and risk on the part of that OEM.

Table of Contents

Customers generally do not make long term commitments to purchase our products and our customers may cease purchasing our products at any time.

Sales of our products are often made pursuant to individual purchase orders and not under long-term commitments and contracts. Our customers frequently do not provide any assurance of minimum or future sales and are not prohibited from purchasing products from our competitors at any time. Accordingly, we are exposed to competitive pricing pressures on each order. Our customers also engage in the practice of purchasing products from more than one manufacturer to avoid dependence on sole-source suppliers for certain of their needs. The existence of these practices makes it more difficult for us to increase price, gain new customers and win repeat business from existing customers.

We may face claims for liability related to damages of customer materials attributed to the failure of our products or services, exposing us to significant financial or reputational harm.

Our automation products for the semiconductor manufacturing market are used in the handling and movement of silicon wafers at various points in the production process, and our automated cold storage systems for the life sciences sample management market are used in the handling, movement and storage of biological and chemical samples. We also provide sample storage services to customers where we store their biological and chemical samples at our facilities. In any case, damage to our customers' materials may be attributed to a failure of our products or services which could lead to claims for damages made by our customers and could also harm our relationship with our customers and damage our reputation in each of these industries, resulting in material harm to our business.

Risks Relating to Owning Our Securities

Our stock price is volatile.

The market price of our common stock has fluctuated widely. From the beginning of fiscal year 2017 through the end of fiscal year 2018, our stock price fluctuated between a high of \$39.60 per share and a low of \$12.89 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 and services;
- global 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 in the past experienced significant price and volume fluctuations. These fluctuations have particularly affected the market prices of the securities of high technology companies like ours. These market fluctuations could adversely affect the market price of our common stock.

We may not pay dividends on our common stock.

Holders of our common stock are only entitled to receive dividends when and if they are declared by our Board of Directors. Although we have declared cash dividends on our common stock for the past several years, we are not

Table of Contents

required to do so and may reduce or eliminate our cash dividends in the future. This could adversely affect the market price of our common stock.

Provisions in our charter documents and, Delaware law may delay or prevent an acquisition of us, which could decrease the value of your shares.

Our restated certificate of incorporation and by-laws and Delaware law contain provisions that could make it harder for a third party to acquire us without the consent of our Board of Directors. These provisions include limitations on actions by our stockholders by written consent, the inability of stockholders to call special meetings and the potential for super majority votes of our stockholders in certain circumstances. In addition, our Board of Directors has the right to issue preferred stock without stockholder approval, which could be used to dilute the stock ownership of a potential hostile acquirer.

Our restated certificate of incorporation makes us subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits publicly held Delaware corporations to which it applies from engaging in a “business combination” with an “interested stockholder” for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is approved in a prescribed manner. This provision could discourage others from bidding for our shares of common stock and could, as a result, reduce the likelihood of an increase in the price of our common stock that would otherwise occur if a bidder sought to buy our common stock.

Delaware law also imposes restrictions on mergers and other business combinations between us and any holder of 15% or more of our outstanding common stock. Although we believe these provisions provide for an opportunity to receive a higher bid by requiring potential acquirers to negotiate with our Board of Directors, these provisions apply even if the offer may be considered beneficial by stockholders. If a change of control or change in management is delayed or prevented, the market price of our common stock could decline.

Our certificate of incorporation authorizes the issuance of shares of blank check preferred stock.

Our certificate of incorporation provides that our Board of Directors is authorized to issue from time to time, without further stockholder approval, up to 1,000,000 shares of preferred stock in one or more series and to fix and designate the rights, preferences, privileges and restrictions of the preferred stock, including dividend rights, conversion rights, voting rights, redemption rights and terms of redemption and liquidation preferences. Such shares of preferred stock could have preferences over our common stock with respect to dividends and liquidation rights. Our issuance of preferred stock may have the effect of delaying or preventing a change in control. Our issuance of preferred stock could decrease the amount of earnings and assets available for distribution to the holders of common stock or could adversely affect the rights and powers, including voting rights, of the holders of common stock. The issuance of preferred stock could have the effect of decreasing the market price of our common stock.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our corporate headquarters and primary manufacturing/research and development facilities are currently located in three buildings in Chelmsford, Massachusetts.

Table of Contents

We maintained the following principal facilities as of September 30, 2018:

Location	Functions	Square Footage (Approx.)	Ownership Status/Lease Expiration
Chelmsford, Massachusetts	Corporate headquarters, training, manufacturing, R&D and sales & support	298,000	Owned
Indianapolis, Indiana	Sample storage, sales & support	98,000	September 2023
Yongin-City, South Korea	Manufacturing, R&D and sales & support	48,600	September 2019
Fremont, California	Manufacturing, R&D and sales & support	44,940	August 2025
Manchester, United Kingdom	Manufacturing, R&D and sales & support	44,670	December 2019
Chu Bei City, Taiwan	Sales & support	28,600	June 2020

Our Brooks Semiconductor Solutions Group segment utilizes the facilities in Chelmsford, Massachusetts; Fremont, California; South Korea, Germany and Taiwan. Our Brooks Life Sciences segment utilizes the facilities in Manchester, United Kingdom; Indianapolis, Indiana; Chelmsford, Massachusetts; Bronx, New York; and Fremont, California.

We maintain additional sales, support and training offices in Texas, Europe (France and Germany), Asia (China, Japan and Singapore) and the Middle East (Israel). We also maintain sample storage facilities in China, Germany and Singapore.

Item 3. Legal Proceedings

We are subject to various legal proceedings, both asserted and unasserted, that arise in the ordinary course of business. We cannot predict the ultimate outcome of such legal proceedings or in certain instances provide reasonable ranges of potential losses. However, as of the date of this report, we believe that none of these claims will have a material adverse effect on our consolidated financial condition or results of operations. In the event of unexpected subsequent developments and given the inherent unpredictability of these legal proceedings, there can be no assurance that our assessment of any claim will reflect the ultimate outcome and an adverse outcome in certain matters could, from time-to-time, have a material adverse effect on our consolidated financial condition or results of operations in particular quarterly or annual periods.

Item 4. Mine Safety Disclosures

Not applicable.

Table of Contents

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 Nasdaq Stock Market LLC under the symbol “BRKS.” The following table sets forth the high and low intraday sales prices per share of our common stock as reported by the Nasdaq Stock Market LLC and the cash dividends declared per common share for the periods indicated:

	Market Price		Dividends Declared
	High	Low	
Fiscal Year Ended September 30, 2018:			
First quarter	\$ 34.39	\$ 22.54	\$ 0.10
Second quarter	30.15	23.30	0.10
Third quarter	36.36	24.88	0.10
Fourth quarter	39.60	28.71	0.10
Fiscal Year Ended September 30, 2017:			
First quarter	\$ 17.80	\$ 12.89	\$ 0.10
Second quarter	22.40	16.68	0.10
Third quarter	29.60	21.14	0.10
Fourth quarter	30.36	21.78	0.10

Number of Holders

As of November 9, 2018, there were 535 holders of record of our common stock.

Dividend Policy

Dividends are declared at the discretion of our Board of Directors and depend on actual cash flow from operations, our financial condition, capital requirements and any other factors our Board of Directors may consider relevant. Future dividend declarations, as well as the record and payment dates for such dividends, will be determined by our Board of Directors on a quarterly basis.

On November 6, 2018, our Board of Directors approved a cash dividend of \$0.10 per share payable on December 20, 2018 to common stockholders of record on December 7, 2018.

Comparative Stock Performance

The following graph compares the cumulative total shareholder return (assuming reinvestment of dividends) from investing \$100 on September 30, 2013, and plotted at the last trading day of each of the fiscal years ended September 30, 2014, 2015, 2016, 2017 and 2018, in each of (i) our Common Stock; (ii) the Nasdaq/NYSE MKT/NYSE Index of companies; (iii) a peer group for the fiscal year ended September 30, 2018 (“Current Peer Group”), and (iv) a peer group for the fiscal year ended September 30, 2016 (“Prior Peer Group”).

The Current Peer Group for the year ended September 30, 2018 is comprised of Advanced Energy Industries, Inc., Axcelis Technologies Inc., Bio Rad Laboratories Inc., Bruker Corp., Cabot Microelectronics Corp., Coherent Inc., Entegris, Inc., Formfactor Inc., Haemonetics Corp., MKS Instruments, Inc., MTS Instruments, Inc., Novanta Inc.,

Rudolph Technologies Inc., Ultra Clean Holdings, Inc., Varex Imaging Corp. and Veeco Instruments Inc. The Prior Peer Group is comprised of Advanced Energy Industries, Inc., Bruker Corp., Entegris, Inc., Formfactor Inc., MKS Instruments, Inc., Photronics, Inc., Teradyne Inc., Ultra Clean Holdings, Inc., Veeco Instruments Inc. and Xcerra Corp. The Current Peer Group was expanded to include life sciences companies due to the growing percentage of our revenue from the Brooks Life Sciences segment.

Table of Contents

The stock price performance on the graph below is not necessarily indicative of future price performance.

	9/30/2013	9/30/2014	9/30/2015	9/30/2016	9/30/2017	9/30/2018
Brooks Automation, Inc.	\$ 100.00	\$ 116.63	\$ 134.58	\$ 162.05	\$ 368.09	\$ 430.52
Nasdaq/NYSE						
American/NYSE	100.00	114.58	108.82	123.26	146.27	166.32
Prior Peer Group	100.00	108.15	102.93	136.64	226.47	212.25
Current Peer Group	100.00	100.20	99.03	134.83	217.75	234.16

The information included under the heading “Comparative Stock Performance” in Item 5 of "this report" shall not be deemed to be “soliciting material” or subject to Regulation 14A, shall not be deemed “filed” for purposes of Section 18 of the Exchange Act, or otherwise subject to the liabilities of that section, nor shall it be deemed incorporated by reference in any filing under the Securities Act of 1933, as amended, or the Exchange Act.

Issuer’s Purchases of Equity Securities

On September 29, 2015, our Board of Directors approved a share repurchase program for up to \$50.0 million worth of our common stock. The timing and amount of any shares to be repurchased under this program will be based on market and business conditions, legal requirements and other factors and may be commenced or suspended at any time at our discretion. There were no shares repurchased under this program during fiscal year ended September 30, 2018.

Table of Contents

Item 6. Selected Financial Data

The selected consolidated financial data (1)(5) set forth below should be read in conjunction with our Consolidated Financial Statements and notes thereto and “Management’s Discussion and Analysis of Financial Condition and Results of Operations,” appearing elsewhere in this report.

	Year Ended September 30,				
	2018	2017	2016	2015	2014
	(2)		(2)	(4)	(4)(6)
	(In thousands, except per share data)				
Revenue	\$ 631,560	\$ 527,499	\$ 434,012	\$ 406,874	\$ 344,934
Gross profit	246,081	198,887	156,689	132,766	114,106
Operating income (loss)	31,409	14,319	(17,054)	(22,564)	(37,800)
Income (loss) from continuing operations	67,717	10,687	(85,457)	(12,523)	(23,171)
Income from discontinued operations, net of tax	48,747	51,925	15,981	26,744	54,693
Net income (loss) attributable to Brooks Automation, Inc.	116,575	62,612	(69,476)	14,221	31,361
Basic net income (loss) per share attributable to Brooks Automation, Inc. common stockholders:					
Income (loss) from continuing operations	0.96	0.15	(1.25)	(0.19)	(0.35)
Income from discontinued operations, net of tax	0.69	0.75	0.23	0.40	0.82
Basic net income (loss) per share attributable to Brooks Automation, Inc.	\$ 1.65	\$ 0.90	\$ (1.01)	\$ 0.21	\$ 0.47
Diluted net income (loss) per share attributable to Brooks Automation, Inc. common stockholders:					
Income (loss) from continuing operations	\$ 0.96	\$ 0.15	\$ (1.25)	\$ (0.18)	\$ (0.34)
Income from discontinued operations, net of tax	0.69	0.74	0.23	0.39	0.81
Diluted net income (loss) per share attributable to Brooks Automation, Inc.	\$ 1.65	\$ 0.89	\$ (1.01)	\$ 0.21	\$ 0.46
Dividend declared per share	\$ 0.40	\$ 0.40	\$ 0.40	\$ 0.40	\$ 0.34
	As of September 30,				
	2018	2017	2016	2015	2014
	(In thousands)				
Cash and cash equivalents and marketable securities	\$ 251,227	\$ 104,292	\$ 91,221	\$ 214,030	\$ 245,456
Working capital (3)	98,650	50,738	54,651	45,319	40,870
Total assets	1,095,257	766,628	685,905	758,702	777,227
Total capital lease obligation	—	—	—	—	8,298
Total equity	717,832	607,644	553,690	632,045	642,889

	Year Ended September 30, 2018			
	First Quarter	Second Quarter (2)	Third Quarter	Fourth Quarter
	(In thousands, except per share data)			
Revenue	\$ 142,599	\$ 156,952	\$ 172,363	\$ 159,646
Gross profit	54,259	62,386	66,816	62,620
Operating income	4,925	10,321	12,547	3,616
Net income attributable to Brooks Automation, Inc.	16,486	67,020	22,717	10,352
Basic net income per share	0.23	0.95	0.32	0.15
Diluted net income per share	0.23	0.95	0.32	0.15

Table of Contents

	Year Ended September 30, 2017			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(In thousands, except per share data)			
Revenue	\$ 126,138	\$ 130,401	\$ 136,387	\$ 134,573
Gross profit	44,250	48,077	52,593	53,967
Operating income	5,024	3,031	4,341	1,923
Net income attributable to Brooks Automation, Inc.	13,871	14,005	17,350	17,386
Basic net income per share	0.20	0.20	0.25	0.25
Diluted net income per share	0.20	0.20	0.25	0.25

- (1) We make acquisitions frequently and includes the operation results from these acquisitions in the results of operations from the dates of the acquisitions. Please refer to Note 4, "Acquisitions" to our Consolidated Financial Statements for additional information.
- (2) Operating income (loss) and net income (loss) includes a charge of \$76.5 million during fiscal year 2016 related to an additional valuation allowance against our U.S. net deferred tax assets and a benefit of \$77.2 million during fiscal year 2018 due to the partial reversal of the valuation allowance against U.S. net deferred tax assets. Please refer to Note 12, "Income Taxes" to our Consolidated Financial Statements for additional information.
- (3) The calculation of working capital excludes "Cash and cash equivalents" and "Marketable securities".
- (4) Working capital amounts were adjusted to reflect the reclassification of current deferred tax assets and liabilities to non-current in accordance with Accounting Standard Update 2015-17, Income Taxes (Topic 740): Balance Sheet Classification of Deferred Taxes, issued by the Financial Accounting Standards Board. We reclassified \$16.4 million and \$18.2 million, respectively, of net deferred tax assets from current to non-current at September 30, 2015 and September 30, 2014.
- (5) On August 27, 2018, we entered into an agreement to sell the Cryogenics business. We determined that the Cryogenics business met the criteria of being reported as a discontinued operation as of September 30, 2018. As a result, the selected financial data presented for current period and prior periods have been revised to reflect the discontinued operation classification. Please refer to Note 3, "Discontinued Operations" to our consolidated financial statements for additional information.
- (6) In March 2014, we entered into an agreement to sell the Granville-Phillips Gas Analysis & Vacuum Measurement, or Granville-Phillips. In the second quarter of fiscal year 2014, we determined that the Granville-Phillips business met the criteria of being reported as a discontinued operation. As a result, the selected financial data presented for periods prior to the second quarter of fiscal year 2014 has been revised to present the operating results of the Granville-Phillips business as a discontinued operation.

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

The Management's Discussion and Analysis of Financial Condition and Results of Operations, or MD&A, describes principal factors affecting the results of our operations, financial condition and liquidity, as well as our critical accounting policies and estimates that require significant judgment and thus have the most significant potential impact on our Consolidated Financial Statements. Our MD&A is organized as follows:

- Overview. This section provides a general description of our business and operating segments, recent developments, as well as a brief discussion and overall analysis of our business and financial performance, including key developments affecting us during fiscal years ended September 30, 2018, 2017 and 2016.

Critical Accounting Policies and Estimates. This section discusses accounting policies and estimates that require us to exercise subjective or complex judgments in their application. We believe these accounting policies and estimates are important to understanding the assumptions and judgments incorporated in our reported financial results.

Table of Contents

- Results of Operations. This section provides an analysis of our financial results for the fiscal year ended September 30, 2018 compared to the fiscal year ended September 30, 2017 and for the fiscal year ended September 30, 2017 compared to the fiscal year ended September 30, 2016.
- Liquidity and Capital Resources. This section provides an analysis of our liquidity and changes in cash flows, as well as a discussion of available borrowings and contractual commitments.

You should read the MD&A in conjunction with our Consolidated Financial Statements and related notes in this Form 10-K. In addition to historical information, the MD&A contains forward-looking statements that involve risks and uncertainties. You should read "Information Related to Forward-Looking Statements" included above in this Form 10 K and "Item 1A. Risk Factors" for a discussion of important factors that could cause our actual results to differ materially from our expectations.

OVERVIEW

General

We are a leading global provider of automation and cryogenic solutions for multiple markets. We primarily serve two distinct and unrelated markets: the semiconductor capital equipment market and the life sciences sample management market. We believe our leadership positions and our global support capability in each of these markets makes us a valued business partner to the largest semiconductor capital equipment and device makers, and pharmaceutical and life science research institutions in the world. Our offerings are also applied to other adjacent technology and industrial markets, and we provide customer support services globally.

In the semiconductor capital equipment market, equipment productivity and availability are critical factors for our customers, who typically operate equipment under demanding temperature and/or pressure environments. We are a leader in wafer automation and contamination controls solutions and services that are designed to improve throughput, yield, and cost of ownership of tools in semiconductor fabs. Our product offerings include vacuum and atmospheric robots, turnkey vacuum and atmospheric wafer handling systems, as well as wafer carrier cleaning and reticle storage systems. We also capture the complete life cycle of value through our global service network of expert application and field engineers who are located close to our customers. Our services include rapid refurbishment of robots to stringent specifications, upgrades to improve equipment productivity, and proactive monitoring and diagnostics for predictive risk management and improved up-time of the installed base. Although the demand for semiconductors and semiconductor manufacturing equipment is cyclical resulting in periodic expansions and contractions, we expect the semiconductor equipment market to remain one of our principal markets as we continue making investments to maintain and grow our semiconductor product and service offerings. A majority of our research and development spending advances our current product lines and drives innovations for new product offerings. We invest in research and development initiatives within the Brooks Semiconductor Solutions Group segment to maintain continued leadership position in the markets we serve. We have recently launched our newest Vacuum Automation platform, MagnaTran LEAP™, for the rapidly emerging advanced technologies related to manufacturing 10 nanometer design rule semiconductor chips. MagnaTran LEAP is well positioned to deliver clean, accurate and fast wafer transport available for the fast-growing Deposition and Etch markets. In addition, we expect to continue to support and expand our technology and product offerings for the semiconductor market through acquisitions. In 2018, we acquired Tec-Sem Group AG, or Tec-Sem, a Switzerland-based provider of semiconductor fabrication automation equipment with a focus on reticle management. The acquisition is expected to enhance our contamination controls solutions offerings.

In the life sciences sample management market, we utilize our core competencies and capabilities in automation and cryogenics to provide comprehensive bio-sample management solutions to a broad range of end markets within the life sciences industry. Our offerings include automated ultra-cold storage freezers, consumable sample storage containers, instruments which assist in the workflow of sample management, and both on-site and off-site full sample management services. We expect the life sciences sample management market to remain one of our principal markets

for our product and service offerings and provide favorable opportunities for the growth of our overall business. Over the past several years, we have acquired and developed essential capabilities required to strategically address the sample management needs across multiple end markets within the life sciences industry.

30

Table of Contents

In November of 2015, we acquired BioStorage Technologies, a full-service outsourcing sample management business, for a total purchase price of \$125.2 million, net of cash acquired. The acquisition provided us with the capability to support customers with an integrated, comprehensive set of sample management products, services and solutions. In July 2017, we acquired substantially all of the assets and liabilities of Pacific Bio-Material Management, Inc., or PBMMI, and Novare, LLC, or Novare, for a total purchase price of \$34.1 million, net of cash acquired. PBMMI and Novare provide storage, transportation, management, and cold chain logistics of biological materials. The acquisition is expected to expand our existing capabilities with respect to sample management and integrated cold chain storage and transportation solutions. We acquired Cool Lab, LLC, a subsidiary of BioCision, LLC, which provides a range of cryogenic product solutions that assist in managing the temperature stability of therapeutics, biological samples and related biomaterials in ultra-cold environments, in November 2016. We held an equity interest in BioCision prior to the acquisition of Cool Lab and collaborated in the development of advanced solutions in temperature-controlled environments. The aggregate purchase price of \$15.2 million consisted of a cash payment of \$4.8 million, a liability to the seller of \$0.1 million and a non-cash consideration of \$10.3 million measured at fair value on the acquisition date. We have made several investments in developing new consumable and instrument offerings since the acquisitions of FluidX and Cool Lab.

In fiscal year 2017, we launched BioStudies, a bioinformatics sample intelligence software platform that enables customers to manage their global samples. In August 2017, we acquired certain assets and liabilities related to FreezerPro® web-based software platform from RURO, Inc. for a total purchase price of \$5.5 million. RURO, Inc. provides sample management software across multiple end markets, including academic research, government, pharmaceutical, biotech, and healthcare. We expect the acquisition of FreezerPro to complement our BioStudies offerings and extend our informatics solutions to address laboratories, biobanks or enterprises that manage biological samples. In October 2017, we acquired all of the outstanding capital stock of 4titude Limited, or 4titude, a U.K.-based manufacturer of scientific consumables for biological sample materials used in a variety of genomic and DNA analytical applications, for a total purchase price of \$65.1 million, net of cash acquired. The acquisition has expanded our existing offerings of consumables and instruments within the Brooks Life Sciences segment. In April 2018, we acquired BioSpeciMan Corporation, or BioSpeciMan, a Canadian provider of storage services for biological sample materials. We made a total cash payment of \$5.2 million, net of cash acquired and subject to working capital adjustments. The acquisition is expected to expand customer relationships and geographic reach within our growing sample management storage services business.

On September 26, 2018, we entered into a definitive agreement to acquire GENEWIZ, a leading provider of genomic services, based in New Jersey with operations throughout the United States, Asia, and Europe for a cash price of \$450.0 million, subject to customary adjustments. We completed this acquisition on November 15, 2018. Please refer to Note 23, "Subsequent Events" to our Consolidated Financial Statements included under "Item 8, Financial Statements and Supplementary Data" of this Form 10-K.

Since entering the life sciences industry, we have also strengthened and broadened our product portfolio and market reach by investing in internal product development. During fiscal years 2018, 2017 and 2016, more than 24% of our cumulative research and development spending was focused on innovating and advancing solutions in the life sciences sample management market. We expect to continue investing in research and development and making strategic acquisitions with the objective of expanding our offerings in the life sciences sample management market. Within the Brooks Life Sciences segment, we have developed and continue to develop automated biological sample storage solutions for operating in ultra-low temperature environments. We have developed the Twin-bank platform which provides -20°C and -80°C ultracold storage and the BioStore™ III Cryo for -190°C cryogenic storage.

Recent Developments

In the fourth quarter of fiscal year 2018, we entered into a definitive agreement to sell our semiconductor cryogenics business to Edwards Vacuum LLC (a member of the Atlas Copco Group) for approximately \$675.0 million in cash, subject to customary adjustments. We originally acquired the cryogenics business in 2005 as part of the acquisition of Helix Technology Corporation. The closing of our sale of the cryogenics business is subject to various closing conditions and regulatory approvals. The semiconductor cryogenics business has been classified as discontinued operations and, unless otherwise noted, the description of our business in this report relates solely to our continuing operations and does not include the operations of our semiconductor cryogenics business.

Table of Contents

As discussed above, on November 15, 2018, we completed our acquisition of GENEWIZ for a cash purchase price of \$450.0 million, which is subject to customary adjustments. We financed a portion of the cash purchase price through a new \$350.0 million senior secured incremental term loan, under our Credit Agreement, dated October 4, 2017. Please refer to the "Liquidity and Capital Resources" section below for a detailed description of the senior secured incremental term loan.

Segments

We have two operating and reportable segments consisting of Brooks Semiconductor Solutions Group and Brooks Life Sciences. For additional information on our operating segments and the related restructuring actions, as well as segment revenues and their operating results, please refer to Note 17, "Restructuring and Other Charges" and Note 20, "Segment and Geographic Information" to our Consolidated Financial Statements included in Item 8 "Financial Statements and Supplementary Data" of this Form 10 K.

The Brooks Semiconductor Solutions Group segment provides a variety of products, services and solutions that enable improved throughput and yield in controlled operating environments, as well as an extensive range of support services. The solutions include atmospheric and vacuum robots, robotic modules, tool automation systems, and contamination control of wafer carrier front opening unified pods. The support services include repair services, diagnostic support services, and installation services in support of the products, which enable our customers to maximize process tool uptime and productivity. This segment also provides end-user customers with spare parts and productivity enhancement upgrades to maximize tool productivity.

The Brooks Life Sciences segment provides comprehensive life cycle sample management solutions for life science and bioscience customers to advance scientific research and support drug development. The segment's product offerings include automated cold sample management systems for compound and biological sample storage, equipment for sample preparation and handling, consumables, and informatics that help customers manage samples throughout their research discovery and development work flows. The segment's service offerings include sample storage and support services provided to a wide range of life science customers, including pharmaceutical companies, biotechnology companies, biobanks and research institutes.

Business and Financial Performance

Fiscal Year Ended September 30, 2018 Compared to Fiscal Year Ended September 30, 2017

Results of Operations - We reported revenue of \$631.6 million for fiscal year 2018 compared to \$527.5 million for fiscal year 2017, an increase of \$104.1 million, or 20%. Gross margin was 39.0% for fiscal year 2018 compared to 37.7% for fiscal year 2017, an increase in gross profit of \$47.2 million. Operating expenses were \$214.7 million for fiscal year 2018 compared to \$184.6 million for fiscal year 2017, an increase of \$30.1 million. Operating income was \$31.4 million for fiscal year 2018 compared to \$14.3 million for fiscal year 2017, an increase of \$17.1 million, which was primarily attributable to the revenue growth and gross margin improvement, partially offset by higher operating expenses. We generated income from continuing operations of \$67.7 million during fiscal year 2018 as compared to \$10.7 million in fiscal year 2017. This increase was primarily attributable to the decrease in income taxes of \$50.6 million driven by the release of the tax valuation allowance of \$77.2 million and an increase in operating income of \$17.1 million. These increases were partially offset by higher net non-operating expenses of \$11.2 million compared to the prior fiscal year, primarily related to increased interest expense of \$9.1 million due to the term loan, higher foreign exchanges losses of \$1.0 million and the impact of a \$1.8 million gain recorded on the settlement of our investment in Biocision, LLC, during fiscal year 2017. Please refer to the "Results of Operations" section below for a

detailed discussion of our financial results for the fiscal year 2018 compared to fiscal year 2017.

Cash Flows and Liquidity - Cash and cash equivalents and marketable securities were \$251.2 million at September 30, 2018 as compared to \$104.3 million at September 30, 2017. The increase in cash and cash equivalents and marketable securities of \$146.9 million was primarily attributable to cash inflows of \$197.6 million related to proceeds from the term loan and cash inflows of \$74.0 million generated from our operating activities, partially offset by cash payments of \$85.8 million related to acquisitions, cash outflows of \$28.3 million related to dividend payments made to

Table of Contents

our shareholders, as well as capital expenditure payments of \$12.8 million. Please refer to the "Liquidity and Capital Resources" section below for a detailed discussion of our liquidity and changes in cash flows for fiscal year 2018 compared to fiscal year 2017.

Fiscal Year Ended September 30, 2017 Compared to Fiscal Year Ended September 30, 2016

Results of Operations- We generated revenue of \$527.5 million during fiscal year 2017 compared to \$434.0 million during fiscal year 2016, an increase of \$93.5 million, or 22%. Gross margin was 37.7% for fiscal year 2017 as compared to 36.1% for fiscal year 2016, an increase in gross profit of \$42.2 million. Operating expenses were \$184.6 million during fiscal year 2017 as compared to \$173.7 million during fiscal year 2016, an increase of \$10.8 million. Operating income was \$14.3 million during fiscal year 2017 as compared to a loss of \$17.1 million during fiscal year 2016, an increase of \$31.4 million, which was primarily attributable to the revenue growth and gross margin improvement, partially offset by higher operating expenses. We generated income from continuing operations of \$10.7 million during fiscal year 2017 as compared to a loss of \$85.4 million during fiscal year 2016. This increase of \$96.1 million was primarily attributable to a lower income tax provision of \$62.9 million which is mostly due to a \$76.5 million valuation allowance recorded against U.S. net deferred tax assets during fiscal year 2016, as well as higher operating income of \$31.4 million during fiscal year 2017. Please refer to the "Results of Operations" section below for a detailed discussion of our financial results for the fiscal year 2017 compared to fiscal year 2016.

Cash Flows and Liquidity - Cash and cash equivalents and marketable securities were \$104.3 million at September 30, 2017 as compared to \$91.2 million at September 30, 2016. The increase in cash and cash equivalents and marketable securities of \$13.1 million was primarily attributable to cash inflows of \$96.2 million generated from our operating activities, partially offset by cash outflows related to acquisitions of \$44.8 million, dividends payments to our shareholders of \$27.9 million, and capital expenditure payments of \$12.7 million during fiscal year 2017. Please refer to the "Liquidity and Capital Resources" section below for a detailed discussion of our liquidity and changes in cash flows for fiscal year 2017 compared to fiscal year 2016.

CRITICAL ACCOUNTING POLICIES AND ESTIMATES

The preparation of the Consolidated 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, intangible assets, goodwill, inventories, income taxes, and stock-based compensation. We base our estimates on historical experience and various other assumptions that are believed to be reasonable under the circumstances. We evaluate current and anticipated worldwide economic conditions, both in general and specifically in relation to the semiconductor and life science industries, that serve as a basis for making judgments about the carrying values of assets and liabilities that are not readily determinable based on information from other sources. Actual results may differ from these estimates under different assumptions or conditions that could have a material impact on our financial condition and results of operations.

We believe that the assumptions and estimates associated with the following critical accounting policies involve significant judgment and thus have the most significant potential impact on our Consolidated Financial Statements.

Revenue Recognition

We generate revenue from the sale of products and services. A description of our revenue recognition policies is included in the Note 2, "Summary of Significant Accounting Policies" in the Notes to the Consolidated Financial Statements included in Item 8 "Financial Statements and Supplementary Data" of this Form 10 K.

Although most of our sales agreements contain standard terms and conditions, certain agreements contain multiple elements or non-standard terms and conditions. We exercise judgment in interpreting the commercial terms and determining when all revenue recognition criteria have been met to ensure revenue was recognized in the appropriate accounting period. Moreover, judgment is required to properly identify the units of accounting in multiple element arrangements and determine the manner in which revenue should be allocated among separate units of accounting. We exercise judgment in determining whether the deliverables specified in these arrangements should be treated as separate

Table of Contents

units of accounting for revenue recognition purposes, and, if so, how the consideration should be allocated among the elements and when revenue for each element should be recognized. We allocate revenue to each element in the contractual arrangement based on the selling price hierarchy that may require us to estimate the selling price of certain deliverables that are not sold separately or where third-party evidence of pricing is not observable. Our estimate of selling price impacts the amount and timing of revenue recognized in multiple element arrangements. While changes in the allocation of the estimated sales price between the units of accounting will not affect the total revenue amount recognized for a particular sales arrangement, any material changes in these allocations could impact the timing of revenue recognition that could have a material effect on our financial condition and results of operations.

We recognize revenue for certain arrangements based on the percentage of completion method and develop profit estimates for long-term contracts based on total revenue expected to be generated from the project and total costs anticipated to be incurred. Significant judgment is required in estimating such total costs and measuring the progress of the project completion, as well as whether a loss is expected to be incurred on the contract. We use certain assumptions and develop estimates based on a number of factors, including the degree of required product customization and the customer's existing environment based on installation work, as well as our historical experience, project plans and an assessment of the risks and uncertainties inherent in the contract related to implementation delays or performance issues that may or may not be within our control. We estimate a loss on a contract by comparing total estimated contract revenue to the total estimated contract costs and recognize a loss during the period in which it becomes probable and can be reasonably estimated. We review profit estimates for long-term contracts during each reporting period and revise them based on changes in circumstances.

If our judgment regarding revenue recognition proves incorrect, our revenue in particular periods may be adversely affected and could have a material impact on our financial condition and results of operations.

Business Combinations

We account for business acquisitions using the purchase method of accounting, in accordance with which assets acquired and liabilities assumed are recorded at their respective fair values at the acquisition date. The fair value of the consideration paid, including contingent consideration, is assigned to the assets acquired and liabilities assumed based on their respective fair values. Goodwill represents the excess of the purchase price over the estimated fair values of the assets acquired and liabilities assumed.

Significant judgment is used in determining fair values of assets acquired and liabilities assumed, as well as intangibles and their estimated useful lives. Fair value and useful life determinations are based on, among other factors, estimates of future expected cash flows, royalty cost savings and appropriate discount rates used in computing present values. These judgments may materially impact the estimates used in allocating acquisition date fair values to assets acquired and liabilities assumed, as well as our current and future operating results. Actual results may vary from these estimates that may result in adjustments to goodwill and acquisition date fair values of assets and liabilities during a measurement period or upon a final determination of asset and liability fair values, whichever occurs first. Adjustments to fair values of assets and liabilities made after the end of the measurement period are recorded within our operating results.

Changes in the fair value of a contingent consideration resulting from a change in the underlying inputs are recognized in results of operations until the arrangement is settled.

Intangible Assets, Goodwill and Other Long-Lived Assets

We have identified intangible assets and generated significant goodwill as a result of our acquisitions. Intangible assets other than goodwill are valued based on estimated future cash flows and amortized over their estimated useful

lives. Goodwill is tested for impairment annually or more often if impairment indicators are present, at the reporting unit level. Intangible assets other than goodwill and long-lived assets are subject to impairment testing if events and circumstances indicate that the carrying amount of an asset or a group of assets may not be recoverable.

The goodwill impairment test is performed at the reporting unit level. A reporting unit is either an operating segment or one level below it, which is referred to as a “component.” The level at which the impairment test is

Table of Contents

performed requires an assessment of whether the operations below an operating segment constitute a self-sustaining business, in which case testing is generally performed at this level.

We have two operating and reportable segments consisting of Brooks Semiconductor Solutions Group and Brooks Life Sciences. We have five reporting units, including four reporting units within the Brooks Semiconductor Solutions Group operating segment and one reporting unit which is the Brooks Life Sciences operating segment.

We perform our annual goodwill impairment assessment on April 1st of each fiscal year. In accordance with ASC 350, Intangibles- Goodwill and Other, we initially assess qualitative factors to determine whether the existence of events or circumstances indicates that it is more likely than not that the fair value of a reporting unit is less than its carrying value. If we determine, based on this assessment, that it is more likely than not that the fair value of the reporting unit is less than its carrying value, we perform a quantitative goodwill impairment test by comparing the reporting unit's fair value with its carrying value. An impairment loss is recognized for the amount by which the reporting unit's carrying value exceeds its fair value, up to the total amount of goodwill allocated to the reporting unit. No impairment loss is recognized if the fair value of the reporting exceeds its carrying value.

We determine fair values of our reporting units based on an income approach in accordance with the discounted cash flow method, or DCF Method. The DCF Method is based on projected future cash flows and terminal value estimates discounted to their present values. Terminal value represents a present value an investor would pay on the valuation date for the rights to the cash flows of the business for the years subsequent to the discrete cash flow projection period. We consider the DCF Method to be the most appropriate valuation technique since it is based on management's long-term financial projections. Due to the cyclical nature of the semiconductor equipment market, management's projections as of the valuation date are considered more objective since market metrics of peer companies fluctuate during the cycle. In addition, we also compare aggregate values of our net corporate assets and reporting unit fair values to our overall market capitalization and use certain market-based valuation techniques to test the reasonableness of the reporting unit fair values determined in accordance with the DCF Method. The observable inputs used in the DCF Method include discount rates that are at or above our weighted-average cost of capital. We derive discount rates that are commensurate with the risks and uncertainties inherent in the respective businesses and our internally developed projections of future cash flows.

We completed the annual goodwill impairment test for our five reporting units as of April 1, 2018 and determined that no adjustment to goodwill was necessary since the fair value of each reporting unit was significantly in excess of the carrying value of each reporting unit. We conducted a qualitative assessment for three reporting units within the Brooks Semiconductor Solutions Group segment and determined that it was not likely that their fair values were less than their carrying values. As a result of the analysis, we did not perform the quantitative assessment for these reporting units and did not recognize impairment losses. We also performed the quantitative goodwill impairment test for the fourth reporting unit within the Brooks Semiconductor Solutions Group segment and for the Brooks Life Sciences reporting unit. We determined that no adjustment to goodwill was necessary for these two reporting units since their fair values significantly exceeded their respective carrying values. We evaluate a reporting unit's goodwill for impairment between annual tests if events occur or circumstances change that would more likely than not reduce the fair value of such reporting unit below its carrying value.

Application of the goodwill impairment test requires judgment based on market and operational conditions at the time of the evaluation, including management's best estimates of the reporting unit's future business activity and the related estimates and assumptions of future cash flows from the assets that include the associated goodwill. Different assumptions of forecasted sales volumes, product costs, future cash flows, risk-adjusted weighted average cost of capital discount rate, as well as long-term growth rate projections used in the DCF model could result in different estimates of the reporting unit's fair value as of each testing date.

We are required to test long-lived assets, other than goodwill, for impairment when impairment indicators are present. For purposes of this test, long-lived assets are grouped with other assets and liabilities at the lowest level for which identifiable cash flows are largely independent of the cash flows of other assets and liabilities. If we determine that indicators of potential impairment are present, we assess the recoverability of the long-lived asset group by comparing its undiscounted future cash flows to its carrying value. If the carrying value of the long-lived asset group exceeds its future cash flows, we determine fair values of the individual net assets within the long-lived asset group to

Table of Contents

assess potential impairment. If the aggregate fair values of the individual net assets of the group are less than their carrying values, an impairment loss is recognized for an amount in excess of the group's aggregate carrying value over its fair value. The loss is allocated to the assets within the group based on their relative carrying values, with no asset reduced below its fair value. We did not test our long-lived assets for impairment during fiscal years 2018, and 2017 since no events indicating impairment occurred during the periods then ended.

Inventory

We state our inventory at the lower of cost or market amount and make adjustments to reduce the inventory cost to its net realizable value by providing estimated reserves for obsolete or unmarketable inventory. The reserves are established for the difference between the cost of inventory and its estimated market value based on assumptions related to future demand and market conditions. We fully reserve for inventories and non-cancelable purchase orders for inventory deemed obsolete. We perform periodic reviews of our inventory to identify excess inventories on hand. We compare on-hand inventory balances to anticipated inventory usage based on our recent historical activity and anticipated or forecasted demand for our products developed through our planning systems and sales and marketing inputs.

We adjust the reserves for obsolete or unmarketable inventory and record additional inventory write downs based on unfavorable changes in estimated customer demand or actual market conditions that may differ from management projections.

Deferred Income Taxes

We record a valuation allowance to reduce our deferred tax assets to the amount that is more likely than not will be realized. We consider recent historical income, estimated future taxable income, carry-forward periods of tax attributes, the volatility of the semiconductor industry and ongoing tax planning strategies in assessing the need for the valuation allowance. Throughout fiscal year 2017 we maintained a full valuation allowance against our U.S. net deferred tax assets along with those of certain foreign tax-paying components. We evaluate the realizability of our deferred tax assets by tax-paying component and assess the need for a valuation allowance on an annual and quarterly basis. We evaluate the profitability of each tax-paying component on a historic cumulative basis and on a forward-looking basis while performing this analysis. After evaluating all the relevant positive and negative evidence as of March 31, 2018, we concluded that it was more likely than not that a substantial portion of the U.S. deferred tax assets would be realized. In the second quarter of fiscal year 2018 we reached a significant level of cumulative profitability in the U.S., coupled with an improved outlook of U.S. earnings. During the full fiscal year 2018, we reduced our U.S. valuation against our U.S. net deferred tax assets resulting in a tax benefit of \$77.2 million. The remaining portion of our U.S. valuation allowance is related to the realizability of certain state tax credits and net operating loss carry-forwards. We continue to maintain valuation allowances against net deferred tax assets in certain foreign tax-paying components as of the end of fiscal year 2018.

Stock-Based Compensation

We measure compensation cost for all employee stock awards at fair value on the date of grant and recognize compensation expense over the service period for awards expected to vest. The fair value of restricted stock units is determined based on the number of shares granted and the closing price of our common stock quoted on Nasdaq on the date of grant, and the fair value of stock options is determined using the Black-Scholes valuation model. Such fair values are recognized as expense over the service period, net of estimated forfeitures. The estimation of stock awards that will ultimately vest requires significant judgment. We consider many factors when estimating expected forfeitures, including types of awards, employee class, and historical experience. In addition, for stock-based awards where vesting is dependent upon achieving certain operating performance goals, we estimate the likelihood of

achieving the performance goals. Actual results, and future changes in estimates, may differ from our current estimates.

Recently Issued Accounting Pronouncements

For a summary of recently issued accounting pronouncements applicable to our Consolidated Financial Statements which is incorporated here by reference, please refer to Note 2, "Summary of Significant Accounting Policies" in the

36

Table of Contents

Notes to the Consolidated Financial Statements included in Item 8 "Financial Statements and Supplementary Data" of this Form 10 K.

RESULTS OF OPERATIONS

Fiscal Year Ended September 30, 2018 Compared to Fiscal Year Ended September 30, 2017

Revenue

We reported revenue of \$631.6 million for fiscal year 2018 compared to \$527.5 million for fiscal year 2017, an increase of \$104.1 million, or 20%.

Our Brooks Semiconductor Solutions Group segment reported revenue of \$435.0 million for fiscal year 2018 compared to \$378.8 million for fiscal year 2017. The increase of \$56.2 million, or 15%, reflects increases in revenues from robotic automation products, systems and related services business, partially offset by a decline in revenues from our contamination control systems. These increases include revenues generated by the Tec-Sem acquisition of \$11.6 million which we acquired in the third quarter of fiscal year 2018.

Our Brooks Life Sciences segment reported revenue of \$196.5 million for fiscal year 2018 compared to \$148.7 million for fiscal year 2017. The increase of \$47.8 million, or 32%, included organic growth of \$22.6 million, or 14%. The organic growth was broad-based across all major product lines, including sample storage services, automated storage systems, including the BioStore III Cryo, consumables, instruments and informatics. Acquisitions accounted for \$25.2 million of the increase compared to fiscal year 2017, which consisted of \$15.6 million from the acquisition of 4titude, \$8.1 million from the acquisition of PBMMI, and \$0.5 million from the acquisition of BioSpeciMan.

We anticipate continued growth in revenue from our Brooks Life Sciences segment through our internally-developed products and services and through our acquired businesses. We will continue to seek opportunities to expand our market share in the semiconductor and adjacent technology markets served by our Brooks Semiconductor Solutions Group segment. These markets are cyclical, and often fluctuate significantly from quarter to quarter. Demand for our Brooks Semiconductor Solution Group products is affected by these cycles.

Revenue generated outside the United States amounted to \$398.9 million, or 63% of total revenue, for fiscal year 2018 compared to \$354.6 million, or 67% of total revenue, for fiscal year 2017.

Gross Margin

We reported gross margins of 39.0% for fiscal year 2018 compared to 37.7% for fiscal year 2017. Gross margin increased 1.9% in the Brooks Semiconductor Solutions Group segment and decreased 0.1% in the Brooks Life Sciences segment. Cost of revenue for fiscal year 2018 included \$4.9 million of charges for amortization related to completed technology as compared to \$3.9 million incurred during fiscal year 2017. Additionally, cost of revenue for fiscal year 2018 also included \$1.9 million of inventory step-up charges, compared to \$0.5 million for fiscal year 2017.

Our Brooks Semiconductor Solutions Group segment reported gross margins of 40.0% for fiscal year 2018 compared to 38.0% for fiscal year 2017. Margins improved on the impact of product mix, volume leverage of fixed costs, and lower charges related to warranty and excess and obsolete inventory. Cost of revenue during fiscal year 2018 included \$3.4 million of amortization related to completed technology compared to \$2.5 million during fiscal year 2017. During fiscal years 2018 and 2017, cost of revenue included \$0.7 million and \$0.1 million, respectively, of inventory

step-up charges.

Our Brooks Life Sciences segment reported gross margins of 36.7% for fiscal year 2018 compared to 36.8% for fiscal year 2017. Margins benefitted from recent acquisitions and the continued growth of our BioStorage services, which carries higher than average gross margins. These benefits were offset by lower margins in our manufactured automated stores business, which experienced cost overruns in the areas of production and project management. Cost of revenue during fiscal year 2018 included \$1.5 million of amortization related to completed technology as compared to \$1.4 million incurred during fiscal year 2017. During fiscal year 2018 and 2017, cost of revenue included \$1.2 million and \$0.4 million, respectively, of inventory step-up charges.

37

Table of Contents

Research and Development

Research and development expenses were \$46.9 million in fiscal year 2018 compared to \$39.9 million in fiscal year 2017. The increase of \$7.1 million was due to increased expense of \$4.2 million within the Brooks Semiconductor Solutions Group segment and \$2.8 million within the Brooks Life Sciences segment. Higher research and development expenses during fiscal year 2018 as compared to fiscal year 2017 were primarily attributable increased investments for new product development in both of our segments.

Selling, General and Administrative

Selling, general and administrative expenses were \$167.0 million in fiscal year 2018 compared to \$141.5 million in fiscal year 2017. The increase of \$25.5 million was primarily attributable to: (i) higher employee-related costs driven by increased incentive bonuses and higher salaries resulting from hiring additional personnel to support the growth of our business, (ii) higher amortization costs due to acquisitions during the period, (iii) higher operating expenses related to the acquisitions of PBMML, 4titude, Tec-Sem and BioSpeciMan and (iv) higher stock-based compensation expense driven mostly by higher estimates of the expected payout related to the achievement of performance goals for our performance-based awards. Fiscal year 2018 also included a loss recovery from an insurance claim which partially offset the increases described above.

Amortization expense related primarily to customer relationships was \$19.3 million and \$13.2 million, respectively, during fiscal years 2018 and 2017.

Restructuring Charges

We recorded restructuring charges of \$0.7 million during fiscal year 2018 as compared to \$3.1 million during fiscal year 2017.

Restructuring Charges Incurred During Fiscal Year Ended September 30, 2018

Restructuring charges of \$0.7 million incurred during fiscal year 2018 were related to severance costs and consisted primarily of actions initiated during the fourth quarter of fiscal year 2018. Of these charges, \$0.3 million related to the integration of Tec-Sem which was acquired during fiscal year 2018 as part of our Brooks Semiconductor Solutions Group segment and \$0.3 million related to the announced closure of our Denmark facility which will eliminate redundancies in our Brooks Life Sciences segment. Cost savings realized during fiscal year 2018 related to these actions were nominal as these actions were initiated during the fourth quarter of fiscal year 2018.

Restructuring Charges Incurred During Fiscal Year Ended September 30, 2017

Restructuring charges of \$3.1 million incurred during fiscal year 2017 were related to severance costs and consisted of \$1.7 million related to restructuring actions initiated during fiscal year 2017 and \$1.4 million related to restructuring actions initiated in prior periods.

The charges from restructuring actions initiated during fiscal year 2017 were primarily related to the action to streamline field service operations in our Brooks Semiconductor Solutions Group segment. This action had been completed as of September 30, 2017 and resulted in approximately \$1.9 million in annualized cost of revenue reductions. We realized approximately \$1.9 million and \$0.8 million, respectively, of cost savings related to this action during fiscal year 2018 and 2017.

The charges from actions initiated prior to fiscal year 2017 was primarily related to the consolidation of the Jena, Germany repair facility into the Chelmsford, Massachusetts repair operation. This restructuring action was initiated to streamline the service repair operations and reduce the overhead cost structure within our Brooks Semiconductor Solutions Group segment. This restructuring action was substantially completed as of September 30, 2017. We recognized \$0.8 million cost savings related to this action during the fiscal year 2017 and \$1.5 million during fiscal year 2018. Total cost savings from this action consisted of \$1.0 million of cost of revenue reductions and \$0.6 million of selling, general and administrative expense reductions.

Table of Contents

The charges from actions initiated prior to fiscal year 2017 also include a small portion of charges from the company-wide restructuring action initiated in fiscal year 2016 to streamline business operations and improve competitiveness and overall profitability. This action had been completed as of September 30, 2017. Cost savings from this action were \$13.1 million during fiscal year 2017. Savings realized during fiscal year 2017 consisted of \$4.3 million of cost of revenue reductions, \$2.6 million of research and development expense reductions, and \$6.1 million of selling, general and administrative expense reductions.

Non-Operating Income (Expenses)

Gain on Settlement of Equity Method Investment - During fiscal year 2017, we recognized a gain of \$1.8 million on the settlement of the equity method investment in BioCision which was included as a part of the non-cash consideration for an acquisition of Cool Lab.

Interest income – During fiscal years 2018 and 2017, we recorded interest income of \$1.9 million and \$0.5 million respectively, which represented interest earned on our marketable securities.

Interest expense – During fiscal years 2018 and 2017, we recorded interest expense of \$9.5 million and \$0.4 million, respectively. The increase in interest expense during fiscal year 2018 primarily related to the term loan originated in October 2017. Please refer to the “Liquidity and Capital Resources” section below for further information on the term loan.

Other expenses, net – During fiscal years 2018 and 2017 we recorded other expenses, net of \$3.3 million and \$1.7 million, respectively. The \$1.6 million increase in expense was primarily attributable to higher foreign currency exchange losses of \$1.0 million recognized during fiscal year 2018 as compared to the corresponding period of the prior year, as well as gains recognized in fiscal year 2017 related to a pension settlement of \$0.3 million and sale of property, plant and equipment of \$0.2 million. Please refer to Item 7A. “Quantitative and Qualitative Disclosures About Market Risk – Currency Rate Exposure” in this Annual Report on Form 10-K for additional information about these currency exchange losses.

Income Tax Provision

We recorded an income tax benefit on continuing operations of \$47.3 million in fiscal year 2018 compared to an income tax provision of \$3.4 million in fiscal year 2017. The income tax benefit during fiscal year 2018 was driven primarily by the reversal of the valuation allowance against a substantial portion of the U.S. net deferred tax assets. We have estimated the toll charge on our taxable foreign earnings, net of foreign tax credits, associated with the enactment of the Tax Cuts and Jobs Act during fiscal year 2018 to be \$8.0 million. This amount is an offset to the valuation allowance reversal recorded during the year and is included in the full year tax benefit reported. The tax benefit for fiscal year 2018 also included a \$0.7 million tax benefit related to the re-measurement of net U.S. deferred tax liabilities to account for the reduced 21 percent statutory Federal income tax rate. The overall benefit for fiscal year 2018 was partially offset by the tax provisions on earnings in our foreign jurisdictions during the year.

Equity in Earnings of Equity Method Investments

We incurred losses of \$0.5 million from our investment in BioCision during fiscal year 2017. Our investment in BioCision was settled during the first quarter of fiscal year 2017 as a part of the non-cash consideration for the acquisition of Cool Lab on November 28, 2016. Prior to closing the equity investment, we traditionally recorded the income and losses related to the equity method investment in BioCision one quarter in arrears. During fiscal year 2017, we recorded two additional months of activity in the carrying value of the investment as a result of its settlement. We deemed the amount of \$0.2 million related to two additional months of activity to be insignificant.

Discontinued Operations

We incurred revenue and net income from discontinued operations of \$196.1 million and \$48.7 million, respectively for fiscal year 2018 related to our semiconductor cryogenics business as compared to \$165.4 million and \$51.9 million, respectively for fiscal year 2017. The net income is inclusive of income from the UCI joint venture in 2018 and 2017. The income from discontinued operations only includes direct operating expenses incurred that (1) are clearly

Table of Contents

identifiable as costs being disposed of upon completion of the sale and (2) will not be continued by the Company on an ongoing basis. Indirect expenses which supported the Cryogenics business, and which will remain as part of the continuing operations, are not reflected in income from discontinued operations.

Fiscal Year Ended September 30, 2017 Compared to Fiscal Year Ended September 30, 2016

Revenue

We reported revenue of \$527.5 million for fiscal year 2017 compared to \$434.0 million for fiscal year 2016, an increase of \$93.5 million, or 22%.

Our Brooks Semiconductor Solutions Group segment reported revenue of \$378.8 million for fiscal year 2017 compared to \$325.9 million for fiscal year 2016. The increase of \$52.9 million, or 16%, reflects increases in revenues from contamination control systems and robotic automation products and systems, partially offset by a decline in revenues from services.

The robotic automation products revenue has historically included revenue from patent royalties and sales of third party atmospheric robots under a distribution agreement in North America. During fiscal year 2016, these revenue streams stopped, driving a decline of \$8.7 million attributable to the expiration of certain patents and \$13.0 million from exiting the atmospheric robot distribution arrangement. Royalty income generated from the expired patents was \$8.7 million in fiscal years 2016. Product revenue from the atmospheric robot distribution arrangement was \$13.0 million in fiscal years 2016. There was no royalty income and no revenue from the atmospheric robot distribution arrangement generated during fiscal year 2017.

Our Brooks Life Sciences segment reported revenue of \$148.7 million for fiscal year 2017 compared to \$108.1 million for fiscal year 2016. The increase of \$40.6 million, or 38%, was primarily driven by organic growth of \$25.3 million, or 23%. The organic growth was primarily attributable to sample storage services, automated storage systems, including the BioStore III Cryo, and consumables and instruments. Acquisitions accounted for \$15.3 million of the increase compared to fiscal year 2016, which consisted of \$8.2 million from two additional months of revenue from BioStorage acquired on November 30, 2015, \$3.7 million from the acquisition of Cool Labs, and \$3.4 million from the acquisition of PBMML.

Revenue generated outside the United States amounted to \$354.6 million, or 67% of total revenue, for fiscal year 2017 compared to \$277.1 million, or 64% of total revenue, for fiscal year 2016.

Gross Margin

We reported gross margins of 37.7% for fiscal year 2017 compared to 36.1% for fiscal year 2016. Gross margin increased in the Brooks Semiconductor Solutions Group segment and Brooks Life Sciences segment by 1.9 percentage points and 0.7 percentage points, respectively. Cost of revenue for fiscal year 2017 included \$3.9 million of charges for amortization related to completed technology as compared to \$4.2 million incurred during fiscal year 2016. Additionally, cost of revenue for fiscal year 2017 also included \$0.5 million of inventory step-up charges, compared to \$0.6 million for fiscal year 2016.

Our Brooks Semiconductor Solutions Group segment reported gross margins of 38.0% for fiscal year 2017 compared to 36.1% for fiscal year 2016. Product margins increase was driven by improved operating leverage from higher revenue and the outcome of product cost optimization efforts. Service margins increase was driven by lower material costs for robot repair, and cost savings from the restructuring actions that resulted in reduced repair operations costs and increased field service productivity. Please refer to the "Restructuring Charges" section below for further

information on the restructuring actions. Cost of revenue during fiscal year 2017 included \$2.5 million of amortization related to completed technology compared to \$2.7 million during fiscal year 2016. During fiscal years 2017 and 2016, cost of revenue included \$0.1 million and \$0.6 million, respectively, of inventory step-up charges.

Our Brooks Life Sciences segment reported gross margins of 36.8% for fiscal year 2017 compared to 36.1% for fiscal year 2016. The increase was driven by improved cost management on large stores projects, volume leverage driven by organic revenue growth, favorable contributions from recent acquisitions and savings from the recent

Table of Contents

restructuring actions, partially offset by increased expenses supporting the transition to in-sourcing of manufacturing from a contract provider to our Manchester location and expenses related to the consolidation of our Cool Labs operations. Please refer to the "Restructuring Charges" section below for further information on these restructuring actions. Cost of revenue during fiscal year 2017 included \$1.4 million of amortization related to completed technology as compared to \$1.5 million during fiscal year 2016. Additionally, cost of revenue for fiscal year 2017 included \$0.4 million of inventory step-up charges. There were no such charges during fiscal year 2016.

Research and Development

Research and development expenses were \$39.9 million in fiscal year 2017 compared to \$44.2 million in fiscal year 2016. The decrease of \$4.3 million reflects expense reductions of \$2.6 million within the Brooks Semiconductor Solutions Group segment and \$1.7 million within the Brooks Life Sciences System segment. Lower research and development expenses during fiscal year 2017 as compared to fiscal year 2016 were primarily attributable to the full year realization of savings from restructuring actions initiated prior to fiscal year 2017 and the progression of certain projects from the development stage to market which resulted in lower project spending.

Selling, General and Administrative

Selling, general and administrative expenses were \$141.5 million in fiscal year 2017 compared to \$119.3 million in fiscal year 2016. The increase of \$22.2 million was primarily attributable to: (i) higher compensation costs primarily driven by increased headcounts, and increased incentive bonuses and commissions, (ii) higher stock-based compensation expense related primarily to performance above targets, (iii) higher merger-related costs during fiscal years 2017, (iv) higher amortization expense during fiscal years 2017, (v) higher outside service costs and (vi) higher operating expenses as a result of the PBMMI acquisition. These increases were partially offset by lower depreciation expense in information technology systems.

Amortization expense related primarily to customer relationships was \$13.2 million and \$10.8 million, respectively, during fiscal years 2017 and 2016.

Restructuring Charges

We recorded restructuring charges of \$3.1 million during fiscal year 2017 as compared to \$10.2 million during fiscal year 2016.

Restructuring Charges Incurred During Fiscal Year Ended September 30, 2017

Restructuring charges of \$3.1 million incurred during fiscal year 2017 were related to severance costs and consisted of \$1.7 million related to restructuring actions initiated during fiscal year 2017 and \$1.4 million related to restructuring actions initiated in prior periods.

The charges from restructuring actions initiated during fiscal year 2017 was primarily related to streamlined field service operations in our Brooks Semiconductor Solutions Group segment. This action had been completed as of September 30, 2017 and resulted in approximately \$1.9 million in annualized cost of revenue reductions. We realized approximately \$1.9 million and \$0.8 million, respectively, of cost savings during fiscal year 2018 and 2017.

The charges from actions initiated prior to fiscal year 2017 were primarily related to the consolidation of the Jena, Germany repair facility into the Chelmsford, Massachusetts repair operation. This restructuring action was initiated to streamline the service repair operations and reduce the overhead cost structure within our Brooks Semiconductor Solutions Group segment. This restructuring action was substantially completed as of September 30, 2018. We

recognized \$0.8 million cost savings related to this action during the fiscal year 2017 and \$1.5 million during fiscal year 2018. Total annualized cost savings from this action consisted of \$1.0 million of cost of revenue reductions and \$0.6 million of selling, general and administrative expense reductions.

The charges from actions initiated prior to fiscal year 2017 also include a small portion of charges from the company-wide restructuring action initiated in fiscal year 2016 to streamline business operations and improve competitiveness and overall profitability. This action had been completed as of September 30, 2017. Cost savings from

Table of Contents

this action were \$13.1 million and \$5.8 million, respectively, during fiscal year 2017 and 2016. Savings realized during fiscal year 2017 consisted of \$4.3 million of cost of revenue reductions, \$2.6 million of research and development expense reductions, and \$6.1 million of selling, general and administrative expense reductions.

Restructuring Charges Incurred During Fiscal Year Ended September 30, 2016

Restructuring charges of \$10.2 million incurred during fiscal year 2016 were related to severance costs which consisted of \$8.9 million related to restructuring actions initiated during fiscal year 2016 and \$1.3 million related to restructuring actions initiated in prior periods.

Charges from restructuring actions initiated during fiscal year 2016 consisted of: (i) \$3.1 million attributable to the Brooks Life Sciences segment to streamline the segment's management structure, integrate acquisitions, consolidate facility and improve profitability, (ii) \$1.2 million attributable to the Brooks Semiconductor Solutions Group segment to consolidate our Jena, Germany repair facility into our Chelmsford, Massachusetts repair operation, and (iii) \$4.5 million of costs related to the company-wide restructuring action to streamline business operations, improve competitiveness and overall profitability.

These actions in the Brooks Life Sciences segment resulted in approximately \$3.8 million in annual pre-tax cost savings, including \$1.0 million of cost of revenue reductions and \$2.9 million of selling, general and administrative expense reductions. Total cost savings realized as a result of these restructuring initiatives amounted to \$5.1 million, of which \$1.3 million were realized prior to fiscal year 2017 and \$3.8 million were realized during fiscal year 2017.

Our restructuring actions initiated in prior periods was primarily related to the Brooks Semiconductor Solutions segment to integrate Contact, and to close and transfer the Mistelgau, Germany manufacturing operations to a contract manufacturer.

Non-Operating Income (Expenses)

Gain on Settlement of Equity Method Investment – During fiscal year 2017, we recognized a gain of \$1.8 million on the settlement of the equity method investment in BioCision which was included as a part of the non-cash consideration for an acquisition of Cool Lab.

Interest income – During both fiscal years 2017 and 2016, we recorded interest income of \$0.5 million, which represented interest earned on our marketable securities.

Interest expense – During fiscal years 2017 and 2016, we recorded interest expense of 0.4 million and \$0.2 million, respectively.

Other expenses, net – During fiscal years 2017 and 2016 we recorded other expenses, net of \$1.7 million and \$1.4 million, respectively. The \$0.3 million increase in expense was primarily attributable to higher foreign currency exchange losses of \$0.4 million recognized during fiscal year 2017 and higher losses of \$0.2 million during fiscal year 2017 as compared to fiscal year 2016 related to fair value measurement of convertible debt securities in BioCision. These increases were partially offset by a gain on pension settlement of \$0.3 million recognized during fiscal year 2017.

Income Tax Provision

We recorded an income tax provision on continuing operations of \$3.4 million in fiscal year 2017 compared to an income tax provision of \$66.3 million in fiscal year 2016. The continuing operations income tax provision for fiscal

year 2017 was primarily comprised of the provision on our earnings during that fiscal year. The continuing operations income tax provision for fiscal year 2016 was primarily driven by the establishment of a full valuation allowance against our U.S. net deferred tax assets during that year.

Equity in Earnings of Equity Method Investments

We incurred losses of \$0.5 million from our investment in BioCision during fiscal year 2017 compared to losses of \$1.1 million during fiscal year 2016. Our investment in BioCision was settled during the first quarter of fiscal year 2017

42

Table of Contents

as a part of the non-cash consideration for the acquisition of Cool Lab on November 28, 2016. Prior to closing the equity investment, we traditionally recorded the income and losses related to the equity method investment in BioCision one quarter in arrears. During fiscal year 2017, we recorded two additional months of activity in the carrying value of the investment as a result of its settlement. We deemed the amount of \$0.2 million related to two additional months of activity to be insignificant.

Discontinued Operations

We incurred revenue and net income from discontinued operations of \$165.4 million and \$51.9 million, respectively for fiscal year 2017 related to our semiconductor cryogenics business as compared to \$126.3 million and \$16.0 million, respectively for fiscal year 2016. The net income is inclusive of income from the UCI joint venture in 2017 and 2016. The income from discontinued operations only includes direct operating expenses incurred that (1) are clearly identifiable as costs being disposed of upon completion of the sale and (2) will not be continued by the Company on an ongoing basis. Indirect expenses which supported the cryogenics business, and which will remain as part of the continuing operations, are not reflected in income from discontinued operations.

LIQUIDITY AND CAPITAL RESOURCES

A considerable portion of our revenue is dependent on the demand for semiconductor capital equipment which historically has experienced periodic downturns. We believe that we have adequate resources to satisfy our working capital, financing activities, debt service and capital expenditure requirements for the next twelve months. The cyclical nature of our served markets and uncertainty in the current global economic environment make it difficult for us to predict longer-term liquidity requirements with sufficient certainty. We may be unable to obtain any required additional financing on terms favorable to us, if at all. If adequate funds are not available to us on acceptable terms or otherwise, we may be unable to successfully develop or enhance products and services, respond to competitive pressure or take advantage of acquisition opportunities, any of which could have a material adverse effect on our business, financial condition and operating results.

The discussion of our cash flows and liquidity that follows does not include the impact of the disposition of our cryogenics business and is stated on a total company consolidated basis.

Overview of Cash Flows and Liquidity

Our cash, cash equivalents and marketable securities as of September 30, 2018 and 2017 consist of the following (in thousands):

	Year Ended September 30,	
	2018	2017
Cash and cash equivalents	\$ 197,708	\$ 101,622
Short-term marketable securities	46,281	28
Long-term marketable securities	7,237	2,642
	\$ 251,226	\$ 104,292

Our cash, cash equivalents and marketable securities were \$251.2 million as of September 30, 2018. Our cash balances are held in numerous locations throughout the world, with the substantial majority of those amounts located outside of the United States. As of September 30, 2018, we had cash and cash equivalents of \$197.7 million, of which \$84.7 million was held outside of the United States. If these funds are needed for the U.S. operations, we would need

to repatriate these funds. As a result of recent changes in U.S. tax legislation, any repatriation in the future would not result in U.S. federal income tax. Our intent is to permanently reinvest these funds outside of the U.S. and our current operating plans do not demonstrate a need to repatriate these funds for our U.S. operations. We had marketable securities of \$53.5 million and \$2.7 million, respectively, as of September 30, 2018 and 2017. Our marketable securities are generally readily convertible to cash without an adverse impact.

43

Table of Contents

Fiscal Year Ended September 30, 2018 Compared to Fiscal Year Ended September 30, 2017

Overview

Cash and cash equivalents and marketable securities were \$251.2 million at September 30, 2018 as compared to \$104.3 million at September 30, 2017. The increase in cash and cash equivalents and marketable securities of \$146.9 million was primarily attributable to cash inflows of \$197.6 million related to proceeds from the term loan and cash inflows of \$74.0 million generated from our operating activities, partially offset by cash payments of \$85.8 million related to acquisitions, cash outflows of \$28.3 million related to dividend payments made to our shareholders, as well as capital expenditure payments of \$12.8 million.

Operating Activities

Cash flows from operating activities can fluctuate significantly from period to period as earnings, working capital needs and the timing of payments for income taxes, restructuring activities and other charges impact reported cash flows.

Cash flows provided by operating activities were \$74.0 million during fiscal year 2018 comprised primarily of earnings of \$120.6 million, including net income of \$116.5 million and the impact of non-cash related charges of \$4.1 million. Partially offsetting these items were the uses of cash of \$46.6 million related to the changes in our operating assets and liabilities. The changes in operating assets and liabilities that resulted in a use of cash consisted primarily of an increase in accounts receivable as a result of higher revenue and an increase in inventory levels to support the growth of our business. These uses of cash were partially offset by sources of cash related primarily to increases in accounts payable as well as increased accrued compensation and tax withholdings. Cash flows provided by operating activities were \$96.2 million during fiscal year 2017 and were comprised primarily of earnings of \$96.9 million, including net income of \$62.6 million and the impact of non-cash related earnings of \$34.3 million. Partially offsetting these items were uses of cash of \$0.7 million related to the changes in our operating assets and liabilities.

Net income from discontinued operations contributed \$48.7 million and \$51.9 million for fiscal years ended 2018 and 2017, respectively, in the net income referenced for the respective periods above. Cash flows from operations will be negatively impacted in future periods by the completion of sale of our cryogenic business.

Investing Activities

Cash flows from investing activities consist primarily of cash used for acquisitions, capital expenditures and purchases of marketable securities as well as cash proceeds generated from sales and maturities of marketable securities. Cash used in investing activities was \$148.5 million during fiscal year 2018 as compared to \$54.2 million during the fiscal year 2017. Cash used in investing activities of \$148.5 million during fiscal year 2018 included cash payments of \$85.8 million for acquisitions, \$69.7 million for the purchases of marketable securities and \$12.8 million of capital expenditures, partially offset by cash inflows from sales and maturities of marketable securities of \$19.1 million and \$0.7 million in proceeds from other investments and sales of property, plant and equipment. Cash used in investing activities of \$54.2 million during fiscal year 2017 included \$44.8 million for acquisitions and \$12.7 million of capital expenditures, offset by \$3.6 million of proceeds from sales and maturities of marketable securities.

Capital expenditures are made primarily for increasing capacity, replacing equipment, supporting new product development and improving information technology infrastructure. Capital expenditures were \$12.8 million during fiscal year 2018 as compared to \$12.7 million during the fiscal year 2017.

Financing Activities

Cash provided by financing activities was \$170.3 million during fiscal year 2018 as compared to \$25.9 million used in financing activities during fiscal year 2017. Cash provided by financing activities during fiscal year 2018 included cash inflows of \$197.6 million related to proceeds from the term loan originated in October 2017, partially offset by cash dividend payments to our shareholders of \$28.3 million and principal payments on the term loan of \$1.5 million. Cash used in financing activities was \$25.9 million during fiscal year 2017 and related primarily to cash dividend payments to our shareholders.

Table of Contents

Fiscal Year Ended September 30, 2017 Compared to Fiscal Year Ended September 30, 2016

Overview

Cash and cash equivalents and marketable securities were \$104.3 million at September 30, 2017 as compared to \$91.2 million at September 30, 2016. The increase in cash and cash equivalents and marketable securities of \$13.1 million was primarily attributable to cash inflows of \$96.2 million generated from our operating activities, partially offset by cash outflows related to acquisitions of \$44.8 million, dividends payments to our shareholders of \$27.9 million, and capital expenditure payments of \$12.7 million during fiscal year 2017.

Operating Activities

Cash flows provided by operating activities were \$96.2 million during fiscal year 2017 and were comprised primarily of earnings of \$96.9 million, including net income of \$62.6 million and the impact of non-cash related earnings of \$34.3 million. Partially offsetting these items were uses of cash of \$0.7 million related to the changes in our operating assets and liabilities. The changes in operating assets and liabilities that resulted in a use of cash consisted primarily of an increase in accounts receivable as a result of higher revenue and an increase in inventory levels to support the growth of our business. These uses of cash were partially offset by sources of cash related primarily to increases in accounts payable as well as increased accrued compensation and tax withholdings and restructuring costs. Cash flows provided by operating activities were \$39.5 million during fiscal year 2016 and were comprised primarily of earnings of \$39.3 million, including the impact of non-cash related earnings of \$108.8 million and a net loss of \$69.5 million. Partially offsetting these items were sources of cash of \$0.2 million related to the changes in our operating assets and liabilities.

Net income from discontinued operations contributed \$51.9 million and \$16.0 million for fiscal years ended 2017 and 2016, respectively, in the net income referenced for the respective periods above.

Investing Activities

Cash used in investing activities was \$54.2 million during fiscal year 2017 as compared to \$10.9 million during fiscal year 2016. Cash used in investing activities of \$54.2 million during fiscal year 2017 included \$44.8 million for acquisitions and \$12.7 million of capital expenditures, offset by \$3.6 million of proceeds from sales and maturities of marketable securities. Cash used in investing activities of \$10.9 million during fiscal year 2016 included \$125.2 million for the acquisition of BioStorage, \$12.8 million of capital expenditures and the disbursement of \$1.8 million for a loan provided to BioCision, partially offset by \$139.4 million proceeds from sales and maturities of marketable securities.

Capital expenditures are made primarily for increasing capacity, replacing equipment, supporting new product development and improving information technology infrastructure. Capital expenditures were \$12.7 million during fiscal year 2017 as compared to \$12.8 million during fiscal year 2016.

Financing Activities

Cash used in financing activities was \$25.9 million during fiscal year 2017 as compared to \$26.0 million during fiscal year 2016. Cash used in financing activities in both fiscal years 2017 and 2016 related primarily to cash dividend payments to our shareholders of \$27.9 million and \$27.5 million, respectively, partially offset by proceeds from issuance of common stock.

Capital Resources

Senior Secured Term Loan Facility

On October 4, 2017, we entered into a \$200.0 million term loan with Morgan Stanley Senior Funding, Inc., JPMorgan Chase Bank, N.A. and Wells Fargo Securities, LLC. The term loan was issued at \$197.6 million, or 98.8% of its par value, resulting in a discount of \$2.4 million, or 1.2%, which represented loan origination fees paid at the closing. The loan proceeds are used for acquisition and general corporate purposes.

45

Table of Contents

As of September 30, 2018, the outstanding term loan principal balance was \$198.5 million, excluding unamortized deferred financing costs of \$2.4 million. The term loan matures and becomes fully payable on October 4, 2024. Installment principal payments equal to 0.25% of the initial principal amount of the term loan are payable on the last day of each quarter, with any remaining principal amount becoming due and payable on the maturity date. During fiscal year 2018, we made principal payments of \$1.5 million under the term loan. Subject to certain conditions stated in the term loan agreement, we may redeem the term loan at any time at our option without a significant premium or penalty, except for a repricing transaction, as defined in the term loan agreement. We would also be required to redeem the term loan at the principal amount then outstanding upon the occurrence of certain events, as set forth in the term loan agreement.

Borrowings under the term loan bear variable interest rates, at our option, based on either LIBOR, the federal funds effective rate or the prime rate plus an applicable percentage. As a result, we may experience exposure to interest rate risk due to the potential volatility associated with the variable interest rates on the term loan. If rates increase, we may be subject to higher costs of servicing the loan which could reduce our profitability and cash flows. During fiscal year 2018, the weighted average stated interest rate on the term loan was 4.4%. During fiscal year 2018, we incurred cash interest expense of \$8.7 million on the term loan. Our debt service requirements are expected to be funded through our existing sources of liquidity and operating cash flows.

The term loan agreement contains certain customary representations and warranties, covenants and events of default. As of September 30, 2018, we were in compliance with all covenants and conditions under the term loan agreement.

On November 15, 2018, entered into a new \$350.0 million senior secured incremental term loan, under our Credit Agreement, dated October 4, 2017 to finance a portion of the cash purchase price of our acquisition of GENEWIZ which was completed on that same date.

Line of Credit Facility

We maintain a revolving line of credit with Wells Fargo Bank, N.A. and JPMorgan Chase Bank, N.A that provides for revolving credit financing of up to \$75.0 million, subject to borrowing base availability, as defined in the credit agreement. The line of credit matures on October 4, 2022. The proceeds from the line of credit are available for permitted acquisitions and general corporate purposes.

As of September 30, 2018, we had approximately \$47.5 million available for borrowing under the line of credit. We anticipate that our available borrowings under the line of credit will reduce upon the closure of the sale of our semiconductor cryogenics business. There were no amounts outstanding pursuant to the line of credit as of September 30, 2018. The amount of funds available for borrowing under the line of credit arrangement may fluctuate each period based on our borrowing base availability. The line of credit contains certain customary representations and warranties, a financial covenant, affirmative and negative covenants, as well as events of default. We were in compliance with the line of credit covenants as of September 30, 2018. Although we believe we will be able to generate sufficient cash in the United States and foreign jurisdictions to fund future operating costs, we secured the revolving line of credit as an additional assurance for maintaining liquidity in the United States during potentially severe downturns of the cyclical semiconductor market, as well as for strategic investments and acquisitions.

Shelf Registration Statement

On July 27, 2016, we filed a registration statement on Form S-3 with the SEC to sell securities, including common stock, preferred stock, warrants, debt securities, depository shares, purchase contracts and purchase units in amounts to be determined at the time of an offering. Any such offering, if it does occur, may happen in one or more transactions. The specific terms of any securities to be sold will be described in supplemental filings with the SEC.

This registration statement will expire on July 27, 2019.

Table of Contents

Dividends

Our Board of Directors declared the following dividends during the fiscal years 2018 and 2017 (in thousands, except per share data):

Declaration Date	Dividend per Share	Record Date	Payment Date	Total
Fiscal Year Ended September 30, 2018:				
November 8, 2017	\$ 0.10	December 1, 2017	December 22, 2017	\$ 7,040
January 31, 2018	0.10	March 2, 2018	March 23, 2018	7,050
April 30, 2018	0.10	June 1, 2018	June 22, 2018	7,058
July 31, 2018	0.10	September 7, 2018	September 28, 2018	7,066
Fiscal Year Ended September 30, 2017				
November 9, 2016	\$ 0.10	December 2, 2016	December 23, 2016	\$ 6,952
January 31, 2017	0.10	March 3, 2017	March 24, 2017	6,962
April 27, 2017	0.10	June 2, 2017	June 23, 2017	6,972
August 1, 2017	0.10	September 8, 2017	September 29, 2017	6,980

On November 6, 2018, our Board of Directors approved a cash dividend of \$0.10 per share of our common stock. The total dividend of approximately \$7.2 million will be paid on December 20, 2018 to shareholders of record at the close of business on December 7, 2018. Dividends are declared at the discretion of our Board of Directors and depend on actual cash flow from operations, our financial condition, capital requirements and any other factors our Board of Directors may consider relevant. We intend to pay quarterly cash dividends in the future; however, the amount and timing of these dividends may be impacted by the cyclical nature of certain markets we serve. We may reduce, delay or cancel a quarterly cash dividend based on the severity of a cyclical downturn.

Share Repurchase Program

On September 29, 2015, our Board of Directors approved a share repurchase program for up to \$50.0 million worth of our common stock. The timing and amount of any shares repurchased are based on market and business conditions, legal requirements and other factors and may be commenced or suspended at any time at our discretion. There were no shares repurchased under this program during fiscal year 2018.

Contractual Obligations and Requirements

Our contractual obligations were as follows at September 30, 2018 (in thousands):

	Total	Less than One Year	One to Three Years	Four to Five Years	Thereafter
Contractual Cash Obligations:					
Operating leases	\$ 12,232	\$ 3,842	\$ 3,922	\$ 2,621	\$ 1,847
Pension and other post-retirement benefit plans	4,688	433	876	894	2,485
Term loan	196,071	2,000	4,000	4,000	186,071
Other purchase commitments	89,761	87,111	2,282	368	—

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Total contractual cash obligations	\$ 302,752	\$ 93,386	\$ 11,080	\$ 7,883	\$ 190,403
Other Commercial Commitments:					
Letters of credit	\$ 2,233	\$ 1,716	\$ 517	\$ —	\$ —
Total commitments	\$ 304,985	\$ 95,102	\$ 11,597	\$ 7,883	\$ 190,403

The letters of credit of approximately \$2.2 million are related primarily to customer advances and other performance obligations at September 30, 2018. These arrangements guarantee the refund of advance payments received from our customers in the event that the product is not delivered or warranty obligations are not fulfilled in accordance with the contract terms. These obligations could be called by the beneficiaries at any time before the expiration date of the particular letter of credit if we fail to meet certain contractual requirements. None of these obligations were called during fiscal year 2018, and we currently do not anticipate any of these obligations to be called in the near future.

Table of Contents

As of September 30, 2018, the total amount of net unrecognized tax benefits for uncertain tax positions and the accrual for the related interest was \$3.5 million, all of which represents a potential future cash outlay. In comparison to September 30, 2017 where the balance was \$3.9 million. The reduction largely has to do with the statute of limitations lapsing on certain positions throughout the year. We are unable to make a reasonably reliable estimate of the timing of the cash settlement for this liability since the timing of future tax examinations by various tax jurisdictions and the related resolution is uncertain.

Off-Balance Sheet Arrangements

As of September 30, 2018, we did not have any off-balance sheet arrangements, as defined in Item 303(a)(4)(ii) of SEC Regulation S-K.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

We are exposed to a variety of market risks, including changes in interest rates affecting the return on our cash and cash equivalents, short-term and long-term investments and fluctuations in foreign currency exchange rates.

Interest Rate Exposure

Our \$200.0 million term loan bears variable interest rates which subjects us to interest rate risk. Our primary interest rate risk exposure results from changes in the short-term LIBOR rate, the federal funds effective rate and the prime rate. As of September 30, 2018, the weighted average stated interest rate on the term loan was 4.4%. At September 30, 2018, the outstanding term loan principal balance was \$198.5 million, excluding unamortized deferred financing costs of \$2.4 million. During fiscal year 2018, we incurred interest expense of \$8.7 million on the term loan. A hypothetical 100 basis point change in interest rates would result in a \$2.0 million change in interest expense incurred during fiscal year 2018.

Our cash and cash equivalents consist principally of money market securities which are short-term in nature. At September 30, 2018 and 2017, our aggregate short-term and long-term investments were \$53.5 million and \$2.7 million, respectively, and consisted mostly of highly rated corporate debt securities and municipal securities. At September 30, 2018, the unrealized loss position on marketable securities was insignificant, which is included in "Accumulated other comprehensive income" in the Consolidated Balance Sheets. There were no securities in an unrealized loss position as of September 30, 2017. A hypothetical 100 basis point change in interest rates would result in an annual change of approximately \$1.0 million and less than \$0.1 million, respectively, in interest income earned in fiscal years 2018 and 2017.

Currency Rate Exposure

We have transactions and balances denominated in currencies other than the U.S. dollar. Most of these transactions or balances are denominated in Euros, British Pounds and a variety of Asian currencies. Sales in currencies other than the U.S. dollar were 34% and 38%, respectively, of our total sales for fiscal years ended September 30, 2018 and 2017. These sales were made primarily by our foreign subsidiaries, which have cost structures that substantially align with the currency of sale.

In the normal course of our business, we have liquid assets denominated in non-functional currencies which include cash, short-term advances between our legal entities and accounts receivable which are subject to foreign currency exposure. Such balances were approximately \$84.7 million and \$51.6 million, respectively, at September 30, 2018 and

2017, and related to the Euro, British Pound and a variety of Asian currencies. We mitigate the impact of potential currency translation losses on these short-term intercompany advances by the timely settlement of each transaction, generally within 30 days. We also utilize forward contracts to mitigate our exposures to currency movement. We incurred foreign currency losses of \$3.3 million and \$2.3 million, respectively, in fiscal years 2018 and 2017, which related to the currency fluctuation on these balances between the time the transaction occurred and the ultimate settlement of the transaction. A hypothetical 10% change in foreign exchange rates would result in a change of \$4.9 million and \$0.5 million, respectively, in our net income during fiscal year 2018 and 2017.

Table of Contents

Item 8. Financial Statements and Supplementary Data

<u>Reports of Independent Registered Public Accounting Firms</u>	50
<u>Consolidated Balance Sheets as of September 30, 2018 and 2017</u>	52
<u>Consolidated Statements of Operations for the years ended September 30, 2018, 2017 and 2016</u>	53
<u>Consolidated Statements of Comprehensive Income (Loss) for the years ended September 30, 2018, 2017 and 2016</u>	54
<u>Consolidated Statements of Cash Flows for the years ended September 30, 2018, 2017 and 2016</u>	55
<u>Consolidated Statements of Changes in Equity for the years ended September 30, 2018, 2017 and 2016</u>	56
<u>Notes to Consolidated Financial Statements</u>	57

The supplementary quarterly financial information required by this Item 8 is included in Part II, Item 6, “Selected Financial Data”, and is incorporated herein by reference.

Table of Contents

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of

Brooks Automation, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Brooks Automation, Inc. and its subsidiaries as of September 30, 2018 and 2017, and the related consolidated statements of operations, of comprehensive income (loss), of changes in equity, and of cash flows for each of the three years in the period ended September 30, 2018, including the related notes (collectively referred to as the “consolidated financial statements”). We also have audited the Company's internal control over financial reporting as of September 30, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of September 30, 2018 and 2017, and the results of their operations and their cash flows for each of the three years in the period ended September 30, 2018 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of September 30, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the COSO.

Basis for Opinions

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

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

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

As described in Management's Report on Internal Control over Financial Reporting, management has excluded Tec-Sem Group AG and 4titude, Ltd. from its assessment of internal control over financial reporting as of September 30, 2018, because they were acquired by the Company in purchase business combinations during 2018. We have also excluded Tec-Sem Group AG and 4titude, Ltd. from our audit of internal control over financial reporting. Tec-Sem Group AG and

Table of Contents

4titude, Ltd. are wholly-owned subsidiaries whose total assets and total revenues excluded from management's assessment and our audit of internal control over financial reporting represent approximately 2% and 4%, respectively, of the related consolidated financial statement amounts as of and for the year ended September 30, 2018.

Definition and Limitations of Internal Control over Financial Reporting

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

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

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts

November 29, 2018

We have served as the Company's auditor since 2016.

Table of Contents

BROOKS AUTOMATION, INC.

CONSOLIDATED BALANCE SHEETS

	September 30, 2018	September 30, 2017
	(In thousands, except share and per share data)	
Assets		
Current assets		
Cash and cash equivalents	\$ 197,708	\$ 101,622
Marketable securities	46,281	28
Accounts receivable, net	125,192	93,465
Inventories	96,986	73,397
Prepaid expenses and other current assets	31,741	22,594
Current assets held for sale	66,148	60,671
Total current assets	564,056	351,777
Property, plant and equipment, net	59,988	56,981
Long-term marketable securities	7,237	2,642
Long-term deferred tax assets	43,798	1,692
Goodwill	255,876	207,154
Intangible assets, net	99,956	83,504
Other assets	5,294	6,325
Non-current assets held for sale	59,052	56,553
Total assets	\$ 1,095,257	\$ 766,628
Liabilities and Stockholders' Equity		
Current liabilities		
Current portion of long term debt	\$ 2,000	\$ —
Accounts payable	55,873	49,100
Deferred revenue	25,884	22,564
Accrued warranty and retrofit costs	6,340	5,479
Accrued compensation and benefits	29,322	23,877
Accrued restructuring costs	659	1,708
Accrued income taxes payable	6,746	11,417
Accrued expenses and other current liabilities	30,405	24,808
Current liabilities held for sale	7,388	7,825
Total current liabilities	164,617	146,778
Long-term debt	194,071	—
Long-term tax reserves	1,102	1,687
Long-term deferred tax liabilities	7,135	3,748
Long-term pension liabilities	4,255	1,783
Other long-term liabilities	5,547	4,336
Non-current liabilities held for sale	698	652
Total liabilities	377,425	158,984
Commitments and contingencies (Note 22)		
Stockholders' Equity		
Preferred stock, \$0.01 par value - 1,000,000 shares authorized, no shares issued or outstanding	—	—
	841	833

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Common stock, \$0.01 par value - 125,000,000 shares authorized,
84,164,130 shares issued and 70,702,261 shares outstanding at
September 30, 2018, 83,294,848 shares issued and 69,832,979 shares
outstanding at September 30, 2017

Additional paid-in capital	1,898,434	1,874,918
Accumulated other comprehensive income	13,587	15,213
Treasury stock, at cost- 13,461,869 shares	(200,956)	(200,956)
Accumulated deficit	(994,074)	(1,082,364)
Total stockholders' equity	717,832	607,644
Total liabilities and stockholders' equity	\$ 1,095,257	\$ 766,628

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

Table of Contents

BROOKS AUTOMATION, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS

	Year Ended September 30,		
	2018	2017	2016
	(In thousands, except per share data)		
Revenue			
Products	\$ 482,389	\$ 406,986	\$ 335,923
Services	149,171	120,513	98,089
Total revenue	631,560	527,499	434,012
Cost of revenue			
Products	288,323	249,396	212,029
Services	97,156	79,216	65,294
Total cost of revenue	385,479	328,612	277,323
Gross profit	246,081	198,887	156,689
Operating expenses			
Research and development	46,936	39,875	44,241
Selling, general and administrative	167,022	141,549	119,292
Restructuring charges	714	3,144	10,210
Total operating expenses	214,672	184,568	173,743
Operating income (loss)	31,409	14,319	(17,054)
Interest income	1,881	464	452
Interest expense	(9,520)	(408)	(157)
Gain on settlement of equity method investment	—	1,847	—
Other expenses, net	(3,304)	(1,702)	(1,383)
Income (loss) before income taxes and earnings of equity method investments	20,466	14,520	(18,142)
Income tax provision (benefit)	(47,251)	3,380	66,250
Income (loss) before equity in earnings of equity method investments	67,717	11,140	(84,392)
Equity in earnings of equity method investments	—	(453)	(1,065)
Income (loss) from continuing operations	67,717	10,687	(85,457)
Income from discontinued operations, net of tax	48,747	51,925	15,981
Net income (loss)	\$ 116,464	\$ 62,612	\$ (69,476)
Net loss attributable to noncontrolling interest	111	—	—
Net income (loss) attributable to Brooks Automation, Inc.	\$ 116,575	\$ 62,612	\$ (69,476)
Basic net income (loss) per share attributable to Brooks Automation, Inc. common stockholders:			
Income (loss) from continuing operations	\$ 0.96	\$ 0.15	\$ (1.25)
Income from discontinued operations, net of tax	0.69	0.75	0.23
Basic net income (loss) per share	\$ 1.65	\$ 0.90	\$ (1.01)
Diluted net income (loss) per share attributable to Brooks Automation, Inc. common stockholders:			
Income (loss) from continuing operations	\$ 0.95	\$ 0.15	\$ (1.25)
Income from discontinued operations, net of tax	0.69	0.74	0.23
Diluted net income (loss) per share	\$ 1.64	\$ 0.89	\$ (1.01)
Dividend declared per share	\$ 0.40	\$ 0.40	\$ 0.40

Weighted average shares used in computing net income per share:

Basic	70,489	69,575	68,507
Diluted	70,937	70,485	68,507

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

53

Table of Contents

BROOKS AUTOMATION, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)

	Year Ended September 30,		
	2018	2017	2016
	(In thousands)		
Net income (loss)	\$ 116,464	\$ 62,612	\$ (69,476)
Other comprehensive (loss) income, net of tax:			
Cumulative foreign currency translation adjustments	(1,651)	(221)	8,844
Unrealized (losses) gains on marketable securities, net of tax effects of \$0, \$0 and \$58 for fiscal years 2018, 2017 and 2016	(111)	2	(106)
Actuarial gains (losses), net of tax effects of (\$49), (\$74) and \$161 for fiscal years 2018, 2017 and 2016	136	525	(322)
Pension settlement	—	(259)	—
Pension curtailment	—	—	852
Total other comprehensive (loss) income, net of tax	(1,626)	47	9,268
Comprehensive loss attributable to noncontrolling interest	111	—	—
Comprehensive income (loss)	\$ 114,949	\$ 62,659	\$ (60,208)

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

Table of Contents

BROOKS AUTOMATION, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS

	Year Ended September 30,		
	2018	2017	2016
	(In thousands)		
Cash flows from operating activities			
Net income (loss)	\$ 116,464	\$ 62,612	\$ (69,476)
Adjustments to reconcile net income (loss) to net cash provided by operating activities:			
Depreciation and amortization	37,429	28,149	28,046
Gain on settlement of equity method investment	—	(1,847)	—
Impairment of other assets	—	—	807
Stock-based compensation	19,822	17,278	11,737
Amortization of premium on marketable securities and deferred financing costs	710	252	339
Earnings of equity method investments	(6,788)	(9,381)	(2,380)
Loss recovery on insurance claim	(1,103)	—	—
Deferred income tax benefit	(45,217)	517	70,273
Pension settlement	—	(259)	—
Other gains on disposals of assets	(758)	(406)	(41)
Changes in operating assets and liabilities, net of acquisitions:			
Accounts receivable	(28,463)	(11,178)	(1,796)
Inventories	(24,365)	(12,792)	8,565
Prepaid expenses and other current assets	(3,676)	(5,829)	(428)
Accounts payable	5,457	7,846	(5,143)
Deferred revenue	2,791	8,049	(3,290)
Accrued warranty and retrofit costs	(157)	1,602	290
Accrued compensation and tax withholdings	5,978	5,565	(3,234)
Accrued restructuring costs	(1,080)	(4,241)	3,860
Accrued pension costs	—	(32)	(811)
Accrued expenses and other current liabilities	(3,080)	10,319	2,229
Net cash provided by operating activities	73,964	96,224	39,547
Cash flows from investing activities			
Purchases of property, plant and equipment	(12,787)	(12,677)	(12,848)
Purchases of technology intangibles	—	(240)	—
Purchases of marketable securities	(69,692)	—	(12,901)
Sales of marketable securities	1,584	3,590	139,388
Maturities of marketable securities	17,482	—	—
Proceeds from divestitures	—	—	—
Disbursement for a loan receivable	—	—	(1,821)
Acquisitions, net of cash acquired	(85,755)	(44,791)	(125,248)
Proceeds from other investments	500	(170)	(250)
Proceeds from sales of property, plant and equipment	200	100	2,806
Net cash used in investing activities	(148,468)	(54,188)	(10,874)
Cash flows from financing activities			

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Proceeds from term loan	197,554	—	366
Proceeds from issuance of common stock	2,826	2,040	1,888
Payment of deferred financing costs	(318)	(28)	(708)
Repayment of term loan	(1,500)	—	—
Common stock dividends paid	(28,285)	(27,932)	(27,503)
Net cash provided by (used in) financing activities	170,277	(25,920)	(25,957)
Effects of exchange rate changes on cash and cash equivalents	313	420	1,648
Net increase in cash and cash equivalents	96,086	16,536	4,364
Cash and cash equivalents, beginning of period	101,622	85,086	80,722
Cash and cash equivalents, end of period	\$ 197,708	\$ 101,622	\$ 85,086
Supplemental disclosures:			
Cash paid for interest	\$ 6,537	\$ 200	\$ 114
Cash paid for income taxes, net	21,051	8,142	4,930
Supplemental disclosure of non-cash investing and financing activities:			
Deferred financing costs included in accounts payable	—	423	—
Fair value of non-cash consideration for the acquisition of Cool Lab, LLC	—	10,348	—

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

Table of Contents

BROOKS AUTOMATION, INC.

CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY

	Common Stock Shares (In thousands, except share data)	Common Stock at Par Value	Additional Paid-In Capital	Accumulated Other Comprehensive Income	Accumulated Deficit	Treasury Stock	Total Brooks Automation, Inc. Stockholders' Equity	Noncontrolling Interests in Subsidiaries
0, 2015	81,093,052	\$ 811	\$ 1,846,357	\$ 5,898	\$ (1,020,065)	\$ (200,956)	\$ 632,045	\$ —
d under ck and ns, net	1,127,218	10	(2,391)				(2,381)	
n ck clared, share			11,737				11,737	
ency					(27,503) (69,476)		(27,503) (69,476)	
				8,844			8,844	
ains on								
t of tax 8 ses e year, fects of				(106)			(106)	
ailment				(322) 852			(322) 852	
0, 2016	82,220,270	821	1,855,703	15,166	(1,117,044)	(200,956)	553,690	—
d under ck and ns, net	1,074,578	12	1,937				1,949	
n ck clared, share			17,278				17,278	
ency					(27,932) 62,612		(27,932) 62,612	
				(221)			(221)	

Losses on								
Net of tax				2			2	
Losses								
For the year,								
Effects of				525			525	
Development				(259)			(259)	
For 2017	83,294,848	833	1,874,918	15,213	(1,082,364)	(200,956)	607,644	—
Net under								
Stock and								
Options, net	869,282	8	2,818				2,826	
Net			19,822				19,822	
Stock								
Declared,					(28,285)		(28,285)	
Share								
of								
Issuing			876				876	111
Agency					116,575		116,575	(111)
				(1,651)			(1,651)	
Losses on								
Net of tax								
Losses								
For the year,								
Effects of								
				136			136	
For 2018	84,164,130	\$ 841	\$ 1,898,434	\$ 13,587	\$ (994,074)	\$ (200,956)	\$ 717,832	\$ —

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

Table of Contents

BROOKS AUTOMATION, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Nature of the Business

Brooks Automation, Inc. (“Brooks”, or the “Company”) is a leading global provider of automation and cryogenic solutions for multiple markets. The Company primarily serves two distinct and unrelated markets: the semiconductor capital equipment market and the life sciences sample management market. The Company believes its leadership positions and its global support capability in each of these markets makes it a valued business partner to the largest semiconductor capital equipment and device makers, and pharmaceutical and life science research institutions in the world. The Company’s offerings are also applied to other adjacent technology and industrial markets, and the Company provides customer support services globally.

In the fourth quarter of fiscal year 2018, the Company entered into a definitive agreement to sell its semiconductor cryogenics business to Edwards Vacuum LLC (a member of the Atlas Copco Group), (the “Disposition”). The Company determined that the cryogenics business met the “held for sale” criteria and the “discontinued operations” criteria in accordance with Financial Accounting Standard Boards (“FASB”) Accounting Standards Codification (“ASC”) 205, Presentation of Financial Statements, (“FASB ASC 205”) as of September 30, 2018 (please refer to Note 3, “Discontinued Operations” for further information about the discontinued business). The Consolidated Balance Sheets and Consolidated Statements of Operations, and the notes to the Consolidated Financial Statements were restated for all periods presented to reflect the discontinuation of the cryogenics business, in accordance with FASB ASC 205. The discussion in the notes to these Consolidated Financial Statements, unless otherwise noted, relate solely to the Company's continuing operations.

2. Summary of Significant Accounting Policies

Principles of Consolidation and Basis of Presentation

The accompanying Consolidated Financial Statements include the accounts of the Company and its majority-owned subsidiaries. All intercompany balances and transactions have been eliminated in consolidation. The Company applies equity method of accounting to investments that provide it with ability to exercise significant influence over the entities in which it lacks controlling financial interest and is not a primary beneficiary.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America (“GAAP”) requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported amounts of revenue and expenses during the reporting period. Significant estimates are associated with recording accounts receivable, inventories, goodwill, intangible assets other than goodwill, long-lived assets,

derivative financial instruments, deferred income taxes, warranty and pension obligations, revenue recognized in accordance with the percentage of completion method, and stock-based compensation expense. The Company assesses the estimates on an ongoing basis and records changes in estimates in the period they occur and become known. Actual results could differ from these estimates.

Business Combinations

The Company accounts for business acquisitions using the acquisition method of accounting, in accordance with which assets acquired and liabilities assumed are recorded at their respective fair values at the acquisition date. The fair value of the consideration paid, including contingent consideration, is assigned to the assets acquired and liabilities assumed based on their respective fair values. Goodwill represents excess of the purchase price over the estimated fair values of the assets acquired and liabilities assumed.

Table of Contents

Significant judgments are used in determining fair values of assets acquired and liabilities assumed, as well as intangibles. Fair value and useful life determinations are based on, among other factors, estimates of future expected cash flows, royalty cost savings and appropriate discount rates used in computing present values. These judgments may materially impact the estimates used in allocating acquisition date fair values to assets acquired and liabilities assumed, as well as the Company's current and future operating results. Actual results may vary from these estimates which may result in adjustments to goodwill and acquisition date fair values of assets and liabilities during a measurement period or upon a final determination of asset and liability fair values, whichever occurs first. Adjustments to fair values of assets and liabilities made after the end of the measurement period are recorded within the Company's operating results.

Foreign Currency Translation

Certain transactions of the Company and its subsidiaries are denominated in currencies other than their functional currency. Foreign currency exchange gains (losses) generated from the settlement and remeasurement of these transactions are recognized in earnings and presented within "Other (expense) income, net" in the Company's Consolidated Statements of Operations. Net foreign currency transaction and remeasurement losses totaled \$3.3 million, \$2.3 million and \$1.9 million for the fiscal years ended September 30, 2018, 2017 and 2016, respectively.

The determination of the functional currency of the Company's subsidiaries is based on their financial and operational environment and is the local currency of all of the Company's foreign subsidiaries. The subsidiaries' assets and liabilities are translated into the reporting currency at period-end exchange rates, while revenue, expenses, gains and losses are translated at the average exchange rates during the period. Gains and losses from foreign currency translations are recorded in accumulated other comprehensive income in the Company's Consolidated Balance Sheets and presented as a component of comprehensive income (loss) in the Company's Consolidated Statements of Comprehensive Income (Loss).

Derivative Financial Instruments

All derivatives, whether designated as a hedging relationship or not, are recorded in the Consolidated Balance Sheets at fair value. The accounting for changes in fair value of a derivative instrument depends on whether it has been designated and qualifies as part of a hedging relationship and the type of hedging relationship. For those derivative instruments that are designated and qualify as hedging instruments, the Company must designate the hedging instrument as a fair value hedge, cash flow hedge or a hedge of a net investment in a foreign operation based on the exposure being hedged. Certain derivatives held by the Company are not designated as hedges but are used in managing exposure to changes in foreign exchange rates.

A fair value hedge is a derivative instrument designated for the purpose of hedging the exposure of changes in fair value of an asset or a liability resulting from a particular risk. If the derivative is designated as a fair value hedge, the changes in the fair value of the derivative and of the hedged item attributable to the hedged risk are both recognized in the results of operations and presented in the same caption in the Consolidated Statements of Operations and Consolidated Statements of Comprehensive Income (Loss).

A cash flow hedge is a derivative instrument designated for the purpose of hedging the exposure to variability in future cash flows resulting from a particular risk. If the derivative is designated as a cash flow hedge, the effective portions of changes in the fair value of the derivative are recorded in accumulated other comprehensive income and recognized in the results of operations when the hedged item affects earnings. Ineffective portions of changes in the fair value of cash flow hedges are recognized in the results of operations.

A hedge of a net investment in a foreign operation is achieved through a derivative instrument designated for the purpose of hedging the exposure of changes in value of investments in foreign subsidiaries. If the derivative is designated as a hedge of a net investment in a foreign operation, the effective portions of changes in the fair value of the derivative are recorded in other comprehensive income as a part of the foreign currency translation adjustment. Ineffective portions of net investment hedges are recognized in the results of operations.

For derivative instruments not designated as hedging instruments, changes in fair value are recognized in the Consolidated Statements of Operations as gains or losses consistent with the classification of the underlying risk.

Table of Contents

Concentration of Credit Risk

Financial instruments that potentially subject the Company to concentrations of credit risk consist of cash deposits and cash equivalents, marketable securities, derivative instruments and accounts receivable. All of the Company's cash, cash equivalents, marketable securities and derivative instruments are maintained by major financial institutions.

The Company invests cash not used in operations in investment grade, high credit quality securities in accordance with the Company's investment policy which provides guidelines and limits regarding investments type, concentration, credit quality and maturity terms aimed at maintaining liquidity and reducing risk of capital loss.

The Company regularly monitors the creditworthiness of its customers and believes that it has adequately provided for exposure to potential credit losses. The Company's ten largest customers accounted for approximately 34%, 35% and 35% of its consolidated revenue for the fiscal years ended September 30, 2018, 2017 and 2016, respectively. No customers accounted for more than 10% of the Company's consolidated revenue for fiscal years 2018, 2017 and 2016.

Fair Value of Financial Instruments

The Company's financial instruments consist of cash and cash equivalents, marketable securities, derivative instruments, term loan, accounts receivable, and accounts payable. Marketable securities, derivative instruments and term loan are measured at fair value based on quoted market prices or observable inputs other than quoted market prices for identical or similar assets or liabilities. The carrying amounts of cash, cash equivalent, accounts receivable and accounts payable approximate their fair value due to their short-term nature.

Cash and Cash Equivalents

Cash and cash equivalents consist of cash and highly liquid investments with original maturities of three months or less that are readily convertible to known amounts of cash. At September 30, 2018 and 2017, cash equivalents were \$50.6 million and less than \$0.1 million, respectively. Cash equivalents are reported at cost which approximates their fair value due to their short-term nature and varying interest rates.

Accounts Receivable, Allowance for Doubtful Accounts and Sales Returns

Trade accounts receivable do not bear interest and are recorded at the invoiced amount. The Company maintains an allowance for doubtful accounts representing its best estimate of probable credit losses related to its existing accounts receivable and their net realizable value. The Company determines the allowance based on a number of factors, including an evaluation of customer credit worthiness, the age of the outstanding receivables, economic trends and historical experience. The Company reviews its allowance for doubtful accounts on a quarterly basis and adjusts the balance based on the Company's estimates of the receivables' recoverability in the period the changes in estimates occur and become known. Accounts receivable balances are written off against the allowance for doubtful accounts when the Company determines that the balances are not recoverable. Provisions for doubtful accounts are recorded in "Selling, general and administrative expenses" in the Consolidated Statements of Operations. The Company determines the allowance for sales returns based on its best estimate of probable customer returns. Provisions for sales returns are recorded in "Revenue" in the Consolidated Statements of Operations. The Company does not have any off-balance-sheet credit exposure related to its customers.

Inventories

Inventories are stated at the lower of cost or market determined on a first-in, first-out basis and include the cost of materials, labor and manufacturing overhead. The Company reports inventories at their net realizable value and

provides reserves for excess, obsolete or damaged inventory based on changes in customer demand, technology and other economic factors.

59

Table of Contents

Fixed Assets, Intangible Assets and Impairment of Long-lived Assets

Property, plant and equipment are stated at cost, net of accumulated depreciation. Depreciation expense is computed based on the straight-line method and charged to results of operations to allocate the cost of the assets over their estimated useful lives, as follows:

Buildings	10 - 40 years
Computer equipment and software	3 - 7 years
Machinery and equipment	2 - 10 years
Furniture and fixtures	3 - 10 years

Leasehold improvements are amortized over the shorter of their estimated useful lives or the remaining terms of the respective leases. Equipment used for demonstrations to customers is included in machinery and equipment and depreciated over its estimated useful life. Repair and maintenance costs are expensed as incurred.

The Company has developed software for internal use. Internal and external labor costs incurred during the application development stage of a project are capitalized. Costs incurred prior to application development and post implementation are expensed as incurred. Training and data conversion costs are expensed as incurred. As of September 30, 2018, and 2017, the Company had cumulative capitalized direct costs of \$5.6 million and \$4.7 million, respectively, associated with development of software for its internal use. These capitalized costs are included within "Property, plant and equipment, net" in the accompanying Consolidated Balance Sheets. During fiscal year 2018, the Company capitalized direct costs of \$0.9 million associated with development of software for its internal use.

Cost of disposed assets and the associated accumulated depreciation are derecognized upon their retirement or at the time of disposal, and the resulting gain or loss is included in the Company's results of operations.

The Company identified finite-lived intangible assets other than goodwill as a result of acquisitions. Finite-lived intangible assets are valued based on estimated future cash flows and amortized over their estimated useful lives based on methods that approximate the pattern in which the economic benefits are expected to be realized.

Finite-lived intangibles assets and fixed assets are tested for impairment when indicators of impairment are present. For purposes of this test, long-lived assets are grouped with other assets and liabilities at the lowest level for which identifiable cash flows are largely independent of the cash flows of other assets and liabilities. If the Company determines that indicators of potential impairment are present, it assesses the recoverability of long-lived asset group by comparing its undiscounted future cash flows to its carrying value. The future cash flow period is based on the future service life of the primary asset within the long-lived asset group. If the carrying value of the long-lived asset group exceeds its future cash flows, the Company determines fair values of the individual net assets within the long-lived asset group to assess potential impairment. If the aggregate fair values of the individual net assets of the group are less than their carrying values, an impairment loss is recognized for an amount in excess of the group's aggregate carrying value over its fair value. The loss is allocated to the assets within the group based on their relative carrying values, with no asset reduced below its fair value.

Finite-lived intangible assets are amortized over their useful lives, as follows:

Patents	7 - 15 years
Completed technology	3 - 10 years

Customer relationships 3 - 11 years

Goodwill

Goodwill represents the excess of a purchase price over the fair value of net tangible and identifiable intangible assets of the businesses acquired by the Company. Goodwill is tested for impairment annually or more often if impairment indicators are present at the reporting unit level. The Company has elected April 1st as its annual goodwill impairment assessment date. If the existence of events or circumstances indicates that it is more likely than not that fair

60

Table of Contents

values of the reporting units are below their carrying values, the Company performs additional impairment tests during interim periods to evaluate goodwill for impairment.

Application of the goodwill impairment test requires significant judgment based on market and operational conditions at the time of the evaluation, including management's best estimate of future business activity and the related estimates of future cash flows from the assets and the reporting units that include the associated goodwill. These periodic evaluations could cause management to conclude that impairment factors exist, requiring an adjustment of these assets to their then-current fair market values. Future business conditions and/or activity could differ materially from the projections made by management which could result in additional adjustments and impairment charges.

The goodwill impairment test is performed at the reporting unit level. A reporting unit is either an operating segment or one level below it, which is referred to as a "component". The level at which the impairment test is performed requires an assessment of whether the operations below an operating segment constitute a self-sustaining business, in which case testing is generally performed at this level.

In accordance with ASC 350, Intangibles- Goodwill and Other ("ASC 350"), the Company first assesses qualitative factors to determine whether the existence of events or circumstances indicates that it is more likely than not that the fair value of a reporting unit is less than its carrying value. If the Company determines, based on this assessment, that it is more likely than not that the fair value of the reporting unit is less than its carrying value, it performs a quantitative goodwill impairment test by comparing the reporting unit's fair value with its carrying value. An impairment loss is recognized for the amount by which the reporting unit's carrying value exceeds its fair value, up to the total amount of goodwill allocated to the reporting unit.

The Company determines fair values of its reporting units based on an income approach in accordance with the discounted cash flow method, or DCF Method. The DCF Method is based on projected future cash flows and terminal value estimates discounted to their present values. Terminal value represents a present value an investor would pay on the valuation date for the rights to the cash flows of the business for the years subsequent to the discrete cash flow projection period. The observable inputs used in the DCF Method include discount rates set above the Company's weighted-average cost of capital. The Company derives discount rates that are commensurate with the risks and uncertainties inherent in the respective businesses and its internally developed projections of future cash flows. The Company considers the DCF Method to be the most appropriate valuation technique since it is based on management's long-term financial projections. Due to the cyclical nature of the semiconductor equipment market, management's projections as of the valuation date are considered more objective since market metrics of peer companies fluctuate during the cycle. In addition, the Company also compares aggregate values of its net corporate assets and reporting unit fair values to its overall market capitalization and uses certain market-based valuation techniques to test the reasonableness of the reporting unit fair values determined in accordance with the DCF Method.

Deferred Financing Costs

The Company records commitment fees and other costs directly associated with obtaining the term loan and line of credit financing as deferred financing costs which are presented within "Other assets" in the accompanying Consolidated Balance Sheets. Deferred financing costs were \$2.9 million and \$0.5 million at both September 30, 2018 and 2017. Such costs are amortized over the term of the related financing arrangement and included in "Interest expense" in the accompanying Consolidated Statements of Operations. Amortization expense incurred during fiscal years ended September 30, 2018 and 2017 was not material and was included in interest expense in the accompanying Consolidated Statements of Operations. Please refer to Note 10, "Line of Credit" and Note 11, "Debt" for further information on this arrangement.

Warranty Obligations

The Company offers warranties on the sales of certain of its products and records warranty obligations for estimated future claims at the time revenue is recognized. Warranty obligations are estimated based on historical experience and management's estimate of the level of future claims.

61

Table of Contents

Defined Benefit Pension Plans

The cost and obligations of the Company's defined benefit pension plans are calculated based on certain assumptions related to the estimated benefits that employees earn while working, the amount of which cannot be completely determined until the benefit payments cease. Key assumptions used in accounting for these employee benefit plans include the discount rate, expected return on plan assets and rate of increase in employee compensation levels. Assumptions are determined based on Company data and appropriate market indicators in consultation with third-party actuaries, and are evaluated each year as of the plans' measurement date.

Revenue Recognition

The Company generates revenue from the following sources:

- Products, including sales of tool automation and automated cold sample management systems, atmospheric and vacuum robots, contamination control solutions, as well as consumables and spare parts.
- Services, including repairs, upgrades, diagnostic support, installation, as well as biological sample and other support services.

The Company recognizes revenue for such products and services when it is realized or realizable and earned. Revenue is considered realized and earned when all of the following revenue recognition criteria have been met: (i) persuasive evidence of an arrangement exists; (ii) delivery has occurred or services have been rendered; (iii) the fee is fixed or determinable; and (iv) collectability is probable. The Company recognizes shipping and handling fees billed to customers as revenue and includes the related costs in "Cost of revenue" in the accompanying Consolidated Statements of Operations. Revenue is presented net of taxes assessed by governmental authorities on revenue-producing transactions. Revenue from software products generated during fiscal years ended September 30, 2018 and 2017 was insignificant.

Products

Revenue from the sale of products is recognized upon their delivery to customers, provided all other revenue recognition criteria have been met. Delivery is considered complete when both of the following conditions have been met: (i) legal title and risk of loss have transferred to the customer upon product shipment or delivery; and (ii) the Company has reliably demonstrated that products have met their required specifications prior to shipment and, as a result, the Company possesses an enforceable claim right to amounts recognized as revenue. Revenue is recognized upon obtaining a customer technical acceptance if the Company was not able to demonstrate that products have met their required specifications prior to shipment and / or legal title and risk of loss did not transfer to the customer upon product shipment or delivery. Revenue from third-party sales for which the Company does not meet the criteria for gross revenue recognition is recognized on a net basis. All other revenue is recognized on a gross basis.

Customer allowances and rebates consist primarily of volume discounts and other incentive programs. Customer allowance and rebate amounts are estimated based on historical experience, contractual terms and expected level of sales during the qualifying incentive program period. The Company records customer allowances and rebates as a reduction of revenue at the time of product sale since they represent a reduction in purchase price.

Revenue from product sales that involve significant customization, which include primarily automated cold sample management systems, is recognized based on the percentage of completion method. The Company recognizes revenue as work progresses based on a percentage of actual labor hours incurred on the project to-date and total estimated labor hours expected to be incurred on the project. The Company develops profit estimates for long-term contracts based on total revenue expected to be generated from the project and total costs anticipated to be incurred. These estimates are based on a number of factors, including the degree of required product customization and the customer's

existing environment based on installation work, as well as the Company's historical experience, project plans and an assessment of the risks and uncertainties inherent in the contract related to implementation delays or performance issues that may or may not be within the Company's control. The Company estimates a loss on a contract by comparing total estimated contract revenue to the total estimated contract costs and recognizes a loss during the period in which it becomes

62

Table of Contents

probable and can be reasonably estimated. The Company reviews profit estimates for long-term contracts during each reporting period and revises them based on changes in circumstances.

The Company uses the completed contract method for certain arrangements that involve significant product customization and include contractual terms and customer rights disallowing the use of the percentage of completion method. The Company recognizes revenue for these arrangements upon completion or substantial completion of the project, provided all other revenue recognition criteria have been met. The project is considered substantially complete when the Company receives acceptance and remaining tasks are perfunctory or inconsequential and in control of the Company. Generally, the terms of long-term contracts provide for progress billings based on completion of milestones or other defined phases of work. In certain instances, payments collected from customers in advance of recognizing the related revenue are recorded as deferred revenue.

Services

Service revenue is generally recognized ratably over the period of performance, provided all other revenue recognition criteria have been met. Payments due or received from the customers prior to rendering the associated services are recorded as deferred revenue. Revenue from repair services or upgrades of customer-owned equipment is recognized upon completion of the repair effort and the shipment of the repaired product back to the customer. If the repairs or the upgrades include installation, revenue is generally recognized when the installation is completed unless the installation period is longer term in nature and the project is accounted for on percentage-of-completion basis.

Multiple Element Arrangements

Certain customer arrangements related to the sale of automated cold sample management systems and contamination control solution products represent multiple element arrangements that include product, service and other elements. The Company allocates arrangement consideration to each deliverable that has a standalone value based upon the selling price hierarchy which requires the Company to use vendor-specific objective evidence (the "VSOE") of selling price if it exists, or a third-party evidence (the "TPE") of the selling price in the absence of VSOE. If neither VSOE nor TPE of selling price exists for a deliverable, the Company uses its best estimate of selling price (the "BESP") for that deliverable. The Company has not been able to establish VSOE or TPE for the deliverables included in the multiple element arrangements and, as a result, primarily uses BESP to allocate the arrangement consideration. The Company determines BESP based on the cost plus a reasonable margin approach and considers entity-specific, as well as external market factors, when developing such estimates.

The Company recognizes revenue for each deliverable that has a standalone value in accordance with its revenue recognition policies. Revenue allocated to the delivered elements is recognized at the time of delivery, provided all other revenue recognition criteria are met. Revenue allocated to the undelivered elements is deferred until the elements are delivered and all other revenue recognition criteria have been met.

Certain multiple element arrangements include the sale of automated cold sample management systems and contamination control solution products with installation services. Revenue allocated to the automated cold sample management systems and contamination control solution products is recognized in accordance with the Company's revenue recognition policies. Revenue allocated to the installation services is recognized based on the percentage-of-completion method or the completed contract method in which case it is deferred until the installation-related tasks have been completed.

Certain customer arrangements include contingent revenue provisions in which a portion of the selling price of a delivered element is contingent on meeting specified performance criteria or on delivery of other elements included in the arrangement. The amount of revenue recognized for these arrangements is limited to the lower of either: (i) the

amount billed to the customer that is not contingent on obtaining a customer technical acceptance; or (ii) the value of the arrangement consideration allocated to the delivered elements.

63

Table of Contents

Research and Development Expense

Research and development costs are expensed as incurred. Research and development costs consist primarily of personnel expenses related to development of new products, as well as enhancements and engineering changes to existing products and development of hardware and software components.

Stock-Based Compensation Expense

The Company measures stock-based compensation cost at fair value on the grant date and recognizes the expense over the service period for the awards expected to vest. The fair value of restricted stock units is determined based on the number of shares granted and the closing price of the Company's common stock quoted on Nasdaq on the date of grant.

The Company recognizes stock-based compensation expense on a straight-line basis, net of estimated forfeitures, over the requisite service period. The Company recognizes benefits from stock-based compensation in equity using the with-and-without approach for the utilization of tax attributes. The Company makes estimates of stock award forfeitures and a number of awards expected to vest which requires significant judgment. The Company considers many factors in developing forfeiture estimates, including award types, employee classes and historical experience. The Company assesses the likelihood of achieving the performance goals for stock-based awards that vest upon the satisfaction of these goals. Current estimates may differ from actual results and future changes in estimates.

The following table reflects stock-based compensation expense, excluding amounts related to discontinued operations, recorded during the fiscal years ended September 30, 2018, 2017 and 2016 (in thousands):

	Year Ended September 30,		
	2018	2017	2016
Restricted stock	\$ 18,081	\$ 16,056	\$ 10,859
Employee stock purchase plan	775	517	418
Total stock-based compensation expense	\$ 18,856	\$ 16,573	\$ 11,277

Valuation Assumptions for an Employee Stock Purchase Plan

The fair value of shares issued under the employee stock purchase plan is estimated on the commencement date of each offering period using the Black-Scholes option-pricing model with the following weighted average assumptions for the fiscal years ended September 30, 2018, 2017 and 2016:

	Year Ended September 30,					
	2018		2017		2016	
Risk-free interest rate	1.9	%	0.9	%	0.4	%
Volatility	46	%	34	%	32	%
Expected life	6 months		6 months		6 months	
Dividend yield	1.5	%	3.4	%	3.4	%

The risk-free rate is based on the U.S. Treasury yield curve for notes with terms approximating the expected life of the shares granted. The expected stock price volatility is determined based on the Company's historic stock prices over a

period commensurate with the expected life of the shares granted. The expected life represents the weighted average period over which the shares are expected to be purchased. Dividend yields are projected based on the Company's history of dividend declarations and management's intention for future dividend declarations.

Restructuring Expenses

The Company records restructuring expenses associated with management-approved restructuring actions, such as consolidation of duplicate infrastructure and reduction in force, to streamline its business operations and improve profitability and competitiveness. Restructuring expenses include severance costs, contract termination costs to vacate facilities and consolidate operations, and other costs directly associated with restructuring actions. The Company records severance and other employee termination costs associated with restructuring actions when it is probable that benefits

Table of Contents

will be paid and the amounts can be reasonably estimated. The rates used in determining restructuring liabilities related to severance costs are based on existing plans, historical experience and negotiated settlements.

Income Taxes

The Company records income taxes using the asset and liability method. Deferred income tax assets and liabilities are recognized for the future tax differences between the financial statement carrying amounts of existing assets and liabilities and their respective income tax bases, as well as operating loss and tax credit carryforwards. The Company's Consolidated Financial Statements contain certain deferred tax assets that were recorded as a result of operating losses, as well as other temporary differences between financial and tax accounting. A valuation allowance is established against deferred tax assets if, based upon the evaluation of positive and negative evidence and the extent to which that evidence is objectively verifiable, it is more likely than not that some or all of the deferred tax assets will not be realized.

Significant management judgment is required in determining the Company's income tax provision, the Company's deferred tax assets and liabilities and any valuation allowance recorded against those net deferred tax assets. The Company evaluates the weight of all available evidence to determine whether it is more likely than not that some portion or all of the net deferred income tax assets will not be realized.

The calculation of the Company's tax liabilities involves consideration of uncertainties in the application of complex tax regulations. The Company recognizes liabilities for uncertain tax positions based on a two-step process. The first step is to evaluate the tax position for recognition by determining if the weight of available evidence indicates that it is more likely than not that the position will be sustained upon an audit or an examination conducted by taxing authorities, including resolution of related appeals or litigation processes, if any. If the Company determines that a tax position will more likely than not be sustained, the second step requires the Company to estimate and measure the tax benefit as the largest amount that is more likely than not to be realized upon ultimate settlement. It is inherently difficult and subjective to estimate such amounts, as the Company has to determine the probability of various possible outcomes. The Company re-evaluates these uncertain tax positions on a quarterly basis. This evaluation is based on factors, such as changes in facts or circumstances, tax law, new audit activity and effectively settled issues. Determining whether an uncertain tax position is effectively settled requires judgment. A change in recognition or measurement may result in the recognition of a tax benefit or an additional charge to the tax provision.

Earnings Per Share

Basic income (loss) per share is determined by dividing net income (loss) by the weighted average common shares outstanding during the period. Diluted income (loss) per share is determined by dividing net income (loss) by diluted weighted average shares outstanding during the period. Diluted weighted average shares reflect the dilutive effect, if any, of potential common shares. To the extent their effect is dilutive, employee equity awards and other commitments to be settled in common stock are included in the calculation of diluted income per share based on the treasury stock method. Potential common shares are excluded from the calculation of dilutive weighted average shares outstanding if their effect would be anti-dilutive at the balance sheet date based on a treasury stock method or due to a net loss.

Recently Issued Accounting Pronouncements

In May 2014, the FASB issued new accounting guidance for reporting revenue recognition, ASC 606 Revenue from Contracts with Customers ("ASC 606"). The guidance provides for the recognition of revenue when promised goods or services are transferred to customers in an amount that reflects the consideration that is expected to be received for those goods or services. In addition, the guidance requires disclosure of the nature, amount, timing, and uncertainty of

revenue and cash flows arising from contracts with customers. The guidance also specifies the accounting for certain costs to obtain and fulfill a contract, as codified in ASC 340-40 Accounting for Other Assets and Deferred Costs, (“ASC 340-40”).

The Company will adopt this standard effective October 1, 2018, using the modified retrospective method and will only apply this method to contracts that are not completed as of the effective date and all new contracts initiated on or after the effective date. The Company’s quarterly results beginning with the quarter ended December 31, 2018 will be compliant with ASC 606. The Company’s Annual Report on Form 10-K for the year ended September 30, 2019 will be the

65

Table of Contents

Company's first Annual Report that will be issued in compliance with ASC 606. Comparative prior periods will not be restated.

The Company has established an implementation team to assist with its assessment of the impact of the new revenue guidance on its operations, consolidated financial statements and related disclosures. The implementation team is also responsible for evaluating and designing the necessary changes to the Company's business processes, policies, systems and controls to support recognition and disclosure under the new guidance. The implementation team has completed its procedures over the implementation of ASC 606 and has identified the necessary changes to the Company's processes, policies, systems and controls.

The Company expects to record a cumulative-effect adjustment as of October 1, 2018, which is expected to impact retained earnings by an amount not to exceed \$3 million. This adjustment is driven by the acceleration of revenue within the Semiconductor Solutions Group segment, and deferral of previously recognized revenue and commission expense within the Brooks Life Sciences segment. The anticipated adjustment within the Semiconductor Solutions Group segment is derived from the elimination of billing constraints that historically prevented the Company from recognizing revenue in excess of its right to bill. The anticipated adjustment within the Brooks Life Science segment is derived from the requirement to recognize revenue and commission expense associated with certain transactions over time under ASC 606, while historically these transactions have been recorded at a point in time. In accordance with the adoption of ASC 606, classification of certain balance sheet accounts will be impacted through the creation of contract assets and contract liabilities, and additional disclosures will be required. The Company's systems and internal control environment are not expected to be significantly impacted by the adoption of the standard. The Company will fully disclose the impacts of the new standard in connection with its Quarterly Report on Form 10-Q for the quarter ended December 31, 2018.

In accordance with the adoption of ASC 606, the Company expects to accelerate revenue related to semiconductor contamination control solutions as the Company is no longer required to restrain revenue in accordance with billing constraints defined in the contract with the customer. Under ASC 606, this constraint has been removed, permitting the Company to recognize revenue in an amount equivalent to the transfer of control that has occurred. This change will result in an anticipated impact to retained earnings of approximately \$1 million to \$2 million as of October 1, 2018. In addition, the Company expects to defer previously recognized revenue related to sample life cycle management solutions. Fees associated with the registration of biological samples are currently recognized at a point in time upon completion of the registration services, provided all other criteria for revenue recognition have been met. The adoption of the standard will result in revenue generated from registration fees being recognized ratably over the period of benefit, which is generally two years. This change will result in an anticipated impact to retained earnings of approximately \$2 million to \$4 million as of October 1, 2018. The Company expects this impact to retained earnings to be offset by the deferral of previously recognized commission expense. Sales commissions resulting from the acquisition of contracts with customers are currently expensed when incurred. Upon the adoption of the standard certain costs to obtain a contract will be required to be recorded as an asset when incurred and expensed as the transfer of control of the underlying performance obligations occur or over the estimated customer life, depending on the nature of the underlying contract. The Company expects this change to impact its commissions earned on contracts with a term greater than 12 months. This change will result in an anticipated impact to retained earnings of approximately \$0.8 million to \$1.4 million as of October 1, 2018 for contracts which are not completed as of the effective date. The adoption of ASC 606 will result in additional changes to the Company's retained earnings. The

effect of these changes both individually and in the aggregate are expected to be insignificant and result from identification of additional performance obligations, reallocation of transaction consideration and changes to the timing and amount of revenue recognized for certain product and service offerings. The corresponding tax effect from these adjustment's will have an insignificant impact to the cumulative effect adjustment.

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842), which replaces ASC 840 to set forth disclosure requirements related to leases. In accordance with provisions of the newly issued guidance, a lessee should recognize at the inception of the arrangement a right-of-use asset and a corresponding lease liability initially measured at the present value of lease payments over the lease term. For finance leases, interest on a lease liability should be recognized separately from the amortization of the right-of-use asset, while for operating leases, total lease costs are recorded on a straight-line basis over the lease term. For leases with a term of twelve months or less, a lessee is permitted to make an accounting policy election by class of underlying assets to forgo recognition of right-of-use assets and corresponding lease liabilities and record a lease expense on a straight-line basis. Entities should determine at the inception of the arrangement whether

Table of Contents

a contract represents a lease or contains a lease which is defined as a right to control the use of identified property for a period of time in exchange for consideration. Additionally, entities should separate the lease components from the non-lease components and allocate the contract consideration on a relative standalone price basis in accordance with provisions of ASC 606. The guidance is effective for fiscal years, and interim periods within those years, beginning after December 15, 2018 and should be adopted via a modified retrospective approach with certain optional practical expedients that entities may elect to apply. The Company expects to adopt the guidance during the first quarter of fiscal year 2020 and is currently evaluating the impact of this guidance on its financial position and results of operations.

In June 2016, the FASB issued ASU 2016-13, Financial Instruments—Credit Losses (Topic 326), which amends ASC 326 to add, remove, and clarify disclosure requirements related to credit losses of financial instruments. The new guidance introduces a new "expected loss" impairment model which applies to most financial assets measured at amortized cost and certain other instruments, including trade and other receivables, loans, held-to-maturity debt securities and other financial assets. Entities are required to estimate expected credit losses over the life of financial assets and record an allowance against the assets' amortized cost basis to present them at the amount expected to be collected. Additionally, the guidance amends the impairment model for available for sale debt securities and requires entities to determine whether all or a portion of the unrealized loss on such debt security is a credit loss. The guidance is effective for fiscal years, and interim periods within those years, beginning after December 15, 2019. Early adoption of the newly issued guidance is permitted for fiscal years, and interim periods within those years, beginning after December 15, 2018. The standard should be applied as a cumulative-effect adjustment to retained earnings as of the beginning of the first reporting period in which the guidance is effective. The Company expects to adopt the guidance during the first quarter of fiscal year 2021 and is currently evaluating the impact of this guidance on its financial position and results of operations.

In January 2017, the FASB issued ASU 2017-01, Business Combinations (Topic 805): Clarifying the Definition of a Business, which amends ASC 805 to add, remove, and clarify disclosure requirements related to business combinations. This guidance revised the definition of a business to assist entities with evaluating whether a set of transferred assets and activities represents a business. Such a set of transferred assets and activities does not represent a business if substantially all of the fair value of the gross assets acquired is concentrated in a single identifiable asset or a group of similar identifiable assets. If the threshold is not met, entities need to evaluate whether the set of assets and activities meets the requirement that a business includes, at a minimum, an input and a substantive process that together significantly contribute to the ability to create outputs. The guidance is effective for fiscal years, and interim periods within those years, beginning after December 15, 2017 and should be adopted prospectively. Early adoption of the newly issued guidance is permitted. The Company is currently evaluating the impact of this guidance on its financial position and results of operations.

In March 2018, the FASB issued ASU 2018-02, Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income, which amends ASC 220 to add, remove, and clarify disclosure requirements related to reporting comprehensive income. This ASU gives entities the option to reclassify tax effects recorded in accumulated other comprehensive income as a result of tax reform to retained earnings. The entities have the option to apply the guidance retrospectively or in the period of adoption. The guidance requires entities to make new disclosures, regardless of whether they elect to reclassify tax effects. The guidance is effective for fiscal years beginning after December 15, 2018, and interim periods within those fiscal years. Early adoption in any period is permitted. The Company expects to adopt the guidance during the first quarter of fiscal year 2020 and is evaluating the effect that ASU 2018-02 will have on its consolidated financial statements and related disclosures.

In August 2018, the FASB issued ASU 2018-13, Fair Value Measurement (Topic 820): Disclosure Framework - Changes to the Disclosure Requirements for Fair Value Measurement, which amends ASC 820 to add and remove disclosure requirements related to fair value measurement. The amendments include new disclosure requirement for changes in unrealized gains or losses included in other comprehensive income (OCI) for recurring Level 3 fair value measurements held at the end of the reporting period and the range and weighted average used to develop significant unobservable inputs for Level 3 fair value measurements. The amendments eliminated disclosure requirements for amount of and reasons for transfers between Level 1 and Level 2, valuation processes for Level 3 fair value measurements, and policy for timing of transfers between levels of the fair value hierarchy. In addition, the amendments modified certain disclosure requirement to provide clarification or to promote appropriate exercise of discretion by

Table of Contents

entities. ASU 2018-13 is effective for fiscal years beginning after December 15, 2019, including interim periods therein. Early adoption is permitted. The Company is currently evaluating the impact of this ASU.

In August 2018, the FASB issued ASU 2018-14, Disclosure Framework — Changes to the Disclosure Requirements for Defined Benefit Plans, which amends ASC 715 to add, remove, and clarify disclosure requirements related to defined benefit pension and other postretirement plans. The amendments require additional disclosure for the weighted-average interest crediting rates, a narrative description of the reasons for significant gains and losses, and an explanation of any other significant changes in the benefit obligation or plan assets. The amendment removes disclosure requirement for accumulated other comprehensive income expected to be recognized over the next year, information about plan assets to be returned to the entity, and the effects of a one-percentage-point change on the assumed health care costs and the effect of this change in rates on service cost, interest cost, and the benefit obligation for postretirement health care benefits. The ASU is effective for fiscal years ending after December 15, 2020. Early adoption is permitted. The ASU does not amend the interim disclosure requirements of ASC 715-20. The Company is currently evaluating the impact of this ASU.

Recently Adopted Accounting Pronouncements

In March 2016, the FASB issued ASU 2016-09, Compensation-Stock Compensation (Topic 718): Improvement to Employee Share-Based Payment Accounting, which amends ASC 718 to add, remove, and clarify disclosure requirements related to stock compensation. This guidance was issued to simplify accounting for share-based payment awards issued to employees. The amendment requires recognition of excess tax benefits or deficiencies within income tax expense or benefit and changes their presentation requirements on the statement of cash flows. Additionally, the entity can make an accounting policy election to either estimate the number of awards that are expected to vest, consistent with the current accounting guidance, or account for forfeitures as they occur. The guidance is effective for fiscal years, and interim periods within those years, beginning after December 15, 2016. Early adoption of the newly issued guidance is permitted. The Company adopted the guidance during the first quarter of fiscal year 2018. Upon adoption of this guidance, the Company made an accounting policy election to continue accounting for forfeitures by applying an estimated forfeiture rate. The adoption of this guidance did not have an impact on the stock compensation expense amount recognized during the year ended September 30, 2018 and accumulated deficit at September 30, 2018.

3. Discontinued Operations

On August 27, 2018, the Company entered into a definitive agreement to sell its semiconductor cryogenics business to Edwards Vacuum LLC (a member of the Atlas Copco Group) for \$675.0 million in cash. The purchase price is subject to adjustments for working capital and other items. The Company anticipates closing of the transaction in the first quarter of calendar year 2019 upon satisfaction of various closing conditions and regulatory approvals.

The semiconductor cryogenics business consists of the CTI pump business, Polycold chiller business, the related services business and the Company's 50% share in Ulvac Cryogenics, Inc., a joint venture based in Japan. The semiconductor cryogenics business was originally acquired by the Company in its 2005 merger with Helix Technology Corporation and is included in the Brooks Semiconductor Solutions Group segment as part of the segment.

In connection with the Disposition, the Company and Edwards entered into a transition service agreement, a supply agreement, and lease agreements. The transition service agreement outlines the information technology, people, and facility support the Company expects to provide to Edwards for a period from 1 month to 6 months after transaction

closing date. The supply agreement allows the Company to purchase CTI and Polycold goods at cost from Edwards up to an aggregate amount equal to \$1.0 million during the one-year term after closing of the Disposition. The lease agreements will provide facility space to Edwards free of charge for three years after the transaction closing date. Edwards will have the option to renew each lease at the then current market rates after the initial three-year lease term has ended. This Disposition is consistent with the Company's long-standing strategy to increase shareholder value by accelerating the growth of its Life Sciences business with further acquisitions and strengthening its semiconductor automation business with opportunistic acquisitions.

Table of Contents

The Disposition met the "held for sale" criteria and the "discontinued operation" criteria in accordance with FASB ASC 205 as of September 30, 2018. As such, its operating results have been reported as a discontinued operation for all periods presented.

The following table presents the financial results of discontinued operations (in thousands):

	Fiscal Year Ended September 30,		
	2018	2017	2016
Revenue			
Products	\$ 150,365	\$ 126,638	\$ 85,860
Services	45,731	38,748	40,451
Total revenue	196,096	165,386	126,311
Cost of revenue			
Products	85,350	73,714	55,144
Services	22,834	22,400	28,974
Total cost of revenue	108,184	96,114	84,118
Gross profit	87,912	69,272	42,193
Operating expenses			
Research and development	7,605	6,860	6,932
Selling, general and administrative	25,017	12,536	12,139
Restructuring charges	2	82	1,830
Total operating expenses	32,624	19,478	20,901
Operating income	55,288	49,794	21,292
Interest income			
Interest expense			
Other (expense) income, net	1,091	1,057	804
Income before income taxes and earnings of equity method investment	56,379	50,851	22,096
Income tax provision	14,420	8,760	9,560
Income before equity in earnings of equity method investment	41,959	42,091	12,536
Equity in earnings of equity method investment	6,788	9,834	3,445
Net income	\$ 48,747	\$ 51,925	\$ 15,981

The Company performed its annual goodwill impairment analysis in April 2018. This analysis was updated upon announcement of the Disposition for the year ended September 30, 2018. The Company has concluded that there is no impairment indicator related to the goodwill of the Disposition group at either date the impairment analysis was performed.

The following table presents the summarized financial information for Ulvac Cryogenics, Inc., the unconsolidated subsidiaries accounted for based on the equity method (in thousands):

	September 30,	
	2018	2017
Balance Sheets:		
Current assets	\$ 69,302	\$ 74,645
Non-current assets	21,338	16,829

Current liabilities	26,006	29,622
Non-current liabilities	8,397	7,860

Table of Contents

	Fiscal Year Ended September 30,		
	2018	2017	2016
Statements of Operations:			
Total revenue	\$ 94,652	\$ 104,667	\$ 68,054
Gross profit	34,982	41,241	23,586
Operating Income	18,405	26,340	10,571
Net income	13,345	19,451	7,492

The following table presents the significant non-cash items and capital expenditures for the discontinued operations that are included in the Consolidated Statements of Cash Flows (in thousands):

	Fiscal Year Ended September 30,		
	2018	2017	2016
Depreciation and amortization	\$ 743	\$ 919	\$ 1,034
Capital expenditures	302	1,049	560
Stock-based compensation	966	705	460
Earnings of equity method investment	(6,788)	(9,834)	(3,445)

The carrying value of the assets and liabilities of the discontinued operations on the Consolidated Balance Sheet as of September 30, 2018 and September 30, 2017 were as follows (in thousands):

	Fiscal Year Ended September 30,	
	2018	2017
Assets		
Accounts receivable, net	\$ 27,852	\$ 27,363
Inventories	37,953	32,998
Other current assets	343	310
Total current assets of discontinued operation	\$ 66,148	\$ 60,671
Property, plant and equipment, net	\$ 1,081	\$ 1,481
Goodwill	26,485	26,485
Intangibles, net	14	16
Equity method investment	31,472	28,570
Other assets	-	1
Total long-term assets of discontinued operation	\$ 59,052	\$ 56,553

Liabilities

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Deferred revenue	\$ 1,052	\$ 1,728
Accrued warranty and retrofit costs	2,464	2,574
Accrued compensation and benefits	3,648	3,189
Other current liabilities	224	334
Total current liabilities of discontinued operation	\$ 7,388	\$ 7,825
Long-term liabilities of discontinued operation	\$ 698	\$ 652

70

Table of Contents

4. Acquisitions

Acquisitions Completed in Fiscal Year 2018

Acquisition of Tec-Sem

On April 6, 2018, the Company acquired approximately 93% of the outstanding capital stock of Tec-Sem Group AG (“Tec-Sem”), a Switzerland-based manufacturer of semiconductor fabrication automation equipment with a focus on reticle management. In the fourth quarter of fiscal year 2018, the Company acquired the remaining 7% noncontrolling interest upon the completion of certain procedural steps. The total cash payment to acquire the business was \$15.6 million, net of cash acquired and subject to working capital adjustments. The acquisition of Tec-Sem has expanded the Company’s contamination control solutions business within the Brooks Semiconductor Solutions Group segment.

The preliminary amounts recorded were as follows (in thousands):

	Fair Value of Assets and Liabilities
Accounts receivable (approximates contractual value)	\$ 988
Inventories	4,297
Prepaid expenses and other current assets	4,038
Property, plant and equipment	85
Intangible assets	10,694
Goodwill	7,665
Accounts payable	(1,049)
Accrued liabilities	(6,962)
Deferred tax liabilities	(1,391)
Accrued pension liability	(2,800)
Total purchase price, net of cash acquired	\$ 15,565

The Company applied variations of the income approach to estimate the fair values of the intangible assets acquired. The identifiable intangible assets include completed technology (excess earnings method) of \$8.4 million with a useful life of 10 years, backlog (excess earnings method) of \$1.6 million with a useful life of 1 year, and customer relationships (distributor method) of \$0.7 million with a useful life of 9 years. The intangible assets acquired are amortized over the total weighted average period of 8.6 years using methods that approximate the pattern in which the economic benefits are expected to be realized.

Goodwill of \$7.7 million largely reflects the potential synergies and expansion of technical capabilities to the Company's existing contamination control solutions business. The goodwill from this acquisition is reported within the Brooks Semiconductor Solutions Group segment and is not tax deductible.

As part of the acquisition, the Company assumed all the assets and liabilities of Tec-Sem’s Swiss defined benefit plan, which covered substantially all its full-time employees. At acquisition date, the plan was fully funded for each employee’s pension contribution plus an expected rate of return equal to the statutory discount rate. Total plan assets and plan liability were \$5.1 million and \$7.9 million, respectively, at acquisition date. The Company recorded a liability of \$2.8 million for the unfunded projected benefit obligation related to each plan participant’s future services.

The Company reports the results of operations for Tec-Sem in the Brooks Semiconductor Solutions Group segment. The revenues and net loss from Tec-Sem included in the Company's consolidated results for fiscal year 2018 were \$11.6 million and \$1.2 million, respectively. During fiscal year 2018, the net loss included \$0.7 million related to the step-up in value of the acquired inventories and \$2.1 million related to amortization expense of acquired intangible assets. During fiscal year 2018, the Company incurred \$0.9 million in transaction costs related to the Tec-Sem acquisition.

The escrow at closing had a balance of \$2.6 million which consisted of \$1.8 million related to satisfaction of the sellers' indemnification obligations with respect to their representations and warranties and other indemnities. The remaining \$0.8 million of the escrow balance is related to a performance obligation that the Company assumed at the acquisition date for the transfer of non-core wafer stocker technology to an unrelated third party. Upon successful delivery of such technology, the Company expects to collect a portion of the \$0.8 million which represent reimbursement of costs incurred to complete development.

Table of Contents

The Company did not present a pro forma information summary for its consolidated results of operations for the fiscal years ended September 30, 2018 and 2017 as if the acquisition of Tec-Sem occurred on October 1, 2016 because such results were immaterial.

Acquisition of 4titude Limited

On October 5, 2017, the Company acquired all the outstanding capital stock of 4titude Limited (“4titude”), a U.K.-based manufacturer of scientific consumables for biological sample materials used in a variety of genomic and DNA analytical applications. The acquisition of 4titude has expanded the Company’s existing offerings of consumables and instruments within the Brooks Life Sciences segment. The aggregate purchase price of \$65.1 million, net of cash acquired, consisted primarily of a cash payment of \$64.8 million subject to working capital adjustments and the assumption of the seller’s liabilities of \$0.4 million.

The Company used a market participant approach to record the assets acquired and liabilities assumed in the 4titude acquisition as follows (in thousands):

	Fair Value of Assets and Liabilities
Accounts receivable (approximates contractual value)	\$ 1,581
Inventories	2,667
Prepaid expenses and other current assets	140
Property, plant and equipment	1,555
Intangible assets	27,212
Goodwill	38,185
Accounts payable	(286)
Accrued liabilities	(845)
Deferred tax liabilities	(5,090)
Total purchase price, net of cash acquired	\$ 65,119

The Company applied variations of the income approach to estimate the fair values of the intangible assets acquired. The identified intangible assets include customer relationships (excess earnings method) of \$21.4 million with a useful life of 10 years, completed technology (relief from royalty method) of \$5.2 million with a useful life of 13 years, backlog (excess earnings method) of \$0.4 million with a useful life of 1 year and trademarks (excess earnings method) of \$0.2 million with a useful life of 1 year. The intangible assets acquired are amortized over the total weighted average period of 10.4 years using methods that approximate the pattern in which the economic benefits are expected to be realized.

At the acquisition date, a cash payment of \$0.4 million was placed into escrow which was ascribed to the purchase price. The escrow was related to satisfaction of the sellers' indemnification obligations with respect to their representations and warranties and other indemnities. The escrow balance was \$0.2 million as of September 30, 2018.

Goodwill represents the excess of the consideration paid over the fair value of the net assets acquired and has been assigned to the Brooks Life Sciences segment. Goodwill is primarily the result of expected synergies from combining the operations of 4titude with the Company’s operations and is not deductible for tax purposes.

The operating results of 4titude have been reflected in the results of operations for the Brooks Life Sciences segment. During fiscal year 2018, revenue and net loss from 4titude recognized in the Company's results of operations were \$15.9 million and \$0.8 million, respectively. The net in fiscal year 2018 included recurring charges of \$4.1 million, related to amortization expense of acquired intangible assets. The net loss in fiscal year 2018 also included non-recurring charges of \$1.2 million related to the step-up in value of the acquired inventories. During fiscal year 2018, the Company incurred \$1.1 million in non-recurring transaction costs with respect to the 4titude acquisition.

The Company did not present a pro forma information summary for its consolidated results of operations for the fiscal years ended September 30, 2018 and 2017 as if the acquisition of 4titude occurred on October 1, 2016 because such results were immaterial.

Table of Contents

Other

On April 20, 2018, the Company acquired BioSpeciMan Corporation (“BioSpeciMan”), a Canada-based provider of storage services for biological sample materials. BioSpeciMan, founded in 2002, provides temperature controlled biological sample storage services to an attractive mix of pharma, biotech and contract lab customers. This acquisition has expanded customer relationships and geographic reach within its growing sample management storage services business in the Brooks Life Sciences segment. The total cash payment made by the Company was \$5.2 million, net of cash acquired and subject to working capital adjustments.

The Company allocated the purchase price of \$5.2 million based on the fair value of the assets and liabilities acquired, which included \$0.3 million of accounts receivable, \$2.6 million of customer relationships, \$2.7 million of goodwill and \$0.7 million of assumed liabilities. The Company applied the excess earnings method, a variation of the income approach to determine the fair value of the customer relationship intangible asset. The purchase price allocation was based on a preliminary valuation which is subject to further adjustments within the measurement period when additional information becomes available. The goodwill from this acquisition is reported within the Brooks Life Sciences segment and is not tax deductible.

At the acquisition date, a cash payment of \$0.5 million was placed into escrow which was ascribed to the purchase price. The escrow was related to satisfaction of the sellers' indemnification obligations with respect to their representations and warranties and other indemnities.

The operating results of the acquisition have been reflected in the results of operations for the Brooks Life Sciences segment. The Company did not present a pro forma information summary for its consolidated results of operations for the fiscal years ended September 30, 2018 and 2017 as if the acquisition of BioSpeciMan occurred on October 1, 2016 because such results were immaterial.

Acquisitions Completed in Fiscal Year 2017

Acquisition of Pacific Bio-Material Management, Inc. and Novare, LLC

On July 5, 2017, the Company entered into an asset purchase agreement with Pacific Bio-Material Management, Inc. (“PBMMI”) and Novare, LLC, a wholly owned subsidiary of PBMMI (collectively, the “sellers”), to acquire substantially all the assets and liabilities of the sellers' business related to providing storage, transportation, management, and cold chain logistics of biological materials. The acquisition has expanded the Company's existing capabilities with respect to sample management and integrated cold chain storage and transportation solutions within the Brooks Life Sciences segment. The Company paid to the sellers cash consideration of \$34.3 million, net of cash acquired and subject to working capital adjustments.

The Company used a market participant approach to record the assets acquired and liabilities assumed in the PBMMI acquisition. The amounts recorded were as follows (in thousands):

	Fair Value of Assets and Liabilities
Accounts receivable (approximates contractual value)	\$ 2,800
Prepaid expenses and other current assets	267
Property, plant and equipment	2,887
Intangible assets	8,600

Goodwill	21,434
Accounts payable	(699)
Accrued liabilities	(673)
Deferred revenue	(385)
Other liabilities	(103)
Total purchase price, net of cash acquired	\$ 34,128

Table of Contents

The Company applied variations of the income approach to estimate the fair values of the intangible assets acquired. The identified intangible assets include customer relationship intangible (excess-earnings method) of \$8.5 million and trademarks of \$0.1 million. The intangible assets acquired are amortized over the total weighted average period of 11.0 years using methods that approximate the pattern in which the economic benefits are expected to be realized.

At the acquisition date, a cash payment of \$3.3 million was placed into escrow which was ascribed to the purchase price. The escrow balance of \$3.3 million included \$2.9 million related to satisfaction of the sellers' indemnification obligations with respect to their representations and warranties and other indemnities, as well as \$0.4 million payable to the former owner of Novare as a compensation for a sale of his ownership interest. This escrow arrangement is administered by the Company on behalf of the sellers. The escrow balance related to satisfaction of the sellers' indemnification obligations was \$2.7 million as of September 30, 2018. The Novare escrow balance was reduced by its full amount as of September 30, 2018.

Goodwill represents the excess of the consideration transferred over the fair value of the net assets acquired and has been assigned to the Brooks Life Sciences segment. Goodwill is primarily the result of expected synergies from combining the operations of PBMMI with the Company's operations and is deductible for tax purposes.

The operating results of PBMMI have been reflected in the results of operations for the Brooks Life Sciences segment. During fiscal year 2018, revenue and net income from PBMMI recognized in the Company's results of operations were \$11.5 million and \$0.7 million, respectively. During fiscal year 2017, revenue and net income from PBMMI recognized in the Company's results of operations were \$3.4 million and \$0.8 million, respectively. During fiscal year ended September 30, 2018 and 2017, the net income included amortization expense of \$1.6 million and \$0.3 million, respectively, related to acquired intangible assets. During fiscal year 2018 and 2017, the Company incurred less than \$0.1 million and \$0.3 million in non-recurring transaction costs with respect to the PBMMI acquisition.

The Company did not present a pro forma information summary for its consolidated results of operations for the fiscal years ended September 30, 2017 and 2016 as if the acquisition of PBMMI occurred on October 1, 2015 because such results were immaterial.

Acquisition of Cool Lab, LLC

On November 28, 2016, the Company acquired 100% of the equity of Cool Lab, LLC ("Cool Lab") from BioCision, LLC ("BioCision"). The Company held a 20% equity ownership interest in BioCision prior to the acquisition. Cool Lab was established as a subsidiary of BioCision on November 28, 2016 upon the transfer of certain assets related to cell cryopreservation solutions. Cool Lab's offerings assist in managing the temperature stability of therapeutics, biological samples, and related biomaterials in ultra-cold and cryogenic environments. The acquisition of Cool Lab has allowed the Company to extend its comprehensive sample management solutions across the cold chain of custody, which is consistent with the other offerings it brings to its life sciences customers.

The aggregate purchase price of \$15.2 million consisted of a cash payment of \$4.8 million, a liability to the seller of \$0.1 million and the settlement of certain preexisting relationships with Cool Lab and BioCision, disclosed as non-cash consideration of \$10.3 million, which has been measured at fair value on the acquisition date.

The Company used a market participant approach to record the assets acquired and liabilities assumed in the Cool Lab acquisition. The amounts recorded were as follows (in thousands):

Fair Value of Assets
and Liabilities

Inventory	\$ 1,283
Intangible assets	6,100
Goodwill	8,527
Accrued liabilities	(30)
Other liabilities	(686)
Total purchase price	\$ 15,194

Table of Contents

The Company applied variations of the income approach to estimate the fair values of the intangible assets acquired. The identified intangible assets include customer relationship with a certain customer (excess-earnings method) of \$3.6 million with a useful life of 3 years, completed technology (relief-from-royalty) of \$1.2 million with a useful life of 8 years, and other customer relationship (excess-earnings method) of \$1.3 million with a useful life of 10 years. The intangible assets acquired are amortized over the total weighted average period of 5.4 years using methods that approximate the pattern in which the economic benefits are expected to be realized, including percentage of revenue expected to be generated from sales to a certain customer over the contract term.

Goodwill represents the excess of the consideration transferred over the fair value of the net assets acquired and has been assigned to the Brooks Life Sciences segment. Goodwill is primarily the result of expected synergies from combining the operations of Cool Lab with the Company's operations and is deductible for tax purposes.

The Company recorded a liability of \$0.7 million in the purchase price allocation that represented a pre-acquisition contingency incurred on the acquisition date. The obligation is related to a rebate that is due to a particular customer if the annual product sales volume metrics exceed threshold amounts under the provisions of the contract with this customer assumed by the Company. Fair value of such liability was determined based on a probability weighted discounted cash flow model. The carrying amount of the liability was \$0.8 million and \$0.7 million, respectively, at September 30, 2018 and 2017.

The operating results of Cool Lab have been reflected in the results of operations for the Brooks Life Sciences segment. During fiscal year 2018, revenue and net loss from Cool Lab recognized in the Company's results of operations were \$3.7 million and \$0.2 million, respectively. During fiscal year 2017, revenue and net loss from Cool Lab recognized in the Company's results of operations were \$3.7 million and \$0.3 million, respectively. During fiscal year ended September 30, 2018, the net loss included charges of amortization expense \$1.6 million related to acquired intangible assets. During fiscal year ended September 30, 2017, the net loss included charges of \$0.4 million related to the step-up in value of the acquired inventories and amortization expense \$1.2 million related to acquired intangible assets. During fiscal year 2017, the Company also incurred \$0.4 million in non-recurring transaction costs with respect to the Cool Lab acquisition.

The Company did not present a pro forma information summary for its consolidated results of operations for the fiscal years ended September 30, 2017 and 2016 as if the acquisition of Cool Lab occurred on October 1, 2015 because such results were immaterial.

Other

On August 22, 2017, the Company acquired certain assets and liabilities of RURO, Inc., (the "seller"), a U.S.-based provider of sample management software solutions across multiple end markets, including academic research, government, pharmaceutical, biotech, and healthcare. The acquired FreezerPro® web-based software platform together with an exclusive license to sell and distribute RURO's BioBankPro® software has allowed the Company to complement its existing informatics offerings within the Brooks Life Sciences segment and extend its informatics solutions to address laboratories, biobanks or enterprises that manage biological samples.

The aggregate purchase price of \$5.5 million consisted of a cash payment of \$5.2 million and a liability to the seller of \$0.4 million. The Company allocated the purchase price of \$5.5 million to the assets acquired and liabilities assumed related to the acquisition at their fair values as of the acquisition date, of which \$0.1 million was ascribed to accounts receivable, \$4.0 million to intangible assets, \$1.6 million to goodwill assigned to the Brooks Life Sciences segment and \$0.2 million to deferred revenue. Fair values of intangible assets acquired of \$4.0 million consisted of customer relationship intangible assets of \$3.1 million and completed technology of \$0.9 million.

At the closing of the acquisition, a cash payment of \$0.5 million was placed into escrow which was ascribed to the purchase price. The escrow was related to satisfaction of the sellers' indemnification obligations with respect to their representations and warranties and other indemnities.

75

Table of Contents

The operating results of the acquisition have been reflected in the results of operations for the Brooks Life Sciences segment. The Company did not present a pro forma information summary for its consolidated results of operations for fiscal years ended September 30, 2018 and 2017 as if the acquisition occurred on October 1, 2015.

Acquisitions Completed in Fiscal Year 2016

Acquisition of BioStorage Technologies, Inc.

On November 30, 2015, the Company completed its acquisition of BioStorage Technologies, Inc., or BioStorage, an Indiana-based global provider of comprehensive sample management and integrated cold chain solutions for the biosciences industry. These solutions include collection, transportation, processing, storage, protection, retrieval and disposal of biological samples. These solutions combined with the Company's existing offerings, particularly automation for sample storage and formatting, provide customers with fully integrated sample management cold chain solutions which will help them increase productivity, efficiencies and speed to market. This acquisition has allowed the Company to access a broader customer base that is storing samples at ultra-cold temperatures and simultaneously provide opportunities for BioStorage to use the Company's capabilities to expand into new markets.

The Company acquired 100% of the issued and outstanding shares of BioStorage. A cash payment of \$130.7 million, net of the seller's cash of \$2.8 million, resulted in a net cash outflow of \$128.0 million, including \$125.2 million ascribed to the purchase price and \$2.5 million for retention arrangements with certain employees based on the completion of a service retention period. The cash payment included a debt repayment of \$3.2 million and transaction costs of \$2.9 million paid by the Company on behalf of BioStorage.

On September 9, 2016, the Company reached a settlement with the sellers of BioStorage's stock related to certain working capital adjustments. On September 13, 2016, the Company received \$0.2 million of proceeds from the sellers as a result of such settlement, which was recorded as a decrease in the purchase price and goodwill.

The Company recorded the following assets acquired and liabilities assumed related to BioStorage at their fair values as of the acquisition date, from a market participant's perspective (in thousands):

	Fair Value of Assets and Liabilities
Accounts receivable	\$ 16,942
Prepaid expenses and other current assets	321
Property, plant and equipment	14,345
Intangible assets	41,460
Goodwill	79,639
Other assets	53
Debt assumed	(385)
Accounts payable	(1,708)
Accrued liabilities	(9,423)
Deferred revenue	(1,766)
Long-term deferred tax liabilities	(14,169)
Other liabilities	(61)
Total purchase price, net of cash acquired	\$ 125,248

At the acquisition date, a cash payment of \$5.4 million was placed into escrow which consisted of \$2.9 million ascribed to the purchase price and \$2.5 million related to retention arrangements with certain employees. The escrow balance was reduced by its full amount by the third quarter of fiscal year 2017.

The Company applied variations of the income approach to estimate the fair values of the intangibles assets acquired. The identified intangible assets include customer relationship (excess-earnings method) of \$36.6 million with a useful life of 11.0 years, and trademark (relief-from-royalty method) of \$4.9 million with a useful life of 8.0 years. The intangible assets acquired are amortized over the total weighted average period of 10.6 years using an accelerated depreciation method which approximates the pattern in which the economic benefits are expected to be realized.

Table of Contents

Goodwill represents the excess of the consideration transferred over the fair value of the net assets acquired and has been assigned to the Company's Brooks Life Sciences segment. Goodwill is primarily the result of expected synergies from combining the operations of BioStorage with the Company's operations and is not deductible for tax purposes.

The operating results of BioStorage have been reflected in the results of operations for the Brooks Life Sciences segment. During fiscal year 2018, revenue and net income from BioStorage recognized in the Company's results of operations were \$74.7 million and \$12.6 million, respectively. During fiscal year 2017, revenue and net income from BioStorage recognized in the Company's results of operations were \$62.8 million and \$9.3 million, respectively. During fiscal year 2016, revenue and net income from BioStorage recognized in the Company's results of operations were \$44.6 million and \$2.4 million, respectively. During fiscal years ended September 30, 2018, 2017 and 2016, the net income included amortization expense of \$5.5 million, \$4.6 million and \$2.9 million, respectively, related to acquired intangible assets.

During fiscal years ended September 30, 2018, 2017 and 2016, the Company incurred \$0.3 million, \$0.3 million and \$3.2 million, respectively, in non-recurring transaction costs with respect to the BioStorage acquisition. The retention payment of \$2.5 million was recorded within prepaid expenses and other current assets at the acquisition date and is recognized as a compensation expense over the service period or upon a triggering event in the underlying change in control agreements. The retention payments were completed paid out by the first quarter of fiscal year 2017.

The following unaudited proforma financial information represents a summary of the consolidated results of operations for the Company and BioStorage for fiscal year 2016 as if the acquisition of BioStorage occurred on October 1, 2014 (in thousands):

	Year Ended September 30, 2016
Revenue	\$ 445,058
Net loss	(79,377)
Basic loss per share	\$ (1.16)
Diluted loss per share	\$ (1.16)
Weighted average shares outstanding used in computing net loss per share:	
Basic	68,507
Diluted	68,507

The unaudited pro forma information presented above reflects historical operating results of the Company and BioStorage and includes the impact of certain adjustments directly attributable to the business combination. The unaudited pro forma financial information is presented for informational purposes only and is not necessarily indicative of the results of operations that would have been achieved if the acquisition of BioStorage had taken place on October 1, 2014. During fiscal years ended September 30, 2016, the adjustments reflected in the unaudited pro forma information included aggregate amortization and depreciation expense of \$0.6 million, and tax effects of \$0.5 million. Additionally, the impact of restructuring charges of \$1.9 million was excluded from the proforma net loss during fiscal year ended September 30, 2016.

5. Marketable Securities

The Company invests in marketable securities that are classified as available-for-sale and recorded at fair value in the Company's Consolidated Balance Sheets. Marketable securities reported as current assets represent investments that mature within one year from the balance sheet date. Long-term marketable securities represent investments with maturity dates greater than one year from the balance sheet date.

Unrealized gains and losses are excluded from earnings and reported as a separate component of accumulated other comprehensive income until the security is sold or matures. Gains or losses realized from sales of marketable securities are computed based on the specific identification method and recognized as a component of "Other expenses, net" in the accompanying Consolidated Statements of Operations. During fiscal year 2018, the Company sold marketable securities with a fair value and amortized cost of \$1.6 million each and recognized nominal net losses. The Company collected

Table of Contents

cash proceeds of approximately \$1.6 million from the sale of marketable securities and reclassified unrealized net holding losses of \$0.1 million from accumulated other comprehensive income into "Other expenses, net" in the accompanying Consolidated Statements of Operations as a result of these transactions. During fiscal year 2017, the Company sold marketable securities with fair values and amortized cost of \$3.6 million each and recognized net losses of less than \$0.1 million. The Company collected cash proceeds of \$3.5 million from the sale of marketable securities and reclassified unrealized net holding losses of approximately \$0.1 million from accumulated other comprehensive income into "Other (expense) income, net" in the accompanying Consolidated Statements of Operations as a result of these transactions.

The following is a summary of the amortized cost and the fair value, including accrued interest receivable, as well as unrealized holding gains (losses) on the short-term and long-term marketable securities as of September 30, 2018 and 2017 (in thousands):

	Amortized Cost	Gross Unrealized Losses	Gross Unrealized Gains	Fair Value
September 30, 2018:				
U.S. Treasury securities and obligations of U.S. government agencies				
	\$ 30,142	\$ (65)	\$ —	\$ 30,077
Bank certificates of deposits	5,148	—	1	5,149
Corporate securities	14,763	(30)	—	14,733
Municipal securities	2,797	(17)	—	2,780
Other debt securities	779	—	—	779
	\$ 53,629	\$ (112)	\$ 1	\$ 53,518
September 30, 2017:				
Corporate securities				
	\$ 2,642	\$ —	\$ —	\$ 2,642
Other debt securities				
	28	—	—	28
	\$ 2,670	\$ —	\$ —	\$ 2,670

The fair values of the marketable securities by contractual maturities at September 30, 2018 are presented below (in thousands).

	Fair Value
Due in one year or less	\$ 46,281
Due after one year through five years	4,373
Due after five years through ten years	—
Due after ten years	2,864
Total marketable securities	\$ 53,518

Expected maturities could differ from contractual maturities because the security issuers may have the right to prepay obligations without prepayment penalties.

The Company reviews the marketable securities for impairment at each reporting period to determine if any of the securities have experienced an other-than-temporary decline in fair value. The Company considers factors, such as the length of time and extent to which the market value has been less than the cost, the financial condition and near-term

prospects of the issuer, the Company's intent to sell, or whether it is more likely than not it will be required to sell the investment before recovery of its amortized cost basis. If the Company believes that an other-than-temporary decline in fair value has occurred, it writes down the investment to fair value and recognizes the credit loss in earnings and the non-credit loss in accumulated other comprehensive income. There were no marketable securities in unrealized loss position as of September 30, 2017. As of September 30, 2018, aggregate fair value of the marketable securities in unrealized loss position was \$43.0 million and was comprised primarily of U.S. Treasury securities, corporate securities, and municipal securities. Aggregate unrealized losses for these securities were insignificant as of September 30, 2018 and are presented in the table above. The securities in unrealized loss position as of September 30, 2018 were not considered other-than-temporarily impaired and, as such, the Company did not recognize impairment losses during the period then ended. The unrealized losses were attributable to changes in interest rates that impacted the value of the investments.

Table of Contents

6. Property, Plant and Equipment

Property, plant and equipment were as follows as of September 30, 2018 and 2017 (in thousands):

	September 30,	
	2018	2017
Buildings and land	\$ 47,745	\$ 46,608
Computer equipment and software	56,982	55,352
Machinery and equipment	55,794	48,647
Furniture and fixtures	4,842	4,034
Leasehold improvements	19,433	18,045
Capital projects in progress	5,796	2,761
	190,592	175,447
Less: accumulated depreciation and amortization	(130,604)	(118,466)
Property, plant and equipment, net	\$ 59,988	\$ 56,981

Depreciation expense was \$12.5 million, \$10.1 million and \$12.2 million, respectively, for the fiscal years ended September 30, 2018, 2017 and 2016. The Company recorded \$0.9 million of additions to property, plant and equipment for which cash payments had not yet been made as of September 30, 2018.

7. Goodwill and Intangible Assets

Goodwill represents the excess of net book value over the estimated fair value of net tangible and identifiable intangible assets of a reporting unit. Goodwill is tested for impairment annually or more often if impairment indicators are present at the reporting unit level. The Company elected April 1st as its annual goodwill impairment assessment date. If the existence of events or circumstances indicates that it is more likely than not that fair values of the reporting units are below their carrying values, the Company performs additional impairment tests during interim periods to evaluate goodwill for impairment.

In accordance with ASC 350, the Company initially assesses qualitative factors to determine whether the existence of events or circumstances indicates that it is more likely than not that the fair value of a reporting unit is less than its carrying value. If the Company determines, based on this assessment, that it is more likely than not that the fair value of the reporting unit is less than its carrying value, it performs a quantitative goodwill impairment test by comparing the reporting unit's fair value with its carrying value. An impairment loss is recognized for the amount by which the reporting unit's carrying value exceeds its fair value, up to the total amount of goodwill allocated to the reporting unit. No impairment loss is recognized if the fair value of the reporting exceeds its carrying value.

The Company completed its annual goodwill impairment test as of April 1, 2018 and determined that no adjustment to goodwill was necessary since the fair value of each reporting unit was significantly in excess of the carrying value of each reporting unit. The Company conducted a qualitative assessment for three reporting units within the Brooks Semiconductor Solutions Group segment and determined that it was not likely that their fair values were less than their carrying values. As a result of the analysis, the Company did not perform the quantitative assessment for these reporting units and did not recognize impairment losses. The Company also performed the quantitative goodwill impairment test for the fourth reporting unit within the Brooks Semiconductor Solutions Group segment and for the Brooks Life Sciences reporting unit. The Company determined that no adjustment to goodwill was necessary for these

two reporting units since their fair values significantly exceeded their respective carrying values. If events occur or circumstances change that would more likely than not reduce the fair value of any reporting unit below its carrying value, the Company will evaluate such reporting unit's goodwill for impairment between annual tests.

Table of Contents

The following table sets forth the changes in the carrying amount of goodwill by operating segment for the year ended September 30, 2018 and 2017 (in thousands):

	Brooks Semiconductor Solutions Group	Brooks Life Sciences	Other	Total
Gross goodwill, at September 30, 2016	\$ 629,297	\$ 135,301	\$ 26,014	\$ 790,612
Accumulated goodwill impairments	(588,944)	—	(26,014)	(614,958)
Goodwill, net of accumulated impairments, at September 30, 2016	40,353	135,301	—	175,654
Acquisitions and adjustments	(19)	31,519	—	31,500
Gross goodwill, at September 30, 2017	\$ 629,278	\$ 166,820	\$ 26,014	\$ 822,112
Accumulated goodwill impairments	(588,944)	—	(26,014)	(614,958)
Goodwill, net of accumulated impairments, at September 30, 2017	40,334	166,820	—	207,154
Acquisitions and adjustments	7,629	41,093	—	48,722
Gross goodwill, at September 30, 2018	636,907	207,913	26,014	870,834
Accumulated goodwill impairments	(588,944)	—	(26,014)	(614,958)
Goodwill, net of accumulated impairments, at September 30, 2018	\$ 47,963	\$ 207,913	\$ —	\$ 255,876

During fiscal year 2018, the Company recorded a goodwill increase of \$41.0 million primarily related to the acquisitions of 4titude, TecSem and BioSpeciMan.

The components of the Company's identifiable intangible assets as of September 30, 2018 and 2017 are as follows (in thousands):

	September 30, 2018			September 30, 2017		
	Cost	Accumulated Amortization	Net Book Value	Cost	Accumulated Amortization	Net Book Value
Patents	\$ 5,302	\$ 4,325	\$ 977	\$ 5,302	\$ 4,019	\$ 1,283
Completed technology	44,829	28,934	15,895	31,264	24,379	6,885
Trademarks and trade names	6,298	2,953	3,345	6,138	1,863	4,275
Customer relationships	142,489	62,750	79,739	115,596	44,535	71,061
	\$ 198,918	\$ 98,962	\$ 99,956	\$ 158,300	\$ 74,796	\$ 83,504

Amortization expense for intangible assets was \$24.2 million, \$17.1 million and \$14.8 million, respectively, for the fiscal years ended September 30, 2018, 2017 and 2016.

Estimated future amortization expense for the intangible assets as of September 30, 2018 is as follows (in thousands):

Fiscal year ended September 30, 2019	\$ 23,187
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2020	21,061
2021	14,752
2022	11,839
2023	9,423
Thereafter	19,694
	\$ 99,956

Table of Contents

8. Equity Method and Other Investments

The Company accounts for certain of its investments using the equity method of accounting and records its proportionate share of the investee's earnings (losses) in its results of operations with a corresponding increase (decrease) in the carrying value of the investment.

BioCision, LLC

As of September 30, 2016, the Company held a 20% equity interest in BioCision, LLC, or BioCision, a privately-held company based in Larkspur, California, which was accounted for as an equity method investment. The carrying value of the investment in BioCision was \$1.7 million at September 30, 2016. During fiscal years ended September 30, 2016, the Company recorded a loss associated with BioCision of \$1.1 million.

The Company held a term loan receivable from BioCision as of September 30, 2016. The term loan was provided to BioCision to support its working capital requirements. The term loan had an aggregate principal amount of \$1.5 million and bore an annual interest rate of 10%. At September 30, 2016, the term loan was recorded at its carrying value of \$1.5 million and included in "Other assets" in the Company's Consolidated Balance Sheets.

The Company also held five-year convertible debt securities with a warrant agreement to purchase BioCision's preferred units as of September 30, 2016. The convertible debt securities and the warrant were purchased by the Company in fiscal year 2015 for a total purchase price of \$5.0 million. The convertible debt securities were accruing interest at the annual rate of 9%, and all principal and accrued interest were due at maturity. The convertible debt securities and the warrant were recorded at fair value during each reporting period, and the remeasurement gains and losses were recognized as a component of "Other (expense) income, net" in the Company's Consolidated Statements of Operations. During the fiscal year ended September 30, 2016, the Company recognized remeasurement gains of \$0.4 million related to these financial instruments.

On November 28, 2016, BioCision established Cool Lab as its subsidiary upon transferring certain assets related to cell cryopreservation solutions. The Company acquired a 100% equity interest of the subsidiary on that date for an aggregate purchase price of \$15.2 million, consisting of a cash payment of \$4.8 million, a liability to the seller of \$0.1 million, and non-cash consideration of \$10.3 million measured at fair value on the acquisition date.

The carrying value of the equity method investment in BioCision was \$1.2 million on November 28, 2016. The Company recorded a loss associated with BioCision of \$0.5 million from October 1, 2016 through the acquisition date. The equity method investment in BioCision was measured at fair value of \$3.1 million at the acquisition date, and as a result the Company recognized a gain of \$1.8 million upon the redemption of the equity method investment in its Consolidated Statements of Operations during fiscal year ended September 30, 2017. On November 28, 2016, convertible debt, warrant and the term loan with carrying values of \$5.8 million, less than \$0.1 million and \$1.6 million, respectively, were measured at their fair values of \$5.6 million, less than \$0.1 million and \$1.6 million, respectively. As a result of such measurement, the Company recognized an aggregate loss of \$0.2 million upon the settlement of these financial instruments in "Other (expense) income, net" in its Consolidated Statements of Operations during the year ended September 30, 2017. Please refer to Note 4, "Acquisitions" for further information on the acquisition transaction.

9. Supplementary Balance Sheet Information

The following is a summary of accounts receivable at September 30, 2018 and 2017 (in thousands):

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	September 30,	
	2018	2017
Accounts receivable	\$ 126,350	\$ 94,927
Less allowance for doubtful accounts	(1,113)	(1,381)
Less allowance for sales returns	(45)	(81)
Accounts receivable, net	\$ 125,192	\$ 93,465

Table of Contents

The allowance for doubtful accounts activity for the fiscal years ended September 30, 2018, 2017 and 2016 is as follows (in thousands):

Description	Balance at Beginning of Period	Provisions	Reversals of Bad Debt Expense	Write-offs and Adjustments	Balance at End of Period
2018 Allowance for doubtful accounts	\$ 1,381	\$ 708	\$ (724)	\$ (252)	\$ 1,113
2017 Allowance for doubtful accounts	1,543	—	(131)	(31)	1,381
2016 Allowance for doubtful accounts	332	143	48	1,020	1,543

The allowance for sales returns activity for the fiscal years ended September 30, 2018, 2017 and 2016 is as follows (in thousands):

Description	Balance at Beginning of Period	Provisions	Write-offs and Adjustments	Balance at End of Period
2018 Allowance for sales returns	\$ 81	\$ (36)	\$ —	\$ 45
2017 Allowance for sales returns	101	(20)	—	81
2016 Allowance for sales returns	115	(14)	—	101

The following is a summary of inventories at September 30, 2018 and 2017 (in thousands):

	September 30,	
	2018	2017
Inventories		
Raw materials and purchased parts	\$ 57,527	\$ 53,234
Work-in-process	19,547	7,120
Finished goods	19,912	13,043
Total inventories	\$ 96,986	\$ 73,397

The activity for excess and obsolete inventory reserves is as follows for the fiscal years ended September 30, 2018, 2017 and 2016 (in thousands):

Description	Balance at Beginning of Period	Provisions	Inventory Disposals and Adjustments	Balance at End of Period
2018 Reserves for excess and obsolete inventory	\$ 17,734	\$ 4,455	\$ (7,236)	\$ 14,953
2017 Reserves for excess and obsolete inventory	19,663	4,858	(6,787)	17,734
2016 Reserves for excess and obsolete inventory	19,603	5,754	(5,694)	19,663

The activity for valuation allowance for deferred tax assets is as follows for the fiscal years ended September 30, 2018, 2017 and 2016 (in thousands):

Description	Balance at Beginning of Period	Charged to Provisions	Charged to Other Accounts	Balance at End of Period
2018 Valuation allowance for deferred tax assets	\$ 92,297	\$ (72,842)	\$ (874)	\$ 18,581
2017 Valuation allowance for deferred tax assets	104,802	(10,881)	(1,624)	92,297
2016 Valuation allowance for deferred tax assets	18,797	77,531	8,474	104,802

The Company establishes reserves for estimated cost of product warranties based on historical information. Product warranty reserves are recorded at the time product revenue is recognized, and retrofit accruals are recorded at the time retrofit programs are established. The Company's warranty obligation is affected by product failure rates, utilization levels, material usage, service delivery costs incurred in correcting a product failure and supplier warranties on parts delivered to the Company. The following is a summary of product warranty and retrofit activity on a gross basis,

Table of Contents

excluding amounts related to discontinued operations, for the fiscal years ended September 30, 2018, 2017 and 2016 (in thousands):

	Amount
Balance at September 30, 2015	\$ 4,255
Accruals for warranties during the year	5,851
Costs incurred during the year	(5,947)
Balance at September 30, 2016	4,159
Accruals for warranties during the year	6,683
Costs incurred during the year	(5,363)
Balance at September 30, 2017	5,479
Accruals for warranties during the year	5,209
Costs incurred during the year	(4,348)
Balance at September 30, 2018	\$ 6,340

10. Line of Credit

On May 26, 2016, the Company and certain of its subsidiaries entered into a credit agreement with Wells Fargo Bank, N.A. (the "Wells Fargo"). The credit agreement provided for a five-year senior secured revolving line of credit (the "line of credit") of \$75.0 million. The agreement included sub-limits of up to \$25.0 million for letters of credit and \$7.5 million of swing loans at the time there is more than one lender under the credit agreement.

On October 4, 2017, the Company entered into a \$200.0 million Senior Secured Term Loan Facility (the "term loan") with Morgan Stanley Senior Funding, Inc., JPMorgan Chase Bank, N.A. and Wells Fargo Securities, LLC (collectively, the "lenders"). Coincident with the entry into the term loan agreement, the Company amended certain terms and conditions of the credit agreement and entered into an arrangement with Wells Fargo Bank, N.A. and JPMorgan Chase Bank, N.A. Based on the amended terms of the credit agreement, the line of credit continues to provide for revolving credit financing of up to \$75.0 million, subject to borrowing base availability. Borrowing base availability under the amended line of credit excludes collateral related to fixed assets and is redetermined periodically based on certain percentage of certain eligible U.S. assets, including accounts receivable and inventory. The line of credit matures on October 4, 2022 and expires no less than 90 days prior to the term loan expiration.

The sub-limits for letters of credit were reduced to \$7.5 million under the amended terms of the credit agreement. All outstanding borrowings under the credit agreement are guaranteed by the Company and BioStorage Technologies, Inc., its wholly-owned subsidiary (“guarantor”), and subordinated to the obligations under the term loan which are secured by a first priority lien on substantially all of the assets of the Company and the Guarantor, other than accounts receivable and inventory.

There were no amounts outstanding under the line of credit as of September 30, 2018 and September 30, 2017. The Company records commitment fees and other costs directly associated with obtaining line of credit financing as deferred financing costs, which are amortized over the term of the related financing arrangement. Deferred financing costs were \$0.5 million at both September 30, 2018 and September 30, 2017. The line of credit contains certain customary representations and warranties, a financial covenant and affirmative and negative covenants as well as events of default. The Company was in compliance with the line of credit covenants as of September 30, 2018 and September 30, 2017.

11. Debt

On October 4, 2017, the Company entered into a \$200.0 million term loan with the lenders. The term loan was issued at \$197.6 million, or 98.8% of its par value, resulting in a discount of \$2.4 million, or 1.2%, which represented loan origination fees paid at the closing. The Company incurred additional deferred financing costs of \$0.4 million during the year ended September 30, 2018. The loan proceeds are to be used for general corporate purposes, including acquisitions. The loan principal amount may be increased by an aggregate amount equal to \$75.0 million plus any voluntary repayments of the term loans plus any additional amount such that the secured leverage ratio of the Company is less than 3.00 to 1.00.

Table of Contents

Under the term loan agreement, the Company may elect for the loan to bear an interest rate as Eurodollar Borrowings or as Alternate Base Rate Borrowings. Interest applicable to Eurodollar Borrowings is based on the Adjusted LIBO Rate plus applicable margin of 2.50%. The Adjusted LIBO Rate is the rate appearing on Bloomberg screen LIBOR01 which gets reset at the beginning of each selected interest period based on the LIBOR rate then in effect. Interest applicable to ABR Borrowings is based on the Alternate Base Rate plus applicable margin of 1.50%. Alternate Base Rate is determined based on the highest of: (a) the federal funds effective rate plus 0.50%, (b) prime rate plus 1.00%, or (c) one-month LIBOR rate plus 1.00%.

The Company's obligations under the term loan are also guaranteed by BioStorage Technologies, Inc. as the guarantor, subject to the terms and conditions of the term loan agreement. The Company and the guarantor granted the lenders a perfected first priority security interest in substantially all of the assets of the Company and the guarantor to secure the repayment of the term loan.

The term loan matures and becomes fully payable on October 4, 2024. The principal is payable in installments equal to 0.25% of the initial principal amount of the term loans on March 31st, June 30th, September 30th and December 31st of each year, commencing on March 31, 2018, with any remaining amount of principal becoming due and payable on the maturity date. All accrued and unpaid interest on Borrowings shall be due on the last day of each interest period elected by the Company for such Borrowings, except for interest periods of more than three months in which case all accrued and unpaid interest shall be due and payable every three months.

Subject to certain conditions stated in the term loan agreement, the Company may redeem the term loan at any time at its option without a significant premium or penalty, except for a repricing transaction, as defined in the term loan agreement. The Company would be required to redeem the term loan at the principal amount then outstanding upon occurrence of certain events, including (i) net proceeds received from the sale or other disposition of the Company's or guarantor's assets, subject to certain limitations, (ii) casualty and condemnation proceeds received by the Company or the guarantor, subject to certain exceptions, (iii) net proceeds received by the Company or the guarantor from the issuance of debt or disqualified capital stock after October 4, 2017. Commencing on December 31, 2018, the Company is required to make principal payments equal to the excess cash flow amount, as defined in the term loan agreement. Such prepayments are equal to 50% of the preceding year excess cash flow amount reduced by voluntary prepayments of the term loan, subject to certain limitations.

The Company records commitment fees and other costs directly associated with obtaining term loan financing as deferred financing costs which are presented as a reduction of the term loan principal balance. Such costs are accreted over the term of the loan using the effective interest rate method. At September 30, 2018, deferred financing costs were \$2.4 million.

During the year ended September 30, 2018, the weighted average stated interest rate paid on the term loan was 4.4%. During the year ended September 30, 2018, the Company incurred aggregate interest expense of \$9.1 million in connection with the term loan borrowings, including \$0.4 million of deferred financing costs amortization.

The term loan agreement contains certain customary representations and warranties, covenants and events of default. If any of the events of default occur and are not waived or cured within applicable grace periods, any unpaid amounts under the term loan agreement will bear an annual interest rate at 2.00% above the rate otherwise applicable under the terms and conditions of such agreement. The term loan agreement does not contain financial maintenance covenants. As of September 30, 2018, the Company was in compliance with all covenants and conditions under the term loan agreement.

Table of Contents

The following are the future minimum principal payment obligations under the term loan as of September 30, 2018:

The	Amount
Fiscal year ended September 30,	
2019	\$ 2,000
2020	2,000
2021	2,000
2022	2,000
2023	2,000
Thereafter	188,500
Total outstanding principal balance	198,500
Unamortized deferred financing costs	(2,429)
	196,071
Term loan, current portion	2,000
Term loan, long-term portion	\$ 194,071

As of September 30, 2018, estimated fair value of the term loan outstanding principal balance approximates its carrying value. The fair value was determined based on observable market inputs and classified within Level 2 of the fair value hierarchy due to a lack of an active market for this term loan or a similar loan instrument.

On November 15, 2018, in connection with the closing of the GENEWIZ Group (“GENEWIZ”) acquisition, the Company entered into an amendment of the existing term loan agreement which increased its outstanding principal balance to \$546.0 million. Please refer to Note 23, “Subsequent Events”, for further information on the term loan transaction and the acquisition.

12. Income Taxes

The components of the income tax provision (benefit) from continuing operations for the fiscal years are as follows (in thousands):

	Year Ended September 30,		
	2018	2017	2016
Current income tax provision (benefit):			
Federal	\$ —	\$ —	\$ (145)
State	917	402	(193)
Foreign	7,608	7,499	4,709
Total current income tax provision	8,525	7,901	4,371
Deferred income tax provision (benefit):			
Federal	(48,815)	(4,247)	59,906
State	(5,518)	(249)	4,000
Foreign	(1,443)	(25)	(2,027)
Total deferred income tax provision (benefit)	(55,776)	(4,521)	61,879
Income tax provision (benefit)	\$ (47,251)	\$ 3,380	\$ 66,250

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The components of income (loss) from continuing operations before income taxes and equity in earnings of equity method investments for the fiscal years are as follows (in thousands):

	Year Ended September 30,		
	2018	2017	2016
Domestic	\$ 3,122	\$ (13,211)	\$ (26,775)
Foreign	17,344	27,731	8,633
	\$ 20,466	\$ 14,520	\$ (18,142)

Table of Contents

The differences between the income tax provision (benefit) on income (loss) from continuing operations including income from equity in earnings (losses) of equity method investments and income taxes computed using the applicable U.S. statutory federal tax rates for the fiscal years ended September 30, 2018, 2017 and 2016 are as follows (in thousands):

	Year Ended September 30,		
	2018	2017	2016
Income tax provision computed at federal statutory rate	\$ 5,014	\$ 4,923	\$ (6,722)
State income taxes, net of federal benefit	692	137	(374)
Foreign income taxed at different rates	920	(1,644)	(690)
Impact of investments in subsidiaries	(729)	(965)	(971)
Change in deferred tax asset valuation allowance	(75,918)	319	76,486
Net increase (reduction) in uncertain tax positions	220	731	(1,543)
Impact of U.S. federal tax rate change	15,287	—	—
Compensation	(701)	579	743
Tax credits	(1,633)	(1,151)	(1,555)
Merger costs	1,405	—	503
Transition Tax	8,027	—	—
Other	165	451	373
Income tax provision (benefit)	\$ (47,251)	\$ 3,380	\$ 66,250

The Company has not provided income taxes on the outside basis differences of its foreign subsidiaries consistent with the indefinite reinvestment assertion. As of September 30, 2018, the cumulative unremitted earnings contributing to the outside basis difference amounted to approximately \$164.0 million. The basis difference for U.S. tax purposes is lower because the Company has U.S. tax basis in the foreign earnings as a result of the toll charge recognized during fiscal year 2018. The foreign earnings are expected to be reinvested in foreign operations and acquisitions. The Company has not accrued foreign withholding tax costs on unremitted earnings.

The significant components of the net deferred tax assets and liabilities as of September 30, 2018 and 2017 are as follows (in thousands):

	September 30,	
	2018	2017
Accruals and reserves not currently deductible	\$ 14,581	\$ 18,747
Federal, state and foreign tax credits	27,923	25,413
Other assets	175	42
Equity compensation	5,926	7,615
Net operating loss carryforwards	16,790	50,882
Inventory reserves and valuation	6,520	9,847
Deferred tax assets	71,915	112,546
Depreciation and intangible amortization	(19,476)	(21,200)
Deferred tax liabilities	(19,476)	(21,200)
Valuation allowance	(18,581)	(93,402)
Net deferred tax asset (liability)	\$ 33,858	\$ (2,056)

The deferred tax assets on the balance sheet for September 30, 2018 also includes a \$2.8 million deferred tax charge related to the company's intercompany profit elimination. This amount is included in the net deferred tax asset recorded on the balance sheet.

ASC Topic 740, Income Taxes, requires that all available evidence, both positive and negative, be considered in determining, based on the weight of that evidence, whether a valuation allowance is needed. The weight given to the potential effect of negative and positive evidence should be commensurate with the extent to which it can be objectively verified. The more negative evidence that exists, (a) the more positive evidence is necessary and (b) the more difficult it is to support a conclusion that a valuation allowance is not needed for some portion or the entire deferred tax asset. A

Table of Contents

cumulative loss in recent years is considered a significant piece of negative evidence that is difficult to overcome in assessing the need for a valuation allowance.

The Company evaluates the realizability of its deferred tax assets by tax-paying component and assesses the need for a valuation allowance on an annual and quarterly basis. The Company evaluates the profitability of each tax-paying component on a historic cumulative basis and a forward-looking basis in the course of performing this analysis. The Company evaluated all positive and negative evidence in concluding it was appropriate to establish a full valuation allowance against U.S. net deferred tax assets during fiscal year 2016. The company maintained this position throughout fiscal year 2017 and the first quarter of fiscal year 2018.

After evaluating all the relevant positive and negative evidence as of March 31, 2018, the Company concluded that it was more likely than not that a substantial portion of the U.S. deferred tax assets would be realized. In the second quarter of fiscal year 2018 the Company reached a significant level of cumulative profitability in the U.S., coupled with an improved outlook of U.S. earnings. During the full fiscal year 2018, the Company reduced its U.S. valuation against its U.S. net deferred tax assets resulting in a tax benefit of \$77.2 million. The remaining portion of the Company's U.S. valuation allowance is related to the realizability of certain state tax credits and net operating loss carry-forwards. The Company continues to maintain valuation allowances against net deferred tax assets in certain foreign tax-paying components as of the end of fiscal year 2018.

As of September 30, 2018, the Company had state and foreign net operating loss carry-forwards of approximately \$67.4 million and \$58.7 million, respectively. The state net operating losses are generated in various jurisdictions with different carryover periods and expire starting in 2019 through 2035. Certain foreign net operating loss carryovers will begin to expire in 2019.

As of September 30, 2018, the Company had federal research and development tax credit carry-forwards of \$20.4 million. These credit carry-forwards will expire at various dates beginning in 2019 through 2038. The Company also has \$11.0 million of state credits which begin to expire in 2019, while some of these credits have an unlimited carryover period.

During the fiscal year 2018, the Tax Cuts and Jobs Act ("Tax Reform") was enacted in the U.S., making significant tax law changes affecting the Company. The SEC issued Staff Accounting Bulletin 118 ("SAB 118"), which provided guidance for companies that had not completed the accounting for the income tax effects of Tax Reform. Under SAB 118, a company may report provisional amounts based on reasonable estimates where the accounting is incomplete. These amounts are subject to adjustments during a measurement period of up to one year beginning in the reporting period of the enactment date.

Upon the enactment of Tax Reform, the Company is subject to a toll charge in the U.S. on its previously untaxed accumulated foreign earnings. The Company recorded a tax impact of \$8.0 million, net of foreign tax credits, related to the toll charge during the fiscal year ended September 30, 2018. There are still incomplete components related to the accumulated foreign earnings and tax pools for older tax years that require additional time to analyze the data and complete the calculations. The Company will continue to refine these calculations through the quarter ended December 31, 2018 and continue to monitor legislative updates and clarifications and the related impact to the toll charge as recorded during the fiscal year 2018. The Company did not record any current cash U.S. federal tax provision for the toll charge because sufficient net operating loss carryovers and tax credits exist to offset the resulting tax.

The Company has performed studies to determine if there are any annual limitations on the federal net operating losses under the Section 382 of the Internal Revenue Code of 1986, as amended, or the Internal Revenue Code. As a result of these studies, the Company has determined that ownership changes have occurred primarily in connection

with acquisitions when the Company has issued stock to the sellers, as well as ownership changes in the subsidiaries acquired by the Company. Certain limitations have been calculated, and the benefits of the net operating losses that will expire before utilization have not been recorded as deferred tax assets in the accompanying Consolidated Balance Sheets.

The Company maintains liabilities for uncertain tax positions. These liabilities involve judgment and estimation and are monitored based on the best information available. A reconciliation of the beginning and ending amount of the

Table of Contents

consolidated liability for unrecognized income tax benefits during the fiscal years ended September 30, 2018, 2017 and 2016 is as follows (in thousands):

	Total
Balance at September 30, 2015	\$ 2,191
Reductions from settlements with taxing authorities	4,165
Reductions from lapses in statutes of limitations	(897)
Foreign exchange rate adjustment	(32)
Balance at September 30, 2016	5,427
Additions for tax positions in current year	1,869
Reduction for tax positions in prior year	(3,485)
Net reductions from lapses in statutes of limitations	(431)
Foreign exchange rate adjustment	(2)
Balance at September 30, 2017	3,378
Additions for tax positions in current year	874
Reduction for tax positions in prior year	(656)
Reductions from lapses in statutes of limitations	(353)
Balance at September 30, 2018	\$ 3,243

Included in the ending balance of unrecognized tax benefits for the fiscal year ended September 30, 2018 are \$3.0 million of tax benefits that if recognized would impact the effective tax rate. The Company recognizes interest related to unrecognized benefits as a component of the income tax provision (benefit), of which \$0.1 million, \$0.1 million and \$0.1 million, respectively, was recognized for the fiscal years ended September 30, 2018, 2017 and 2016. The statute of limitations lapsed on several uncertain tax positions in the foreign jurisdictions during fiscal year 2018 that resulted in a \$0.7 million reduction in gross unrecognized tax benefits that impacted the effective tax rate.

The Company is subject to U.S. federal income tax and state, local and international income taxes in various jurisdictions. The amount of income taxes paid is subject to the Company's interpretation of applicable tax laws in the jurisdictions in which it files.

In the normal course of business, the Company is subject to income tax audits in various global jurisdictions in which it operates. The years subject to examination vary for the U.S. and international jurisdictions, with the earliest tax year being 2011. Based on the outcome of these examinations or the expiration of statutes of limitations for specific jurisdictions, it is reasonably possible that the related unrecognized tax benefits could change from those recorded in the Company's Consolidated Balance Sheets. The Company currently anticipates that it is reasonably possible that the unrecognized tax benefits will be reduced by approximately \$0.1 million in the next 12 months.

13. Derivative Instruments

The Company has transactions and balances denominated in currencies other than the U.S. dollar. Most of these transactions or balances are denominated in Euros, British Pounds and a variety of Asian currencies. These transactions and balances, including short-term advances between the Company and its subsidiaries, subject the Company's operations to exposure from exchange rate fluctuations. The impact of currency exchange rate movement can be positive or negative in any period. The Company mitigates the impact of potential currency transaction gains and losses on short-term intercompany advances through timely settlement of each transaction, generally within 30 days.

The Company also enters into foreign exchange contracts to reduce its exposure to currency fluctuations. Under forward contract arrangements, the Company typically agrees to purchase a fixed amount of one currency in exchange for a fixed amount of another currency on specified dates with maturities of three months or less. These transactions do not qualify for hedge accounting. Net gains and losses related to these contracts are recorded as a component of "Other

88

Table of Contents

(expense) income, net" in the accompanying Consolidated Statements of Operations and are as follows for the fiscal years ended September 30, 2018, 2017 and 2016 (in thousands):

	Fiscal Year Ended September 30,		
	2018	2017	2016
Realized gains (losses) on derivatives not designated as hedging instruments	\$ (330)	\$ (545)	\$ 1,434

The fair value of derivative instruments are as follows at September 30, 2018 and 2017 (in thousands):

	Fair Value of Assets		Fair Value of Liabilities	
	2018	2017	2018	2017
As of September 30, Derivatives not designated as hedging instruments				
Foreign exchange contracts	\$ 170	\$ 4	\$ (177)	\$ (146)
Total	\$ 170	\$ 4	\$ (177)	\$ (146)

The fair values of the forward contracts described above are recorded in the Company's accompanying Consolidated Balance Sheets as "Prepaid expenses and other current assets" and "Accrued expenses and other current liabilities".

14. Postretirement Benefits

Defined Benefit Pension Plans

The Company has three active defined benefit pension plans (collectively, the "Plans"), including legacy Taiwan Plan, the legacy Switzerland Plan, and the newly acquired Tec-Sem Plan. The Plans cover substantially all of the Company's employees in Switzerland and Taiwan. Retirement benefits are generally earned based on years of service and the level of compensation during active employment, but the level of benefits varies within the Plans. Eligibility is determined in accordance with local statutory requirements.

Table of Contents

The Company uses September 30th as a measurement date to determine net periodic benefit costs, benefit obligations and the value of plan assets for all plans. The following tables set forth the funded status and amounts recognized in the Company's Consolidated Balance Sheets as of September 30, 2018 and 2017 (in thousands):

	September 30,	
	2018	2017
Benefit obligation at beginning of fiscal year	\$ 3,565	\$ 6,444
Benefit obligation through acquisition	7,852	—
Service cost	382	268
Interest cost	75	22
Actuarial loss	(165)	(601)
Benefits paid	(685)	—
Employee contributions	191	—
Settlements paid	—	(2,526)
Foreign currency translation	(71)	(42)
Benefit obligation at end of fiscal year	\$ 11,144	\$ 3,565
Fair value of assets at beginning of fiscal year	\$ 2,225	\$ 4,532
Fair value of assets through acquisition	5,052	—
Actual return on plan assets	69	55
Disbursements	(685)	(51)
Employer contributions	266	153
Employee contributions	191	101
Settlements paid	—	(2,526)
Foreign currency translation	(40)	(39)
Fair value of assets at end of fiscal year	\$ 7,078	\$ 2,225
Accrued benefit obligation	\$ 4,066	\$ 1,340

The accumulated benefit obligation of the Plans is \$10.6 million and \$3.1 million, respectively, at September 30, 2018 and 2017. All Plans have an accumulated benefit obligation and projected benefit obligation in excess of plans' assets at September 30, 2018.

The following table provides pension-related amounts and their classification within the accompanying Consolidated Balance Sheets as of September 30, 2018 and 2017 (in thousands):

	September 30,	
	2018	2017
Accrued compensation and benefits	\$ 431	\$ 112
Long-term pension liability	3,635	1,228
	\$ 4,066	\$ 1,340

The Company bases its determination of pension expense on a market-related valuation of assets, which reduces year-to-year volatility. This market-related valuation recognizes investment gains or losses over a five-year period from the year in which they occur. Investment gains or losses represent the difference between the expected return calculated using the market-related value of assets and the actual return on assets. Since the market-related value of assets recognizes gains or losses over a five-year period, the future value of assets will be impacted as

previously deferred gains or losses are recognized. At September 30, 2018 and 2017, the Company had cumulative unrecognized net actuarial gains less than \$0.1 million and \$0.4 million, respectively, which are amortized into net periodic benefit cost over the average remaining service period of active Plans' participants. At September 30, 2018 and 2017, the Company had cumulative unrecognized investment gains of \$0.5 million and losses of \$0.1 million, respectively, under the Plans which remain to be recognized in the calculation of the market-related values of assets.

Table of Contents

The components of the Company's net pension cost for the fiscal years ended September 30, 2018, 2017 and 2016 are as follows (in thousands):

	Year Ended September 30,		
	2018	2017	2016
Service cost	\$ 382	\$ 268	\$ 546
Interest cost	75	22	66
Amortization of losses	5	7	1
Expected return on plan assets	(66)	(130)	(156)
Net periodic pension cost	\$ 396	\$ 167	\$ 457
Curtailment gain	—	—	(227)
Settlement (gain) loss	—	(259)	—
Total pension cost (gain)	\$ 396	\$ (92)	\$ 230

The following changes in Plans' assets and benefit obligations were recognized in other comprehensive income (loss) as of September 30, 2018 and 2017 (in thousands):

	September 30,	
	2018	2017
Net (gain) loss	\$ (191)	\$ (577)
Amortization of net loss	(7)	(7)
Curtailment gain	—	—
Settlement gain	—	259
Total recognized in other comprehensive income (loss)	(198)	(325)
Total recognized in net periodic pension cost and other comprehensive income (loss)	\$ 593	\$ 491

The settlement gain of \$0.3 million realized during fiscal year ended September 30, 2017 was recorded as a reduction of accumulated other comprehensive income (loss) and the pension cost during the period then ended. The curtailment gain of \$0.2 million incurred during fiscal years ended September 30, 2016 was reclassified from accumulated other comprehensive income (loss) into the results of operations during fiscal year 2016. Additionally, a curtailment gain of \$1.1 million was recognized as a reclassification from accumulated other comprehensive income and a corresponding reduction in pension liabilities during fiscal year ended September 30, 2016. Please refer to Note 15, "Stockholders' Equity", for further information on these reclassifications and their impact on the accumulated other comprehensive income and other comprehensive income during each fiscal year.

Weighted-average assumptions used to determine the projected benefit obligation for the fiscal years ended September 30, 2018, 2017 and 2016 are as follows:

	Year Ended		
	September 30,		
	2018	2017	2016
Discount rate	1.04 %	0.88 %	0.40 %
Expected return on plan assets	1.06 %	1.75 %	1.75 %
Expected rate of compensation increases	1.19 %	1.54 %	1.31 %

In selecting the appropriate discount rates for the Plans, the Company uses country-specific information, adjusted to reflect the duration of the particular plan. The expected return on plan assets is based on an evaluation of fixed income yield curves and equity return assumption studies applied to the Plans' asset allocations.

Plan Assets

The fair value of plan assets for the two Swiss Plans and the Taiwan Plan were \$6.8 million and \$0.3 million, respectively, at September 30, 2018. The assets of the Swiss Plans are invested in a collective fund with multiple employers through a Swiss insurance company, which is a customary practice for Swiss pension plans. The Company

Table of Contents

does not have any rights or an investment authority over the Plan's assets which are invested primarily in highly rated debt securities.

The assets of the Taiwan Plan are invested with a trustee selected by the Taiwan government, and the Company has no investment authority over the Plan's assets.

The allocation of the Plans' assets at September 30, 2018 is as follows:

	September 30, 2018	
Cash and cash equivalents	3	%
Debt securities	69	
Equity securities	6	
Other	22	
	100	%

The fair values of pension assets by asset category and by level at September 30, 2018 are as follows (in thousands):

	As of September 30, 2018			Total
	Level 1	Level 2	Level 3	
Swiss Life collective foundation	\$ —	\$ 6,754	\$ —	\$ 6,754
Taiwan collective trust	—	324	—	324
Total	\$ —	\$ 7,078	\$ —	\$ 7,078

The fair values of pension assets by asset category and by level at September 30, 2017 are as follows (in thousands):

	As of September 30, 2017			Total
	Level 1	Level 2	Level 3	
Swiss Life collective foundation	\$ —	\$ 1,886	\$ —	\$ 1,886
Taiwan collective trust	—	339	—	339
Total	\$ —	\$ 2,225	\$ —	\$ 2,225

Please refer to Note 21, "Fair Value Measurements" for a description of the levels of inputs used to determine fair value measurements.

Benefit payments expected to be paid over the next five fiscal years and thereafter are as follows (in thousands):

Fiscal year ended September 30,	
2019	\$ 266
2020	253
2021	267
2022	297

2023	293
Thereafter	117

The Company expects to contribute \$0.3 million to the Plans in fiscal year 2019 to meet the minimum funding requirements of the Plans.

Defined Contribution Plans

The Company sponsors a defined contribution plan that meets the requirements of Section 401(k) of the Internal Revenue Code. All United States employees who meet minimum age and service requirements are eligible to participate in the plans. The plans allow employees to invest, on a pre-tax basis, a percentage of their annual salary and bonus subject to statutory limitations. The Company matches a portion of their contributions on a pre-tax basis up to a maximum amount of 4.5% of deferred pay. The expense recognized for the defined contribution plans was \$3.4 million, \$3.0 million and \$3.1 million, respectively, for the fiscal years ended September 30, 2018, 2017 and 2016.

Table of Contents

15. Stockholders' Equity

Preferred Stock

Total number of shares of preferred stock authorized for issuance was 1,000,000 shares at September 30, 2018 and 2017, respectively. Preferred stock has a par value of \$0.01 per share and may be issued at the discretion of the Board of Directors without stockholder approval with such designations, rights and preferences as the Board of Directors may determine. There were no shares of preferred stock issued or outstanding at September 30, 2018 or 2017, respectively.

Accumulated Other Comprehensive Income

The following is a summary of the components of accumulated other comprehensive income, net of tax, at September 30, 2018, 2017 and 2016 (in thousands):

	Currency Translation Adjustments	Unrealized Gains (Losses) on Available- for-Sale Securities	Pension Liability Adjustments	Total
Balance at September 30, 2015	\$ 6,545	\$ 103	\$ (750)	\$ 5,898
Other comprehensive (loss) income before reclassifications	8,844	(231)	(322)	8,291
Amounts reclassified from accumulated other comprehensive income	—	125	852	977
Balance at September 30, 2016	15,389	(3)	(220)	15,166
Other comprehensive income (loss) before reclassifications	(221)	(10)	514	283
Amounts reclassified from accumulated other comprehensive income	—	12	(248)	(236)
Balance at September 30, 2017	15,168	(1)	46	15,213
Other comprehensive (loss) income before reclassifications	(1,651)	(110)	124	(1,637)
Amounts reclassified from accumulated other comprehensive income	—	(1)	12	11
Balance at September 30, 2018	\$ 13,517	\$ (112)	\$ 182	\$ 13,587

Unrealized net holding gains (losses) on available-for-sale marketable securities are reclassified from accumulated other comprehensive income into results of operations at the time of the securities' sale, as described in Note 5, "Marketable Securities." Gains (losses) related to defined benefit pension plan settlements are reclassified from accumulated other comprehensive income into results of operations at the time of the settlement, as described in Note 14, "Postretirement Benefits." Defined benefit pension plan curtailments are recognized as reclassifications from accumulated other comprehensive income and corresponding reductions in pension liabilities and net pension cost, as described in Note 14, "Postretirement Benefits."

16. Equity Incentive Plans

The Company's equity incentive plans are intended to attract and retain employees and provide an incentive for them to contribute to the Company's long-term growth and achievement of its long-range performance goals. The equity incentive plans consist of plans under which employees may be granted options to purchase shares of the Company's stock, restricted stock and other equity incentives. Restricted stock awards generally have a three-year vesting period. At September 30, 2018, a total of 3,006,971 shares were reserved and available for future grant under the equity incentive plans.

2015 Equity Incentive Plan

In accordance with the 2015 Equity Incentive Plan (the "2015 Plan") provisions, the Company may grant (i) restricted stock and other stock-based awards, (ii) nonqualified stock options, and (iii) options intended to qualify as incentive stock options under Section 422 of the Internal Revenue Code. All employees of the Company or any affiliate

Table of Contents

of the Company, independent directors, consultants and advisors are eligible to participate in the 2015 Plan. The 2015 Plan provides for the issuance of a maximum of 5,000,000 shares of common stock in addition to the stock option and restricted stock awards granted out of the 2000 Plan that were canceled or forfeited after February 5, 2015 upon expiration of the 2000 Plan on March 31, 2015.

Restricted Stock Activity

The following table summarizes restricted stock unit activity for the fiscal year ended September 30, 2018:

	Shares	Weighted Average Grant-Date Fair Value
Outstanding at September 30, 2017	2,474,011	\$ 12.34
Granted	535,289	33.28
Vested	(732,356)	12.78
Forfeited	(82,432)	16.51
Outstanding at September 30, 2018	2,194,512	\$ 17.20

The weighted average grant date fair value of restricted stock units granted during fiscal years 2018, 2017 and 2016 was \$33.28, \$14.43 and \$10.84 per share, respectively. The fair value of restricted stock units vested during fiscal years 2018, 2017 and 2016 was \$22.0 million, \$15.0 million and \$14.3 million, respectively. During fiscal years 2018, 2017 and 2016, the Company remitted \$7.3 million, \$4.7 million and \$4.4 million, respectively, for withholding taxes on vested restricted stock units, of which \$0.0 million, \$0.1 million and \$4.3 million, respectively, was paid by the Company. During fiscal years 2018, 2017 and 2016, the Company received \$7.3 million, \$4.6 million and \$0.1 million, respectively, in cash proceeds from employees to satisfy their tax obligations as a result of share issuances.

As of September 30, 2018, the future unrecognized stock-based compensation expense related to restricted stock units expected to vest is \$20.7 million and is expected to be recognized over an estimated weighted average amortization period of 1.5 years.

The Company grants restricted stock units that vest over a required service period and /or achievement of certain operating performance goals. Restricted stock units granted with performance goals may also have a required service period following the achievement of all or a portion of the goals. The following table reflects restricted stock units and stock awards granted during fiscal years ended September 30, 2018, 2017 and 2016:

	Total Units	Time-Based Units	Performance- Based Units
Year ended September 30, 2018	535,289	213,893	284,622
Year ended September 30, 2017	1,018,570	386,713	588,338
Year ended September 30, 2016	1,690,582	744,250	860,250

Among the total restricted stock units granted, 134,993, 124,124, and 109,876 shares, respectively, were granted to the employees who belong to the discontinued operations in the year ended September 30, 2018, 2017 and 2016. As of November 7, 2018, only 61,000 shares granted to these employees were not vested and expected to be vested upon the

closing of the Disposition.

Time-Based Grants

Restricted stock units granted with a required service period typically have three-year vesting schedules in which one-third of awards vest at the first anniversary of the grant date, one-third vest at the second anniversary of the grant date and one-third vest at the third anniversary of the grant date, subject to the award holders meeting service requirements.

94

Table of Contents

Stock Grants

The stock awards granted to the members of the Company's Board of Directors include restricted stock awards and deferred restricted stock units.

Restricted stock awards granted during fiscal year 2018 and 2017 are subject to a one-year vesting period. Restricted stock awards granted during fiscal years 2016 vested on the grant date upon issuance.

Certain members of the Board of Directors have elected to defer receiving their annual awards of restricted stock units and related quarterly dividends until they attain a certain age or cease to provide services as the Company's Board members. Annual restricted stock units granted during fiscal years 2018 and 2017 are subject to a one-year vesting period. Annual restricted stock units granted during fiscal year 2016 vested on the grant date upon issuance.

Performance-Based Grants

Performance-based restricted stock units are earned based on the achievement of performance criteria established by the Human Resources and Compensation Committee and approved by the Board of Directors. The criteria for performance-based awards are weighted and have threshold, target and maximum performance goals.

Performance-based awards granted in fiscal year 2018, 2017 and 2016 allow participants to earn 100% of restricted stock units if the Company's performance meets its target goal for each applicable financial metric, and up to a maximum of 200% if the Company's performance for such metrics meets the maximum or stretch goal. Performance below the minimum threshold for each financial metric results in award forfeitures. Performance goals will be measured over a three-year period for each plan and at the end of the period to determine the number of units earned by recipients who continue to meet the service requirement. Around the third anniversary of each plan's grant date, the Company's Board of Directors determines the number of units earned for participants who continue to meet the service requirements on the vest date.

Employee Stock Purchase Plan

The Company maintains an employee stock purchase plan that allows its employees to purchase shares of common stock at a price equal to 85% of the fair market value of the Company's stock at the beginning or the end of the semi-annual period, whichever is lower. On February 8, 2017, the stockholders approved the 2017 Employee Stock Purchase Plan (the "2017 Plan") to replace the 1995 Employee Stock Purchase Plan (the "1995 Plan") which was terminated upon the expiration of the offering period ending on July 31, 2017. The 2017 Plan allows for purchases by employees of up to 1,250,000 shares of the Company's common stock. As of September 30, 2018, 1,123,326 shares of common stock remain available for purchase under the 2017 Plan. During fiscal year ended September 30, 2018, the Company issued 126,674 shares under the 2017 Plan. During fiscal years 2017, the Company issued 162,360 shares under the 1995 Plan.

17. Restructuring and Other Charges

Fiscal Year 2018 Activities

During fiscal year 2018, the Company incurred restructuring charges of \$0.7 million, primarily related to the planned closure of its Denmark facility and reduction in force at Tec-Sem.

During the fourth quarter of fiscal year 2018, the Company initiated an action to consolidate the operations at its Denmark facility into its operations at its Manchester, UK facility to eliminate cost redundancies. The \$0.3 million

charge resulted from the Denmark action was related to Brooks Life Sciences segment.

During the fourth quarter of fiscal year 2018, the Company also initiated a post-acquisition reduction in force plan at Tec-Sem to maximize synergies with the Company's existing infrastructure. The \$0.3 million charge resulted from the Tec-Sem action was related to the Brooks Semiconductor Solutions Group segment.

95

Table of Contents

Fiscal Year 2017 Activities

During fiscal year 2017, the Company recorded restructuring charges of \$3.1 million related to severance, including \$2.5 million attributable to the Brooks Semiconductor Solutions Group segment, \$0.4 million attributable to the Brooks Life Sciences segment and \$0.3 million attributable to the company-wide restructuring action.

The restructuring charges in the Brooks Semiconductor Solutions Group segment consisted of \$1.5 million of charges related to the actions initiated during fiscal year 2017 to streamline field service operations and optimize the cost structure and improve productivity, and \$1.0 million of charges related to the actions initiated prior to fiscal year 2017 primarily related to consolidate the Jena, Germany repair facility into the Chelmsford, Massachusetts repair operation.

Restructuring charges of \$0.3 million were related to the company-wide restructuring action initiated in fiscal year 2016 to streamline business operations, improve competitiveness and overall profitability.

Fiscal Year 2016 Activities

The Company recorded restructuring charges of \$10.2 million during fiscal year 2016 related to severance costs, including \$8.9 million related to restructuring actions initiated during fiscal year 2016 and \$1.3 million related to restructuring actions initiated in prior periods.

The Company's charges from restructuring actions initiated during fiscal year 2016 consisted of: (i) \$3.1 million attributable to the Brooks Life Sciences segment to streamline the segment's management structure, integrate acquisitions, consolidate facility and improve profitability, (ii) \$1.2 million attributable to the Brooks Semiconductor Solutions Group segment to consolidate its Jena, Germany repair facility into its Chelmsford, Massachusetts repair operation, and (iii) \$4.5 million related to the company-wide restructuring action to streamline business operations, improve competitiveness and overall profitability.

The Company's charges from restructuring actions initiated in prior periods was primarily related to the Brooks Semiconductor Solutions segment to integrate Contact, and to close and transfer the Mistelgau, Germany manufacturing operations to a contract manufacturer.

The following is a summary of activity related to the Company's restructuring and other charges, excluding amounts related to the discontinued operations, for the fiscal years ended September 30, 2018, 2017 and 2016 (in thousands):

	Activity - Year Ended September 30, 2018			Balance September 30, 2018
	Balance September 30, 2017	Expenses	Payments	
Total restructuring liabilities related to workforce termination benefits	\$ 1,708	\$ 714	\$ (1,763)	\$ 659