
**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**
Washington, DC 20549

FORM 10-Q

(MARK ONE)

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

For the quarterly period ended March 31, 2018

or

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

For the transition period from _____ to _____

Commission file number 0-23621

MKS INSTRUMENTS, INC.

(Exact name of registrant as specified in its charter)

Massachusetts
(State or other jurisdiction of
incorporation or organization)

04-2277512
(I.R.S. Employer
Identification No.)

2 Tech Drive, Suite 201, Andover, Massachusetts
(Address of principal executive offices)

01810
(Zip Code)

Registrant's telephone number, including area code (978) 645-5500

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 and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted 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 and post such files). Yes No

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

Large accelerated filer	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/> (Do not check if a smaller reporting company)	Smaller reporting company	<input type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

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

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

As of May 1, 2018 the registrant had 54,681,504 shares of common stock outstanding.

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PART I. FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS.

MKS INSTRUMENTS, INC.
CONDENSED CONSOLIDATED BALANCE SHEETS
(in thousands, except share and per share data)
(Unaudited)

ASSETS	March 31, 2018	December 31, 2017
Current assets:		
Cash and cash equivalents, including restricted cash	\$ 340,888	\$ 333,887
Short-term investments	200,614	209,434
Trade accounts receivable, net of allowance for doubtful accounts of \$4,456 and \$4,135 at March 31, 2018 and December 31, 2017, respectively	341,718	300,308
Inventories, net	365,709	339,081
Other current assets	59,093	53,543
Total current assets	<u>1,308,022</u>	<u>1,236,253</u>
Property, plant and equipment, net	172,802	171,782
Goodwill	593,494	591,047
Intangible assets, net	356,345	366,398
Long-term investments	10,841	10,655
Other assets	39,952	37,883
Total assets	<u>\$ 2,481,456</u>	<u>\$ 2,414,018</u>
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Short-term debt	\$ 5,456	\$ 2,972
Accounts payable	92,364	82,518
Accrued compensation	62,505	96,147
Income taxes payable	31,096	21,398
Deferred revenue	14,003	12,842
Other current liabilities	85,601	73,945
Total current liabilities	<u>291,025</u>	<u>289,822</u>
Long-term debt, net	341,290	389,993
Non-current deferred taxes	61,769	61,571
Non-current accrued compensation	53,848	51,700
Other liabilities	35,184	32,025
Total liabilities	<u>783,116</u>	<u>825,111</u>
Commitments and contingencies (Note 19)		
Stockholders' equity:		
Preferred Stock, \$0.01 par value per share, 2,000,000 shares authorized; none issued and outstanding	—	—
Common Stock, no par value, 200,000,000 shares authorized; 54,492,103 and 54,355,535 shares issued and outstanding at March 31, 2018 and December 31, 2017, respectively	113	113
Additional paid-in capital	791,150	789,644
Retained earnings	892,820	795,698
Accumulated other comprehensive income	14,257	3,452
Total stockholders' equity	<u>1,698,340</u>	<u>1,588,907</u>
Total liabilities and stockholders' equity	<u>\$ 2,481,456</u>	<u>\$ 2,414,018</u>

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

MKS INSTRUMENTS, INC.
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS
AND COMPREHENSIVE INCOME
(in thousands, except per share data)
(Unaudited)

	Three Months Ended March 31,	
	2018	2017
Net revenues:		
Products	\$496,677	\$387,938
Services	57,598	49,215
Total net revenues	554,275	437,153
Cost of revenues:		
Cost of products	261,321	205,834
Cost of services	30,099	25,772
Total cost of revenues (exclusive of amortization shown separately below)	291,420	231,606
Gross profit	262,855	205,547
Research and development	34,857	33,282
Selling, general and administrative	82,949	74,220
Acquisition and integration costs	—	1,442
Restructuring	1,220	522
Environmental costs	1,000	—
Amortization of intangible assets	11,190	12,501
Income from operations	131,639	83,580
Interest income	1,105	516
Interest expense	5,430	8,832
Other (expense) income	(572)	2,021
Income before income taxes	126,742	77,285
Provision for income taxes	21,621	12,225
Net income	\$105,121	\$ 65,060
Other comprehensive income:		
Changes in value of financial instruments designated as cash flow hedges, net of tax benefit(1)	\$ 178	\$ (2,440)
Foreign currency translation adjustments, net of tax of \$0	10,771	4,534
Unrecognized pension (loss) gain, net of tax benefit (expense)(2)	(85)	115
Unrealized (loss) on investments, net of tax benefit(3)	(59)	(126)
Total comprehensive income	\$115,926	\$ 67,143
Net income per share:		
Basic	\$ 1.93	\$ 1.21
Diluted	\$ 1.90	\$ 1.18
Cash dividends per common share	\$ 0.18	\$ 0.175
Weighted average common shares outstanding:		
Basic	54,423	53,769
Diluted	55,286	54,958

(1) Tax benefit was \$112 and \$1,831 for the three months ended March 31, 2018 and 2017, respectively.

(2) Tax benefit (expense) was \$36 and \$(86) for the three months ended March 31, 2018 and 2017, respectively.

(3) Tax benefit was \$17 and \$94 for the three months ended March 31, 2018 and 2017, respectively.

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

MKS INSTRUMENTS, INC.
CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)
(Unaudited)

	Three Months Ended March 31,	
	2018	2017
Cash flows provided by operating activities:		
Net income	\$105,121	\$ 65,060
Adjustments to reconcile net income to net cash provided by operating activities:		
Depreciation and amortization	20,492	21,833
Amortization of debt issuance costs, original issue discount and soft call premium	2,019	2,715
Stock-based compensation	10,426	8,782
Provision for excess and obsolete inventory	5,333	5,031
Provision for bad debt	335	316
Deferred income taxes	(705)	(1,809)
Other	34	85
Changes in operating assets and liabilities:		
Trade accounts receivable	(37,336)	(15,215)
Inventories	(28,177)	(11,714)
Income taxes	8,822	8,067
Other current and non-current assets	(942)	(2,199)
Accrued compensation	(32,531)	(16,786)
Other current and non-current liabilities	10,544	1,082
Accounts payable	9,321	809
Net cash provided by operating activities	<u>72,756</u>	<u>66,057</u>
Cash flows provided by investing activities:		
Purchases of investments	(49,753)	(42,292)
Maturities of investments	49,596	55,672
Sales of investments	8,930	21,179
Purchases of property, plant and equipment	(9,390)	(4,099)
Net cash (used in) provided by investing activities	<u>(617)</u>	<u>30,460</u>
Cash flows used in financing activities:		
Proceeds from short and long-term borrowings	11,907	736
Payments on short-term borrowings	(10,274)	(1,398)
Payments on long-term borrowings	(50,000)	(51,570)
Net payments related to employee stock awards	(8,921)	(2,894)
Dividend payments to common stockholders	(9,808)	(9,419)
Net cash used in financing activities	<u>(67,096)</u>	<u>(64,545)</u>
Effect of exchange rate changes on cash and cash equivalents	1,958	(4,696)
Increase in cash and cash equivalents and restricted cash	7,001	27,276
Cash and cash equivalents, including restricted cash, at beginning of period ⁽¹⁾	<u>333,887</u>	<u>233,910</u>
Cash and cash equivalents, including restricted cash, at end of period ⁽²⁾	<u>\$340,888</u>	<u>\$261,186</u>

(1) Restricted cash at the beginning of the period was \$119 and \$5,287 for the three months ended March 31, 2018 and 2017, respectively.

(2) Restricted cash at the end of the period was \$118 and \$5,274 for the three months ended March 31, 2018 and 2017, respectively.

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

MKS INSTRUMENTS, INC.
 NOTES TO UNAUDITED CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
 (in thousands, except share and per share data)

1) Basis of Presentation

The terms “MKS” and the “Company” refer to MKS Instruments, Inc. and its subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation. The interim financial data as of March 31, 2018, and for the three months ended March 31, 2018 are unaudited; however, in the opinion of MKS, the interim data includes all adjustments, consisting of normal recurring adjustments, necessary for a fair statement of the results for the interim periods. The condensed consolidated balance sheet presented as of December 31, 2017 has been derived from the consolidated audited financial statements as of that date. The unaudited condensed consolidated financial statements presented herein have been prepared in accordance with the instructions to Form 10-Q and do not include all of the information and note disclosures required by United States generally accepted accounting principles (“U.S. GAAP”). The unaudited condensed consolidated financial statements should be read in conjunction with the audited consolidated financial statements and notes thereto included in the MKS Annual Report on Form 10-K for the year ended December 31, 2017 filed with the Securities and Exchange Commission on February 28, 2018.

The preparation of these unaudited condensed consolidated financial statements requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent liabilities at the date of the unaudited condensed consolidated financial statements and the reported amounts of revenues and expenses during the reporting period. On an on-going basis, management evaluates its estimates and judgments, including those related to revenue recognition, stock-based compensation, inventory, intangible assets, goodwill and other long-lived assets, warranty liabilities, pension liabilities, acquisition expenses, income taxes and investments. Management bases its estimates and judgments on historical experience and on various other factors that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

Reclassification of certain line items in prior period financial statements

The Company has historically recorded the revenue and related cost of revenue for the sale of its spare parts within Products in its Statements of Operations for the Vacuum & Analysis segment. The Company has now determined that these items are better presented within revenue and related cost of revenue in Services in its Statements of Operations to align with the current manner in which the Company operates its services business, and has elected to reclassify these amounts in previously issued financial statements as shown below. This change in presentation has no impact on total revenue or total cost of revenue.

	Three Months Ended March 31, 2017		
	As previously reported	Adjustment	As re-classified
Net revenues:			
Products	\$ 392,922	(4,984)	\$387,938
Services	44,231	4,984	49,215
Total net revenues	437,153	—	437,153
Cost of revenues:			
Cost of products	205,060	774	205,834
Cost of services	26,546	(774)	25,772
Total cost of revenues	231,606	—	231,606

2) Recently Issued Accounting Pronouncements

In March 2018, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) 2018-05, “Income Taxes (Topic 740).” This standard is an amendment that adopts the language of Securities and Exchange Commission Staff Accounting Bulletin No. 118 (“SAB 118”) and aims to address certain circumstances that may arise for registrants in accounting for the income tax effects of the Tax Cuts and Jobs Act (the “Act”) and to address any uncertainty or diversity of views in practice regarding the application of Topic 740 in situations where a registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting under Topic 740 for certain income tax effects of the Act for the reporting period in which the Act was enacted. The provisions of this ASU were applied to the Company’s December 31, 2017 financial statements. The Company recorded provisional amounts with respect to the Act under SAB 118 at December 31, 2017 and March 31, 2018 and needs to complete additional analysis and receive additional guidance from the Internal Revenue Service with respect to provisions of the Act that affect the Company before the provisional determinations become final. Until the Company completes its analysis and receives additional guidance, the Company is not able to determine if the impact of ASU 2018-05 is material to the Company’s consolidated financial statements in any period.

MKS INSTRUMENTS, INC.
NOTES TO UNAUDITED CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

In February 2018, the FASB issued ASU 2018-02, "Income Statement – Reporting Comprehensive Income (Topic 220)." The amendments in this standard allow a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the Act. The provisions of this ASU are effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The Company does not expect adoption of this ASU to have a material impact on the Company's consolidated financial statements.

In August 2017, the FASB issued ASU 2017-12, "Derivatives and Hedging (Topic 815)." This standard better aligns an entity's risk management activities and financial reporting for hedging relationships through changes to both the designation and measurement guidance for qualifying hedging relationships and the presentation of hedge results. The provisions of this ASU are effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The Company does not expect adoption of this ASU to have a material impact on the Company's consolidated financial statements.

In May 2017, the FASB issued ASU 2017-09, "Compensation-Stock Compensation (Topic 718)-Scope of Modification Accounting." This standard provides guidance about which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting in Topic 718. The provisions of this ASU are effective for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In March 2017, the FASB issued ASU 2017-07, "Compensation-Retirement Benefits (Topic 715)-Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost." This standard requires that an employer disaggregate the service cost component from the other components of net benefit cost. This standard also provides explicit guidance on how to present the service cost component and the other components of the net benefit cost in the income statement and allows only the service cost component of net benefit cost to be eligible for capitalization. The provisions of this ASU are effective for annual periods beginning after December 31, 2017, including interim periods within those fiscal years. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In January 2017, the FASB issued ASU 2017-01, "Business Combinations (Topic 805)-Clarifying the Definition of a Business." This standard clarifies the definition of a business with the objective of adding guidance to assist entities with evaluating whether transactions should be accounted for as acquisitions (or disposals) of assets or businesses. This standard also provides a more robust framework to use in determining when a set of assets and activities is a business. Because the current definition of a business is interpreted broadly and can be difficult to apply, stakeholders indicated that analyzing transactions is inefficient and costly and that the definition does not permit the use of reasonable judgment. The provisions of this ASU are effective for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In November 2016, the FASB issued ASU 2016-18, "Statement of Cash Flows (Topic 230)-Restricted Cash," an amendment to ASU 2016-15. This standard requires that a statement of cash flows explain the change during the period in the total of cash, cash equivalents and amounts generally described as restricted cash and restricted cash equivalents. Therefore, amounts generally described as restricted cash and restricted cash equivalents should be included with cash and cash equivalents when reconciling the beginning-of-period and end-of-period total amounts shown on the statement of cash flows. The provisions of this ASU are effective for annual periods beginning after December 15, 2017, including interim periods within those fiscal years and should be applied at the time of adoption of ASU 2016-15. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In October 2016, the FASB issued ASU 2016-16, "Income Taxes (Topic 740)-Intra-Entity Transfer of Assets Other Than Inventory." This standard requires that an entity recognize the income tax consequences of an intra-entity transfer of an asset other than inventory when the transfer occurs as opposed to when the assets have been sold to an outside party. The provisions of this ASU are effective for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In August 2016, the FASB issued ASU 2016-15, "Statement of Cash Flows (Topic 230)-Classification of Certain Cash Receipts and Cash Payments." This standard addresses eight specific cash flow issues with the objective of addressing the diversity in practice in how certain cash receipts and cash payments are presented and classified in the statement of cash flows under Topic 230. The

MKS INSTRUMENTS, INC.
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(in thousands, except share and per share data)

provisions of this ASU are effective for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In February 2016, the FASB issued ASU 2016-02, "Leases (Topic 842)." This standard requires the recognition of lease assets and liabilities for all leases, with certain exceptions, on the balance sheet. In transition, lessees and lessors are required to recognize and measure leases at the beginning of the earliest period presented using a modified retrospective approach. This ASU is effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The FASB issued additional updates to the new standard in Topic 842 relating to a practical expedients for land easements (Update 2018-01 in January 2018). The Company has reviewed the requirements of this standard and has formulated a plan for implementation. The management team has communicated its approach to the Audit Committee and will provide regular updates as appropriate. The Company is currently working at accumulating a complete population of leases from all of its locations. The Company has selected a software repository to track all of its lease agreements and to assist in the reporting and disclosure requirements required by the standard. The Company will continue to assess and disclose the impact that this ASU will have on its consolidated financial statements, disclosures and related controls, when known.

In January 2016, the FASB issued ASU 2016-01, "Financial Instruments-Overall (Subtopic 825-10)-Recognition and Measurement of Financial Assets and Financial Liabilities." This ASU provides guidance for the recognition, measurement, presentation, and disclosure of financial instruments. The new standard revises accounting related to equity investments and the presentation of certain fair value changes for financial assets and liabilities measured at fair value. Among other things, it amends the presentation and disclosure requirements of equity securities that do not result in consolidation and are not accounted for under the equity method. Changes in the fair value of these equity securities will be recognized directly in net income. This standard is effective for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The Company adopted this ASU during the three month period ended March 31, 2018. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

In May 2014, the FASB issued ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)" ("ASC 606"). This ASU provides for a single comprehensive model to use in accounting for revenue arising from contracts with customers and has replaced most existing revenue recognition guidance in GAAP. This ASU is effective for fiscal years and interim periods within those years beginning after December 15, 2017. The two permitted transition methods under the new standard are the full retrospective method, in which case the standard would be applied to each prior reporting period presented, or the modified retrospective method, in which case the cumulative effect of applying the standard would be recognized at the date of initial application. The Company used the modified retrospective method upon adoption in the first quarter of 2018. The FASB issued additional updates to the new revenue standard in Topic 606 relating to reporting revenue on a gross versus net basis (Update 2016-08 in March 2016), identifying performance obligations and licensing arrangements (Update 2016-10 in April 2016), narrow-scope improvements and practical expedients (Update 2016-12 in May 2016), technical corrections and improvements (Update 2016-20 in December 2016), and SEC Updates (Update 2017-13 in September 2017 and Update 2017-14 in November 2017). The adoption of this ASU did not have a material impact on the Company's consolidated financial statements as described further in Note 3.

3) Revenue from Contracts with Customers

The Company adopted ASC 606 on January 1, 2018 using the modified retrospective method for all contracts not completed as of the date of adoption. The reported results for the three months ended March 31, 2018 reflect the application of ASC 606 guidance while the reported results for 2017 were prepared under the guidance of ASC 605, Revenue Recognition (ASC 605).

The Company has recorded a net increase to opening retained earnings of \$1,809 as of January 1, 2018 due to the cumulative impact of adopting ASC 606, with the impact primarily related to its service business and certain custom products. The impact to revenues for the quarter ended March 31, 2018 was immaterial as a result of applying ASC 606.

The adoption of ASC 606 represents a change in accounting principle that will more closely align revenue recognition with the delivery of the Company's goods or services and will provide financial statement readers with enhanced disclosures. To achieve this core principle, the Company applies the following five steps:

- *Identify the contract with a customer*
- *Identify the performance obligations in the contract*

MKS INSTRUMENTS, INC.
NOTES TO UNAUDITED CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

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

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

Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring goods or providing services. Performance obligations promised in a contract are identified based on the products or services that will be transferred to the customer that are both capable of being distinct, whereby the customer can benefit from the product or service either on its own or together with other resources that are readily available from third parties or from the Company, and are distinct in the context of the contract, whereby the transfer of the product or service is separately identifiable from other promises in the contract. Sales, value add, and other taxes the Company collects concurrent with revenue-producing activities are excluded from revenue. The Company's normal payment terms are 30 to 60 days but vary by the type and location of its customers and the products or services offered. The time between invoicing and when payment is due is not significant. For certain products or services and customer types, the Company requires payment before the products or services are delivered to the customer. None of the Company's contracts as of March 31, 2018 contain a significant financing component. Contract assets as of January 1 and March 31, 2018 were immaterial and included in other current assets.

Contracts with Multiple Performance Obligations

The Company periodically enters into contracts with its customers in which a customer may purchase a combination of goods and or services, such as products with installation services or extended warranty obligations. These contracts include multiple promises that the Company evaluates to determine if the promises are separate performance obligations. Once the Company determines the performance obligations, the Company then determines the transaction price, which includes estimating the amount of variable consideration to be included in the transaction price, if any. To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method depending on the method the Company expects to better predict the amount of consideration to which it will be entitled. There are no constraints on the variable consideration recorded. The Company then allocates the transaction price to each performance obligation in the contract based on a relative stand-alone selling price charged separately to customers or using an expected cost-plus-margin method. The corresponding revenues are recognized when or as the related performance obligations are satisfied, which are noted above. The impact of variable consideration was immaterial during the three months ended March 31, 2018.

Deferred Revenues

The Company's standard assurance warranty period is normally 12 to 24 months. The Company sells separately-priced service contracts and extended warranty contracts related to certain of its products, especially its laser products. The separately priced contracts generally range from 12 to 60 months. The Company normally receives payment at the inception of the contract and recognizes revenue over the term of the agreement in proportion to the costs expected to be incurred in satisfying the obligations under the contract. The Company has elected to use the practical expedient related to disclosing the remaining performance obligations as of March 31, 2018, as the majority have a duration of less than one year.

MKS INSTRUMENTS, INC.
NOTES TO UNAUDITED CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

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

	Three Months Ended March 31, 2018
Beginning balance, January 1 ⁽¹⁾	\$ 14,448
Amount of deferred revenue recognized in income	(4,757)
Additions to deferred revenue	7,639
Ending balance, March 31 ⁽²⁾	\$ 17,330

- (1) Beginning deferred revenue as of January 1, 2018 includes \$11,322 of current deferred revenue and \$3,126 of long-term deferred revenue.
(2) Ending deferred revenue as of March 31, 2018 includes \$14,003 of current deferred revenue and \$3,327 of long-term deferred revenue.

Costs to Obtain and Fulfill a Contract

Under ASC 606, the Company expenses sales commissions when incurred because the amortization period would have been one year or less. These costs are recorded within selling, general and administration expenses. The Company has elected to recognize the costs for freight and shipping when control over products has transferred to the customer as an expense in cost of sales.

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

Disaggregation of Revenue

The following table summarizes revenue from contracts with customers:

	Three Months Ended March 31, 2018		
	Vacuum & Analysis	Light & Motion	Total
Net revenues:			
Products	\$304,336	\$ 192,341	\$496,677
Services	44,008	13,590	57,598
Total net revenues	\$348,344	\$ 205,931	\$554,275

	Three Months Ended March 31, 2017		
	Vacuum & Analysis	Light & Motion	Total
Net revenues:			
Products	\$241,455	\$ 146,483	\$387,938
Services	36,529	12,686	49,215
Total net revenues	\$277,984	\$ 159,169	\$437,153

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

The following table summarizes revenue from contracts with customers by major market:

	Three Months Ended March 31, 2018		
	Vacuum & Analysis	Light & Motion	Total
Net revenues:			
Semiconductor	\$275,701	\$ 37,813	\$313,514
Advanced markets	72,643	168,118	240,761
Total net revenues	\$348,344	\$ 205,931	\$554,275

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	Three Months Ended March 31, 2017		
	Vacuum & Analysis	Light & Motion	Total
Net revenues:			
Semiconductor	\$218,804	\$ 29,700	\$248,504
Advanced markets	59,180	129,469	188,649
Total net revenues	\$277,984	\$ 159,169	\$437,153

Refer to Note 17 in the financial statements for revenue by reportable segment, geography and groupings of similar products.

4) Investments

The fair value of investments classified as short-term consists of the following:

	March 31, 2018	December 31, 2017
Available-for-sale investments:		
Time deposits and certificates of deposit	\$ 10,459	\$ 9,757
Bankers' acceptance drafts	2,179	5,330
Asset-backed securities	38,012	36,990
Commercial paper	16,010	13,750
Corporate obligations	78,767	77,821
Municipal bonds	2,618	1,970
U.S. treasury obligations	30,220	28,078
U.S. agency obligations	22,349	35,738
	<u>\$ 200,614</u>	<u>\$ 209,434</u>

Investments classified as long-term consist of the following:

	March 31, 2018	December 31, 2017
Available-for-sale investments:		
Group insurance contracts	\$ 6,441	\$ 6,255
Cost method investments:		
Minority interest in a private company	4,400	4,400
	<u>\$ 10,841</u>	<u>\$ 10,655</u>

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

As of March 31, 2018:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Short-term investments:				
Available-for-sale investments:				
Time deposits and certificates of deposit	\$ 10,458	\$ 1	\$ —	\$ 10,459
Bankers' acceptance drafts	2,179	—	—	2,179
Asset-backed securities	38,056	13	(57)	38,012
Commercial paper	16,065	—	(55)	16,010
Corporate obligations	78,778	38	(49)	78,767
Municipal bonds	2,620	—	(2)	2,618
U.S. treasury obligations	30,196	24	—	30,220
U.S. agency obligations	22,343	6	—	22,349
	<u>\$200,695</u>	<u>\$ 82</u>	<u>\$ (163)</u>	<u>\$200,614</u>

As of March 31, 2018:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	\$6,382	\$ 59	\$ —	\$ 6,441

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As of December 31, 2017:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Short-term investments:				
Available-for-sale investments:				
Time deposits and certificates of deposit	\$ 9,756	\$ 1	\$ —	\$ 9,757
Bankers acceptance drafts	5,330	—	—	5,330
Asset-backed securities	37,017	15	(42)	36,990
Commercial paper	13,810	—	(60)	13,750
Corporate obligations	77,788	58	(25)	77,821
Municipal bonds	1,970	—	—	1,970
U.S. treasury obligations	28,054	24	—	28,078
U.S. agency obligations	35,728	10	—	35,738
	<u>\$209,453</u>	<u>\$ 108</u>	<u>\$ (127)</u>	<u>\$209,434</u>

As of December 31, 2017:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	<u>\$6,006</u>	<u>\$ 249</u>	<u>\$ —</u>	<u>\$ 6,255</u>

The tables above, which show the gross unrealized gains and (losses) aggregated by investment category for available-for-sale investments as of March 31, 2018 and December 31, 2017, reflect the inclusion within short-term investments of investments with contractual maturities greater than one year from the date of purchase. Management has the ability, if necessary, to liquidate any of its investments in order to meet the Company's liquidity needs in the next 12 months. Accordingly, those investments with contractual maturities greater than one year from the date of purchase are classified as short-term on the accompanying balance sheets.

The Company reviews and evaluates its investments for any indication of possible impairment. Based on this review, the Company has determined that the unrealized losses related to these investments at March 31, 2018 and December 31, 2017, were temporary.

Interest income is accrued as earned. Dividend income is recognized as income on the date the stock trades "ex-dividend." The cost of marketable securities sold is determined by the specific identification method. Realized gains or losses are reflected in income and were not material for the three months ended March 31, 2018 and 2017.

5) Fair Value Measurements

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

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

- Level 1 Quoted prices in active markets for identical assets or liabilities assessed as of the reporting date. Active markets are those in which transactions for the asset or liability occur in sufficient frequency and volume to provide pricing information on an ongoing basis.
- Level 2 Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities; quoted prices in markets that are not active; or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities. Level 2 assets and liabilities include debt securities with quoted prices that are traded less frequently than exchange-traded instruments or securities or derivative contracts that are valued using a pricing model with inputs that are observable in the market or can be derived principally from or corroborated by observable market data.

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Level 3 Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities. Level 3 assets and liabilities include financial instruments whose value is determined using pricing models, discounted cash flow methodologies, or similar techniques, as well as instruments for which the determination of fair value requires significant management judgment or estimation.

In certain cases, the inputs used to measure fair value may fall into different levels of the fair value hierarchy. In such cases, the Company categorizes such assets and liabilities based on the lowest level input that is significant to the fair value measurement in its entirety. The Company's assessment of the significance of a particular input to the fair value measurement in its entirety requires judgment and considers factors specific to the asset or liability.

Assets and liabilities of the Company are measured at fair value on a recurring basis as of March 31, 2018 and are summarized as follows:

Description	March 31, 2018	Fair Value Measurements at Reporting Date		
		Quoted Prices in Active Markets for Identical Assets or Liabilities (Level 1)	Using Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Cash equivalents:				
Money market funds	\$ 1,075	\$ 1,075	\$ —	\$ —
Commercial paper	18,385	—	18,385	—
Corporate obligations	950	—	950	—
Municipal bonds	1,335	—	1,335	—
U.S. treasury obligations	12,953	—	12,953	—
U.S. agency obligations	9,509	—	9,509	—
Restricted cash — money market funds	118	118	—	—
Available-for-sale investments:				
Time deposits and certificates of deposit	10,459	—	10,459	—
Bankers' acceptance drafts	2,179	—	2,179	—
Asset-backed securities	38,012	—	38,012	—
Commercial paper	16,010	—	16,010	—
Corporate obligations	78,767	—	78,767	—
Municipal bonds	2,618	—	2,618	—
U.S. treasury obligations	30,220	—	30,220	—
U.S. agency obligations	22,349	—	22,349	—
Group insurance contracts	6,441	—	6,441	—
Derivatives — currency forward contracts	85	—	85	—
Funds in investments and other assets:				
Israeli pension assets	15,031	—	15,031	—
Derivatives — interest rate hedge —non-current	8,170	—	8,170	—
Total assets	\$ 274,666	\$ 1,193	\$273,473	\$ —
Liabilities:				
Derivatives — currency forward contracts	\$ 8,273	\$ —	\$ 8,273	\$ —
Reported as follows:				
Assets:				
Cash and cash equivalents ⁽¹⁾	\$ 44,207	\$ 1,075	\$ 43,132	\$ —
Restricted cash	118	118	—	—
Short-term investments	200,614	—	200,614	—
Other current assets	85	—	85	—
Total current assets	\$ 245,024	\$ 1,193	\$243,831	\$ —
Long-term investments ⁽²⁾	\$ 6,441	\$ —	\$ 6,441	\$ —
Other assets	23,201	—	23,201	—
Total long-term assets	\$ 29,642	\$ —	\$ 29,642	\$ —
Liabilities:				
Other current liabilities	\$ 8,273	\$ —	\$ 8,273	\$ —

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- (1) The cash and cash equivalent amounts presented in the table above do not include cash of \$294,903 and non-negotiable time deposits of \$1,660 as of March 31, 2018.
- (2) The long-term investments presented in the table above do not include the Company's minority interest investment in a private company, which is accounted for under the cost method.

Assets and liabilities of the Company are measured at fair value on a recurring basis as of December 31, 2017 and are summarized as follows:

Description	December 31, 2017	Fair Value Measurements at Reporting Date Using		
		Quoted Prices in Active Markets for Identical Assets or Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Cash equivalents:				
Money market funds	\$ 4,987	\$ 4,987	\$ —	\$ —
Time deposits and certificates of deposit	2,100	—	2,100	—
Commercial paper	30,475	—	30,475	—
Restricted cash — money market funds	119	119	—	—
Available-for-sale investments:				
Time deposits and certificates of deposit	9,757	—	9,757	—
Bankers acceptance drafts	5,330	—	5,330	—
Asset-backed securities	36,990	—	36,990	—
Commercial paper	13,750	—	13,750	—
Corporate obligations	77,821	—	77,821	—
Municipal bonds	1,970	—	1,970	—
U.S. treasury obligations	28,078	—	28,078	—
U.S. agency obligations	35,738	—	35,738	—
Group insurance contracts	6,255	—	6,255	—
Derivatives — currency forward contracts	168	—	168	—
Funds in investments and other assets:				
Israeli pension assets	15,048	—	15,048	—
Derivatives — interest rate hedge — non-current	6,179	—	6,179	—
Total assets	<u>\$ 274,765</u>	<u>\$ 5,106</u>	<u>\$269,659</u>	<u>\$ —</u>
Liabilities:				
Derivatives — currency forward contracts	\$ 6,198	\$ —	\$ 6,198	\$ —
Total liabilities	<u>\$ 6,198</u>	<u>\$ —</u>	<u>\$ 6,198</u>	<u>\$ —</u>
Assets:				
Cash and cash equivalents ⁽¹⁾	\$ 37,562	\$ 4,987	\$ 32,575	\$ —
Restricted cash	119	119	—	—
Short-term investments	209,434	—	209,434	—
Other current assets	168	—	168	—
Total current assets	<u>\$ 247,283</u>	<u>\$ 5,106</u>	<u>\$242,177</u>	<u>\$ —</u>
Long-term investments ⁽²⁾	\$ 6,255	\$ —	\$ 6,255	\$ —
Other assets	21,227	—	21,227	—
Total long-term assets	<u>\$ 27,482</u>	<u>\$ —</u>	<u>\$ 27,482</u>	<u>\$ —</u>
Liabilities:				
Other current liabilities	\$ 6,198	\$ —	\$ 6,198	\$ —

- (1) The cash and cash equivalent amounts presented in the table above do not include cash of \$292,808 and non-negotiable time deposits of \$3,398 as of December 31, 2017.
- (2) The long-term investments presented in the table above do not include the Company's minority interest investment in a private company, which is accounted for under the cost method.

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Money Market Funds

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

Available-For-Sale Investments

Available-for-sale investments consisted of time deposits and drafts, certificates of deposit, bankers acceptance drafts, asset-backed securities (which include auto loans, credit card receivables and equipment trust receivables), commercial paper, corporate obligations, municipal bonds, U.S. treasury obligations and U.S. agency obligations.

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

Israeli Pension Assets

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

Derivatives

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

6) Derivatives

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

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

Interest Rate Swap Agreement

On September 30, 2016, the Company entered into an interest rate swap agreement to fix the rate on approximately 50% of its then-outstanding balance under the Credit Agreement, as described further in Note 10. This hedge fixes the interest rate paid on the hedged debt at 1.198% per annum plus the applicable credit spread, which was 2.00% as of March 31, 2018, through September 30, 2020. The interest rate swap is recorded at fair value on the balance sheet and changes in the fair value are recognized in other comprehensive income (loss) ("OCI"). To the extent that this arrangement is no longer an effective hedge, any ineffectiveness measured in the hedging relationship is recorded currently in earnings in the period it occurs. The notional amount of this transaction was \$305,000 and had a fair value of \$8,170 at March 31, 2018. The notional amount of this transaction was \$305,000 and had a fair value of \$6,179 at December 31, 2017.

Foreign Exchange Contracts

The Company hedges a portion of its forecasted foreign currency-denominated intercompany sales of inventory, over a maximum period of eighteen months, using forward foreign exchange contracts accounted for as cash-flow hedges related to Japanese, South Korean, British, Euro and Taiwanese currencies. To the extent these derivatives are effective in off-setting the variability of the

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hedged cash flows, and otherwise meet the hedge accounting criteria, changes in the derivatives' fair value are not included in current earnings but are included in OCI in stockholders' equity. These changes in fair value will subsequently be reclassified into earnings, as applicable, when the forecasted transaction occurs. To the extent that a previously designated hedging transaction is no longer an effective hedge, any ineffectiveness measured in the hedging relationship is recorded currently in earnings in the period it occurs. The cash flows resulting from forward exchange contracts are classified in the consolidated statements of cash flows as part of cash flows from operating activities. The Company does not enter into derivative instruments for trading or speculative purposes.

As of March 31, 2018 and December 31, 2017, the Company had outstanding forward foreign exchange contracts with gross notional values of \$228,463 and \$208,922, respectively. The following tables provide a summary of the primary net hedging positions and corresponding fair values held as of March 31, 2018 and December 31, 2017:

Currency Hedged (Buy/Sell)	March 31, 2018	
	Gross Notional Value	Fair Value(1)
U.S. Dollar/Japanese Yen	\$ 75,339	\$(3,212)
U.S. Dollar/South Korean Won	85,680	(2,772)
U.S. Dollar/Euro	33,186	(1,068)
U.S. Dollar/U.K. Pound Sterling	13,807	(512)
U.S. Dollar/Taiwan Dollar	20,451	(624)
Total	<u>\$ 228,463</u>	<u>\$(8,188)</u>

Currency Hedged (Buy/Sell)	December 31, 2017	
	Gross Notional Value	Fair Value(1)
U.S. Dollar/Japanese Yen	\$ 70,175	\$ (233)
U.S. Dollar/South Korean Won	79,672	(3,799)
U.S. Dollar/Euro	26,140	(1,047)
U.S. Dollar/U.K. Pound Sterling	12,104	(337)
U.S. Dollar/Taiwan Dollar	20,831	(614)
Total	<u>\$ 208,922</u>	<u>\$(6,030)</u>

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

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

Derivatives Designated as Hedging Instruments	March 31, 2018	December 31, 2017
Derivative assets:		
Foreign exchange contracts(1)	\$ 85	\$ 168
Foreign currency interest rate hedge(2)	8,170	6,179
Derivative liabilities:		
Foreign exchange contracts(1)	(8,273)	(6,198)
Total net derivative (liability) asset designated as hedging instruments	<u>\$ (18)</u>	<u>\$ 149</u>

- (1) The derivative asset of \$85 and \$168 as of March 31, 2018 and December 31, 2017, respectively, related to foreign exchange contracts are classified in other current assets in the consolidated balance sheet. The derivative liability of \$(8,273) and \$(6,198) as of March 31, 2018 and December 31, 2017 are classified in other current liabilities in the consolidated balance sheet. These foreign exchange contracts are subject to a master netting agreement with one financial institution. However, the Company has elected to record these contracts on a gross basis in the balance sheet.
- (2) The interest rate hedge assets of \$8,170 and \$6,179 as of March 31, 2018 and December 31, 2017, respectively, are classified in other assets in the consolidated balance sheet.

The net amount of existing gains as of March 31, 2018 that the Company expects to reclassify from OCI into earnings within the next twelve months is immaterial.

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

Derivatives Designated as Cash Flow Hedging Instruments	Three Months Ended March 31,	
	2018	2017
Forward exchange contracts:		
Net gain (loss) recognized in OCI(1)	\$ 66	\$ (4,271)
Net (loss) gain reclassified from accumulated OCI into income(2)	\$ (2,539)	\$ 452

- (1) Net change in the fair value of the effective portion classified in OCI.
(2) Effective portion classified in cost of products for the three months ended March 31, 2018 and 2017. The tax effect of the gains or losses reclassified from accumulated OCI into income is immaterial.

The following table provides a summary of the losses on derivatives not designated as hedging instruments:

Derivatives Not Designated as Hedging Instruments	Three Months Ended March 31,	
	2018	2017
Forward exchange contracts:		
Net loss recognized in income(1)	\$ (1,253)	\$ (1,463)

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

7) Inventories, net

Inventories consist of the following:

	March 31, 2018	December 31, 2017
Raw materials	\$ 203,520	\$ 191,351
Work-in-process	62,212	54,050
Finished goods	99,977	93,680
	<u>\$ 365,709</u>	<u>\$ 339,081</u>

8) Dispositions

Sale of Data Analytics Solutions

In April 2017, the Company completed the sale of its Data Analytics Solutions business for total proceeds of \$72,509, net of cash sold and recorded a gain of \$74,856. This business, which had revenues in 2016 of \$12,700 and was included in the Vacuum & Analysis segment, was no longer a part of the Company's long-term strategic objectives.

The business did not qualify as a discontinued operation as this sale did not represent a strategic shift in the Company's business, nor did the sale have a major effect on the Company's operations. Therefore, the results of operations for all periods are included in the Company's income from operations. The assets and liabilities of this business have not been reclassified or segregated in the consolidated balance sheet or consolidated statements of cash flows as the amounts were immaterial.

9) Goodwill and Intangible Assets

Goodwill

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

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

The changes in the carrying amount of goodwill and accumulated impairment (loss) during the three months ended March 31, 2018 and year ended December 31, 2017 were as follows:

	Three Months Ended March 31, 2018			Twelve Months Ended December 31, 2017		
	Gross Carrying Amount	Accumulated Impairment (Loss)	Net	Gross Carrying Amount	Accumulated Impairment (Loss)	Net
Beginning balance at January 1	\$735,323	\$ (144,276)	\$591,047	\$727,999	\$ (139,414)	\$588,585
Sale of business ⁽¹⁾	—	—	—	(3,115)	—	(3,115)
Impairment loss ⁽²⁾	—	—	—	—	(4,862)	(4,862)
Foreign currency translation	2,447	—	2,447	10,439	—	10,439
Ending balance at March 31, 2018 and December 31, 2017	<u>\$737,770</u>	<u>\$ (144,276)</u>	<u>\$593,494</u>	<u>\$735,323</u>	<u>\$ (144,276)</u>	<u>\$591,047</u>

- (1) In 2017, the Company sold its Data Analytics business and, as a result, charged the related goodwill of \$(3,115) to the gain on sale of business.
(2) In 2017, the Company recorded an impairment loss of \$(4,862) related to the write-off of goodwill related to the discontinuation of a product line and consolidation of two manufacturing plants.

Intangible Assets

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

As of March 31, 2018:	Gross	Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
	Completed technology	\$172,431	\$ (105)	\$ (120,898)	\$ 425
Customer relationships	282,744	(1,406)	(50,138)	2,682	233,882
Patents, trademarks, trade names and other	110,523	—	(39,958)	45	70,610
	<u>\$565,698</u>	<u>\$ (1,511)</u>	<u>\$ (210,994)</u>	<u>\$ 3,152</u>	<u>\$356,345</u>

As of December 31, 2017:	Gross	Impairment Charges ⁽²⁾	Accumulated Amortization	Foreign Currency Translation	Net
	Completed technology ⁽¹⁾	\$172,431	\$ (105)	\$ (115,371)	\$ 333
Customer relationships ⁽¹⁾	282,744	(1,406)	(45,518)	1,571	237,391
Patents, trademarks, trade names and other ⁽¹⁾	110,523	—	(38,730)	(74)	71,719
	<u>\$565,698</u>	<u>\$ (1,511)</u>	<u>\$ (199,619)</u>	<u>\$ 1,830</u>	<u>\$366,398</u>

- (1) In 2017, the Company sold its Data Analytics business and, as a result, wrote off the related intangibles of \$4,155 of completed technology, \$2,300 of customer relationships and \$1,200 of patents, trademarks, trade names and other, which were fully amortized at the time of sale.
(2) In 2017, the Company recorded impairment charges of \$1,511 related to the write-off of intangible assets as a result of the discontinuation of a product line and consolidation of two manufacturing plants.

Aggregate amortization expense related to acquired intangibles for the three months ended March 31, 2018 and 2017 was \$11,190 and \$12,501, respectively. The amortization expense for the three months ended March 31, 2018 and 2017, was net of \$185 and

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\$177, respectively, of amortization income from unfavorable lease commitments. Aggregate net amortization expense related to acquired intangible assets and unfavorable lease commitments for future years is as follows:

Year	Amount
2018 (remaining)	\$ 32,596
2019	40,511
2020	28,393
2021	20,485
2022	17,811
2023	17,427
Thereafter	140,413

10) Debt

Term Loan Credit Agreement

In connection with the completion of the Company's acquisition of Newport Corporation ("Newport") in April 2016 (the "Newport Merger"), the Company entered into a term loan credit agreement (the "Credit Agreement") with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto (the "Lenders"), that provided senior secured financing of \$780,000, subject to increase at the Company's option in accordance with the Credit Agreement (the "Term Loan Facility"). Borrowings under the Term Loan Facility bear interest per annum at one of the following rates selected by the Company: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the "prime rate" quoted in The Wall Street Journal, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00%, and (4) a floor of 1.75%, plus, in each case, an applicable margin; or (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, subject to a LIBOR rate floor of 0.75%, plus an applicable margin. The Company has elected the interest rate as described in clause (b). The Credit Agreement provides that all loans will be determined by reference to the Base Rate if the LIBOR rate cannot be ascertained, if regulators impose material restrictions on the authority of a lender to make LIBOR rate loans, or for other reasons. The Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

On June 9, 2016, the Company entered into Amendment No. 1 (the "Repricing Amendment 1") to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 1 decreased the applicable margin for borrowings under the Company's Term Loan Facility to 2.50% for base rate borrowings and 3.50% for LIBOR borrowings and extended the period during which a prepayment premium may be required for a "Repricing Transaction" (as defined in the Credit Agreement) until six months after the effective date of the Repricing Amendment 1. In connection with the execution of the Repricing Amendment 1, the Company paid a prepayment premium of 1.00%, or \$7,300, as well as certain fees and expenses of the administrative agent and the Lenders, in accordance with the terms of the Credit Agreement. Immediately prior to the effectiveness of the Repricing Amendment 1, the Company prepaid \$50,000 of principal under the Credit Agreement. In September 2016, the Company prepaid an additional \$60,000 under the Credit Agreement.

On September 30, 2016, the Company entered into an interest rate swap agreement, which has a maturity date of September 30, 2020, to fix the rate on \$335,000 of the then-outstanding balance of the Credit Agreement. The rate is fixed at 1.198% per annum plus the applicable credit spread, which was 2.00% at March 31, 2018. The notional amount of this transaction was \$305,000 and had a fair value of \$8,170 at March 31, 2018.

On December 14, 2016, the Company entered into Amendment No. 2 (the "Repricing Amendment 2") to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 2 decreased the applicable margin for the Company's term loan under the Credit Agreement to 2.75% for LIBOR borrowings and 1.75% for base rate borrowings and reset the period during which a prepayment premium may be required for a Repricing Transaction until six months after the effective date of the Repricing Amendment 2. In November 2016, prior to the effectiveness of the Repricing Amendment 2, the Company prepaid an additional \$40,000 of principal under the Credit Agreement. In March 2017, the Company prepaid an additional \$50,000 of principal under the Credit Agreement.

On July 6, 2017, the Company entered into Amendment No. 3 (the "Repricing Amendment 3") to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 3 decreased the applicable margin for the Company's term loan under the Credit Agreement to 2.25% for LIBOR rate loans when the Total Leverage Ratio (as defined in the Credit Agreement) was at or above 1.25:1 and decreased to 2.00% when the Total Leverage Ratio was below 1.25:1, both with a LIBOR floor of 0.75%. The margin for base rate borrowings

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decreased to 1.25% when the Total Leverage Ratio is at or above 1.25:1 and to 1.00% when the Total Leverage Ratio is below 1.25:1. The period during which a prepayment premium may be required for a Repricing Transaction was reset to six months after the effective date of the Repricing Amendment 3.

In July 2017, August 2017, November 2017 and March 2018 the Company prepaid \$50,000, \$75,000, \$50,000 and \$50,000, respectively, of principal under the Credit Agreement. As of March 31, 2018, after total prepayments of \$425,000 and regularly scheduled principal payments of \$6,536, the total outstanding principal balance was \$348,464. The interest rate as of March 31, 2018 was 3.648%.

On April 11, 2018, the Company entered into Amendment No. 4 (the "Repricing Amendment 4") to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 4 decreased the applicable margin for the Company's LIBOR rate term loan under the Credit Agreement to 1.75%, with a LIBOR floor of 0.75%. The margin for base rate borrowings decreased to 0.75% with a base rate floor of 1.75%. The period during which a prepayment premium may be required for a Repricing Transaction was reset to six months after the effective date of the Repricing Amendment 4.

The Company incurred \$28,747 of deferred finance fees, original issue discount and repricing fees related to the term loans under the Term Loan Facility, which is included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method. A portion of these fees has been accelerated in connection with the various debt prepayments during 2016, 2017 and 2018. As of March 31, 2018, the remaining balance of the deferred finance fees, original issue discount and repricing fee related to the Term Loan Facility was \$7,226.

Under the Credit Agreement, the Company is required to prepay outstanding term loans, subject to certain exceptions, with portions of its annual excess cash flow as well as with the net cash proceeds of certain asset sales, certain casualty and condemnation events and the incurrence or issuance of certain debt. The Company is also required to make scheduled quarterly payments each equal to 0.25% of the principal amount of the term loans outstanding, less the amount of certain voluntary and mandatory repayments after such date, with the balance due on the seventh anniversary of the closing date. As a result of making total prepayments of \$425,000 through March 31, 2018, the Company is no longer required to make any scheduled principal payments until maturity date of the loan.

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

The Credit Agreement contains customary representations and warranties, affirmative and negative covenants and provisions relating to events of default. If an event of default occurs, the Lenders under the Term Loan Facility will be entitled to take various actions, including the acceleration of amounts due under the Term Loan Facility and all actions generally permitted to be taken by a secured creditor. At March 31, 2018, the Company was in compliance with all covenants under the Credit Agreement.

Senior Secured Asset-Based Revolving Credit Facility

In connection with the completion of the Newport Merger, the Company also entered into an asset-based credit agreement with Deutsche Bank AG New York Branch, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto (the "ABL Facility"), that provides senior secured financing of up to \$50,000, subject to a borrowing base limitation. The borrowing base for the ABL Facility at any time equals the sum of: (a) 85% of certain eligible accounts; plus (b) subject to certain notice and field examination and appraisal requirements, the lesser of (i) the lesser of (A) 65% of the lower of cost or market value of certain eligible inventory and (B) 85% of the net orderly liquidation value of certain eligible inventory and (ii) 30% of the borrowing base; minus (c) reserves established by the administrative agent; provided that until the administrative agent's receipt of a field examination of accounts receivable the borrowing base shall be equal to 70% of the book value of certain eligible accounts. The ABL Facility includes borrowing capacity in the form of letters of credit up to \$15,000. The Company has not drawn against the ABL Facility as of March 31, 2018.

Borrowings under the ABL Facility bear interest per annum at one of the following rates selected by the Company: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the "prime rate" quoted in The Wall Street Journal, and (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00%, plus, in each case, an initial applicable margin of 0.75%; and (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing

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adjusted for certain additional costs, plus an initial applicable margin of 1.75%. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, the applicable margin for borrowings thereunder is subject to upward or downward adjustment each fiscal quarter, based on the average historical excess availability during the preceding quarter.

The Company incurred \$1,201 of costs in connection with the ABL Facility, which were capitalized and included in other assets in the accompanying consolidated balance sheets and are being amortized to interest expense using the straight-line method over the contractual term of five years of the ABL Facility.

In addition to paying interest on outstanding principal under the ABL Facility, the Company is required to pay a commitment fee in respect of the unutilized commitments thereunder. The initial commitment fee is 0.375% per annum. The total commitment fee recognized in interest expense for the three months ended March 31, 2018, was \$95. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, the commitment fee is subject to downward adjustment based on the amount of average unutilized commitments for the three month period immediately preceding such adjustment date. The Company must also pay customary letter of credit fees and agency fees.

Lines of Credit and Short-Term Borrowing Arrangements

One of the Company's Japanese subsidiaries has lines of credit and short-term borrowing arrangements with two financial institutions, which arrangements generally expire and are renewed at three month intervals. The lines of credit provided for aggregate borrowings as of March 31, 2018 of up to an equivalent of \$21,641 U.S. dollars. One of the borrowing arrangements has an interest rate based on the Tokyo Interbank Offer Rate at the time of borrowing and the other has an interest rate based on the Japanese Short-Term Prime Lending Rate. Total borrowings outstanding under these arrangements were \$941 at March 31, 2018. There were no borrowings outstanding under these arrangements at December 31, 2017.

The Company assumed various revolving lines of credit and a financing facility with the completion of the Newport Merger. These revolving lines of credit and financing facility have no expiration date and provided for aggregate borrowings as of March 31, 2018 of up to an equivalent of \$9,879 U.S. dollars. These lines of credit have a base interest rate of 1.25% plus a Japanese Yen overnight LIBOR rate. Total borrowings outstanding under these arrangements were \$3,828 and \$2,965 at March 31, 2018 and December 31, 2017.

One of the Company's Austrian subsidiaries has various outstanding loans from the Austrian government to fund research and development. These loans are unsecured and do not require principal repayment as long as certain conditions are met. Interest on these loans is payable semi-annually. The interest rates associated with these loans range from 0.75% to 2.00%.

	<u>March 31, 2018</u>	<u>December 31, 2017</u>
Short-term debt:		
Japanese lines of credit	\$ 3,915	\$ 2,750
Japanese receivables financing facility	854	215
Austrian loans due through March 2019	681	—
Other debt	6	7
	<u>\$ 5,456</u>	<u>\$ 2,972</u>
	<u>March 31, 2018</u>	<u>December 31, 2017</u>
Long-term debt:		
Austrian loans due through March 2020	\$ 52	\$ 714
Term Loan Facility, net ⁽¹⁾	341,238	389,279
	<u>\$ 341,290</u>	<u>\$ 389,993</u>

(1) Net of deferred financing fees, original issuance discount and repricing fee of \$7,226 and \$9,185 as of March 31, 2018 and December 31, 2017, respectively.

The Company recognized interest expense of \$5,430 and \$8,832 for the three months ended March 31, 2018 and 2017, respectively.

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Contractual maturities of the Company's debt obligations as of March 31, 2018 are as follows:

Year	Amount
2018 (remaining)	\$ 4,788
2019	668
2020	52
2021	—
2022	—
Thereafter	348,464

11) Product Warranties

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

Product warranty activities were as follows:

	Three Months Ended March 31,	
	2018	2017
Beginning of period	\$ 10,104	\$ 8,261
Provision for product warranties	5,184	3,014
Direct and other charges to warranty liability	(4,073)	(2,790)
End of period ⁽¹⁾	<u>\$ 11,215</u>	<u>\$ 8,485</u>

- (1) Short-term product warranty of \$10,856 and long-term product warranty of \$359 as of March 31, 2018, are included within other current liabilities and other liabilities, respectively, within the accompanying condensed consolidated balance sheet. Short-term product warranty of \$8,071 and long-term product warranty of \$414 as of March 31, 2017, are included within other current liabilities and other liabilities, respectively, within the accompanying condensed consolidated balance sheet.

12) Income Taxes

The Act was enacted on December 22, 2017. The Act reduces the U.S. federal corporate income tax rate from 35% to 21%, requires companies to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously tax deferred, and creates new taxes on certain foreign sourced earnings. The Company is applying SAB 118 when accounting for the enactment effects of the Act. As of March 31, 2018, the Company has not completed the accounting for all of the tax effects of the Act, however provisional estimates have been recorded.

For the quarter ended March 31, 2018, the Company recognized a tax benefit of \$790 related to the provisional estimates recorded for the Act and included these adjustments as a component of income tax expense from continuing operations. The calculations will continue to be refined and adjusted as additional analysis is completed and more guidance is issued. These future adjustments could be material to income tax expense.

The global intangible low-taxed income ("GILTI") provision from the Act subjects a U.S. shareholder to current tax on GILTI earned by certain foreign subsidiaries. The FASB Staff Q&A, Topic 740 No. 5, Accounting for Global Intangible Low-Taxed Income, states that an entity can make an accounting policy election to either recognize deferred taxes for temporary differences expected to reverse as GILTI in future years or to recognize the resulting tax on GILTI as a period expense in the period the tax is incurred. The Company has elected to recognize the resulting tax on GILTI as a period expense in the period the tax is incurred and expects to incur tax for the year ended December 31, 2018. The reasonable estimate for this adjustment, net of foreign tax credits, increased the Company's effective tax rate for 2018 by approximately 1.0%.

The Company's effective tax rate for the three months ended March 31, 2018 and 2017 was 17.1% and 15.8%, respectively. The effective tax rate for the three months ended March 31, 2018, and related income tax expense, was lower than the U.S. statutory tax rate mainly due to the geographic mix of income earned by the Company's international subsidiaries being taxed at rates lower than the U.S. statutory tax rate, windfall benefits of stock compensation, and the new deduction for foreign derived intangible income

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from the Act offset by the tax effects of the new provision for global intangible low taxed income from the Act and state income taxes.

The effective tax rate for the three months ended March 31, 2017 was lower than the U.S. statutory tax rate mainly due to the impact of lower tax rates on foreign income, the deduction for domestic production activities and windfall benefits of stock compensation.

As of March 31, 2018 and December 31, 2017, the total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately \$27,938 and \$27,345, respectively. As of March 31, 2018, if these benefits were recognized in a future period, the timing of which is not estimable, the net unrecognized tax benefit of \$20,525, excluding interest and penalties, would impact the Company's effective tax rate. The Company accrues interest expense, and if applicable, penalties, for any uncertain tax positions. Interest and penalties are classified as a component of income tax expense. As of March 31, 2018 and December 31, 2017, the Company had accrued interest on unrecognized tax benefits of approximately \$532 and \$327, respectively.

Over the next 12 months it is reasonably possible that the Company may recognize approximately \$1,047 of previously net unrecognized tax benefits, excluding interest and penalties, related to various U.S. federal, state and foreign tax positions primarily as a result of the expiration of certain statutes of limitations.

The Company and its subsidiaries are subject to examination by U.S. federal, state and foreign tax authorities. The United States Internal Revenue Service commenced an examination of the Company's U.S. federal income tax filings for tax years 2015 and 2016 during the quarter ended September 30, 2017. This audit was effectively settled during the quarter ended March 31, 2018, and the impact was not material. Also during the quarter, the Company received notification from the United States Internal Revenue Service that a new audit is scheduled to begin for its U.S. subsidiary, Newport Corporation, for tax year 2015. The U.S. statute of limitations remains open for tax years 2014 through present. The statute of limitations for the Company's tax filings in other jurisdictions varies between fiscal years 2012 through present. We also have certain federal credit carry-forwards and state tax loss and credit carry-forwards that are open to examination for tax years 2000 through the present.

13) Pension Plans

As a result of the acquisition of Newport, the Company has assumed all assets and liabilities of Newport's defined benefit pension plans, which covers substantially all of its full-time employees in France, Germany, Israel and Japan. In addition, there are certain pension liabilities relating to former employees in the United Kingdom. The German plan is unfunded, as permitted under the plan and applicable laws. The net periodic benefit costs were immaterial for both the three month periods ended March 31, 2018 and 2017. The Company's contributions to these plans for both the three month period ended March 31, 2018 and 2017, as required by local pension accounting laws, were immaterial.

14) Net Income Per Share

The following table sets forth the computation of basic and diluted net income per share:

	Three Months Ended March 31,	
	2018	2017
Numerator:		
Net income	\$ 105,121	\$ 65,060
Denominator:		
Shares used in net income per common share — basic	54,423,000	53,769,000
Effect of dilutive securities:		
Restricted stock units, stock appreciation rights and shares issued under employee stock purchase plan	863,000	1,189,000
Shares used in net income per common share — diluted	55,286,000	54,958,000
Net income per common share:		
Basic	\$ 1.93	\$ 1.21
Diluted	\$ 1.90	\$ 1.18

Basic earnings per share ("EPS") is computed by dividing income available to common stockholders by the weighted-average number of common shares outstanding during the period. The computation of diluted EPS is similar to the computation of basic EPS except that the denominator is increased to include the number of additional common shares that would have been outstanding

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(using the treasury stock method) if securities containing potentially dilutive common shares (restricted stock units and stock appreciation rights) had been converted to such common shares, and if such assumed conversion is dilutive.

For the three months ended March 31, 2018, there were approximately 380 weighted-average restricted stock units and no weighted-average stock appreciation rights, that would have had an anti-dilutive effect on EPS, and would thus need to be excluded from the computation of diluted weighted-average shares. For the three months ended March 31, 2017, there were no weighted-average shares of restricted stock units or stock appreciation rights that would have had an anti-dilutive effect on EPS, and would thus need to be excluded from the computation of diluted weighted-average shares.

15) Stockholders' Equity

Share Repurchase Program

On July 25, 2011, the Company's Board of Directors approved a share repurchase program for the repurchase of up to an aggregate of \$200,000 of its outstanding common stock from time to time in open market purchases, privately negotiated transactions or through other appropriate means. The timing and quantity of any shares repurchased will depend upon a variety of factors, including business conditions, stock market conditions and business development activities, including, but not limited to, merger and acquisition opportunities. These repurchases may be commenced, suspended or discontinued at any time without prior notice. The Company has repurchased approximately 1,770,000 shares of common stock for approximately \$52,000 pursuant to the program since its adoption. During the three months ended March 31, 2018 and 2017, there were no repurchases of common stock.

Cash Dividends

Holders of the Company's common stock are entitled to receive dividends when and if they are declared by the Company's board of directors. During the three months ended March 31, 2018, we paid cash dividends of \$9,808 in the aggregate or \$0.18 per share. During the three months ended March 31, 2017, we paid cash dividends of \$9,419 in the aggregate or \$0.175 per share. Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of the Company's Board of Directors. In addition, under the terms of the Company's senior secured Term Loan Facility and its senior secured asset-based revolving credit facility, the Company may be restricted from paying dividends under certain circumstances.

16) Stock-Based Compensation

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

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

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

During the three months ended March 31, 2018, the Company granted 122,831 RSUs with a weighted average grant date fair value of \$109.62. During the three months ended March 31, 2017, the Company granted 171,179 RSUs with a weighted average grant date fair value of \$66.06. There were no SARs granted during the three months ended March 31, 2018 or 2017.

The total stock-based compensation expense included in the Company's consolidated statements of income and comprehensive income was as follows:

	Three Months Ended March 31, 2018	Three Months Ended March 31, 2017
Cost of revenue	\$ 1,005	\$ 930
Research and development expense	722	745
Selling, general and administrative expense	8,699	7,107
Total pre-tax stock-based compensation expense	<u>\$ 10,426</u>	<u>\$ 8,782</u>

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At March 31, 2018, the total compensation expense related to unvested stock-based awards granted to employees, officers and directors under the 2014 Plan that had not been recognized was \$22,844, net of estimated forfeitures. The future compensation expense is recognized on a straight-line basis over the requisite service period, net of estimated forfeitures except for retirement eligible employees in which the Company expenses the fair value of the grant in the period the grant is issued. The Company considers many factors when estimating expected forfeitures, including types of awards and historical experience. Actual results and future changes in estimates may differ substantially from the Company's current estimates.

The following table presents the activity for RSUs under the Plan:

	Three Months Ended March 31, 2018	
	Outstanding RSUs	Weighted Average Grant Date Fair Value
RSUs — beginning of period	943,379	\$ 47.57
Accrued dividend shares	18	124.85
Granted	122,831	109.62
Vested	(204,290)	40.96
Forfeited	(23,740)	61.63
RSUs — end of period	<u>838,198</u>	<u>\$ 57.88</u>

The following table presents the activity for SARs under the Plan:

	Three Months Ended March 31, 2018	
	Outstanding SARs	Weighted Average Grant Date Fair Value
SARs — beginning of period	282,907	\$ 28.62
Exercised	(17,775)	27.90
Forfeited or expired	(773)	31.13
SARs Outstanding — end of period	<u>264,359</u>	<u>\$ 28.66</u>

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

The Company is a global provider of instruments, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity. The Company's products are derived from its core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, residual gas analysis, leak detection, control technology, ozone generation and delivery, RF & DC power, reactive gas generation, vacuum technology, lasers, photonics, sub-micron positioning, vibration control, and optics. The Company also provides services related to the maintenance and repair of its products, installation services and training.

The Company's Chief Operating Decision Maker ("CODM") utilizes financial information to make decisions about allocating resources and assessing performance for the entire Company, which is used in the decision making process to assess performance. Based upon the information provided to the CODM, the Company has determined it has two reportable segments. The Company's two reportable segments are: Vacuum & Analysis and Light & Motion.

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

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

The Company derives its segment results directly from the manner in which results are reported in its management reporting system. The accounting policies that the Company uses to derive reportable segment results are substantially the same as those used for external reporting purposes. The Company does not disclose external or intersegment revenues separately by reportable segment as this information is not presented to the CODM for decision making purposes.

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The following are net revenues by reportable segment:

	Three Months Ended March 31,	
	2018	2017
Vacuum & Analysis	\$ 348,344	\$ 277,984
Light & Motion	205,931	159,169
	<u>\$ 554,275</u>	<u>\$ 437,153</u>

The following is a reconciliation of segment gross profit to consolidated net income:

	Three Months Ended March 31,	
	2018	2017
Gross profit by reportable segment:		
Vacuum & Analysis	\$ 158,500	\$ 128,924
Light & Motion	104,355	76,623
Total gross profit by reportable segment	262,855	205,547
Operating expenses:		
Research and development	34,857	33,282
Selling, general and administrative	82,949	74,220
Acquisition and integration costs	—	1,442
Restructuring	1,220	522
Environmental costs	1,000	—
Amortization of intangible assets	11,190	12,501
Income from operations	131,639	83,580
Interest and other expense, net	(4,897)	(6,295)
Income before income taxes	126,742	77,285
Provision for income taxes	21,621	12,225
Net income	<u>\$ 105,121</u>	<u>\$ 65,060</u>

The following are capital expenditures by reportable segment for the three months ended March 31, 2018 and 2017:

	Vacuum & Analysis	Light & Motion	Total
Three Months Ended March 31, 2018:			
Capital expenditures	\$ 6,197	\$ 3,193	\$9,390
Three Months Ended March 31, 2017:			
Capital expenditures	\$ 2,374	\$ 1,725	\$4,099

The following are depreciation and amortization of intangible assets by reportable segment for the three months ended March 31, 2018 and 2017:

	Vacuum & Analysis	Light & Motion	Total
Three Months Ended March 31, 2018:			
Depreciation and amortization	\$ 5,129	\$ 15,363	\$20,492
Three Months Ended March 31, 2017:			
Depreciation and amortization	\$ 5,122	\$ 16,711	\$21,833

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

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The following are segment assets by reportable segment:

March 31, 2018:	Vacuum & Analysis	Light & Motion	Corporate, Eliminations & Other	Total
Segment assets:				
Accounts receivable	\$ 225,822	\$ 131,677	\$ (15,781)	\$341,718
Inventory, net	216,237	149,472	—	365,709
Total segment assets	<u>\$ 442,059</u>	<u>\$ 281,149</u>	<u>\$ (15,781)</u>	<u>\$707,427</u>

December 31, 2017:	Vacuum & Analysis	Light & Motion	Corporate, Eliminations & Other	Total
Segment assets:				
Accounts receivable	\$ 201,318	\$ 119,934	\$ (20,944)	\$300,308
Inventory, net	197,831	141,250	—	339,081
Total segment assets	<u>\$ 399,149</u>	<u>\$ 261,184</u>	<u>\$ (20,944)</u>	<u>\$639,389</u>

A reconciliation of segment assets to consolidated total assets is as follows:

	March 31, 2018	December 31, 2017
Total segment assets	\$ 707,427	\$ 639,389
Cash and cash equivalents, restricted cash and investments	552,343	553,976
Other current assets	59,093	53,543
Property, plant and equipment, net	172,802	171,782
Goodwill and intangible assets, net	949,839	957,445
Other assets	39,952	37,883
Consolidated total assets	<u>\$ 2,481,456</u>	<u>\$ 2,414,018</u>

Geographic

Information about the Company's operations in different geographic regions is presented in the tables below. Net revenues to unaffiliated customers are based on the location in which the sale originated. Transfers between geographic areas are at negotiated transfer prices and have been eliminated from consolidated net revenues.

	Three Months Ended March 31,	
	2018	2017
Net revenues:		
United States	\$ 276,720	\$ 218,050
Korea	54,011	44,878
Japan	58,274	37,792
Asia (excluding Korea and Japan)	101,384	88,243
Europe	63,886	48,190
	<u>\$ 554,275</u>	<u>\$ 437,153</u>

	March 31, 2018	December 31, 2017
Long-lived assets:(1)		
United States	\$ 127,637	\$ 124,689
Europe	28,787	28,820
Asia	49,566	49,645
	<u>\$ 205,990</u>	<u>\$ 203,154</u>

(1) Long-lived assets include property, plant and equipment, net and certain other long-term assets, excluding long-term tax related accounts.

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

	March 31, 2018	December 31, 2017
Reportable segment:		
Vacuum & Analysis	\$ 197,689	\$ 197,617
Light & Motion	395,805	393,430
Total goodwill	<u>\$ 593,494</u>	<u>\$ 591,047</u>

Worldwide Product Information

Because the reportable segment information above does not reflect worldwide sales of the Company's products, the Company groups its products into six groups of similar products based upon the similarity of product function. The following table sets forth worldwide net revenue for each group of products:

	Three Months Ended March 31,	
	2018	2017
Analytical and Control Solutions Products	\$ 33,712	\$ 31,820
Power, Plasma and Reactive Gas Solutions Products	167,052	122,800
Vacuum Solutions Products	147,580	123,364
Lasers Products	74,797	44,944
Optics Products	54,379	46,505
Photonics Products	76,755	67,720
	<u>\$ 554,275</u>	<u>\$ 437,153</u>

Sales of Analytical and Control Solutions Products; Power, Plasma and Reactive Gas Solutions Products; and Vacuum Solutions Products are included in the Company's Vacuum & Analysis segment. Sales of Laser Products; Optics Products; and Photonics Products are included in the Light & Motion segment.

Major Customers

The Company had two customers with net revenues greater than 10% of total net revenues in the periods shown below:

	Three Months Ended March 31,	
	2018	2017
LAM Research Corporation.	12.6%	12.6%
Applied Materials, Inc.	12.2%	13.0%

18) Restructuring

During the three months ended March 31, 2018 and 2017, the Company recorded restructuring charges of \$1,220 and \$522, respectively. The restructuring charges for the three months ended March 31, 2018 primarily related to severance costs related to streamlining and consolidating certain administrative functions. The restructuring charges for the three months ended March 31, 2017 relate to the restructuring of one of the Company's international facilities and the consolidation of certain sales offices.

Restructuring activities were as follows:

	Three Months Ended March 31,	
	2018	2017
Beginning of period	\$ 3,244	\$ 540
Charged to expense	1,220	522
Payments and adjustments	(1,806)	(347)
End of period	<u>\$ 2,658</u>	<u>\$ 715</u>

19) Commitments and Contingencies

On March 9, 2016, a putative class action lawsuit captioned *Dixon Chung v. Newport Corp., et al.*, Case No. A-16-733154-C, was filed in the District Court, Clark County, Nevada on behalf of a putative class of stockholders of Newport for claims related to the

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Merger Agreement between the Company, Newport, and Merger Sub. On March 25, 2016, a second putative class action complaint captioned *Hubert C. Pincon v. Newport Corp., et al.*, Case No. A-16-734039-B, was filed in the District Court, Clark County, Nevada, on behalf of a putative class of Newport's stockholders for claims related to the Merger Agreement. The lawsuits named as defendants the Company, Newport, Merger Sub, and certain then current and former members of Newport's board of directors. Both complaints alleged that the directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices, and by omitting material information from the proxy statement. The complaints also alleged that the Company, Newport, and Merger Sub aided and abetted the directors' alleged breaches of their fiduciary duties. The complaints sought injunctive relief, including to enjoin or rescind the Merger Agreement, and an award of attorneys' and other fees and costs, among other relief. On April 14, 2016, the Court granted plaintiffs' motion to consolidate the Pincon and Chung actions.

On October 19, 2016, plaintiffs filed an amended complaint captioned *In re Newport Corporation Shareholder Litigation*, Case No. A-16-733154-B, in the District Court, Clark County, Nevada, on behalf of a putative class of Newport's stockholders for claims related to the Merger Agreement. The complaint named as defendants the Company, Newport, and the then-current members of Newport's former board of directors. It alleged that the named directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices, and by omitting material information from the proxy statement. The complaint also alleged that the Company and Newport aided and abetted the named directors' alleged breaches of their fiduciary duties. The complaint sought monetary damages, including pre- and post-judgment interest. On December 9, 2016, defendants filed motions to dismiss the amended complaint, which plaintiffs opposed. On June 22, 2017, the Court dismissed the amended complaint against all defendants but granted plaintiffs leave to amend.

On July 27, 2017, plaintiffs filed a second amended complaint, which names as defendants certain former directors of Newport. On August 8, 2017, the Court dismissed the Company and Newport from the action pursuant to stipulations among the parties. The second amended complaint alleges that the directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, and by omitting material information from the proxy statement. The second amended complaint seeks monetary damages, including pre- and post-judgment interest. On September 1, 2017 the Newport directors filed a motion to dismiss the second amended complaint, which plaintiffs opposed. The Court held a hearing on the motion to dismiss on December 7, 2017. On January 5, 2018, the Court entered an order denying the motion to dismiss. The Newport directors answered the second amended complaint, denying the material allegations of the complaint and asserting defenses, on February 20, 2018. On April 13, 2018, the Company received a third-party subpoena *duces tecum* requesting documents and a deposition on various topics in the state of Nevada. The Company served plaintiffs with objections and responses to the subpoena on April 27, 2018.

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

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ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS.

This Quarterly Report on Form 10-Q contains "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). When used herein, the words "believes," "anticipates," "plans," "expects," "estimates," "would," "will," "intends" and similar expressions are intended to identify forward-looking statements. These forward-looking statements reflect management's current opinions and are subject to certain risks and uncertainties that could cause results to differ materially from those stated or implied. While we may elect to update forward looking statements in the future, we specifically disclaim any obligation to do so even if our estimates or expectations change. Risks and uncertainties include, but are not limited to those discussed in our Annual Report on Form 10-K for the year ended December 31, 2017 in the section entitled "Risk Factors" as referenced in Part II, Item 1A "Risk Factors" of this Quarterly Report on Form 10-Q.

Overview

We are a global provider of instruments, subsystems and process control solutions that measure, monitor, deliver, analyze, power and control critical parameters of advanced manufacturing processes to improve process performance and productivity. Our products are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, residual gas analysis, leak detection, control technology, ozone generation and delivery, RF & DC power, reactive gas generation, vacuum technology, lasers, photonics, sub-micron positioning, vibration control, and optics. We also provide services relating to the maintenance and repair of our products, installation services and training.

Our two reportable segments are the Vacuum & Analysis segment and the Light & Motion segment.

The Vacuum & Analysis segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, residual gas analysis, leak detection, control technology, ozone generation and delivery, RF & DC power, reactive gas generation and vacuum technology. The Light & Motion segment provides a broad range of instruments, components and subsystems which are derived from our core competencies in lasers, photonics, sub-micron positioning, vibration control, and optics.

Our primary served markets are manufacturers of capital equipment for semiconductor manufacturing, industrial technologies, life and health sciences, as well as research and defense. We have a diverse base of customers. Approximately 57% our net revenues for both the three months ended March 31, 2018 and 2017, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers. Approximately 43% of our net revenues for both three months ended March 31, 2018 and 2017, were from other advanced manufacturing applications. These include, but are not limited to, industrial technologies, life and health sciences, and research and defense.

Net revenues from semiconductor capital equipment manufacture and semiconductor device manufacture customers increased by \$65.0 million or 26% for the three months ended March 31, 2018, compared to 2017. This increase is comprised of net revenues from semiconductor customers in our Vacuum & Analysis segment of \$56.9 million and in our Light & Motion segment of \$8.1 million. The semiconductor capital equipment industry is subject to rapid demand shifts, which are difficult to predict, and we are uncertain as to the timing or extent of future demand or any future weakness in the semiconductor capital equipment industry. Our net revenues from customers in other advanced markets, which exclude semiconductor capital equipment and semiconductor device manufacture customers, increased by \$52.1 million, or 28%, for the three months ended March 31, 2018, compared to 2017. The increase was primarily attributed to increases in our industrial technologies and life and health sciences markets.

A significant portion of our net revenues are from sales to customers in international markets. For both periods ended March 31, 2018 and 2017, international net revenues accounted for approximately 50% of our total net revenues. A significant portion of our international net revenues were in Japan, South Korea, Germany, Israel and China. We expect that international net revenues will continue to represent a significant percentage of our total net revenues. Long-lived assets located in the United States were \$127.6 million and \$124.7 million as of March 31, 2018 and December 31, 2017, respectively, excluding goodwill and intangibles, and long-term tax-related accounts. Long-lived assets located outside of the United States were \$78.4 million and \$78.5 million as of March 31, 2018 and December 31, 2017, respectively, excluding goodwill and intangibles, and long-term tax-related accounts.

Recent Events

Sale of Data Analytics Solutions business

In April 2017, we completed the sale of our Data Analytics Solutions business for total proceeds of \$72.5 million, net of cash sold and recorded a pre-tax gain of \$74.9 million. This business, which had net revenues in 2016 of \$12.7 million and was included in the Vacuum & Analysis segment, was no longer a part of our long-term strategic objectives.

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The business did not qualify as a discontinued operation as this sale did not represent a strategic shift in our business, nor did the sale have a major effect on our operations. Therefore, the results of operations for all periods are included in our income from operations. The assets and liabilities of this business have not been reclassified or segregated in the consolidated balance sheet or consolidated statements of cash flows as the amounts were immaterial.

Critical Accounting Policies and Estimates

The preparation of our consolidated financial statements and related disclosures in conformity with accounting principles generally accepted in the United States requires management to make judgments, assumptions and estimates that affect the amounts reported. There have been no material changes in our critical accounting policies since December 31, 2017, other than the adoption of Accounting Standard Update 2014-09, "Revenue from Contracts with Customers (Topic 606)" ("ASC 606") as outlined below.

For further information, please see the discussion of critical accounting policies in our Annual Report on Form 10-K for the year ended December 31, 2017 in the section captioned "Management's Discussion and Analysis of Financial Condition and Results of Operations – Critical Accounting Policies and Estimates."

We adopted ASC 606 on January 1, 2018 using the modified retrospective method for all contracts not completed as of the date of adoption. The reported results for the three months ended March 31, 2018 reflect the application of ASC 606 guidance while the reported results for 2017 were prepared under the guidance of ASC 605, Revenue Recognition (ASC 605).

We have recorded a net increase to opening retained earnings of \$1.8 million as of January 1, 2018 due to the cumulative impact of adopting ASC 606, with the impact primarily related to our service business and certain custom products. The impact to revenues for the quarter ended March 31, 2018 was immaterial as a result of applying ASC 606.

The adoption of ASC 606 represents a change in accounting principle that will more closely align revenue recognition with the delivery of our goods or services and will provide financial statement readers with enhanced disclosures. To achieve this core principle, we apply the following five steps:

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

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

Revenue is measured as the amount of consideration we expect to receive in exchange for transferring goods or providing services. Performance obligations promised in a contract are identified based on the products or services that will be transferred to the customer that are both capable of being distinct, whereby the customer can benefit from the product or service either on its own or together with other resources that are readily available from third parties or from us, and are distinct in the context of the contract, whereby the transfer of the product or service is separately identifiable from other promises in the contract. Sales, value add, and other taxes we collect concurrent with revenue-producing activities are excluded from revenue. Our normal payment terms are 30 to 60 days but vary by the type and location of our customers and the products or services offered. The time between invoicing and when payment is due is not significant. For certain products or services and customer types, we require payment before the products or services are delivered to the customer. None of our contracts as of March 31, 2018 contain a significant financing component. Contract assets as of January 1 and March 31, 2018 were immaterial and included in other current assets.

Contracts with Multiple Performance Obligations

We periodically enter into contracts with our customers in which a customer may purchase a combination of goods and or services, such as products with installation services or extended warranty obligations. These contracts include multiple promises that we evaluate to determine if the promises are separate performance obligations. Once we determine the performance obligations, we then determine the transaction price, which includes estimating the amount of variable consideration to be included in the transaction price, if any. To the extent the transaction price includes variable consideration, we estimate the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method depending on the method we expect to better predict the amount of consideration to which it will be entitled. There are no constraints on the variable consideration recorded. We then allocate the transaction price to each performance obligation in the contract based on a relative stand-alone selling price charged separately to customers or using an expected cost-plus-margin method. The corresponding revenues are recognized when or as the related performance obligations are satisfied, which are noted above. The impact of variable consideration was immaterial during the three months ended March 31, 2018.

Deferred Revenues

Our standard assurance warranty period is normally 12 to 24 months. We sell separately-priced service contracts and extended warranty contracts related to certain of our products, especially our laser products. The separately priced contracts generally range from 12 to 60 months. We normally receive payment at the inception of the contract and recognize revenue over the term of the agreement in proportion to the costs expected to be incurred in satisfying the obligations under the contract. We have elected to use the practical expedient related to disclosing the remaining performance obligations as of March 31, 2018, as the majority have a duration of less than one year.

Costs to Obtain and Fulfill a Contract

Under ASC 606, we expense sales commissions when incurred because the amortization period would have been one year or less. These costs are recorded within selling, general and administration expenses. We have elected to recognize the costs for freight and shipping when control over products has transferred to the customer as an expense in cost of sales.

We monitor and track the amount of product returns and reduce revenue at the time of shipment for the estimated amount of future returns, based on historical experience. We make estimates evaluating our allowance for doubtful accounts. We continuously monitor collections and payments from our customers and maintain a provision for estimated credit losses based upon our historical experience and any specific customer collection issues that we have identified.

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Results of Operations

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

	Three Months Ended March 31,	
	2018	2017
Net revenues:		
Product	89.6%	88.7%
Services	10.4	11.3
Total net revenues	100.0	100.0
Cost of revenues:		
Cost of product revenues	47.2	47.1
Cost of service revenues	5.4	5.9
Total cost of revenues (exclusive of amortization shown separately below)	52.6	53.0
Gross profit	47.4	47.0
Research and development	6.3	7.6
Selling, general and administrative	15.0	17.0
Acquisition and integration costs	—	0.3
Environmental costs	0.2	—
Restructuring	0.2	0.1
Amortization of intangible assets	2.0	2.9
Income from operations	23.7	19.1
Interest income	0.2	0.1
Interest expense	1.0	2.0
Other (expense) income, net	—	0.5
Income from operations before income taxes	22.9	17.7
Provision for income taxes	3.9	2.8
Net income	19.0%	14.9%

Net Revenues

	Three Months Ended March 31,	
	2018	2017
(dollars in millions)		
Product	\$496.7	\$ 387.9
Service	57.6	49.2
Total net revenues	\$554.3	\$ 437.1

Product revenues increased \$108.8 million during the three months ended March 31, 2018, compared to the same period in the prior year. The increase was attributed to an increase of \$56.2 million in product revenues from semiconductor customers and an increase in product revenues from customers in our other advanced markets of \$52.6 million, primarily due to increases in our industrial technologies market.

Service revenues consisted mainly of fees for services related to the maintenance and repair of our products, sales of spare parts, and installation and training. In 2018, we started to record the sales of spare parts in our service revenue and related cost of sales line items. Therefore, for the three months ended March 31, 2017, we re-classified \$5.0 million of product revenue for spare parts from product to service revenue. Service revenues increased \$8.4 million during the three months ended March 31, 2018, compared to the same period in the prior year. The increase was primarily attributed to an increase of \$8.8 million in service revenues from semiconductor customers, partially offset by a net decrease of \$0.4 million in service revenues from customers in other advanced markets.

Total international net revenues, including product and service, was \$277.6 million for the three months ended March 31, 2018, compared to \$219.1 million for the three months ended March 31, 2017. The increase of \$58.5 million in total international net revenues for the three months ended March 31, 2018, compared to the same period in the prior year, was due to increases in net revenues in Japan, Germany, South Korea and China.

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

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Net revenues:		
Vacuum & Analysis	\$ 348.4	\$ 278.0
Light & Motion	205.9	159.1
Total net revenues	<u>\$554.3</u>	<u>\$ 437.1</u>

Net revenues from our Vacuum & Analysis segment increased \$70.4 million for the three months ended March 31, 2018, compared to the same period in the prior year. The increase was attributed to an increase in net revenues from semiconductor customers of \$56.9 million and an increase in product revenues from customers in our other advanced markets of \$13.5 million, primarily due to an increase in our industrial technologies market.

Net revenues from our Light & Motion segment increased \$46.8 million for the three months ended March 31, 2018, compared to the same period in the prior year. The increase was attributed to an increase in net revenues from customers in our other advanced markets of \$38.7 million, primarily due to increases in our industrial technologies and life and health sciences markets. The remainder of the increase is attributed to net revenues from semiconductor customers of \$8.1 million.

Gross Profit

	Three Months Ended March 31,		
	2018	2017	% Points Change
Gross profit as a percentage of net revenues:			
Product	47.4%	46.9%	0.5%
Service	47.7	47.6	0.1
Total gross profit	<u>47.4%</u>	<u>47.0%</u>	<u>0.4%</u>

Gross profit as a percentage of net product revenues increased by 0.5 percentage points for the three months ended March 31, 2018, compared to the same period in the prior year. The increase was primarily attributed higher revenue volumes.

Gross profit as a percentage of net service revenues remained relatively flat for the three months ended March 31, 2018, compared to the same period in the prior year.

The following is gross profit as a percentage of net revenues by reportable segment:

	Three Months Ended March 31,		
	2018	2017	% Points Change
Gross profit:			
Vacuum & Analysis	45.5%	46.4%	(0.9)%
Light & Motion	50.7	48.1	2.6
Total gross profit	<u>47.4%</u>	<u>47.0%</u>	<u>0.4%</u>

Gross profit for our Vacuum & Analysis segment decreased by 0.9 percentage points for the three months ended March 31, 2018, compared to the same period in the prior year, primarily due to unfavorable product mix and an unfavorable change in material costs, primarily attributed to a non-recurring credit adjustment to material costs during the three months ended March 31, 2017. These decreases were partially offset by higher revenue volumes.

Gross profit for our Light & Motion segment increased by 2.6 percentage points for the three months ended March 31, 2018, compared to the same period in the prior year, primarily due to higher revenue volumes and favorable product mix, partially offset by unfavorable changes in foreign exchange.

Research and Development

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Research and development expenses	\$ 34.9	\$ 33.3

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Research and development expenses increased \$1.6 million for the three months ended March 31, 2018, compared to the same period in the prior year. The increase was primarily related to an increase of \$1.3 million in compensation costs and related benefits and \$0.4 million in project materials.

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

We have thousands of products, and our research and development efforts primarily consist of a large number of projects related to these products, none of which is individually material to us. Current projects typically have durations of 3 to 30 months depending upon whether the product is an enhancement of existing technology or a new product. Our current initiatives include projects to enhance the performance characteristics of older products, to develop new products and to integrate various technologies into subsystems. These projects support in large part the transition in the semiconductor industry to smaller integrated circuit geometries and in the flat panel display and solar markets to larger substrate sizes, which require more advanced process control technology. Research and development expenses consist primarily of salaries and related expenses for personnel engaged in research and development, fees paid to consultants, material costs for prototypes and other expenses related to the design, development, testing and enhancement of our products.

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

Selling, General and Administrative

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Selling, general and administrative expenses	\$ 82.9	\$ 74.2

Selling, general and administrative expenses increased by \$8.7 million for the three months ended March 31, 2018, compared to the same period in the prior year, primarily due to an increase of \$7.3 million of compensation costs, of which \$3.9 million is incentive compensation and \$3.4 million is salaries and fringes, and related benefits and \$1.2 million of commissions expense.

Acquisition and Integration Costs

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Acquisition and integration costs	\$ —	\$ 1.4

We incurred \$1.4 million of acquisition and integration costs for the three months ended March 31, 2017 related to Newport Merger. These costs were primarily related to legal and other professional fees.

Restructuring

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Restructuring	\$ 1.2	\$ 0.5

Restructuring charges for the three months ended March 31, 2018 primarily related to severance costs related to streamlining and consolidating certain administrative functions. The restructuring charges for the three months ended March 31, 2017 relate to the restructuring of one of our international facilities and the consolidation of certain sales offices.

Environmental Costs

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Environmental costs	\$ 1.0	\$ —

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We recorded \$1.0 million of environmental costs for the three months ended March 31, 2018 related to a U.S. Environmental Protection Agency-designated Superfund site acquired as part of our acquisition of Newport.

Amortization of Intangible Assets

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Amortization of intangible assets	\$ 11.2	\$ 12.5

Amortization of intangible assets decreased by \$1.3 million during the three months ended March 31, 2018 compared to the same period in the prior year, due to certain intangible assets becoming fully amortized.

Interest (Expense), Net

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Interest expense, net	\$ 4.3	\$ 8.3

Interest expense, net, decreased by \$4.0 million for the three months ended March 31, 2018, compared to the same period in the prior year. The decrease for the three months ended March 31, 2018 was due primarily to principal prepayments of \$225.0 million since the first quarter of 2017 and repricings of our Term Loan Facility (as defined in Note 10 in the financial statements).

Other (expense) income, net

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Other (expense) income, net	\$ (0.1)	\$ 2.0

The changes in other (expense) income, net for the three months ended March 31, 2018 and 2017, respectively, primarily related to changes in foreign exchange rates.

Provision for Income Taxes

<i>(dollars in millions)</i>	Three Months Ended March 31,	
	2018	2017
Provision for income taxes	\$ 21.6	\$ 12.2

Our effective tax rates for the periods ended March 31, 2018 and 2017 were 17.1% and 15.8%, respectively. The effective tax rate in 2018 and related income tax expense, was impacted by the Tax Cuts and Jobs Act (the "Act") which was enacted into law on December 22, 2017. We account for income tax effects resulting from changes in tax laws in accordance with the authoritative guidance, which requires that these tax effects be recognized in the period in which the law is enacted and that the effects are recorded as a component of provision for income taxes from continuing operations. As a result, we recorded provisional amounts as of December 31, 2017 related to the one-time transition tax and the change in U.S. net deferred tax liabilities resulting from the change in the U.S. statutory rate resulting from the enactment of the Act in accordance with the Securities and Exchange Commission Staff Accounting Bulletin No. 118 ("SAB 118"). The provisional amounts associated with the Act were adjusted in the period ended March 31, 2018 and resulted in a decrease to our effective tax rate. We expect to finalize the provisional amounts when we file our 2017 tax returns in October 2018. The reduction in the corporate tax rate from 35% for 2017 to 21% for 2018, as a result of the Act, also impacted our effective tax rate and tax expense in the period ending March 31, 2018 as compared to March 31, 2017. In addition, the effective tax rate in the period ending March 31, 2018 was lower than the U.S. statutory rate due to foreign earnings taxed at lower rates, windfall benefits of stock compensation, and the new deduction for foreign derived intangible income from the Act offset by the tax effects of the new provisions for global intangible low taxed income from the Act and state income taxes.

The effective tax rate for the three months ended March 31, 2017 was lower than the U.S. statutory tax rate mainly due to the impact of lower tax rates on foreign income, the deduction for domestic production activities and windfall stock compensation tax benefit.

At March 31, 2018, the total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately \$27.9 million. At December 31, 2017, our total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately \$27.3 million. The net increase from December 31, 2017 was primarily attributable to the addition of reserves for state taxes

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and certain non-U.S. items offset by decreases from settlement of an IRS audit. At March 31, 2018, excluding interest and penalties, there were \$20.5 million of net unrecognized tax benefits that, if recognized, would impact our annual effective tax rate. We accrue interest and, if applicable, penalties for any uncertain tax positions. Interest and penalties are classified as a component of income tax expense. As of March 31, 2018 and December 31, 2017, we had accrued interest on unrecognized tax benefits of approximately \$0.5 million and \$0.3 million, respectively.

Over the next 12 months it is reasonably possible that we may recognize approximately \$1.0 million of previously net unrecognized tax benefits, excluding interest and penalties, related to federal, state and foreign tax positions as a result of the expiration of statutes of limitation. The U.S. statute of limitations remains open for tax years 2014 through present. The statute of limitations for our tax filings in other jurisdictions varies between fiscal years 2012 through the present. We also have certain federal credit carry-forwards and state tax loss and credit carry-forwards that are open to examination for tax years 2000 through the present.

We are subject to examination by U.S. federal, state and foreign tax authorities. The U.S. Internal Revenue Service commenced an examination of our U.S. federal income tax filings for tax years 2015 and 2016 during the quarter ended September 30, 2017. This audit was effectively settled during the quarter ended March 31, 2018. Also during the quarter, we received notification from the U.S. Internal Revenue Service that a new audit is scheduled to begin for our U.S. subsidiary, Newport, for tax year 2015.

On a quarterly basis, we evaluate both positive and negative evidence that affects the realizability of net deferred tax assets and assess the need for a valuation allowance. The future benefit to be derived from our deferred tax assets is dependent upon our ability to generate sufficient future taxable income in each jurisdiction of the right type to realize the assets.

Our future effective tax rate depends on various factors, including further interpretations and guidance from U.S. federal and state governments on the impact of the enactment of the Act, as well as the geographic composition of our pre-tax income, and changes in tax reserves for unrecognized tax benefits. We monitor these factors and timely adjust our estimates of the effective tax rate accordingly. We expect that the geographic mix of pre-tax income will continue to have a favorable impact on our effective tax rate, however the geographic mix of pre-tax income can change based on multiple factors resulting in changes to the effective tax rate in future periods. The effective tax rate in 2018 could be affected by adjustments to the provisional amounts recorded under the guidance of SAB 118 for the one-time transition tax and the revaluation of deferred tax assets and liabilities due to the U.S. statutory rate change in 2017. While we believe we have adequately provided for all tax positions, amounts asserted by taxing authorities could materially differ from our accrued positions as a result of uncertain and complex application of tax law and regulations. Additionally, the recognition and measurement of certain tax benefits include estimates and judgment by management. Accordingly, we could record additional provisions or benefits for U.S. federal, state, and foreign tax matters in future periods as new information becomes available.

Liquidity and Capital Resources

Cash and cash equivalents, restricted cash and short-term marketable investments totaled \$541.5 million at March 31, 2018, compared to \$543.3 million at December 31, 2017.

Net cash provided by operating activities was \$72.7 million for the three months ended March 31, 2018 and resulted from net income of \$105.1 million, which included non-cash charges of \$37.9 million, offset by a net increase in working capital of \$70.3 million. The net increase in working capital was primarily due to an increase in accounts receivable of \$37.3 million and an increase in inventories of \$28.2 million, related to an increase in business activities and a decrease in accrued compensation of \$32.5 million, as year-end bonuses were paid. These increases in working capital were offset by an increase in other current and non-current liabilities of \$10.5 million, an increase in accounts payable of \$9.3 million and an increase in income taxes of \$8.8 million.

Net cash provided by operating activities was \$66.1 million for the three months ended March 31, 2017, and resulted from net income of \$65.1 million, which included non-cash charges of \$36.9 million, offset by a net increase in working capital of \$35.9 million. The net increase in working capital was primarily due to a decrease in accrued compensation of \$16.8 million, as year-end bonuses were paid, an increase in trade accounts receivable of \$15.2 million and an increase in inventories of \$11.7 million, related to an increase in business activities and an increase in other current assets of \$1.5 million. These increases in working capital were partially offset by an increase in income taxes of \$8.1 million and an increase in other current and non-current liabilities of \$1.1 million.

Net cash used in investing activities was \$0.6 million for the three months ended March 31, 2018 due to purchases of production-related equipment of \$9.4 million, offset by net sales and maturities of short-term investments of \$8.8 million. Net cash provided by investing activities was \$30.5 million for the three months ended March 31, 2017, and resulted from \$34.6 million of net sale and maturities of short-term investments, partially offset by \$4.1 million in purchases of production-related equipment.

Net cash used in financing activities was \$67.1 million for the three months ended March 31, 2018 and resulted from partial repayment of the Term Loan Facility of \$50.0 million, dividend payments made to common stockholders of \$9.8 million and net payments related to tax payments for employee stock awards of \$8.9 million, partially offset by a net increase in proceeds from short-term borrowings relating to our

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lines of credit of \$1.6 million. Net cash used in financing activities was \$64.7 million for the three months ended March 31, 2017, and resulted primarily from \$51.6 million used for the partial repayment of the Term Loan Facility, \$9.4 million of dividend payments made to common stockholders and \$2.9 million of net payments related to tax payments for employee stock awards.

On July 25, 2011, our Board of Directors approved a share repurchase program for the repurchase of up to an aggregate of \$200 million of our outstanding common stock from time to time in open market purchases, privately negotiated transactions or through other appropriate means. The timing and quantity of any shares repurchased depends upon a variety of factors, including business conditions, stock market conditions and business development activities, including but not limited to merger and acquisition opportunities. These repurchases may be commenced, suspended or discontinued at any time without prior notice. We have repurchased approximately 1,770,000 shares of common stock for approximately \$52.0 million pursuant to the program since its adoption. During the three months ended March 31, 2018 and 2017, there were no repurchases of common stock.

Holders of our common stock are entitled to receive dividends when and if they are declared by our board of directors. During the three months ended March 31, 2018, we paid cash dividends of \$9.8 million in the aggregate, or \$0.18 per share. During the three months ended March 31, 2017, we paid cash dividends of \$9.4 million in the aggregate, or \$0.175 per share. Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of our Board of Directors. In addition, under the terms of our senior secured Term Loan Facility and our senior secured asset-based revolving credit facility, we may be restricted from paying dividends under certain circumstances.

Sale of Data Analytics Solutions Business

In April 2017, we completed the sale of our Data Analytics Solutions business for total proceeds of \$72.5 million, net of cash sold and recorded a pre-tax gain of \$74.9 million.

Term Loan Credit Agreement

In connection with the completion of the Newport Merger, we entered into a term loan credit agreement (the "Credit Agreement") with Barclays Bank PLC, as administrative agent and collateral agent, and the lenders from time to time party thereto (the "Lenders"), that provided senior secured financing of \$780.0 million, subject to increase at our option in accordance with the Credit Agreement (the "Term Loan Facility"). Borrowings under the Term Loan Facility bear interest per annum at one of the following rates selected by the Company: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the "prime rate" quoted in The Wall Street Journal, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00%, and (4) a floor of 1.75%, plus, in each case, an applicable margin; or (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, subject to a LIBOR rate floor of 0.75%, plus an applicable margin. We have elected the interest rate as described in clause (b). The Credit Agreement provides that all loans will be determined by reference to the Base Rate if the LIBOR rate cannot be ascertained, if regulators impose material restrictions on the authority of a lender to make LIBOR rate loans, and for other reasons. The Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

In June 2016, we entered into Amendment No. 1 (the "Repricing Amendment 1") to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 1 decreased the applicable margin for borrowings under our Term Loan Facility to 2.50% for base rate borrowings and 3.50% for LIBOR borrowings and extended the period during which a prepayment premium may be required for a "Repricing Transaction" (as defined in the Credit Agreement) until six months after the effective date of the Repricing Amendment 1. In connection with the execution of the Repricing Amendment 1, we paid a prepayment premium of 1.00%, or \$7.3 million, as well as certain fees and expenses of the administrative agent and the Lenders, in accordance with the terms of the Credit Agreement. Immediately prior to the effectiveness of the Repricing Amendment 1, we prepaid \$50.0 million of principal under the Credit Agreement. In September 2016, we prepaid an additional \$60.0 million under the Credit Agreement.

In September 2016, we entered into an interest rate swap agreement, which has a maturity date of September 30, 2020, to fix the rate on \$335.0 million of the then-outstanding balance under the Credit Agreement. The rate is fixed at 1.198% per annum plus the applicable credit spread, which was 2.00% at March 31, 2018. At March 31, 2018, the notional amount of the interest rate swap agreement was \$305.0 million.

In December 2016, we entered into Amendment No. 2 (the "Repricing Amendment 2") to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 2 decreased the applicable margin for our term loan under the Credit Agreement to 2.75% for LIBOR borrowings and 1.75% for base rate borrowings and reset the period during which a prepayment premium may be required for a Repricing Transaction until six months after the effective date of the Repricing Amendment 2. In November 2016, prior to the effectiveness of the Repricing Amendment 2, we prepaid an additional \$40.0 million of principal under the Credit Agreement. In March 2017, we prepaid an additional \$50.0 million of principal under the Credit Agreement.

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In July 2017, we entered into Amendment No. 3 (the “Repricing Amendment 3”) to our Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 3 decreased the applicable margin for our term loan under the Credit Agreement to 2.25% for LIBOR rate loans when the Total Leverage Ratio (as defined in the Credit Agreement) is at or above 1.25:1 and decreased to 2.00% when the Total Leverage Ratio was below 1.25:1, both with a LIBOR floor of 0.75%. The margin for base rate borrowings decreased to 1.25% when our Total Leverage Ratio was at or above 1.25:1 and will decrease to 1.00% when the Total Leverage Ratio is below 1.25:1. The period in which a prepayment premium may be required for a Repricing Transaction was reset to six months after the effective date of the Repricing Amendment 3.

In July 2017, August 2017, November 2017 and March 2018 we voluntarily prepaid \$50.0 million, \$75.0 million, \$50.0 million and \$50.0 million, respectively, of principal under the Credit Agreement. As of March 31, 2018, after total principal prepayments of \$425.0 million and regularly scheduled principal payments of \$6.5 million, the total outstanding principal balance was \$348.5 million. The interest rate as of March 31, 2018 was 3.648%.

In April 2018, we entered into Amendment No. 4 (the “Repricing Amendment 4”) to the Credit Agreement by and among the Company, the Lenders and Barclays Bank PLC, as administrative agent and collateral agent for the Lenders. The Repricing Amendment 4 decreased the applicable margin for our term loan under the Credit Agreement to 1.75%, with a LIBOR rate floor of 0.75%. The margin for base rate borrowings decreased to 0.75%, with a base rate floor of 1.75%. The period during which a prepayment premium may be required for a Repricing Transaction was reset to six months after the effective date of the Repricing Amendment 4.

We incurred \$28.7 million of deferred finance fees, original issue discount and repricing fees related to the term loans under the Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method. A portion of these fees have been accelerated in connection with the various debt prepayments during 2016, 2017 and 2018. As of March 31, 2018, the remaining balance of the deferred finance fees, original issue discount and repricing fees related to the Term Loan Facility was \$7.2 million.

Under the Credit Agreement, we are required to prepay outstanding term loans, subject to certain exceptions, with portions of our annual excess cash flow as well as with the net cash proceeds of certain asset sales, certain casualty and condemnation events and the incurrence or issuance of certain debt. We are also required to make scheduled quarterly payments each equal to 0.25% of the principal amount of the term loan, less the amount of certain voluntary and mandatory repayments after such date, with the balance due on the seventh anniversary of the closing date. As a result of making total prepayments of \$425.0 million through March 31, 2018, we are no longer required to make any scheduled quarterly principal payments until maturity of the loan.

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

The Credit Agreement contains customary representations and warranties, affirmative and negative covenants and provisions relating to events of default. If an event of default occurs, the Lenders under the Term Loan Facility will be entitled to take various actions, including the acceleration of amounts due under the Term Loan Facility and all actions generally permitted to be taken by a secured creditor. At March 31, 2018, we were in compliance with all covenants under the Credit Agreement.

Senior Secured Asset-Based Revolving Credit Facility

In connection with the completion of the Newport Merger, we also entered into an asset-based credit agreement with Deutsche Bank AG New York Branch, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto (the “ABL Facility”), that provides senior secured financing of up to \$50.0 million, subject to a borrowing base limitation. The borrowing base for the ABL Facility at any time equals the sum of: (a) 85% of certain eligible accounts; plus (b) subject to certain notice and field examination and appraisal requirements, the lesser of (i) the lesser of (A) 65% of the lower of cost or market value of certain eligible inventory and (B) 85% of the net orderly liquidation value of certain eligible inventory and (ii) 30% of the borrowing base; minus (c) reserves established by the administrative agent; provided that until the administrative agent’s receipt of a field examination of accounts receivable the borrowing base shall be equal to 70% of the book value of certain eligible accounts. The ABL Facility includes borrowing capacity in the form of letters of credit up to \$15.0 million. We have not drawn against the ABL Facility.

Borrowings under the ABL Facility bear interest per annum at one of the following rates selected by us: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the “prime rate” quoted in The Wall Street Journal, and (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00%, plus, in each case, an initial applicable margin of 0.75%; and (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, plus an initial applicable margin of 1.75%. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, the

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applicable margin for borrowings thereunder is subject to upward or downward adjustment each fiscal quarter, based on the average historical excess availability during the preceding quarter.

We have incurred \$1.2 million of costs in connection with the ABL Facility, which were capitalized and included in other assets in the accompanying consolidated balance sheets and are being amortized to interest expense using the straight-line method over the contractual term of five years of the ABL Facility.

In addition to paying interest on outstanding principal under the ABL Facility, we are required to pay a commitment fee in respect of the unutilized commitments thereunder. The initial commitment fee is 0.375% per annum. The total commitment fee recognized in interest expense for the three months ended March 31, 2018 was \$0.1 million. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, the commitment fee is subject to downward adjustment based on the amount of average unutilized commitments for the three month period immediately preceding such adjustment date. We must also pay customary letter of credit fees and agency fees.

Lines of Credit and Short-Term Borrowing Arrangements

One of our Japanese subsidiaries has lines of credit and short-term borrowing arrangements with two financial institutions which arrangements generally expire and are renewed at three-month intervals. The lines of credit provide for aggregate borrowings as of March 31, 2018, of up to an equivalent of \$21.6 million U.S. dollars. One of the borrowing arrangements has an interest rate based on the Tokyo Interbank Offer Rate at the time of borrowing and the other has an interest rate based on the Japanese Short-Term Prime Lending Rate. Total borrowings outstanding under these arrangements were \$0.9 million at March 31, 2018. There were no borrowings outstanding under these arrangements at December 31, 2017.

We assumed various revolving lines of credit and a financing facility with the completion of the Newport Merger. These revolving lines of credit and financing facility have no expiration date and provide for aggregate borrowings as of March 31, 2018 of up to an equivalent of \$9.9 million U.S. dollars. These lines of credit have a base interest rate of 1.25% plus a Japanese Yen overnight LIBOR rate. Total borrowings outstanding under these arrangements were \$3.8 million and \$3.0 million at March 31, 2018 and December 31, 2017.

One of our Austrian subsidiaries has various outstanding loans from the Austrian government to fund research and development. These loans are unsecured and do not require principal repayment as long as certain conditions are met. Interest on these loans is payable semi-annually. The interest rates associated with these loans range from 0.75% to 2.00%.

Off-Balance Sheet Arrangements

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

Contractual Obligations

After total prepayments of \$425.0 million and regularly scheduled principal payments of \$6.5 million during the three months ended March 31, 2018, our total outstanding principal balance on our Credit Agreement was \$348.5 million. As a result of making total prepayments since the inception of the Credit Agreement, we are no longer required to make any scheduled principal payments until the maturity date of the loan. There have been no other changes outside the ordinary course of business to our contractual obligations as disclosed in our Annual Report on Form 10-K for the year ended December 31, 2017.

Recently Issued Accounting Pronouncements

In March 2018, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) 2018-05, “Income Taxes (Topic 740).” This standard is an amendment that adopts the language of SAB 118 and aims to address certain circumstances that may arise for registrants in accounting for the income tax effects of the Act and to address any uncertainty or diversity of views in practice regarding the application of Topic 740 in situations where a registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting under Topic 740 for certain income tax effects of the Act for the reporting period in which the Act was enacted. The provisions of this ASU were applied to our December 31, 2017 financial statements. We recorded provisional amounts with respect to the Act under SAB 118 at December 31, 2017 and March 31, 2018 and need to complete additional analysis and receive additional guidance from the Internal Revenue Service with respect to provisions of the Act that affect us before the provisional determinations become final. Until we complete our analysis and receive additional guidance, we are not able to determine if the impact of ASU 2018-05 is material to our consolidated financial statements in any period.

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In February 2018, the FASB issued ASU 2018-02, “Income Statement – Reporting Comprehensive Income (Topic 220).” The amendments in this standard allow a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the Act. The provisions of this ASU are effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. We do not expect adoption of this ASU to have a material impact on our consolidated financial statements.

In August 2017, the FASB issued ASU 2017-12, “Derivatives and Hedging (Topic 815).” This standard better aligns an entity’s risk management activities and financial reporting for hedging relationships through changes to both the designation and measurement guidance for qualifying hedging relationships and the presentation of hedge results. The provisions of this ASU are effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. We do not expect adoption of this ASU to have a material impact on our consolidated financial statements.

In February 2016, the FASB issued ASU 2016-02, “Leases (Topic 842).” This standard requires the recognition of lease assets and liabilities for all leases, with certain exceptions, on the balance sheet. In transition, lessees and lessors are required to recognize and measure leases at the beginning of the earliest period presented using a modified retrospective approach. This ASU is effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. We have reviewed the requirements of the new standard and have formulated a plan for implementation. We have communicated our approach to our Audit Committee and will provide regular updates as appropriate. We are currently working at accumulating a complete population of leases from all of our locations. We have selected a software repository to track all of our lease agreements and to assist in the reporting and disclosure requirements required by the standard. We will continue to assess and disclose the impact that this ASU will have on our consolidated financial statements, disclosures and related controls, when known.

In May 2014, the FASB issued ASU 2014-09, “Revenue from Contracts with Customers (Topic 606).” This ASU provides for a single comprehensive model to use in accounting for revenue arising from contracts with customers and has replaced most existing revenue recognition guidance in Generally Accepted Accounting Principles. This ASU is effective for fiscal years and interim periods within those years beginning after December 15, 2017. The two permitted transition methods under the new standard are the full retrospective method, in which case the standard would be applied to each prior reporting period presented, or the modified retrospective method, in which case the cumulative effect of applying the standard would be recognized at the date of initial application. We used the modified retrospective method upon adoption in the first quarter of 2018. The adoption of this ASU did not have a material impact on our financial statements as described further in Note 3 of the consolidated financial statements.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.

Information concerning market risk is contained in the section entitled “Quantitative and Qualitative Disclosures About Market Risk” contained in our Annual Report on Form 10-K for the year ended December 31, 2017 filed with the Securities and Exchange Commission on February 28, 2018. As of March 31, 2018, there were no material changes in our exposure to market risk from December 31, 2017.

ITEM 4. CONTROLS AND PROCEDURES.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of March 31, 2018. The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the “Exchange Act”), means controls and other procedures of an issuer that are designed to ensure that information required to be disclosed by the issuer in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the Securities and Exchange Commission’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by an issuer in the reports that it files or submits under the Exchange Act is accumulated and communicated to the issuer’s management, including its principal executive and principal financial officers, or persons performing similar functions as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of March 31, 2018, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms and is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the quarter ended March 31, 2018, that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

PART II. OTHER INFORMATION

ITEM 1. LEGAL PROCEEDINGS.

On March 9, 2016, a putative class action lawsuit captioned *Dixon Chung v. Newport Corp., et al.*, Case No. A-16-733154-C, was filed in the District Court, Clark County, Nevada on behalf of a putative class of stockholders of Newport for claims related to the Merger Agreement between the Company, Newport, and Merger Sub. On March 25, 2016, a second putative class action complaint captioned *Hubert C. Pincon v. Newport Corp., et al.*, Case No. A-16-734039-B, was filed in the District Court, Clark County, Nevada, on behalf of a putative class of Newport's stockholders for claims related to the Merger Agreement. The lawsuits named as defendants the Company, Newport, Merger Sub, and certain then current and former members of Newport's board of directors. Both complaints alleged that the directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices, and by omitting material information from the Proxy statement. The complaints also alleged that the Company, Newport, and Merger Sub aided and abetted the directors' alleged breaches of their fiduciary duties. The complaints sought injunctive relief, including to enjoin or rescind the Merger Agreement, and an award of attorneys' and other fees and costs, among other relief. On April 14, 2016, the Court granted plaintiffs' motion to consolidate the Pincon and Chung actions.

On October 19, 2016, plaintiffs filed an amended complaint captioned *In re Newport Corporation Shareholder Litigation*, Case No. A-16-733154-B, in the District Court, Clark County, Nevada, on behalf of a putative class of Newport's stockholders for claims related to the Merger Agreement. The complaint named as defendants the Company, Newport, and the then-current members of Newport's former board of directors. It alleged that the named directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices, and by omitting material information from the Proxy statement. The complaint also alleged that the Company and Newport aided and abetted the named directors' alleged breaches of their fiduciary duties. The complaint sought monetary damages, including pre- and post-judgment interest. On December 9, 2016, defendants filed motions to dismiss the amended complaint, which plaintiffs opposed. On June 22, 2017, the Court dismissed the amended complaint against all defendants but granted plaintiffs leave to amend.

On July 27, 2017, plaintiffs filed a second amended complaint, which names as defendants certain former directors of Newport. On August 8, 2017, the Court dismissed the Company and Newport from the action pursuant to stipulations among the parties. The second amended complaint alleges that the directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, and by omitting material information from the Proxy statement. The second amended complaint seeks monetary damages, including pre- and post-judgment interest. On September 1, 2017 the Newport directors filed a motion to dismiss the second amended complaint, which plaintiffs opposed. The Court held a hearing on the motion to dismiss on December 7, 2017. On January 5, 2018, the Court entered an order denying the motion to dismiss. The Newport directors answered the second amended complaint, denying the material allegations of the complaint and asserting defenses, on February 20, 2018. On April 13, 2018, the Company received a third-party subpoena *duces tecum* requesting documents and a deposition on various topics in the state of Nevada. The Company served plaintiffs with objections and responses to the subpoena on April 27, 2018.

We are subject to various legal proceedings and claims, which have arisen in the ordinary course of business. In the opinion of management, the ultimate disposition of these matters will not have a material adverse effect on our results of operations, financial condition or cash flows.

ITEM 1A. RISK FACTORS.

Information regarding risk factors affecting the Company's business are discussed in the Company's Annual Report on Form 10-K for the year ended December 31, 2017 in the section entitled "Risk Factors." There have been no material changes from the risks disclosed therein.

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ITEM 6. EXHIBITS.

<u>Exhibit No.</u>	<u>Exhibit Description</u>
+3.1(1)	Restated Articles of Organization of the Registrant
+3.2(2)	Articles of Amendment to Restated Articles of Organization of the Registrant, as filed with the Secretary of State of Massachusetts on May 18, 2001
+3.3(3)	Articles of Amendment to Restated Articles of Organization of the Registrant, as filed with the Secretary of State of Massachusetts on May 16, 2002
+3.4(4)	Amended and Restated By-Laws of the Registrant
*10.1	Amendment, dated March 27, 2018, to Employment Agreement, dated as of October 22, 2013, between Gerald Colella and the Registrant
*10.2	MKS Instruments, Inc. Management and Key Employee Bonus Plan
*10.3	MKS Instruments, Inc. Light & Motion Division Management and Key Employee Bonus Plan
31.1	Certification of Principal Executive Officer pursuant to Rule 13a-14(a)/Rule 15d-14(a) of the Securities Exchange Act of 1934, as amended
31.2	Certification of Principal Financial Officer pursuant to Rule 13a-14(a)/Rule 15d-14(a) of the Securities Exchange Act of 1934, as amended
32.1	Certification of Chief Executive Officer and Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
101.LAB	XBRL Taxonomy Extension Label Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document

+ Previously filed

* Management contract or compensatory plan arrangement.

- (1) Incorporated by reference to the Registration Statement on Form S-4 (File No. 333-49738) filed with the Securities and Exchange Commission on November 13, 2000.
- (2) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2001.
- (3) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2002.
- (4) Incorporated by reference to the Registrant's Current Report on Form 8-K filed with the Securities and Exchange Commission on May 6, 2014.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

MKS INSTRUMENTS, INC.

May 8, 2018

By: /s/ Seth H. Bagshaw
Seth H. Bagshaw
Senior Vice President, Chief Financial Officer and Treasurer
(Principal Financial Officer)

AMENDMENT TO EMPLOYMENT AGREEMENT

This AMENDMENT (the "Amendment") to the Employment Agreement is made this 27th day of March 2018, by and between MKS Instruments, Inc., a Massachusetts Corporation ("MKS"), and Gerald G. Colella of Seabrook, New Hampshire (the "Executive").

WHEREAS, MKS and the Executive are parties to an employment agreement dated October 22, 2013 (the "Employment Agreement"); and

WHEREAS, MKS and the Executive wish to modify certain provisions of the Executive's Supplemental Retirement Benefits described in Appendix A to the Employment Agreement;

NOW THEREFORE, for good and valuable consideration, the sufficiency and receipt whereof are hereby acknowledged, the parties agree as follows:

1. Effective as of the date of this Amendment, Section 2.1 of Appendix A to the Employment Agreement is deleted and replaced with the following:

2.1 "Actuarially Equivalent" means a benefit of equivalent value to another benefit, determined on the following basis:

Interest Rate: Interest rate shall be fixed at 2.61 percent per annum; and

Mortality: The most recent "applicable mortality table" prescribed by Section 417(e)(3)(A)(ii) of the Internal Revenue Code (or a successor provision determined by the Corporation).

2. Except as modified in paragraph 1 above, the Employment Agreement, including the Executive's Supplemental Retirement Benefits described in Appendix attached thereto, remains unchanged.

In witness whereof, the parties hereto have executed, in the Commonwealth of Massachusetts, this Amendment as a sealed instrument, as of the day, month and year first written above.

MKS INSTRUMENTS, INC.

By: /s/ John R. Bertucci
Chairman of the Board of Directors

/s/ Gerald G. Colella
Gerald G. Colella



MKS Instruments, Inc.
Management and Key Employee Bonus Plan
 (as approved by the Compensation Committee on February 12, 2018)

1. Purpose:

The Management and Key Employee Bonus Plan (the “Plan”) provides certain executive officers¹ of MKS Instruments, Inc. (“MKS” or the “Company”) designated by the Compensation Committee of the Board of Directors of MKS (the “Compensation Committee”) and other key employees of MKS with the opportunity to benefit financially for improving MKS’ overall business performance by the receipt of annual cash incentive payments (the “Participants”). Eligible employees are those who work in positions that influence how well MKS performs. Participation in this Plan for employees who are not executive officers or whose participation is not otherwise approved by the Compensation Committee requires the approval of the most senior individual in the applicable organization as well as Human Resources and the Chief Executive Officer.

2. Determination of a Participant’s Bonus Amount:

Each Participant’s actual bonus payout under the Plan, if any, will be determined by multiplying the Participant’s Target Bonus Amount by the Company Performance Score, each as defined below.

2.1. Participant’s Target Bonus Amount:

Participant’s target bonus amount, which is attached on Exhibit A, is equal to a percentage of Participant’s Eligible Earnings for the fiscal year being measured (“Measurement Year”) under the Plan (“Target Bonus Amount”). Eligible Earnings are defined as eligible W-2 earnings received during the Measurement Year (i.e. base salary including regular, holiday, vacation, sick and retro pay, but not including bonus payments). A Participant’s Target Bonus Amount will not exceed 120% of his or her Eligible Earnings.

2.2. Company Performance Score:

Company performance will be measured using one financial metric, Company Non-GAAP Operating Income, which is defined under this Plan for all Participants as GAAP Operating Income for the Measurement Year, excluding any charges or income not related to the operating performance of MKS. Company performance levels with respect to this metric for the Measurement Year are set forth on Exhibit B hereto. These performance levels were recommended by MKS management and approved by the Compensation Committee. After the conclusion of the Measurement Year, the Compensation Committee will review MKS’ performance with respect to this metric for such year and approve a score based upon achievement of the performance level set forth in Exhibit B ranging from zero to a maximum of 200% (“Company Performance Score”). All of a Participant’s bonus is tied to the achievement level of this Company financial metric.

¹ “Executive officers” for the purposes of this Plan are executive officers as defined in Rule 3b-7 under the Securities Exchange Act of 1934, as amended.

3. Clawback:

Any bonus payment made hereunder shall be subject to potential cancellation, recoupment, rescission, payback or other action in accordance with the terms of any applicable Company clawback policy (the "Clawback Policy") or any applicable law, as may be in effect from time to time. The Participant hereby acknowledges and consents to the Company's application, implementation and enforcement of (i) any applicable Clawback Policy in effect at the time the Participant is notified of his or her eligibility to receive the award under this Plan and (ii) any provision of applicable law relating to cancellation, recoupment, rescission or payment of compensation, and agrees that the Company may take such actions as may be necessary to effectuate the Clawback Policy without further consideration or action.

4. Bonus Payment Date:

Bonus payouts under this Plan shall be made as soon as possible after the performance assessment has been completed with respect to the Measurement Year and approved by the Compensation Committee, but in no event later than March 15 of the subsequent year.

5. Administration:

The Plan will be administered by the Compensation Committee. The Compensation Committee shall have authority to adopt, amend and repeal such administrative rules, guidelines and practices relating to the Plan as it shall deem advisable. The Compensation Committee may construe and interpret the terms of the Plan. The Compensation Committee may correct any defect, supply any omission or reconcile any inconsistency in the Plan in the manner and to the extent it shall deem expedient and it shall be the sole and final judge of such expediency. All decisions by the Compensation Committee shall be made in the Compensation Committee's sole discretion and shall be final and binding on all persons having or claiming any interest in this Plan.

6. Amendment and Termination:

The Compensation Committee may amend, suspend or terminate the Plan or any portion thereof at any time. The Plan shall remain in effect until terminated.

7. Miscellaneous:

7.1 No Right to Employment:

In no way does participation in the Plan create a contract or a right of employment.

7.2 Tax Withholding:

The Company shall have the right to deduct from all payments under the Plan any federal, state or local taxes required by law to be withheld with respect to such payments.

7.3 Governing Law:

The provisions of the Plan and all awards made hereunder shall be governed by and interpreted in accordance with the laws of the Commonwealth of Massachusetts, excluding choice-of-law principles of the law of such state that would require the application of the laws of a jurisdiction other than the Commonwealth of Massachusetts.

7.4 Limitations on Liability:

Notwithstanding any other provisions of the Plan, no individual acting as a director, officer, employee or agent of the Company will be liable to any Participant, former Participant, spouse, beneficiary, or any other person for any claim, loss, liability, or expense incurred in connection with the Plan, nor will such individual be personally liable with respect to the Plan because of any contract or other instrument he or she executes in his or her capacity as a director, officer, employee or agent of the Company. The Company will indemnify and hold harmless each director, officer, employee or agent of the Company to whom any duty or power relating to the administration or interpretation of the Plan has been or will be delegated, against any cost or expense (including attorneys' fees) or liability (including any sum paid in settlement of a claim with the approval of the Company's Board of Directors) arising out of any act or omission to act concerning the Plan unless arising out of such person's own fraud or bad faith.

7.5 Participants are Unsecured Creditors:

Participants and their heirs, successors and assigns shall have no legal or equitable rights, interest or claims in any property or assets of the Company by virtue of participation in the Plan. The Company's obligation under the Plan shall be that of an unfunded and unsecured promise of the Company to pay money in the future.

7.6 IRC Section 409A:

The Plan is intended to either be exempt from, or to comply with, all provisions of IRC Section 409A and to the maximum extent possible shall be so interpreted and administered. Without limiting the generality of the foregoing, to the extent that any amount that becomes payable to any Participant by reason of such Participant's separation from service, as defined in the IRC Section 409A, is subject to IRC Section 409A, and that such Participant is a "specified employee" as defined in IRC Section 409A at the time of such separation from service, such amount shall not be paid until the earlier of the first day of the seventh month following the month that includes the separation from service or the date of the Participant's death. Notwithstanding the foregoing, in no event shall the Company be liable to any Participant for any tax or penalty imposed upon the Participant pursuant to IRC Section 409A or otherwise.

Participant: _____

2018 Target Bonus Amount: ____% of Eligible Earnings



MKS Instruments, Inc.
Light & Motion Division
Management and Key Employee Bonus Plan
 (as approved by the Compensation Committee on February 12, 2018)

1. Purpose:

The Light & Motion Division Management and Key Employee Bonus Plan (the “Plan”) provides key employees of the Light & Motion Division (“L&M Division”) of MKS Instruments, Inc. (“MKS” or the “Company”) with the opportunity to benefit financially for improving the L&M Division’s overall business performance by the receipt of annual cash incentive payments. Eligible employees (the “Participants”) are those who work in positions that influence how well the L&M Division performs. Participation in this Plan for employees who are not executive officers¹ or whose participation is not otherwise approved by the Compensation Committee of the Board of Directors of MKS Instruments, Inc. (the “Compensation Committee”) requires the approval of the most senior individual in the Light & Motion Division as well as Human Resources and the Chief Executive Officer.

2. Determination of a Participant’s Bonus Amount:

Each Participant’s actual bonus payout under the Plan, if any, will be determined by multiplying the Participant’s Target Bonus Amount by the L&M Division Performance Score, each as defined below.

2.1. Participant’s Target Bonus Amount:

Participant’s target bonus amount, which is attached on Exhibit A, is equal to a percentage of Participant’s Eligible Earnings for the fiscal year being measured (“Measurement Year”) under the Plan (“Target Bonus Amount”). Eligible Earnings are defined as eligible W-2 earnings received during the Measurement Year (i.e. base salary including regular, holiday, vacation, sick and retro pay, but not including bonus payments). A Participant’s Target Bonus Amount will not exceed 100% of his or her Eligible Earnings.

2.2. L&M Division Performance Score:

L&M Division performance will be measured using one financial metric, L&M Division Non-GAAP Operating Income, which is defined under this Plan for all Participants as L&M Division GAAP Operating Income for the Measurement Year, excluding any charges or income not related to the operating performance of the L&M Division. L&M Division performance levels with respect to this metric for the Measurement Year are set forth on Exhibit B hereto. These performance levels were recommended by MKS management and approved by the Compensation Committee. After the conclusion of the Measurement Year, the Compensation Committee will review the L&M Division’s performance with respect to this metric for such year and approve a score based upon achievement of the performance level set forth in Exhibit B ranging from zero to a maximum of 200% (“L&M Division Performance Score”). All of a Participant’s bonus is tied to the achievement level of this L&M Division financial metric.

¹ “Executive officers” for the purposes of this Plan are executive officers as defined in Rule 3b-7 under the Securities Exchange Act of 1934, as amended.

3. Clawback:

Any bonus payment made hereunder shall be subject to potential cancellation, recoupment, rescission, payback or other action in accordance with the terms of any applicable MKS clawback policy (the "Clawback Policy") or any applicable law, as may be in effect from time to time. The Participant hereby acknowledges and consents to MKS' application, implementation and enforcement of (i) any applicable Clawback Policy in effect at the time the Participant is notified of his or her eligibility to receive the award under this Plan and (ii) any provision of applicable law relating to cancellation, recoupment, rescission or payment of compensation, and agrees that MKS may take such actions as may be necessary to effectuate the Clawback Policy without further consideration or action.

4. Bonus Payment Date:

Bonus payouts under this Plan shall be made as soon as possible after the performance assessment has been completed with respect to the Measurement Year and approved by the Compensation Committee, but in no event later than March 15 of the subsequent year.

5. Administration:

The Plan will be administered by the Compensation Committee. The Compensation Committee shall have authority to adopt, amend and repeal such administrative rules, guidelines and practices relating to the Plan as it shall deem advisable. The Compensation Committee may construe and interpret the terms of the Plan. The Compensation Committee may correct any defect, supply any omission or reconcile any inconsistency in the Plan in the manner and to the extent it shall deem expedient and it shall be the sole and final judge of such expediency. All decisions by the Compensation Committee shall be made in the Compensation Committee's sole discretion and shall be final and binding on all persons having or claiming any interest in this Plan.

6. Amendment and Termination:

The Compensation Committee may amend, suspend or terminate the Plan or any portion thereof at any time. The Plan shall remain in effect until terminated.

7. Miscellaneous:

7.1 No Right to Employment:

In no way does participation in the Plan create a contract or a right of employment.

7.2 Tax Withholding:

MKS shall have the right to deduct from all payments under the Plan any federal, state or local taxes required by law to be withheld with respect to such payments.

7.3 Governing Law:

The provisions of the Plan and all awards made hereunder shall be governed by and interpreted in accordance with the laws of the Commonwealth of Massachusetts, excluding choice-of-law principles of the law of such state that would require the application of the laws of a jurisdiction other than the Commonwealth of Massachusetts.

7.4 Limitations on Liability:

Notwithstanding any other provisions of the Plan, no individual acting as a director, officer, employee or agent of MKS will be liable to any Participant, former Participant, spouse, beneficiary, or any other person for any claim, loss, liability, or expense incurred in connection with the Plan, nor will such individual be personally liable with respect to the Plan because of any contract or other instrument he or she executes in his or her capacity as a director, officer, employee or agent of MKS. MKS will indemnify and hold harmless each director, officer, employee or agent of MKS to whom any duty or power relating to the administration or interpretation of the Plan has been or will be delegated, against any cost or expense (including attorneys' fees) or liability (including any sum paid in settlement of a claim with the approval of MKS' Board of Directors) arising out of any act or omission to act concerning the Plan unless arising out of such person's own fraud or bad faith.

7.5 Participants are Unsecured Creditors:

Participants and their heirs, successors and assigns shall have no legal or equitable rights, interest or claims in any property or assets of MKS by virtue of participation in the Plan. MKS' obligation under the Plan shall be that of an unfunded and unsecured promise of MKS to pay money in the future.

7.6 IRC Section 409A:

The Plan is intended to either be exempt from, or to comply with, all provisions of IRC Section 409A and to the maximum extent possible shall be so interpreted and administered. Without limiting the generality of the foregoing, to the extent that any amount that becomes payable to any Participant by reason of such Participant's separation from service, as defined in the IRC Section 409A, is subject to IRC Section 409A, and that such Participant is a "specified employee" as defined in IRC Section 409A at the time of such separation from service, such amount shall not be paid until the earlier of the first day of the seventh month following the month that includes the separation from service or the date of the Participant's death. Notwithstanding the foregoing, in no event shall MKS be liable to any Participant for any tax or penalty imposed upon the Participant pursuant to IRC Section 409A or otherwise.

Participant: _____

2018 Target Bonus Amount: ____% of Eligible Earnings

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER
PURSUANT TO RULE 13a-14(a)/RULE 15d-14(a) OF THE
SECURITIES EXCHANGE ACT OF 1934, AS AMENDED

I, Gerald G. Colella, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of MKS Instruments, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: May 8, 2018

/s/ Gerald G. Colella

Gerald G. Colella
Chief Executive Officer and President
(Principal Executive Officer)

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER
PURSUANT TO RULE 13a-14(a)/RULE 15d-14(a) OF THE
SECURITIES EXCHANGE ACT OF 1934, AS AMENDED

I, Seth H. Bagshaw, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of MKS Instruments, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: May 8, 2018

/s/ Seth H. Bagshaw

Seth H. Bagshaw
Senior Vice President, Chief Financial Officer and Treasurer
(Principal Financial Officer)

CERTIFICATION OF CHIEF EXECUTIVE OFFICER AND CHIEF FINANCIAL OFFICER

PURSUANT TO 18 U.S.C. SECTION 1350,

AS ADOPTED PURSUANT TO

SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Quarterly Report on Form 10-Q of MKS Instruments, Inc. (the "Company") for the period ended March 31, 2018, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Gerald G. Colella, Chief Executive Officer and President of the Company, and Seth H. Bagshaw, Senior Vice President, Chief Financial Officer and Treasurer of the Company, each hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, based on his knowledge:

- (1) the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: May 8, 2018

/s/ Gerald G. ColellaGerald G. Colella
Chief Executive Officer and President

Dated: May 8, 2018

/s/ Seth H. BagshawSeth H. Bagshaw
Senior Vice President, Chief Financial Officer and Treasurer