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 June 30, 2019

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

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, no par value	MKSI	Nasdaq Global Select Market

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

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit 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, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act:

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

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

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

As of July 31, 2019, the registrant had 54,484,896 shares of common stock outstanding.

MKS INSTRUMENTS, INC.
FORM 10-Q
INDEX

PART I. FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS.

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

	June 30, 2019	December 31, 2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 366,935	$ 644,345
Short-term investments	92,985	73,826
Trade accounts receivable, net of allowance for doubtful accounts of $4,460 and $5,243 at June 30, 2019 and December 31, 2018, respectively	313,530	295,454
Inventories	479,497	384,689
Other current assets	80,303	65,790
Assets classified as held for sale	36,750	—
Total current assets	1,370,000	1,464,104
Property, plant and equipment, net	230,649	194,367
Right-of-use asset	68,631	—
Goodwill	1,058,667	586,996
Intangible assets, net	599,372	319,807
Long-term investments	10,401	10,290
Other assets	44,228	38,682
Total assets	$ 3,381,948	$ 2,614,246
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Short-term debt	$ 10,931	$ 3,986
Accounts payable	88,046	83,825
Accrued compensation	64,415	82,350
Income taxes payable	12,811	16,358
Lease liability	20,670	—
Deferred revenue and customer advances	26,597	14,246
Other current liabilities	61,686	62,520
Total current liabilities	285,156	263,285
Long-term debt, net	926,879	343,842
Non-current deferred taxes	76,042	48,223
Non-current accrued compensation	62,947	55,598
Non-current lease liability	51,141	—
Other liabilities	34,296	30,111
Total liabilities	1,436,461	741,059
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; 54,479,692 and 54,039,554 shares issued and outstanding at June 30, 2019 and December 31, 2018, respectively	113	113
Additional paid-in capital	849,585	793,932
Retained earnings	1,113,036	1,084,797
Accumulated other comprehensive loss	(17,247)	(5,655)
Total stockholders' equity	1,945,487	1,873,187
Total liabilities and stockholders' equity	$ 3,381,948	$ 2,614,246

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 June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Net revenues:				
Products	$401,326	$509,999	$798,689	$1,006,676
Services	72,784	63,141	138,982	120,739
Total net revenues	474,110	573,140	937,671	1,127,415
Cost of revenues:				
Cost of products	226,213	266,890	455,923	528,211
Cost of services	36,870	31,373	72,603	61,472
Total cost of revenues (exclusive of amortization shown separately below)	263,083	298,263	528,526	589,683
Gross profit	211,027	274,877	409,145	537,732
Research and development	41,855	36,504	80,788	71,361
Selling, general and administrative	83,236	76,181	165,691	159,130
Fees and expenses related to term loan	—	378	5,847	378
Acquisition and integration costs	3,240	(1,168)	33,407	(1,168)
Restructuring and other	1,242	790	3,165	3,010
Amortization of intangible assets	17,552	10,901	33,279	22,091
Income from operations	63,902	151,291	86,968	282,930
Interest income	1,423	1,456	3,137	2,561
Interest expense	12,674	3,922	21,793	9,352
Other expense, net	788	281	1,113	853
Income before income taxes	51,863	148,544	67,199	275,286
Provision for income taxes	14,124	25,682	17,005	47,303
Net income	$ 37,739	$122,862	$ 50,194	$ 227,983
Other comprehensive income:				
Changes in value of financial instruments designated as cash flow hedges, net of tax (benefit) expense(1)	$ (739)	$ 7,712	$ (687)	$ 7,890
Foreign currency translation adjustments, net of tax of $0	593	(18,508)	(3,675)	(7,737)
Unrecognized pension gain (loss), net of tax (benefit) expense(2)	2	48	1	(37)
Unrealized loss on investments, net of tax benefit(3)	(96)	(266)	(146)	(325)
Total comprehensive income	$ 37,499	$111,848	$ 45,687	$ 227,774
Net income per share:				
Basic	$ 0.69	$ 2.25	$ 0.92	$ 4.18
Diluted	$ 0.69	$ 2.22	$ 0.91	$ 4.12
Weighted average common shares outstanding:				
Basic	54,815	54,719	54,481	54,571
Diluted	55,089	55,274	54,966	55,280

(1) Tax (benefit) expense was $(227) and $2,367 for the three months ended June 30, 2019 and 2018, respectively. Tax (benefit) expense was $(212) and $2,255 for the six months ended June 30, 2019 and 2018, respectively

(2) Tax (benefit) expense was $(1) and $12 for the three months ended June 30, 2019 and 2018, respectively. Tax expense (benefit) was $20 and $(24) for the six months ended June 30, 2019 and 2018, respectively

(3) Tax benefit was $(30) and $(22) for the three months ended June 30, 2019 and 2018, respectively. Tax benefit was $(46) and $(39) for the six months ended June 30, 2019 and 2018, respectively.

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

MKS INSTRUMENTS, INC.
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands, except per share data)
(Unaudited)

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income/(Loss)	Total Stockholders' Equity
Balance at December 31, 2018	54,039,554	$ 113	$793,932	$1,084,797	$ (5,655)	$1,873,187
Net issuance under stock-based plans	192,218		22,491			22,491
Stock-based compensation			27,838			27,838
Cash dividend ($0.20 per common share)				(10,843)		(10,843)
Comprehensive income (net of tax):						
Net income				12,455		12,455
Other comprehensive loss					(4,267)	(4,267)
Balance at March 31, 2019	54,231,772	113	844,261	1,086,409	(9,922)	1,920,861
Net issuance under stock-based plans	247,920		(2,113)			(2,113)
Stock-based compensation			7,205			7,205
Cash dividend ($0.20 per common share)				(10,880)		(10,880)
Stock dividends accrued			232	(232)		—
Comprehensive income (net of tax):						
Net income				37,739		37,739
Other comprehensive loss					(7,325)	(7,325)
Balance at June 30, 2019	54,479,692	$ 113	$849,585	$1,113,036	$ (17,247)	$1,945,487

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income/(Loss)	Total Stockholders' Equity
Balance at December 31, 2017	54,355,535	$ 113	$789,644	$ 795,698	$ 3,452	$1,588,907
Net issuance under stock-based plans	136,568		(8,920)			(8,920)
Stock-based compensation			10,426			10,426
Cash dividend ($0.18 per common share)				(9,808)		(9,808)
Accounting Standards Codification Topic 606 adjustment				1,809		1,809
Comprehensive income (net of tax):						
Net income				105,121		105,121
Other comprehensive gain					10,805	10,805
Balance at March 31, 2018	54,492,103	113	791,150	892,820	14,257	1,698,340
Net issuance under stock-based plans	295,050		(4,132)			(4,132)
Stock-based compensation			6,366			6,366
Cash dividend ($0.20 per common share)				(10,942)		(10,942)
Accounting Standards Codification Topic 606 adjustment				(42)		(42)
Comprehensive income (net of tax):						
Net income				122,862		122,862
Other comprehensive loss					(11,014)	(11,014)
Balance at June 30, 2018	54,787,153	$ 113	$793,384	$1,004,698	$ 3,243	$1,801,438

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)

	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018
Cash flows provided by operating activities:		
Net income	$ 50,194	$ 227,983
Adjustments to reconcile net income to net cash provided by operating activities:		
Depreciation and amortization	52,655	40,377
Amortization of inventory step-up adjustment to fair value	7,624	—
Amortization of debt issuance costs, original issue discount, and soft call premium	2,953	2,887
Stock-based compensation	34,767	16,792
Provision for excess and obsolete inventory	12,053	10,292
(Recovery) provision for doubtful accounts	(691)	596
Deferred income taxes	(2,625)	1,170
Other	917	460
Changes in operating assets and liabilities, net of business acquired:		
Trade accounts receivable	27,163	(42,511)
Inventories	(30,821)	(59,529)
Income taxes	(3,941)	(11,416)
Other current and non-current assets	(897)	(4,317)
Accrued compensation	(17,808)	(15,933)
Other current and non-current liabilities	(273)	9,912
Accounts payable	(24,666)	5,604
Net cash provided by operating activities	106,604	182,367
Cash flows used in investing activities:		
Acquisition of business, net of cash acquired	(988,599)	—
Purchases of investments	(117,919)	(148,816)
Maturities of investments	40,386	90,734
Sales of investments	157,710	63,363
Proceeds from sale of assets	35	—
Purchases of property, plant and equipment	(28,254)	(21,818)
Net cash used in investing activities	(936,641)	(16,537)
Cash flows provided by (used in) financing activities:		
Net proceeds from short and long-term borrowings	640,939	36,989
Payments on short-term borrowings	(1,926)	(28,059)
Payments on long-term borrowings	(51,625)	(50,000)
Net payments related to employee stock awards	(11,012)	(13,052)
Dividend payments to common stockholders	(21,723)	(20,750)
Net cash provided by (used in) financing activities	554,653	(74,872)
Effect of exchange rate changes on cash and cash equivalents	(2,026)	2,586
(Decrease) Increase in cash and cash equivalents and restricted cash	(277,410)	93,544
Cash and cash equivalents at beginning of period	644,345	333,887
Cash and cash equivalents at end of period	$ 366,935	$ 427,431

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 June 30, 2019, and for the three and six months ended June 30, 2019 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, 2018 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, 2018 filed with the Securities and Exchange Commission on February 26, 2019.

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.

2) Recently Issued Accounting Pronouncements

In October 2018, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) 2018-16, “Derivatives and Hedging (Topic 815).” This standard permits the use of the Overnight Index Swap Rate (“OIS”) based on the Secured Overnight Financing Rate as a U.S. benchmark interest rate for hedge accounting purposes under Topic 815 in addition to the interest rates on direct treasury obligations of the U.S. government, the London Interbank Offered Rate (“LIBOR”) swap rate, the OIS rate based on the Federal Funds Effective Rate and the Securities Industry and Financial Markets Association Municipal Swap Rate. This standard is effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The Company adopted this ASU during the first quarter of 2019 and the adoption of this ASU did not have a material impact on the Company’s consolidated financial statements.

In August 2018, the FASB issued ASU 2018-15, “Intangibles-Goodwill and Other-Internal-Use Software (Subtopic 350-40): Customer’s Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement that is a Service Contract.” This standard aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The accounting for the service element of a hosting arrangement that is a service contract is not affected by the amendments to this update. This standard is effective for annual periods beginning after December 15, 2019, including interim periods within those fiscal years. The Company is currently evaluating the requirements of this ASU and adoption could 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 adopted this ASU during the first quarter of 2019 and 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”. This standard requires the recognition of lease assets and liabilities for all leases, with certain exceptions, on the balance sheet. This ASU is effective for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The Company adopted ASU 2016-02 on January 1, 2019, and used the effective date as its date of initial application. As such, the Company did not adjust prior period amounts. The Company also elected to adopt the package of practical expedients upon transition, which permits companies to not reassess lease identification, classification, and initial direct costs for leases that commenced prior to the effective date.

(in thousands, except share and per share data)

The Company implemented internal controls and a lease accounting information system to enable preparation on adoption. Upon adoption, the Company recorded a cumulative effect of initially applying this new standard, resulting in the addition of $71,042 of right-of-use assets and $20,192 and $54,147 of short-term and long-term lease liabilities, respectively. The right-of-use asset is net of the deferred rent liability, prepaid rent and a net favorable lease asset which were re-classified to the right-of-use asset upon adoption of the standard. For additional information on the required disclosures related to the impact of adopting this standard, see Note 3 to the Consolidated Condensed Financial Statements.

3) Leases

The Company has various operating leases for real estate and non-real estate items. The non-real estate leases are mainly comprised of automobiles but also include copiers, printers and other lower-valued items. The Company does not have any finance leases.

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

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

A right-of-use asset of $68,631, short-term lease liability of $20,670 and long-term lease liability of $51,141 were reflected on the balance sheet as of June 30, 2019.

The elements of lease expense were as follows:

	Three Months Ended June 30, 2019	Six Months Ended June 30, 2019
Lease Cost:		
Operating lease cost	$ 6,004	$ 11,381

The weighted average discount rate and the weighted average remaining lease term were 3.8% and 5.1 years, respectively, for the period ended June 30, 2019. Operating cash flows used for operating leases for the six months ended June 30, 2019 was $11,515.

Future lease payments under non-cancelable leases as of June 30, 2019 are detailed as follows:

	Amount
Year Ending December 31,	
2019 (remaining)	$ 11,607
2020	20,951
2021	13,899
2022	8,324
2023	7,061
Thereafter	17,301
Total lease payments	79,143
Less: imputed interest	7,332
Total operating lease liabilities	$ 71,811

(in thousands, except share and per share data)

Minimum lease payments under operating leases prior to adoption of ASU 2016-02 were as follows:

	Operating Leases
Year Ending December 31,	
2019	$ 20,106
2020	17,142
2021	10,325
2022	5,573
2023	4,411
Thereafter	8,739
Total minimum lease payments	$ 66,296

4) Revenue from Contracts with Customers

Contract assets as of June 30, 2019 and December 31, 2018 were $2,883 and $3,624, respectively, and included in other current assets.

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

	Six Months Ended June 30, 2019
Beginning balance, January 1[(1)]	$ 17,474
Deferred revenue and customer advances assumed in ESI Merger	4,629
Additions to deferred revenue and customer advances	34,772
Amount of deferred revenue and customer advances recognized in income	(27,407)
Ending balance, June 30[(2)]	$ 29,468

(1) Beginning deferred revenue and customer advances as of January 1, 2019 included $8,134 of current deferred revenue, $3,228 of long-term deferred revenue and $6,112 of current customer advances.

(2) Ending deferred revenue as of June 30, 2019 included $17,968 of current deferred revenue, $2,871 of long-term deferred revenue and $8,629 of current customer advances.

Disaggregation of Revenue

The following table summarizes revenue from contracts with customers:

	Three Months Ended June 30, 2019			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	$191,760	$167,363	$ 42,203	$401,326
Services	43,895	15,216	13,673	72,784
Total net revenues	$235,655	$182,579	$ 55,876	$474,110

	Three Months Ended June 30, 2018			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	$321,454	$188,545	$ —	$509,999
Services	46,874	16,267	—	63,141
Total net revenues	$368,328	$204,812	$ —	$573,140

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

	Six Months Ended June 30, 2019			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	$384,408	$346,060	$ 68,221	$ 798,689
Services	85,602	30,507	22,873	138,982
Total net revenues	$470,010	$376,567	$ 91,094	$ 937,671

	Six Months Ended June 30, 2018			
	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Net revenues:				
Products	$625,790	380,886	$ —	$1,006,676
Services	90,882	29,857	—	120,739
Total net revenues	$716,672	$410,743	$ —	$1,127,415

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 is recorded over time.

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

5) Investments

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

	June 30, 2019	December 31, 2018
Available-for-sale investments:		
Time deposits and certificates of deposit	$ 5,262	$ 102
Bankers' acceptance drafts	3,833	989
Asset-backed securities	—	9,113
Commercial paper	60,154	19,359
Corporate obligations	8,219	9,352
U.S. treasury obligations	—	13,298
U.S. agency obligations	15,517	21,613
	$ 92,985	$ 73,826

Investments classified as long-term consist of the following:

	June 30, 2019	December 31, 2018
Available-for-sale investments:		
Group insurance contracts	$ 6,001	$ 5,890
Cost method investments:		
Minority interest in a private company	4,400	4,400
	$ 10,401	$ 10,290

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

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

As of June 30, 2019:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Short-term investments:				
Available-for-sale investments:				
Time deposits and certificates of deposit	$ 5,261	$ 1	$ —	$ 5,262
Bankers' acceptance drafts	3,833	—	—	3,833
Commercial paper	60,526	—	(372)	60,154
Corporate obligations	8,218	1	—	8,219
U.S. agency obligations	15,512	6	(1)	15,517
	$93,350	$ 8	$ (373)	$92,985

As of June 30, 2019:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	$5,567	$ 434	$ —	$ 6,001

As of December 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	$ 102	$ —	$ —	$ 102
Bankers' acceptance drafts	989	—	—	989
Asset-backed securities	9,121	1	(9)	9,113
Commercial paper	19,504	—	(145)	19,359
Corporate obligations	9,367	—	(15)	9,352
U.S. treasury obligations	13,294	4	—	13,298
U.S. agency obligations	21,617	2	(6)	21,613
	$73,994	$ 7	$ (175)	$73,826

As of December 31, 2018:	Cost	Gross Unrealized Gains	Gross Unrealized (Losses)	Estimated Fair Value
Long-term investments:				
Available-for-sale investments:				
Group insurance contracts	$5,546	$ 344	$ —	$ 5,890

The tables above, which show the gross unrealized gains and (losses) aggregated by investment category for available-for-sale investments as of June 30, 2019 and December 31, 2018, 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 June 30, 2019 and December 31, 2018 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 six months ended June 30, 2019 and 2018.

6) 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.

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.

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

Assets and liabilities of the Company are measured at fair value on a recurring basis as of June 30, 2019 and are summarized as follows:

		Fair Value Measurements at Reporting Date Using		
Description	June 30, 2019	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	$ 104	$ 104	$ —	$ —
Time deposits and certificates of deposit	3,396	—	3,396	—
Commercial paper	36,968	—	36,968	—
U.S. agency obligations	22,632	—	22,632	—
Restricted cash – money market funds	322	322	—	—
Available-for-sale investments:				
Time deposits and certificates of deposit	5,262	—	5,262	—
Bankers' acceptance drafts	3,833	—	3,833	—
Commercial paper	60,154	—	60,154	—
Corporate obligations	8,219	—	8,219	—
U.S. agency obligations	15,517	—	15,517	—
Group insurance contracts	6,001	—	6,001	—
Derivatives – currency forward contracts	2,920	—	2,920	—
Funds in investments and other assets:				
Israeli pension assets	15,744	—	15,744	—
Deferred compensation plan assets:				
Mutual funds and exchange traded funds	2,001	—	2,001	—
Money market securities	288	—	288	—
Total assets	$ 183,361	$ 426	$182,935	$ —
Liabilities:				
Derivatives – currency forward contracts	$ 1,023	$ —	$ 1,023	$ —
Derivatives – interest rate hedge – non-current	4,633	—	4,633	—
Total liabilities	$ 5,656	$ —	$ 5,656	$ —
Reported as follows:				
Assets:				
Cash and cash equivalents, including restricted cash(1)	$ 63,422	$ 426	$ 62,996	$ —
Short-term investments	92,985	—	92,985	—
Other current assets	2,920	—	2,920	—
Total current assets	$ 159,327	$ 426	$158,901	$ —
Long-term investments(2)	$ 6,001	$ —	$ 6,001	$ —
Other assets	18,033	—	18,033	—
Total long-term assets	$ 24,034	$ —	$ 24,034	$ —
Liabilities:				
Other current liabilities	$ 1,023	$ —	$ 1,023	$ —
Other liabilities	$ 4,633	$ —	$ 4,633	$ —

(1) The cash and cash equivalent amounts presented in the table above do not include cash of $303,513 as of June 30, 2019.
(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.

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

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

		Fair Value Measurements at Reporting Date Using		
Description	December 31, 2018	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	$ 180,340	$ 180,340	$ —	$ —
Time deposits and certificates of deposit	850	—	850	—
Commercial paper	2,687	—	2,687	—
U.S. agency obligations	3,418	—	3,418	—
Restricted cash – money market funds	110	110	—	—
Available-for-sale investments:				
Time deposits and certificates of deposit	102	—	102	—
Bankers’ acceptance drafts	989	—	989	—
Asset-backed securities	9,113	—	9,113	—
Commercial paper	19,359	—	19,359	—
Corporate obligations	9,352	—	9,352	—
U.S. treasury obligations	13,298	—	13,298	—
U.S. agency obligations	21,613	—	21,613	—
Group insurance contracts	5,890	—	5,890	—
Derivatives – currency forward contracts	2,485	—	2,485	—
Funds in investments and other assets:				
Israeli pension assets	14,408	—	14,408	—
Derivatives – interest rate hedge – non-current	6,083	—	6,083	—
Total assets	$ 290,097	$ 180,450	$109,647	$ —
Liabilities:				
Derivatives – currency forward contracts	$ 1,168	$ —	$ 1,168	$ —
Reported as follows:				
Assets:				
Cash and cash equivalents, including restricted cash[(1)]	$ 187,405	$ 180,450	$ 6,955	$ —
Short-term investments	73,826	—	73,826	—
Other current assets	2,485	—	2,485	—
Total current assets	$ 263,716	$ 180,450	$ 83,266	$ —
Long-term investments[(2)]	$ 5,890	$ —	$ 5,890	$ —
Other assets	20,491	—	20,491	—
Total long-term assets	$ 26,381	$ —	$ 26,381	$ —
Liabilities:				
Other current liabilities	$ 1,168	$ —	$ 1,168	$ —

(1) The cash and cash equivalent amounts presented in the table above do not include cash of $456,940 as of December 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.

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, certificates of deposit, bankers' acceptance drafts, asset-backed securities (which include auto loans, credit card receivables and equipment trust receivables), commercial paper, corporate obligations, U.S. treasury obligations, U.S. agency obligations and group insurance contracts.

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

Israeli Pension Assets

Israeli pension assets represent investments in mutual funds, government securities and other time deposits. These investments are set aside for the retirement benefit of the employees 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.

7) 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 Agreements

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 11. This hedge fixes the interest rate paid on the hedged debt at 1.198% per annum plus the applicable credit spread, which was 2.0% as of June 30, 2019, through September 30, 2020. At June 30, 2019, the notional amount of this transaction was $290,000 and had a fair value asset of $2,055. At December 31, 2018, the notional amount of this transaction was $290,000 and had a fair value asset of $6,083.

On April 3, 2019, the Company entered into an interest rate swap agreement, which has a maturity date of March 31, 2023, to fix the rate on $300,000 of the then-outstanding balance of the 2019 Incremental Term Loan Facility, as described further in Note 11. The rate is fixed at 2.309% per annum plus the applicable credit spread, which was 2.25% at June 30, 2019. At June 30, 2019, the notional amount of this transaction was $300,000 and had a fair value liability of $6,688.

(in thousands, except share and per share data)

The interest rate swaps are 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 these arrangements are no longer an effective hedge, any ineffectiveness measured in the hedging relationships is recorded currently in earnings in the period it occurs.

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 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 June 30, 2019 and December 31, 2018, the Company had outstanding forward foreign exchange contracts with gross notional values of $161,278 and $159,394, respectively. The following tables provide a summary of the primary net hedging positions and corresponding fair values held as of June 30, 2019 and December 31, 2018:

	June 30, 2019	
Currency Hedged (Buy/Sell)	Gross Notional Value	Fair Value(1)
U.S. Dollar/Japanese Yen	$ 46,933	$ (508)
U.S. Dollar/South Korean Won	52,484	1,523
U.S. Dollar/Euro	31,603	306
U.S. Dollar/U.K. Pound Sterling	10,208	276
U.S. Dollar/Taiwan Dollar	20,050	300
Total	$ 161,278	$ 1,897

	December 31, 2018	
Currency Hedged (Buy/Sell)	Gross Notional Value	Fair Value(1)
U.S. Dollar/Japanese Yen	$ 43,770	$ (478)
U.S. Dollar/South Korean Won	59,149	570
U.S. Dollar/Euro	23,515	688
U.S. Dollar/U.K. Pound Sterling	11,827	323
U.S. Dollar/Taiwan Dollar	21,133	214
Total	$ 159,394	$ 1,317

(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:

	June 30, 2019	December 31, 2018
Derivative assets:		
Foreign exchange contracts(1)	$ 2,920	$ 2,485
Interest rate hedge(2)	—	6,083
Derivative liabilities:		
Foreign exchange contracts(1)	(1,023)	(1,168)
Interest rate hedge(2)	(4,633)	—
Total net derivative (liability) asset designated as hedging instruments	$ (2,736)	$ 7,400

(1) The derivative assets of $2,920 and $2,485 as of June 30, 2019 and December 31, 2018, respectively, related to foreign exchange contracts and are classified in other current assets in the consolidated balance sheet. The derivative liabilities of $1,023 and $1,168 as of June 30, 2019 and December 31, 2018, respectively, 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 liability of $4,633 as of June 30, 2019 is classified in other liabilities in the consolidated balance sheet. The interest rate hedge asset of $6,083 as of December 31, 2018 is classified in other assets in the consolidated balance sheet.

(in thousands, except share and per share data)

The net amount of existing gains as of June 30, 2019 that the Company expects to reclassify from OCI into earnings within the next twelve months is immaterial.

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

Derivatives Designated as Cash Flow Hedging Instruments	Three Months Ended June 30, 2019	Three Months Ended June 30, 2018	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018
Forward exchange contracts:				
Net gain (loss) recognized in OCI[1]	$(10,232)	$10,079	$(10,165)	$10,145
Net gain (loss) reclassified from accumulated OCI into income[2]	$ 1,128	$ (2,648)	$ 2,077	$ (5,188)

(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 and six months ended June 30, 2019 and 2018. The tax effect of the gains or losses reclassified from accumulated OCI into income is immaterial.

The following table provides a summary of the gain (loss) on derivatives not designated as hedging instruments:

Derivatives Not Designated as Hedging Instruments	Three Months Ended June 30, 2019	Three Months Ended June 30, 2018	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018
Forward exchange contracts:				
Net gain (loss) recognized in income[1]	$ (305)	$ 1,375	$ (248)	$ 122

(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.

8) Inventories

Inventories consist of the following:

	June 30, 2019	December 31, 2018
Raw materials	$ 300,484	$ 235,593
Work-in-process	82,661	61,908
Finished goods	96,352	87,188
	$ 479,497	$ 384,689

9) Acquisitions

Electro Scientific Industries, Inc.

On February 1, 2019, the Company completed its acquisition of Electro Scientific Industries, Inc. (“ESI”) pursuant to an Agreement and Plan of Merger, dated as of October 29, 2018 (the “Merger Agreement”), by and among the Company, EAS Equipment, Inc., formerly a Delaware corporation and a wholly-owned subsidiary of the Company, and ESI (the “ESI Merger”). At the effective time of the ESI Merger and pursuant to the terms and conditions of the Merger Agreement, each share of ESI’s common stock that was issued and outstanding immediately prior to the effective time of the ESI Merger was converted into the right to receive $30.00 in cash, without interest and subject to deduction of any required withholding tax.

The aggregate consideration was $1,032,671, which excludes related transaction fees and expenses, and non-cash consideration related to the exchange of share-based awards of $30,630, for a total purchase consideration of $1,063,301. The Company funded the payment of the aggregate consideration with a combination of the Company’s available cash on hand and the proceeds from the Company’s senior secured term loan facility described in Note 11.

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

ESI provides laser-based manufacturing solutions for the micro-machining industry that enable customers to optimize production. It's market is composed primarily of flexible and rigid PCB processing/fabrication, semiconductor wafer processing and passive component manufacturing and testing. ESI solutions incorporate specialized laser technology and proprietary control software to efficiently process the materials and components that are an integral part of electronic devices and systems.

The purchase price of ESI consisted of the following:

Cash paid for outstanding shares[1]	$1,032,671
Settlement of share-based compensation awards[2]	30,630
Total purchase price	1,063,301
Less: Cash and cash equivalents acquired	(44,072)
Total purchase price, net of cash and cash equivalents acquired	$1,019,229

(1) Represents cash paid of $30.00 per share for 34,422,361 shares of ESI common stock, without interest and subject to a deduction for any required withholding tax.

(2) Represents the vested but not issued portion of ESI share-based compensation awards as of the acquisition date of February 1, 2019.

Under the acquisition method of accounting, the total estimated acquisition consideration is allocated to the acquired tangible and intangible assets and assumed liabilities of ESI based on their fair values as of the acquisition date. Any excess of the acquisition consideration over the fair value of assets acquired and liabilities assumed is allocated to goodwill. The Company expects that none of such goodwill and intangible assets will be deductible for tax purposes.

The following table summarizes the allocation of the preliminary purchase price to the fair values assigned to assets acquired and liabilities assumed at the date of the ESI Merger:

Current assets (excluding inventory)	$ 208,009
Inventory	83,036
Intangible assets	316,200
Goodwill	472,695
Property, plant and equipment	65,489
Long-term assets	9,633
Total assets acquired	1,155,062
Current liabilities	51,479
Non-current deferred taxes	33,123
Other long-term liabilities	7,159
Total liabilities assumed	91,761
Fair value of assets acquired and liabilities assumed	1,063,301
Less: Cash and cash equivalents acquired	(44,072)
Total purchase price, net of cash and cash equivalents acquired	$1,019,229

During the three months ended June 30, 2019, the Company recorded an increase in fair value of approximately $12,600 to property, plant and equipment, based upon the final valuation for land and three ESI facilities located in Portland, Oregon. The Company also recorded a reduction in fair value of approximately $9,800 to inventories relating to three product lines. These adjustments also resulted in an adjustment to intangible assets of $2,400 and goodwill of $1,300 and the related impact to the deferred tax line items.

(in thousands, except share and per share data)

The fair value write-up of acquired finished goods inventory was $7,624, the amount of which will be expensed over the period during which the acquired inventory is sold. Accordingly, for the three and six months ended June 30, 2019, the Company recorded $2,484 and $7,624, respectively, of incremental cost of sales charges associated with the fair value write-up of inventory acquired in the ESI Merger.

The fair value write-up of acquired property, plant and equipment of $39,267 will be amortized over the estimated useful life of the applicable assets, excluding the fair value write-up in the value of land. Property, plant and equipment is valued at its value-in-use, unless there was a known plan to dispose of the asset.

The acquired intangible assets are being amortized on a straight-line basis, which approximates the economic use of the asset.

The following table reflects the allocation of the acquired intangible assets and related estimate of useful lives:

Completed technology - Laser	$255,700
Completed technology - Non-Laser	18,300
Trademarks and trade names	14,400
Customer relationships	25,400
Backlog	2,400
	$316,200

The net fair value of the acquired intangibles was determined using the income approach. In performing these valuations, the key underlying probability-adjusted assumptions of the discounted cash flows were projected revenues, gross margin expectations and operating cost estimates. The valuations were based on the information that was available as of the acquisition date and expectations and assumptions that have been deemed reasonable by the Company’s management. There are inherent uncertainties and management judgment required in these determinations. This acquisition resulted in a purchase price that exceeded the estimated fair value of tangible and intangible assets, the excess amount of which was allocated to goodwill.

While the Company uses its best estimates and assumptions as part of the purchase price allocation process to value the assets acquired and liabilities assumed on the acquisition date, its estimates and assumptions are subject to refinement. Fair value estimates are based on a complex series of judgments about future events and uncertainties and rely heavily on estimates and assumptions. The judgments used to determine the estimated fair value assigned to each class of assets acquired and liabilities assumed, as well as asset lives, can materially impact the Company’s results of operations. The finalization of the purchase accounting assessment will result in a change in the valuation of assets acquired and liabilities assumed and may have a material impact on the Company’s results of operations and financial position. As a result, during the measurement period, which may be up to one year from the acquisition date, the Company records adjustments to the assets acquired and liabilities assumed with a corresponding offset to goodwill to reflect additional information received about facts and circumstances which existed at the date of acquisition. The Company records adjustments to the assets acquired and liabilities assumed subsequent to the purchase price allocation period in the Company’s operating results in the period in which the adjustments are determined. The size and breadth of the ESI Merger will necessitate the use of this measurement period to adequately analyze and assess a number of the factors used in establishing the fair value of certain tangible and intangible assets acquired and liabilities assumed as of the acquisition date and the related tax impacts of any changes made. Any potential adjustments made could be material in relation to the preliminary values presented above.

The Company believes the amount of goodwill relative to identifiable intangible assets relates to several factors, including broadening its position in key industrial end markets to complementary solutions, and leveraging component and systems expertise to provide robust solutions to meet customer evolving technology needs.

The results of this acquisition were included in the Company’s consolidated statement of operations beginning on February 1, 2019. ESI constitutes the Company’s Equipment & Solutions reportable segment (see Note 17).

Certain executives from ESI had severance provisions in their respective ESI employment agreements. The agreements included terms that were accounted for as dual-trigger arrangements. Through the Company’s acquisition accounting, the expense relating to these benefits was recognized in the combined entity’s financial statements. The Company recorded costs of $2,701 and $14,023 in acquisition and integration costs as compensation expense and stock-based compensation expense, respectively, for the six months ended June 30, 2019 associated with these severance provisions. The restricted stock units and stock appreciation rights that were eligible for accelerated vesting if the executive exercised his or her rights but were not issued as of each reporting period-end, were excluded from the computation of basic earnings per share and included in the computation of diluted earnings per share for such reporting period.

(in thousands, except share and per share data)

The Company's consolidated net revenue and earnings for the three and six months ended June 30, 2019 include the following amounts of revenue and earnings of ESI since the acquisition date:

	Three Months Ended June 30, 2019	Six Months Ended June 30, 2019
Total net revenues	$ 55,877	$ 91,096
Net loss	$ (3,129)	$ (34,844)
Net loss per share:		
Basic	$ (0.06)	$ (0.64)
Diluted	$ (0.06)	$ (0.63)

Pro Forma Results

The following unaudited pro forma financial information presents the combined results of operations of the Company as if the ESI Merger had occurred on January 1, 2018. The unaudited pro forma financial information is not necessarily indicative of what the Company's condensed consolidated results of operations actually would have been had the acquisition occurred at the beginning of each year. In addition, the unaudited pro forma financial information does not attempt to project the future results of operations of the combined Company.

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Total net revenues	$474,110	$683,764	$952,179	$1,344,409
Net income	$ 47,464	$132,601	$ 89,871	$ 230,765
Net income per share:				
Basic	$ 0.87	$ 2.42	$ 1.65	$ 4.23
Diluted	$ 0.86	$ 2.40	$ 1.64	$ 4.17

The unaudited pro forma financial information above gives effect primarily to the following:

(1) Incremental amortization and depreciation expense related to the estimated fair value of identifiable intangible assets and property, plant and equipment, respectively, from the purchase price allocation.

(2) Revenue and cost of goods sold adjustments as a result of the reduction in deferred revenue and the cost related to their estimated fair value.

(3) Incremental interest expense related to the Company's 2019 Incremental Term Loan Facility, as defined and discussed in Note 11.

(4) The exclusion of acquisition costs and inventory step-up amortization from the three and six month period ended June 30, 2019 and the addition of these items to the three and six month period ended June 30, 2018.

(5) The exclusion of debt issuance costs due to the modification of the 2019 Incremental Term Loan Facility from the three and six month period ended June 30, 2019 and the addition of this item to the three and six month period ended June 30, 2018.

(6) The estimated tax impact of the above adjustments.

10) 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.

(in thousands, except share and per share data)

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.

Effective July 1, 2018, the Company reassigned goodwill to certain reporting units within the Light & Motion reportable segment resulting from a reorganization of the composition of goodwill reporting units. The goodwill was reassigned to the reporting units affected using the relative fair value approach. In conjunction with this goodwill reassignment, the Company performed an interim quantitative impairment test as of July 1, 2018 for all of its reporting units and concluded that the fair values of each reporting unit exceeded their respective carrying values.

Effective January 1, 2019, the Company reassigned goodwill to certain reporting units within the Light & Motion reportable segment resulting from a reorganization of the composition of goodwill reporting units. The goodwill was reassigned to the reporting units affected using the relative fair value approach. The Company also concluded that the fair value of each reporting unit exceeded its respective carrying value.

The changes in the carrying amount of goodwill and accumulated impairment loss during the six months ended June 30, 2019 and year ended December 31, 2018 were as follows:

	Six Months Ended June 30, 2019			Twelve Months Ended December 31, 2018		
	Gross Carrying Amount	Accumulated Impairment Loss	Net	Gross Carrying Amount	Accumulated Impairment Loss	Net
Beginning balance at January 1	$ 731,272	$ (144,276)	$ 586,996	$ 735,323	$ (144,276)	$ 591,047
Acquired goodwill[1]	472,695	—	472,695	—	—	—
Foreign currency translation	(1,024)	—	(1,024)	(4,051)	—	(4,051)
Ending balance at June 30, 2019 and December 31, 2018	$1,202,943	$ (144,276)	$1,058,667	$ 731,272	$ (144,276)	$ 586,996

(1) During the six months ended June 30, 2019, the Company recorded $472,695 of goodwill related to the ESI Merger.

Intangible Assets

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

As of June 30, 2019:	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Completed technology[1]	$446,431	$ (105)	$ (157,407)	$ (156)	$288,763
Customer relationships[1]	308,144	(1,406)	(73,888)	(677)	232,173
Patents, trademarks, trade names and other[1]	120,895	—	(42,567)	108	78,436
	$875,470	$ (1,511)	$ (273,862)	$ (725)	$599,372

(1) During the six months ended June 30, 2019, the Company recorded $316,200 of separately identified intangible assets related to the ESI Merger, of which $274,000 was completed technology, $25,400 was customer relationships and $16,800 was trademarks, trade names and backlog. Separately, on January 1, 2019, the Company reclassified $6,428 of gross favorable lease assets and $3,445 of related accumulated amortization from patents, trademarks, trade names and other to the right-of-use asset line in the balance sheet.

(in thousands, except share and per share data)

As of December 31, 2018:	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Completed technology	$172,431	$ (105)	$ (137,283)	$ (73)	$ 34,970
Customer relationships	282,744	(1,406)	(63,788)	(269)	217,281
Patents, trademarks, trade names and other	110,523	—	(42,954)	(13)	67,556
	$565,698	$ (1,511)	$ (244,025)	$ (355)	$319,807

Aggregate amortization expense related to acquired intangibles for the six months ended June 30, 2019 and 2018 was $33,279 and $22,091, respectively. The net amortization expense from favorable lease commitments for the six months ended June 30, 2019 and 2018 was net of $0 and $277, respectively. Aggregate net amortization expense related to acquired intangible assets for future years is as follows:

Year	Amount
2019 (remaining)	$ 34,538
2020	55,565
2021	47,765
2022	45,294
2023	44,942
2024	44,024
Thereafter	271,344

11) Debt

Term Loan Credit Agreement

In connection with the completion of the acquisition of Newport Corporation ("Newport") in 2016 (the "Newport Merger"), the Company entered into a term loan credit agreement (the "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 in the original principal amount of $780,000 (the "2016 Term Loan Facility"), subject to increase at the Company's option and subject to receipt of lender commitments in accordance with the Credit Agreement (the 2016 Term Loan Facility, together with the 2019 Incremental Term Loan Facility (as defined below), the "Term Loan Facility"). The 2016 Term Loan Facility matures on April 29, 2023. 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, unless an alternate rate of interest is agreed, all loans will be determined by reference to the Base Rate if the LIBOR rate cannot be ascertained, if regulators impose material restrictions on the authority of a lender to make LIBOR rate loans, or for other reasons. The 2016 Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

The Company subsequently entered into four separate repricing amendments to the 2016 Term Loan Facility, which decreased the applicable margin for LIBOR borrowings from 4.0% to 1.75%, with a LIBOR rate floor of 0.75%. As a consequence of the pricing of the 2019 Incremental Term Loan Facility (defined below), the applicable margin for the 2016 Term Loan Facility was increased to 2.00% (from 1.75%) with respect to LIBOR borrowings and 1.00% (from 0.75%) with respect to base rate borrowings. The interest rate on the 2016 Term Loan Facility as of June 30, 2019 was 4.4%.

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 2016 Term Loan Facility. The rate is fixed at 1.198% per annum plus the applicable credit spread, which was 2.0% at June 30, 2019. At June 30, 2019, the notional amount of this transaction was $290,000 and had a fair value asset of $2,055.

As of June 30, 2019, after total principal prepayments of $475,000 (which includes a $50,000 prepayment made during the three months ended June 30, 2019) and regularly scheduled principal payments of $6,536, the total outstanding principal balance of the 2016 Term Loan Facility was $298,464. As a result of making these prepayments, the Company is no longer required to make any regularly scheduled principal payments on the 2016 Term Loan Facility until the maturity date of the loan.

The Company incurred $28,747 of deferred finance fees, original issue discount and repricing fees related to the term loans under the 2016 Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method. A portion of these fees have been accelerated in connection with the various debt prepayments during 2016, 2017 and 2018. As of June 30, 2019, the remaining balance of the deferred finance fees, original issue discount and repricing fees related to the 2016 Term Loan Facility was $2,648.

On February 1, 2019, in connection with the completion of the ESI Merger, the Company entered into an amendment ("Amendment No. 5") to the Credit Agreement. Amendment No. 5 provided an additional tranche B-5 term loan commitment in the principal amount of $650,000 (the "2019 Incremental Term Loan Facility"), all of which was drawn down in connection with the closing of the ESI Merger. Pursuant to Amendment No. 5, the Company also effectuated certain amendments to the Credit Agreement which make certain of the negative covenants and other provisions less restrictive. The 2019 Incremental Term Loan Facility matures on February 1, 2026 and bears interest at a rate per annum equal to, at the Company's option, a base rate or LIBOR rate (as described above) plus, in each case, an applicable margin equal to 1.25% with respect to base rate borrowings and 2.25% with respect to LIBOR borrowings. The 2019 Incremental Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

On April 3, 2019, the Company entered into an interest rate swap agreement, which has a maturity date of March 31, 2023, to fix the rate on $300,000 of the then-outstanding balance of the 2019 Incremental Term Loan Facility. The rate is fixed at 2.309% per annum plus the applicable credit spread, which was 2.25% at June 30, 2019. At June 30, 2019, the notional amount of this transaction was $300,000 and had a fair value liability of $6,688.

The Company incurred $11,362 of deferred finance fees and original issue discount fees related to the term loans under the 2019 Incremental Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method. As of June 30, 2019, the remaining balance of the deferred finance fees and original issue discount related to the 2019 Incremental Term Loan Facility was $10,895.

The Company is required to make scheduled quarterly payments each equal to 0.25% of the original principal amount of the 2019 Incremental Term Loan Facility, with the balance due on February 1, 2026. If, on or prior to the date that is six months after the closing date of Amendment No. 5, the Company prepays any loans under the 2019 Incremental Term Loan Facility in connection with a repricing transaction, the Company must pay a prepayment premium of 1.00% of the aggregate principal amount of the loans so prepaid. At June 30, 2019, after regularly scheduled principal payments of $1,625, the total balance outstanding of the 2019 Incremental Term Loan Facility was $648,375 and the interest rate was 4.7%.

Under the Credit Agreement, the Company is required to prepay outstanding term loans under the 2016 Term Loan Facility and the 2019 Incremental Term Loan Facility, 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. As a result of the Company's Total Leverage Ratio, it was not required to make a prepayment of excess cash flow for the fiscal year ended December 31, 2018.

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 June 30, 2019, the Company was in compliance with all covenants under the Credit Agreement.

Senior Secured Asset-Based Revolving Credit Facility

On February 1, 2019, in connection with the completion of the ESI Merger, the Company entered into an asset-based credit agreement with Barclays Bank PLC, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto (the "ABL Credit Agreement"), that provides senior secured revolving credit financing of up to $100,000, subject to a borrowing base limitation (the "ABL Facility"). On April 26, 2019, the Company entered into a First Amendment to the

(in thousands, except share and per share data)

ABL Credit Agreement which amended the borrowing base calculation for eligible inventory prior to an initial field examination and appraisal requirements. The borrowing base for the ABL Facility at any time equals the sum of: (a) 85% of certain eligible accounts; plus (b) prior to certain notice and field examination and appraisal requirements, the lesser of (i) 20% of net book value of eligible inventory in the United States and (ii) 30% of the borrowing base, and after the satisfaction of such requirements, the lesser of (i) the lesser of (A) 65% of the lower of cost or market value of certain eligible inventory and (B) 85% of the net orderly liquidation value of certain eligible inventory and (ii) 30% of the borrowing base; minus (c) reserves established by the administrative agent, in each case, subject to additional limitations and examination requirements for eligible accounts and eligible inventory acquired in an acquisition after February 1, 2019. The ABL Facility includes borrowing capacity in the form of letters of credit up to $25,000.

Borrowings under the ABL Facility bear interest at a rate per annum equal to, at the Company's option, any of the following, plus, in each case, an applicable margin: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the "prime rate" quoted in *The Wall Street Journal*, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00% and (4) a floor of 0.00%; and (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, with a floor of 0.00%. The initial applicable margin for borrowings under the ABL Facility is 0.50% with respect to base rate borrowings and 1.50% with respect to LIBOR borrowings. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, the applicable margin for borrowings thereunder is subject to upward or downward adjustment each fiscal quarter, based on the average historical excess availability during the preceding quarter.

In addition to paying interest on any outstanding principal under the ABL Facility, the Company is required to pay a commitment fee in respect of the unutilized commitments thereunder equal to 0.25% per annum. The Company must also pay customary letter of credit fees and agency fees.

The Company incurred $785 of costs in connection with the ABL Facility, which were capitalized and included in other assets in the accompanying consolidated balance sheet and are being amortized to interest expense over the contractual term of five years of the ABL Facility. As a result of a prior asset-based facility being terminated concurrently with our entry into the ABL Facility, the Company wrote off $216 of previously capitalized debt issuance costs.

The ABL Credit Agreement also contains customary representations and warranties, affirmative covenants and provisions relating to events of default. If an event of default occurs, the lenders under the ABL Facility will be entitled to take various actions, including the acceleration of amounts due under the ABL Facility and all actions permitted to be taken by a secured creditor. The Company has not borrowed against this ABL Facility to date.

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 June 30, 2019 of up to an equivalent of $21,312. 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. There were no borrowings outstanding under these arrangements at June 30, 2019 and December 31, 2018, respectively.

The Company has various revolving lines of credit and a financing facility. These revolving lines of credit and financing facility have no expiration date and as of June 30, 2019, provided for aggregate borrowings of up to an equivalent of $11,583. 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 $4,431 and $3,389 at June 30, 2019 and December 31, 2018, respectively.

	June 30, 2019	December 31, 2018
Short-term debt:		
Japanese lines of credit	$ 3,701	$ 2,724
Japanese receivables financing facility	730	665
Other debt	—	597
Term Loan Facility	6,500	—
	$ 10,931	$ 3,986

(in thousands, except share and per share data)

	June 30, 2019	December 31, 2018
Long-term debt:		
Other debt	$ 84	$ 86
Term Loan Facility, net(1)	926,795	343,756
	$ 926,879	$ 343,842

(1) Net of deferred financing fees, original issuance discount and repricing fee of $13,543 and $4,708 as of June 30, 2019 and December 31, 2018, respectively.

The Company recognized interest expense of $21,793 and $9,352 for the six months ended June 30, 2019 and 2018, respectively.

Contractual maturities of the Company's debt obligations as of June 30, 2019 are as follows:

Year	Amount
2019 (remaining)	$ 7,681
2020	6,571
2021	6,512
2022	6,500
2023	304,964
2024	6,500
Thereafter	612,625

12) 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:

	Six Months Ended June 30,	
	2019	2018
Beginning of period	$ 10,399	$ 10,104
Assumed product warranty liability from ESI Merger	7,177	—
Provision for product warranties	12,891	8,484
Direct and other charges to warranty liability	(14,418)	(7,328)
End of period(1)	$ 16,049	$ 11,260

(1) As of June 30, 2019, short-term product warranty of $12,845 and long-term product warranty of $3,204 were included within other current liabilities and other liabilities, respectively, within the accompanying condensed consolidated balance sheet. As of June 30, 2018, short-term product warranty of $10,846 and long-term product warranty of $414 were included within other current liabilities and other liabilities, respectively, within the accompanying condensed consolidated balance sheet.

13) Income Taxes

The Company's effective tax rates for the three and six months ended June 30, 2019 were 27.2% and 25.3%, respectively. The effective tax rates for the three and six months ended June 30, 2019 and related income tax expense, were higher than the U.S. statutory tax rate primarily due to a correction of an out of period error with respect to deferred tax assets related to limitations on the deduction of executive compensation in the amount of $5,023. This correction, which should have been recorded during the three months ended September 30, 2018, increased the Company's effective tax rates in the three and six months ended June 30, 2019 by 9.8% and 7.5%, respectively. The prior period error and subsequent correction were not material to prior or current interim and annual financial statements. The effective tax rates for these periods were also higher than the U.S. statutory tax rate due to tax effects of the global intangible low taxed income inclusion offset by the deduction for foreign derived intangible income, the benefit from the reinstatement of a capital loss and the utilization of various tax credits.

(in thousands, except share and per share data)

The Company’s effective tax rates for the three and six months ended June 30, 2018 were 17.3% and 17.2%, respectively. The effective tax rates for the three and six months ended June 30, 2018, and related income tax expense, were 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 deduction for foreign derived intangible income offset by the tax effects of the global intangible low taxed income inclusion and state income taxes.

As of June 30, 2019, the total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately $40,766. At December 31, 2018, the total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately $32,684. The net increase was primarily attributable to the addition of historical gross unrecognized tax benefits for ESI as a result of the ESI Merger during the quarter ended March 31, 2019. As of June 30, 2019, if these benefits were recognized in a future period, the timing of which is not estimable, the net unrecognized tax benefit of $33,069, 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 June 30, 2019 and December 31, 2018, the Company had accrued interest on unrecognized tax benefits of approximately $560 and $568, respectively.

Over the next 12 months it is reasonably possible that the Company may recognize approximately $1,175 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 U.S. 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 ended March 31, 2018 the Company received notification from the U.S. Internal Revenue Service of their intent to audit its U.S. subsidiary, Newport, for tax year 2015. This audit commenced during the quarter ended June 30, 2018 and was effectively settled during the quarter ended June 30, 2019 with a no change result. The U.S. statute of limitations remains open for tax years 2016 through present. The statute of limitations for the Company’s tax filings in other jurisdictions varies between fiscal years 2013 through present. The Company also has certain federal credit carry-forwards and state tax loss and credit carry-forwards that are open to examination for tax years 2000 through the present.

14) Net Income Per Share

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

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Numerator:				
Net income	$ 37,739	$ 122,862	$ 50,194	$ 227,983
Denominator:				
Shares used in net income per common share – basic	54,815,000	54,719,000	54,481,000	54,571,000
Effect of dilutive securities:				
Restricted stock units, stock appreciation rights and shares issued under employee stock purchase plan	274,000	555,000	485,000	709,000
Shares used in net income per common share – diluted	55,089,000	55,274,000	54,966,000	55,280,000
Net income per common share:				
Basic	$ 0.69	$ 2.25	$ 0.92	$ 4.18
Diluted	$ 0.69	$ 2.22	$ 0.91	$ 4.12

Basic earnings per share (“EPS”) is computed by dividing income available to common stockholders by the weighted-average number of common shares outstanding during the period. The computation of diluted EPS is similar to the computation of basic

EPS except that the denominator is increased to include the number of additional common shares that would have been outstanding (using the treasury stock method) if securities containing potentially dilutive common shares (restricted stock units ("RSUs") and stock appreciation rights ("SARs")) had been converted to such common shares, and if such assumed conversion is dilutive.

For the three and six months ended June 30, 2019, there were approximately 206,000 and 166,000 weighted-average RSUs, respectively, 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 and six months ended June 30, 2018, there were approximately 99,000 and 49,000 weighted-average RSUs, respectively, 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) Stock-Based Compensation

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

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

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

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

Included in the total number of assumed RSUs are 326,283 shares of the Company's common stock for employees and outside directors that are part of the ESI Deferred Compensation plan (the "ESI DC Plan"). These shares will not become issued shares until their respective release dates.

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

The 748,920 shares of the Company's common stock that are issuable pursuant to the Assumed RSUs and the Assumed SARs under the Company's 2014 Plan were registered under the Securities Act of 1933 on the Registration Statement on Form S-8. These shares are in addition to the 18,000,000 shares of the Company's common stock reserved for issuance under the Company's 2014 Plan and previously registered under the Securities Act of 1933 on the Registration Statement on Form S-8.

During the six months ended June 30, 2019, the Company granted 396,192 RSUs with a weighted average grant date fair value of $86.54. During the six months ended June 30, 2018, the Company granted 259,597 RSUs with a weighted average grant date fair value of $112.56. There were no SARs granted during the six months ended June 30, 2019 or 2018.

(in thousands, except share and per share data)

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

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Cost of revenues	$ 636	$ 1,489	$ 1,058	$ 2,494
Research and development expense	1,061	819	1,871	1,541
Selling, general and administrative expense	4,206	4,058	12,244	12,757
Acquisition and integration related expense	1,026	—	19,594	—
Total pre-tax stock-based compensation expense	$ 6,929	$ 6,366	$34,767	$16,792

At June 30, 2019, the total compensation expense related to unvested stock-based awards granted to employees and directors under the 2014 Plan that had not been recognized was $38,497, net of estimated forfeitures. The future compensation expense for time-based awards is recognized on a straight-line basis and the future compensation expense for performance-based awards is recognized using the accelerated graded vesting method, both of which expense over the requisite service period, net of estimated forfeitures, except for retirement eligible employees, in which case 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:

	Six Months Ended June 30, 2019	
	Outstanding RSUs	Weighted Average Grant Date Fair Value
RSUs – beginning of period	647,394	$ 74.04
Assumed shares from ESI Merger	736,133	$ 84.10
Accrued dividend shares	3,084	$ 76.13
Granted	396,192	$ 86.54
Vested	(513,370)	$ 68.66
Forfeited	(87,666)	$ 90.98
RSUs – end of period	1,181,767	$ 85.59

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

	Six Months Ended June 30, 2019	
	Outstanding SARs	Weighted Average Grant Date Fair Value
SARs – beginning of period	177,538	$ 28.52
Assumed SARs from ESI Merger	12,787	$ 17.38
Exercised	(38,999)	$ 26.80
Forfeited or expired	(3,857)	$ 23.02
SARs Outstanding – end of period	147,469	$ 28.19

16) 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 2,588,000 shares of common stock for approximately $127,000 pursuant to the program since its adoption. During the three and six months ended June 30, 2019 and 2018, there were no repurchases of common stock.

Cash Dividends

Holders of the Company's common stock are entitled to receive dividends when they are declared by the Company's Board of Directors. In addition, the Company accrues dividend equivalents on the RSUs the Company assumed in the ESI Merger described in Note 15 above when dividends are declared by the Company's Board of Directors. The Company's Board of Directors declared a cash dividend of $0.20 per share during each of the first and second quarters of 2019, which totaled $21,723 or $0.40 per share. The Company's Board of Directors declared a cash dividend of $0.18 per share during the first quarter of 2018 and $0.20 per share during the second quarter of 2018, which totaled $20,750 or $0.38 per share.

On July 29, 2019, the Company's Board of Directors declared a quarterly cash dividend of $0.20 per share to be paid on September 6, 2019 to shareholders of record as of August 26, 2019. 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 Term Loan Facility and its ABL Facility, the Company may be restricted from paying dividends under certain circumstances.

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 for its customers. The Company's products are derived from its core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, residual gas analysis, leak detection, control technology, ozone generation and delivery, power, reactive gas generation, vacuum technology, lasers, photonics, sub-micron positioning, vibration control, optics and laser-based manufacturing solutions. The Company also provides services relating to the maintenance and repair of its products, installation services and training. The Company's primary served markets include semiconductor, industrial technologies, life and health sciences, and research and defense.

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. Effective February 1, 2019, in conjunction with its acquisition of ESI, the Company created a third reportable segment known as the Equipment & Solutions segment in addition to its two then-existing reportable segments: 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 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 Equipment & Solutions segment provides laser-based manufacturing solutions for the micro-machining industry that enable customers to optimize production. The segment's market is composed primarily of flexible and rigid PCB processing/fabrication, semiconductor wafer processing and passive component manufacturing & test. Equipment & Solutions incorporate specialized laser technology and proprietary control software to efficiently process the materials and components that are an integral part of electronic devices and systems.

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.

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

The following table sets forth net revenues by reportable segment:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Vacuum & Analysis	$ 235,655	$ 368,328	$470,010	$ 716,672
Light & Motion	182,579	204,812	376,567	410,743
Equipment & Solutions	55,876	—	91,094	—
	$ 474,110	$ 573,140	$937,671	$1,127,415

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

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Gross profit by reportable segment:				
Vacuum & Analysis	$ 102,095	$ 171,082	$ 200,234	$ 329,582
Light & Motion	84,948	103,795	177,689	208,150
Equipment & Solutions	23,984	—	31,222	
Total gross profit by reportable segment	211,027	274,877	409,145	537,732
Operating expenses:				
Research and development	41,855	36,504	80,788	71,361
Selling, general and administrative	83,236	76,181	165,691	159,130
Fees and expenses related to term loan	—	378	5,847	378
Acquisition and integration costs	3,240	(1,168)	33,407	(1,168)
Restructuring and other	1,242	790	3,165	3,010
Amortization of intangible assets	17,552	10,901	33,279	22,091
Income from operations	63,902	151,291	86,968	282,930
Interest and other expense, net	12,039	2,747	19,769	7,644
Income before income taxes	51,863	148,544	67,199	275,286
Provision for income taxes	14,124	25,682	17,005	47,303
Net income	$ 37,739	$ 122,862	$ 50,194	$ 227,983

The following table sets forth capital expenditures by reportable segment for the three and six months ended June 30, 2019 and 2018:

	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Three Months Ended June 30, 2019:				
Capital expenditures	$ 6,700	$ 4,938	$ 2,087	$13,725
Six Months Ended June 30, 2019:				
Capital expenditures	$ 14,188	$ 10,092	$ 3,974	$28,254
Three Months Ended June 30, 2018:				
Capital expenditures	$ 6,972	$ 5,456	$ —	$12,428
Six Months Ended June 30, 2018:				
Capital expenditures	$ 13,169	$ 8,649	$ —	$21,818

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

The following table sets forth depreciation and amortization by reportable segment for the three and six months ended June 30, 2019 and 2018:

	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Total
Three Months Ended June 30, 2019:				
Depreciation and amortization	$ 3,941	$ 13,292	$ 10,211	$27,444
Six Months Ended June 30, 2019				
Depreciation and amortization	$ 7,986	$ 27,432	$ 17,237	$52,655
Three Months Ended June 30, 2018:				
Depreciation and amortization	$ 4,968	$ 14,917	$ —	$19,885
Six Months Ended June 30, 2018:				
Depreciation and amortization	$ 10,097	$ 30,280	$ —	$40,377

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

The following table sets forth segment assets by reportable segment:

June 30, 2019:	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Corporate, Eliminations & Other	Total
Segment assets:					
Trade accounts receivable	$ 141,551	$ 155,452	$ 46,322	$ (29,795)	$313,530
Inventories	232,595	174,124	72,918	(140)	479,497
Total segment assets	$ 374,146	$ 329,576	$ 119,240	$ (29,935)	$793,027

December 31, 2018:	Vacuum & Analysis	Light & Motion	Equipment & Solutions	Corporate, Eliminations & Other	Total
Segment assets:					
Trade accounts receivable	$ 171,604	$ 140,658	$ —	$ (16,808)	$295,454
Inventories	222,965	161,658	—	66	384,689
Total segment assets	$ 394,569	$ 302,316	$ —	$ (16,742)	$680,143

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

	June 30, 2019	December 31, 2018
Total segment assets	$ 793,027	$ 680,143
Cash and cash equivalents and investments	470,321	728,461
Other current assets	80,303	65,790
Assets classified as held for sale	36,750	—
Property, plant and equipment, net	230,649	194,367
Right-of-use asset	68,631	—
Goodwill and intangible assets, net	1,658,039	906,803
Other assets	44,228	38,682
Consolidated total assets	$3,381,948	$ 2,614,246

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

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 tax transfer prices and have been eliminated from consolidated net revenues.

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Net revenues:				
United States	$ 217,549	$ 281,818	$441,896	$ 558,538
China	56,002	32,005	93,750	63,077
Korea	38,896	66,983	74,698	120,994
Japan	30,995	54,087	73,097	112,361
Other Asia	72,426	75,188	136,005	145,500
Europe	58,242	63,059	118,225	126,945
	$ 474,110	$ 573,140	$937,671	$1,127,415

	June 30, 2019	December 31, 2018
Long-lived assets:(1)		
United States	$ 171,324	$ 146,687
Europe	30,514	26,794
Asia	60,072	50,572
	$ 261,910	$ 224,053

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

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

	June 30, 2019	December 31, 2018
Reportable segment:		
Vacuum & Analysis	$ 196,777	$ 197,126
Light & Motion	389,539	389,870
Equipment & Solutions	472,351	—
Total goodwill	$1,058,667	$ 586,996

Worldwide Product Information

The Company groups its product offerings into three groups based upon the similarity of product function as follows:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Advanced Manufacturing Components	$ 359,123	$ 509,999	$730,468	$1,006,676
Global Service	72,784	63,141	138,982	120,739
Advanced Manufacturing Systems	42,203	—	68,221	—
	$ 474,110	$ 573,140	$937,671	$1,127,415

Advanced manufacturing components are comprised of product revenues from the Company's Vacuum & Analysis and Light & Motion segments. Global service is comprised of total service revenues for all three of the Company's reportable segments. Advanced manufacturing systems is comprised of product revenues for the Company's Equipment & Solutions segment.

(in thousands, except share and per share data)

18) Restructuring and Other

Restructuring

The Company recorded restructuring charges of $1,242 and $1,465 during the three and six months ended June 30, 2019, respectively, primarily related to severance costs as a result of an organization-wide reduction in workforce, the consolidation of service functions in Asia and the movement of certain products to low cost regions. The Company recorded restructuring charges of $790 and $2,010 during the three and six months ended June 30, 2018, respectively, primarily related to severance costs as a result of streamlining and consolidating certain administrative functions.

Restructuring activities were as follows:

	Six Months Ended June 30,	
	2019	2018
Beginning of period restructuring accrual	$ 2,632	$ 3,244
Charged to expense	1,465	2,010
Payments and adjustments	(1,445)	(2,727)
End of period restructuring accrual	$ 2,652	$ 2,527

Other

We recorded a charge of $1,700 during the six months ended June 30, 2019 related to a contractual obligation we acquired as part of our acquisition of Newport in April 2016.

We recorded $1,000 of environmental costs during the six months ended June 30, 2018 related to a U.S. Environmental Protection Agency-designated Superfund site acquired as part of the Newport Merger.

19) Commitments and Contingencies

Newport Litigation

In 2016, two putative class actions lawsuit captioned Dixon Chung v. Newport Corp., et al., Case No. A-16-733154-C, and Hubert C. Pincon v. Newport Corp., et al., Case No. A-16-734039-B, were filed in the District Court, Clark County, Nevada on behalf of a putative class of stockholders of Newport for claims related to the merger agreement ("Newport Merger Agreement") between the Company, Newport, and a wholly-owned subsidiary of the Company ("Merger Sub"). The lawsuits named as defendants the Company, Newport, Merger Sub, and certain then current and former members of Newport's board of directors. Both complaints alleged that Newport directors breached their fiduciary duties to Newport's stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices and by omitting material information from the proxy statement. The complaints also alleged that the Company, Newport and Merger Sub aided and abetted the directors' alleged breaches of their fiduciary duties. The Court consolidated the actions, and plaintiffs later filed an amended complaint captioned In re Newport Corporation Shareholder Litigation, Case No. A-16-733154-B, in the District Court, Clark County, Nevada, on behalf of a putative class of Newport's stockholders for claims related to the Newport Merger Agreement. The amended complaint alleged Newport's former board of directors breached their fiduciary duties to Newport's stockholders and that the Company, Newport and Merger Sub had aided and abetted those breaches. It sought monetary damages, including pre- and post-judgment interest. In June 2017, the Court granted defendants' motion to dismiss and dismissed the amended complaint against all defendants but granted plaintiffs leave to amend.

On July 27, 2017, plaintiffs filed a second amended complaint containing substantially similar allegations but naming only Newport's former directors as defendants. On August 8, 2017, the Court dismissed the Company and Newport from the action. The second amended complaint seeks monetary damages, including pre- and post-judgment interest. The Court granted a motion for class certification on September 27, 2018, appointing Mr. Pincon and Locals 302 and 612 of the International Union of Operating Engineers - Employers Construction Industry Retirement Trust as class representatives. On June 11, 2018, plaintiff Dixon Chung was voluntarily dismissed from the litigation. On May 1, 2019, the Court granted the defendants' motion to strike plaintiffs' jury demand and determined that the case will be tried by the Court, and not a jury. A bench trial is scheduled for the first quarter of 2020. Fact discovery in the action is complete, and expert discovery is ongoing.

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 our results of operations, financial condition or cash flows.

20) Assets Classified as Held for Sale

During the three months ended June 30, 2019, the Company re-classified $36,750 of certain assets from property, plant and equipment to current assets as held for sale, as these assets met the criteria for classification as held for sale. These assets relate to the expected sale of three buildings and land in Portland, Oregon related to our Equipment & Solutions segment as well as two buildings and land in Boulder, Colorado related to our Vacuum & Analysis segment. The Company will be consolidating into one leased facility at each location and anticipates closing on both of these sales during the third quarter of 2019.

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, 2018 and 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 for our customers. Our products are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, residual gas analysis, leak detection, control technology, ozone generation and delivery, power, reactive gas generation, vacuum technology, lasers, photonics, sub-micron positioning, vibration control, optics and laser-based manufacturing solutions. We also provide services relating to the maintenance and repair of our products, installation services and training. Our primary served markets include semiconductor, industrial technologies, life and health sciences, research and defense.

Acquisition of Electro Scientific Industries, Inc.

On February 1, 2019, we completed our acquisition of Electro Scientific Industries, Inc. (“ESI”) pursuant to an Agreement and Plan of Merger, dated as of October 29, 2018 (the “ESI Merger”). At the effective time of the ESI Merger and pursuant to the terms and conditions of the merger agreement, each share of ESI's common stock that was issued and outstanding immediately prior to the effective time of the ESI Merger was converted into the right to receive $30.00 in cash, without interest and subject to deduction of any required withholding tax. We paid the former ESI stockholders aggregate consideration of approximately $1.033 billion, excluding related transaction fees and expenses, and non-cash consideration related to the exchange of share-based awards of approximately $31 million for a total purchase consideration of approximately $1.063 billion. We funded the payment of the aggregate consideration with a combination of our available cash on hand and the proceeds from our senior secured term loan facility as described below.

Segments and Markets

Effective February 1, 2019, in conjunction with our acquisition of ESI, we created a third reportable segment known as the Equipment & Solutions segment in addition to our two then-existing reportable segments: the Vacuum & Analysis segment and the Light & Motion segment. ESI provides laser-based manufacturing solutions for the micro-machining industry that enable customers to optimize production. ESI's primary served markets include flexible and rigid PCB processing/fabrication, semiconductor wafer processing and passive component manufacturing and testing. ESI solutions incorporate specialized laser technology and proprietary control software to efficiently process the materials and components that are an integral part of electronic devices and systems.

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.

We have a diverse base of customers. Approximately 54% and 42% of our net revenues for the six months ended June 30, 2019 and 2018, respectively, were from advanced manufacturing applications. These include, but are not limited to, industrial technologies, life and health sciences, and research and defense.

Approximately 46% and 58% of our net revenues for the six months ended June 30, 2019 and 2018, respectively, were from sales to semiconductor capital equipment manufacturers and semiconductor device manufacturers.

Net revenues from customers in our advanced markets increased by $23.4 million, or 10%, for the three months ended June 30, 2019, compared to the same period in the prior year, primarily due to an increase of $52.2 million from our Equipment & Solutions segment as a result of the ESI Merger. This increase was offset by a decrease of $16.8 million and $12.0 million in revenue from customers in our advanced markets in our Light & Motion and Vacuum & Analysis segments, respectively.

Net revenues from customers in our advanced markets increased by $25.8 million, or 5%, for the six months ended June 30, 2019, compared to the same period in the prior year, primarily due to an increase of $80.8 million from our Equipment & Solutions segment as a result of the ESI Merger, which included five months of revenue from customers in our advanced markets for the six months ended June 30, 2019. This increase was offset by a decrease of $27.8 million and $27.2 million in revenue from customers in our advanced markets in our Light & Motion and Vacuum & Analysis segments, respectively.

Net revenues from semiconductor capital equipment manufacture and semiconductor device manufacture customers decreased by $122.4 million, or 36%, for the three months ended June 30, 2019, compared to the same period in the prior year. This decrease was comprised of a decrease in net semiconductor revenues of $120.7 million and $5.4 million in the Vacuum & Analysis and Light & Motion segments, respectively, offset by an increase of $3.7 million from our Equipment & Solutions segment as a result of the ESI Merger.

Net revenues from semiconductor capital equipment manufacture and semiconductor device manufacture customers decreased by $215.6 million, or 33%, for the six months ended June 30, 2019, compared to the same period in the prior year. This decrease was comprised of a decrease in net semiconductor revenues of $219.5 million and $6.4 million in the Vacuum & Analysis and Light & Motion segments, respectively, offset by an increase of $10.3 million from our Equipment & Solutions segment as a result of the ESI Merger, which included five months of revenue from semiconductor customers for the six months ended June 30, 2019.

The semiconductor capital equipment industry has been experiencing a moderation in capital spending in the near term and we have seen a similar effect on our semiconductor revenue in the first and second quarters and expect that to continue into the third quarter. The semiconductor capital equipment industry is subject to rapid demand shifts, which are difficult to predict, and we cannot be certain as to the timing or extent of future demand or any future weakness in the semiconductor capital equipment industry.

A significant portion of our net revenues is from sales to customers in international markets. For the six months ended June 30, 2019 and 2018, international net revenues accounted for approximately 53% and 50% of our total net revenues. A significant portion of our international net revenues was from China, Germany, South Korea, Japan and Israel. 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 $175.9 million and $146.7 million, as of June 30, 2019 and December 31, 2018, respectively, excluding goodwill and intangibles, and long-term tax-related accounts. Long-lived assets located outside of the United States were $90.6 million and $77.4 million, as of June 30, 2019 and December 31, 2018, respectively, excluding goodwill and intangibles, and long-term tax-related accounts.

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, 2018, other than the adoption of ASC 842 as outlined below.

Leases

In February 2016, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU"), Leases, ("ASU 2016-02"), to enhance the transparency and comparability of financial reporting related to leasing arrangements. We adopted ASU 2016-02 on January 1, 2019, or the effective date, and used the effective date as our date of initial application.

At the inception of an arrangement, we determine whether the arrangement is or contains a lease based on the facts and circumstances present. Most leases with a term greater than one year are recognized on the balance sheet as right-of-use assets, short-term lease liabilities and long-term lease liabilities. We have elected not to recognize on the balance sheet leases with terms of one year or less. Operating lease liabilities and their corresponding right-of-use assets are recorded based on the present value of lease payments over the expected remaining fixed lease term. Certain adjustments to the right-of-use asset may be required for items such as incentives received. In calculating the present value of future lease payments, we utilize our incremental borrowing rates, which are the rates incurred to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment. We have elected to utilize a single blended interest rate based on currencies, geographies and lease terms that comprise the lease portfolio.

Although separation of lease and non-lease components is required, certain practical expedients are available. Entities may elect the practical expedient to not separate lease and non-lease components. We have elected to account for the lease and non-lease components of each of our operating leases as a single lease component and allocate all of the contract consideration to the lease component only. The lease component results in an operating right-of-use asset being recorded on the balance sheet and amortized on a straight-line basis as lease expense.

Many of our leases contain options to renew and extend lease terms, and options to terminate leases early. We do not recognize the right-of-use asset or lease liability for renewal or termination periods unless we are reasonably certain to exercise the option at lease inception.

For further information about our critical accounting policies, including our revenue recognition policy, please see the discussion of critical accounting policies in our Annual Report on Form 10-K for the year ended December 31, 2018 in the section captioned "Management's Discussion and Analysis of Financial Condition and Results of Operations – Critical Accounting Policies and Estimates."

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 June 30,		Six Months Ended June 30,	
	2019	2018	2019	2018
Net revenues:				
Product	84.7%	89.0%	85.2%	89.3%
Services	15.3	11.0	14.8	10.7
Total net revenues	100.0	100.0	100.0	100.0
Cost of revenues:				
Cost of product revenues	47.7	46.5	48.6	46.8
Cost of service revenues	7.8	5.5	7.8	5.5
Total cost of revenues (exclusive of amortization shown separately below)	55.5	52.0	56.4	52.3
Gross profit	44.5	48.0	43.6	47.7
Research and development	8.8	6.4	8.6	6.3
Selling, general and administrative	17.6	13.4	17.7	14.1
Fees and expenses related to term loan	—	—	0.6	—
Acquisition and integration costs	0.7	(0.2)	3.5	(0.1)
Restructuring and other	0.2	0.1	0.3	0.3
Amortization of intangible assets	3.7	1.9	3.6	2.0
Income from operations	13.5	26.4	9.3	25.1
Interest income	0.3	0.3	0.3	0.2
Interest expense	2.7	0.7	2.3	0.8
Other expense, net	0.1	0.1	0.1	0.1
Income from operations before income taxes	11.0	25.9	7.2	24.4
Provision for income taxes	3.0	4.5	1.8	4.2
Net income	8.0%	21.4%	5.4%	20.2%

Net Revenues

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Product	$401.3	$510.0	$798.7	$1,006.7
Service	72.8	63.1	139.0	120.7
Total net revenues	$474.1	$573.1	$937.7	$1,127.4

Product revenues decreased $108.7 million and $208.0 million during the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year. These decreases were primarily attributed to a decrease in net product revenues from our semiconductor customers, primarily due to lower volume, of $120.7 million and $213.2 million, respectively, for the same periods, partially offset by an increase in net product revenues from customers in our advanced markets of $12.0 million and $5.2 million. The decreases in product revenues from semiconductor customers for the MKS business, excluding the impact of the ESI Merger (the “legacy MKS business”), for the three and six months ended June 30, 2019, were $124.4 million and $223.5 million, respectively, offset by increases in product revenues from our semiconductor customers of $3.7 million and $10.3 million, respectively, for the same periods, from the Equipment & Solutions segment as a result of the ESI Merger, which included five months of product revenue for the six months ended June 30, 2019. The decreases in product revenues from customers in advanced markets for the legacy MKS business for the three and six month periods ended June 30, 2019 were $26.5 million and $52.7 million, respectively, mainly due to decreases in the industrial technologies market, which we believe has been negatively impacted by the general trade tensions between the U.S. and China as a result of increasing tariffs and other trade restrictions. These decreases were offset by increases in product revenues from customers in our advanced markets of $38.5 million and $57.9 million, for the three and six months ended June 30, 2019, respectively, for the same periods, from the Equipment & Solutions segment as a result of the ESI Merger.

Service revenues consisted mainly of fees for services related to the maintenance and repair of our products, sales of spare parts, and installation and training. Service revenues increased $9.7 million and $18.3 million during the three and six month periods ended June 30, 2019, respectively, compared to the same periods in the prior year. These increases were primarily attributed to increases in service revenues from customers in our advanced markets of $11.4 million and $20.6 million for the three and six months ended June 30, 2019, respectively, from the Equipment & Solutions segment as a result of the ESI Merger.

Total international net revenues, including product and service, were $256.6 million and $495.8 million for the three and six months ended June 30, 2019, respectively, compared to $291.3 million and $568.9 million for the three and six months ended June 30, 2018, respectively. The decreases of $34.7 million and $73.1 million for the three and six months ended June 30, 2019 were primarily due to decreases in net revenues in Japan and South Korea.

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

(dollars in millions)	Three Months Ended June 30, 2019	Three Months Ended June 30, 2018	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018
Net revenues:				
Vacuum & Analysis	$ 235.6	$ 368.3	$ 470.0	$ 716.7
Light & Motion	182.6	204.8	376.6	410.7
Equipment & Solutions	55.9	—	91.1	—
Total net revenues	$ 474.1	$ 573.1	$ 937.7	$ 1,127.4

Net revenues from our Vacuum & Analysis segment decreased $132.7 million and $246.7 million for the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year, due to decreases in net revenues from semiconductor customers of $120.7 million and $219.5 million for the three and six months ended June 30, 2019, respectively, and decreases in net revenues from customers in our advanced markets of $12.0 million and $27.2 million for the three and six months ended June 30, 2019, respectively, primarily from customers in our industrial technologies market.

Net revenues from our Light & Motion segment decreased $22.2 million and $34.1 million for the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year. The decreases were primarily attributed to decreases in net revenues from customers in our advanced markets of $16.8 million and $27.8 million for the three and six months ended June 30, 2019, respectively, primarily from customers in our industrial technologies market. The remainder of the decreases were attributed to decreases in net revenues from semiconductor customers of $5.4 million and $6.3 million for the three and six months ended June 30, 2019, respectively.

Gross Profit

	Three Months Ended June 30, 2019	Three Months Ended June 30, 2018	% Points Change	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018	% Points Change
Gross profit as a percentage of net revenues:						
Product	43.6%	47.7%	(4.1)%	42.9%	47.5%	(4.6)%
Service	49.3	50.3	(1.0)	47.8	49.1	(1.3)
Total gross profit	44.5%	48.0%	(3.5)%	43.6%	47.7%	(4.1)%

Gross profit as a percentage of net product revenues decreased by 4.1 and 4.6 percentage points for the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year, primarily due lower revenue volumes and lower factory utilization, partially offset by favorable product mix.

Gross profit as a percentage of net service revenues decreased by 1.0 percentage point for the three months ended June 30, 2019, compared to the same period in the prior year, primarily due to higher material costs and higher excess and obsolete inventory charges, offset by favorable absorption. Gross profit as a percentage of net service revenues decreased by 1.3 percentage points for the six months ended June 30, 2019, primarily due to unfavorable mix and higher material costs, offset by favorable absorption.

The following table sets forth gross profit as a percentage of net revenues by reportable segment:

	Three Months Ended June 30,			Six Months Ended June 30,		
	2019	2018	% Points Change	2019	2018	% Points Change
Gross profit as a percentage of net revenues:						
Vacuum & Analysis	43.3%	46.4%	(3.1)%	42.5%	46.0%	(3.5)%
Light & Motion	45.7	50.7	(5.0)	46.8	50.7	(3.9)
Equipment & Solutions	44.5	—	100.0	35.3	—	100.0
Total gross profit	44.5%	48.0%	(3.5)%	43.6%	47.7%	(4.1)%

Gross profit for our Vacuum & Analysis segment decreased by 3.1 and 3.5 percentage points for the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year, primarily due to lower revenue volumes.

Gross profit for our Light & Motion segment decreased by 5.0 and 3.9 percentage points for the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year, primarily due to unfavorable product mix, lower factory utilization and lower revenue volumes.

Gross profit for our Equipment & Solutions segment of 44.5% and 35.3% for the three and six months ended June 30, 2019, respectively, includes the inventory step-up adjustment to fair value from purchase accounting of $2.5 million and $5.1 million, respectively. Excluding these adjustments, the gross margins would have been 49.0% and 43.6%, respectively, for these periods.

Research and Development

(dollars in millions)	Three Months Ended June 30, 2019	Three Months Ended June 30, 2018	Six Months Ended June 30, 2019	Six Months Ended June 30, 2018
Research and development expenses	$ 41.9	$ 36.5	$ 80.8	$ 71.4

Research and development expenses increased $5.4 million for the three months ended June 30, 2019, compared to the same period in the prior year, primarily due to the ESI Merger, which included $5.2 million of compensation-related expenses, $0.8 million of depreciation expense and $0.6 million of project materials. These increases were offset by a decrease of $1.5 million of compensation-related expenses relating to the legacy MKS business.

Research and development expenses increased $9.4 million for the six months ended June 30, 2019, compared to the same period in the prior year, primarily due to the ESI Merger, which included $7.7 million of compensation-related expenses, $1.3 million of depreciation expense, $1.2 million of project materials and $0.6 million of occupancy costs. These increases were offset by a decrease of $2.4 million of compensation-related expenses related to the legacy MKS business.

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 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

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Selling, general and administrative expenses	$ 83.2	$ 76.2	$165.7	$159.1

Selling, general and administrative expenses increased by $7.0 million for the three months ended June 30, 2019, compared to the same period in the prior year. This increase was primarily attributed to the ESI Merger, which included $7.4 million of compensation-related expense, $1.1 million of depreciation expense, $1.0 million of consulting and professional fees and $0.6 million of travel and entertainment expense. The increase was also attributed to an increase of $0.6 million of commissions expense and an increase of $0.5 million of information technology related expenses, offset by a decrease of $5.3 million of compensation-related expense related to the legacy MKS business.

Selling, general and administrative expenses increased by $6.6 million for the six months ended June 30, 2019, compared to the same period in the prior year. This increase was primarily attributed to the ESI Merger, which included $11.5 million of compensation-related expense, $2.1 million of depreciation expense, $1.5 million of consulting and professional fees, $1.0 million of travel and entertainment expense and $0.6 million of commission expense. The increase was also attributed to an increase of $0.7 million of information technology related expenses, offset by a decrease of $11.2 million of compensation-related expense related to the legacy MKS business.

Fees and Expenses Related to Incremental Term Loan Facility

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Fees and expenses related to term loan	$ —	$ 0.4	$ 5.8	$ 0.4

We recorded fees and expenses related to Amendment No. 5 to our senior secured term loan facility, as described below, which related to the ESI Merger, during the six months ended June 30, 2019. We recorded fees and expenses during the three and six months ended June 30, 2018 related to the fourth repricing of our Term Loan Credit Agreement.

Acquisition and Integration Costs

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Acquisition and integration costs	$ 3.2	$ (1.2)	$ 33.4	$ (1.2)

We recorded acquisition and integration costs related to the ESI Merger, which closed on February 1, 2019, during the three and six months ended June 30, 2019. These costs consisted primarily of compensation costs for certain executives from ESI who had change in control provisions in their respective ESI employment agreements that were accounted for as dual-trigger arrangements and other stock vesting accelerations, as well as consulting and professional fees associated with the ESI Merger.

During the three and six months ended June 30, 2018, we reversed a portion of acquisition and integration costs recognized during previous periods related to the acquisition of Newport Corporation in April 2016 (the “Newport Merger”), related to severance agreement provisions that were not met.

Restructuring and Other

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Restructuring and other	$ 1.2	$ 0.8	$ 3.2	$ 3.0

We recorded restructuring costs of $1.2 million and $1.5 million during the three and six months ended June 30, 2019, respectively, which consisted primarily of severance costs related to an organization-wide reduction in workforce, the consolidation of service functions in Asia and the movement of certain products to low cost regions. We recorded restructuring costs of $0.8 million and $2.0 million during the three and six months ended June 30, 2018, respectively, which consisted primarily of severance costs related to streamlining and consolidating certain administrative functions.

We recorded a charge of $1.7 million during the six months ended June 30, 2019 related to a contractual obligation we acquired as part of the Newport Merger.

We recorded $1.0 million of environmental costs during the six months ended June 30, 2018 related to a U.S. Environmental Protection Agency-designated Superfund site acquired as part of the Newport Merger.

Amortization of Intangible Assets

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Amortization of intangible assets	$ 17.6	$ 10.9	$ 33.3	$ 22.1

Amortization of intangible assets increased by $6.7 million and $11.2 million during the three and six months ended June 30, 2019, respectively, compared to the same periods in the prior year, primarily due to the amortization of intangible assets acquired as part of the ESI Merger.

Interest Expense, Net

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Interest expense, net	$ 11.3	$ 2.5	$ 18.7	$ 6.8

Interest expense, net, increased by $8.8 million and $11.9 million for the three and six months ended June 30, 2019, respectively, primarily due to interest expense related to Amendment No. 5 to our senior secured term loan facility, as described below.

Other Expense, Net

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Other expense, net	$ 0.8	$ 0.3	$ 1.1	$ 0.9

The changes in other expense, net, for the three and six months ended June 30, 2019, respectively, primarily related to changes in foreign exchange rates.

Provision for Income Taxes

	Three Months Ended June 30,		Six Months Ended June 30,	
(dollars in millions)	2019	2018	2019	2018
Provision for income taxes	$ 14.1	$ 25.7	$ 17.0	$ 47.3

Our effective tax rates for the three and six months ended June 30, 2019 were 27.2% and 25.3%, respectively. Our effective tax rates for the three and six months ended June 30, 2019, and related income tax expense, were higher than the U.S. statutory tax rate primarily due to a correction of an out of period error with respect to deferred tax assets related to limitations on the deduction of executive compensation in the amount of $5.0 million. This correction, which should have been recorded during the three months ended September 30, 2018, increased our effective tax rates in the three and six months ended June 30, 2019 by 9.8% and 7.5% respectively. The prior period error and subsequent correction were not material to prior or current interim and annual financial statements. Our effective tax rates for these periods were also higher than the U.S. statutory tax rate due to the tax effect of the global intangible low taxed income inclusion offset by the deduction for foreign derived intangible income, the benefit from the reinstatement of a capital loss, and the utilization of various tax credits.

Our effective tax rates for the three and six months ended June 30, 2018 were 17.3% and 17.2%, respectively. Our effective tax rates for the three and six months ended June 30, 2018, and related income tax expense, were lower than the U.S. statutory rate due to foreign earnings taxed at lower rates, windfall benefits of stock compensation and the deduction for foreign derived intangible income offset by the tax effect of the provision for global intangible low taxed income inclusion and state income taxes.

As of June 30, 2019, the total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately $40.8 million. At December 31, 2018, the total amount of gross unrecognized tax benefits, which excludes interest and penalties, was approximately $32.7 million. The net increase is primarily attributable to the addition of historical gross unrecognized tax benefits for ESI as a result of the ESI Merger during the quarter ended March 31, 2019. As of June 30, 2019, excluding interest and penalties, there were approximately $33.1 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 June 30, 2019 and December 31, 2018, we had accrued interest on unrecognized tax benefits of approximately $0.6 million and $0.6 million, respectively.

Over the next 12 months it is reasonably possible that we may recognize approximately $1.2 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 2016 through present. The statute of limitations for our tax filings in other jurisdictions varies between fiscal years 2013 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, and the impact was not material. Also during the quarter ended March 31, 2018 we received notification from the U.S. Internal Revenue Service of their intent to audit our U.S. subsidiary, Newport Corporation, for tax year 2015. This audit commenced during the quarter ended June 30, 2018 and was effectively settled during the quarter ended June 30, 2019 with a no change result.

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 Tax Cuts and Jobs Act, the adoption of the proposed regulations on the foreign derived intangible income and the global intangible low-taxed income provision, as well as the geographic composition of our pre-tax income, and changes in income tax reserves for unrecognized tax benefits. We monitor these factors and timely adjust our estimates of the effective tax rate accordingly. We expect 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. 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 and short-term marketable investments totaled $459.9 million at June 30, 2019, compared to $718.2 million at December 31, 2018. This decrease primarily related to the use of $406.0 million of cash to fund the payment of a portion of the purchase price for ESI on February 1, 2019.

Net cash provided by operating activities was $106.6 million for the six months ended June 30, 2019 and resulted from net income of $50.2 million, which included non-cash charges of $107.6 million, offset by a net increase in working capital of $51.2 million. The net increase in working capital was due to an increase in inventories of $30.8 million, a decrease in accounts payable of $24.6 million, a decrease in accrued compensation of $17.8 million, a decrease in income taxes of $3.9 million, an increase in other-current and non-current assets of $0.9 million, and a decrease in other current and non-current liabilities of $0.3 million, offset by a decrease in trade accounts receivable of $27.1 million.

Net cash provided by operating activities was $182.4 million for the six months ended June 30, 2018 and resulted from net income of $228.0 million, which included non-cash charges of $72.6 million, offset by a net increase in working capital of $118.2 million. The net increase in working capital was primarily due to an increase in inventories of $59.5 million and an increase in accounts receivable of $42.5 million, related to an

increase in business activities, a decrease in accrued compensation of $15.9 million, as year-end bonuses were paid during the first quarter of 2018, a decrease in income taxes of $11.4 million and an increase in other current and non-current assets of $4.3 million. This increase in working capital was offset by an increase in other current and non-current liabilities of $9.9 million and an increase in accounts payable of $5.6 million.

Net cash used in investing activities was $936.6 million for the six months ended June 30, 2019 and was primarily due to the payment of a portion of the purchase price for the ESI Merger of $988.6 million and purchases of production-related equipment of $28.2 million, partially offset by net sales and maturities of short-term investments of $80.2 million. Net cash used in investing activities was $16.5 million for the six months ended June 30, 2018 due to purchases of production-related equipment of $21.8 million, offset by net sales and maturities of short-term investments of $5.3 million.

Net cash provided by financing activities was $554.6 million for the six months ended June 30, 2019 and was primarily from net proceeds of $587.4 million, mainly from our 2019 Incremental Term Loan Facility, as described below, used to finance the ESI Merger, partially offset by net payments related to tax payments for employee stock awards of $11.0 million and dividend payments made to common stockholders of $21.7 million. Net cash used in financing activities was $74.9 million for the six months ended June 30, 2018 and resulted from partial repayment of the Term Loan Facility, as described below, of $50.0 million, dividend payments made to common stockholders of $20.8 million and net payments related to tax payments for employee stock awards of $13.0 million, partially offset by net borrowings relating to our lines of credit of $8.9 million.

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 2,588,000 shares of common stock for approximately $127.0 million pursuant to the program since its adoption. During the six months ended June 30, 2019 and 2018, 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. In addition, we accrue dividend equivalents on the restricted stock units we assumed in the ESI Merger when dividends are declared by our Board of Directors. Our Board of Directors declared a cash dividend of $0.20 per share during each of the first and second quarters of 2019, respectively, which totaled $21.7 million, or $0.40 per share. Our Board of Directors declared a cash dividend of $0.18 per share during the first quarter of 2018 and $0.20 per share during the second quarter of 2018, which totaled $20.8 million, or $0.38 per share.

On July 29, 2019, our Board of Directors declared a quarterly cash dividend of $0.20 per share to be paid on September 6, 2019 to shareholders of record as of August 26, 2019. 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.

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 in the original principal amount of $780.0 million (the "2016 Term Loan Facility"), subject to increase at our option and subject to the receipt of lender commitments in accordance with the Credit Agreement (the 2016 Term Loan Facility, together with the 2019 Incremental Term Loan Facility (as defined below), the "Term Loan Facility"). The 2016 Term Loan Facility matures on April 29, 2023. 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, unless an alternate rate of interest is agreed, all loans will be determined by reference to the Base Rate if the LIBOR rate cannot be ascertained, if regulators impose material restrictions on the authority of a lender to make LIBOR rate loans, or for other reasons. The 2016 Term Loan Facility was issued with original issue discount of 1.00% of the principal amount thereof.

We subsequently entered into four separate repricing amendments to the 2016 Term Loan Facility, which decreased the applicable margin for LIBOR borrowings from 4.0% to 1.75%, with a LIBOR rate floor of 0.75%. As a consequence of the pricing of the 2019 Incremental Term Loan Facility (defined below), the applicable margin for the 2016 Term Loan Facility was increased to 2.00% (from 1.75%) with respect to LIBOR borrowings and 1.00% (from 0.75%) with respect to base rate borrowings. The interest rate on the 2016 Term Loan Facility as of June 30, 2019 was 4.4%.

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 2016 Term Loan Facility. The rate is fixed at 1.198% per annum plus the applicable credit spread, which was 2.0% at June 30, 2019. The notional amount of the interest rate swap agreement was $290.0 million and had a fair value asset of $2.1 million at June 30, 2019.

As of June 30, 2019, after total principal prepayments of $475.0 million (which includes a $50.0 million prepayment made during the three months ended June 30, 2019) and regularly scheduled principal payments of $6.5 million, the total outstanding principal balance of the 2016 Term Loan Facility was $298.5 million. As a result of making these prepayments, we are no longer required to make any regularly scheduled principal payments on the 2016 Term Loan Facility until the maturity date of the loan.

We incurred $28.7 million of deferred finance fees, original issue discount and repricing fees related to the term loans under the 2016 Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method. A portion of these fees have been accelerated in connection with the various debt prepayments during 2016, 2017 and 2018. As of June 30, 2019, the remaining balance of the deferred finance fees, original issue discount and repricing fees related to the 2016 Term Loan Facility was $2.6 million.

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

On April 3, 2019, we entered into an interest rate swap agreement, which has a maturity date of March 31, 2023, to fix the rate on $300.0 million of the outstanding balance of the 2019 Incremental Term Loan Facility. The rate is fixed at 2.309% per annum plus the applicable credit spread, which was 2.25% at June 30, 2019. At June 30, 2019, the notional amount of this transaction was $300.0 million and had a fair value liability of $6.7 million.

We incurred $11.4 million of deferred finance fees and original issue discount fees related to the term loans under the 2019 Incremental Term Loan Facility, which are included in long-term debt in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method. As of June 30, 2019, the remaining balance of the deferred finance fees and original issue discount related to the 2019 Incremental Term Loan Facility was $10.9 million.

We are required to make scheduled quarterly payments each equal to 0.25% of the original principal amount of the 2019 Incremental Term Loan Facility, with the balance due on February 1, 2026. If, on or prior to the date that is six months after the closing date of Amendment No. 5, we prepay any loans under the 2019 Incremental Term Loan Facility in connection with a repricing transaction, we must pay a prepayment premium of 1.00% of the aggregate principal amount of the loans so prepaid. At June 30, 2019, after regularly scheduled principal payments of $1.6 million, the total balance outstanding of the 2019 Incremental Term Loan Facility was $648.4 million, and the interest rate was 4.7%.

Under the Credit Agreement, we are required to prepay outstanding term loans under the 2016 Term Loan Facility and the 2019 Incremental Term Loan Facility, 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. As a result of our Total Leverage Ratio, we were not required to make a prepayment of excess cash flow for the fiscal year ended December 31, 2018.

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

The 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 June 30, 2019, we were in compliance with all covenants under the Credit Agreement.

Senior Secured Asset-Based Revolving Credit Facility

On February 1, 2019, in connection with the completion of the ESI Merger, we entered into an asset-based credit agreement with Barclays Bank PLC, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto (the “ABL Credit Agreement”), that provides senior secured revolving credit financing of up to $100.0 million, subject

to a borrowing base limitation (the "ABL Facility"). On April 26, 2019, we entered into a First Amendment to the ABL Credit Agreement which amended the borrowing base calculation for eligible inventory prior to an initial field examination and appraisal requirements. The borrowing base for the ABL Facility at any time equals the sum of: (a) 85% of certain eligible accounts; plus (b) prior to certain notice and field examination and appraisal requirements, the lesser of (i) 20% of net book value of eligible inventory in the United States and (ii) 30% of the borrowing base, and after the satisfaction of such requirements, the lesser of (i) the lesser of (A) 65% of the lower of cost or market value of certain eligible inventory and (B) 85% of the net orderly liquidation value of certain eligible inventory and (ii) 30% of the borrowing base; minus (c) reserves established by the administrative agent, in each case, subject to additional limitations and examination requirements for eligible accounts and eligible inventory acquired in an acquisition after February 1, 2019. The ABL Facility includes borrowing capacity in the form of letters of credit up to $25.0 million.

Borrowings under the ABL Facility bear interest at a rate per annum equal to, at our option, any of the following, plus, in each case, an applicable margin: (a) a base rate determined by reference to the highest of (1) the federal funds effective rate plus 0.50%, (2) the "prime rate" quoted in *The Wall Street Journal*, (3) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for an interest period of one month adjusted for certain additional costs, plus 1.00% and (4) a floor of 0.00%; and (b) a LIBOR rate determined by reference to the costs of funds for U.S. dollar deposits for the interest period relevant to such borrowing adjusted for certain additional costs, with a floor of 0.00%. The initial applicable margin for borrowings under the ABL Facility is 0.50% with respect to base rate borrowings and 1.50% with respect to LIBOR borrowings. Commencing with the completion of the first fiscal quarter ending after the closing of the ABL Facility, the applicable margin for borrowings thereunder is subject to upward or downward adjustment each fiscal quarter, based on the average historical excess availability during the preceding quarter.

In addition to paying interest on any outstanding principal under the ABL Facility, we are required to pay a commitment fee in respect of the unutilized commitments thereunder equal to 0.25% per annum. We must also pay customary letter of credit fees and agency fees.

We incurred $0.8 million of costs in connection with the ABL Facility, which were capitalized and included in other assets in the accompanying consolidated balance sheet and are being amortized to interest expense over the contractual term of five years of the ABL Facility. As a result of a prior asset-based facility being terminated concurrently with our entry into the ABL Facility, we wrote off $0.2 million of previously capitalized debt issuance costs.

The ABL Credit Agreement also contains customary representations and warranties, affirmative covenants and provisions relating to events of default. If an event of default occurs, the lenders under the ABL Facility will be entitled to take various actions, including the acceleration of amounts due under the ABL Facility and all actions permitted to be taken by a secured creditor. We have not borrowed against this ABL Facility to date.

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

Other than the 2019 Incremental Term Loan Facility for $650.0 million described above, 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, 2018.

Recently Issued Accounting Pronouncements

In August 2018, the FASB issued ASU 2018-15, "Intangibles-Goodwill and Other-Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement that is a Service Contract." This standard aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The accounting for the service element of a hosting arrangement that is a service contract is not affected by the amendments to this update. This standard is effective for annual periods beginning after December 15, 2019, including interim periods within those fiscal years. We are currently evaluating the requirements of this ASU and adoption could have a material impact on our 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, 2018 filed with the Securities and Exchange Commission on February 26, 2019. As of June 30, 2019, there were no material changes in our exposure to market risk from December 31, 2018.

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 June 30, 2019. 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 June 30, 2019, 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 June 30, 2019, 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.

Newport Litigation

In 2016, two putative class actions lawsuit captioned Dixon Chung v. Newport Corp., et al., Case No. A-16-733154-C, and Hubert C. Pincon v. Newport Corp., et al., Case No. A-16-734039-B, were filed in the District Court, Clark County, Nevada on behalf of a putative class of stockholders of Newport Corporation (“Newport”) for claims related to the merger agreement (“Newport Merger Agreement”) between the Company, Newport, and a wholly-owned subsidiary of the Company (“Merger Sub”). The lawsuits named as defendants the Company, Newport, Merger Sub, and certain then current and former members of Newport’s board of directors. Both complaints alleged that Newport directors breached their fiduciary duties to Newport’s stockholders by agreeing to sell Newport through an inadequate and unfair process, which led to inadequate and unfair consideration, by agreeing to unfair deal protection devices and by omitting material information from the proxy statement. The complaints also alleged that the Company, Newport and Merger Sub aided and abetted the directors’ alleged breaches of their fiduciary duties. The Court consolidated the actions, and plaintiffs later filed an amended complaint captioned In re Newport Corporation Shareholder Litigation, Case No. A-16-733154-B, in the District Court, Clark County, Nevada, on behalf of a putative class of Newport’s stockholders for claims related to the Newport Merger Agreement. The amended complaint alleged Newport’s former board of directors breached their fiduciary duties to Newport’s stockholders and that the Company, Newport and Merger Sub had aided and abetted these breaches. It sought monetary damages, including pre- and post-judgment interest. In June 2017, the Court granted defendants’ motion to dismiss and dismissed the amended complaint against all defendants but granted plaintiffs leave to amend.

On July 27, 2017, plaintiffs filed a second amended complaint containing substantially similar allegations but naming only Newport’s former directors as defendants. On August 8, 2017, the Court dismissed the Company and Newport from the action. The second amended complaint seeks monetary damages, including pre- and post-judgment interest. The Court granted a motion for class certification on September 27, 2018, appointing Mr. Pincon

and Locals 302 and 612 of the International Union of Operating Engineers - Employers Construction Industry Retirement Trust as class representatives. On June 11, 2018, plaintiff Dixon Chung was voluntarily dismissed from the litigation. On May 1, 2019, the Court granted the defendants' motion to strike plaintiffs' jury demand and determined that the case will be tried by the Court, and not a jury. A bench trial is scheduled for the first quarter of 2020. Fact discovery in the action is complete, and expert discovery is ongoing.

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 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, 2018 in the section entitled "Risk Factors." There have been no material changes to the risk factors as described in Part I, Item 1A, "Risk Factors," in our Annual Report on Form 10-K for the year ended December 31, 2018 other than the supplemental risk factor added below.

If significant tariffs or other trade restrictions on our products or components that are imported from or exported to China continue or are increased, our business, financial condition and results of operations may be materially harmed.

General trade tensions between the U.S. and China have been escalating throughout 2018 and 2019, with one round of U.S. tariffs on Chinese goods taking effect in July 2018, a second round in August 2018 and a third round in September 2018. In response to each of these rounds of U.S. tariffs, China imposed retaliatory tariffs in July 2018, August 2018 and September 2018 on certain products made in the U.S. and shipped to China. The Trump Administration subsequently increased its third round of U.S. tariffs on Chinese goods in May 2019 from 10% to 25% and China responded with retaliatory increases to its third round of tariffs on certain U.S. goods in June 2019. These tariffs currently affect some of our products made in China and some of the components that we or our suppliers source from China, and some of our products and components we export to China. The U.S. and China tariffs have negatively impacted our business, financial condition and results of operations. We are exploring and will continue to explore all of our options to reduce the impact of these tariffs on our business, including but not limited to, seeking alternative sources for our components, modifying other business practices, raising our prices, and shifting production outside of China.

In May 2019, the U.S. Department of Commerce's Bureau of Industry and Security ("BIS") added Chinese-based Huawei Technologies Co. Ltd. and 68 of its affiliates onto the BIS Entity List, thereby prohibiting the sale of U.S. goods to Huawei, without a license from BIS. Accordingly, the Company has had to suspend outstanding orders from Huawei, and has been negatively impacted by the cancellation of orders from customers who are providers to Huawei. In addition, China's Ministry of Commerce announced in May 2019 that China will introduce an "unreliable entity list" under which non-Chinese entities that cut off suppliers to Chinese companies may be subject to government action.

On August 1, 2019, the Trump Administration proposed a fourth round of U.S. tariffs on thousands of categories of goods, including electronics, of 10%. In addition, the Trump Administration has continued to signal that it may alter trade agreements and terms between China and the United States, including limiting trade with China. It is possible that additional restrictions on trade will be imposed, that further tariffs will be imposed, including the tariffs proposed on August 1, 2019, and that existing tariffs will be increased on imports of our products or the components used in our products, or that our business will be impacted by additional retaliatory tariffs or restrictions imposed and/or increased by China or other countries in response to existing or future tariffs, causing us to lose sales revenue, incur increased costs and lower margins, seek alternative suppliers, raise prices or make changes to our operations, any of which could materially harm our business, financial condition and results of operations.

Further, the geopolitical and economic uncertainty between the U.S. and China caused by the tariffs and trade bans have caused, and may continue to cause, decreased demand for our products, directly and indirectly, which could materially harm our business, financial condition and results of operations. This trade uncertainty has caused, and may continue to cause, customers to delay or cancel orders as they limit expenditures that could be affected by future actions and evaluate ways to mitigate their own tariff and cost exposure. Such delays and cancellations could have a material impact on our business, financial condition and results of operations.

Table of Contents

ITEM 6. EXHIBITS.

Exhibit No.	Exhibit Description
+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 No. 1 to ABL Credit Agreement, dated as of April 26, 2019, by and among the Registrant, Barclays Bank PLC, as administrative agent and collateral agent, the other borrowers from time to time party thereto, and the lenders and letters of credit issuers from time to time party thereto
*10.2	Employment Agreement, dated August 1, 2016, between Kathleen Burke and the Registrant, as amended on October 29, 2018
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 – the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL 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 (File No. 000-23621), filed with the Securities and Exchange Commission on August 14, 2001.
(3) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2002 (File No. 000-23621), filed with the Securities and Exchange Commission on August 13, 2002.
(4) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on May 6, 2014.

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.

Date: August 7, 2019

By: /s/ Seth H. Bagshaw

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

Execution Version

AMENDMENT NO. 1 TO ABL CREDIT AGREEMENT

This AMENDMENT NO. 1 TO ABL CREDIT AGREEMENT, dated as of April 26, 2019 (this "Agreement"), by and among MKS Instruments, Inc., a Massachusetts corporation (the "Borrower"), the other Loan Parties party hereto, Barclays Bank PLC ("Barclays"), as the administrative agent and the collateral agent (in such capacity, the "Administrative Agent") under the Credit Agreement referred to below, and each Lender party hereto.

RECITALS:

WHEREAS, reference is made to the ABL Credit Agreement, dated as of February 1, 2019 and as amended, restated, amended and restated, supplemented or otherwise modified prior to the date hereof, the "Existing Credit Agreement"; and as amended by this Agreement, the "Credit Agreement"), among the Borrower, the other Borrowers from time to time party thereto, the Lenders and L/C Issuers from time to time party thereto and the Administrative Agent (capitalized terms used but not defined herein having the meaning provided in the Credit Agreement), pursuant to which the Lenders provided the Borrower with a senior secured asset-based revolving credit facility in the amount of $100,000,000;

WHEREAS, each Loan Party under the Existing Credit Agreement expects to realize substantial direct and indirect benefits as a result of this Agreement becoming effective and the consummation of the transactions contemplated hereby and agrees to reaffirm its obligations pursuant to the Credit Agreement, the Collateral Documents, and the other Loan Documents to which it is a party;

WHEREAS, the Borrower has requested that the Existing Credit Agreement be amended as set forth herein;

WHEREAS, the undersigned, constituting the Supermajority Lenders, are willing to agree to such amendments as set forth herein;

NOW, THEREFORE, in consideration of the premises and agreements, provisions and covenants herein contained, the parties hereto agree as follows:

1. **Credit Agreement Amendments**. Effective as of the Amendment No. 1 Effective Date, the Existing Credit Agreement is hereby amended as follows:

The definition of "Borrowing Base" in the Existing Credit Agreement is hereby amended and restated in its entirety as follows:

"Borrowing Base" means (a) the sum of 85% of Eligible Accounts of the Loan Parties; plus (b) either (i) with respect to any calculation conducted at any time prior to the completion of Administrative Agent's and its third-party consultants' and representatives' initial field examination and appraisal of the Inventory of the Loan Parties after the Closing Date (it being understood that the Administrative Agent shall be permitted to conduct (or engage third parties to conduct) customary field examinations and inventory appraisals on the Inventory in its Permitted Discretion at any such time, and such initial field examination and inventory appraisal shall constitute a field examination and/or appraisal, as applicable, contemplated by Section 6.06(b)(i)), the lesser of (A) 20% of the net book value of Eligible Inventory of the Loan Parties located in the U.S. and (B) 30% of the Borrowing Base or (ii) with respect to any calculation conducted at any time thereafter, the lesser of (A) the lesser of (x) 65% of the lower of cost or market value (on a first-in-first-out basis) of Eligible Inventory of the Loan Parties and (y) 85% of the Net Orderly Liquidation Value of Eligible Inventory of the Loan Parties and (B) 30% of the Borrowing Base; minus (c) Reserves established by the Administrative Agent in the exercise of its Permitted Discretion. The Administrative Agent shall have the right, acting within the Administrative Agent's Permitted Discretion, (x) to modify eligibility standards upon three (3) Business Days' prior notice to MKS and (y) to establish and modify Reserves against the Borrowing Base upon three (3) Business Days' prior notice to MKS (it being understood that on or after the third Business Day prior to the effectiveness of such establishment or modification, solely for purposes of incurring any new Credit Extension, the Borrowing Base shall be calculated after giving effect to such establishment or modification of Reserves).

In connection with any Post-Closing Acquisition, MKS may submit a Borrowing Base Certificate reflecting a calculation of the Borrowing Base that includes Eligible Accounts acquired in connection therewith (the "Acquired Eligible Accounts") and, if Eligible Inventory has been included in the Borrowing Base pursuant to clause (b) of this definition above, Eligible Inventory acquired in connection therewith (the "Acquired Eligible Inventory"). From and after the Acquisition Date (as defined below), the Borrowing Base hereunder shall be calculated giving effect thereto; provided that prior to the occurrence of a Borrowing Base Examination with respect to such Acquired Eligible Accounts and Acquired Eligible Inventory, from the date such Post-Closing Acquisition is consummated (the "Acquisition Date") until the date that is 60 days after the Acquisition Date, the aggregate amount of Acquired Eligible Accounts and Acquired Eligible Inventory included in the Borrowing Base prior to the completion of a Borrowing Base Examination with respect thereto shall not exceed 10% of the Borrowing Base (calculated after giving effect to the inclusion of the Acquired Eligible Accounts and Acquired Eligible Inventory as to which a Borrowing Base Examination has not occurred). From the 61st day following the Acquisition Date (or such later day as the Administrative Agent may agree) with respect to any applicable Acquired Eligible Accounts and Acquired Eligible Inventory, the Borrowing Base shall be calculated without reference to such Acquired Eligible Accounts and the Acquired Eligible Inventory until a Borrowing Base Examination has occurred with respect to such assets; it being understood and agreed that (x) no Default or Event of Default shall result from any failure for a Borrowing Base Examination with respect to Acquired Eligible Accounts or Acquired Eligible Inventory to occur on or prior to the dates indicated above and (y) any such Borrowing Base Examination with respect to Acquired Eligible Accounts or Acquired Eligible Inventory shall not count toward the limitations on the number of inventory appraisals and field examinations contained in Section 6.06(b)."

4. **Effective Date Conditions**. This Agreement will become effective on the date (the "Amendment No. 1 Effective Date"), on which each of the following conditions have been satisfied in accordance with the terms therein:

(a) **Executed Amendment**. The Administrative Agent (or its counsel) shall have received duly executed counterparts of this Agreement;

(b) **Representations and Warranties**. The representations and warranties of the Borrowers and the other Loan Parties contained in Article V of the Credit Agreement and in any other Loan Document shall be (i) in the case of representations and warranties qualified by "materiality," "Material Adverse Effect" or similar language, true and correct in all respects on the date of hereof and (ii) in the case of all other representations and warranties, true and correct in all material respects, in each case, on and as of the date hereof, in each case, except to the extent that such representations and warranties specifically refer to an earlier date, in which case they shall be true and correct on the basis set forth above as of such earlier date;

(c) **No Default**. No Default or Event of Default shall have occurred and be continuing on the Amendment No. 1 Effective Date immediately after giving effect to this Amendment; and

(d) **Payment of Fees**. The Administrative Agent shall have received all fees and other amounts previously agreed to in writing by the Arrangers and the Borrower to be due on or prior to the Amendment No. 1 Effective Date, including, to the extent invoiced at least two (2) Business Days prior to the Amendment No. 1 Effective Date (or such later date as is reasonably agreed by the Borrower), legal fees and expenses and the fees and expenses of any other advisors in accordance with the terms of the Credit Agreement.

5. **Representations and Warranties**. By its execution of this Agreement, each Loan Party (and solely in the case of clause (d) below, each Borrower) hereby represents and warrants that:

(a) such Loan Party has all requisite corporate or other organizational power and authority to execute, deliver and perform its obligations under this Agreement;

(b) the execution, delivery and performance by such Loan Party of this Agreement (x) have been duly authorized by all necessary corporate, partnership, limited liability company or other organizational action, and (y) do not and will not (i) contravene the terms of any of such Loan Party's Organization Documents, (ii) conflict with or result in any breach or contravention of, or the creation of any Lien (other than Permitted Liens) under, any Contractual Obligation to which such Loan Party is a party or any order, injunction, writ or decree of any Governmental Authority or any arbitral award to which such Person or its property is subject except in the case of this clause (ii) any such conflict, breach or contravention that would not reasonably be expected individually or in the aggregate to have a Material Adverse Effect or (iii) violate any Law, except in any case for such violations that would not reasonably be expected, individually or in the aggregate, to have a Material Adverse Effect;

(c) this Agreement has been duly executed and delivered by each Loan Party that is party hereto, and this Agreement constitutes a legal, valid and binding obligation of such Loan Party, enforceable against each Loan Party that is party thereto in accordance with its terms, except (i) as such enforceability may be limited by applicable bankruptcy, insolvency, examinership, reorganization, moratorium or similar laws affecting the enforcement of creditors' rights generally and (ii) that rights of acceleration and the availability of equitable remedies may be limited by equitable principles of general applicability (regardless of whether enforcement is sought by proceedings in equity or at law); and

(d) both immediately before and after giving effect to the Amendment No. 1 Effective Date, (i) the representations and warranties of the Borrowers and the other Loan Parties contained in Article V of the Credit Agreement and in any other Loan Document shall be (A) in the case of representations and warranties qualified by "materiality," "Material Adverse Effect" or similar language, true and correct in all respects on the date of hereof and (B) in the case of all other representations and warranties, true and correct in all material respects, in each case, on and as of the date hereof, in each case, except to the extent that such representations and warranties specifically refer to an earlier date, in which case they shall be true and correct on the basis set forth above as of such earlier date and (ii) no Default or Event of Default shall have occurred and be continuing.

6. **Reaffirmation of the Loan Parties; Reference to and Effect on the Credit Agreement and the other Loan Documents**.

(a) Each Loan Party hereby consents to the amendment of the Credit Agreement effected hereby and confirms and agrees that, notwithstanding the effectiveness of this Agreement, each Loan Document to which such Loan Party is a party is, and the obligations of such Loan Party contained in the Credit Agreement, this Agreement or in any other Loan Document to which it is a party are, and shall continue to be, in full force and effect and are hereby ratified and confirmed in all respects, in each case as amended by this Agreement. For greater certainty and without limiting the foregoing, each Loan Party hereby confirms that the existing security interests granted by such Loan Party in favor of the Senior Credit Parties pursuant to the Loan Documents in the Collateral described therein shall continue to secure the obligations of the Loan Parties under the Credit Agreement and the other Loan Documents as and to the extent provided in the Loan Documents. Except as specifically amended by this Agreement, the Credit Agreement and the other Loan Documents shall remain in full force.

(b) The execution, delivery and performance of this Agreement shall not constitute a waiver of any provision of, or operate as a waiver of any right, power or remedy of any Agent or Lender under, the Credit Agreement or any of the other Loan Documents.

(c) On and after the Amendment No. 1 Effective Date, each reference in the Credit Agreement to “this Agreement”, “hereunder”, “hereof”, “herein” or words of like import referring to the Credit Agreement, and each reference in the other Loan Documents to the “Credit Agreement”, “thereunder”, “thereof” or words of like import referring to the Credit Agreement shall mean and be a reference to the Credit Agreement as amended by this Agreement.

7. **Amendment, Modification and Waiver**. This Agreement may not be amended, modified or waived except as permitted by Section 10.01 of the Credit Agreement.

8. **Integration**. This Agreement constitute the entire contract among the parties relating to the subject matter hereof and supersede any and all previous agreements and understandings, oral or written, relating to the subject matter hereof. This Agreement shall not constitute a novation of any amount owing under the Existing Credit Agreement and all amounts owing in respect of principal, interest, fees and other amounts pursuant to the Existing Credit Agreement and the other Loan Documents shall, to the extent not paid or exchanged on or prior to the Amendment No. 1 Effective Date, continue to be owing under the Credit Agreement or such other Loan Documents until paid in accordance therewith.

9. **Severability**. The provisions of Section 10.12 of the Existing Credit Agreement are hereby incorporated by reference, mutatis mutandis, as if originally made a part hereof.

10. **GOVERNING LAW; JURISDICTION; SERVICE OF PROCESS; WAIVER OF JURY TRIAL**. THE PROVISIONS OF SECTION 10.13 OF THE CREDIT AGREEMENT ARE HEREBY INCORPORATED BY REFERENCE, MUTATIS MUTANDIS, AS IF ORIGINALLY MADE A PART HEREOF.

11. **Counterparts**. This Agreement may be executed in counterparts (and by different parties hereto in different counterparts), each of which shall constitute an original, but all of which when taken together shall constitute a single contract. Delivery of an executed counterpart of a signature page of this Agreement by telecopier shall be effective as delivery of a manually executed counterpart of this Agreement.

12. **Loan Document**. On and after the Amendment No. 1 Effective Date, this Agreement shall constitute a "Loan Document" for all purposes of the Credit Agreement and the other Loan Documents (it being understood that for the avoidance of doubt this Agreement may be amended or waived by the parties hereto solely as set forth in Section 7 above).

[Signature Pages Follow]

IN WITNESS WHEREOF, each of the undersigned has caused its duly authorized officer to execute and deliver this Agreement as of the date first set forth above.

MKS INSTRUMENTS, INC.

By: /s/ Seth H. Bagshaw
Name: Seth H. Bagshaw
Title: Senior Vice President, Chief Financial Officer and Treasurer

NEWPORT CORPORATION

By: /s/ Seth H. Bagshaw
Name: Seth H. Bagshaw
Title: President and Treasurer

ELECTRO SCIENTIFIC INDUSTRIES, INC.

By: /s/ Seth H. Bagshaw
Name: Seth H. Bagshaw
Title: President and Treasurer

ESI INTERNATIONAL CORPORATION

By: /s/ Seth H. Bagshaw
Name: Seth H. Bagshaw
Title: President and Treasurer

[Signature Page to First Amendment to ABL Credit Agreement]

ESI CHINA, INC.

By: /s/ Seth H. Bagshaw
Name: Seth H. Bagshaw
Title: President and Treasurer

ESI LEASING, LLC

By: /s/ Kathleen F. Burke
Name: Kathleen F. Burke
Title: Manager

BARCLAYS BANK PLC, as Administrative Agent and as a Lender

By: /s/ Komal Ramkirath
Name: Komal Ramkirath
Title: Assistant Vice President

[Signature Page to First Amendment to ABL Credit Agreement]

BANK OF AMERICA, N.A., as a Lender

By: /s/ Matthew T. O'Keefe
Name: Matthew T. O'Keefe
Title: Senior Vice President

HSBC BANK USA, NATIONAL ASSOCIATION,
as a Lender

By: /s/ Manuel Burgueno
Name: Manuel Burgueno
Title: Senior Vice President

[Signature Page to First Amendment to ABL Credit Agreement]

EMPLOYMENT AGREEMENT

MKS Instruments, Inc., a Massachusetts corporation (the "Company"), and Kathleen Burke of Winchester, MA ("Employee") agree, effective August 1, 2016, as follows.

1. **Employment.** The Company is employing Employee on an at-will basis in the position of Senior Vice President, General Counsel and Assistant Secretary. Employee agrees to comply with the Company's policies.

2. **Confidential Information Agreement.** Employee will sign and deliver to the Company, at the same time that Employee executes this Employment Agreement, the Confidential Information, Intellectual Property and Non-Solicitation Agreement of MKS Instruments, Inc. ("Confidential Information Agreement") that is Attachment 1 to this Employment Agreement.

3. **Duty to The Company**. While employed by the Company, Employee: (a) will devote his or her full working time and best efforts to the business of the Company; and (b) will not (without the prior, express, written consent of the Chief Executive Officer of the Company) engage in any business activity (whether or not for gain) that interferes with Employee's work for the Company. Notwithstanding the previous sentence, this Employment Agreement does not prohibit Employee from managing his or her personal investments or engaging in charitable and unpaid professional activities (including serving on charitable and professional boards), so long as doing so does not materially interfere with Employee's work for the Company or violate Section 7 of this Employment Agreement.

4. **Compensation.**

(a) **Base Salary.** The Company will pay Employee base salary at the rate of $350,000 per year (the "Base Salary"), in accordance with the Company's normal payroll practices. The Company may review and adjust the amount of the Base Salary from time to time in its sole discretion.

(b) **Incentive Compensation Plan.** Employee will be entitled to participate in the Company's Annual Corporate Management/Key Employee Bonus Plan, to the extent applicable to Employee's position.

(c) **Stock Incentive Plan.** Employee will be entitled to participate in the Company's stock incentive plan to the extent applicable to Employee's position.

(d) **Benefits.** Employee will be eligible to participate in the Company's generally available employee benefit plans, which currently include medical, dental, vision, life, accidental death and dismemberment, short-term disability and long-term disability insurance, a 401(k) savings plan and an employee stock purchase plan, subject to the terms and conditions of each plan.

(e) **Paid Time Off.** Employee will be eligible for 20 days of paid vacation per year, plus paid sick time and holidays, all subject to the terms and conditions of the Company's policies.

(f) **Expenses.** The Company will reimburse Employee for expenses Employee reasonably incurs in performing his or her duties, to the extent provided in the Company's expense reimbursement policies. Reimbursement of expenses in one tax year will not affect reimbursement of expenses in any other tax year.

5. **End of Employment**. Either Employee or the Company may end the employment relationship at any time, for any reason, with or without notice or cause. The employment relationship will end automatically and immediately upon Employee's death or entitlement to long-term disability benefits under the Company's long-term disability program. The date on which Employee's employment ends, whether as the result of a resignation by Employee, a termination of employment by the Company or an automatic termination of employment upon death or disability, is referred to in this Employment Agreement as the "Employment End Date." If Employee resigns or the Company terminates Employee's employment, the Company will (in either case) have the right at any time, for any reason in its sole discretion to decide the Employment End Date. In no event will the Company's deciding the Employment End Date following Employee's resignation be considered termination by the Company of Employee's employment.

6. **Company Obligations Upon End of Employment.** When the employment relationship ends, the Company will have no obligation to pay or provide Employee at any time any compensation, payment or benefit of any kind, except as expressly provided in Sections 6(a) though through 6(e) below.

(a) **Minimum Obligations.** When the employment relationship ends, no matter how it ends: (i) the Company will pay Employee any unpaid Base Salary through the Employment End Date; (ii) Employee will be entitled to accrued, vested benefits under the Company's benefit plans and programs to the extent provided in Section 4(d); (iii) the Company will pay Employee for any accrued but unused vacation; and (iv) the Company will reimburse Employee for any unreimbursed expenses incurred through the Employment End Date to the extent provided in Section 4(f).

(b) **30 Days' Base Salary After Certain Resignations**. If Employee provides the Company at least 30 days' advance written notice of resignation of employment, is an active employee in good standing at the time of such notice and continues to perform his or her duties diligently and professionally to the extent requested thereafter, the Company will pay Employee his or her Base Salary for at least 30 days after such notice, even if the Employment End Date is earlier.

(c) **30 Days' Base Salary After Certain Terminations**. If the Company terminates Employee's employment other than for Cause, as defined below, the Company will provide Employee with written notice of termination and pay Employee his or her Base Salary for at least 30 days after such notice of termination, even if the Employment End Date is earlier.

(d) **Eligibility for Ordinary Severance Pay**. If the Company terminates Employee's employment, Employee will be eligible for severance pay in a lump sum in an amount equal to a minimum of 6 months of Base Salary or two weeks of Base Salary per year of service, whichever is greater, in either case provided that all of the following conditions are satisfied: (i) the Company's primary reason for terminating Employee's employment was a change to the Company's business needs (such as reduction in force or elimination of position) and not Cause as defined below; (ii) Employee has complied with and continues to comply with all of Employee's obligations under this Employment Agreement and the Confidential Information Agreement; and (iii) Employee executes, provides to the Company within 45 days after the Employment End Date and does not thereafter revoke or attempt to revoke, a general release of claims in a form satisfactory to the Company ("General Release"). The Company's good-faith determination that one or more of the conditions listed above has not been satisfied will be binding and conclusive.

(e) **Eligibility for Enhanced Severance Compensation.** Employee will become eligible for the "Enhanced Severance Compensation," as described below, instead of severance pay under Section 6(d) above or under any other program or policy of the Company, if and only if all of the following conditions are satisfied: (i) the Company terminates Employee's employment without "Cause" (as defined below) or Employee resigns for "Good Reason" (as defined below); (ii) the Employment End Date is within 24 months after the effective date of a Change in Control (as defined below); (iii) Employee has complied with and continues to comply with all of Employee's obligations under this Employment Agreement and the Confidential Information Agreement; and (iv) Employee executes, provides to the Company within 45 days after the Employment End Date and does not thereafter revoke or attempt to revoke, a General Release. The Company's good-faith determination that one or more of the conditions listed above has not been satisfied will be binding and conclusive.

(f) **"Enhanced Severance Compensation."** If Employee becomes eligible for the Enhanced Severance Compensation:

(i) **Base Salary.** The Company will pay Employee, within 14 days after the General Release become irrevocable, a lump sum in an amount equal to one and one half times annual Base Salary (determined without regard to any reduction in Base Salary giving rise to "Good Reason," as defined below).

(ii) **Incentive Compensation.** The Company will pay Employee, within 14 days after the General Release becomes irrevocable, a lump sum equal to one and one half times the annual amount of incentive compensation for which Employee was eligible under any Incentive Compensation Plan of the Company then in effect for the year containing the Employment End Date. Additionally, the Employee will receive a payment for target bonus, prorated for the current year.

(iii) **Continuation of Benefits.** For a period of 18 months after the Employment End Date, to the extent Employee elects to continue group medical, vision, or dental insurance coverage under COBRA and timely remits the amount of premium assessed to similarly situated active employees for comparable coverage, the Company will pay the Company's usual share of such premiums. Benefits payable under this Section 6(f)(iii) will terminate to the extent Employee ceases to be eligible for COBRA coverage under the Company's medical benefits plan. Notwithstanding the foregoing, the Company will not pay the contribution toward COBRA coverage described above to the extent that the Company reasonably determines that doing so would subject the Company to the excise tax under Section 4980D of the Internal Revenue Code (the "Code") (as a result of discriminatory coverage under a group health plan).

(iv) **Restricted Stock Units or Stock Appreciation Rights.** Employee's unvested equity awards as of the Employment End Date will be subject to accelerated vesting to the extent provided in the respective equity award agreement issued to Employee under the then effective MKS Instruments, Inc. equity incentive plan (including the MKS Instruments, Inc. 2014 Stock Incentive Plan.

(vi) **No Obligation to Mitigate Damages; Effect on Other Contractual Rights.** Employee will not be required to mitigate damages or the amount of any payment provided for under this Employment Agreement by seeking other employment or otherwise, nor will any payment provided for under this Employment Agreement be reduced by any compensation earned by Employee as the result of employment by an employer other than the Company or a direct or indirect parent, subsidiary or affiliate of the Company after the Employment End Date, or otherwise.

(g) **"Cause."** "Cause" to terminate Employee's employment will exist if Employee:

(i) commits a felony or engages in fraud, misappropriation or embezzlement;

(ii) knowingly fails or refuses to perform Employee's duties in a material way and, to the extent that the Company determines such failure or refusal can reasonably be cured, fails or refuses to effect a cure within 10 days after the Company notifies Employee in writing of the failure or refusal;

(iii) knowingly causes, or knowingly creates a serious risk of causing, material harm to the Company's business or reputation; or

(iv) breaches, in a material way, this Employment Agreement, the Confidential Information Agreement or any other agreement between Employee and the Company, and, to the extent that the Company determines such breach can reasonably be cured, fails or refuses to effect a cure within 10 days after the Company notifies Employee in writing of the breach.

(h) **"Good Reason."** "Good Reason" for Employee to resign will exist if, without Employee's express written consent:

(i) the Company materially reduces Employee's position, duties or responsibilities;

(ii) the Company reduces Employee's Base Salary as in effect on the date hereof or as the same may be increased from time to time during the term of this Employment Agreement;

(iii) the Company changes Employee's principal place of work to a location more than 50 miles from Employee's current principal place of work.

Notwithstanding the foregoing, an action described above will not constitute Good Reason unless: (A) Employee, within 30 days after the he or she learns, or with reasonable diligence should have learned, of such action, delivers to the Company written notice identifying the action as Good Reason and demanding its correction; (B) the Company fails to correct such event within 30 days after receipt of such notice; and (C) Employee resigns for Good Reason within 90 days after the date Employee learned, or with reasonable diligence should have learned, of such action.

(i) **"Change in Control."** For purposes of this Employment Agreement, the term "Change in Control" will mean the first to occur of any of the following events: (i) any "person" (as that term is used in Section 13 and 14(d)(2) of the Securities Exchange Act of 1934 ("Exchange Act")) becomes the beneficial owner (as that term is used in Section 13(d) of the Exchange Act), directly or indirectly, of fifty percent (50%) or more of MKS' capital stock entitled to vote in the election of directors; (ii) the shareholders of MKS approve any consolidation or merger of MKS other than a consolidation or merger of MKS in which the holders of the common stock of MKS immediately prior to the consolidation or merger hold more than fifty percent (50%) of the common stock of the surviving corporation immediately after the consolidation or merger; or (iii) the shareholders of MKS approve the sale or transfer of all or substantially all of the assets of MKS to parties that are not within a "controlled group of corporations" (as defined in Code Section 1563) in which MKS is a member.

7. **Non-Competition**.

(a) During Employee's MKS Employment (as defined below) and for 12 months immediately thereafter (together, the "Non-Compete Period"), Employee will not engage in or otherwise carry on, directly or indirectly anywhere in the world (as principal, agent, employee, employer, investor, shareholder (except for holdings of no greater than 1% of the total outstanding shares in a publicly-traded company), consultant, partner, member, manager, financier or in any other individual or representative capacity of any kind whatsoever), any Competitive Activity (as defined below).

(b) "MKS Employment" means the period beginning on the first day that Employee is employed by the Company and ending on the first day on which Employee is no longer employed by any MKS Entity (as defined below).

(c) "MKS Entity" means (i) the Company; (ii) any current or future parent, subsidiary or affiliate of the Company; or (iii) any successor or assign of (i) or (ii).

(d) "Competitive Activity" means business or activity competitive with an MKS Entity but only to the extent that business or activity is related to, similar to or competitive with the activities of the business unit(s), division(s), laborator(y)(ies), facilit(y)(ies) and other operational unit(s) in or for which Employee performed work for an MKS Entity or about which Employee acquired Proprietary Information (as defined in the Confidential Information Agreement).

(e) The Non-Compete Period will be extended for any period during which Employee is in breach of this Employment Agreement or the Confidential Information Agreement.

(f) If any court of competent jurisdiction determines that this Section 7 is unenforceable because the Non-Compete Period is too long or because Competitive Activity includes too great a range of activities or too wide a geographic scope, the parties agree that this Section 7 should be interpreted to extend only over the maximum period of time or range of activities or geographic scope as to which it may be enforceable.

(g) The post-employment restrictions on Employee's conduct contained in this Employment Agreement and in the Confidential Information Agreement: (i) will continue to apply even if Employee's duties, title, compensation, location or other terms or conditions of employment change, and even if such change or changes are material; and (ii) will apply regardless of how or why Employee's employment ends.

(h) The Company and Employee agree that violation by Employee of any of the provisions of this Section 7 of this Employment Agreement would cause the Company irreparable harm beyond what could reasonably or adequately be compensated in damages, and that the Company would therefore be entitled (in addition to the Company's other remedies) to an injunction, declaratory judgment or restraining order against any such violation or threatened violation.

8. **Code Section 409A Compliance**.

(a) Where this Employment Agreement refers to Employee's termination of employment for purposes of receiving any payment, whether such a termination has occurred will be determined in accordance with Section 409A of the Internal Revenue Code (the "Code") and Treasury Regulation Section 1.409A-1(h) (or any successor provisions) to the extent required by law.

(b) To the extent that benefits under Section 6 are contingent upon Employee providing a General Release, Employee will sign and return the General Release within the reasonable time period designated by the Company, which will not be more than 45 days. If the period for Employee to review a General Release plus any revocation period crosses calendar years, payments contingent upon the Release will be made in the later calendar year. Any payments contingent upon the General Release that would otherwise be made during the period for review and revocation of the General Release will be made, provided that the General Release is timely executed and returned to the Company and not revoked, on the first scheduled payment date after such period ends. Each payment in respect of Employee's termination of employment under Section 6 of the Employment Agreement is designated as a separate payment for Section 409A purposes.

(c) If Employee is designated as a "specified Executive" within the meaning of Code Section 409A (while the Company is publicly traded), any deferred compensation payment subject to Section 409A to be made during the six-month period following Employee's termination of employment will be withheld and the amount of the payments withheld will be paid in a lump sum, without interest, during the seventh month after Employee's termination; provided, however, that if Employee dies prior to the expiration of such six month period, payment to Employee's beneficiary will be made as soon as reasonably practicable following Employee's death. The Company will identify in writing delivered to Employee any payments it reasonably determines are subject to delay under this Section 8(c). In no event will the Company have any liability or obligation with respect to taxes for which Employee may become liable as a result of the application of Code Section 409A.

9. **Code Sections 280G/4999.** If (a) any payments or benefits to Employee in connection with this Employment Agreement ("Payments") would be subject to the excise tax imposed by Code Section 4999 (the "Parachute Tax"), (b) paying Employee a lesser amount would avoid the Parachute Tax entirely and (c) payment of such lesser amount would, after taking into account applicable federal, state and local income taxes and the Parachute Tax, result in Employee receiving a greater after-tax payment than if the Company made the Payments in full, then the Company will pay Employee such lesser amount instead of making the Payments in full. The reporting and payment of any Parachute Tax will in all events be Employee's responsibility. The Company will not in any event provide a gross-up or any other payment to compensate Employee for the payment of the Parachute Tax or for any reduction in the Payments. The Company will withhold from the Payments any amounts it reasonably determines are required under Code Section 4999(c) and the Treasury Regulations thereunder.

10. **Withholding.** The Company will deduct from the amounts payable to Employee pursuant to this Employment Agreement all withholding amounts and deductions required by law or authorized by Employee.

11. **Changes to Plans and Policies.** Nothing in this Employment Agreement will: (a) require the Company or its affiliates to establish, maintain or continue any incentive compensation plan, stock incentive plan or other benefit plan, policy or arrangement; (b) restrict the right of the Company or any of its affiliates to amend, modify or terminate any such plan, policy or arrangement; (c) entitle Employee to participate in any such plan policy or arrangement at any specified level (or at all) in any year; or (d) prevent any future change to any such plan, policy or arrangement from applying to Employee in accordance with the terms of the change.

12. **Assignment**. The rights and obligations of the Company under this Employment Agreement will inure to the benefit of, and be binding upon, the Company's successors and assigns. The rights and obligations of Employee under this Employment Agreement will inure to the benefit of, and will be binding upon, Employee's heirs, executors and legal representatives. Employee may not delegate or assign any obligations under this Employment Agreement.

13. **Entire Agreement and Severability**. This Employment Agreement and the Confidential Information Agreement supersede any and all other agreements, either oral or in writing, between Employee and the Company with respect to the Company's employment of Employee. They contain all of the covenants and agreements between the parties with respect to such employment. Neither party is entering into this Employment Agreement on the basis of any representation, inducement, promise or agreement, oral or otherwise, by any party, or by any one acting on behalf of any party, which is not stated herein. Any modification of this Employment Agreement will be effective only if it is in writing and signed by both parties to this Employment Agreement. If any provision in this Employment Agreement is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remaining provisions will nevertheless continue in full force and effect without being impaired or invalidated in any way.

14. **Miscellaneous**. This Employment Agreement and the rights and obligations of the parties hereunder will be governed by, and construed in accordance with, the laws of the Commonwealth of Massachusetts, excluding (but only to the extent permitted by law) its conflict of laws and choice of law rules. The parties agree that service of any process, summons, notice or document by U.S. certified mail or overnight delivery by a generally recognized commercial courier service to Employee’s last known address (or any mode of service recognized to be effective by applicable law) will be effective service of process for any action, suit or proceeding brought against Employee. The failure of either party hereto to enforce any right under this Employment Agreement will not be considered a waiver of that right, or of damages caused thereby, or of any other rights under this Employment Agreement.

15. **Arbitration and Waiver of Jury Trial**.

(a) Any “Legal Dispute” (as defined below) between Employee and any MKS Entity (or between Employee and any employee or agent of any MKS Entity, to the extent directly or indirectly arising from or relating in any way to Employee’s employment with or separation from the Company) will be resolved by final and binding arbitration. Notwithstanding the foregoing sentence, the Company may, in its sole discretion, obtain preliminary injunctive relief enforcing the provisions of the Confidential Information Agreement or Section 7 of this Employment Agreement from any court of competent jurisdiction.

(b) “Legal Dispute” means a dispute about legal rights or legal obligations, including but not limited to any rights or obligations arising under this Employment Agreement; the Confidential Information Agreement; any other agreement; any applicable legal or equitable doctrine; any applicable common law theory; or any applicable federal, state or local, statute, regulation or other legal requirement.

(c) The arbitration will be held in the Commonwealth of Massachusetts. It will be conducted in accordance with the then-prevailing Employment Arbitration Rules of the American Arbitration Association.

(d) Notwithstanding any other provision of this Employment Agreement or any other agreement or of any arbitration rules, no Legal Dispute involving any MKS Entity may be included in any class or collective arbitration or any other class or collective proceeding. The exclusive method for resolving any such Legal Dispute will be arbitration on an individual basis.

(e) Any issues about whether a dispute is subject to arbitration will be determined by a court of competent jurisdiction and not by an arbitrator. Any issues about the meaning or enforceability of Section 15(d) will be decided by a court of competent jurisdiction and not by an arbitrator.

(f) The Company, Employee and the arbitrator will treat all aspects of the arbitration proceedings, including without limitation, discovery, testimony and other evidence, briefs and the award, as strictly confidential, except that the arbitration award may be disclosed to the extent necessary to enforce the award, the provisions of the Confidential Information Agreement or the provisions of this Employment Agreement.

(g) Employee and the Company understand and acknowledge that by agreeing to arbitrate the disputes covered by this Section 15, they are waiving the right to resolve those disputes in court and waiving any right to a jury trial with respect to those disputes.

16. **Knowing and Voluntary Agreement.** Employee understands that Employee has the right to consult counsel before signing this Employment Agreement.

IN WITNESS WHEREOF, the parties hereto have executed, in the Commonwealth of Massachusetts, this Employment Agreement as a sealed instrument, all as of the day, month and year first written above.

MKS INSTRUMENTS, INC.

By:	/s/ Gerald G. Colella	Dated:	8/11/16
Name:	Gerald G. Colella		
Title:	CEO & President		

/s/ Kathleen F. Burke	Dated:	8-9-16
[EMPLOYEE]		

Exhibit 10.2

AMENDMENT TO EMPLOYMENT AGREEMENT

This AMENDMENT (the "Amendment") to the Employment Agreement is made this 29th day of October, 2018, by and between MKS Instruments, Inc., a Massachusetts corporation ("MKS") and Kathleen Burke of Winchester, MA ("Employee").

WHEREAS, MKS and Employee are parties to an employment agreement effective August 1, 2016 (the "Employment Agreement"); and

WHEREAS, MKS and Employee wish to modify certain provisions of the Employment Agreement relating to Employee's eligibility for severance pay and benefits;

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

1. In Section 6(d) of the Employment Agreement, the words "a minimum of 6 months of Base Salary or two weeks of Base Salary per year of service, whichever is greater, in either case" are deleted and replaced with the words "12 months of Base Salary".

2. In Section 6(d) of the Employment Agreement, the following new sentence is added immediately after the first sentence: "If the Company terminates Employee's employment and provided that all of the immediately foregoing conditions, (i)-(iii), are satisfied, the Company shall also continue to pay for any medical, dental and/or vision insurance that Employee elects to continue receiving under COBRA for twelve (12) months after the last full day Employee works prior to the effective date of Employee's termination under this Employment Agreement, less the premium contribution paid by similarly-situated active employees who are enrolled in comparable coverage."

3. Except as modified in paragraphs 1 and 2 above, the Employment Agreement shall remain unchanged. To avoid any doubt and without limitation of any kind, the parties acknowledge and agree that this Amendment is not intended to, and shall not, have any effect on Employee's obligations under Section 7 of the Employment Agreement, notwithstanding the enactment of Section 24L of Chapter 149 of the Massachusetts General Laws or any other change in the law after the parties entered into the Employment Agreement. To ensure that MKS's ability to enforce the post-employment restrictions set forth in Section 7 of the Employment Agreement is in no way diminished by the parties entering into this Amendment, Employee agrees that MKS may (if it deems advisable in its sole discretion) add to the General Release referred to in Section 6(d) of the Employment Agreement post-employment restrictions identical to the post-employment restrictions set forth in Section 7 of the Employment Agreement.

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

MKS INSTRUMENTS, INC.

By: Catherine M. Langtry
SVP HR

/s/ Kathleen F. Burke
Kathleen Burke

EXHIBIT 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

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: August 7, 2019

/s/ Gerald G. Colella
Gerald G. Colella
Chief Executive Officer
(Principal Executive Officer)

EXHIBIT 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

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: August 7, 2019

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

EXHIBIT 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

In connection with the Quarterly Report on Form 10-Q of MKS Instruments, Inc. (the “Company”) for the period ended June 30, 2019, as filed with the Securities and Exchange Commission on the date hereof (the “Report”), the undersigned, Gerald G. Colella, Chief Executive Officer 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: August 7, 2019

/s/ Gerald G. Colella

Gerald G. Colella
Chief Executive Officer

Dated: August 7, 2019

/s/ Seth H. Bagshaw

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