

**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 September 30, 2023

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)

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

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

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 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	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/>	Smaller reporting company	<input type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

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

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

As of November 6, 2023, the registrant had 66,878,495 shares of common stock outstanding.

MKS INSTRUMENTS, INC.
FORM 10-Q
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PART I. FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS.

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

ASSETS	September 30, 2023	December 31, 2022
Current assets:		
Cash and cash equivalents	\$ 859	\$ 909
Short-term investments	1	1
Accounts receivable, net of allowance for doubtful accounts of \$8 and \$11 at September 30, 2023 and December 31, 2022, respectively	618	720
Inventories	1,009	977
Other current assets	288	187
Total current assets	2,775	2,794
Property, plant and equipment, net	761	800
Right-of-use assets, net	227	234
Goodwill	2,540	4,308
Intangible assets, net	2,614	3,173
Other assets	223	186
Total assets	\$ 9,140	\$ 11,495
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Short-term debt	\$ 87	\$ 93
Accounts payable	309	426
Other current liabilities	442	433
Total current liabilities	838	952
Long-term debt, net	4,787	4,834
Non-current deferred taxes	595	783
Non-current accrued compensation	139	138
Non-current lease liabilities	208	215
Other non-current liabilities	97	90
Total liabilities	6,664	7,012
Commitments and contingencies (Note 17)		
Stockholders' equity:		
Preferred stock, \$0.01 par value per share, 2 shares authorized; no shares issued and outstanding	—	—
Common stock, no par value, 200 shares authorized; 66.9 and 66.6 shares issued and outstanding at September 30, 2023 and December 31, 2022, respectively	—	—
Additional paid-in capital	2,180	2,142
Retained earnings	455	2,272
Accumulated other comprehensive (loss) income	(159)	69
Total stockholders' equity	2,476	4,483
Total liabilities and stockholders' equity	\$ 9,140	\$ 11,495

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

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

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Net revenues:				
Products	\$ 818	\$ 841	\$ 2,416	\$ 2,153
Services	114	113	314	308
Total net revenues	<u>932</u>	<u>954</u>	<u>2,730</u>	<u>2,461</u>
Cost of revenues:				
Products	446	506	1,326	1,243
Services	60	58	173	156
Total cost of revenues (exclusive of amortization shown separately below)	<u>506</u>	<u>564</u>	<u>1,499</u>	<u>1,399</u>
Gross profit	426	390	1,231	1,062
Research and development	71	63	218	168
Selling, general and administrative	167	126	514	319
Acquisition and integration costs	3	31	14	41
Restructuring	1	5	13	10
Amortization of intangible assets	68	47	225	77
Goodwill and intangible asset impairments	—	—	1,827	—
Gain on sale of long-lived assets	(2)	—	(2)	(7)
Income (loss) from operations	<u>118</u>	<u>118</u>	<u>(1,578)</u>	<u>454</u>
Interest income	(4)	(1)	(10)	(2)
Interest expense	93	80	266	93
Other expense (income), net	7	(1)	14	(4)
Income (loss) before income taxes	<u>22</u>	<u>40</u>	<u>(1,848)</u>	<u>367</u>
(Benefit) provision for income taxes	(17)	34	(76)	88
Net income (loss)	<u>\$ 39</u>	<u>\$ 6</u>	<u>\$ (1,772)</u>	<u>\$ 279</u>
Other comprehensive (loss) income, net of tax:				
Changes in value of financial instruments designated as cash flow hedges	\$ 16	\$ 48	\$ 45	\$ 73
Foreign currency translation adjustments	(96)	(227)	(269)	(275)
Change in net investment hedge	21	—	8	—
Unrecognized gain (loss) on investments	4	—	(7)	—
Net unrecognized pension gain (loss)	—	5	(5)	5
Total comprehensive (loss) income	<u>\$ (16)</u>	<u>\$ (168)</u>	<u>\$ (2,000)</u>	<u>\$ 82</u>
Net income (loss) per share:				
Basic	<u>\$ 0.59</u>	<u>\$ 0.09</u>	<u>\$ (26.53)</u>	<u>\$ 4.85</u>
Diluted	<u>\$ 0.58</u>	<u>\$ 0.09</u>	<u>\$ (26.53)</u>	<u>\$ 4.84</u>
Weighted average common shares outstanding:				
Basic	<u>66.9</u>	<u>61.0</u>	<u>66.8</u>	<u>57.4</u>
Diluted	<u>67.1</u>	<u>61.1</u>	<u>66.8</u>	<u>57.6</u>

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

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

	Common Stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2022	66.6	\$ —	\$ 2,142	\$ 2,272	\$ 69	\$ 4,483
Net issuance under stock-based plans	0.1		(6)			(6)
Stock-based compensation			18			18
Cash dividend (\$0.22 per common share)				(15)		(15)
Comprehensive (loss) income (net of tax):						
Net loss				(42)		(42)
Other comprehensive income					13	13
Balance at March 31, 2023	66.7	\$ —	2,154	2,215	82	4,451
Net issuance under stock-based plans	0.2		1			1
Stock-based compensation			13			13
Cash dividend (\$0.22 per common share)				(15)		(15)
Comprehensive loss (net of tax):						
Net loss				(1,769)		(1,769)
Other comprehensive loss					(186)	(186)
Balance at June 30, 2023	66.9	\$ —	2,168	431	(104)	2,495
Net issuance under stock-based plans	—		(1)			(1)
Stock-based compensation			13			13
Cash dividend (\$0.22 per common share)				(15)		(15)
Comprehensive income (loss) (net of tax):						
Net income				39		39
Other comprehensive loss					(55)	(55)
Balance at September 30, 2023	66.9	\$ —	2,180	455	(159)	2,476

	Common Stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2021	55.5	\$ —	\$ 907	\$ 1,991	\$ (11)	\$ 2,887
Net issuance under stock-based plans	0.1		(6)			(6)
Stock-based compensation			8			8
Cash dividend (\$0.22 per common share)				(12)		(12)
Comprehensive income (net of tax):						
Net income				143		143
Other comprehensive income					7	7
Balance at March 31, 2022	55.6	\$ —	909	2,122	(4)	3,027
Net issuance under stock-based plans	0.1		1			1
Stock-based compensation			13			13
Cash dividend (\$0.22 per common share)				(12)		(12)
Comprehensive income (loss) (net of tax):						
Net income				130		130
Other comprehensive loss					(30)	(30)
Balance at June 30, 2022	55.7	\$ —	923	2,240	(34)	3,129
Net issuance under stock-based plans	0.1		5			5
Shares issued for the acquisition of Atotech Limited	10.7		1,186			1,186
Stock-based compensation			10			10
Cash dividend (\$0.22 per common share)				(13)		(13)
Comprehensive income (loss) (net of tax):						
Net income				6		6
Other comprehensive loss					(174)	(174)
Balance at September 30, 2022	66.5	\$ —	2,124	2,233	(208)	4,149

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

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

	Nine Months Ended September 30,	
	2023	2022
Cash flows from operating activities:		
Net (loss) income	\$ (1,772)	\$ 279
Adjustments to reconcile net (loss) income to net cash provided by operating activities:		
Depreciation and amortization	301	120
Amortization of inventory step-up to fair value	—	39
Goodwill and intangible asset impairments	1,827	—
Unrealized loss on derivatives not designated as hedging instruments	23	6
Amortization of debt issuance costs and original issue discount	23	46
Gain on sale of long-lived assets	(2)	(7)
Stock-based compensation	43	31
Provision for excess and obsolete inventory	54	10
Deferred income taxes	(173)	4
Other	4	3
Changes in operating assets and liabilities, net of effects of business acquired		
Accounts receivable	85	(37)
Inventories	(99)	(188)
Other current and non-current assets	12	2
Accounts payable	(110)	55
Accrued compensation	(11)	(37)
Income taxes payable	(75)	(27)
Other current and non-current liabilities	8	46
Net cash provided by operating activities	138	345
Cash flows from investing activities:		
Acquisition of business, net of cash acquired	—	(4,473)
Purchases of investments	—	(1)
Maturities of investments	—	76
Proceeds from sale of long-lived assets	3	7
Purchases of property, plant and equipment	(53)	(109)
Net cash used in investing activities	(50)	(4,500)
Cash flows from financing activities:		
Proceeds from borrowings	1	4,985
Payments of borrowings	(67)	(835)
Dividend payments	(44)	(37)
Net payments related to employee stock awards	(5)	(5)
Other financing activities	(1)	—
Net cash (used in) provided by financing activities	(116)	4,108
Effect of exchange rate changes on cash and cash equivalents	(22)	(35)
Decrease in cash and cash equivalents	(50)	(82)
Cash and cash equivalents at beginning of period	909	966
Cash and cash equivalents at end of period	\$ 859	\$ 884

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

(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 September 30, 2023, and for the three and nine months ended September 30, 2023, 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, 2022 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, 2022 filed with the U.S. Securities and Exchange Commission on March 14, 2023.

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, inventory valuation, warranty costs, stock-based compensation, intangible assets, goodwill, other long-lived assets and income taxes. 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. As a result of rounding, there may be immaterial differences in amounts presented and certain calculations may not sum to the total number expressed in each category or tie to a corresponding schedule.

(2) Revenue from Contracts with Customers

Contract assets as of September 30, 2023 and December 31, 2022 were \$31 and \$46, respectively. A roll-forward of the Company’s deferred revenue and customer advances is as follows:

	Nine Months Ended	
	September 30, 2023	September 30, 2022
Beginning balance, January 1 ⁽¹⁾	\$ 96	\$ 40
Assumed deferred revenue and customer advances from the acquisition of Atotech Limited	—	36
Additions to deferred revenue and customer advances	122	149
Amount of deferred revenue and customer advances recognized in income	(136)	(121)
Ending balance, September 30 ⁽²⁾	<u>\$ 82</u>	<u>\$ 104</u>

⁽¹⁾ Beginning balance as of January 1, 2023 included \$94 of current deferred revenue and customer advances and \$2 of non-current deferred revenue. Beginning balance as of January 1, 2022 included \$37 of current deferred revenue and customer advances, and \$3 of non-current deferred revenue.

⁽²⁾ Ending balance as of September 30, 2023 included \$80 of current deferred revenue and customer advances and \$2 of non-current deferred revenue. Ending balance as of September 30, 2022 included \$103 of current deferred revenue and customer advances and \$1 of non-current deferred revenue.

Revenue from certain custom products, including MSD (as defined in this Note 2) plating equipment, and revenue from certain service contracts are recorded over time. Remaining product and services revenues are recorded at a point in time.

Disaggregation of Revenue

The following tables summarize revenue from contracts with customers in MKS' three reportable segments: the Vacuum Solutions Division ("VSD"), the Photonics Solutions Division ("PSD") and the Materials Solutions Division ("MSD").

	Three Months Ended September 30, 2023			
	VSD	PSD	MSD	Total
Net revenues:				
Products	\$ 285	\$ 234	\$ 299	\$ 818
Services	60	42	12	114
Total net revenues	<u>\$ 345</u>	<u>\$ 276</u>	<u>\$ 311</u>	<u>\$ 932</u>
	Three Months Ended September 30, 2022			
	VSD	PSD	MSD	Total
Net revenues:				
Products	\$ 450	\$ 227	\$ 164	\$ 841
Services	60	40	13	113
Total net revenues	<u>\$ 510</u>	<u>\$ 267</u>	<u>\$ 177</u>	<u>\$ 954</u>
	Nine Months Ended September 30, 2023			
	VSD	PSD	MSD	Total
Net revenues:				
Products	\$ 902	\$ 640	\$ 874	\$ 2,416
Services	163	111	40	314
Total net revenues	<u>\$ 1,065</u>	<u>\$ 751</u>	<u>\$ 914</u>	<u>\$ 2,730</u>
	Nine Months Ended September 30, 2022			
	VSD	PSD	MSD	Total
Net revenues:				
Products	\$ 1,310	\$ 679	\$ 164	\$ 2,153
Services	181	114	13	308
Total net revenues	<u>\$ 1,491</u>	<u>\$ 793</u>	<u>\$ 177</u>	<u>\$ 2,461</u>

(3) 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 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.

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

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

Assets and liabilities of the Company are measured at fair value on a recurring basis as of September 30, 2023 and are summarized as follows:

Description	September 30, 2023	Fair Value Measurements at Reporting Date Using		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Cash equivalents:				
Money market funds	\$ 278	\$ 278	\$ —	\$ —
Time deposits	13	13	—	—
Available-for-sale securities:				
Time deposits and certificates of deposit	1	—	1	—
Group insurance contracts	6	—	6	—
Derivatives				
Foreign exchange forward contracts	7	—	7	—
Interest rate hedges - non-current	113	—	113	—
Pension and deferred compensation plan assets	19	—	19	—
Total assets	<u>\$ 437</u>	<u>\$ 291</u>	<u>\$ 146</u>	<u>\$ —</u>
Liabilities:				
Derivatives				
Foreign exchange forward contracts	\$ 3	\$ —	\$ 3	\$ —
Total liabilities	<u>\$ 3</u>	<u>\$ —</u>	<u>\$ 3</u>	<u>\$ —</u>
Reported as follows:				
Assets:				
Cash and cash equivalents	\$ 291	\$ 291	\$ —	\$ —
Short-term investments	1	—	1	—
Other current assets	7	—	7	—
Total current assets	<u>\$ 299</u>	<u>\$ 291</u>	<u>\$ 8</u>	<u>\$ —</u>
Other assets	<u>\$ 138</u>	<u>\$ —</u>	<u>\$ 138</u>	<u>\$ —</u>
Liabilities:				
Other current liabilities	<u>\$ 3</u>	<u>\$ —</u>	<u>\$ 3</u>	<u>\$ —</u>

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

Assets and liabilities of the Company are measured at fair value on a recurring basis as of December 31, 2022 and are summarized as follows:

Description	December 31, 2022	Fair Value Measurements at Reporting Date Using		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Cash equivalents:				
Money market funds	\$ 60	\$ 60	\$ —	\$ —
Available-for-sale securities:				
Time deposits and certificates of deposit	1	—	1	—
Group insurance contracts	6	—	6	—
Derivatives				
Foreign exchange forward contracts	7	—	7	—
Interest rate hedges-non-current	104	—	104	—
Pension and deferred compensation plan assets	17	—	17	—
Total assets	\$ 195	\$ 60	\$ 135	\$ —
Liabilities:				
Derivatives				
Foreign exchange forward contracts	\$ 8	\$ —	\$ 8	\$ —
Total liabilities	\$ 8	\$ —	\$ 8	\$ —
Reported as follows:				
Assets:				
Cash and cash equivalents	\$ 60	\$ 60	\$ —	\$ —
Short-term investments	1	—	1	—
Other current assets	8	—	8	—
Total current assets	\$ 69	\$ 60	\$ 9	\$ —
Other assets	\$ 126	\$ —	\$ 126	\$ —
Liabilities:				
Other current liabilities	\$ 8	\$ —	\$ 8	\$ —

Other Fair Value Disclosures

The estimated carrying value and fair value of the Company's debt as of September 30, 2023 and December 31, 2022 are as follows:

	September 30, 2023		December 31, 2022	
	Carrying Value	Fair Value	Carrying Value	Fair Value
Outstanding debt	\$ 5,047	\$ 5,052	\$ 5,122	\$ 5,071

The estimated carrying value and fair value of the Company's debt was determined using available market information based on recent trades or activity of debt instruments with substantially similar risks, terms and maturities, which fall within Level 2 under the fair value hierarchy.

Pension and Deferred Compensation Plan Assets

The pension and deferred compensation plan assets represent investments in mutual funds, exchange traded funds, government securities and other time deposits. These investments are set aside for retirement benefits of certain of the Company's subsidiaries.

Derivatives

As a result of the Company's global operating activities and variable interest rate borrowings, the Company is exposed to market risks from changes in foreign currency exchange rates and 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 and interest rate contracts in the institutional market in an over-the-counter environment with a relatively high level of price transparency. The market participants are typically large commercial banks. The contracts are valued using broker quotations or market transactions.

(4) Derivatives

Foreign Exchange Forward Contracts

The Company hedges a portion of its forecasted foreign currency-denominated intercompany sales of inventory, over a maximum period of eighteen months, using foreign exchange forward contracts accounted for as cash-flow hedges. To the extent these derivatives are effective in offsetting 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 other comprehensive income ("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 in earnings in the period it occurs. The cash flows resulting from foreign exchange forward contracts are classified in the condensed 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.

The Company also enters into foreign exchange forward 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 cash flow hedging instruments and gains or losses from these derivatives are recorded immediately in other expense (income), net.

The following tables summarize the primary net hedging positions and fair values of foreign exchange forward contracts outstanding as of September 30, 2023 and December 31, 2022:

Currency Hedged (Buy/Sell)	September 30, 2023	
	Net Notional Value	Fair Value Asset (Liability)
U.S. dollar/Japanese yen	\$ 56	\$ 4
U.S. dollar/South Korean won	80	—
U.S. dollar/Taiwan dollar	21	1
U.S. dollar/Singapore dollar	1	—
U.S. dollar/Chinese renminbi	13	—
Euro/U.S. dollar	22	—
Euro/Chinese renminbi	18	(1)
U.K. pound sterling/U.S. dollar	26	—
Total	\$ 237	\$ 4

Currency Hedged (Buy/Sell)	December 31, 2022	
	Net Notional Value	Fair Value (Liability) Asset
U.S. dollar/Japanese yen	\$ 57	\$ —
U.S. dollar/South Korean won	75	(4)
U.S. dollar/Taiwan dollar	33	1
U.S. dollar/U.K. pound sterling	7	—
U.S. dollar/Singapore dollar	1	—
U.S. dollar/Chinese renminbi	9	—
Euro/U.S. dollar	485	1
Euro/Chinese renminbi	31	1
U.K. pound sterling/euro	4	—
Total	\$ 702	\$ (1)

MKS INSTRUMENTS, INC.
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The following table summarizes the net (gains) on derivatives designated as cash flow hedging instruments:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Foreign exchange forward contracts:				
Net (gains) recognized in accumulated OCI	\$ (16)	\$ (48)	\$ (45)	\$ (73)
Net (gains) reclassified from accumulated OCI into income	\$ (2)	\$ (5)	\$ (4)	\$ (9)

The net amount of existing (gains) as of September 30, 2023 expected to be reclassified from OCI into earnings within the next 12 months is immaterial.

Net Investment Hedge

During the nine months ended September 30, 2023, the Company designated a euro net investment hedge to offset the foreign exchange exposure of the Euro Tranche B as defined and described further in Note 8. The outstanding principal amount of the Euro Tranche B was \$628 as of September 30, 2023. As a result, any mark-to-market foreign exchange impact of the Euro Tranche B is recorded in OCI.

Interest Rate Agreements

The Company has various interest rate swap agreements that exchange a forward-looking term rate based on the variable secured overnight financing rate (“Term SOFR”) paid on the outstanding balance of its New Term Loan Facility, as defined and further described in Note 8, to a fixed rate. The Company acquired USD London Interbank Offered Rate (“LIBOR”) interest rate cap agreements as a result of its acquisition of Atotech Limited (“Atotech”) on August 17, 2022 (the “Atotech Acquisition”) and had utilized these agreements to offset Term SOFR on its New Term Loan Facility. Effective June 30, 2023, the Company’s USD LIBOR based interest rate caps were converted to Term SOFR. The Company also had two USD LIBOR based swaps that were converted to Term SOFR, effective June 30, 2023. The conversions from USD LIBOR to Term SOFR did not have a material impact on the Company’s results of operations.

The following table summarizes the terms and fair values of interest rate swaps and interest rate caps outstanding at September 30, 2023 and December 31, 2022:

Effective Date	Maturity	Fixed Rate	Notional Amount at Effective Date	Notional Amount at September 30, 2023	September 30, 2023	December 31, 2022
					Fair Value Asset	Fair Value Asset
<i>Interest Rate Swaps</i>						
April 5, 2019	March 31, 2023	2.309 %	\$ 300	\$ —	\$ —	\$ 1
June 30, 2023	February 28, 2025	0.391 %	200	200	13	16
June 30, 2023	February 28, 2025	0.543 %	300	300	19	22
September 30, 2022	September 30, 2026	3.156 %	350	350	14	8
January 2, 2024	January 31, 2028	2.841 %	250	—	13	5
September 30, 2022	September 30, 2027	3.198 %	350	350	15	8
January 2, 2024	January 31, 2029	2.986 %	250	—	14	4
September 30, 2022	September 30, 2026	3.358 %	600	600	15	10
			2,600	1,800	103	74
<i>Interest Rate Caps</i>						
June 30, 2023	January 31, 2024	0.805 %	350	350	5	15
June 30, 2023	January 31, 2024	0.805 %	350	350	5	15
			700	700	10	30
		Total	\$ 3,300	\$ 2,500	\$ 113	\$ 104

The interest rate swaps are recorded at fair value on the balance sheet and changes in the fair value are recognized in OCI. To the extent these arrangements are no longer effective hedges, the hedging relationship will be discontinued and changes in the fair value of the hedging instruments from the last assessment period that were effective up to the current period will be recorded immediately in earnings. Amounts previously recorded in OCI will remain in OCI and will be reclassified to earnings when the interest payments impact consolidated earnings. If the Company determines that the interest payments are unlikely to occur, amounts previously recorded in OCI will be reclassified to earnings immediately. Changes in the fair value of interest rate caps are recorded immediately in earnings, as the Company has not designated these instruments as hedges and therefore these instruments do not qualify for hedge accounting.

The following table summarizes the losses on derivatives not designated as hedging instruments, consisting of balance sheet hedges and interest rate caps:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Net losses recognized in income	\$ 12	\$ 11	\$ 28	\$ 4

Currency Option Agreements

In connection with financing the Atotech Acquisition, the Company issued euro denominated term loan debt. In anticipation of entering into these euro denominated loans, the Company purchased foreign currency option contracts in 2021 to fix the conversion of 300 euros into U.S. dollars. The options settled on January 31, 2022 and the Company recorded a gain of \$5, net of premiums in 2022, which is included in other expense (income), net.

(5) Inventories

Inventories consist of the following:

	September 30, 2023		December 31, 2022	
Raw materials	\$ 747		\$ 689	
Work-in-process		99		115
Finished goods		163		173
Total	\$ 1,009		\$ 977	

(6) Acquisition

On August 17, 2022 (the “Effective Date”), the Company completed the Atotech Acquisition, through the acquisition of the entire issued share capital of Atotech by Atotech Manufacturing, Inc. (“Bidco”), a Delaware corporation and indirect wholly owned subsidiary of the Company. The Atotech Acquisition was implemented by means of a scheme of arrangement under the laws of Jersey (the “Scheme”) pursuant to the definitive agreement entered into by the Company and Atotech on July 1, 2021, as amended by the Letter Agreement dated October 29, 2021 by and among the Company, Atotech and Bidco, and as further amended by the Amendment to the Implementation Agreement dated April 1, 2022 by and among the Company, Atotech and Bidco (together, the “Implementation Agreement”).

Atotech, which the Company operates as MSD, develops leading process and manufacturing technologies for advanced surface modification, electroless and electrolytic plating, and surface finishing. Applying a comprehensive systems-and-solutions approach, Atotech’s portfolio includes chemistry, equipment, software, and services for innovative and high-technology applications in a wide variety of end markets. Atotech further broadens the Company’s capabilities by bringing leadership in critical chemistry solutions for electronics and packaging and specialty industrial applications.

On the Effective Date, pursuant to the Scheme and in accordance with the terms and conditions of the Implementation Agreement, Bidco acquired each issued and outstanding ordinary share of Atotech in exchange for per share consideration of \$16.20 in cash and 0.0552 of a share of Company common stock. The Company funded the payment of the aggregate cash consideration with a combination of cash on hand and the proceeds from the New Term Loan Facility, as defined in Note 8.

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As a result of the Atotech Acquisition, the Company issued an aggregate of 10.7 shares of Company common stock to the former Atotech shareholders.

The purchase price of Atotech consisted of the following:

Cash consideration to Atotech stockholders, net	\$	2,886
Value of MKS shares issued		1,186
Repayment of Atotech senior secured term loans		1,545
Settlement of accelerated Atotech share-based awards		47
Total purchase price, net of cash and cash equivalents acquired	<u>\$</u>	<u>5,664</u>

Under the acquisition method of accounting, the total purchase price was allocated to the acquired tangible and intangible assets and assumed liabilities of Atotech based on their fair values as of the Effective Date, except for contract assets and liabilities, which remain at book value in accordance with Accounting Standards Codification Topic 606, Revenue from Contracts with Customers. Any excess of the acquisition consideration over the fair value of assets acquired and liabilities assumed was allocated to goodwill and none of this goodwill or intangible assets will be deductible for tax purposes. The Company believes the amount of goodwill relative to identifiable intangible assets relates to several factors, including (1) broadening its position in key electronics and industrial markets to offer complementary solutions, and (2) leveraging component and systems expertise to provide robust solutions to meet its customers' evolving technology needs.

The following table summarizes the allocation of the purchase price to the fair values assigned to assets acquired and liabilities assumed at the Effective Date, inclusive of immaterial measurement period adjustments:

Cash and cash equivalents	\$	238
Accounts receivable		283
Inventories		244
Other current assets		104
Property, plant and equipment		381
Intangible assets		2,726
Goodwill		3,054
Other assets		131
Total assets acquired		<u>7,161</u>
Accounts payable		194
Other current liabilities		166
Non-current deferred taxes		719
Non-current accrued compensation		99
Other non-current liabilities		81
Total liabilities assumed		<u>1,259</u>
Fair value of assets acquired and liabilities assumed		5,902
Less: Cash and cash equivalents acquired		(238)
Total purchase price, net of cash and cash equivalents acquired	<u>\$</u>	<u>5,664</u>

The fair value of the acquired intangible assets was determined using the income approach. In performing these valuations, the key underlying assumptions used included the appropriate discount rates as well as forecasted revenue growth rates, gross profit and operating expenses. 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 valuations were based on the information that was available during the one-year measurement period that existed as of the Effective Date and the expectations and assumptions that have been deemed reasonable by the Company's management. The size and breadth of the Atotech Acquisition necessitated 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 Effective Date and the related tax impacts of any changes made. The measurement period is now complete.

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

Customer relationships	\$	1,756	11-14 years
Completed technology		595	8-9 years
Trade names		145	16 years
Backlog		40	1.5 years
In-process research and development		190	
	\$	<u>2,726</u>	

The acquired intangible assets are being amortized on a straight-line basis, which approximates the economic use of the assets over their estimated useful lives. Upon completion of the related projects, the Company expects the in-process research and development (“IPR&D”) intangible asset to be amortized over its estimated useful life of eight to nine years.

Pro Forma Results

The following unaudited pro forma financial information presents the combined results of operations of the Company as if the Atotech Acquisition had occurred on January 1, 2021. 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 on the assumed date. 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		Nine Months Ended	
	September 30, 2022		September 30, 2022	
Total net revenues	\$	1,141	\$	3,364
Net (loss) income	\$	(34)	\$	140

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

- applying the Company’s accounting policies;
- incremental interest expense related to the New Term Loan Facility;
- incremental amortization of acquired intangible assets related to the estimated fair value from the purchase price allocation;
- incremental depreciation of acquired property, plant and equipment related to the estimated fair value from the purchase price allocation;
- incremental compensation expense for share-based compensation arrangements; and
- the estimated tax impact of the above adjustments.

(7) Goodwill and Intangible Assets

Goodwill

The Company’s methodology for allocating the purchase price of an acquisition 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. 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.

Goodwill and intangible assets with indefinite useful lives are not amortized but are reviewed for impairment annually during the fourth quarter of each fiscal year or whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. To measure impairment, the Company compares the fair value of the reporting unit to its carrying amount, which includes goodwill. If the fair value of the reporting unit exceeds the carrying value of the reporting

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unit, no impairment exists. If the fair value of the reporting unit is less than the carrying value of the reporting unit, a goodwill impairment is recorded.

Amortizable intangible assets and other long-lived assets are also subject to an impairment test if there is an indicator of impairment. When the Company determines that the carrying value of intangible assets or other long-lived assets may not be recoverable based upon the existence of one or more indicators of impairment, the Company uses the projected undiscounted cash flow method to determine whether an impairment exists, and then measures the impairment using discounted cash flows.

The process of evaluating the potential impairment of goodwill, intangible assets and other long-lived assets requires significant judgment. The Company regularly monitors current business conditions and other factors, including, but not limited to, adverse industry or economic trends, restructuring actions and lower projections of profitability that may impact future operating results. The Company's stock price and any estimated control premium are factors affecting the assessment of the fair value of the Company's underlying reporting units for purposes of performing any goodwill impairment assessment.

During the quarter ended June 30, 2023, the Company identified softer industry demand, particularly in the personal computer and smartphone markets, and concluded there was a triggering event at each of its electronics and general metal finishing reporting units, which together constitute MSD, and the equipment solutions reporting unit of PSD. For MSD, the Company concluded information on the softening of industry demand as of the filing date of the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2023 did not exist as of the Effective Date.

For each of the three reporting units, the Company performed a quantitative assessment of goodwill using an equal weighting of the income approach and market approach. The income approach was based upon projected future cash flows that were discounted to present value and an assumed terminal growth rate. The key underlying assumptions included forecasted revenues, which incorporated external market data, gross profit and operating expenses, as well as an applicable discount rate for each reporting unit. The market approach for each of the three reporting units incorporated observed multiples of guideline public companies. The market approach for the electronics and general metal finishing reporting units also incorporated multiples from guideline transactions.

Fair value estimates are based on complex series of judgments about future events and uncertainties and rely heavily on estimates and assumptions that have been deemed reasonable by the Company's management. There are inherent uncertainties and management judgment required in these determinations.

This quantitative assessment during the quarter ended June 30, 2023 resulted in the following:

Reporting Unit	Goodwill Impairment	Remaining Goodwill
Electronics	\$826	\$1,420
General Metal Finishing	428	307
Equipment Solutions	372	100

In addition, the Company used an income approach to determine the fair value of the long-lived and indefinite lived intangible assets within these reporting units (Level 3 within the fair value hierarchy). These valuations resulted in a \$20 fair value and \$152 impairment of completed technology within the equipment solutions reporting unit and a \$72 fair value and \$49 impairment of IPR&D within the electronics reporting unit. After evaluating forecast updates and carrying values, the Company did not identify impairments at any other of its reporting units.

For the completed technology valuation within the equipment solutions division, the forecasted future undiscounted cash flows were consistent with the Company's goodwill analysis, using an approximate 7 year useful life, an 8% weighted-average forecasted revenue growth rate, and a discount rate of 13.5%. For the IPR&D intangible asset within the electronics reporting unit, the forecasted undiscounted future cash flows utilized were consistent with the Company's goodwill analysis, with estimated time to complete in-process projects of up to 2 years, and a discount rate of 12.5%.

During the quarter ended September 30, 2023, the Company identified a further decrease in demand and an increase in the discount rate at its equipment solutions reporting unit. The Company performed a quantitative assessment of goodwill using an income approach that was based upon projected future cash flows that were discounted to present value and an assumed terminal growth rate. The key underlying assumptions included forecasted revenues, which incorporated external market data, gross profit and operating expenses, as well as the discount rate. The Company concluded that there was no goodwill or intangible asset impairment at the equipment solutions reporting unit in the third quarter. The Company also considered other quantitative and qualitative considerations, including the decline in public market capitalization since June 30, 2023, and

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determined there were no triggering events for its other reporting units or asset groups in the third quarter. The Company will continue to monitor for future triggering events which could result in an impairment charge.

The changes in the carrying amount of goodwill and accumulated impairment loss during the nine months ended September 30, 2023 were as follows:

	Gross Carrying Amount	Accumulated Impairment Loss	Net
Beginning balance, January 1	\$ 4,454	\$ (146)	\$ 4,308
Impairment charge	—	(1,626)	(1,626)
Foreign currency translation and measurement period adjustments	(142)	—	(142)
Ending balance, September 30	<u>\$ 4,312</u>	<u>\$ (1,772)</u>	<u>\$ 2,540</u>

Intangible Assets

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

As of September 30, 2023:	Gross	Accumulated Imp airment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Completed technology	\$ 1,212	\$ (152)	\$ (378)	\$ (28)	\$ 654
Customer relationships	2,072	(1)	(299)	(78)	1,694
Patents, trademarks, trade names and other	437	(49)	(112)	(10)	266
	<u>\$ 3,721</u>	<u>\$ (202)</u>	<u>\$ (789)</u>	<u>\$ (116)</u>	<u>\$ 2,614</u>

During the nine months ended September 30, 2023, \$61 of IPR&D included within patents, trademarks, trade names, and other was reclassified into completed technology. During the nine months ended September 30, 2023, \$9 of IPR&D was written off to amortization expense as certain projects were cancelled.

As of December 31, 2022:	Gross	Accumulated Impairment Charges	Accumulated Amortization Charges	Foreign Currency Translation	Net
Completed technology	\$ 1,151	\$ —	\$ (303)	\$ 4	\$ 852
Customer relationships	2,072	(1)	(190)	11	1,892
Patents, trademarks, trade names and other	498	—	(71)	2	429
	<u>\$ 3,721</u>	<u>\$ (1)</u>	<u>\$ (564)</u>	<u>\$ 17</u>	<u>\$ 3,173</u>

Aggregate amortization expense related to acquired intangible assets for the nine months ended September 30, 2023 and 2022 was \$225 and \$77, respectively. The increase in amortization of intangible assets was a result of increased amortization related to acquired intangible assets from the Atotech Acquisition. Aggregate net amortization expense related to acquired intangible assets for future years is as follows:

<u>Year</u>	<u>Amount</u>
2023 (remaining)	\$ 67
2024	236
2025	236
2026	232
2027	231
2028	231
Thereafter	1,259

The Company excluded from the above table intangible assets of \$56 of indefinite-lived trademarks and trade names, and \$66 of IPR&D, which were not subject to amortization.

(8) Debt

The Company's outstanding debt is as follows:

	September 30, 2023	December 31, 2022
Short-term debt:		
New Term Loan Facility	\$ 87	\$ 93
Long-term debt, net:		
New Term Loan Facility	\$ 4,787	\$ 4,834

Long-term debt is net of deferred financing fees, original issuance discount and repricing fees in the aggregate amount of \$173 and \$195 as of September 30, 2023 and December 31, 2022, respectively.

New Credit Facilities

In connection with the completion of the Atotech Acquisition, the Company entered into a credit agreement with JPMorgan Chase Bank, N.A., as administrative agent and collateral agent, Barclays Bank PLC, and the lenders from time to time party thereto (the "New Credit Agreement"). The New Credit Agreement provides for (i) a senior secured term loan facility (the "New Term Loan Facility") comprised of three tranches: a USD 1,000 loan (the "USD Tranche A"), a USD 3,600 loan (the "USD Tranche B") and a EUR 600 loan (the "Euro Tranche B"), each of which were borrowed in full on the Effective Date, and (ii) a senior secured revolving credit facility of USD 500 (the "New Revolving Facility" and, together with the New Term Loan Facility, the "New Credit Facilities"), with the commitments under each of the foregoing facilities subject to increase from time to time subject to certain conditions.

Borrowings under the New Credit Facilities 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) with respect to the USD Tranche A, the USD Tranche B and the New Revolving Facility, (x) 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*, or (3) a forward-looking term rate based on Term SOFR (plus an applicable credit spread adjustment) for an interest period of one month, plus 1.00%; and (y) a Term SOFR rate (plus an applicable credit spread adjustment) for the interest period relevant to such borrowing, subject to a rate floor of (I) with respect to the USD Tranche B, 0.50% and (II) with respect to the USD Tranche A and the New Revolving Facility, 0.0%; and (b) with respect to the Euro Tranche B, a Euro Interbank Offered Rate ("EURIBOR") rate determined by reference to the costs of funds for Euro deposits for the interest period relevant to such borrowing adjusted for certain additional costs, subject to a EURIBOR rate floor of 0.0%. The USD Tranche A was issued with original issue discount of 0.25% of the principal amount thereof. The USD Tranche B and the Euro Tranche B were issued with original issue discount of 2.00% of the principal amount thereof. The applicable margin for borrowings under the USD Tranche A is 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings. The applicable margin for borrowings under the USD Tranche B is 1.75% with respect to base rate borrowings and 2.75% with respect to Term SOFR borrowings. The applicable margin for borrowings under the Euro Tranche B is 3.00%. The applicable margin for borrowings under the New Revolving Facility is 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings.

In addition to paying interest on outstanding principal under the New Credit Facilities, the Company is required to pay a commitment fee in respect of the unutilized commitments under the New Revolving Facility. The initial commitment fee is 0.375% per annum. Commencing with the delivery of financial statements with respect to the first quarter ending after the closing of the New Credit Agreement, the commitment fee is subject to downward adjustment based on the Company's first lien net leverage ratio as of the end of the preceding quarter. The Company must also pay customary letter of credit fees and agency fees.

The Company incurred \$242 of deferred financing fees and original issue discount related to the term loans under the New Term Loan Facility, which are included in long-term debt, net in the accompanying condensed 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 the deferred financing fees and original issue discount was accelerated in connection with the debt prepayment and extinguishment of the Prior Term Loan Facility (as defined below).

Under the New Credit Agreement, the Company is required to prepay outstanding term loans, subject to certain exceptions, with portions of its annual excess cash flow as well as with the net cash proceeds of certain of its asset sales, certain casualty and condemnation events and the incurrences or issuances of certain debt.

If at any time the aggregate amount of outstanding loans, unreimbursed letter of credit drawings and undrawn letters of credit under the New Revolving Facility exceeds the aggregate commitments under the New Revolving Facility, the Company is required to repay outstanding loans and/or cash collateralize letters of credit, with no reduction of the commitment amount.

The Company may voluntarily prepay outstanding loans under the New Credit Facilities from time to time, subject to certain conditions, without premium or penalty other than customary “breakage” costs with respect to Term SOFR or EURIBOR loans; provided, however, that subject to certain exceptions, if on or prior to the date that is twelve months after the closing date of the New Term Loan Facility, the Company prepaid any loans under the USD Tranche B or the Euro Tranche B in connection with a repricing transaction, the Company would have been required to pay a prepayment premium of 1.00% of the aggregate principal amount of the loans so prepaid. Additionally, the Company may voluntarily reduce the unutilized portion of the commitment amount under the New Revolving Facility.

The Company is required to make scheduled quarterly payments each equal to 1.25% of the original principal amount of the USD Tranche A (increasing to 1.875% in years 3 and 4 and 2.50% in year 5) and 0.25% of the original principal amount of the USD Tranche B and the Euro Tranche B, beginning with the fiscal quarter ended December 31, 2022, with the balance due thereunder on the fifth anniversary of the closing date in the case of the USD Tranche A and the seventh anniversary of the closing date in the case of the USD Tranche B and the Euro Tranche B.

There is no scheduled amortization under the New Revolving Facility. Any principal amount outstanding under the New Revolving Facility is due and payable in full on the fifth anniversary of the closing date.

The Company incurred \$7 of costs in connection with the New Revolving Facility, which were capitalized and included in other assets in the accompanying condensed consolidated balance sheet and are being amortized to interest expense over the estimated life of four years. As a result of the termination of the Prior ABL Credit Facility (as defined below) concurrently with the Company’s entry into the New Revolving Facility, the Company wrote off an immaterial amount of previously capitalized debt issuance costs.

All obligations under the New Credit Facilities are guaranteed by certain of the Company’s wholly-owned domestic subsidiaries and are required to be guaranteed by certain of the Company’s future wholly-owned domestic subsidiaries, and are secured by substantially all of the Company’s assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

Under the New Credit Agreement, the Company has the ability to incur additional incremental debt facilities in an amount up to (x) the greater of (1) \$1,011 and (2) 75% of consolidated EBITDA, plus (y) an amount equal to the sum of all voluntary prepayments of term loans under the New Term Loan Facility, plus (z) an additional unlimited amount subject to pro forma compliance with certain leverage ratio tests (based on the security and priority of such incremental debt).

Under the USD Tranche A and the New Revolving Facility, so long as any USD Tranche A loans (or commitments in respect thereof) are outstanding as of the end of any fiscal quarter, the Company may not allow its total net leverage ratio as of the end of such fiscal quarter to be greater than 5.50 to 1.00, with an annual step-down of 0.25:1.00 and subject to a step-up of 0.50:1.00 for the four full fiscal quarter period following any material acquisition, not to exceed 5.50 to 1.00.

In addition, in the event there are no loans outstanding under the USD Tranche A, as of the end of any fiscal quarter of the Company when the aggregate amount of loans outstanding under the New Revolving Facility (net of (a) all letters of credit (whether cash collateralized or not) and (b) unrestricted cash of the Company and its restricted subsidiaries) exceeds 35% of the aggregate amount of all commitments under the New Revolving Facility in effect as of such date, the Company may not allow its first lien net leverage ratio as of the end of each such fiscal quarter to be greater than 6.00 to 1.00.

The USD Tranche B and the Euro Tranche B are not subject to financial maintenance covenants.

The New Credit Agreement contains a number of negative covenants that, among other things and subject to certain exceptions, restrict the ability of the Company and each of its subsidiaries to incur additional indebtedness; pay dividends on its capital stock or redeem, repurchase or retire its capital stock or its subordinated indebtedness; make investments, loans and acquisitions; create restrictions on the payment of dividends or other amounts to the Company from the Company’s restricted subsidiaries or restrictions on the ability of the Company’s restricted subsidiaries to incur liens; engage in transactions with its affiliates; sell assets, including capital stock of its subsidiaries; materially alter the business it conducts; consolidate or merge; incur liens; and engage in sale-leaseback transactions.

The New 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 New Credit Facilities will be entitled to take various actions, including the acceleration of amounts due under the New Credit Facilities and all actions permitted to be

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taken by a secured creditor. As of September 30, 2023, the Company was in compliance with all covenants under the New Credit Agreement.

The proceeds of the New Term Loan Facility were used on the Effective Date, among other things, to fund a portion of the consideration payable in connection with the Atotech Acquisition and to refinance the Prior Term Loan Facility and the Prior ABL Credit Facility and certain indebtedness of Atotech. The Company also paid certain customary fees and expenses of JPMorgan Chase Bank, N.A., Barclays Bank PLC, BofA Securities Inc., Citigroup Global Markets Inc., HSBC Securities (USA) Inc. and Mizuho Bank, Ltd. in their respective capacities as lead arrangers and bookrunners in connection with the New Credit Facilities.

On the Effective Date, in connection with the entry into the New Credit Agreement described above, the Company terminated and prepaid the prior term loan credit facility under that certain Term Loan Credit Agreement, dated as of April 29, 2016, by and among the Company, Barclays Bank PLC and the other financial institutions from time to time party thereto (as amended, the “Prior Term Loan Credit Agreement” and the term loan credit facility thereunder, the “Prior Term Loan Facility”) and terminated the prior revolving credit facility under that certain ABL Credit Agreement, dated as of February 1, 2019, by and among the Company, Barclays Bank PLC and the other financial institutions from time to time party thereto (as amended, the “Prior ABL Credit Agreement” and the revolving credit facility thereunder, the “Prior ABL Credit Facility”).

As of September 30, 2023, the outstanding principal amount of the New Term Loan Facility was \$5,047 and the weighted average interest rate was 7.9%. As of September 30, 2023, there were no borrowings under the New Revolving Facility.

Lines of Credit and Borrowing Arrangements

Certain of the Company’s Japanese subsidiaries have lines of credit and a financing facility with various financial institutions, many of which generally expire and are renewed at three-month intervals with the remaining having no expiration date. The lines of credit and financing facility provided for aggregate borrowings as of September 30, 2023 of up to an equivalent of \$13. There were no borrowings outstanding under these arrangements at September 30, 2023 and December 31, 2022.

Contractual maturities of the Company’s debt obligations as of September 30, 2023 are as follows:

Year	Amount
2023 (remaining)	\$ 22
2024	93
2025	110
2026	115
2027	695
2028	42
Thereafter	3,970

(9) Product Warranties

The Company provides for the estimated costs to fulfill customer warranty obligations upon the recognition of the related revenue. The Company’s warranty obligations are 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. The Company engages in extensive product quality programs and processes, including actively monitoring and evaluating the quality of its component suppliers.

Product warranty activities were as follows:

	Nine Months Ended September 30,	
	2023	2022
Beginning of period	\$ 27	\$ 21
Assumed product warranty liability from Atotech Acquisition	—	5
Provision for product warranties	8	20
Charges to warranty liability	(11)	(21)
End of period	\$ 24	\$ 25

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As of September 30, 2023, short-term product warranties of \$16 and long-term product warranties of \$8 were included within other current liabilities and other non-current liabilities, respectively, within the accompanying condensed consolidated balance sheet. As of September 30, 2022, short-term product warranties of \$19 and long-term product warranties of \$6 were included within other current liabilities and other non-current liabilities, respectively, within the accompanying condensed consolidated balance sheet.

(10) Other Current Liabilities

Other current liabilities consisted of the following:

	September 30, 2023	December 31, 2022
Accrued compensation and other employee-related obligations	\$ 153	\$ 162
Deferred revenue and customer advances	80	94
Income taxes payable	56	51
Lease liabilities	28	26
Other	125	100
Total other current liabilities	<u>\$ 442</u>	<u>\$ 433</u>

(11) Income Taxes

The Company's effective tax rates for the three and nine months ended September 30, 2023 were (75.3)% and 4.1%, respectively. The Company's effective tax rate for the three months ended September 30, 2023 was lower than the U.S. statutory tax rate primarily due to the U.S. deduction of foreign derived intangible income ("FDII") and various tax credits. The Company's effective tax rate for the nine months ended September 30, 2023 was lower than the U.S. statutory tax rate primarily due to the tax benefit related to the impairment of intangible assets and the aforementioned credits.

The Company's effective tax rates for the three and nine months ended September 30, 2022 were 85.5% and 24.1%, respectively. The Company's effective tax rates for the three and nine months ended September 30, 2022 were higher than the U.S. statutory tax rate mainly due to additional estimated accrued withholding taxes related to the Company's change of indefinite reinvestment assertion, non-deductibility of certain costs associated with the Atotech Acquisition, and the U.S. global intangible low-taxed income inclusion, offset by U.S. deduction for FDII and the geographic mix of income earned by the Company's international subsidiaries being taxed at rates lower than the U.S. statutory tax rate.

(12) Net Income (Loss) Per Share

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

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Numerator:				
Net income (loss)	\$ 39	\$ 6	\$ (1,772)	\$ 279
Denominator:				
Shares used in net income (loss) per common share – basic	66.9	61.0	66.8	57.4
Effect of dilutive securities	0.2	0.1	—	0.2
Shares used in net income (loss) per common share – diluted	<u>67.1</u>	<u>61.1</u>	<u>66.8</u>	<u>57.6</u>
Net income (loss) per common share:				
Basic	\$ 0.59	\$ 0.09	\$ (26.53)	\$ 4.85
Diluted	\$ 0.58	\$ 0.09	\$ (26.53)	\$ 4.84

Basic earnings per share ("EPS") is computed by dividing income (loss) 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 had been converted to such common shares, and if such assumed conversion is dilutive. In periods in which a net loss is recognized, the impact of restricted stock units ("RSUs") is not included as they are antidilutive.

For the three and nine months ended September 30, 2023 and 2022, the Company had an immaterial quantity of RSUs that were antidilutive and were excluded from the computation of diluted weighted-average shares.

(13) Stock-Based Compensation

Prior to May 10, 2022, the Company granted RSUs to employees and directors under the 2014 Stock Incentive Plan (the “2014 Plan”). Following shareholder approval of the 2022 Stock Incentive Plan (the “2022 Plan” and, together with the 2014 Plan, the “Plans”) on May 10, 2022, the Company discontinued granting RSUs to employees and directors under the 2014 Plan and began granting them under the 2022 Plan. The Plans are administered by the Compensation Committee of the Company’s Board of Directors. The Plans are 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 enable these individuals to participate in the long-term growth of the Company.

In connection with the Atotech Acquisition, all Atotech time-based RSUs and performance-based RSU awards outstanding immediately prior to the acquisition were cancelled and replaced with the Company’s time-based RSUs under the 2022 Plan in accordance with the Implementation Agreement. Based on a formula in the Implementation Agreement, such cancelled RSUs were replaced with the Company’s RSUs, which are subject to the terms and conditions of the 2022 Plan and the related RSU agreements.

The total stock-based compensation expense included in the Company’s condensed consolidated statements of operations and comprehensive (loss) income was as follows:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Cost of revenues	\$ 1	\$ 1	\$ 4	\$ 4
Research and development	2	1	5	4
Selling, general and administrative	10	8	34	23
Total stock-based compensation expense	\$ 13	\$ 10	\$ 43	\$ 31

At September 30, 2023, the total compensation expense related to unvested stock-based awards granted to employees and directors under the Plans that had not been recognized was \$57. The Company determines the fair value of RSUs based on the closing market price of the Company’s common stock on the date of the award and estimates the fair value of employee stock purchase plan rights using the Black-Scholes valuation model. Such values are recognized as expense on a straight-line basis for time-based awards and using the accelerated graded vesting method for performance-based awards, both over the requisite service periods.

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

	Nine Months Ended September 30, 2023	
	Quantity	Weighted Average Grant Date Fair Value Per Share
RSUs – beginning of period	0.8	\$ 118.96
Granted	0.7	\$ 87.17
Vested or forfeited	(0.5)	\$ 118.64
RSUs – end of period	1.0	\$ 98.36

(14) 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 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 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. The Company has repurchased approximately 2.6 shares of common stock for approximately \$127

pursuant to the program since its adoption. During the three and nine months ended September 30, 2023 and 2022, there were no repurchases of common stock. Under the New Credit Facilities, the Company may be restricted from repurchasing its common stock under certain circumstances.

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. During each of the first three quarters of 2023 and 2022, the Company’s Board of Directors declared a cash dividend of \$0.22 per share, which totaled \$44 and \$37 for the nine months ended September 30, 2023 and 2022, respectively. 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 New Credit Facilities, the Company may be restricted from paying dividends under certain circumstances.

(15) Business Segment, Geographic Area, and Significant Customer Information

The Company has three reportable segments: VSD, PSD and MSD. The Company’s Chief Operating Decision Maker (“CODM”), which is the Company’s Chief Executive Officer, 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 and allocate resources to the three segments.

Reportable Segments

VSD delivers foundational technology solutions to leading edge semiconductor manufacturing, advanced electronics and specialty industrial applications. VSD products are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, and vacuum technology.

PSD provides a full range of solutions including lasers, beam measurement and profiling, precision motion control, vibration isolation systems, photonics instruments, temperature sensing, opto-mechanical components, optical elements, laser-based systems for flexible printed circuit board (“PCB”) processing, and laser-based systems for high density interconnect PCB and package substrate manufacturing.

MSD develops leading process and manufacturing technologies for advanced surface modification, electroless and electrolytic plating, and surface finishing. Atotech is a brand within MSD. Applying a comprehensive systems-and-solutions approach, MSD’s portfolio includes chemistry, equipment, software, and services for innovative and high-technology applications in a wide variety of end markets.

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 groups similar products within its three reportable segments.

The following table sets forth net revenues by reportable segment:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Vacuum Solutions Division	\$ 345	\$ 510	\$ 1,065	\$ 1,491
Photonics Solutions Division	276	267	751	793
Materials Solutions Division	311	177	914	177
	<u>\$ 932</u>	<u>\$ 954</u>	<u>\$ 2,730</u>	<u>\$ 2,461</u>

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The following table reconciles gross profit by reportable segment to net (loss) income:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
Gross profit by reportable segment:				
Vacuum Solutions Division	\$ 143	\$ 220	\$ 443	\$ 645
Photonics Solutions Division	115	125	323	372
Materials Solutions Division	168	45	465	45
Total gross profit by reportable segment	426	390	1,231	1,062
Operating expenses:				
Research and development	71	63	218	168
Selling, general and administrative	167	126	514	319
Acquisition and integration costs	3	31	14	41
Restructuring	1	5	13	10
Amortization of intangible assets	68	47	225	77
Goodwill and intangible asset impairments	—	—	1,827	—
Gain on sale of long-lived assets	(2)	—	(2)	(7)
Income (loss) from operations	118	118	(1,578)	454
Interest income	(4)	(1)	(10)	(2)
Interest expense	93	80	266	93
Other expense (income), net	7	(1)	14	(4)
Income (loss) before income taxes	22	40	(1,848)	367
(Benefit) provision for income taxes	(17)	34	(76)	88
Net income (loss)	\$ 39	\$ 6	\$ (1,772)	\$ 279

Interest income, interest expense and income tax (benefit) expense are not presented by reportable segment because the necessary information is not classified within the segments nor used by the CODM.

The following table sets forth segment assets by reportable segment:

September 30, 2023	Accounts receivable, net	Inventories	Total
Vacuum Solutions Division	\$ 183	\$ 551	\$ 734
Photonics Solutions Division	192	294	486
Materials Solutions Division	243	164	407
Total segment assets	\$ 618	\$ 1,009	\$ 1,627
December 31, 2022	Accounts receivable, net	Inventories	Total
Vacuum Solutions Division	\$ 270	\$ 491	\$ 761
Photonics Solutions Division	194	296	490
Materials Solutions Division	256	190	446
Total segment assets	\$ 720	\$ 977	\$ 1,697

The Company adjusted the accounts receivable, net balances as of December 31, 2022 to correct for immaterial errors in the segments.

The following table reconciles segment assets to total assets:

	September 30, 2023	December 31, 2022
Total segment assets	\$ 1,627	\$ 1,697
Cash and cash equivalents and short-term investments	860	910
Other current assets	288	187
Property, plant and equipment, net	761	800
Right-of-use assets, net	227	234
Goodwill and intangible assets, net	5,154	7,481
Other assets	223	186
Total assets	\$ 9,140	\$ 11,495

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Geographic Area

Information about the Company's operations by geographic area is presented in the tables below. Net revenues from unaffiliated customers are based on the location in which the sale originated. Intercompany sales between geographic areas are at tax transfer prices and have been eliminated from consolidated net revenues.

Net revenues:	Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022
United States	\$ 317	\$ 393	\$ 937	\$ 1,083
China	183	135	505	284
South Korea	99	82	260	260
Japan	59	46	180	147
Germany	44	100	181	176
Other	230	198	667	511
	<u>\$ 932</u>	<u>\$ 954</u>	<u>\$ 2,730</u>	<u>\$ 2,461</u>

Long-lived assets include property, plant and equipment, net, right-of-use assets, net and certain other assets, and exclude goodwill, intangible assets and long-term tax-related accounts.

Long-lived assets:	September 30, 2023	December 31, 2022
United States	\$ 522	\$ 508
Germany	146	160
China	154	175
Other	325	343
	<u>\$ 1,147</u>	<u>\$ 1,186</u>

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

Reportable segment:	VSD	PSD	MSD	Total
Gross goodwill, at December 31, 2022	\$ 336	\$ 1,031	\$ 3,087	\$ 4,454
Foreign currency translation and measurement period adjustments	(1)	(3)	(138)	(142)
Gross goodwill, at September 30, 2023	335	1,028	2,949	4,312
Accumulated goodwill impairment, at December 31, 2022	(141)	(5)	—	(146)
Impairment charge	—	(372)	(1,254)	(1,626)
Accumulated goodwill impairment, at September 30, 2023	(141)	(377)	(1,254)	(1,772)
Goodwill, net of accumulated impairment, foreign currency translation and measurement period adjustments, at September 30, 2023	<u>\$ 194</u>	<u>\$ 651</u>	<u>\$ 1,695</u>	<u>\$ 2,540</u>

(16) Restructuring

The Company recorded restructuring charges of \$1 and \$13 during the three and nine months ended September 30, 2023, respectively, primarily related to severance costs due to global cost-saving initiatives implemented in each of the first and second quarters of 2023. The Company recorded restructuring charges of \$5 during the three months ended September 30, 2022, primarily related to executive payments related to the Atotech Acquisition, and \$10 during the nine months ended September 30, 2022, primarily related to severance costs due to a global cost-saving initiative, the closure of two facilities in Europe and executive payments related to the Atotech Acquisition.

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Restructuring activities were as follows:

	Nine Months Ended September 30,	
	2023	2022
Restructuring accrual beginning of period	\$ 3	\$ 3
Charged to expense	13	10
Payments and adjustments	(10)	(10)
Restructuring accrual end of period	<u>\$ 6</u>	<u>\$ 3</u>

(17) Commitments and Contingencies

Litigation

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

(18) Subsequent Events

On October 3, 2023 (the “Repricing Effective Date”), the Company entered into the First Amendment to the Credit Agreement (the “Repricing Amendment”), which amended the New Credit Agreement. The Repricing Amendment (i) decreased the applicable margin for the USD Tranche B from 2.75% to 2.50% with respect to Term SOFR borrowings and from 1.75% to 1.50% with respect to base rate borrowings, (ii) removed the credit spread adjustments applicable to Term SOFR borrowings of the USD Tranche B and (iii) extended the period during which a 1.00% prepayment premium may be required if the Company prepays any loans under the USD Tranche B in connection with a repricing transaction until the date that is six months following the Repricing Effective Date. The repriced loans were issued with original issue discount of 0.25%. In connection with the execution of the Repricing Amendment, the Company paid customary fees and expenses to JPMorgan Chase Bank, N.A.

On October 31, 2023, the Company made a voluntary prepayment of \$100 aggregate principal amount on the USD Tranche A.

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 of 1933 and Section 21E of the Securities Exchange Act of 1934 regarding the future financial performance, business prospects and growth of MKS Instruments, Inc. (“MKS”, the “Company,” “our,” or “we”). These statements are only predictions based on current assumptions and expectations. Any statements that are not statements of historical fact (including statements containing the words “will,” “projects,” “intends,” “believes,” “plans,” “anticipates,” “expects,” “estimates,” “forecasts,” “continues” and similar expressions) should be considered to be forward-looking statements. Actual events or results may differ materially from those in the forward-looking statements set forth herein.

Among the important factors that could cause actual events to differ materially from those in the forward-looking statements that we make are the need to generate sufficient cash flows to service and repay the substantial indebtedness we incurred in connection with our acquisition of Atotech Limited (“Atotech” and such transaction, the “Atotech Acquisition”), which we completed in August 2022; the terms of our existing credit facilities under which we incurred such debt; our entry into the chemicals technology business through the Atotech Acquisition, in which we do not have experience and which may expose us to significant additional liabilities; the risk that we are unable to integrate the Atotech Acquisition successfully or realize the anticipated synergies, cost savings and other benefits of the Atotech Acquisition; the ongoing assessment of the ransomware event we identified on February 3, 2023, including legal, reputational, financial and contractual risks resulting from the incident, and other risks related to cybersecurity, data privacy and intellectual property; competition from larger, more advanced or more established companies in our markets; the ability to successfully grow our business and the businesses of Atotech and Electro Scientific Industries, Inc., which we acquired in February 2019 and financial risks associated with those and potential future acquisitions, including goodwill and intangible asset impairments; manufacturing and sourcing risks, including those associated with limited and sole source suppliers and the impact and duration of supply chain disruptions, component shortages, and price increases; changes in global demand and the impact of COVID-19 or any other pandemic, including with respect to such supply chain disruptions, component shortages and price increases; risks associated with doing business internationally, including geopolitical conflicts, trade compliance, regulatory restrictions on our products, components or markets, particularly the semiconductor market, and unfavorable currency exchange and tax rate fluctuations, which risks become more significant as we grow our business internationally and in China specifically; conditions affecting the markets in which we operate, including fluctuations in capital spending in the semiconductor, electronics manufacturing and automotive industries, and fluctuations in sales to our major customers or disruptions or delays from third-party service providers upon which our operations may rely; the ability to anticipate and meet customer demand; the challenges, risks and costs involved with integrating or transitioning local and international operations of the companies we have acquired; risks associated with the attraction and retention of key personnel; potential fluctuations in quarterly results; dependence on new product development; rapid technological and market change; acquisition strategy; volatility of stock price; risks associated with chemical manufacturing and environmental regulation compliance; risks related to defective products; financial and legal risk management; and the other important factors described under the heading “Risk Factors” in Part I, Item 1A of our Annual Report on Form 10-K for the year ended December 31, 2022 filed with the U.S. Securities and Exchange Commission on March 14, 2023 (“Annual Report”). We are under no obligation to, and expressly disclaim any obligation to, update or alter these forward-looking statements, whether as a result of new information, future events or otherwise, even if subsequent events cause our views to change.

The Management’s Discussion and Analysis of Financial Condition and Results of Operations describes principal factors affecting the results of operations, financial condition and liquidity, as well as our critical accounting policies and estimates that require significant judgment and thus have the most significant potential impact on our condensed consolidated financial statements. This section provides an analysis of our financial results for the three months ended September 30, 2023 compared to the three months ended June 30, 2023, and the nine months ended September 30, 2023 compared to the nine months ended September 30, 2022.

Overview

We enable technologies that transform our world. We deliver foundational technology solutions to leading edge semiconductor manufacturing, electronics and packaging, and specialty industrial applications. We apply our broad science and engineering capabilities to create instruments, subsystems, systems, process control solutions and specialty chemicals technology that improve process performance, optimize productivity and enable unique innovations for many of the world’s leading technology and industrial companies. Our solutions are critical to addressing the challenges of miniaturization and complexity in advanced device manufacturing by enabling increased power, speed, feature enhancement and optimized connectivity. Our solutions are also critical to addressing ever-increasing performance requirements across a wide array of specialty industrial applications.

Ransomware Event

On February 3, 2023, we identified that we had become subject to a ransomware event. We took immediate action to activate our incident response and business continuity protocols to contain the incident, including engaging appropriate incident response professionals and notifying law enforcement authorities. We then initiated the recovery phase, contained the incident, and have since reopened our affected manufacturing and service operations and completed restoration of virtually all of our information technology (“IT”) systems, including our enterprise resource planning systems.

Based on our investigation, we concluded ransomware actors encrypted certain of our systems by deploying malware. This incident required us to temporarily suspend operations at certain of our facilities and had a material impact in the first quarter of 2023 on our ability to process orders, ship products and provide service to our Vacuum Solutions Division (“VSD”) and Photonics Solutions Division (“PSD”) customers. As a result of our inability to fulfill orders, we estimated the ransomware event negatively impacted our revenue in the first quarter of 2023 by approximately \$160 million. We recovered approximately \$120 million of that amount in the second quarter of 2023 and approximately \$30 million of that amount in the third quarter of 2023, as we shipped orders that were delayed during the first quarter. Please see “—Markets—Semiconductor Market,” “—Markets—Electronics and Packaging Market” and “—Markets—Specialty Industrial Market” for a discussion of the estimated impact of the ransomware event on our revenue by end market. As we have already shipped most of the orders that were delayed as a result of the ransomware event, we do not expect the ransomware event to have a material impact on our revenue in the fourth quarter of 2023. The incident did not impact the operations of our Materials Solutions Division (“MSD”).

We engaged security specialists to assist in the review, assessment and remediation of our IT controls and strengthened access requirements and unauthorized access detection. We are also implementing procedures to facilitate more timely restoration of our financial reporting systems.

As a result of the ransomware event, we incurred approximately \$2 million and \$14 million of net costs for the three and nine months ended September 30, 2023, respectively. These costs were primarily comprised of various third-party consulting services, including forensic experts, restoration experts, legal counsel, and other IT and accounting professional expenses, enhancements to our cybersecurity measures, costs to restore our systems and access our data, and employee-related expenses, including with respect to increased overtime. We expect to continue to incur these and other costs related to this incident in the future. As a result of the incident, we have been and may be subject to subsequent investigations, claims or actions, in addition to other costs, fines, penalties, or other obligations related to impacted data, whether or not such data is misused. In addition, we are currently subject to a class action lawsuit arising from this ransomware event. We are unable to predict at this time the potential timing and outcome of these claims and whether we may be subject to further private litigation or inquiries and proceedings by various government agencies, law enforcement and other governmental authorities. For additional information on the risks we face related to this incident and other cybersecurity incidents, refer to “Risk Factors—Risks Related to Cybersecurity, Data Privacy and Intellectual Property Protection” and “Risk Factors—Legal, Tax, Regulatory and Compliance Risks” in Part I, Item 1A of our Annual Report.

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, 2022.

For further information about our critical accounting policies, please see the discussion of critical accounting policies in our Annual Report in the section captioned “Management’s Discussion and Analysis of Financial Condition and Results of Operations — Critical Accounting — Policies and Estimates.”

Segments

VSD delivers foundational technology solutions to leading edge semiconductor manufacturing, electronics and packaging and specialty industrial applications. VSD products are derived from our core competencies in pressure measurement and control, flow measurement and control, gas and vapor delivery, gas composition analysis, electronic control technology, reactive gas generation and delivery, power generation and delivery, and vacuum technology.

PSD provides a full range of solutions including lasers, beam measurement and profiling, precision motion control, vibration isolation systems, photonics instruments, temperature sensing, opto-mechanical components, optical elements, laser-based systems for flexible printed circuit board (“PCB”) processing, and laser-based systems for high density interconnect PCB and package substrate manufacturing.

MSD develops leading process and manufacturing technologies for advanced surface modification, electroless and electrolytic plating, and surface finishing. Atotech is a brand within MSD. Applying a comprehensive systems-and-solutions approach,

MSD’s portfolio includes chemistry, equipment, software, and services for innovative and high-technology applications in a wide variety of end markets.

Markets

Net Revenues by End Market

<i>(dollars in millions)</i>	Three Months Ended				Nine Months Ended			
	September 30, 2023	% Total	June 30, 2023	% Total	September 30, 2023	% Total	September 30, 2022	% Total
Semiconductor	\$ 367	39 %	\$ 441	44 %	\$ 1,117	41 %	\$ 1,538	63 %
Electronics and Packaging	243	26 %	225	22 %	691	25 %	275	11 %
Specialty Industrial	322	35 %	337	34 %	922	34 %	648	26 %
Total net revenues	\$ 932	100 %	\$ 1,003	100 %	\$ 2,730	100 %	\$ 2,461	100 %

Semiconductor Market

MKS is a critical solutions provider for semiconductor manufacturing. Our products are used in major semiconductor processing steps, such as depositing thin films of material onto silicon wafer substrates, etching, cleaning, lithography, metrology, and inspection. The semiconductor industry continually faces new challenges, as products become smaller, more powerful and highly mobile. Ultra-thin layers, smaller critical dimensions, new materials, 3D structures, and the ongoing need for higher yield and productivity drive the need for tighter process measurement and control, all of which MKS supports. We believe we are the broadest critical subsystem provider in the wafer fabrication equipment ecosystem and address over 85% of the market. We have characterized our broad and unique offering as Surround the WaferSM to reflect the technology enablement we provide across almost every major process in semiconductor manufacturing today.

A significant portion of our sales is derived from products sold to semiconductor capital equipment manufacturers and semiconductor device manufacturers. While the semiconductor device manufacturing market is global, major semiconductor manufacturers are concentrated in China, Japan, South Korea, Taiwan and the United States. The semiconductor 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 industry. Currently, we are experiencing softened demand in our semiconductor market consistent with a decline in industry-wide wafer fabrication equipment spending.

For the three months ended September 30, 2023, net revenues in our semiconductor market decreased by \$74 million or 17%, compared to the prior quarter. We estimate that orders delayed by the ransomware event positively impacted our semiconductor revenue by approximately \$20 million for the three months ended September 30, 2023 compared to approximately \$90 million for the three months ended June 30, 2023, accounting for nearly all of the decrease in net revenues for the current quarter. We estimate that we have recovered all of the revenue from orders delayed by the ransomware event from the three months ended March 31, 2023, amounting to \$110 million.

For the nine months ended September 30, 2023, net revenues in our semiconductor market decreased \$421 million, or 27%, compared to the same period in the prior year primarily due to softened demand for semiconductor capital equipment, partially the result of negative macroeconomic conditions.

In October 2022, the U.S. Department of Commerce’s Bureau of Industry and Security (“BIS”) published regulations that introduce new and novel restrictions related to end-uses in semiconductor, semiconductor manufacturing, supercomputer, and advanced computing, along with certain equipment used to develop and produce them (the “New BIS Rules”). The New BIS Rules restrict our direct and indirect sales to China and primarily impact our semiconductor market. As a result of the New BIS Rules, we initially expected an overall annualized reduction of net revenues in the range of \$250 million to \$350 million. We currently expect an annualized reduction of net revenues on the lower end of that range. While we continue to adjust our policies and practices to ensure compliance with these regulations, and we will seek to mitigate their impact, there can be no assurances that the New BIS Rules will not have an effect on our business that exceeds our expectations.

Electronics and Packaging Market

MKS is a foundational solutions provider for the electronics and packaging market. Our portfolio includes photonics components, laser drilling systems, electronics chemistries and plating equipment that are critical for the manufacturing of PCBs and package substrates, as well as in wafer level packaging (“WLP”) applications. Similar to the semiconductor industry, the PCB, package substrate and WLP industries demand smaller features, greater density, and better performance. We characterize our complementary offering of laser systems and chemistry solutions as Optimize the Interconnect, to reflect the unique technology enablement we provide at the Interconnect level within PCBs, package substrates and WLPs. This end market also includes our vacuum and photonics solutions for display manufacturing applications.

For the three months ended September 30, 2023, net revenues in our electronics and packaging market increased by \$18 million, or 8%, compared to the prior quarter. Net revenues grew sequentially due to higher chemistry sales as a result of normal seasonality associated with the consumer electronics market, as well as slightly higher PCB and package substrate production ahead of the Golden Week holidays in Asia in the beginning of the fourth quarter, all of which we report in MSD. Net revenues of laser drilling solutions, which we report in PSD, also increased.

For the nine months ended September 30, 2023, net revenues in our electronics and packaging market increased by \$416 million, or 151%, compared to the same period in the prior year. This increase was mainly driven by the Atotech Acquisition, which we completed on August 17, 2022. We estimate the impact of the ransomware event on our electronics and packaging market was nominal.

Specialty Industrial Market

MKS' strategy in the specialty industrial market is to leverage our domain expertise and proprietary technologies across a broad array of applications in industrial technologies, life and health sciences, and research and defense markets.

Industrial Technologies

Industrial technologies encompass a wide range of diverse applications, including chemistries for functional coatings, surface finishing and wear resistance in the automobile industry, vacuum solutions for synthetic diamond manufacturing and photonics for solar manufacturing. Other applications include, but are not limited to, vacuum and photonics solutions for light emitting diode and laser diode manufacturing.

Life and Health Sciences

Our products for life and health sciences are used in a diverse array of applications, including bioimaging, medical instrument sterilization, medical device manufacturing, analytical, diagnostic and surgical instrumentation, consumable medical supply manufacturing and pharmaceutical production.

Research and Defense

Our products for research and defense are sold to government, university and industrial laboratories for applications involving research and development in materials science, physical chemistry, photonics, optics and electronics materials. Our products are also sold for monitoring and defense applications, including surveillance, imaging and infrastructure protection.

For the three months ended September 30, 2023, net revenues in our specialty industrial market decreased by \$15 million, or 4%, compared to the prior quarter. We estimate that orders delayed by the ransomware event positively impacted our specialty industrial market revenue by approximately \$10 million for the three months ended September 30, 2023 compared to approximately \$30 million for the three months ended June 30, 2023, accounting for the decrease in net revenues for the current quarter. We estimate that we have recovered approximately \$40 million of the approximate \$45 million of delayed orders from the three months ended March 31, 2023.

For the nine months ended September 30, 2023, net revenues in our specialty industrial market increased by \$274 million, or 42%, compared to the same period in the prior year. This increase was driven by an increase in net revenues from the Atotech Acquisition, which we completed on August 17, 2022.

International Markets

A significant portion of our net revenues is from sales to customers in international markets. For the nine months ended September 30, 2023 and 2022, international revenues accounted for approximately 66% and 56%, respectively, of our total net revenues. The increase in the percentage of international revenues is attributable to the Atotech Acquisition. A significant portion of our international net revenues was from China, South Korea, Japan and Germany. We expect international net revenues will continue to account for a significant percentage of total net revenues for the foreseeable future.

Long-lived assets located outside of the United States accounted for approximately 54% and 57% of our total long-lived assets as of September 30, 2023 and December 31, 2022, respectively. Long-lived assets include property, plant and equipment, net, right-of-use assets, net and certain other assets and exclude goodwill, intangible assets and long-term tax-related accounts.

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 condensed consolidated statements of operations and comprehensive (loss) income data:

	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Net revenues:				
Products	87.8%	88.2%	88.5%	87.5%
Services	12.2	11.8	11.5	12.5
Total net revenues	100.0	100.0	100.0	100.0
Cost of revenues:				
Cost of product revenues	47.9	46.9	48.6	50.5
Cost of service revenues	6.4	6.3	6.3	6.3
Total cost of revenues (exclusive of amortization shown separately below)	54.3	53.1	54.9	56.8
Gross profit	45.7	46.9	45.1	43.2
Research and development	7.6	7.5	8.0	6.8
Selling, general and administrative	17.9	17.1	18.8	13.0
Acquisition and integration costs	0.3	0.5	0.5	1.7
Restructuring	0.1	1.1	0.5	0.4
Amortization of intangible assets	7.3	7.6	8.2	3.1
Goodwill and intangible asset impairments	—	182.2	66.9	—
Gain on sale of long-lived assets	(0.2)	—	(0.1)	(0.3)
Income (loss) from operations	12.7	(169.1)	(57.8)	18.5
Interest income	(0.4)	(0.4)	(0.4)	(0.1)
Interest expense	10.0	8.8	9.7	3.8
Other expense (income), net	0.8	1.1	0.5	(0.2)
Income (loss) before income taxes	2.4	(178.6)	(67.7)	15.0
(Benefit) provision for income taxes	(1.8)	(2.2)	(2.8)	3.6
Net income (loss)	4.2%	(176.4%)	(64.9%)	11.4%

Net revenues

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Products	\$ 818	\$ 885	\$ 2,416	\$ 2,153
Services	114	118	314	308
Total net revenues	\$ 932	\$ 1,003	\$ 2,730	\$ 2,461

For the three months ended September 30, 2023, net product revenues decreased \$67 million compared to the prior quarter. This decrease was primarily due to the effects of the ransomware event, as we recovered approximately \$17 million in product revenues during the three months ended September 30, 2023 compared to approximately \$105 million during the three months ended June 30, 2023.

For the nine months ended September 30, 2023, net product revenues increased \$263 million compared to the same period in the prior year. This increase was mainly driven by the Atotech Acquisition, with MSD net product revenues increasing by \$710 million for the nine months ended September 30, 2023 compared to the same period in the prior year, partially offset by decreases in net product revenues of \$408 million and \$39 million in VSD and PSD, respectively. VSD and PSD net product revenues were negatively impacted by volume decreases as a result of softening demand in our semiconductor and electronics and packaging markets.

Net 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. For the three months ended September 30, 2023, net service revenues decreased \$4 million compared to the prior quarter and were down slightly in VSD, PSD and MSD.

For the nine months ended September 30, 2023, net service revenues increased \$6 million compared to the same period in the prior year. This increase was mainly driven by the Atotech Acquisition, with MSD net services revenues increasing by \$26 million for the nine months ended September 30, 2023, partially offset by decreases in net service revenues of \$18 million and \$2 million in VSD and PSD, respectively. VSD net service revenues were negatively impacted by volume decreases as a result of softening demand in our semiconductor market.

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

(dollars in millions)	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Net revenues:				
Vacuum Solutions Division	\$ 345	\$ 426	\$ 1,065	\$ 1,491
Photonics Solutions Division	276	279	751	793
Materials Solutions Division	311	298	914	177
Total net revenues	\$ 932	\$ 1,003	\$ 2,730	\$ 2,461

For the three months ended September 30, 2023, net revenues from VSD decreased \$81 million compared to the prior quarter, primarily due to the effects of the ransomware event, as we recovered approximately \$6 million in net revenues during the three months ended September 30, 2023 compared to \$87 million during the three months ended June 30, 2023. For the three months ended September 30, 2023, net revenues from MSD increased \$13 million compared to the prior quarter, primarily due to higher chemistry sales to customers of our electronics and general metal finishing reporting units.

For the nine months ended September 30, 2023, net revenues from VSD decreased \$426 million compared to the same period in the prior year, which was largely reflective of volume decreases in the semiconductor market.

For the nine months ended September 30, 2023, net revenues from PSD decreased \$42 million compared to the same period in the prior year, partially due to decreased industry demand for flexible PCB via drilling equipment as a result of softened demand for electronics, such as personal computers and smartphones, and partially due to decreased demand in the specialty industrial market and volume decreases in the semiconductor market.

For the nine months ended September 30, 2023, revenues from MSD increased \$737 million compared to the prior year, as MSD was established in connection with the closing of the Atotech Acquisition in the third quarter of 2022.

Gross margin

	Three Months Ended			Nine Months Ended		
	September 30, 2023	June 30, 2023	% Points Change	September 30, 2023	September 30, 2022	% Points Change
Gross margin as a percentage of net revenues:						
Products	45.4%	46.9%	(1.5)%	45.1%	42.3%	2.8%
Services	48.0%	46.3%	1.7%	44.9%	49.2%	(4.3)%
Total gross margin	45.7%	46.9%	(1.2)%	45.1%	43.1%	2.0%

Gross margin for our products decreased for the three months ended September 30, 2023, compared to the three months ended June 30, 2023, as a result of lower revenue volumes and higher excess and obsolete inventory charges, mainly related to the discontinuation of a product line. These decreases were partially offset by favorable product mix.

Gross margin for our products increased for the nine months ended September 30, 2023 compared to the same period in the prior year, primarily due to higher revenue volumes related to MSD, which had higher gross margins than VSD and PSD, and favorable product mix, including contributions from MSD. These increases in gross margin were partially offset by lower factory absorption at VSD and higher excess and obsolete inventory charges, mainly related to the discontinuation of a product line.

Gross margin for our services increased for the three months ended September 30, 2023 compared to the prior quarter. The increase in gross margin for our services for the three months ended September 30, 2023 was mainly the result of favorable product mix, partially offset by unfavorable direct labor and overhead absorption.

Gross margin for our services decreased for the nine months ended September 30, 2023 compared to the same period in the prior year. The decrease in gross margin for our services for the nine months ended September 30, 2023 was primarily due to unfavorable product mix and unfavorable overhead absorption.

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

	Three Months Ended			Nine Months Ended		
	September 30, 2023	June 30, 2023	% Points Change	September 30, 2023	September 30, 2022	% Points Change
Gross margin as a percentage of net revenues:						
Vacuum Solutions Division	41.3 %	45.2 %	(3.9)%	41.6 %	43.3 %	(1.7)%
Photonics Solutions Division	41.7 %	46.0 %	(4.3)%	43.1 %	46.9 %	(3.8)%
Materials Solutions Division	54.1 %	50.0 %	4.1 %	50.9 %	25.1 %	25.8 %
Total gross margin	45.7 %	46.9 %	(1.2)%	45.1 %	43.1 %	2.0 %

Gross margin for VSD decreased for the three months ended September 30, 2023, compared to the prior quarter, primarily due to lower revenue volumes and unfavorable product mix. Gross margin for VSD decreased for the nine months ended September 30, 2023, compared to the same period in the prior year, primarily due to lower revenue volumes and unfavorable overhead absorption as a result of softening demand in our semiconductor market, and higher excess and obsolete inventory charges, partially offset by favorable product mix.

Gross margin for PSD decreased for the three months ended September 30, 2023, compared to the prior quarter, primarily due to higher excess and obsolete inventory charges, mainly related to the discontinuation of a product line. Gross margin for PSD decreased for the nine months ended September 30, 2023, compared to the same period in the prior year, primarily due to higher excess and obsolete inventory charges, mainly related to the discontinuation of a product line, and lower revenue volumes.

Gross margin for MSD increased for the three months ended September 30, 2023, compared to the prior quarter, primarily due to favorable product mix and lower overhead costs. Gross margin for MSD increased for the nine months ended September 30, 2023, compared to the same period in the prior year, primarily due to higher revenue volumes and favorable product mix. There were lower net revenues from MSD for the nine months ended September 30, 2022 as MSD was established in connection with the closing of the Atotech Acquisition in the third quarter of 2022.

Research and development

(dollars in millions)	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Research and development	\$ 71	\$ 75	\$ 218	\$ 168

For the three months ended September 30, 2023, research and development expenses decreased by \$4 million, compared to the prior quarter, primarily due to decreases in compensation-related costs. For the nine months ended September 30, 2023, research and development expenses increased by \$50 million, compared to the same period in the prior year, primarily due to the Atotech Acquisition.

Our research and development efforts are primarily focused on developing and improving our instruments, components, chemistry, subsystems, systems 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. Projects typically have a duration of 3 to 36 months but may be extended for development of new products.

We continue to make product advancements to meet our customers' evolving needs. We have developed, and continue to develop, new products to address industry trends, such as the shrinking of integrated circuit critical dimensions and technology inflections, and, in the flat panel display and solar markets, the transition to larger substrate sizes, which require more advanced processing and process control technology, the continuing drive toward more complex and accurate components and devices within the handset and tablet market, the transition to 5G for both devices and infrastructure, the growth in units and via counts in the high density interconnect PCB drilling market, and the transition from internal combustion to electric vehicles. In addition, we have developed, and continue to develop, products that support the migration to new classes of materials, ultra-thin layers, and 3D structures that are used in small geometry manufacturing. In our chemistry and equipment plating businesses, a majority of our research and development investment supports existing customers' product improvement needs and their short-term research and development goals, which enables us to pioneer new high-value solutions while limiting commercial risk. 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, electronics and packaging, and specialty industrial 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 and advanced markets applications. If our products are not chosen to be designed into our customers' products, our net revenues may be reduced during the lifespan of those products.

Selling, general and administrative

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Selling, general and administrative	\$ 167	\$ 172	\$ 514	\$ 319

For the three months ended September 30, 2023, selling, general and administrative expenses decreased \$5 million, compared to the prior quarter, primarily due to a decrease of \$3 million in compensation-related costs and a decrease of \$2 million in travel-related costs.

For the nine months ended September 30, 2023, selling, general and administrative expenses increased \$195 million, compared to the same period in the prior year, mainly driven by \$173 million from the Atotech Acquisition, as well as increases from VSD and PSD of \$22 million. The increases in VSD and PSD were the result of \$14 million in net costs incurred as a result of the ransomware event, an increase of \$5 million in compensation-related costs and an increase of \$5 million in consulting and professional fees, partially offset by a decrease of \$2 million in bad debt expense.

Acquisition and integration costs

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Acquisition and integration costs	\$ 3	\$ 5	\$ 14	\$ 41

Acquisition and integration costs incurred during the three months ended September 30, 2023 and June 30, 2023 and the nine months ended September 30, 2023 and 2022 were primarily related to consulting and professional fees related to the Atotech Acquisition.

Restructuring

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Restructuring	\$ 1	\$ 11	\$ 13	\$ 10

Restructuring charges during the three and nine months ended September 30, 2023 and the three months ended June 30, 2023 were related to severance costs as a result of global cost saving initiatives implemented in each of the first and second quarters of 2023. Restructuring charges during the nine months ended September 30, 2022 were primarily related to severance costs due to a global cost-saving initiative and the closure of two facilities in Europe as well as executive payments related to the Atotech Acquisition.

Amortization of intangible assets

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Amortization of intangible assets	\$ 68	\$ 76	\$ 225	\$ 77

For the three months ended September 30, 2023, amortization of intangible assets decreased by \$8 million, compared to the prior quarter, primarily due to the write-off of completed technology at our equipment solutions business ("ESB") in the second quarter of 2023. For the nine months ended September 30, 2023, amortization of intangible assets increased \$148 million, compared to the same period in the prior year, primarily due to amortization of intangible assets as a result of the Atotech Acquisition.

Goodwill and intangible asset impairments

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Goodwill and intangible asset impairments	\$ —	\$ 1,827	\$ 1,827	\$ —

During the quarter ended June 30, 2023, as a result of softer industry demand, particularly in the personal computer and smartphone markets, we concluded there was a triggering event at our Electronics (“EL”) and General Metal Finishing (“GMF”) reporting units, which together constitute MSD, and our ESB reporting unit of PSD. We concluded there was no triggering event at our other reporting units within VSD and PSD.

For the EL, GMF and ESB reporting units, we performed a quantitative assessment of goodwill using a combination of market approach and the income approach. Fair value estimates are based on complex series of judgments about future events and uncertainties and rely heavily on estimates and assumptions that have been deemed reasonable by our management. There are inherent uncertainties and management judgment required in these determinations.

This quantitative assessment resulted in a non-cash goodwill impairment of \$826 million for the EL reporting unit, \$428 million for the GMF reporting unit and \$372 million for the ESB reporting unit. In addition, we recorded a \$49 million impairment of in-process research and development allocated to the EL reporting unit and a \$152 million impairment related to completed technology allocated to the ESB reporting unit.

We will continue to monitor and evaluate the carrying value of goodwill and intangible assets. If market and economic conditions or business performance deteriorate, the likelihood that we would record an impairment charge would increase, which could materially and adversely affect our financial condition and operating results. There were no impairment charges in the third quarter of 2023.

Gain on sale of long-lived assets

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Gain on sale of long-lived assets	\$ (2)	\$ —	\$ (2)	\$ (7)

In the three and nine months ended September 30, 2023 and the nine months ended September 30, 2022, we recorded gains as a result of receiving cash from the sale of a minority interest investment in a private company.

Interest expense

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Interest expense	\$ 93	\$ 88	\$ 266	\$ 93

For the three months ended September 30, 2023, interest expense increased \$5 million, compared to the prior quarter, primarily due to higher interest rates related to the outstanding borrowings on the New Term Loan Facility we entered into in connection with the Atotech Acquisition. For the nine months ended September 30, 2023, interest expense increased \$173 million, compared to the same period in the prior year, primarily due to borrowings on the New Term Loan Facility we entered into in connection with the Atotech Acquisition.

Other expense (income), net

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
Other expense (income), net	\$ 7	\$ 11	\$ 14	\$ (4)

Other expense (income), net, for the three and nine months ended September 30, 2023, three months ended June 30, 2023 and nine months ended September 30, 2022 consisted primarily of net foreign exchange and fair value gains and losses.

(Benefit) provision for income taxes

<i>(dollars in millions)</i>	Three Months Ended		Nine Months Ended	
	September 30, 2023	June 30, 2023	September 30, 2023	September 30, 2022
(Benefit) provision for income taxes	\$ (17)	\$ (22)	\$ (76)	\$ 88

Our effective tax rate for the three months ended September 30, 2023 and June 30, 2023 was (75.3)% and 1.2%, respectively. Our effective tax rate for the three months ended September 30, 2023 was lower than the U.S. statutory tax rate, primarily due

to the deduction for foreign derived intangible income and various tax credits. Our effective tax rate for the three months ended June 30, 2023 was lower than the U.S. statutory tax rate primarily due to the tax benefit related to impairment of intangible assets discretely recorded during the three-month period.

Our effective tax rate for the nine months ended September 30, 2023 and September 30, 2022 was 4.1% and 24.1%, respectively. Our effective tax rate for the nine months ended September 30, 2023 was lower than the U.S. statutory tax rate primarily due to the tax benefit related to the impairment of intangible assets and various tax credits. Our effective tax rate for the nine months ended September 30, 2022 was higher than the U.S. statutory rate mainly due to additional estimated accrued withholding taxes related to our change in indefinite reinvestment assertion, non-deductibility of certain costs associated with the Atotech Acquisition, and the U.S. global intangible low-taxed income inclusion.

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 the impact of tax legislation, further interpretations and guidance from U.S. federal and state governments on the impact of proposed regulations issued by the Internal Revenue Service, further interpretations and guidance from foreign governments, 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 the Atotech Acquisition will continue to have an unfavorable impact on our effective tax rate as MSD operates primarily in jurisdictions with tax rates higher than the U.S. statutory 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 includes estimates and requires judgment by management. Accordingly, we may 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 at September 30, 2023 and December 31, 2022 totaled \$860 million and \$910 million, respectively. The primary driver in our current and anticipated future cash flows is, and we expect will continue to be, cash generated from operations, consisting primarily of our net (loss) income, excluding non-cash charges and changes in operating assets and liabilities. In periods when our sales are growing, higher sales to customers will result in increased trade receivables, and inventories will generally increase as we build products for future sales. This may result in lower cash generated from operations. Conversely, in periods when our sales are declining, our accounts receivable and inventory balances will generally decrease, resulting in increased cash from operations. We believe that our current cash and investments position and available borrowing capacity, together with the cash anticipated to be generated from our operations will be sufficient to satisfy our estimated working capital, planned capital expenditure requirements, payments of debt, and any future cash dividends declared by our Board of Directors or share repurchases through at least the next 12 months and the foreseeable future.

Net cash provided by operating activities was \$138 million for the nine months ended September 30, 2023, resulting from a net loss of \$1,772 million, which included non-cash charges of \$2,100 million, mainly the result of a \$1,827 million non-cash impairment of goodwill and intangible assets, offset by a net increase in working capital of \$190 million. The net increase in working capital was primarily due to a decrease in accounts payable of \$110 million, a decrease in income taxes payable of \$75 million, a decrease of \$11 million in accrued compensation, and an increase in inventory of \$99 million. This net increase in working capital was partially offset by a decrease in accounts receivable of \$85 million, a decrease in other current and non-current assets of \$12 million and an increase of \$8 million in other current and non-current liabilities.

Net cash used in investing activities was \$50 million for the nine months ended September 30, 2023, consisting primarily of \$53 million in capital expenditures.

Net cash used in financing activities was \$116 million for the nine months ended September 30, 2023, primarily due to \$67 million of payments on our New Term Loan Facility and \$44 million of dividend payments.

Holders of our common stock are entitled to receive dividends when they are declared by our Board of Directors. During each of the first three quarters of 2023 and 2022, our Board of Directors declared a cash dividend of \$0.22 per share. The cash dividends totaled \$44 million and \$37 million for the nine months ended September 30, 2023 and 2022, respectively. 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 New Credit Facilities as defined and described further below, we may be restricted from paying dividends under certain circumstances.

Atotech Acquisition and New Credit Facilities

On August 17, 2022, we completed the Atotech Acquisition. The total net purchase price, including cash consideration, net of cash acquired, value of MKS shares issued, repayment of Atotech debt and settlement of share-based awards totaled \$5.7 billion. We funded the payment of the aggregate cash consideration with a combination of cash on hand and the proceeds from the New Term Loan Facility, as defined below. As a result of the Atotech Acquisition, we issued an aggregate of 10.7 million shares of our common stock to the former Atotech shareholders. Additional information regarding the funding of the Atotech Acquisition, the entry into the New Term Loan Facility and the New Revolving Facility and the replacement of the Prior Term Loan Facility and the Prior ABL Credit Facility, is discussed below.

In connection with the completion of the Atotech Acquisition, we entered into a credit agreement with JPMorgan Chase Bank, N.A., as administrative agent and collateral agent, Barclays Bank PLC, and the lenders from time to time party thereto (the “New Credit Agreement”). The New Credit Agreement provides for (i) a senior secured term loan facility (the “New Term Loan Facility”) comprised of three tranches: a USD 1 billion loan (the “USD Tranche A”), a USD 3.6 billion loan (the “USD Tranche B”) and a EUR 600 million loan (the “Euro Tranche B”), each of which were borrowed in full on the Effective Date, and (ii) a senior secured revolving credit facility of USD 500 million (the “New Revolving Facility”) and, together with the New Term Loan Facility, the “New Credit Facilities”), with the commitments under each of the foregoing facilities subject to increase from time to time subject to certain conditions.

Borrowings under the New Credit Facilities bear interest at a rate per annum equal to, at our option, any of the following, plus, in each case, an applicable margin: (a) with respect to the USD Tranche A, the USD Tranche B and the New Revolving Facility, (x) 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*, or (3) a forward-looking term rate based on the variable secured overnight financing rate (“Term SOFR”) (plus, except as described further below with respect to the USD Tranche B, an applicable credit spread adjustment) for an interest period of one month, plus 1.00%; and (y) a Term SOFR rate (plus, except as described further below with respect to the USD Tranche B, an applicable credit spread adjustment) for the interest period relevant to such borrowing, subject to a rate floor of (I) with respect to the USD Tranche B, 0.50% and (II) with respect to the USD Tranche A and the New Revolving Facility, 0.0%; and (b) with respect to the Euro Tranche B, a Euro Interbank Offered Rate (“EURIBOR”) rate determined by reference to the costs of funds for Euro deposits for the interest period relevant to such borrowing adjusted for certain additional costs, subject to a EURIBOR rate floor of 0.0%. The USD Tranche A was issued with original issue discount of 0.25% of the principal amount thereof. The USD Tranche B and the Euro Tranche B were issued with original issue discount of 2.00% of the principal amount thereof. The applicable margin for borrowings under the USD Tranche A is 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings. As of September 30, 2023, the applicable margin for borrowings under the USD Tranche B was 1.75% with respect to base rate borrowings and 2.75% with respect to Term SOFR borrowings. The applicable margin for borrowings under the Euro Tranche B is 3.00%. The applicable margin for borrowings under the New Revolving Facility is 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings.

In addition to paying interest on outstanding principal under the New Credit Facilities, we are required to pay a commitment fee in respect of the unutilized commitments under the New Revolving Facility. The initial commitment fee is 0.375% per annum. Commencing with the delivery of financial statements with respect to the first quarter ending after the closing of the New Credit Agreement, the commitment fee is subject to downward adjustment based on our first lien net leverage ratio as of the end of the preceding quarter. We must also pay customary letter of credit fees and agency fees.

We incurred \$242 million of deferred financing fees and original issue discount related to the term loans under the New Term Loan Facility, which are included in long-term debt, net in the accompanying condensed 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 the deferred financing fees and original issue discount was accelerated in connection with the debt prepayment and extinguishment of the Prior Term Loan Facility (as defined below).

Under the New Credit Agreement, we are required to prepay outstanding term loans, subject to certain exceptions, with portions of our annual excess cash flow as well as with the net cash proceeds of certain of our asset sales, certain casualty and condemnation events and the incurrences or issuances of certain debt.

If at any time the aggregate amount of outstanding loans, unreimbursed letter of credit drawings and undrawn letters of credit under the New Revolving Facility exceeds the aggregate commitments under the New Revolving Facility, we are required to repay outstanding loans and/or cash collateralize letters of credit, with no reduction of the commitment amount.

We may voluntarily prepay outstanding loans under the New Credit Facilities from time to time, subject to certain conditions, without premium or penalty other than customary “breakage” costs with respect to Term SOFR or EURIBOR loans; provided, however, that subject to certain exceptions, if on or prior to the date that is twelve months after the closing date of the New Term Loan Facility, we prepaid any loans under the USD Tranche B or the Euro Tranche B in connection with a repricing transaction, we would have been required to pay a prepayment premium of 1.00% of the aggregate principal amount of the

loans so prepaid. Additionally, we may voluntarily reduce the unutilized portion of the commitment amount under the New Revolving Facility.

We are required to make scheduled quarterly payments each equal to 1.25% of the original principal amount of the USD Tranche A (increasing to 1.875% in years 3 and 4 and 2.50% in year 5) and 0.25% of the original principal amount of the USD Tranche B and the Euro Tranche B, beginning with the fiscal quarter ending December 31, 2022, with the balance due thereunder on the fifth anniversary of the closing date in the case of the USD Tranche A and the seventh anniversary of the closing date in the case of the USD Tranche B and the Euro Tranche B.

There is no scheduled amortization under the New Revolving Facility. Any principal amount outstanding under the New Revolving Facility is due and payable in full on the fifth anniversary of the closing date.

We incurred \$7 million of costs in connection with the New Revolving Facility, which were capitalized and included in other assets in the accompanying condensed consolidated balance sheet and are being amortized to interest expense over the estimated life of four years. As a result of our Prior ABL Credit Facility (as defined below) being terminated concurrently with our entry into the New Revolving Facility, we wrote off an immaterial amount of previously capitalized debt issuance costs.

All obligations under the New Credit Facilities are guaranteed by certain of our wholly-owned domestic subsidiaries and are required to be guaranteed by certain of our future wholly-owned domestic subsidiaries and are secured by substantially all of our assets and the assets of such subsidiaries, subject to certain exceptions and exclusions.

Under the New Credit Agreement, we have the ability to incur additional incremental debt facilities in an amount up to (x) the greater of (1) \$1.01 billion and (2) 75% of consolidated EBITDA, plus (y) an amount equal to the sum of all voluntary prepayments of term loans under the New Term Loan Facility, plus (z) an additional unlimited amount subject to pro forma compliance with certain leverage ratio tests (based on the security and priority of such incremental debt).

Under the USD Tranche A and the New Revolving Facility, so long as any USD Tranche A loans (or commitments in respect thereof) are outstanding as of the end of any fiscal quarter, we may not allow our total net leverage ratio as of the end of such fiscal quarter to be greater than 5.50 to 1.00, with an annual step-down of 0.25:1.00 and subject to a step-up of 0.50:1.00 for the four full fiscal quarter period following any material acquisition, not to exceed 5.50 to 1.00.

In addition, in the event there are no loans outstanding under the USD Tranche A, as of the end of any fiscal quarter of ours when the aggregate amount of loans outstanding under the New Revolving Facility (net of (a) all letters of credit (whether cash collateralized or not) and (b) unrestricted cash of ours and our restricted subsidiaries) exceeds 35% of the aggregate amount of all commitments under the New Revolving Facility in; effect as of such date, we may not allow our first lien net leverage ratio as of the end of each such fiscal quarter to be greater than 6.00 to 1.00.

The USD Tranche B and the Euro Tranche B are not subject to financial maintenance covenants.

The New Credit Agreement contains a number of negative covenants that, among other things and subject to certain exceptions, restrict our ability and each of our subsidiaries to incur additional indebtedness; pay dividends on our capital stock or redeem, repurchase or retire our capital stock or our subordinated indebtedness; make investments, loans and acquisitions; create restrictions on the payment of dividends or other amounts to us from our restricted subsidiaries or restrictions on the ability of our restricted subsidiaries to incur liens; engage in transactions with our affiliates; sell assets, including capital stock of our subsidiaries; materially alter the business it conducts; consolidate or merge; incur liens; and engage in sale-leaseback transactions.

The New 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 New Credit Facilities will be entitled to take various actions, including the acceleration of amounts due under the New Credit Facilities and all actions permitted to be taken by a secured creditor. As of September 30, 2023, we were in compliance with all covenants under the New Credit Agreement.

The proceeds of the New Term Loan Facility were used on the Effective Date, among other things, to fund a portion of the consideration payable in connection with the Atotech Acquisition and to refinance the Prior Term Loan Facility, the Prior ABL Credit Facility and certain indebtedness of Atotech. We also paid certain customary fees and expenses of JPMorgan Chase Bank, N.A., Barclays Bank PLC, BofA Securities Inc., Citigroup Global Markets Inc., HSBC Securities (USA) Inc. and Mizuho Bank, Ltd. in their respective capacities as lead arrangers and bookrunners in connection with the New Credit Facilities.

On the Effective Date, in connection with the entry into the New Credit Agreement described above, we terminated and prepaid the prior term loan credit facility under that certain Term Loan Credit Agreement, dated as of April 29, 2016, by and among us, Barclays Bank PLC and the other financial institutions from time to time party thereto (as amended, the "Prior Term Loan Credit Agreement" and the term loan credit facility thereunder, the "Prior Term Loan Facility") and terminated the prior revolving credit facility under that certain ABL Credit Agreement, dated as of February 1, 2019, by and among the us, Barclays

Bank PLC and the other financial institutions from time to time party thereto (as amended, the “Prior ABL Credit Agreement” and the revolving credit facility thereunder, the “Prior ABL Credit Facility”).

As of September 30, 2023, the outstanding principal amount of the New Term Loan Facility was \$5.0 billion and the weighted average interest rate was 7.9%. As of September 30, 2023, there were no borrowings under the New Revolving Facility.

On October 3, 2023 (the “Repricing Effective Date”), we entered into the First Amendment to our Credit Agreement (the “Repricing Amendment”), which amended our New Credit Agreement. The Repricing Amendment (i) decreased the applicable margin for our USD Tranche B from 2.75% to 2.50% with respect to Term SOFR borrowings and from 1.75% to 1.50% with respect to base rate borrowings, (ii) removed the credit spread adjustments applicable to Term SOFR borrowings of the USD Tranche B and (iii) extended the period during which a 1.00% prepayment premium may be required if we prepay any loans under the USD Tranche B in connection with a repricing transaction until the date that is six months following the Repricing Effective Date. The repriced loans were issued with original issue discount of 0.25%. In connection with the execution of the Repricing Amendment, we paid customary fees and expenses to JPMorgan Chase Bank, N.A.

On October 31, 2023, we made a voluntary prepayment of \$100 million aggregate principal amount on our USD Tranche A.

Lines of Credit and Borrowing Arrangements

Certain of our Japanese subsidiaries have lines of credit and a financing facility with various financial institutions, many of which generally expire and are renewed at three-month intervals with the remaining having no expiration date. These lines of credit and financing facility provided for aggregate borrowings as of September 30, 2023 of up to an equivalent of \$13 million. There were no borrowings under these arrangements at September 30, 2023 and December 31, 2022.

Derivatives

We enter into derivative instruments for risk management purposes only, including derivatives designated as hedging instruments and those utilized as economic hedges. We operate internationally, and in the normal course of business, are exposed to fluctuations in interest rates and foreign exchange rates. These fluctuations can increase the costs of financing, investing and operating the business. We have used derivative instruments, such as foreign exchange forward contracts and options, to manage certain foreign currency exposure, and interest rate swaps and caps to manage interest rate exposure.

By nature, all financial instruments involve market and credit risks. We enter into derivative instruments with major investment grade financial institutions and no collateral is required. We have policies to monitor the credit risk of these counterparties. While there can be no assurance, we do not anticipate any material non-performance by any of these counterparties.

Interest Rate Agreements

We have various interest rate swap agreements as described further in Note 4 to the Notes to the Condensed Consolidated Financial Statements that exchange the variable Term SOFR rate to a fixed rate in order to manage the exposure to interest rate fluctuations associated with the variable Term SOFR rate paid on the outstanding balance of the New Term Loan Facility. We acquired USD London Interbank Offered Rate (“LIBOR”) interest rate cap agreements as a result of the Atotech Acquisition and we utilized these agreements to offset the Term SOFR rate on our New Term Loan Facility. Effective June 30, 2023, our USD LIBOR based interest rate caps were converted to Term SOFR. We also had two USD LIBOR based swaps that were converted to Term SOFR, effective June 30, 2023. The conversions from USD LIBOR to Term SOFR did not have a material impact on our results of operations.

Contractual Obligations

There have been no changes outside the ordinary course of business to our contractual obligations as disclosed in our Annual Report.

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. As of September 30, 2023, there were no material changes in our exposure to market risk from December 31, 2022.

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 September 30, 2023. 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 that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that, as of September 30, 2023, the Company’s disclosure controls and procedures were not effective because of the material weakness in our internal control over financial reporting as described below and in “Controls and Procedures” contained in our Annual Report.

Based on its assessment, our management concluded that a material weakness existed as of December 31, 2022 which has not been remediated as of September 30, 2023. We did not maintain sufficient information technology (“IT”) controls to prevent or detect, on a timely basis, unauthorized access to the Company’s financial reporting systems. Specifically, we did not design and maintain effective controls with regard to our financial reporting systems related to access authentication, intrusion detection and response capability, and backup and restoration such that recovery from a cybersecurity incident could be performed in a more timely manner. This material weakness did not result in a misstatement to the annual or interim consolidated financial statements previously filed or included in this Quarterly Report on Form 10-Q. However, this material weakness could result in a material misstatement to the annual or interim consolidated financial statements that would not be prevented or detected.

Remediation Plan for Material Weakness in Internal Control over Financial Reporting

We have been actively addressing the identified material weakness. Several remediation measures have been completed and actions with regard to our remediation plan are ongoing and include the following:

- engaging security specialists to assist in the review, assessment and remediation of our IT controls;
- strengthening access requirements and unauthorized access detection to our financial reporting systems; and
- implementing procedures to facilitate more timely restoration of our financial reporting systems.

Though the remediation plan is subject to continual review, we expect the remediation plan described above will address the identified material weakness. The remediation plan is subject to oversight by the Audit Committee of our Board of Directors and the identified material weakness will not be considered remediated until the remediation plan has been fully implemented, the applicable controls operate for a sufficient period of time, and we have concluded that newly implemented controls are operating effectively.

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 September 30, 2023 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

PART II. OTHER INFORMATION

ITEM 1A. RISK FACTORS.

Information regarding risk factors affecting our business is discussed in the section entitled “Risk Factors” in our Annual Report on Form 10-K for the year ended December 31, 2022 filed with the U.S. Securities and Exchange Commission on March 14, 2023.

ITEM 5. OTHER INFORMATION.

The following table describes, for the quarterly period covered by this report, each trading arrangement for the sale or purchase of Company securities adopted or terminated by our directors and officers (as defined in Rule 16a-1(f) under the Exchange Act) that is either (1) a contract, instruction or written plan intended to satisfy the affirmative defense conditions of Rule 10b5-1(c) (a “Rule 10b5-1 trading arrangement”) or (2) a “non-Rule 10b5-1 trading arrangement” (as defined in Item 408(c) of Regulation S-K):

Name (Title)	Action Taken (Date of Action)	Type of Trading Arrangement	Nature of Trading Arrangement	Duration of Trading Arrangement	Aggregate Number of Securities
Jacqueline F. Moloney (Director)	Adoption (August 30, 2023)	Rule 10b5-1 trading arrangement	Sale	Until October 4, 2024, or such earlier date upon which all transactions are completed or expire without execution	Up to 1,000 shares

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 (5)	First Amendment to Credit Agreement, dated as of October 3, 2023, by and among the Registrant, as parent borrower, the other loan parties party thereto, JPMorgan Chase Bank, N.A., as administrative agent, and each lender party thereto.
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	Inline 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	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted as inline XBRL with applicable taxonomy extension information contained in Exhibits 101)

+ Previously filed

- (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.
- (5) 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 October 3, 2023.

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: November 8, 2023

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

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, John T.C. Lee, 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.

Dated: November 8, 2023

/s/ John T.C. Lee

John T.C. Lee
President and Chief Executive Officer
(Principal Executive Officer)

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

I, Seth H. Bagshaw, certify that:

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

Dated: November 8, 2023

/s/ Seth H. Bagshaw

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

CERTIFICATION OF CHIEF EXECUTIVE OFFICER AND CHIEF FINANCIAL OFFICER

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

AS ADOPTED PURSUANT TO

SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Quarterly Report on Form 10-Q of MKS Instruments, Inc. (the "Company") for the period ended September 30, 2023 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, John T.C. Lee, President and Chief Executive Officer of the Company, and Seth H. Bagshaw, Executive 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: November 8, 2023

/s/ John T.C. Lee

John T.C. Lee
President and Chief Executive Officer
(Principal Executive Officer)

Dated: November 8, 2023

/s/ Seth H. Bagshaw

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