UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-Q

(MARK ONE)

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

For the quarterly period ended June 30, 2024

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	**04-2277512**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
2 Tech Drive, Suite 201, Andover, Massachusetts	**01810**
(Address of principal executive offices)	**(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	☒	Accelerated filer	☐
Non-accelerated filer	☐	Smaller reporting company	☐
		Emerging growth company	☐

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

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

As of July 29, 2024, the registrant had 67,287,594 shares of common stock outstanding.

MKS INSTRUMENTS, INC.
FORM 10-Q
INDEX

PART I. FINANCIAL INFORMATION

ITEM 1.	FINANCIAL STATEMENTS (Unaudited)	3
	Condensed Consolidated Balance Sheets – June 30, 2024 and December 31, 2023	3
	Condensed Consolidated Statements of Operations and Comprehensive Income (Loss) – Three and Six Months Ended June 30, 2024 and 2023	4
	Condensed Consolidated Statements of Stockholders' Equity – Three and Six Months Ended June 30, 2024 and 2023	5
	Condensed Consolidated Statements of Cash Flows – Six Months Ended June 30, 2024 and 2023	6
	Notes to Unaudited Condensed Consolidated Financial Statements	7
ITEM 2.	MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS	29
ITEM 3.	QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK	42
ITEM 4.	CONTROLS AND PROCEDURES	42

PART II. OTHER INFORMATION

ITEM 1A.	RISK FACTORS	43
ITEM 5.	OTHER INFORMATION	44
ITEM 6.	EXHIBITS	45

SIGNATURES 46

PART I. FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS.

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

ASSETS	June 30, 2024	December 31, 2023
Current assets:		
Cash and cash equivalents	$ 850	$ 875
Short-term investments	1	—
Accounts receivable, net of allowance for doubtful accounts of $7 and $6 at June 30, 2024 and December 31, 2023, respectively	597	603
Inventories	938	991
Other current assets	262	227
Total current assets	2,648	2,696
Property, plant and equipment, net	759	784
Right-of-use assets, net	229	225
Goodwill	2,495	2,554
Intangible assets, net	2,418	2,619
Other assets	314	240
Total assets	$ 8,863	$ 9,118
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Short-term debt	$ 50	$ 93
Accounts payable	291	327
Other current liabilities	399	428
Total current liabilities	740	848
Long-term debt, net	4,832	4,696
Non-current deferred taxes	588	640
Non-current accrued compensation	144	151
Non-current lease liabilities	202	205
Other non-current liabilities	124	106
Total liabilities	6,630	6,646
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; 67.3 and 66.9 shares issued and outstanding at June 30, 2024 and December 31, 2023, respectively	—	—
Additional paid-in capital	2,042	2,195
Retained earnings	381	373
Accumulated other comprehensive (loss) income	(190)	(96)
Total stockholders' equity	2,233	2,472
Total liabilities and stockholders' equity	$ 8,863	$ 9,118

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

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

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Net revenues:				
Products	$ 770	$ 885	$ 1,524	$ 1,597
Services	117	118	231	200
Total net revenues	887	1,003	1,755	1,797
Cost of revenues:				
Products	412	470	810	878
Services	56	63	111	113
Total cost of revenues (exclusive of amortization shown separately below)	468	533	921	991
Gross profit	419	470	834	806
Research and development	66	75	136	147
Selling, general and administrative	161	172	331	348
Acquisition and integration costs	2	5	3	11
Restructuring and other	2	11	5	12
Fees and expenses related to amendments to the Term Loan Facility	—	—	3	—
Amortization of intangible assets	61	76	123	157
Goodwill and intangible asset impairments	—	1,827	—	1,827
Income (loss) from operations	127	(1,696)	233	(1,696)
Interest income	(5)	(4)	(11)	(7)
Interest expense	79	88	166	173
Loss on extinguishment of debt	38	—	47	—
Other (income) expense, net	(7)	11	(10)	9
Income (loss) before income taxes	22	(1,791)	41	(1,871)
(Benefit) provision for income taxes	(1)	(22)	4	(59)
Net income (loss)	$ 23	$ (1,769)	$ 37	$ (1,812)
Other comprehensive income (loss), net of tax:				
Changes in value of financial instruments designated as cash flow hedges	$ 2	$ 44	$ 33	$ 29
Foreign currency translation adjustments	(52)	(218)	(166)	(173)
Change in net investment hedge	8	2	28	(13)
Unrealized (loss) gain on investments	—	(11)	8	(11)
Net unrecognized pension gain (loss)	2	(3)	3	(5)
Total comprehensive (loss) income	$ (17)	$ (1,955)	$ (57)	$ (1,985)
Net income (loss) per share:				
Basic	$ 0.34	$ (26.47)	$ 0.56	$ (27.14)
Diluted	$ 0.33	$ (26.47)	$ 0.55	$ (27.14)
Weighted average common shares outstanding:				
Basic	67.3	66.8	67.2	66.8
Diluted	67.5	66.8	67.5	66.8

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 (Loss) Income	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2023	66.9	$ 0.1	$ 2,195	$ 373	$ (96)	$ 2,472
Net issuance under stock-based plans	0.2		(9)			(9)
Stock-based compensation			15			15
Cash dividend ($0.22 per common share)				(15)		(15)
Comprehensive (loss) income (net of tax):						
Net income (loss)				15		15
Other comprehensive (loss) income					(54)	(54)
Balance at March 31, 2024	67.1	0.1	2,201	373	(150)	2,424
Net issuance under stock-based plans	0.2		(2)			(2)
Stock-based compensation			11			11
Purchase of capped calls related to Convertible Notes			(167)			(167)
Cash dividend ($0.22 per common share)				(15)		(15)
Comprehensive (loss) income (net of tax):						
Net income (loss)				23		23
Other comprehensive (loss) income					(40)	(40)
Balance at June 30, 2024	67.3	0.1	2,042	381	(190)	2,233

	Common Stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive (Loss) Income	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) income				(42)		(42)
Other comprehensive income (loss)					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) income (net of tax):						
Net (loss) income				(1,769)		(1,769)
Other comprehensive (loss) income					(186)	(186)
Balance at June 30, 2023	66.9	—	2,168	431	(104)	2,495

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)

	Six Months Ended June 30,	
	2024	2023
Cash flows from operating activities:		
Net income (loss)	$ 37	$ (1,812)
Adjustments to reconcile net income (loss) to net cash provided by (used in) operating activities:		
Depreciation and amortization	175	208
Goodwill and intangible asset impairments	—	1,827
Unrealized loss (gain) on derivatives not designated as hedging instruments	—	20
Amortization of debt issuance costs and original issue discount	16	15
Loss on extinguishment of debt	47	—
Stock-based compensation	26	31
Provision for excess and obsolete inventory	25	30
Deferred income taxes	(95)	(120)
Other	4	1
Changes in operating assets and liabilities	—	
Accounts receivable	(11)	80
Inventories	13	(94)
Other current and non-current assets	23	(11)
Accounts payable	(30)	(108)
Accrued compensation	(48)	(35)
Income taxes payable	33	(56)
Other current and non-current liabilities	(26)	2
Net cash provided by (used in) operating activities	189	(22)
Cash flows from investing activities:		
Proceeds from sale of long-lived assets	1	1
Purchases of property, plant and equipment	(45)	(35)
Net cash used in investing activities	(44)	(34)
Cash flows from financing activities:		
Proceeds from borrowings	2,161	1
Payments of borrowings	(2,075)	(45)
Purchase of capped calls related to Convertible Notes	(167)	—
Payments of deferred financing fees	(33)	—
Dividend payments	(30)	(29)
Net (payments) proceeds related to employee stock awards	(11)	(5)
Other financing activities	(4)	—
Net cash used in financing activities	(159)	(78)
Effect of exchange rate changes on cash and cash equivalents	(11)	(18)
Decrease in cash and cash equivalents	(25)	(152)
Cash and cash equivalents at beginning of period	875	909
Cash and cash equivalents at end of period	$ 850	$ 757

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 June 30, 2024, and for the three and six months ended June 30, 2024, 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, 2023 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, 2023 filed with the U.S. Securities and Exchange Commission on February 27, 2024.

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.

The Company has three reportable segments: the Vacuum Solutions Division (“VSD”), the Photonics Solutions Division (“PSD”) and the Materials Solutions Division (“MSD”) as described in Note 15. During the quarter ended March 31, 2024, the Company moved its Optical Sensing Products (“OSP”) product line from the PSD segment to the VSD segment. The purpose of this realignment was to group the OSP products with related semiconductor products within the VSD segment. Prior periods have been recast to reflect this change. The Company reserves the right to make reclassifications between segments.

(2) Recent Accounting Pronouncements

Segment Reporting (Topic 280): Improvements to Reportable Segment Disclosures

In November 2023, the Financial Accounting Standards Board (“FASB”) issued Accounting Standard Update (“ASU”) No. 2023-07, Segment Reporting (Topic 280): Improvements to Reportable Segment Disclosures, which requires a public entity to disclose significant segment expenses and other segment items on an annual and interim basis and provide in interim periods all disclosures about a reportable segment’s profit or loss and assets that are currently required annually. Additionally, it requires a public entity to disclose the title and position of the Chief Operating Decision Maker (“CODM”). The ASU does not change how a public entity identifies its operating segments, aggregates them, or applies the quantitative thresholds to determine its reportable segments. The new standard is effective for fiscal years beginning after December 15, 2023, and interim periods within fiscal years beginning after December 15, 2024, with early adoption permitted. A public entity should apply the amendments in this ASU retrospectively to all prior periods presented in the financial statements. The Company is currently evaluating the impact of this ASU on its disclosures within the consolidated financial statements.

Income Taxes (Topic 740): Improvements to Income Tax Disclosures

In December 2023, the FASB issued ASU No. 2023-09, Income Taxes (Topic 740): Improvements to Income Tax Disclosures, which focuses on the rate reconciliation and income taxes paid. ASU No. 2023-09 requires a public business entity (“PBE”) to disclose, on an annual basis, a tabular rate reconciliation using both percentages and currency amounts, broken out into specified categories with certain reconciling items further broken out by nature and jurisdiction to the extent those items exceed a specified threshold. In addition, all entities are required to disclose income taxes paid, net of refunds received disaggregated by federal, state/local, and foreign and by jurisdiction if the amount is at least 5% of total income tax

payments, net of refunds received. For PBEs, the new standard is effective for annual periods beginning after December 15, 2024, with early adoption permitted. An entity may apply the amendments in this ASU prospectively by providing the revised disclosures for the period ending December 31, 2025 and continuing to provide the pre-ASU disclosures for the prior periods, or may apply the amendments retrospectively by providing the revised disclosures for all period presented. The Company is currently evaluating the impact of this ASU on its consolidated financial statements and related disclosures.

(3) Revenue from Contracts with Customers

Contract assets as of June 30, 2024 and December 31, 2023 were $22 and $26, respectively. A roll-forward of the Company's deferred revenue and customer advances is as follows:

	Six Months Ended	
	June 30, 2024	June 30, 2023
Beginning balance, January 1[1]	$ 79	$ 96
Additions to deferred revenue and customer advances	60	84
Amount of deferred revenue and customer advances recognized in income	(72)	(93)
Ending balance, June 30[2]	$ 67	$ 87

(1) Beginning balance as of January 1, 2024 included $77 of current deferred revenue and customer advances and $2 of non-current deferred revenue. Beginning balance as of January 1, 2023 included $94 of current deferred revenue and customer advances and $2 of non-current deferred revenue.

(2) Ending balance as of June 30, 2024 included $65 of current deferred revenue and customer advances and $2 of non-current deferred revenue. Ending balance as of June 30, 2023 included $85 of current deferred revenue and customer advances and $2 of non-current deferred revenue.

Revenue from certain custom products, including MSD 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 product and service revenue from contracts with customers in MKS' three reportable segments.

	Three Months Ended June 30, 2024			
	VSD	PSD	MSD	Total
Net revenues:				
Products	$ 276	$ 210	$ 284	$ 770
Services	59	44	14	117
Total net revenues	$ 335	$ 254	$ 298	$ 887

	Three Months Ended June 30, 2023			
	VSD	PSD	MSD	Total
Net revenues:				
Products	$ 373	$ 228	$ 284	$ 885
Services	61	43	14	118
Total net revenues	$ 434	$ 271	$ 298	$ 1,003

	Six Months Ended June 30, 2024			
	VSD	PSD	MSD	Total
Net revenues:				
Products	$ 550	$ 424	$ 550	$ 1,524
Services	118	83	30	231
Total net revenues	$ 668	$ 507	$ 580	$ 1,755

	Six Months Ended June 30, 2023			
	VSD	PSD	MSD	Total
Net revenues:				
Products	$ 635	$ 387	$ 575	$ 1,597
Services	103	70	27	200
Total net revenues	$ 738	$ 457	$ 602	$ 1,797

The following table summarizes revenue from contracts with customers in the Company's three end markets: Semiconductor, Electronics and Packaging, and Specialty Industrial.

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Semiconductor	$ 369	$ 441	$ 720	$ 750
Electronics and Packaging	229	225	437	447
Specialty Industrial	289	337	598	600
	$ 887	$ 1,003	$ 1,755	$ 1,797

(4) 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.

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 June 30, 2024 and are summarized as follows:

		Fair Value Measurements at Reporting Date Using		
Description	June 30, 2024	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	$ 324	$ 324	$ —	$ —
Time deposits	21	—	21	—
Equity securities	2	2	—	—
Available-for-sale securities:				
Time deposits and certificates of deposit	1	—	1	—
Group insurance contracts	6	—	6	—
Derivatives				
Foreign exchange forward contracts	10	—	10	—
Interest rate hedges - current	15	—	15	—
Interest rate hedges - non-current	53	—	53	—
Pension and deferred compensation plan assets	20	—	20	—
Total assets	$ 452	$ 326	$ 126	$ —
Liabilities:				
Derivatives				
Foreign exchange forward contracts-current	$ 2	$ —	$ 2	$ —
Interest rate hedges-non-current	1	—	1	—
Total liabilities	$ 3	$ —	$ 3	$ —
Reported as follows:				
Assets:				
Cash and cash equivalents[(1)]	$ 345	$ 324	$ 21	$ —
Short-term investments	1	—	1	—
Other current assets	25	—	25	—
Total current assets	$ 371	$ 324	$ 47	$ —
Other assets	$ 81	$ 2	$ 79	$ —
Liabilities:				
Other current liabilities	$ 2	$ —	$ 2	$ —
Other non-current liabilities	$ 1	$ —	$ 1	$ —

[(1)] The cash and cash equivalents amount presented in the table above does not include cash of $505 as of June 30, 2024.

Assets and liabilities of the Company are measured at fair value on a recurring basis as of December 31, 2023 and are summarized as follows:

		Fair Value Measurements at Reporting Date Using		
Description	December 31, 2023	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	$ 356	$ 356	$ —	$ —
Time deposits	12	—	12	—
Available-for-sale securities:				
Group insurance contracts	6	—	6	—
Derivatives				
Foreign exchange forward contracts	2	—	2	—
Interest rate hedge - current	3	—	3	—
Interest rate hedge - non-current	41	—	41	—
Pension and deferred compensation plan assets	19	—	19	—
Total assets	$ 439	$ 356	$ 83	$ —
Liabilities:				
Derivatives				
Foreign exchange forward contracts	$ 5	$ —	$ 5	$ —
Total liabilities	$ 5	$ —	$ 5	$ —
Reported as follows:				
Assets:				
Cash and cash equivalents [(1)]	$ 368	$ 356	$ 12	$ —
Other current assets	5	—	5	—
Total current assets	$ 373	$ 356	$ 17	$ —
Other assets	$ 66	$ —	$ 66	$ —
Liabilities:				
Other current liabilities	$ 5	$ —	$ 5	$ —

[(1)] The cash and cash equivalents amount presented in the table above does not include cash of $507 as of December 31, 2023.

Other Fair Value Disclosures

The estimated carrying value and fair value of the Company’s debt as of June 30, 2024 and December 31, 2023 are as follows:

	June 30, 2024		December 31, 2023	
	Carrying Value	Fair Value	Carrying Value	Fair Value
Term Loan Facility	$ 3,617	$ 3,622	$ 4,953	$ 4,965
Convertible Notes	1,400	1,493	—	—
Total	$ 5,017	$ 5,115	$ 4,953	$ 4,965

The estimated carrying value and fair value of the Company’s Term Loan Facility, as defined and further described in Note 8, 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. The estimated fair value of the Company’s Convertible Notes, as defined and further described in Note 8, was determined based on the last traded price of the Convertible Notes for the period ended June 30, 2024, and falls under Level 2 of 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 employee 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 is 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.

(5) Derivatives and Net Investment Hedge

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 (income) expense, net.

The following tables summarize the primary net hedging positions and fair values of foreign exchange forward contracts outstanding as of June 30, 2024 and December 31, 2023:

	June 30, 2024	
Currency Hedged (Buy/Sell)	Net Notional Value	Fair Value Asset (Liability)
U.S. dollar/Japanese yen	$ 31	$ 5
U.S. dollar/South Korean won	72	2
U.S. dollar/Taiwan dollar	27	1
U.S. dollar/Singapore dollar	1	—
U.S. dollar/Chinese renminbi	20	—
U.S. dollar/Mexican peso	6	—
U.S. dollar/Thai baht	4	—
U.S. dollar/Hong Kong dollar	1	—
Euro/U.S. dollar	5	—
Euro/Chinese renminbi	2	—
Euro/Canadian dollar	1	—
Malaysian ringgit/U.S. dollar	7	—
Polish zloty/U.S. dollar	1	—
U.K. pound sterling/U.S. dollar	27	—
Canadian dollar/U.S. dollar	1	—
Total	$ 206	$ 8

	December 31, 2023	
Currency Hedged (Buy/Sell)	Net Notional Value	Fair Value (Liability) Asset
U.S. dollar/Japanese yen	$ 65	$ —
U.S. dollar/South Korean won	70	(3)
U.S. dollar/Taiwan dollar	22	—
U.S. dollar/Singapore dollar	1	—
U.S. dollar/Chinese renminbi	8	—
U.S. dollar/Mexican peso	5	—
Euro/U.S. dollar	71	—
Euro/Chinese renminbi	4	—
Euro/Canadian dollar	1	—
U.K. pound sterling/U.S. dollar	19	—
Total	$ 266	$ (3)

The following table summarizes the net gains (losses) on derivatives designated as cash flow hedging instruments:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Foreign exchange forward contracts and interest rate hedges:				
Net gains (losses) recognized in accumulated OCI	$ 2	$ 44	$ 33	$ 29
Net gains (losses) reclassified from accumulated OCI into income	$ 2	$ 1	$ 1	$ 2

In the above table, the Company corrected for immaterial presentation errors in net gains (losses) recognized in accumulated OCI and net gains (losses) reclassified from accumulated OCI into income for the three and six months ended June 30, 2023. The net amount of existing gains as of June 30, 2024 expected to be reclassified from OCI into earnings within the next 12 months is immaterial.

Net Investment Hedges

On January 1, 2023, the Company designated certain Euro-denominated debt as a net investment hedge to hedge a portion of its net investments in certain of its entities with functional currencies denominated in the Euro. On January 22, 2024, the Company prepaid its USD Tranche A in full using, in part, a €250 incremental borrowing under its Euro Tranche B, each as defined and further described in Note 8. On January 22, 2024, the Company designated the additional €250 of its Euro Tranche B as a net investment hedge. As of June 30, 2024, the total principal amount outstanding under its Euro Tranche B was €838 and the entire balance was designated as a net investment hedge. As of December 31, 2023, the total principal amount outstanding under its Euro Tranche B was €593 and the entire balance was designated as a net investment hedge. For these net investment hedges, the Company defers recognition of the foreign currency remeasurement gains and losses within the foreign currency translation adjustment component of 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 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 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 June 30, 2024 and December 31, 2023:

					June 30, 2024	December 31, 2023
Effective Date	Maturity	Fixed Rate	Notional Amount at Effective Date	Notional Amount at June 30, 2024	Fair Value Asset (Liability)	Fair Value Asset (Liability)
Interest Rate Swaps						
June 30, 2023	February 28, 2025	0.391 %	$ 200	$ 200	$ 6	$ 9
June 30, 2023	February 28, 2025	0.543 %	300	300	9	14
September 30, 2022	September 30, 2026	3.156 %	350	350	10	5
January 2, 2024	January 31, 2028	2.841 %	250	250	11	7
September 30, 2022	September 30, 2027	3.198 %	350	350	11	5
January 2, 2024	January 31, 2029	2.986 %	250	250	12	6
September 30, 2022	September 30, 2026	3.358 %	600	400	9	5
December 28, 2023	December 31, 2027	4.550 %	500	500	(1)	(10)
			2,800	2,600	67	41
Interest Rate Caps						
June 30, 2023	January 31, 2024	0.805 %	350	—	—	1
June 30, 2023	January 31, 2024	0.805 %	350	—	—	2
			700	—	—	3
		Total	$ 3,500	$ 2,600	$ 67	$ 44

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 were recorded immediately in earnings, as the Company did not designate these instruments as hedges and therefore these instruments did not qualify for hedge accounting. The interest rate caps expired on January 31, 2024.

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

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Net gains (losses) recognized in income	$ 1	$ (6)	$ (3)	$ (16)

In the above table, the Company corrected for immaterial presentation errors in the net gains (losses) recognized in income for the three and six months ended June 30, 2023.

(6) Inventories

Inventories consist of the following:

	June 30, 2024	December 31, 2023
Raw materials	$ 718	$ 740
Work-in-process	85	94
Finished goods	135	157
Total	$ 938	$ 991

(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 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.

The changes in the carrying amount of goodwill and accumulated impairment loss during the six months ended June 30, 2024 were as follows:

	Gross Carrying Amount	Accumulated Impairment Loss	Net
Beginning balance, January 1, 2024	$ 4,387	$ (1,833)	$ 2,554
Foreign currency translation and measurement period adjustments	(59)	—	(59)
Ending balance, June 30, 2024	$ 4,328	$ (1,833)	$ 2,495

During the quarter ended June 30, 2023, the Company noted 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 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 for 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 in-process research and development (“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 reporting unit, the forecasted future undiscounted cash flows were consistent with the Company’s goodwill analysis, using an approximate seven 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 two years, and a discount rate of 12.5%.

Intangible Assets

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

As of June 30, 2024:	Gross	Accumulated Impairment Charges	Accumulated Amortization	Foreign Currency Translation	Net
Completed technology	$ 1,268	$ (152)	$ (451)	$ (24)	$ 641
Customer relationships	2,072	(1)	(406)	(70)	1,595
Patents, trademarks, trade names and other	381	(63)	(124)	(12)	182
	$ 3,721	$ (216)	$ (981)	$ (106)	$ 2,418

As of December 31, 2023:	Gross	Accumulated Impairment Charges	Accumulated Amortization Charges	Foreign Currency Translation and Measurement Period Adjustments	Net
Completed technology	$ 1,268	$ (152)	$ (405)	$ (4)	$ 707
Customer relationships	2,072	(1)	(335)	(17)	1,719
Patents, trademarks, trade names and other	381	(63)	(118)	(7)	193
	$ 3,721	$ (216)	$ (858)	$ (28)	$ 2,619

During the six months ended June 30, 2023, $9 of IPR&D was written off to amortization expense as certain projects were cancelled.

Aggregate amortization expense related to acquired intangible assets for the six months ended June 30, 2024 and 2023 was $123 and $157, respectively.

Aggregate net amortization expense related to acquired intangible assets for future years is as follows:

Year	Amount
2024 (remaining)	$ 124
2025	245
2026	241
2027	240
2028	240
2029	238
Thereafter	1,034

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

(8) Debt

The Company's outstanding debt is as follows:

	June 30, 2024	December 31, 2023
Short-term debt:		
Term Loan Facility	$ 50	$ 93
Long-term debt:		
Term Loan Facility	$ 3,567	$ 4,860
Debt issuance costs - Term Loan Facility	(107)	(164)
Term Loan Facility, net	3,460	4,696
Convertible Notes	1,400	—
Debt issuance costs - Convertible Notes	(28)	—
Convertible Notes, net	1,372	—
Total long-term debt, net	$ 4,832	$ 4,696

Credit Facilities

In connection with the completion of the Atotech Acquisition, on August 17, 2022 (the "Effective Date") 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 "Credit Agreement"). The Credit Agreement provided for (i) a senior secured term loan facility comprised of three tranches: a $1,000 loan (the "USD Tranche A"), a $3,600 loan (as further increased, refinanced and otherwise modified as described herein, the "USD Tranche B") and a €600 loan (as further increased and otherwise modified as described herein, the "Euro Tranche B" and together with the USD Tranche A and the USD Tranche B, the "Term Loan Facility"), each of which were borrowed in full on the Effective Date, and (ii) a senior secured revolving credit facility of $500 (as further increased and otherwise modified as described herein, the "Revolving Facility" and, together with the Term Loan Facility, the "Credit Facilities"), with the commitments under each of the foregoing facilities subject to increase from time to time subject to certain conditions. The proceeds of the 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 existing term loan and revolving credit facilities of the Company and certain indebtedness of Atotech.

Initially, borrowings under the Credit Facilities bore 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 Revolving Facility and the USD Tranche B, (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 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%. Initially, the applicable margins for borrowings under the Credit Facilities were (i) under the USD Tranche A, 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings, (ii) under the USD Tranche B, 1.75% with respect to base rate borrowings and 2.75% with respect to Term SOFR borrowings, (iii) under the Euro Tranche B, 3.00% and (iv) under the Revolving Facility, 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 Credit Facilities, the Company is required to pay a commitment fee in respect of the unutilized commitments under the Revolving Facility. The commitment fee is 0.375% per annum. 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 fiscal quarter. The Company must also pay customary letter of credit fees and agency fees.

On October 3, 2023 (the "First Amendment Effective Date"), the Company entered into the First Amendment to Credit Agreement (the "First Amendment"), which refinanced all of the $3,564 outstanding USD Tranche B to (i) decrease the applicable margin for the USD Tranche B to 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings and (ii) remove the credit spread adjustment applicable to Term SOFR borrowings of the USD Tranche B.

On January 22, 2024 (the "Second Amendment Effective Date"), the Company entered into the Second Amendment to Credit Agreement (the "Second Amendment"), pursuant to which the Company (i) borrowed additional USD Tranche B loans in an aggregate principal amount of $490 and additional Euro Tranche B loans in an aggregate principal amount of €250 (collectively, the "Incremental Tranche B Loans") and (ii) used a portion of the proceeds of the Incremental Tranche B Loans to prepay the USD Tranche A in full in an aggregate principal amount of $744.

On February 13, 2024, the Company entered into the Third Amendment to Credit Agreement (the "Third Amendment"), pursuant to which the Company increased the available borrowing capacity under the Revolving Facility by $175 (the "Incremental Revolving Commitments"). As of June 30, 2024, the available borrowing capacity under the Revolving Facility was $675.

The USD Tranche B and the Euro Tranche B were issued on the Effective Date with original issue discount of 2.00% of the principal amounts thereof. The USD Tranche B was issued on the First Amendment Effective Date with original issue discount of 0.25% of the principal amount thereof. The Incremental Tranche B Loans were issued with original issue discount of 0.25% of the principal amount thereof.

The Company incurred $242 of deferred financing fees and original issue discount related to the term loans under the Term Loan Facility funded on the Effective Date, which are included in long-term debt, net in the accompanying consolidated balance sheets and are being amortized to interest expense over the estimated life of the term loans using the effective interest method.

The Company incurred $11 of deferred financing fees and original issue discount related to the USD Tranche B funded on the First Amendment Effective Date, of which $9 is included in long-term debt, net in the accompanying consolidated balance sheets and is being amortized to interest expense over the estimated life of the term loans using the effective interest method. The Company recorded an $8 loss on extinguishment of debt in connection with the First Amendment.

The Company incurred $5 of deferred financing fees and original issue discount related to the Incremental Tranche B Loans funded on the Second Amendment Effective Date, of which $2 is included in long-term debt, net in the accompanying consolidated balance sheets and is being amortized to interest expense over the estimated life of the term loans using the effective interest method. The Company recorded a $9 loss on extinguishment of debt in connection with the Second Amendment.

Under the Credit Agreement, the Company is required to prepay outstanding term loans, subject to certain exceptions, with portions of its annual excess cash flow as well as with the net cash proceeds of certain of its asset sales, certain casualty and condemnation events and the incurrence 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 Revolving Facility exceeds the aggregate commitments under the 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 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 six months after the Second Amendment Effective Date, the Company prepays any loans under the USD Tranche B or the Euro Tranche B in connection with a repricing transaction, the Company must pay a prepayment premium of 1.00% of the aggregate principal amount of the loans so prepaid. Additionally, the Company may voluntarily reduce the unutilized portion of the commitment amount under the Revolving Facility.

Prior to the repayment in full of the USD Tranche A, the Company was required to make scheduled quarterly payments each equal to 1.25% of the original principal amount of the USD Tranche A. The Company is required to make scheduled quarterly payments each equal to approximately $10 with respect to the USD Tranche B and approximately €2 with respect to the Euro Tranche B, in each case with the balance due thereunder on the seventh anniversary of the Effective Date.

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

All obligations under the 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 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 earnings before interest, taxes, depreciation, and amortization (“EBITDA”), plus (y) an amount equal to the sum of all voluntary prepayments of term loans under the 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 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 5.25 to 1.00 for the fiscal quarters ending December 31, 2023 through September 30, 2024, 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 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 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 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 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 Credit Facilities will be entitled to take various actions, including the acceleration of amounts due under the Credit Facilities and all actions permitted to be taken by a secured creditor. As of June 30, 2024, the Company was in compliance with all covenants under the Credit Agreement.

The Company paid certain customary fees to and expenses of (i) JPMorgan Chase Bank, N.A., Barclays Bank PLC, BofA Securities, Inc., Citibank, N.A., HSBC Securities (USA) Inc. and Mizuho Bank, Ltd. in their respective capacities as lead

arrangers and bookrunners in connection with the Credit Facilities on the Effective Date, (ii) JPMorgan Chase Bank, N.A. in its capacity as lead arranger in connection with each of the First Amendment, the Second Amendment and the Third Amendment and (iii) the lenders providing the Incremental Revolving Commitments pursuant to the Third Amendment.

As described further below under "Convertible Notes," on May 16, 2024, the Company completed a private offering of convertible senior notes. A significant portion of the net proceeds from the offering was used to repay approximately $1,206 of the USD Tranche B. As a result of the repayment, the Company recorded a $38 loss on extinguishment of debt.

As of June 30, 2024, the weighted average interest rate of the Term Loan Facility was 7.5%. The Revolving Facility has a maturity date in August 2027 while the USD Tranche B and Euro Tranche B have a maturity date in August 2029. As of June 30, 2024, there were no borrowings under the Revolving Facility.

Convertible Notes

On May 16, 2024, the Company completed a private offering of $1,400 aggregate principal amount of its convertible senior notes due 2030 (the "Convertible Notes"). The Convertible Notes were sold in a private placement under a purchase agreement, dated as of May 13, 2024 (the "Purchase Agreement"), entered into by and between the Company and each of Morgan Stanley & Co. LLC, J.P. Morgan Securities LLC, BofA Securities, Inc. and Mizuho Securities USA LLC, as representatives of the several initial purchasers named therein, for resale to persons reasonably believed to be qualified institutional buyers in reliance on Rule 144A under the Securities Act of 1933, as amended.

The aggregate principal amount of the Convertible Notes sold in the offering was $1,400, which included $200 aggregate principal amount of the Convertible Notes issued pursuant to an option to purchase, within a 13-day period beginning on, and including, the date on which the Convertible Notes were first issued, which the initial purchasers exercised in full on May 14, 2024 and which additional purchase was also completed on May 16, 2024.

The net proceeds from the offering were approximately $1,374 after deducting the initial purchasers' discounts and commissions and estimated offering expenses paid by the Company. The Company used approximately $167 of the net proceeds from the offering to pay the cost of the capped call transactions described below. The Company used the remaining net proceeds from the offering to repay approximately $1,206 in borrowings outstanding under the USD Tranche B, together with accrued interest, as well as for general corporate purposes.

Indenture and the Convertible Notes

On May 16, 2024, the Company entered into an indenture (the "Indenture") with respect to the Convertible Notes with U.S. Bank Trust Company, National Association, as trustee (the "Trustee"). Under the Indenture, the Convertible Notes are senior unsecured obligations of the Company and bear interest at a coupon rate of 1.25% per annum, with interest payable semiannually in arrears on June 1 and December 1 of each year, beginning on December 1, 2024. The Convertible Notes will mature on June 1, 2030, unless earlier converted, redeemed or repurchased in accordance with their terms.

Subject to certain conditions, on or after June 5, 2027, the Company may redeem for cash all or any portion of the Convertible Notes at a redemption price equal to 100% of the principal amount of the Convertible Notes to be redeemed, plus accrued and unpaid interest to, but excluding, the redemption date, if the last reported sale price of the Company's common stock has been at least 130% of the conversion price then in effect for at least 20 trading days (whether or not consecutive) during the period of 30 consecutive trading days ending on, and including, the trading day immediately preceding the date the notice of redemption is sent.

The conversion rate for the Convertible Notes is initially 6.4799 shares of the Company's common stock per one thousand dollars principal amount of the Convertible Notes, which is equivalent to an initial conversion price of approximately $154.32 per share. The conversion rate is subject to adjustment upon the occurrence of certain events.

Upon conversion, the Company will pay cash up to the aggregate principal amount of the Convertible Notes to be converted and pay or deliver, as the case may be, cash, shares of common stock or a combination of cash and shares of common stock, at the Company's election, in respect of the remainder, if any, of its conversion obligation in excess of the aggregate principal amount of the Convertible Notes being converted. Prior to March 1, 2030, noteholders may convert all or any portion of their Convertible Notes only upon the occurrence of certain events and during certain periods, and thereafter, at any time until the second scheduled trading day immediately preceding the maturity date.

If the Company undergoes a fundamental change (as defined in the Indenture) prior to the maturity date of the Convertible Notes, holders may require the Company to repurchase for cash all or any portion of their Convertible Notes at a fundamental change repurchase price equal to 100% of the principal amount of the Convertible Notes to be repurchased, plus any accrued and unpaid interest to, but excluding, the fundamental change repurchase date.

The Indenture contains customary terms and covenants, including that upon certain events of default that are occurring and continuing, either the Trustee or the holders of at least 25% in aggregate principal amount of the outstanding Convertible Notes may declare 100% of the principal of, and accrued and unpaid interest, if any, on, all the Convertible Notes to be due and payable.

As of June 30, 2024, the Convertible Notes are classified as a long-term liability, net of issuances costs, on the condensed consolidated balance sheet. The Convertible Notes were issued at par and costs associated with the issuance of the Convertible Notes are amortized to interest expense over the contractual term of the Convertible Notes. As of June 30, 2024, the effective interest rate of the Convertible Notes was 1.56%.

Capped Call Transactions

On May 13, 2024, in connection with the pricing of the Convertible Notes, and on May 14, 2024, in connection with the exercise in full by the initial purchasers of their option to purchase additional Convertible Notes, the Company entered into privately negotiated capped call transactions with certain of the initial purchasers of the Convertible Notes or their respective affiliates and other financial institutions. The capped call transactions are expected generally to reduce the potential dilution to the Company’s common stock upon conversion of any Convertible Notes and/or offset any cash payments that the Company is required to make in excess of the principal amount of any converted Convertible Notes, as the case may be, with such reduction and/or offset subject to a cap initially equal to $237.42 per share, which represents a premium of 100% over the last reported sale price of $118.71 per share of the Company’s common stock on The Nasdaq Global Select Market on May 13, 2024, and is subject to customary adjustments under the terms of the capped call transactions.

The Company evaluated the capped call transactions and determined that they should be accounted for separately from the Convertible Notes. The cost of $167 to purchase the capped call transactions was recorded as a reduction to additional paid-in capital in the consolidated balance sheet as of June 30, 2024 as the capped call transactions are indexed to the Company’s own stock and met the criteria to be classified in stockholders' equity.

The Company’s interest expense is as follows:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Term Loan Facility:				
Contractual interest expense	$ 82	$ 98	$ 177	$ 188
Amortization of debt issuance costs as interest expense	7	6	15	14
Total interest expense on Term Loan Facility	$ 89	$ 104	$ 192	$ 202
Convertible Notes:				
Contractual interest expense	$ 2	$ —	$ 2	$ —
Amortization of debt issuance costs as interest expense	1	—	1	—
Total interest expense on Convertible Notes	$ 3	$ —	$ 3	$ —
Other interest expense, net [(1)]	$ (13)	$ (16)	$ (29)	$ (29)
Total interest expense	$ 79	$ 88	$ 166	$ 173

[(1)] Other interest expense, net primarily consists of interest (income) expense related to the Company’s interest rate swap and interest rate cap agreements.

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 June 30, 2024 and December 31, 2023 of up to an equivalent of $19 and $14, respectively. There were no borrowings outstanding under these arrangements at June 30, 2024 and December 31, 2023.

Contractual maturities of the Company's debt obligations as of June 30, 2024 are as follows:

Year	Amount
2024 (remaining)	$ 25
2025	50
2026	50
2027	50
2028	50
2029	3,392
Thereafter	1,400

(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:

	Six Months Ended June 30,	
	2024	2023
Beginning of period	$ 22	$ 27
Provision for product warranties	13	4
Charges to warranty liability	(12)	(8)
End of period	$ 23	$ 23

As of June 30, 2024, short-term product warranties of $14 and long-term product warranties of $9 were included within other current liabilities and other non-current liabilities, respectively, within the accompanying condensed consolidated balance sheet. As of June 30, 2023, short-term product warranties of $17 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:

	June 30, 2024	December 31, 2023
Accrued compensation and other employee-related obligations	$ 110	$ 159
Deferred revenue and customer advances	65	77
Income taxes payable	89	57
Lease liabilities	37	30
Other	98	105
Total other current liabilities	$ 399	$ 428

(11) Income Taxes

The Company's effective tax rates for the three and six months ended June 30, 2024 were (3.6)% and 8.9% respectively. The Company's effective tax rates for the three and six months ended June 30, 2024 were lower than the U.S. statutory tax rate mainly due to the tax benefit related to the U.S. deduction for foreign derived intangible income ("FDII") and research and development tax credits, partially offset by an expected increase in foreign withholding taxes and U.S. base erosion and anti-abuse tax.

The Company's effective tax rates for the three and six months ended June 30, 2023 were 1.2% and 3.2%, respectively. The goodwill impairment relating to the electronics and general metal finishing reporting units of MSD and the equipment solutions reporting unit of PSD was considered non-deductible goodwill for tax purposes and therefore no tax benefit was recorded related to the goodwill impairment. The tax effect of the impairment of the intangible assets was discretely recorded in its entirety during the three months ended June 30, 2023. The Company's tax benefits of $22 for the three months ended June 30, 2023 and $59 for the six months ended June 30, 2023 were primarily due to the loss from operations and the impairment of intangible assets for these periods. The Company's effective tax rates for the three and six months ended June 30, 2023 were lower than the U.S. statutory tax rate primarily due to the tax benefit related to the impairment of intangible assets.

(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 June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Numerator:				
Net income (loss)	$ 23	$ (1,769)	$ 37	$ (1,812)
Denominator:				
Shares used in net income (loss) per common share – basic	67.3	66.8	67.2	66.8
Effect of dilutive securities	0.2	—	0.3	—
Shares used in net income (loss) per common share – diluted	67.5	66.8	67.5	66.8
Net income (loss) per common share:				
Basic	$ 0.34	$ (26.47)	$ 0.56	$ (27.14)
Diluted	$ 0.33	$ (26.47)	$ 0.55	$ (27.14)

Basic earnings per share is computed by dividing net income (loss) available to common shareholders by the weighted-average number of common shares outstanding during the period.

Diluted net income (loss) per common share is computed by dividing the diluted net income (loss) available to common shareholders by the weighted-average number of shares of common stock and potentially dilutive shares of common stock outstanding during the period. The dilutive effect of equity awards is calculated based on the average stock price for the relevant period, using the treasury stock method. In periods in which a net loss is recognized, the impact of restricted stock units ("RSUs") is not included as they are antidilutive. The dilutive effect of the Convertible Notes is calculated under the if-converted method.

For the three and six months ended June 30, 2024, the Company had an immaterial quantity of RSUs that were antidilutive and were excluded from the computation of diluted weighted-average shares. For the three months ended June 30, 2024, the Convertible Notes 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.

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

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
Cost of revenues	$ 2	$ 2	$ 3	$ 3
Research and development	1	2	3	3
Selling, general and administrative	8	9	20	25
Total stock-based compensation expense	$ 11	$ 13	$ 26	$ 31

At June 30, 2024, the total compensation expense related to unvested stock-based awards granted to employees and directors under the Plans that had not been recognized was $66. Stock-based awards include (i) time-based RSUs, (ii) performance-based RSUs based on the achievement of adjusted EBITDA targets (the "Adjusted EBITDA RSUs"), (iii) performance-based RSUs based on the Company's total shareholder return relative to a group of peers over a three-year performance period (the "rTSR RSUs") and (iv) employee stock purchase plan rights. The Company determines the fair value of time-based RSUs based on the closing market price of the Company's common stock on the date of the award. The Company determines the original fair value of Adjusted EBITDA RSUs based upon the closing market price of the Company's stock on the date of the award and adjusts the fair value quarterly during the first year based upon actual and forecasted results against Adjusted EBITDA targets. The Company estimates the fair value of rTSR RSUs using the Monte Carlo simulation model, which requires the use of highly subjective and complex assumptions, including the price volatility of the underlying stock. The Company estimates the fair value of employee stock purchase plan rights using the Black-Scholes valuation method. Such values are recognized as expense on a straight-line basis for time-based awards and rTSR RSUs and using the accelerated graded vesting method for Adjusted EBITDA RSUs, all over the requisite service periods.

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

	Six Months Ended June 30, 2024	
	Quantity	Weighted Average Grant Date Fair Value Per Share
RSUs – beginning of period	1.0	$ 98.36
Granted	0.4	$ 122.22
Vested or forfeited	(0.4)	$ 107.17
RSUs – end of period	1.0	$ 104.59

(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 will depend upon a variety of factors, including business conditions, stock market conditions and business development activities, including, but not limited to, merger and acquisition opportunities. These repurchases may be commenced, suspended or discontinued at any time without prior notice. The Company has repurchased approximately 2.6 shares of common stock for approximately $127 pursuant to the program since its adoption. During the three and six months ended June 30, 2024 and 2023, there were no repurchases of common stock.

Cash Dividends

Holders of the Company's common stock are entitled to receive dividends when they are declared by the Company's Board of Directors. During each of the first and second quarters of 2024 and 2023, the Company's Board of Directors declared a cash dividend of $0.22 per share, which totaled $30 and $29 for the six months ended June 30, 2024 and 2023, respectively.

On August 5, 2024, the Company's Board of Directors declared a quarterly cash dividend of $0.22 per share to be paid on September 6, 2024 to stockholders of record as of August 26, 2024.

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.

(15) Business Segment and Geographic Information

The Company has three reportable segments: VSD, PSD and MSD. The Company's 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, electronics and packaging and specialty industrial applications. VSD products are derived from the Company's 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, temperature sensing, and vacuum technology.

PSD provides a full range of solutions including lasers, beam measurement and profiling, precision motion control, vibration isolation systems, photonics instruments, 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. 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.

During the quarter ended March 31, 2024, the Company moved its OSP product line from the PSD segment to the VSD segment. The purpose of this realignment was to better align the OSP products with semiconductor related products within the VSD segment. Prior periods have been recast to reflect this change.

The following table sets forth net revenues by reportable segment:

	Three Months Ended June 30,		Six Months Ended June 30,	
	2024	2023	2024	2023
VSD	$ 335	$ 434	$ 668	$ 738
PSD	254	271	507	457
MSD	298	298	580	602
	$ 887	$ 1,003	$ 1,755	$ 1,797

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

	Three Months Ended June 30, 2024	Three Months Ended June 30, 2023	Six Months Ended June 30, 2024	Six Months Ended June 30, 2023
Gross profit by reportable segment:				
VSD	$ 142	$ 196	$ 283	$ 310
PSD	110	125	227	200
MSD	167	149	324	296
Total gross profit by reportable segment	419	470	834	806
Operating expenses:				
Research and development	66	75	136	147
Selling, general and administrative	161	172	331	348
Acquisition and integration costs	2	5	3	11
Restructuring and other	2	11	5	12
Fees and expenses related to amendments to the Term Loan Facility	—	—	3	—
Amortization of intangible assets	61	76	123	157
Goodwill and intangible asset impairments	—	1,827	—	1,827
Income (loss) from operations	127	(1,696)	233	(1,696)
Interest income	(5)	(4)	(11)	(7)
Interest expense	79	88	166	173
Loss on extinguishment of debt	38	—	47	—
Other (income) expense, net	(7)	11	(10)	9
Income (loss) before income taxes	22	(1,791)	41	(1,871)
(Benefit) provision for income taxes	(1)	(22)	4	(59)
Net income (loss)	$ 23	$ (1,769)	$ 37	$ (1,812)

Interest income, interest expense and income tax (benefit) provision 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:

June 30, 2024	Accounts receivable, net	Inventories	Total
VSD	$ 189	$ 525	$ 714
PSD	170	262	432
MSD	238	151	389
Total segment assets	$ 597	$ 938	$ 1,535

December 31, 2023	Accounts receivable, net	Inventories	Total
VSD	$ 181	$ 553	$ 734
PSD	171	283	454
MSD	251	155	406
Total segment assets	$ 603	$ 991	$ 1,594

The following table reconciles total segment assets to total assets:

	June 30, 2024	December 31, 2023
Total segment assets	$ 1,535	$ 1,594
Cash and cash equivalents and short-term investments	851	875
Other current assets	262	227
Property, plant and equipment, net	759	784
Right-of-use assets, net	229	225
Goodwill and intangible assets, net	4,913	5,173
Other assets	314	240
Total assets	$ 8,863	$ 9,118

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

	VSD	PSD	MSD	Total
Reportable segment:				
Gross goodwill, at December 31, 2023	$ 359	$ 1,007	$ 3,021	$ 4,387
Foreign currency translation	(1)	(2)	(56)	(59)
Gross goodwill, at June 30, 2024	358	1,005	2,965	4,328
Accumulated goodwill impairment, at December 31, 2023 and June 30, 2024	(141)	(390)	(1,302)	(1,833)
Goodwill, net of accumulated impairment and foreign currency translation, at June 30, 2024	$ 217	$ 615	$ 1,663	$ 2,495

Geographic Area

Information about the Company's operations by geographic area is presented in the tables below. Starting in the second quarter of 2024, the Company changed its basis of reporting geographical net revenues from the location in which the sale originated to the shipped-to location of the end customer. Prior periods have been recast to reflect this change, which was made to better align with how management reviews geographic net revenues. Intercompany sales between geographic areas are at tax transfer prices and have been eliminated from consolidated net revenues.

	Three Months Ended June 30,		Six Months Ended June 30,	
Net revenues:	2024	2023	2024	2023
United States	$ 202	$ 265	$ 421	$ 452
China	199	200	369	360
South Korea	82	90	170	169
Taiwan	62	65	110	128
Japan	55	82	112	140
Singapore	55	69	111	124
Other	232	232	462	424
	$ 887	$ 1,003	$ 1,755	$ 1,797

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:	June 30, 2024	December 31, 2023
United States	$ 462	$ 459
China	165	163
Germany	136	149
Other	321	326
	$ 1,084	$ 1,097

(16) Restructuring and Other

The Company recorded restructuring and other charges of $2 and $5 during the three and six months ended June 30, 2024, respectively, primarily related to severance costs due a global cost-saving initiative implemented in the fourth quarter of 2023. Restructuring and other charges for these periods also included a $1 charge related to a legal matter. The Company recorded restructuring charges of $11 and $12 during the three and six months ended June 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 activity related to the Company's restructuring accrual is shown below:

	Six Months Ended June 30,	
	2024	2023
Restructuring accrual, beginning of period	$ 9	$ 3
Charged to expense	4	12
Payments and adjustments	(6)	(6)
Restructuring accrual, end of period	$ 7	$ 9

(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 Event

On July 23, 2024 (the "Fourth Amendment Effective Date"), the Company entered into the Fourth Amendment to the Credit Agreement (the "Fourth Amendment"). Pursuant to the Fourth Amendment, the Company (i) refinanced its existing USD Tranche B loan and Euro Tranche B loan with a new $2,650 USD Tranche B loan and a new €800 Euro Tranche B loan, (ii) decreased the applicable margin for the USD Tranche B from 2.50% to 2.25% with respect to Term SOFR borrowings and from 1.50% to 1.25% with respect to base rate borrowings, (iii) decreased the applicable margin for the Euro Tranche B from 3.00% to 2.75% and (iv) extended the period during which a 1.00% prepayment premium may be required if the Company prepays any loans under the USD Tranche B or the Euro Tranche B in connection with a repricing transaction until the date that is six months following the Fourth Amendment Effective Date. In connection with the execution of the Fourth Amendment, the Company paid customary fees and expenses to JPMorgan Chase Bank, N.A.

On July 23, 2024, immediately prior to the effectiveness of the Fourth Amendment, the Company made a voluntary prepayment of $110 aggregate principal amount under the Term Loan Facility, consisting of $69 principal amount of its USD Tranche B loan and €38 principal amount of its Euro Tranche B loan.

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 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 level and terms of our substantial indebtedness and our ability to service such debt; our entry into the chemicals technology business through our acquisition of Atotech Limited (“Atotech”) in August 2022 (the “Atotech Acquisition”) 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; legal, reputational, financial and contractual risks resulting from the ransomware event we identified in February 2023, 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, including through growth of the Atotech business and growth of the Electro Scientific Industries, Inc. business, 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; the impact of a pandemic or other widespread health crisis; risks associated with doing business internationally, including geopolitical conflicts, such as the conflict in the Middle East, 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; 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 global 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, 2023 filed with the U.S. Securities and Exchange Commission on February 27, 2024 (“Annual Report”) and any subsequent Quarterly Reports on Form 10-Q. 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, cash flows 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, and is intended to better allow investors to view the Company from management’s perspective. This section focuses on material events and uncertainties known to management that are reasonably likely to cause reported financial information not to be necessarily indicative of our future operating results or our future financial condition. This section provides an analysis of our financial results for the three months ended June 30, 2024 compared to the three months ended March 31, 2024, and the six months ended June 30, 2024 compared to the six months ended June 30, 2023.

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.

Segments

We have three divisions which are our reportable segments, Vacuum Solutions Division ("VSD"), Photonics Solutions Division ("PSD") and Materials Solutions Division ("MSD").

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, temperature sensing and vacuum technology.

PSD provides a full range of solutions including lasers, beam measurement and profiling, precision motion control, vibration isolation systems, photonics instruments, 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. During the quarter ended March 31, 2024, we moved our Optical Sensing Products ("OSP") product line from the PSD segment to the VSD segment. The purpose of this realignment was to better align the OSP products with semiconductor related products within the VSD segment. Prior periods have been recast to reflect this change.

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, 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

	Three Months Ended				Six Months Ended			
(dollars in millions)	June 30, 2024	% Total	March 31, 2024	% Total	June 30, 2024	% Total	June 30, 2023	% Total
Semiconductor	$ 369	42 %	$ 351	40 %	$ 720	41 %	$ 750	42 %
Electronics and Packaging	229	26 %	208	24 %	437	25 %	447	25 %
Specialty Industrial	289	33 %	309	36 %	598	34 %	600	33 %
Total net revenues	$ 887	100 %	$ 868	100 %	$ 1,755	100 %	$ 1,797	100 %

Semiconductor Market

MKS is a critical solutions provider for semiconductor manufacturing. Our products are used in major semiconductor processing steps, such as deposition, 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 ("WFE") ecosystem and address over 85% of the market. We have characterized our broad and unique offering as Surround the Wafer® to reflect the technology enablement we provide across almost every major process in semiconductor manufacturing today.

The semiconductor market 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 softening in the semiconductor capital equipment industry. In addition to these rapid demand shifts, the semiconductor capital equipment industry is subject to significant trade restrictions, especially in China.

For the three months ended June 30, 2024, net revenues in our semiconductor market increased by $18 million, or 5%, compared to the prior quarter primarily due to strong in-quarter demand conversion within VSD.

For the six months ended June 30, 2024, net revenues in our semiconductor market decreased by $30 million, or 4%, compared to the same period in the prior year. This decrease was mainly due to continued softened demand for semiconductor capital equipment related to deposition and etching, partially offset by an increase in sales of our lithography, metrology and inspection products.

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, and critical to 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. In addition, the electronics and packaging market also includes sales of our vacuum and photonics solutions for display manufacturing applications. 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.

For the three months ended June 30, 2024, net revenues in our electronics and packaging market increased by $21 million, or 10%, compared to the prior quarter primarily due to an increase in chemistry sales within MSD. This sequential increase was also due to seasonality related to the Lunar New Year in the three months ended March 31, 2024.

For the six months ended June 30, 2024, net revenues in our electronics and packaging market decreased by $10 million, or 2%, compared to the same period in the prior year. This decrease was primarily due to lower revenue within MSD mainly as a result of lower palladium prices that are passed through to our customers, which were partially offset by volume growth in chemistry sales.

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 encompasses 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 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 June 30, 2024, net revenues in our specialty industrial market decreased by $20 million, or 7%, compared to the prior quarter mainly due to lower revenue in our general industrial and defense markets within VSD and PSD.

For the six months ended June 30, 2024, net revenues in our specialty industrial market were essentially flat compared to the same period in the prior year.

International Markets

Starting in the second quarter of 2024, we changed our basis of reporting geographical net revenues from the location in which the sale originated to the shipped-to location of the end customer. Prior periods have been recast to reflect this change, which was made to better align with how management reviews geographic net revenues.

A significant portion of our net revenues is from sales to customers in international markets. For the six months ended June 30, 2024 and 2023, international net revenues accounted for approximately 76% and 75%, respectively, of our total net revenues. A significant portion of our international net revenues was generated from sales to customers in China, South Korea, Japan, Taiwan and Singapore. 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 57% and 58% of our total long-lived assets as of June 30, 2024 and December 31, 2023. Long-lived assets include property, plant and equipment, net, right-of-use assets, net and certain other assets.

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, 2023.

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."

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		Six Months Ended	
	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Net revenues:				
Products	86.8 %	86.9 %	86.8 %	88.9 %
Services	13.2	13.1	13.2	11.1
Total net revenues	100.0	100.0	100.0	100.0
Cost of revenues:				
Cost of product revenues	46.4	45.9	46.2	48.9
Cost of service revenues	6.3	6.3	6.3	6.3
Total cost of revenues (exclusive of amortization shown separately below)	52.8	52.2	52.5	55.2
Gross profit	47.3	47.8	47.5	44.8
Research and development	7.4	8.1	7.7	8.2
Selling, general and administrative	18.2	19.6	18.9	19.4
Acquisition and integration costs	0.2	0.1	0.2	0.6
Restructuring and other	0.2	0.3	0.3	0.7
Fees and expenses related to amendments to the Term Loan Facility	—	0.3	0.2	—
Amortization of intangible assets	6.9	7.1	7.0	8.7
Goodwill and intangible asset impairments	—	—	—	101.7
Income (loss) from operations	14.4	12.2	13.3	(94.5)
Interest income	(0.6)	(0.7)	(0.6)	(0.4)
Interest expense	8.9	10.0	9.5	9.6
Loss on extinguishment of debt	4.3	1.0	2.7	—
Other (income) expense, net	(0.8)	(0.3)	(0.6)	0.5
Income (loss) before income taxes	2.6	2.2	2.3	(104.2)
Provision (benefit) for income taxes	(0.1)	0.5	0.2	(3.3)
Net income (loss)	2.6 %	1.7 %	2.1 %	(100.9 %)

<u>Net revenues</u>

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Products	$ 770	$ 754	$ 1,524	$ 1,597
Services	117	114	231	200
Total net revenues	$ 887	$ 868	$ 1,755	$ 1,797

For the three months ended June 30, 2024, net product revenues increased $16 million compared to the prior quarter. This increase was primarily due to higher chemistry sales at MSD.

For the six months ended June 30, 2024, net product revenues decreased $73 million compared to the same period in the prior year, primarily due to lower demand in our semiconductor market, with a decrease in net product revenue from VSD partially offset by an increase in net product revenue from PSD. In addition, net product revenues in our electronics and packaging market decreased mainly from lower equipment sales in MSD.

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 June 30, 2024, net service revenues increased $3 million compared to the prior quarter.

For the six months ended June 30, 2024, net service revenues increased $31 million compared to the same period in the prior year, primarily due to an increase in net services revenue from VSD and PSD. This increase is reflective of lower product sales, as customers service their older equipment rather than purchase new equipment, and increased prices for servicing.

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

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Net revenues:				
Vacuum Solutions Division	$ 335	$ 332	$ 668	$ 738
Photonics Solutions Division	254	254	507	457
Materials Solutions Division	298	282	580	602
Total net revenues	$ 887	$ 868	$ 1,755	$ 1,797

For the three months ended June 30, 2024, net revenues from VSD increased $3 million compared to the prior quarter. For the six months ended June 30, 2024, net revenues from VSD decreased $70 million compared to the same period in the prior year, mainly due to a decrease in revenues from customers in the semiconductor market as a result of continued softened demand for semiconductor capital equipment in the deposition and etching tool markets.

For the three months ended June 30, 2024, net revenues from PSD were flat compared to the prior quarter. For the six months ended June 30, 2024, net revenues from PSD increased $50 million compared to the same period in the prior year mainly in the semiconductor and specialty industrial markets. The increase in semiconductor revenue is mainly related to an increase in sales of our lithography, metrology and inspection products. The increase in specialty industrial market revenue is mainly related to increases in sales to data communications and research and defense customers.

For the three months ended June 30, 2024, net revenues from MSD increased $16 million compared to the prior quarter, primarily due to an increase in chemistry sales due to seasonality as a result of the Lunar New Year in the prior quarter. For the six months ended June 30, 2024, revenues from MSD decreased $22 million compared to the same period in the prior year, primarily due to lower equipment revenue as customers postponed certain investment decisions, and a small decrease in chemistry sales, primarily due to lower palladium prices that are passed on to our customers, offset by increases in chemistry volumes.

Gross margin

	Three Months Ended			Six Months Ended		
	June 30, 2024	March 31, 2024	% Points Change	June 30, 2024	June 30, 2023	% Points Change
Gross margin as a percentage of net revenues:						
Products	46.6 %	47.2 %	(0.6)%	46.9 %	45.0 %	1.9 %
Services	51.9 %	52.1 %	(0.2)%	52.0 %	43.2 %	8.8 %
Total gross margin	47.3 %	47.8 %	(0.5)%	47.5 %	44.8 %	2.7 %

Gross margin for our products decreased for the three months ended June 30, 2024 compared to the prior quarter, mainly as a result of higher warranty costs and higher tariff and duty costs.

Gross margin for our products increased for the six months ended June 30, 2024 compared to the same period in the prior year, primarily due to favorable product mix, higher factory utilization and lower material costs, partially offset by higher warranty costs.

Gross margin for our services decreased for the three months ended June 30, 2024 compared to the prior quarter, mainly as a result of higher excess and obsolete inventory charges for service parts.

Gross margin for our services increased for the six months ended June 30, 2024 compared to the same period in the prior year, primarily due to favorable product mix, higher revenue volumes, and lower direct labor and overhead costs.

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

	Three Months Ended			Six Months Ended		
	June 30, 2024	March 31, 2024	% Points Change	June 30, 2024	June 30, 2023	% Points Change
Gross margin as a percentage of net revenues:						
Vacuum Solutions Division	42.4 %	42.3 %	0.1 %	42.4 %	41.9 %	0.5 %
Photonics Solutions Division	43.2 %	46.4 %	(3.2)%	44.8 %	43.8 %	1.0 %
Materials Solutions Division	56.2 %	55.6 %	0.6 %	55.9 %	49.2 %	6.7 %
Total gross margin	47.3 %	47.8 %	(0.5)%	47.5 %	44.8 %	2.7 %

Gross margin for VSD was flat for the three months ended June 30, 2024, compared to the prior quarter. Gross margin for VSD increased for the six months ended June 30, 2024, compared to the same period in the prior year, primarily due to higher factory utilization and lower material costs partially offset by lower revenue volumes, unfavorable product mix and higher warranty costs.

Gross margin for PSD decreased for the three months ended June 30, 2024, compared to the prior quarter, primarily due to unfavorable product mix, unfavorable factory utilization, higher warranty cost and higher excess and obsolete inventory charges. Gross margin for PSD increased for the six months ended June 30, 2024 compared to the same period in the prior year, primarily due to higher revenue volumes, lower freight and duty costs and lower excess and obsolete inventory charges, partially offset by higher physical inventory and material variances.

Gross margin for MSD increased for the three months ended June 30, 2024, compared to the prior quarter, primarily due to favorable product mix and lower palladium prices, partially offset by higher warranty costs. Gross margin for MSD increased for the six months ended June 30, 2024, compared to the same period in the prior year, primarily due to lower palladium prices, favorable product mix and lower excess and obsolete inventory charges, partially offset by higher warranty cost.

Research and development

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Research and development	$ 66	$ 70	$ 136	$ 147

For the three months ended June 30, 2024, research and development expenses decreased $4 million compared to the prior quarter, primarily due to a decrease of $5 million in compensation-related costs, including salaries, fringe and bonus expenses. Research and development expenses decreased by $11 million for the six months ended June 30, 2024 compared to the same period in the prior year, mainly due to decreases of $7 million in compensation-related costs, including salaries, fringe and bonus expenses, $2 million in project material costs and $2 million in test equipment costs.

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 three to thirty-six months but may be extended for development of new products.

We continue to make product advancements designed to meet our customers' evolving needs. We have developed, and continue to develop, new products designed 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 seek to 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

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Selling, general and administrative	$ 161	$ 170	$ 331	$ 348

For the three months ended June 30, 2024, selling, general and administrative expenses decreased $9 million, compared to the prior quarter, primarily due to a decrease of $11 million in compensation-related costs including stock compensation and fringe costs.

For the six months ended June 30, 2024, selling, general and administrative expenses decreased $17 million, compared to the same period in the prior year, mainly as a result of decreases of $17 million in compensation-related costs and $10 million in net costs incurred as a result of the ransomware event in February 2023, partially offset by increases of $5 million in information technology investments and $3 million in consulting and professional fees.

Acquisition and integration costs

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Acquisition and integration costs	$ 2	$ 1	$ 3	$ 11

Acquisition and integration costs incurred during the three and six months ended June 30, 2024 and 2023 were related to consulting and professional fees related to the Atotech Acquisition.

Restructuring and other

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Restructuring and other	$ 2	$ 3	$ 5	$ 12

Restructuring charges during the three and six months ended June 30, 2024 and three months ended March 31, 2024, primarily related to severance costs as a result of a global cost saving initiative implemented in the fourth quarter of 2023. Restructuring charges during the six months ended June 30, 2023 primarily related to severance costs as a result of global cost saving initiatives implemented in each of the first and second quarters of 2023.

Fees and expenses related to amendments to the Term Loan Facility

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Fees and expenses related to amendments to the Term Loan Facility	$ —	$ 3	$ 3	$ —

During the three months ended March 31, 2024 and six months ended June 30, 2024, we recorded fees and expenses related to borrowing additional USD Tranche B and additional Euro Tranche B, each as defined and described further below under “Credit Facilities,” pursuant to the Second Amendment to Credit Agreement, dated as of January 22, 2024, by and among us as parent borrower, the other loan parties party thereto, JPMorgan Chase Bank, N.A., as administrative agent, and each lender party thereto (the “Second Amendment”).

Amortization of intangible assets

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Amortization of intangible assets	$ 61	$ 62	$ 123	$ 157

For the three months ended June 30, 2024, amortization of intangible assets decreased by $1 million, compared to the prior quarter. For the six months ended June 30, 2024, amortization of intangible assets decreased by $34 million, compared to the same period in the prior year, primarily due to backlog related to MSD being fully amortized in the three months ended December 31, 2023, and the write-off of completed technology at our equipment solutions business (“ESB”) reporting unit of PSD in the second quarter of 2023.

Goodwill and intangible asset impairments

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Goodwill and intangible asset impairments	$ —	$ —	$ —	$ 1,827

During the three months 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 the ESB reporting unit of 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.

We have concluded there were no triggering events across our reporting units through the six months ended June 30, 2024.

Interest expense, net

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Interest expense, net	$ 74	$ 81	$ 155	$ 166

For the three months ended June 30, 2024, interest expense, net decreased $7 million, compared to the prior quarter, primarily related to the issuance of $1.4 billion of Convertible Notes, as defined and described further below under “Convertible Notes,” at a coupon rate of 1.25%, in May 2024. Of the proceeds, $1.2 billion was used to pay down our loans under the Term Loan Facility, as defined and described further below under “Credit Facilities,” at an interest rate of approximately 7.8%. For the six months ended June 30, 2024, interest expense, net decreased by $11 million compared to the same period in the prior year. In addition to the issuance of the Convertible Notes and subsequent pay down of our loans under the Term Loan Facility, interest expense, net was lower as a result of the voluntary prepayments of $100 million in October 2023, $50 million in February 2024 and $50 million in April 2024 on loans under the Term Loan Facility.

Loss on extinguishment of debt

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Loss on extinguishment of debt	$ 38	$ 9	$ 47	$ —

For the three and six months ended June 30, 2024, in connection with the issuance in May 2024 of the Convertible Notes, as defined and described further below under “Credit Facilities,” we recorded a loss on extinguishment of debt as a result of the acceleration of deferred financing and original issue discount costs associated with our loans under the Term Loan Facility.

For the three months ended March 31, 2024 and the six months ended June 30, 2024, we recorded a loss on extinguishment of debt as a result of the acceleration of deferred financing costs associated with the extinguishment of our senior secured tranche A term loans using proceeds from borrowing additional USD Tranche B and additional Euro Tranche B pursuant to the Second Amendment.

Other (income) expense, net

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
Other (income) expense, net	$ (7)	$ (3)	$ (10)	$ 9

Other (income) expense, net, for the three and six months ended June 30, 2024, three months ended March 31, 2024 and six months ended June 30, 2023, consisted primarily of net foreign exchange and fair value gains and losses.

Benefit (provision) for income taxes

	Three Months Ended		Six Months Ended	
(dollars in millions)	June 30, 2024	March 31, 2024	June 30, 2024	June 30, 2023
(Benefit) provision for income taxes	$ (1)	$ 4	$ 4	$ (59)

Our effective tax rates for the three months ended June 30, 2024 and March 31, 2024 were (3.6)% and 23.1% respectively. Our effective tax rate for the three months ended June 30, 2024 was lower than the U.S. statutory tax rate mainly due to the tax benefit related to the U.S deduction for foreign derived intangibles income (“FDII”) and research and development

credits, partially offset by an expected increase in foreign withholding taxes and U.S. base erosion and anti-abuse tax. Our effective tax rate for the three months ended March 31, 2024 was higher than the U.S. statutory tax rate, mainly due to an expected increase in foreign withholding taxes and U.S. base erosion and anti-abuse tax, partially offset by the U.S. deduction for FDII and research and development credits.

Our effective tax rates for the six months ended June 30, 2024 and 2023 were 8.9% and 3.2%, respectively. Our effective tax rate for the six months ended June 30, 2024 was lower than the U.S. statutory tax rate mainly due to the tax benefit related to the U.S deduction for FDII and research and development credits, partially offset by an expected increase in foreign withholding taxes and U.S. base erosion and anti-abuse tax. Our effective tax rate for the six months ended June 30, 2023 was lower than the U.S. statutory tax rate primarily due to the tax benefit related to the impairment of intangible assets.

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 investments at June 30, 2024 and December 31, 2023 totaled $851 million and $875 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 income (loss), 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 $189 million for the six months ended June 30, 2024, resulting from net income of $37 million, which included non-cash charges of $198 million, mainly the result of $175 million of depreciation and amortization expense and $47 million of loss on extinguishment of debt, partially offset by $95 million in deferred income taxes and a net increase in working capital of $46 million. The net increase in working capital was primarily due to a decrease in accrued compensation of $48 million, a decrease in accounts payable of $30 million and a decrease in other current and non-current liabilities of $26 million. This net increase in working capital was partially offset by an increase in income taxes payable of $33 million and a decrease in other current and non-current assets of $23 million.

Net cash used in investing activities was $44 million for the six months ended June 30, 2024, and consisted primarily of $45 million in capital expenditures.

Net cash used in financing activities was $159 million for the six months ended June 30, 2024, primarily due to net proceeds from the issuance of Convertible Notes of $1.4 billion and incremental loans under the Term Loan Facility in an aggregate principal amount of $761 million. The proceeds of the incremental loans under the Term Loan Facility were used in part to prepay the USD Tranche A term loans outstanding under the Credit Agreement in full in an aggregate principal amount of $744 million and the proceeds of the Convertible Notes were used in part to prepay a portion of the USD Tranche B loans in an aggregate principal amount of $1.2 billion. In addition, there were normal quarterly debt payments and voluntary prepayments that totaled $125 million. We also made payments of $167 million to purchase a capped call option related to the Convertible Notes, $33 million of debt financing costs and $30 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 and second quarters of 2024 and 2023, our Board of Directors declared a cash dividend of $0.22 per share. The cash dividends totaled $30 million and $29 million for the six months ended June 30, 2024 and 2023, respectively. On August 5, 2024, our Board of Directors declared a quarterly cash dividend of $0.22 per share to be paid on September 6, 2024 to stockholders of record as of August 26, 2024. 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.

Credit Facilities

In connection with the completion of the Atotech Acquisition, on August 17, 2022 (the "Effective Date") 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, which we have amended several times since (as amended, the "Credit Agreement"). As of June 30, 2024, the Credit Agreement provided for (i) a senior secured term loan facility comprised of two tranches: a $2.7 billion loan (the "USD Tranche B") and a €838 million loan (the "Euro Tranche B" and together with the USD Tranche B, the "Term Loan Facility") and (ii) a senior secured revolving credit facility of $675 million (the "Revolving Facility" and, together with the Term Loan Facility, the "Credit Facilities"), with the commitments under each of the foregoing facilities subject to increase from time to time subject to certain conditions.

As of June 30, 2024, borrowings under the Credit Facilities bore 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 B and the 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 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 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%. As of June 30, 2024, the applicable margins for borrowings under the Credit Facilities were (i) under the USD Tranche B and the Revolving Facility, 1.50% with respect to base rate borrowings and 2.50% with respect to Term SOFR borrowings and (ii) under the Euro Tranche B, 3.00%.

In addition to paying interest on outstanding principal under the Credit Facilities, we are required to pay a commitment fee in respect of the unutilized commitments under the Revolving Facility. As of June 30, 2024, the commitment fee was 0.375% per annum. The commitment fee is subject to adjustment based on our first lien net leverage ratio as of the end of the preceding fiscal quarter. We must also pay customary letter of credit fees and agency fees.

As of June 30, 2024, the weighted average interest rate of the Term Loan Facility was 7.5%. The Revolving Facility has a maturity date in August 2027 while the USD Tranche B and Euro Tranche B have a maturity date in August 2029. As of June 30, 2024, there were no borrowings under the Revolving Facility.

On July 23, 2024, we entered into the Fourth Amendment to the Credit Agreement (the "Repricing Amendment"). Pursuant to the Repricing Amendment we (i) refinanced the existing USD Tranche B loan and Euro Tranche B loan with a new $2.6 billion USD Tranche B loan and a new €800 million Euro Tranche B loan, (ii) decreased the applicable margin for the USD Tranche B from 2.50% to 2.25% with respect to Term SOFR borrowings and from 1.50% to 1.25% with respect to base rate borrowings, (iii) decreased the applicable margin for the Euro Tranche B from 3.00% to 2.75% and (iv) provided that a 1.00% prepayment premium may be required if we prepay any loans under the Term Loan Facility in connection with a repricing transaction prior to January 23, 2025. In connection with the execution of the Repricing Amendment, we paid customary fees and expenses to JPMorgan Chase Bank, N.A. On July 23, 2024, immediately prior to the effectiveness of the Repricing Amendment, we made a voluntary prepayment of $110 million aggregate principal amount of the Term Loan Facility, consisting of $69 million principal amount of the USD Tranche B loan and €38 million principal amount of the Euro Tranche B loan.

We are required to make scheduled quarterly principal payments equal to approximately $10 million with respect to the USD Tranche B and approximately €2 million with respect to the Euro Tranche B, in each case with the balance due thereunder on the seventh anniversary of the Effective Date. There is no scheduled amortization under the Revolving Facility. Any principal amount outstanding under the Revolving Facility is due and payable in full on the fifth anniversary of the Effective Date.

Under the Credit Agreement, we are required to prepay outstanding term loans, subject to certain exceptions, with portions of our annual excess cash flow as well as with the net cash proceeds of certain of its asset sales, certain casualty and condemnation events and the incurrence 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 Revolving Facility exceeds the aggregate commitments under the 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, and have voluntarily repaid, outstanding loans under the 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 and any prepayment premium that might be applicable to repayments we make prior to January 23, 2025. Additionally, we may voluntarily reduce the unutilized portion of the commitment amount under the Revolving Facility.

All obligations under the 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 Credit Agreement, we have the ability to incur additional incremental debt facilities in an amount up to (x) the greater of (1) $1,011 million and (2) 75% of consolidated earnings before interest, taxes, depreciation, and amortization, plus (y) an amount equal to the sum of all voluntary prepayments of term loans under the 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).

The Credit Agreement contains customary representations and warranties, covenants and provisions relating to events of default. As of June 30, 2024, we were in compliance with all covenants under the Credit Agreement. The USD Tranche B and the Euro Tranche B are not subject to financial maintenance covenants.

On May 16, 2024, we completed a private offering of Convertible Notes. A significant portion of the net proceeds from the offering was used to repay approximately $1.2 billion of the USD Tranche B. As a result of the repayment, we recorded a $38 million loss on extinguishment of debt.

Convertible Notes

On May 16, 2024, we completed a private offering of $1.4 billion aggregate principal amount of convertible senior notes due 2030 (the "Convertible Notes"). The Convertible Notes were sold in a private placement under a purchase agreement, dated as of May 13, 2024, entered into by and among us and Morgan Stanley & Co. LLC, J.P. Morgan Securities LLC, BofA Securities, Inc. and Mizuho Securities USA LLC, as representatives of the several initial purchasers named therein, for resale to persons reasonably believed to be qualified institutional buyers in reliance on Rule 144A under the Securities Act of 1933, as amended.

The net proceeds from the offering were approximately $1.4 billion after deducting the initial purchasers' discounts and commissions and estimated offering expenses paid by us. We used approximately $167 million of the net proceeds from the offering to pay the cost of the capped call transactions described below. We used the remaining net proceeds from the offering to repay approximately $1.2 billion in borrowings outstanding under the USD Tranche B, together with accrued interest, as well as for general corporate purposes.

Indenture and the Convertible Notes

On May 16, 2024, we entered into an indenture (the "Indenture") with respect to the Convertible Notes with U.S. Bank Trust Company, National Association, as trustee. Under the Indenture, the Convertible Notes are senior unsecured obligations of ours and bear interest at a coupon rate of 1.25% per annum, with interest payable semiannually in arrears on June 1 and December 1 of each year, beginning on December 1, 2024. The Convertible Notes will mature on June 1, 2030, unless earlier converted, redeemed or repurchased in accordance with their terms.

Subject to certain conditions, on or after June 5, 2027, we may redeem for cash all or any portion of the Convertible Notes at a redemption price equal to 100% of the principal amount of the Convertible Notes to be redeemed, plus accrued and unpaid interest to, but excluding, the redemption date, if the last reported sale price of our common stock has been at least 130% of the conversion price then in effect for at least 20 trading days (whether or not consecutive) during the period of 30 consecutive trading days ending on, and including, the trading day immediately preceding the date the notice of redemption is sent.

The conversion rate for the Convertible Notes is initially 6.4799 shares of our common stock per one thousand dollars principal amount of Notes, which is equivalent to an initial conversion price of approximately $154.32 per share. The conversion rate is subject to adjustment upon the occurrence of certain events.

Upon conversion, we will pay cash up to the aggregate principal amount of the Convertible Notes to be converted and pay or deliver, as the case may be, cash, shares of common stock or a combination of cash and shares of common stock, at our election, in respect of the remainder, if any, of its conversion obligation in excess of the aggregate principal amount of the Convertible Notes being converted. Prior to March 1, 2030, noteholders may convert all or any portion of their Convertible Notes only upon the occurrence of certain events and during certain periods, and thereafter, at any time until the second scheduled trading day immediately preceding the maturity date.

If we undergo a fundamental change (as defined in the Indenture) prior to the maturity date of the Convertible Notes, holders may require us to repurchase for cash all or any portion of their Convertible Notes at a fundamental change repurchase price equal to 100% of the principal amount of the Convertible Notes to be repurchased, plus any accrued and unpaid interest to, but excluding, the fundamental change repurchase date.

The Indenture contains customary terms and covenants, including that upon certain events of default that are occurring and continuing, either the trustee or the holders of at least 25% in aggregate principal amount of the outstanding Convertible Notes may declare 100% of the principal of, and accrued and unpaid interest, if any, on, all the Convertible Notes to be due and payable.

As of June 30, 2024, the Convertible Notes are classified as a long-term liability, net of issuances costs, on the condensed consolidated balance sheet. The Convertible Notes were issued at par and costs associated with the issuance of the Convertible Notes are amortized to interest expense over the contractual term of the Convertible Notes. As of June 30, 2024, the effective interest rate of the Convertible Notes was 1.56%.

Capped Call Transactions

On May 13, 2024, in connection with the pricing of the Convertible Notes, and on May 14, 2024, in connection with the exercise in full by the initial purchasers of their option to purchase additional Convertible Notes, we entered into privately negotiated capped call transactions with certain of the initial purchasers of the Convertible Notes or their respective affiliates and other financial institutions. The capped call transactions are expected generally to reduce the potential dilution to our common stock upon conversion of any Convertible Notes and/or offset any cash payments that we are required to make in excess of the principal amount of any converted Convertible Notes, as the case may be, with such reduction and/or offset subject to a cap initially equal to $237.42 per share (which represents a premium of 100% over the last reported sale price of $118.71 per share of our common stock on The Nasdaq Global Select Market on May 13, 2024), and is subject to customary adjustments under the terms of the capped call transactions.

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 June 30, 2024 and December 31, 2023 of up to an equivalent of $19 million and $14 million, respectively. There were no borrowings under these arrangements at June 30, 2024 and December 31, 2023.

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 5 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 Term Loan Facility.

Contractual Obligations

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

Recent Accounting Pronouncements

Segment Reporting (Topic 280): Improvements to Reportable Segment Disclosures

In November 2023, the Financial Accounting Standards Board ("FASB") issued Accounting Standard Update ("ASU") No. 2023-07, Segment Reporting (Topic 280): Improvements to Reportable Segment Disclosures, which requires a public entity to disclose significant segment expenses and other segment items on an annual and interim basis and provide in interim periods all disclosures about a reportable segment's profit or loss and assets that are currently required annually. Additionally, it requires a public entity to disclose the title and position of the Chief Operating Decision Maker. The ASU does not change how a public entity identifies its operating segments, aggregates them, or applies the quantitative thresholds to determine its reportable segments. The new standard is effective for fiscal years beginning after December 15, 2023, and interim periods within fiscal years beginning after December 15, 2024, with early adoption permitted. A public entity should apply the amendments in this ASU retrospectively to all prior periods presented in the financial statements. We are currently evaluating the impact of this ASU on our disclosures within the consolidated financial statements.

Income Taxes (Topic 740): Improvements to Income Tax Disclosures

In December 2023, the FASB issued ASU No. 2023-09, Income Taxes (Topic 740): Improvements to Income Tax Disclosures, which focuses on the rate reconciliation and income taxes paid. ASU No. 2023-09 requires a public business entity ("PBE") to disclose, on an annual basis, a tabular rate reconciliation using both percentages and currency amounts, broken out into specified categories with certain reconciling items further broken out by nature and jurisdiction to the extent those items exceed a specified threshold. In addition, all entities are required to disclose income taxes paid, net of refunds received disaggregated by federal, state/local, and foreign and by jurisdiction if the amount is at least 5% of total income tax payments, net of refunds received. For PBEs, the new standard is effective for annual periods beginning after December 15, 2024, with early adoption permitted. An entity may apply the amendments in this ASU prospectively by providing the revised disclosures for the period ending December 31, 2025 and continuing to provide the pre-ASU disclosures for the prior periods, or may apply the amendments retrospectively by providing the revised disclosures for all period presented. We are currently evaluating the impact of this ASU on our consolidated financial statements and related disclosures.

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 June 30, 2024, there were no material changes in our exposure to market risk from December 31, 2023.

ITEM 4. CONTROLS AND PROCEDURES.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer (who serves as both our principal executive officer and principal financial officer), evaluated the effectiveness of our disclosure controls and procedures as of June 30, 2024. 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 (“SEC”) 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 concluded that, as of June 30, 2024, our disclosure controls and procedures were effective to provide reasonable assurance that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms and is accumulated and communicated to our management, including our Chief Executive Officer, as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the quarter ended June 30, 2024 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, 2023 filed with the U.S. Securities and Exchange Commission on February 27, 2024 (the "Annual Report").

The risk factor disclosure in the Annual Report is qualified by new risk factor disclosure set forth below related to our recent offering of $1.4 billion aggregate principal amount of convertible senior notes due 2030 (the "Convertible Notes").

The market price of our common stock has fluctuated and may continue to fluctuate for reasons over which we have no control.

The stock market has from time to time experienced, and is likely to continue to experience, extreme price and volume fluctuations. For example, the closing price of our common stock ranged from a high of $137.16 to a low of $97.35 between January 1, 2024 and June 30, 2024. Prices of securities of technology companies have been especially volatile and have often fluctuated for reasons that are unrelated to the operating performance of the companies. Historically, the market price of shares of our common stock has fluctuated greatly and could continue to fluctuate due to a variety of factors. In the past, companies that have experienced volatility in the market price of their stock have been the subject of securities class action litigation. If we become the subject of securities class action litigation, it could result in substantial costs and a diversion of our management's attention and resources.

The market price of our common stock is also likely to be influenced by the Convertible Notes. For example, the market price of our common stock could become more volatile and could be depressed by: (i) investors' anticipation of the potential resale in the market of a substantial number of additional shares of our common stock received upon conversion of the Convertible Notes; and (ii) hedging or arbitrage trading activity that may develop involving the Convertible Notes and our common stock.

Our consolidated indebtedness has increased substantially as a result of the Atotech Acquisition, as well as our offering of the Convertible Notes. This increased level of indebtedness could adversely affect us, including by increasing our interest expense and decreasing our business flexibility.

As of July 31, 2024, we had approximately $3.6 billion of principal indebtedness outstanding under a senior secured term loan facility (the "Term Loan Facility") comprised of two tranches: a $2.6 billion loan (the "USD Tranche B") and a €800 million loan (the "Euro Tranche B"). As of July 31, 2024, we also had $675 million of available borrowing capacity under a senior secured revolving credit facility (the "Revolving Facility" and together with the Term Loan Facility, the "Credit Facilities"). On May 16, 2024, we completed a private offering of $1.4 billion aggregate principal amount of the Convertible Notes, and used approximately $1.2 billion of the proceeds to partially repay borrowings under the USD Tranche B.

This level of indebtedness could have the effect, among other things, of reducing our flexibility to respond to changing business, industry and economic conditions, limiting our ability to obtain financing in the future and increasing interest expense. We also have incurred and will continue to incur various costs and expenses associated with our indebtedness. The amount of cash required to pay interest on our increased indebtedness levels, and the demands on our cash resources that come from that debt, are significant. Our level of indebtedness could also reduce funds available for working capital, capital expenditures, acquisitions and other general corporate purposes and may create competitive disadvantages relative to other companies with lower debt levels. If the financial performance of the combined company does not meet current expectations, then our ability to service our indebtedness may be adversely impacted.

With respect to the Convertible Notes, the accounting method for convertible debt securities that may be settled in cash, such as the Convertible Notes, could have a material effect on our reported financial results. Furthermore, in the event the conditional conversion feature of the Convertible Notes is triggered, holders of Convertible Notes will be entitled to convert the Convertible Notes at any time during specified periods at their option. If one or more holders elect to convert their Convertible Notes, we would be required to settle any converted principal in cash, which could adversely affect our liquidity. In addition, even if holders do not elect to convert their Convertible Notes, we would be required under applicable accounting rules to reclassify all or a portion of the outstanding principal of the Convertible Notes as a current rather than long-term liability, which would result in a material reduction of our net working capital.

If a fundamental change occurs prior to the maturity date of the Convertible Notes, holders of the Convertible Notes will have the right, at their option, to require us to repurchase all or a portion of their Notes. In addition, if a make-whole

fundamental change occurs prior to the maturity date of the Convertible Notes, we will in some cases be required to increase the conversion rate for a holder that elects to convert its Convertible Notes in connection with such make-whole fundamental change. Furthermore, the indenture governing the Convertible Notes prohibits us from engaging in certain mergers or acquisitions unless, among other things, the surviving entity assumes our obligations under the Convertible Notes and the indenture. These and other provisions in the indenture could deter or prevent a third party from acquiring us even when the acquisition may be favorable to investors.

Despite our current level of indebtedness, we and our subsidiaries may still be able to incur more indebtedness. Although our debt agreements contain restrictions on the incurrence of additional indebtedness, these restrictions are subject to certain qualifications and exceptions, and thus, additional indebtedness may be incurred in compliance with these restrictions. This could further exacerbate the risks we describe.

Moreover, we may be required to raise substantial additional financing to fund working capital, capital expenditures, acquisitions or other general corporate requirements. Our ability to arrange additional financing or refinancing will depend on, among other factors, our financial position and performance, as well as prevailing market conditions and other factors beyond our control. There can be no assurance that we will be able to obtain additional financing or refinancing on terms acceptable to us or at all.

ITEM 5. OTHER INFORMATION.

For the three months ended June 30, 2024, none of our directors or officers (as defined in Rule 16a-1(f) under the Exchange Act) adopted or terminated a trading arrangement for the sale or purchase of Company securities that is either (1) a contract, instruction or written plan intended to satisfy the affirmative defense conditions of Rule 10b5-1(c) or (2) a “non-Rule 10b5-1 trading arrangement” (as defined in Item 408(c) of Regulation S-K).

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
+4.1(5)	Indenture, dated May 16, 2024, between the Registrant and U.S. Bank Trust Company, National Association, as trustee
+4.2(5)	Form of Global Note (included with Exhibit 4.1)
10.1*	Employment Agreement, effective April 30, 2024, between John Williams and the Registrant
+10.2(6)*	Second Amendment, dated May 7, 2024, to Employment Agreement, effective September 16, 2019, between James A. Schreiner and the Registrant
+10.3(7)	Fourth Amendment to Credit Agreement, dated as of July 23, 2024, 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 and 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 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 with Embedded Linkbase Documents
104	Cover Page Interactive Data File (formatted as inline XBRL with applicable taxonomy extension information contained in Exhibits 101)

+ Previously filed

* Management contract or compensatory plan arrangement

(1) Incorporated by reference to the Registration Statement on Form S-4 (File No. 333-49738), filed with the Securities and Exchange Commission on November 13, 2000.

(2) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2001 (File No. 000-23621), filed with the Securities and Exchange Commission on August 14, 2001.

(3) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 30, 2002 (File No. 000-23621), filed with the Securities and Exchange Commission on August 13, 2002.

(4) Incorporated by reference to the Registrant's Current Report on Form 8-K (File No. 000-23621), filed with the Securities and Exchange Commission on May 6, 2014.

(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 May 16, 2024.

(6) 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 8, 2024.

(7) 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 July 23, 2024.

SIGNATURES

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

MKS INSTRUMENTS, INC.

Date: August 8, 2024

By: /s/ John T.C. Lee

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

Exhibit 10.1

EMPLOYMENT AGREEMENT

-

This Employment Agreement is effective 30 day of April 2024, by and between MKS Instruments, Inc., a Massachusetts corporation ("MKS" or the "Company"), and John Williams of Tualatin, Oregon ("Employee").

WHEREAS, the Company and Employee entered into an Employment Agreement effective March 19, 2021 (the "Prior Employment Agreement");

WHEREAS, the Company and Employee intend to amend and restate the terms of their employment relationship as more particularly set forth herein in connection with Employee's promotion to Executive Vice President and General Manager, Photonics Solutions Division; and

WHEREAS, the Company and Employee intend that as of the Start Date (as defined below), this Employment Agreement and the Confidential Information Agreement referenced in Section 2 below shall supersede the Prior Employment Agreement and any other agreements relating to the employment relationship between the Company and Employee, including the Confidential Information Agreement of MKS Instruments, Inc. March 19, 2021; and

NOW THEREFORE, in consideration of the premises and the mutual promises contained herein, the Company and Employee hereby agree as follows:

1. Employment. The Company is employing Employee on an at-will basis in the position of Executive Vice President and General Manager, Photonics Solutions Division, beginning May 12, 2024 (the "Start Date"). Employee's principal place of employment shall be Beaverton, Oregon. Employee agrees to comply with the Company's policies.

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

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

4. Compensation.

(a)**Base Salary.** The Company will pay Employee base salary at the rate of $450,000 per year, less applicable withholding and deductions (the "Base Salary"), in accordance with the Company's normal payroll practices. The Company may review and adjust the amount of the Base Salary from time to time in its sole discretion.

(b)**Incentive Compensation Plan.** Employee will be entitled to participate in the Company's Management Incentive Plan, to the extent applicable to Employee's position. Employee's bonus target will be 65% of eligible earnings, subject to the terms and conditions of the Management Incentive Plan. The Company may review and adjust the amount of the bonus target from time to time in its sole discretion.

(c)**Stock Incentive Plan.** Employee will continue to be entitled to participate in the Company's stock incentive plan to the extent applicable to Employee's position. Employee is eligible to receive a 2024 target equity award with a grant date value of $650,000 on May 15, 2024, which will consist of 50% time-based restricted stock units ("RSU's") and 50% performance-based restricted stock units ("PSUs") under the 2022 Stock Incentive Plan. Such equity award shall vest and be subject to the performance criteria as approved by MKS' Compensation Committee for all other executive officers' 2024 annual equity awards at its meeting on February 5, 2024 and as set forth in such restricted stock unit agreements under the 2022 Stock Incentive Plan.

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

(e)**Paid Time Off.** Employee will be eligible for 25 days of paid vacation per year, plus paid sick time and holidays, all subject to the terms and conditions of the Company's policies.

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

5. End of Employment. Either Employee or the Company may end the employment relationship at any time, for any reason, with or without notice or cause. The employment relationship will end automatically and immediately upon Employee's death or entitlement to long-term disability benefits under the Company's long-term disability program. The date on which Employee's employment ends, regardless of how it ends, is referred to in this Employment Agreement as the "Employment End Date." If Employee resigns or the Company terminates Employee's employment, the Company will (in either case) have the right at any time, for any reason in its sole discretion to decide the Employment End Date.

In no event will the Company's deciding the Employment End Date following Employee's resignation be considered termination by the Company of Employee's employment.

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

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

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

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

(d)**Eligibility for Ordinary Severance Compensation**. If the Company terminates Employee's employment, Employee will be eligible for Ordinary Severance Compensation, as described below, provided that all of the following conditions are satisfied: (i) the Company's primary reason for terminating Employee's employment was a change to the Company's business needs (such as reduction in force or elimination of position) and not Cause as defined below; (ii) Employee has complied with and continues to comply with all of Employee's obligations under this Employment Agreement and the Confidential Information Agreement; and (iii) Employee executes, provides to the Company within 45 days after the Employment End Date and does not thereafter revoke or attempt to revoke, a general release of claims, which may at the Company's option and in the Company's sole discretion include post-employment restrictions substantially identical to the post-employment restrictions contained in Section 7 below, all in a form satisfactory to the Company ("General Release Agreement"). The Company's good-faith determination that one or more of the conditions listed above has not been satisfied will be binding and conclusive.

(e)**"Ordinary Severance Compensation."** If employee becomes eligible for Ordinary Severance Compensation:

(i) **Base Salary.** The Company will pay Employee, within 14 days after the General Release Agreement becomes irrevocable, a lump sum in an amount equal to 12 months of Base Salary.

(ii) **Continuation of Benefits.** For a period of 12 months after the Employment End Date, to the extent Employee is eligible for and elects to continue group medical, vision, or dental insurance coverage under COBRA and timely remits the amount of premium assessed to similarly situated active employees for comparable coverage, the Company will pay the Company's usual share of such premiums. Benefits payable under this Section 6(e)(ii) will terminate to the extent Employee ceases to be eligible for COBRA coverage under the Company's medical benefits plan. Notwithstanding the foregoing, the Company will not pay the contribution toward COBRA coverage described above to the extent that the Company reasonably determines that doing so would subject the Company to the excise tax under Section 4980D of the Internal Revenue Code (the "Code") (as a result of discriminatory coverage under a group health plan).

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

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

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

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

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

(iv) **Restricted Stock Units or Stock Appreciation Rights.** Employee's unvested equity awards as of the Employment End Date will be subject to accelerated vesting to the extent provided in the respective equity award agreement issued to Employee under the then effective MKS Instruments, Inc. equity incentive plan (including the MKS Instruments, Inc. 2022 Stock Incentive Plan).

(h)**No Obligation to Mitigate Damages; Effect on Other Contractual Rights.** Employee will not be required to mitigate damages, by seeking other employment or otherwise, as a condition of receiving any portion of the Ordinary Severance Compensation or the Enhanced Severance Compensation. Nor will the Ordinary Severance Compensation or the Enhanced Severance Compensation be reduced by any compensation earned by Employee as the result of employment by an employer other than the Company or a direct or indirect parent, subsidiary or affiliate of the Company after the Employment End Date. Nothing in this Section 6(h) is intended to or shall delay, prevent or require any compensation for any termination of COBRA benefits that may occur pursuant to Section 6(e)(ii) or Section 6(g)(iii) above.

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

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

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

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

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

a cure within 10 days after the Company notifies Employee in writing of the breach.

(j) **“Good Reason.”** “Good Reason” for Employee to resign will exist if, without Employee’s express written consent:

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

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

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

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

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

7. Non-Competition.

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

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

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

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

(e)The Non-Compete Period shall be extended to two (2) years upon Employee’s breach of his/her fiduciary duty and/or unlawful taking, physically or electronically, of property belonging to the Company.

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

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

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

(i) Employee has had an opportunity to have this Agreement reviewed by an attorney before signing.

(j) Employee acknowledges and agrees that this non-competition covenant is supported by the following mutually-agreed upon consideration, which the parties acknowledge and agree is fair and reasonable: at-will employment with the Company, the compensation and benefits associated therewith and the other terms and conditions of this Agreement.

(k)If and to the extent Employee is employed in California, the provisions of this Section 7 shall not apply.

8. Code Section 409A Compliance.

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

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

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

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

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

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

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

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

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

15. Arbitration and Waiver of Jury Trial.

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

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

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

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

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

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

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

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

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

MKS INSTRUMENTS, INC.

By: /s/ Sally Ann Bouley
Sally Ann Bouley

Dated: April 30, 2024

Title: EVP & Chief Human Resources Officer

/s/ John Williams
John Williams

Dated: 4/3/24

EXHIBIT 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER AND PRINCIPAL FINANCIAL 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: August 8, 2024

/s/ John T.C. Lee

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

EXHIBIT 32.1

CERTIFICATION

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

AS ADOPTED PURSUANT TO

SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Quarterly Report on Form 10-Q of MKS Instruments, Inc. (the "Company") for the period ended June 30, 2024 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, 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, as amended; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: August 8, 2024

/s/ John T.C. Lee

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