UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

☒ Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the fiscal year ended December 31, 2022 or
☐ Transition Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934

Commission file number 1-8002

THERMO FISHER SCIENTIFIC INC.

(Exact name of Registrant as specified in its charter)

Delaware	04-2209186
(State of incorporation)	*(I.R.S. Employer Identification No.)*

168 Third Avenue
Waltham, Massachusetts 02451
(Address of principal executive offices) (Zip Code)

Registrant's telephone number, including area code: (781) 622-1000

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, $1.00 par value	TMO	New York Stock Exchange
0.750% Notes due 2024	TMO 24A	New York Stock Exchange
0.125% Notes due 2025	TMO 25B	New York Stock Exchange
2.000% Notes due 2025	TMO 25	New York Stock Exchange
3.200% Notes due 2026	TMO 26B	New York Stock Exchange
1.400% Notes due 2026	TMO 26A	New York Stock Exchange
1.450% Notes due 2027	TMO 27	New York Stock Exchange
1.750% Notes due 2027	TMO 27B	New York Stock Exchange
0.500% Notes due 2028	TMO 28A	New York Stock Exchange
1.375% Notes due 2028	TMO 28	New York Stock Exchange
1.950% Notes due 2029	TMO 29	New York Stock Exchange
0.875% Notes due 2031	TMO 31	New York Stock Exchange
2.375% Notes due 2032	TMO 32	New York Stock Exchange
3.650% Notes due 2034	TMO 34	New York Stock Exchange
2.875% Notes due 2037	TMO 37	New York Stock Exchange
1.500% Notes due 2039	TMO 39	New York Stock Exchange
1.875% Notes due 2049	TMO 49	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the Registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months 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 during the preceding 12 months. 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 ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to § 240.10D-1(b). ☐

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 1, 2022, the aggregate market value of the voting stock held by nonaffiliates of the Registrant was approximately $214,582,365,000 (based on the last reported sale of common stock on the New York Stock Exchange Composite Tape reporting system on July 1, 2022).

As of February 4, 2023, the Registrant had 385,430,077 shares of Common Stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Sections of Thermo Fisher's definitive Proxy Statement for the 2023 Annual Meeting of Shareholders are incorporated by reference into Parts II and III of this report.

THERMO FISHER SCIENTIFIC INC.

ANNUAL REPORT ON FORM 10-K
FOR THE FISCAL YEAR ENDED DECEMBER 31, 2022
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PART I

Forward-looking Statements

Forward-looking statements, within the meaning of Section 21E of the Securities Exchange Act of 1934 (the Exchange Act), are made throughout this Annual Report on Form 10-K. Any statements contained herein that are not statements of historical fact may be deemed to be forward-looking statements, including without limitation statements regarding: projections of revenues, expenses, earnings, margins, tax rates, tax provisions, cash flows, pension and benefit obligations and funding requirements, and our liquidity position; cost reductions, restructuring activities, new product and service developments, competitive strengths or market position, acquisitions or divestitures; growth, declines and other trends in markets we sell into; new or modified laws, regulations and accounting pronouncements; outstanding claims, legal proceedings, tax audits and assessments and other contingent liabilities; foreign currency exchange rates and fluctuations in those rates; general economic and capital markets conditions; the timing of any of the foregoing; assumptions underlying any of the foregoing; the expected impact of the COVID-19 pandemic on the company's business; and any other statements that address events or developments that Thermo Fisher intends or believes will or may occur in the future. Without limiting the foregoing, the words "believes," "anticipates," "plans," "expects," "seeks," "estimates," and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements are accompanied by such words. While the company may elect to update forward-looking statements in the future, it specifically disclaims any obligation to do so, even if the company's estimates change, and readers should not rely on those forward-looking statements as representing the company's views as of any date subsequent to the date of the filing of this report. A number of important factors could cause the results of the company to differ materially from those indicated by such forward-looking statements, including those detailed under the heading, "Risk Factors" in Part I, Item 1A.

Item 1. Business

Description of Business

Thermo Fisher Scientific Inc. (also referred to in this document as "Thermo Fisher," "we," the "company," or the "registrant") is the world leader in serving science. Our Mission is to enable our customers to make the world healthier, cleaner and safer. We serve customers working in pharmaceutical and biotech companies, hospitals and clinical diagnostic labs, universities, research institutions and government agencies, as well as environmental, industrial, research and development, quality and process control settings. Our global team delivers an unrivaled combination of innovative technologies, purchasing convenience and pharmaceutical services through our industry-leading brands, including Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific, Unity Lab Services, Patheon and PPD.

We continuously increase our depth of capabilities across our broad portfolio of innovative products and services and leverage our extensive global channels to address our customers' needs. We do this through organic investments in research and development, capacity, and through acquisitions. Our goal is to enable our customers to be more productive in an increasingly competitive business environment and enabling them to advance their important work.

Business Segments and Products

We report our business in four segments – Life Sciences Solutions, Analytical Instruments, Specialty Diagnostics, and Laboratory Products and Biopharma Services.

Life Sciences Solutions Segment

Through our Life Sciences Solutions segment, we provide an extensive portfolio of reagents, instruments and consumables used in biological and medical research, discovery and production of new drugs and vaccines as well as diagnosis of infection and disease. These products and services are used by customers in pharmaceutical, biotechnology, agricultural, clinical, healthcare, academic, and government markets. Life Sciences Solutions includes four primary businesses – Biosciences, Genetic Sciences, Clinical Next-Generation Sequencing, and BioProduction.

Our biosciences business includes reagents, instruments and consumables that help our customers conduct biological and medical research in areas such as molecular biology and protein biology, discover new drugs and vaccines, and diagnose infection and disease. Our genetic sciences business combines a wide variety of instruments and related reagents used to provide high-value genomic solutions to assist customer decisions in the research, clinical, healthcare and applied markets. Our clinical next-generation sequencing (NGS) business focuses on delivering simple, fast and cost-effective NGS technology for a range of applications with a particular focus on oncology. Our bioproduction business supports developers and manufacturers of biological-based therapeutics and vaccines with a portfolio of premium solutions and services focused on upstream cell

culture, downstream purification, analytics for detection and quantitation of process/product impurities, and a suite of single-use solutions spanning the biologics workflow.

Analytical Instruments Segment

Through our Analytical Instruments segment, we provide a broad offering of instruments and the supporting consumables, software and services that are used for a range of applications. These products and services are used by customers in pharmaceutical, biotechnology, academic, government, environmental and other research and industrial markets, as well as the clinical laboratory. This segment includes three primary businesses – Chromatography and Mass Spectrometry, Chemical Analysis, and Electron Microscopy.

Our chromatography and mass spectrometry business develops and provides analytical instrumentation for organic and inorganic sample analysis across both applied technologies and scientific research. Our chemical analysis products fall into three main categories: production, process and analytics; field and safety instruments; and environmental and process instruments. Our electron microscopy business serves customers in the life sciences, materials science, and semiconductor markets providing integrated workflows that power research development and production solutions.

Specialty Diagnostics Segment

Our Specialty Diagnostics segment offers a wide range of diagnostic test kits, reagents, culture media, instruments and associated products to serve customers in healthcare, clinical, pharmaceutical, industrial, and food safety laboratories. Our healthcare products are used to increase the speed and accuracy of diagnoses, which improves patient care in a more cost-efficient manner. This segment has five primary businesses – Clinical Diagnostics, ImmunoDiagnostics, Microbiology, Transplant Diagnostics and our Healthcare Market Channel.

Our clinical diagnostics products include a broad offering of liquid, ready-to-use and lyophilized immunodiagnostic reagent kits, calibrators, controls and calibration verification fluids. Such products are used for, among other things, drugs-of-abuse testing, therapeutic drug monitoring, thyroid hormone testing, serum toxicity, first trimester screening, and tumor markers testing. Our immunodiagnostics offerings include developing, manufacturing and marketing complete blood-test systems to support the clinical diagnosis and monitoring of allergy, asthma and autoimmune diseases. Our microbiology offerings include dehydrated and prepared culture media, collection and transport systems, instrumentation and consumables to detect pathogens in blood, diagnostic and rapid direct specimen tests, quality-control products and associated products for the microbiology laboratory. Our transplant diagnostics products include human leukocyte antigen (HLA) typing and testing for the organ transplant market. Our healthcare market channel offerings include a broad array of consumables, diagnostic kits and reagents, equipment, instruments, solutions and services for hospitals, clinical laboratories, reference laboratories, physicians' offices and other clinical testing facilities.

Laboratory Products and Biopharma Services Segment

Our Laboratory Products and Biopharma Services segment offers virtually everything needed for the laboratory. Our unique combination of self-manufactured and sourced products and extensive service offering enables our customers to focus on their core activities and helps them to be more efficient, productive and cost-effective. The segment also includes a comprehensive offering of outsourced services used by the pharmaceutical and biotech industries for drug development, clinical research, clinical trials services and commercial drug manufacturing. We serve the pharmaceutical, biotechnology, academic, medical device, government and other research and industrial markets, as well as the clinical laboratory market through five key businesses: Laboratory Products, Laboratory Chemicals, Research and Safety Market Channel, Pharma Services and Clinical Research.

Our laboratory products are used for life science research and drug discovery and development to advance the prevention and cure of diseases and enhance quality of life. Our laboratory chemicals offering comprises a broad range of chemicals, solvents and reagents supporting virtually every laboratory application – from research and drug discovery to development and manufacturing. Our research and safety market channel offers a mix of products that are manufactured by Thermo Fisher, by third parties for us on a private-label basis, and by third parties under their brands but offered for sale through us. Our pharma services business provides the entire spectrum of development, manufacturing and clinical trials services for both small-molecule and large-molecule pharmaceuticals. Our clinical research business offers comprehensive, integrated clinical development and analytical services including all phases of development (i.e., Phases I-IV), peri- and post-approval and site and patient access services.

During 2022, the Life Sciences Solutions and Specialty Diagnostics segments as well as the laboratory products business continued to support COVID-19 diagnostic testing, scaling and evolving their molecular diagnostics solutions and plastic consumables businesses to respond to the on-going COVID-19 pandemic. The biosciences, bioproduction and laboratory equipment and consumables businesses also leveraged their capacity to meet the needs of pharma and biotech customers as they

rapidly expanded their own production volumes to meet global vaccine manufacturing requirements. Additionally, through our pharma services business, we provided our pharma and biotech customers with the services they needed to develop and produce vaccines and therapies globally.

Sales and Marketing

We market and sell our products and services through a direct sales force, customer-service professionals, electronic commerce and third-party distributors. Our global team delivers a combination of innovative technologies, purchasing convenience and pharmaceutical services through our industry-leading brands, including Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific, Unity Lab Services, Patheon and PPD.

We have approximately 15,000 sales personnel including highly trained technical specialists who enable us to better meet the needs of our more technical end-users. We also provide customers with product standardization and other supply-chain-management services to reduce procurement costs.

New Products and Research and Development

Our business includes the development and introduction of new products and may include entry into new business segments. We anticipate that we will continue to make significant expenditures for research and development as we seek to provide a continuing flow of innovative products to maintain and improve our competitive position.

Resources

Raw Materials

Our management team believes that we have a readily available supply of raw materials for all of our significant products from various sources. No single supplier is material, although for reasons of quality assurance, regulatory requirements, cost effectiveness, availability or uniqueness of design, certain materials components may be sourced from a single supplier or a limited number of suppliers that can readily provide such materials or components.

Raw material and fuel prices are subject to fluctuations due to market conditions. We employ many strategies, including the use of alternative materials, to mitigate the effect of these fluctuations on our results.

Patents, Licenses and Trademarks

Patents are important in many aspects of our business. No particular patent, or related group of patents, is so important, however, that its loss would significantly affect our operations as a whole. Where appropriate, we seek patent protection for inventions and developments made by our personnel that are incorporated into our products or otherwise fall within our fields of interest. Patent rights resulting from work sponsored by outside parties do not always accrue exclusively to the company and may be limited by agreements or contracts.

We protect some of our technology as trade secrets and, where appropriate, we use trademarks or register trademarks used in connection with products. We also enter into license agreements with others to grant and/or receive rights to intellectual property rights.

All trademarks, trade names, product names, graphics and logos of Thermo Fisher contained herein are trademarks or registered trademarks of Thermo Fisher or its subsidiaries, as applicable, in the United States and/or other countries. Solely for convenience, we may refer to trademarks in this Annual Report on Form 10-K without the ™ and ® symbols. Such references are not intended to indicate, in any way, that we will not assert, to the fullest extent permitted by law, our rights to our trademarks. To the extent other trademarks appear in this Annual Report on Form 10-K, they are the property of their respective owners.

Seasonal Influences

Revenues in the fourth quarter are historically stronger than in other quarters due to the capital spending patterns of industrial, pharmaceutical and government customers. Sales of seasonal products, such as COVID-19, allergy and flu tests and related diagnostic products, vary quarter to quarter and year to year.

Competition

The company encounters aggressive and able competition in virtually all of the markets we serve. Because of the diversity of our products and services, we face many different types of competitors and competition. Our competitors include a broad range of manufacturers, third-party distributors and service providers. Competitive climates in many of the markets we serve are characterized by changing technology and customer demands that require continuing research and development. Our success primarily depends on the following factors:

- technical performance and advances in technology that result in new products and improved price/performance ratios;
- product differentiation, availability and reliability;
- the depth of our capabilities;
- our reputation among customers as a quality provider of products and services;
- customer service and support;
- active research and application-development programs; and
- relative prices of our products and services.

Government Regulation

Environmental Regulations

We are subject to various laws and governmental regulations concerning environmental matters and employee safety and health in the United States and other countries. U.S. federal environmental legislation that affects us includes the Toxic Substances Control Act, the Resource Conservation and Recovery Act, the Clean Air Act, the Clean Water Act, the Safe Drinking Water Act, and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). We are also subject to regulation by the Occupational Safety and Health Administration (OSHA) concerning employee safety and health matters. The United States Environmental Protection Agency (USEPA), OSHA, and other federal agencies have the authority to promulgate regulations that have an effect on our operations.

In addition to these federal laws and regulations, various states have been delegated certain authority under the aforementioned federal statutes and have authority over these matters under state laws. Many state and local governments have adopted environmental and employee safety and health laws and regulations, some of which are similar to federal requirements.

A number of our operations involve the handling, manufacturing, use or sale of substances that are or could be classified as toxic or hazardous materials within the meaning of applicable laws. Consequently, some risk of environmental harm is inherent in our operations and products, as it is with other companies engaged in similar businesses.

Our expenses for environmental requirements are incurred generally for ongoing compliance and historical remediation matters. Based on current information, we believe that these compliance costs are not material. For historical remediation obligations, our expenditures relate primarily to the cost of permitting, installing, and operating and maintaining groundwater-treatment systems and other remedial measures.

Our Fair Lawn and Somerville, New Jersey facilities entered into administrative consent orders with the New Jersey Department of Environmental Protection in 1984 to maintain groundwater-remediation activities at these sites, and are currently under the State's Licensed Site Remediation Professional Program. As the owner of the Fair Lawn facility, we are listed as a potentially responsible party for remediation within an area called the Fair Lawn Wellfields Superfund Site, and, in 2008, the company and certain other parties entered into a consent order with the USEPA to complete a Remedial Investigation/Feasibility Study. In 2018, the USEPA issued a Record of Decision, setting forth the scope of required remediation work at the site, which includes upgrading a water treatment plant to address constituents such as chlorinated organic compounds, 1,4-dioxane, and perfluorooctanoic acid/perfluorooctane sulfonate (PFOA/PFOS). In 2020, the court approved a consent decree that requires the company and another responsible party to finance and perform the required remediation work with USEPA oversight, which has been ongoing and is pending USEPA's approval of the water treatment plant design.

In 2011, our Life Technologies subsidiary entered into a consent decree with the USEPA and other responsible parties to implement a groundwater remedy at the former Davis Landfill Superfund site in Smithfield, Rhode Island. After years of additional study, in September, 2020, USEPA revised its cleanup plan by selecting an interim remedial approach that includes groundwater treatment followed by additional monitoring of site conditions. Depending on the results of these treatment and monitoring activities over the next several years, USEPA anticipates selecting a final groundwater remedy for the site. In November 2021, the 2011 consent decree was amended to reflect the parties' obligations to implement USEPA's interim remedy, for which pre-design work commenced during 2022.

We record accruals for environmental liabilities based on current interpretations of environmental laws and regulations when it is probable that a liability has been incurred and the amount of such liability can be reasonably estimated. We calculate estimates based upon several factors, including reports prepared by environmental specialists and management's knowledge and experience with these environmental matters. We include in these estimates potential costs for investigation, remediation and operation and maintenance of cleanup sites. Accrued liabilities for environmental matters totaled $75 million at December 31, 2022.

These environmental liabilities do not include third-party recoveries to which we may be entitled. We believe that our accrual is adequate for the environmental liabilities we currently expect to incur. As a result we believe that our ultimate

liability with respect to environmental matters will not have a material adverse effect on our financial position, results of operations or cash flows. However, we may be subject to remedial or compliance costs due to future events, such as changes in existing laws and regulations, changes in agency direction or enforcement policies, developments in remediation technologies, changes in the conduct of our operations, and the effect of changes in accounting rules, which could have a material adverse effect on our financial position, results of operations or cash flows. For a discussion of the environmental laws and regulations that the Company's operations, products and services are subject to and other environmental contingencies, refer to Note 12 to our Consolidated Financial Statements.

Other Laws and Regulations

Our operations, and some of the products and services we offer, are subject to a number of complex and stringent laws and regulations governing the development, testing, approval, production, handling, transportation and distribution of chemicals, drugs and other similar products, including the operating and security standards of the Food and Drug Administration, the Drug Enforcement Administration, the Bureau of Alcohol, Tobacco, Firearms and Explosives, and various state boards of pharmacy as well as comparable state and foreign agencies. As Thermo Fisher's businesses also include export and import activities, we are subject to pertinent laws enforced by the U.S. Departments of Commerce, State and Treasury. In addition, our logistics activities must comply with the rules and regulations of the Department of Transportation, the Federal Aviation Administration and similar foreign agencies. While we believe we are in compliance in all material respects with such laws and regulations, any noncompliance could result in substantial fines or otherwise restrict our ability to provide competitive distribution services and thereby have an adverse effect on our financial condition. To date, no such laws or regulations have had a material impact on our operations.

We are subject to laws and regulations governing government contracts, and failure to address these laws and regulations or comply with government contracts could harm our business by leading to a reduction in revenues associated with these customers. We have agreements relating to the sale of our products to government entities and, as a result, we are subject to various statutes and regulations that apply to companies doing business with the government. We are also subject to investigation for compliance with the regulations governing government contracts. A failure to comply with these regulations could also result in suspension of these contracts, criminal, civil and administrative penalties or debarment.

For a discussion of risks related to changes in governmental regulations, refer to "Risk Factors" in Part I, Item 1A.

Human Capital

The success of Thermo Fisher is fueled by colleagues who are highly engaged and feel empowered to achieve their goals. Everything we do starts with our Mission – to enable our customers to make the world healthier, cleaner and safer. Our colleagues understand the role they play in fulfilling that Mission and that inspires them to bring their best to work each day. Our Mission is not only a differentiator for us externally, but a motivator for us internally.

Our culture is rooted in our 4i Values of Integrity, Intensity, Innovation and Involvement. Within this framework, we strive to create a safe, fair and positive working environment for our colleagues around the world. We want our teams to feel they have a stake in our success, a voice in our direction and to be empowered to make a difference for the key stakeholders we serve.

Every year, we conduct an Employee Involvement Survey to solicit direct feedback from our colleagues on what we're doing well and where we need to improve. We then compile the feedback to measure our progress using three key indices: Leadership, Involvement and Inclusion. Our continued focus on enhancing our culture helps position our company to be an even better place to work.

We are committed to maintaining the strongest team in our industry, focusing on developing and retaining our colleagues, while leveraging our leadership to attract new colleagues to our company. As of December 31, 2022, we employed approximately 130,000 colleagues globally, with an approximate regional distribution as follows: 67,000 based in the Americas, 21,000 in the Asia Pacific region, and nearly 42,000 in Europe, the Middle East and Africa (EMEA).

Diversity and Inclusion

We recognize that the future aspirations outlined in our Vision for 2030, which serves as our long-term roadmap, will only be achievable if we have a culture that values diversity and inclusion. While diversity of gender and ethnicity are important – and we're focused on continuously improving– for us, diversity of backgrounds, experiences and viewpoints is equally vital to our long-term success. When those differences are welcomed and supported, we create an inclusive workplace that unlocks the true benefits of diversity.

Diversity and Inclusion (D&I) is not an initiative at Thermo Fisher. It's woven into the fabric of our culture, and our colleagues are encouraged to openly share the wide range of perspectives they represent. We work together to create an

inclusive culture where our colleagues feel they belong and are empowered to contribute, collaborate and innovate. Embracing individual differences is critical to our success. For example, Thermo Fisher was named as a Top Female Friendly Company, Best Employer for Women, and Best Employer for Veterans by Forbes in 2022, Best Place to Work for Disability Inclusion, as well as a Best Place to Work for LGBTQ Equality for the seventh consecutive year. Establishing this kind of environment is critical in empowering our colleagues so they can contribute their best ideas and bring their true selves to work each day.

Our D&I focus is embedded in every stage of our colleague lifecycle – from recruiting to onboarding, training, development and longer-term career planning. We track our progress on our D&I strategic objectives through a core set of metrics that are reviewed during routine business operating mechanisms, including Quarterly Business Reviews, Human Resource Reviews, Board Reviews and through team dashboards that are shared each month with leaders across the company. This enables frequent, meaningful, data-driven discussions across our businesses and functions on a range of D&I factors, including gender and ethnic representation. This approach also ensures we consistently prioritize our opportunities to improve. We understand the critical role diversity plays in sustained business success, and our teams are empowered to ensure our workforce represents the customers we serve. Further, to provide additional transparency to our U.S. workforce demographics, following our report submission to the U.S. Equal Employment Opportunity Commission, we disclose our EEO-1 report on our website each year.

We are committed to ensuring our colleagues have access to resources, awareness training and internal networks that offer support and guidance. Our D&I strategy is greatly enabled by our Business Resource Groups (BRGs), which bring together individuals with similar interests to share experiences, learn from each other and collaborate to identify solutions to business challenges. Our BRGs reinforce that all colleagues can make a difference for our customers, for each other and for our company. As of December 31, 2022, we had 9 global BRGs, with more than 230 local BRG chapters.

Talent Development

Our overarching goal from a talent perspective is to create opportunities for our colleagues to achieve their full potential and career aspirations here at Thermo Fisher. We focus on the entire lifecycle of a colleague's career, from their initial recruitment, to onboarding, through ongoing development and training to enhance their skills so they are in the best position to deliver on their goals and achieve their career aspirations.

In today's environment, we know talent is a key competitive advantage, and that building the strongest team in the industry is critical to our future. From our colleague referral program, summer internships, university relations, to our Graduate Leadership Development Program, we continue to build strong internal and external sourcing channels.

Once on board, talent development at Thermo Fisher is a key organizational capability. We continue to make significant investments to support our colleagues along every step of their career journey to help support their success. Our talent development framework incorporates a multi-faceted approach, including formal and self-paced training, networking opportunities, on-the-job stretch learning, coaching, mentoring and manager training utilizing contemporary technology solutions to support the broad needs of our workforce.

We provide multiple programs at all career levels, from online learning for all colleagues through Thermo Fisher University, to focused trainings for managers at various experience levels, to our Global Leadership Program for executives. We also support our colleagues' career advancement through our tuition reimbursement program.

In a company our size, we can also actively manage our talent through rotational opportunities across our businesses, functions and geographies that help our colleagues gain new experiences, share knowledge and broaden their skills. Our executives and leaders participate in frequent talent discussions as well as formal reviews, leveraging workforce data and predictive analytics to better anticipate the talent requirements of our business based on our growth opportunities and market demand.

Thermo Fisher is dedicated to talent development to meet our evolving business needs and to provide our colleagues with opportunities for long and fulfilling careers. Our colleagues are passionate about our company, and their role in our success, and it's our responsibility to help them reach their full potential.

Total Rewards

We offer a comprehensive total rewards package that we regularly evaluate and measure against established benchmarks to ensure its effectiveness in recruiting and retention, and to position Thermo Fisher as an employer of choice. In 2022, we reinvested approximately $350 million of additional compensation payments to our colleagues to help them with the temporary impacts of high inflation.

Our health and wellness programs provide competitive, flexible programs that our global colleagues and their families can count on. For example, for U.S. colleagues, we offer a choice of comprehensive national medical, dental and vision plans; a

wellness program, including valuable health incentive opportunities and tax-advantaged savings and spending accounts; as well as commuter benefits, employee assistance programs, optional group legal coverage, and company-paid disability, accident and life insurance. We also offer a company-paid proprietary program for cancer care called the Impact Program, which gives our colleagues and their families access to personalized support and direct lines of communication to experts in cancer genetics and genomics. Similar benefits are available in all countries around the world where we operate.

We also invest in our colleagues' financial health, helping them to grow and protect their savings, plan for the future and share in the success of the company they are helping to build. We deliver comprehensive rewards, including competitive base pay, and also provide a variety of incentive and equity programs that, by design, directly link the impact of colleague contributions to the company's overall success.

Disclosure Pursuant to Section 13(r) of the Exchange Act

The Russian Federal Security Service (the FSB) is designated as a blocked party under Executive Order 13382. While we have paused sales and manufacturing operations in Russia and Belarus, in the normal course of business, as authorized by General License 1B issued by the U.S. Department of the Treasury's Office of Foreign Assets Control, our Russian affiliate responds to regulatory inquiries from the FSB and otherwise engages with the FSB as a licensing authority. These interactions did not result in any revenue or otherwise contribute to our net income for the quarter. Our Russian affiliate may respond to similar regulatory inquiries and otherwise continue to engage with the FSB as a licensing authority in the future, as necessary and to the extent permitted by applicable U.S. sanctions laws and regulations.

Available Information

The company files annual, quarterly and current reports, proxy statements and other documents with the Securities and Exchange Commission (SEC) under the Exchange Act. The SEC maintains a website that contains reports, proxy and information statements and other information that issuers, including the company, file electronically with the SEC. The public can obtain any documents that we file with the SEC at www.sec.gov. We also make available free of charge on or through our own website at www.thermofisher.com our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and, if applicable, amendments to those reports filed or furnished pursuant to Section 13(a) of the Exchange Act as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. In addition, paper copies of these documents may be obtained free of charge by writing to the company care of its Investor Relations Department at our principal executive office located at 168 Third Avenue, Waltham, Massachusetts 02451.

Information about Our Executive Officers

As of February 23, 2023, our executive officers were:

Name	Age	Present Title (Fiscal Year First Became Executive Officer)	Other Positions Held
Marc N. Casper	54	Chairman, President and Chief Executive Officer (2001)	President and Chief Executive Officer (2009-2020) Chief Operating Officer (2008-2009) Executive Vice President (2006-2009)
Michel Lagarde	49	Executive Vice President and Chief Operating Officer (2017)	Executive Vice President (2019-2021) Senior Vice President and President, Pharma Services (2017-2019) President and Chief Operating Officer, Patheon N.V. (2016-2017) Managing Director, JLL Partners (2008-2016)
Gianluca Pettiti	44	Executive Vice President (2021)	Senior Vice President and President, Specialty Diagnostics (2019-2021) President, Biosciences (2018-2019) President, China (2015-2017)
Michael A. Boxer	61	Senior Vice President and General Counsel (2018)	Senior Vice President, General Counsel and Secretary (2021-2022) Executive Vice President and Group General Counsel, Luxottica Group S.p.A. (2011-2017)
Stephen Williamson	56	Senior Vice President and Chief Financial Officer (2015)	Vice President, Financial Operations (2008-2015)
Joseph R. Holmes	44	Vice President and Chief Accounting Officer (2021)	Senior Director, Technical Accounting (2017-2021)

Item 1A. Risk Factors

Set forth below are the risks that we believe are material to our investors. This section contains forward-looking statements. You should refer to the explanation of the qualifications and limitations on forward-looking statements in Item 1. Business under the caption "Forward-looking Statements".

Industry and Economic Risks

Our growth would suffer if the markets into which we sell our products and services decline, do not grow as anticipated or experience cyclicality. Our growth depends in part on the growth of the markets which we serve. Any decline or lower than expected growth in our served markets would diminish demand for our products and services, which would adversely affect our financial statements. Certain of our businesses operate in industries that may experience periodic, cyclical downturns.

Our business is affected by general economic conditions and related uncertainties affecting markets in which we operate. Our business is affected by general economic conditions, both inside and outside the U.S. Both domestic and international markets experienced significant inflationary pressures in 2022 and inflation rates in the U.S., as well as in other countries in which we operate, continue at elevated levels for the near-term. If the global economy and financial markets, or economic conditions in Europe, the U.S. or other key markets, continue to be unstable, they could adversely affect the business, results of operations and financial condition of the company and its customers, distributors, and suppliers, having the effect of:

- reducing demand for some of our products;
- increasing the rate of order cancellations or delays;
- increasing the risk of excess and obsolete inventories;
- increasing pressure on the prices for our products and services;
- causing supply interruptions, which could disrupt our ability to produce our products; and
- creating longer sales cycles, and greater difficulty in collecting sales proceeds and slower adoption of new technologies.

Economic, political, foreign currency and other risks associated with international sales and operations could adversely affect our results of operations. International markets contribute a substantial portion of our revenues, and we intend to continue expanding our presence in these regions. The exposure to fluctuations in currency exchange rates takes on different forms. International revenues and costs are subject to the risk that fluctuations in exchange rates could adversely affect our reported revenues and profitability when translated into U.S. dollars for financial reporting purposes. These fluctuations could also adversely affect the demand for products and services provided by us. As a multinational corporation, our businesses occasionally invoice third-party customers in currencies other than the one in which they primarily do business (which we refer to as the functional currency). Movements in the invoiced currency relative to the functional currency could adversely impact our cash flows and our results of operations. As our international sales grow, exposure to fluctuations in currency exchange rates could have a larger effect on our financial results. In 2022, currency translation had an unfavorable effect of $1.35 billion on revenues due to the strengthening of the U.S. dollar relative to other currencies in which the company sells products and services.

Some emerging market countries may be particularly vulnerable to periods of global and local political, legal, regulatory and financial instability, including issues of geopolitical relations, the imposition of international sanctions in response to certain state actions and/or sovereign debt issues, and may have a higher incidence of corruption and fraudulent business practices. As a result of these and other factors, our strategy to grow in emerging markets may not be successful, and growth rates in these markets may not be sustainable.

In addition, many of our employees, contract manufacturers, suppliers, job functions, outsourcing activities and manufacturing facilities are located outside the U.S. Accordingly, our future results could be harmed by a variety of factors, including:

- interruption to transportation flows for delivery of parts to us and finished goods to our customers;
- changes in a specific country's or region's political, economic or other conditions;
- changes in diplomatic and trade relationships, including new tariffs, trade protection measures, import or export licensing requirements, trade embargoes and sanctions and other trade barriers;

- tariffs imposed by the U.S. on goods from other countries and tariffs imposed by other countries on U.S. goods, including the tariffs adopted by the U.S. government on various imports from China and by the Chinese government on certain U.S. goods;
- the impact of public health epidemics/pandemics on the global economy, such as the COVID-19 pandemic;
- uncertainties regarding the collectability of accounts receivable;
- the imposition of governmental controls;
- diverse data privacy and protection requirements;
- supply interruptions, which could disrupt our ability to produce our products;
- increases in materials, energy, labor or other manufacturing-related costs or higher supply chain logistics costs;
- negative consequences from changes in tax laws;
- difficulty in staffing and managing widespread operations;
- differing labor regulations;
- differing protection of intellectual property;
- unexpected changes in regulatory requirements; and
- geopolitical uncertainty or turmoil, including terrorism and war.

Demand for some of our products depends on capital spending policies of our customers and on government funding policies. Our customers include pharmaceutical and chemical companies, laboratories, universities, healthcare providers, government agencies and public and private research institutions. Many factors, including public policy spending priorities, available resources, and product and economic cycles, have a significant effect on the capital spending policies of these entities. Spending by some of these customers fluctuates based on budget allocations and the timely passage of the annual federal budget. An impasse in federal government budget decisions could lead to substantial delays or reductions in federal spending.

We are subject to risks associated with public health epidemics and pandemics, such as the ongoing COVID-19 pandemic. Our global operations expose us to risks associated with public health epidemics and pandemics. COVID-19 has had an adverse impact on certain of our operations, supply chains and distribution systems, and we may experience unpredictable reductions in supply and demand for certain of our products and services. National, state and local governments have implemented and may continue to implement safety precautions, including quarantines, border closures, increased border controls, travel restrictions, shelter in place orders and shutdowns and other measures. These measures may disrupt normal business operations and may have significant negative impacts on businesses and financial markets worldwide. Our ability to continue to manufacture products is highly dependent on our ability to maintain the safety and health of our factory employees. The ability of our employees to work may be significantly impacted by the COVID-19 pandemic or future epidemics and pandemics. In addition, the duration and extent of future revenues from sales of products related to the COVID-19 response are uncertain and dependent primarily on customer testing demand as well as therapy and vaccine demand.

Business Risks

We must develop new products, adapt to rapid and significant technological change, respond to introductions of new products by competitors and maintain quality to remain competitive. Our growth strategy includes significant investment in and expenditures for product development. We sell our products in several industries that are characterized by rapid and significant technological changes, frequent new product and service introductions and enhancements and evolving industry standards. Competitive factors include technological innovation, price, service and delivery, breadth of product line, customer support, e-business capabilities and the ability to meet the special requirements of customers. Our competitors may adapt more quickly to new technologies and changes in customers' requirements than we can. Without the timely introduction of new products, services and enhancements, our products and services will likely become technologically obsolete over time, in which case our revenues and operating results would suffer.

Many of our existing products and those under development are technologically innovative and require significant planning, design, development and testing at the technological, safety, quality, product and manufacturing-process levels. Our customers use many of our products to develop, test and manufacture their own products. As a result, we must anticipate industry trends and develop products in advance of the commercialization of our customers' products. If we fail to adequately develop products or predict our customers' needs and future activities, we may invest heavily in research and development of products and services that do not lead to significant revenues.

It may be difficult for us to implement our strategies for improving internal growth. Our growth depends in part on the growth of the markets which we serve. Any decline or lower than expected growth in our served markets could diminish demand for our products and services, which would adversely affect our results of operations and financial condition. To address this issue, we are pursuing a number of strategies to improve our internal growth, including:

- strengthening our presence in selected geographic markets;
- allocating research and development funding to products with higher growth prospects;
- developing new applications for our technologies;
- expanding our service offerings;
- continuing key customer initiatives;
- combining sales and marketing operations in appropriate markets to compete more effectively;
- finding new markets for our products; and
- continuing the development of commercial tools and infrastructure to increase and support cross-selling opportunities of products and services to take advantage of our depth in product offerings.

We may not be able to successfully implement these strategies, and these strategies may not result in the expected growth of our business.

Because we compete directly with certain of our larger customers and product suppliers, our results of operations could be adversely affected in the short term if these customers or suppliers abruptly discontinue or significantly modify their relationship with us. Our largest customer in the laboratory products business is also a significant competitor. Our business may be harmed in the short term if our competitive relationship in the marketplace with certain of our large customers results in a discontinuation of their purchases from us. In addition, we manufacture products that compete directly with products that we source from third-party suppliers. We also source competitive products from multiple suppliers. Our business could be adversely affected in the short term if any of our large third-party suppliers abruptly discontinues selling products to us.

Our inability to complete any pending acquisitions or to successfully integrate any new or previous acquisitions could have a material adverse effect on our business. Our business strategy includes the acquisition of technologies and businesses that complement or augment our existing products and services. Certain acquisitions may be difficult to complete for a number of reasons, including the need for antitrust and/or other regulatory approvals, as well as disputes or litigation. Any acquisition we may complete may be made at a substantial premium over the fair value of the net identifiable assets of the acquired company. Further, we may not be able to integrate acquired businesses successfully into our existing businesses, make such businesses profitable, or realize anticipated cost savings or synergies, if any, from these acquisitions, which could adversely affect our business.

Moreover, we have acquired many companies and businesses. As a result of these acquisitions, we recorded significant goodwill and indefinite-lived intangible assets (primarily tradenames) on our balance sheet, which amount to approximately $41.20 billion and $1.24 billion, respectively, as of December 31, 2022. In addition, we have definite-lived intangible assets totaling $16.21 billion as of December 31, 2022. We assess the realizability of goodwill and indefinite-lived intangible assets annually as well as whenever events or changes in circumstances indicate that these assets may be impaired. We assess the realizability of definite-lived intangible assets whenever events or changes in circumstances indicate that these assets may be impaired. These events or circumstances would generally include operating losses or a significant decline in earnings associated with the acquired business or asset. Our ability to realize the value of the goodwill and intangible assets will depend on the future cash flows of these businesses. These cash flows in turn depend in part on how well we have integrated these businesses. If we are not able to realize the value of the goodwill and intangible assets, we may be required to incur material charges relating to the impairment of those assets.

Operational Risks

Our reliance upon sole or limited sources of supply for certain materials or components could cause production interruptions, delays and inefficiencies. Some of our businesses purchase certain materials from sole or limited source suppliers for reasons of quality assurance, regulatory requirements, cost effectiveness, availability or uniqueness of design. If these or other suppliers encounter financial, operating or other difficulties, or if our relationship with them changes, we might not be able to quickly establish or qualify replacement sources of supply. The supply chains for our businesses could also be disrupted by supplier capacity constraints, bankruptcy or exiting of the business for other reasons, decreased availability or increased cost of key raw materials or commodities, such as energy, and external events such as global economic downturns and macroeconomic trends, natural disasters, pandemic health issues such as COVID-19, war, terrorist actions, governmental

actions and legislative or regulatory changes. Any of these factors could result in production interruptions, delays, extended lead times and inefficiencies.

A significant disruption in, or breach in security of, our information technology systems or violation of data privacy laws could adversely affect our business. As a part of our ongoing effort to upgrade our current information systems, we periodically implement new enterprise resource planning software and other software applications to manage certain of our business operations. As we implement and add functionality, problems could arise that we have not foreseen. Such problems could disrupt our ability to provide quotes, take customer orders and otherwise run our business in a timely manner. When we upgrade or change systems, we may suffer interruptions in service, loss of data or reduced functionality. In addition, if our new systems fail to provide accurate pricing and cost data our results of operations and cash flows could be adversely affected.

We also rely on our information technology systems to process, transmit and store electronic information (including sensitive data such as confidential business information and personally identifiable data relating to employees, customers and other business partners) and to manage or support a variety of critical business processes and activities (such as interacting with suppliers, selling our products and services, fulfilling orders and billing, collecting and making payments, shipping products, providing services and support to customers, tracking customer activity, fulfilling contractual obligations and otherwise conducting business). Our systems may be vulnerable to damage or interruption from natural disasters, power loss, telecommunication failures, terrorist attacks, computer hackers, computer viruses, ransomware, phishing, computer denial-of-service attacks, unauthorized access to customer or employee data or company trade secrets, and other attempts to harm our systems. Certain of our systems are not redundant, and our disaster recovery planning is not sufficient for every eventuality. Despite any precautions we may take, such problems could result in, among other consequences, interruptions in our services, which could harm our reputation and financial results. Our key business partners face similar risks and any security breach of their systems could adversely affect our security posture. Any of the cyber-attacks, breaches or other disruptions or damage described above, if significant, could materially interrupt our operations, delay production and shipments, result in theft of our and our customers' intellectual property and trade secrets, damage customer, business partner and employee relationships and our reputation or result in defective products or services, legal claims and proceedings, liability and penalties under privacy laws and increased cost for security and remediation, each of which could adversely affect our business and financial results. Our liability insurance may not be sufficient in type or amount to cover us against claims related to security breaches, cyber-attacks and other related breaches.

If we are unable to maintain reliable information technology systems and appropriate controls with respect to global data privacy and security requirements and prevent data breaches, we may suffer regulatory consequences in addition to business consequences. As a global organization, we are subject to data privacy and security laws, regulations, and customer-imposed controls in numerous jurisdictions as a result of having access to and processing confidential, personal and/or sensitive data in the course of our business. For example, in the U.S., individual states regulate data breach and security requirements and multiple governmental bodies assert authority over aspects of the protection of personal privacy. European laws require us to have an approved legal mechanism to transfer personal data out of Europe, and the EU General Data Protection Regulation imposes significantly stricter requirements in how we collect and process personal data. Several countries, such as China, have passed laws that require personal data relating to their citizens to be maintained on local servers and impose additional data transfer restrictions. Government enforcement actions can be costly and interrupt the regular operation of our business, and data breaches or violations of data privacy laws can result in fines, reputational damage and civil lawsuits, any of which may adversely affect our business, reputation and financial statements.

We may have difficulty attracting and retaining a highly qualified workforce. Our success is largely dependent upon our ability to attract and retain highly qualified scientific, technical, clinical and management workforce in a highly competitive environment. Qualified individuals are in high demand, and we may incur significant costs to attract them. We may face difficulty in attracting and retaining key talent for a number of reasons, including management changes or recruitment by competitors. Our ability to attract and retain key talent also depends in part on how well we maintain a strong workplace culture that is attractive to employees. Macroeconomic conditions, specifically increased competition for employees and wage inflation, could have a material impact on our ability to attract and retain talent, our turnover rate and the cost of operating our business. We cannot ensure that we will be able to hire or retain the personnel necessary for our operations or that the loss of any personnel will not have a material impact on our financial condition and results of operations.

We may incur unexpected costs from increases in fuel and raw material prices, which could reduce our earnings and cash flows. Our primary commodity exposures are for fuel, petroleum-based resins and steel. The costs for these commodities, as well as the costs of transportation, construction and services necessary for the production and distribution of our products, continue to increase and be volatile. While we may seek to minimize the impact of price increases through higher prices to customers and various cost-saving measures, our earnings and cash flows could be adversely affected in the event these measures are insufficient to cover our costs.

Because we rely heavily on third-party package-delivery services, a significant disruption in these services or significant increases in prices may disrupt our ability to ship products, increase our costs and lower our profitability. We ship a significant portion of our products to our customers through independent package delivery companies, such as Federal Express in the U.S. and DHL in Europe. We also maintain a small fleet of vehicles dedicated to the delivery of our products and ship our products through other carriers, including national and regional trucking firms, overnight carrier services and the U.S. Postal Service. If one or more of these third-party package-delivery providers were to experience a major work stoppage, preventing our products from being delivered in a timely fashion or causing us to incur additional shipping costs we could not pass on to our customers, our costs could increase and our relationships with certain of our customers could be adversely affected. In addition, if one or more of these third-party package-delivery providers were to increase prices, and we were not able to find comparable alternatives or make adjustments in our delivery network, our profitability could be adversely affected.

Natural disasters, public health crises, political crises, and other catastrophic events or other events outside of our control may disrupt our facilities or the facilities of third parties on which we depend, and could impact customer spending. We have significant operations in California, near major earthquake faults, which make us susceptible to earthquake risk. An earthquake or other natural disaster (including the effects of climate change such as sea level rise, drought, flooding, wildfires and more intense weather events), could disrupt our operations or impair our critical systems. Any of these disruptions or other events outside of our control, such as strikes or other labor unrest, could have an adverse effect on our results of operations. In addition, if any of our facilities, including our manufacturing or warehouse facilities, or the facilities of our suppliers, third-party service providers, or customers, is affected by natural disasters, such as earthquakes, tsunamis, power shortages or outages, fires, floods or monsoons, public health crises, such as pandemics and epidemics, political crises, such as terrorism, war, political instability or other conflict, or other events outside of our control, such as trade protectionism, strikes or other labor unrest, our results of operations could be adversely affected. Moreover, these types of events could negatively impact customer spending in the impacted regions or depending upon the severity, globally, which could also adversely impact our operating results.

Increasing attention to environmental, social and governance matters may impact our business, financial results, stock price or reputation. We face increasing scrutiny from stakeholders related to our environmental, social and governance (ESG) practices and disclosures, including practices and disclosures related to climate change, diversity and inclusion and governance standards. Investor advocacy groups, certain institutional investors, lenders, investment funds and other influential investors are also increasingly focused on ESG practices and disclosures and in recent years have placed increasing importance on the implications and social cost of their investments. In addition, government organizations are enhancing or advancing legal and regulatory requirements specific to ESG matters. The heightened stakeholder focus on ESG issues related to our business requires the continuous monitoring of various and evolving laws, regulations, standards and expectations and the associated reporting requirements. A failure to adequately meet evolving stakeholder expectations may result in noncompliance, the loss of business, reputational impacts, diluted market valuation, an inability to attract customers and an inability to attract and retain top talent. In addition, if legislation or regulations are enacted or promulgated in the U.S. or in any other jurisdiction in which we do business that impose more stringent restrictions and requirements than our current legal or regulatory obligations, we and companies in our supply chain may experience increased compliance burdens and costs to meet the regulatory obligations, which could cause disruption in the sourcing, manufacturing and distribution of our products and adversely affect our business, financial condition or results of operations. In addition, our adoption of certain standards or mandated compliance to certain requirements could necessitate additional investments that could impact our profitability.

Legal, Quality and Regulatory Risks

Changes in governmental regulations may reduce demand for our products or increase our expenses. We compete in many markets in which we and our customers must comply with federal, state, local and international regulations, such as environmental, health and safety and food and drug regulations. We develop, configure and market our products to meet customer needs created by those regulations. Any significant change in regulations could reduce demand for our products or increase our expenses. For example, we manufacture pharmaceuticals and many of our instruments are marketed to the pharmaceutical industry for use in discovering and developing drugs. Changes in the U.S. Food and Drug Administration's (the FDA) regulation of the drug discovery and development process could have an adverse effect on the demand for these products.

We are subject to laws and regulations governing government contracts, and failure to address these laws and regulations or comply with government contracts could harm our business by leading to a reduction in revenues associated with these customers. We have agreements relating to the sale of our products to government entities and, as a result, we are subject to various statutes and regulations that apply to companies doing business with the government. The laws governing government contracts differ from the laws governing private contracts and government contracts may contain pricing terms and conditions that are not applicable to private contracts. We are also subject to investigation for compliance with the

regulations governing government contracts. A failure to comply with these regulations could result in suspension of these contracts, criminal, civil and administrative penalties or debarment.

Our pharma services offerings are highly complex, and if we are unable to provide quality and timely offerings to our customers, our business could suffer. Our pharma services offerings are highly exacting and complex, due in part to strict quality and regulatory requirements. Our operating results in this business depend on our ability to execute and, when necessary, improve our quality management strategy and systems, and our ability to effectively train and maintain our employee base with respect to quality management. A failure of our quality control systems could result in problems with facility operations or preparation or provision of products. In each case, such problems could arise for a variety of reasons, including equipment malfunction, failure to follow specific protocols and procedures, problems with raw materials or environmental factors and damage to, or loss of, manufacturing operations. Such problems could affect production of a particular batch or series of batches of products, requiring the destruction of such products or a halt of facility production altogether.

In addition, our failure to meet required quality standards may result in our failure to timely deliver products to our customers, which in turn could damage our reputation for quality and service. Any such failure could, among other things, lead to increased costs, lost revenues, reimbursement to customers for lost drug product, registered intermediates, registered starting materials, and active pharmaceutical ingredients, other customer claims, damage to and possibly termination of existing customer relationships, time and expense spent investigating the cause and, depending on the cause, similar losses with respect to other batches or products. Production problems in our drug and biologic manufacturing operations could be particularly significant because the cost of raw materials for such manufacturing is often high. If problems in preparation or manufacture of a product or failures to meet required quality standards for that product are not discovered before such product is released to the market, we may be subject to adverse regulatory actions, including product recalls, product seizures, injunctions to halt manufacture and distribution, restrictions on our operations, civil sanctions, including monetary sanctions, and criminal actions. In addition, such problems or failures could subject us to litigation claims, including claims from our customers for reimbursement for the cost of lost or damaged active pharmaceutical ingredients, the cost of which could be significant.

We are subject to product and other liability risks for which we may not have adequate insurance coverage. We may be named as a defendant in product liability or errors and omissions lawsuits, which may allege that products or services we have provided have resulted or could result in an unsafe condition, property damage or injury to end users or financial loss for consumers. Additionally, products currently or previously sold by our environmental and process instruments and radiation measurement and security instruments businesses include fixed and portable instruments used for chemical, radiation and trace explosives detection. These products are used in airports, embassies, cargo facilities, border crossings and other high-threat facilities for the detection and prevention of terrorist acts. If any of these products were to malfunction, it is possible that explosive or radioactive material could fail to be detected by our product, which could lead to product liability claims. In addition, patients involved in our clinical services trials conducted by our clinical development services business or taking drugs approved on the basis of those trials may also bring personal injury claims against us. There are also many other factors beyond our control that could lead to liability claims, such as the reliability and competence of the customers' operators and the training of such operators.

Any such product liability claims brought against us could be significant and any adverse determination may result in liabilities subject to insurance policy exclusions where insurance would not respond or in excess of our insurance coverage. Although we carry product liability and errors and omissions insurance, we cannot be certain that our current insurance will be sufficient to cover these claims or that it can be maintained on acceptable terms, if at all.

We are required to comply with a wide variety of laws and regulations, and are subject to regulation by various federal, state and foreign agencies. We are subject to various local, state, federal, foreign and transnational laws and regulations, which include the operating and security standards of the FDA, the U.S. Drug Enforcement Agency (the DEA), various state boards of pharmacy, state health departments, the U.S. Department of Health and Human Services (the DHHS), the European Medicines Agency (the EMA), the EU member states and other comparable agencies and, in the future, any changes to such laws and regulations could adversely affect us. In particular, we are subject to laws and regulations concerning current good manufacturing practices and drug safety. Our subsidiaries may be required to register for permits and/or licenses with, and may be required to comply with the laws and regulations of, the DEA, the FDA, the DHHS, foreign agencies including the EMA, and other various state boards of pharmacy, state health departments and/or comparable state agencies as well as certain accrediting bodies depending upon the type of operations and location of product distribution, manufacturing and sale.

The manufacture, distribution and marketing of many of our products and services, including medical devices, and our pharma and clinical development services, are subject to extensive ongoing regulation by the FDA, the DEA, the EMA, and other equivalent local, state, federal and non-U.S. regulatory authorities. In addition, we are subject to inspections by these regulatory authorities. Failure by us or by our customers to comply with the requirements of these regulatory authorities,

including without limitation, remediating any inspectional observations to the satisfaction of these regulatory authorities, could result in warning letters, product recalls or seizures, monetary sanctions, injunctions to halt manufacture and distribution, restrictions on our operations, civil or criminal sanctions, or withdrawal of existing or denial of pending approvals, including those relating to products or facilities. In addition, such a failure could expose us to contractual or product liability claims, contractual claims from our customers, including claims for reimbursement for lost or damaged active pharmaceutical ingredients or personal injury, as well as ongoing remediation and increased compliance costs, any or all of which could be significant. We are the sole manufacturer of a number of pharmaceuticals for many of our customers and a negative regulatory event could impact our customers' ability to provide products to their customers.

We are also subject to a variety of federal, state, local and international laws and regulations that govern, among other things, the handling, transportation and manufacture of substances that could be classified as hazardous, and we are required to comply with various import laws and export control and economic sanctions laws, which may affect our transactions with certain customers. In certain circumstances, export control and economic sanctions regulations may prohibit the export of certain products, services and technologies. In other circumstances, we may be required to obtain an export license before exporting the controlled item. Compliance with the various import laws that apply to our businesses can restrict our access to, and increase the cost of obtaining, certain products and at times can interrupt our supply of imported inventory. Any noncompliance by us with applicable laws and regulations or the failure to maintain, renew or obtain necessary permits and licenses could result in criminal, civil and administrative penalties and could have an adverse effect on our results of operations.

Our reputation, ability to do business and financial statements may be impaired by improper conduct by any of our employees, agents, business partners or other third parties. We have internal controls and compliance systems to protect the company against acts committed by employees, agents or businesses that we acquire that would violate U.S. and/or non-U.S. laws, including the laws governing payments to government officials, bribery, fraud, kickbacks and false claims, pricing, sales and marketing practices, conflicts of interest, competition, employment practices and workplace behavior, export and import compliance, money laundering and data privacy, but these controls and systems may not be sufficient to prevent every such wrongful act. In particular, the U.S. Foreign Corrupt Practices Act, the U.K. Bribery Act 2010 and similar anti-bribery laws in other jurisdictions generally prohibit companies and their intermediaries from making improper payments to government officials for the purpose of obtaining or retaining business, and we operate in many parts of the world that have experienced governmental corruption to some degree. Any such improper actions or allegations of such acts could damage our reputation and subject us to civil or criminal investigations in the U.S. and in other jurisdictions and related shareholder lawsuits, could lead to substantial civil and criminal, monetary and nonmonetary penalties and could cause us to incur significant legal and investigatory fees. In addition, the government may seek to hold us liable for violations committed by companies which we acquire. We also rely on our suppliers to adhere to our supplier standards of conduct, and material violations of such standards of conduct could occur that could have a material effect on our business, reputation and financial statements. In addition, any allegations of issues resulting from the misuse of our products could, even if untrue, adversely affect our reputation and our customers' willingness to purchase products from us. Any such allegations could cause us to lose customers and divert our resources from other tasks, which could materially and adversely affect our business and operating results.

Our inability to protect our intellectual property could have a material adverse effect on our business. In addition, third parties may claim that we infringe their intellectual property, and we could suffer significant litigation or licensing expense as a result. We place considerable emphasis on obtaining patent and trade secret protection for significant new technologies, products and processes because of the length of time and expense associated with bringing new products through the development process and into the marketplace. Our success depends in part on our ability to develop patentable products and obtain and enforce patent protection for our products both in the U.S. and in other countries. We own numerous U.S. and foreign patents, and we intend to file additional applications, as appropriate, for patents covering our products. Patents may not be issued for any pending or future patent applications owned by or licensed to us, and the claims allowed under any issued patents may not be sufficiently broad to protect our technology. Any issued patents owned by or licensed to us may be challenged, invalidated or circumvented, and the rights under these patents may not provide us with competitive advantages. In addition, competitors may design around our technology or develop competing technologies. Intellectual property rights may also be unavailable or limited in some foreign countries, which could make it easier for competitors to capture increased market position. We could incur substantial costs to defend ourselves in suits brought against us or in suits in which we may assert our patent rights against others. An unfavorable outcome of any such litigation could materially adversely affect our business and results of operations.

We also rely on trade secrets and proprietary know-how with which we seek to protect our products, in part, by confidentiality agreements with our collaborators, employees and consultants. These agreements may not adequately protect our trade secrets and other proprietary rights. These agreements may be breached and we may not have adequate remedies for any breach. In addition, our trade secrets may otherwise become known or be independently developed by our competitors.

We also depend in part on our trademarks and the strength of our proprietary brands, which we consider important to our business. If we are unable to protect or preserve the value of our intellectual property rights for any reason, including our inability to successfully defend against counterfeit, knock offs, grey-market, infringing or otherwise unauthorized products, our brand and reputation could be damaged, and our business may be harmed.

Third parties may assert claims against us to the effect that we are infringing on their intellectual property rights. In the event that a claim relating to intellectual property is asserted against us, or third parties not affiliated with us hold pending or issued patents that relate to our products or technology, we may seek licenses to such intellectual property or challenge those patents. However, we may be unable to obtain these licenses on commercially reasonable terms, if at all, and our challenge of the patents may be unsuccessful. Our failure to obtain the necessary licenses or other rights could prevent the sale, manufacture, or distribution of our products and, therefore, could have a material adverse effect on our business, financial condition and results of operations.

Risks Relating to Financial Profile

Fluctuations in our effective tax rate may adversely affect our results of operations and cash flows. As a global company, we are subject to taxation in numerous countries, states and other jurisdictions. In preparing our financial statements, we record the amount of tax that is payable in each of the countries, states and other jurisdictions in which we operate. Our future effective tax rate, however, may be lower or higher than experienced in the past due to numerous factors, including a change in the mix of our profitability from country to country, changes in accounting for income taxes, the results of examinations and audits of our tax filings and recently enacted and future changes in tax laws in jurisdictions in which we operate. Any of these factors could cause us to experience an effective tax rate significantly different from previous periods or our current expectations, which could have an adverse effect on our business, results of operations and cash flows.

Our existing and future indebtedness may restrict our investment opportunities or limit our activities and negatively impact our credit ratings. As of December 31, 2022, we had approximately $34.49 billion in outstanding indebtedness. In addition, we have availability to borrow under a revolving credit facility that provides for up to $5.00 billion of unsecured multi-currency revolving credit (the Facility). We may also obtain additional long-term debt and lines of credit to meet future financing needs, which would have the effect of increasing our total leverage.

Our leverage could have negative consequences, including increasing our vulnerability to adverse economic and industry conditions, limiting our ability to obtain additional financing and limiting our ability to acquire new products and technologies through strategic acquisitions.

Our ability to make scheduled payments, refinance our obligations or obtain additional financing will depend on our future operating performance and on economic, financial, competitive and other factors beyond our control. Our business may not generate sufficient cash flow to meet our obligations. If we are unable to service our debt, refinance our existing debt or obtain additional financing, we may be forced to delay strategic acquisitions, capital expenditures or research and development expenditures.

Additionally, the agreements governing our debt require that we maintain a financial ratio, and contain affirmative and negative covenants that restrict our activities by, among other limitations, limiting our ability to incur additional indebtedness, merge or consolidate with other entities and create liens. The covenants in the Facility include a Consolidated Net Interest Coverage Ratio (Consolidated EBITDA to Consolidated Net Interest Expense), as such terms are defined in the Facility. Specifically, the company has agreed that, so long as any lender has any commitment under the Facility, any letter of credit is outstanding under the Facility, or any loan or other obligation is outstanding under the Facility, it will maintain a minimum Consolidated Net Interest Coverage Ratio of 3.5:1.0 as of the last day of any fiscal quarter.

Our ability to comply with these financial restrictions and covenants is dependent on our future performance, which is subject to prevailing economic conditions and other factors, including factors that are beyond our control such as the impact of foreign exchange rates and interest rates. Our failure to comply with any of these restrictions or covenants may result in an event of default under the applicable debt instrument, which could permit acceleration of the debt under that instrument and require us to prepay that debt before its scheduled due date. Also, an acceleration of the debt under certain of our debt instruments would trigger an event of default under other of our debt instruments.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

The company owns and leases office, engineering, laboratory, production and warehouse space throughout the world.

Item 3. Legal Proceedings

There are various lawsuits and claims against the company involving product liability, intellectual property, employment and commercial issues. See Note 12 to our Consolidated Financial Statements – Commitments and Contingencies.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

Item 5. Market for the Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Market Price of Common Stock

Our common stock is traded on the New York Stock Exchange under the symbol TMO.

Holders of Common Stock

As of February 4, 2023, the company had 2,460 holders of record of its common stock. This does not include holdings in street or nominee names.

Issuer Purchases of Equity Securities

A summary of the share repurchase activity for the company's fourth quarter of 2022 follows:

Period	Total number of shares purchased	Average price paid per share	Total number of shares purchased as part of publicly announced plans or programs (1)	Maximum dollar amount of shares that may yet be purchased under the plans or programs (1) (in millions)
Fiscal October (Oct. 2 - Nov. 5)	1,989,832	$ 502.55	1,989,832	$ —
Fiscal November (Nov. 6 - Dec. 3)	—	—	—	4,000
Fiscal December (Dec. 4 - Dec. 31)	—	—	—	4,000
Total fourth quarter	1,989,832	$ 502.55	1,989,832	$ 4,000

(1) On September 23, 2021, the Board of Directors authorized the repurchase of up to $3.00 billion of the company's common stock. All of the shares of common stock repurchased by the company during the fourth quarter were purchased under this program, depleting the 2021 authorization. On November 10, 2022, the Board of Directors authorized the repurchase of up to $4.00 billion of the company's common stock. Early in the first quarter of 2023, the company repurchased $3.00 billion of the company's common stock (5.2 million shares). At February 23, 2023, $1.00 billion was available for future repurchases of the company's common stock under this authorization.

Item 6. Reserved

Not applicable.

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

Reference is made throughout this Management's Discussion and Analysis of Financial Condition and Results of Operations to Notes to the Consolidated Financial Statements, which begin on page F-1 of this report. Management's Discussion and Analysis of Financial Condition and Results of Operations for 2020 is included in Item 7 of the company's 2021 Annual Report on Form 10-K filed with the Securities and Exchange Commission.

The company refers to various amounts or measures not prepared in accordance with generally accepted accounting principles (non-GAAP measures). These non-GAAP measures are further described and reconciled to their most directly comparable amount or measure under the section "Non-GAAP Measures" later in this Management's Discussion and Analysis of Financial Condition and Results of Operations.

Overview

Thermo Fisher Scientific Inc. enables customers to make the world healthier, cleaner and safer by helping them accelerate life sciences research, solve complex analytical challenges, increase laboratory productivity, and improve patient health through

diagnostics and the development and manufacture of life-changing therapies. Markets served include pharmaceutical and biotech, academic and government, industrial and applied, as well as healthcare and diagnostics. The company's operations fall into four segments (Note 4): Life Sciences Solutions, Analytical Instruments, Specialty Diagnostics and Laboratory Products and Biopharma Services.

Consolidated Results

(Dollars in millions except per share amounts)	2022	2021	Change
Revenues	$ 44,915	$ 39,211	15 %
GAAP operating income	$ 8,393	$ 10,028	(16) %
GAAP operating income margin	18.7 %	25.6 %	(6.9) pt
Adjusted operating income *(non-GAAP measure)*	$ 10,985	$ 12,138	(9) %
Adjusted operating income margin *(non-GAAP measure)*	24.5 %	31.0 %	(6.5) pt
GAAP diluted earnings per share attributable to Thermo Fisher Scientific Inc.	$ 17.63	$ 19.46	(9) %
Adjusted earnings per share *(non-GAAP measure)*	$ 23.24	$ 25.13	(8) %

Organic Revenue Growth

Revenue growth	15 %
Impact of acquisitions	18 %
Impact of currency translation	(3)%
Organic revenue growth* *(non-GAAP measure)*	0 %

* Results may not sum due to rounding.

Since 2020, the Life Sciences Solutions and Specialty Diagnostics segments as well as the laboratory products business have supported COVID-19 diagnostic testing, scaling and evolving their molecular diagnostics solutions and plastic consumables businesses to respond to the ongoing COVID-19 pandemic. The biosciences and bioproduction businesses have expanded their capacity to meet the needs of pharma and biotech customers as they have expanded their own production volumes to meet global vaccine manufacturing requirements. Additionally, our pharma services business has provided our pharma and biotech customers with the services they needed to develop and produce vaccines and therapies globally. While these positive impacts are expected to continue through 2023, the duration and extent of future revenues from such sales are uncertain and dependent primarily on customer testing as well as therapy and vaccine demand. Sales of products related to COVID-19 testing were $3.11 billion and $7.26 billion in 2022 and 2021, respectively.

During 2022 demand from pharma and biotech customers was very strong, driven by our differentiated customer value proposition and trusted partner status. We saw good growth in the academic and government market as we remain well positioned to meet customer needs. The industrial and applied market was strong, driven by robust demand for our analytical instruments serving our semi-conductor and materials science customers. The diagnostics and healthcare market declined due to decreased demand for COVID-19 testing products. During 2022, robust sales growth in North America and the Asia Pacific region, including China, was partially offset by a decline in COVID-19 testing demand. In Europe, strong sales were more than offset during 2022 due to lower COVID-19 testing demand. Contributions to organic revenue during 2022 were driven by the Laboratory Products and Biopharma Services and Analytical Instruments segments, as offset by the Life Sciences Solutions and Specialty Diagnostics segments.

The company continues to execute its proven growth strategy which consists of three pillars:

- Developing high-impact, innovative new products,
- Leveraging our scale in high-growth and emerging markets, and
- Delivering a unique value proposition to our customers.

GAAP operating income margin and adjusted operating income margin decreased in 2022 due primarily to lower COVID-19 testing volumes, continued strategic growth investments, and the expected impact of incorporating recent acquisitions. This was partially offset by strong pricing realization across all segments to address higher inflation while also driving strong productivity. GAAP operating income margin in 2022 was also impacted by higher amortization expense as a result of 2021 acquisitions.

The company's references to strategic growth investments generally refer to targeted spending for enhancing commercial capabilities, including expansion of geographic sales reach and e-commerce platforms, marketing initiatives, expanded service and operational infrastructure, research and development projects and other expenditures to enhance the customer experience, as well as incentive compensation and recognition for employees. The company's references throughout this discussion to

productivity improvements generally refer to improved cost efficiencies from its Practical Process Improvement (PPI) business system including reduced costs resulting from implementing continuous improvement methodologies, global sourcing initiatives, a lower cost structure following restructuring actions, including headcount reductions and consolidation of facilities, and low cost region manufacturing.

Notable Recent Acquisitions

On January 15, 2021, the company acquired, within the Laboratory Products and Biopharma Services segment, the Belgium-based European viral vector manufacturing business of Groupe Novasep SAS. The European viral vector manufacturing business provides manufacturing services for vaccines and therapies to biotechnology companies and large biopharma customers. The acquisition expands the segment's capabilities for cell and gene vaccines and therapies.

On February 25, 2021, the company acquired, within the Life Sciences Solutions segment, Mesa Biotech, Inc., a U.S.-based molecular diagnostic company. Mesa Biotech has developed and commercialized a PCR based rapid point-of-care testing platform available for detecting infectious diseases including COVID-19. The acquisition enables the company to accelerate the availability of reliable and accurate advanced molecular diagnostics at the point of care.

On September 30, 2021, the company assumed operating responsibility, within the Laboratory Products and Biopharma Services segment, of a new state-of-the-art biologics manufacturing facility in Lengnau, Switzerland from CSL Limited to perform pharma services for CSL with capacity to serve other customers as well.

On December 8, 2021, the company acquired, within the Laboratory Products and Biopharma Services segment, PPD, Inc., a U.S.-based global provider of clinical research services to the pharma and biotech industry. The addition of PPD's clinical research services enhances our offering to biotech and pharma customers by enabling them to accelerate innovation and increase their productivity within the drug development process.

On December 30, 2021, the company acquired, within the Life Sciences Solutions segment, PeproTech, Inc., a U.S.-based developer and manufacturer of recombinant proteins. PeproTech provides bioscience reagents known as recombinant proteins, including cytokines and growth factors. The acquisition expands the segment's bioscience offerings.

On January 3, 2023, the company acquired, within the Specialty Diagnostics segment, The Binding Site Group, a U.K.-based provider of specialty diagnostic assays and instruments to improve the diagnosis and management of blood cancers and immune system disorders. The acquisition expands the segment's portfolio with the addition of pioneering innovation in diagnostics and monitoring for multiple myeloma.

Segment Results

The company's management evaluates segment operating performance using operating income before certain charges/credits as defined in Note 4. Accordingly, the following segment data are reported on this basis.

(Dollars in millions)	2022	2021
Revenues		
Life Sciences Solutions	$ 13,532	$ 15,631
Analytical Instruments	6,624	6,069
Specialty Diagnostics	4,763	5,659
Laboratory Products and Biopharma Services	22,511	14,862
Eliminations	(2,515)	(3,010)
Consolidated revenues	$ 44,915	$ 39,211

Life Sciences Solutions

(Dollars in millions)	2022	2021	Total Change	Currency Translation	Acquisitions/ Divestitures	Organic* *(non-GAAP measure)*
Revenues	$ 13,532	$ 15,631	(13) %	(3)%	1 %	(12)%
Segment income	$ 5,582	$ 7,817	(29) %			
Segment income margin	41.2 %	50.0 %	(8.8) pt			

The decrease in organic revenues in 2022 was primarily due to lower revenue in the genetic sciences business, driven by moderation in testing demand to diagnose COVID-19, partially offset by growth in the bioproduction business. The decrease in segment income margin resulted primarily from business mix and strategic growth investments, partially offset by productivity improvements.

Analytical Instruments

(Dollars in millions)	2022	2021	Total Change	Currency Translation	Acquisitions/ Divestitures	Organic* *(non-GAAP measure)*
Revenues	$ 6,624	$ 6,069	9 %	(5)%	0 %	14 %
Segment income	1,507	1,197	26 %			
Segment income margin	22.8 %	19.7 %	3.1 pt			

The increase in organic revenues in 2022 was due to increased demand across all the segment's businesses, with particular strength in the electron microscopy and chromatography and mass spectrometry businesses. The increase in segment income margin resulted primarily from profit on higher sales, productivity improvements and business mix, offset in part by strategic growth investments.

Specialty Diagnostics

(Dollars in millions)	2022	2021	Total Change	Currency Translation	Acquisitions/ Divestitures	Organic* *(non-GAAP measure)*
Revenues	$ 4,763	$ 5,659	(16) %	(3)%	0 %	(13)%
Segment income	1,024	1,280	(20) %			
Segment income margin	21.5 %	22.6 %	(1.1) pt			

The decrease in organic revenues in 2022 was primarily driven by products addressing diagnosis of COVID-19, partially offset by growth in the immunodiagnostics and transplant diagnostics businesses. The decrease in segment income margin was primarily due to lower COVID-19 testing volume, largely offset by productivity improvements and positive business mix. Segment income margin in 2021 was also impacted by a $13 million credit to cost of product revenue as a result of changing the method of accounting for inventories.

Laboratory Products and Biopharma Services

(Dollars in millions)	2022	2021	Total Change	Currency Translation	Acquisitions/ Divestitures	Organic* *(non-GAAP measure)*
Revenues	$ 22,511	$ 14,862	51 %	(3)%	45 %	10 %
Segment income	2,872	1,844	56 %			
Segment income margin	12.8 %	12.4 %	0.4 pt			

The increase in organic revenues in 2022 was primarily due to higher sales across each of the segment's businesses, with particular strength in the pharma services business and research and safety market channel. PPD, the company's clinical research business, contributed $7.11 billion of revenue during 2022. The increase in segment income margin was primarily due to the benefit of recent acquisitions, profit on higher sales, and productivity improvements, offset in part by strategic growth investments. Segment income margin in 2021 was also impacted by a $20 million credit to cost of product revenue as a result of changing the method of accounting for inventories.

* Results may not sum due to rounding

Non-operating Items

(Dollars in millions)	2022	2021
Net interest expense	$ 454	$ 493
GAAP other income/(expense)	(104)	(694)
Adjusted other income/(expense) *(non-GAAP measure)*	13	38
GAAP tax rate	9.0 %	12.5 %
Adjusted tax rate *(non-GAAP measure)*	13.0 %	14.6 %

Net interest expense (interest expense less interest income) decreased due primarily to lower average interest rates on debt and higher average interest rates on cash balances, partially offset by the increase in debt to finance the acquisition of PPD and for general corporate purposes. See additional discussion under the caption "Liquidity and Capital Resources" below.

GAAP other income/(expense) and adjusted other income/(expense) includes currency transaction gains, losses on non-operating monetary assets and liabilities, and net periodic pension benefit cost/income, excluding the service cost component. GAAP other income/(expense) in 2022 also includes $160 million of net losses on investments, $26 million of losses on the

early extinguishment of debt (Note 10), partially offset by $67 million of net gains on derivative instruments to address certain foreign currency risks and $2 million of net settlement gains on pension plans. GAAP other income/(expense) in 2021 also includes $767 million of losses on the early extinguishment of debt and $36 million of financing costs associated with obtaining bridge financing commitments in connection with the agreement to acquire PPD (Note 2), offset in part by $66 million of net gains on investments.

The company's GAAP and adjusted tax rates decreased in 2022 compared to 2021 primarily due to releases of valuation allowances of $87 million in 2022 in jurisdictions where the deferred tax assets are now expected to be realized. The company's 2022 GAAP tax rate was also impacted by changes in tax rates and higher amortization expense as a result of 2021 acquisitions, as well as a net benefit of $208 million resulting from tax audit settlements (see Note 8). The company's 2021 GAAP and adjusted tax rates were also impacted by income tax benefits on intra-entity transactions totaling $284 million.

The effective tax rate in both 2022 and 2021 was also affected by relatively significant earnings in lower tax jurisdictions. Due primarily to the non-deductibility of intangible asset amortization for tax purposes, the company's cash payments for income taxes were higher than its income tax expense for financial reporting purposes and totaled $1.23 billion and $2.18 billion in 2022 and 2021, respectively.

The company expects its GAAP effective tax rate in 2023 will be between 7% and 9% based on currently forecasted rates of profitability in the countries in which the company conducts business and expected generation of foreign tax credits. The effective tax rate can vary significantly from period to period as a result of discrete income tax factors and events. The company expects its adjusted tax rate will be approximately 11% in 2023.

The company has operations and a taxable presence in approximately 70 countries outside the U.S. Some of these countries have lower tax rates than the U.S. The company's ability to obtain a benefit from lower tax rates outside the U.S. is dependent on its relative levels of income in countries outside the U.S. and on the statutory tax rates in those countries. Based on the dispersion of the company's non-U.S. income tax provision among many countries, the company believes that a change in the statutory tax rate in any individual country is not likely to materially affect the company's income tax provision or net income, aside from any resulting one-time adjustment to the company's deferred tax balances to reflect a new rate.

Liquidity and Capital Resources

The company's proven growth strategy has enabled it to generate free cash flow as well as access the capital markets. The company deploys its capital primarily via mergers and acquisitions and secondarily via share buybacks and dividends.

(In millions)	December 31, 2022	December 31, 2021
Cash and cash equivalents	$ 8,524	$ 4,477
Total debt	34,488	34,870

Approximately half of the company's cash balances and cash flows from operations are from outside the U.S. The company uses its non-U.S. cash for needs outside of the U.S. including acquisitions, capacity expansion, and repayment of third-party foreign debt by foreign subsidiaries. In addition, the company also transfers cash to the U.S. using non-taxable returns of capital as well as dividends where the related U.S. dividend received deduction or foreign tax credit equals any tax cost arising from the dividends. As a result of using such means of transferring cash to the U.S., the company does not expect any material adverse liquidity effects from its significant non-U.S. cash balances for the foreseeable future.

The company believes that its existing cash and cash equivalents and its future cash flow from operations together with available borrowing capacity under its revolving credit agreement will be sufficient to meet the cash requirements of its existing businesses for the foreseeable future, including at least the next 24 months.

As of December 31, 2022, the company's short-term debt totaled $5.58 billion. The company has a revolving credit facility with a bank group that provides up to $5.00 billion of unsecured multi-currency revolving credit (Note 10). If the company borrows under this facility, it intends to leave undrawn an amount equivalent to outstanding commercial paper to provide a source of funds in the event that commercial paper markets are not available. As of December 31, 2022, no borrowings were outstanding under the company's revolving credit facility, although available capacity was reduced by immaterial outstanding letters of credit.

(In millions)	2022	2021
Net cash provided by operating activities	$ 9,154	$ 9,312
Net cash used in investing activities	(2,159)	(21,932)
Net cash (used in) provided by financing activities	(2,810)	6,581
Free cash flow *(non-GAAP measure)*	6,935	6,809

Operating Activities

During 2022, cash provided by income was offset in part by investments in working capital. Increases in accounts receivable and inventories used cash of $0.43 billion and $0.83 billion, respectively, primarily to support growth in sales. An increase in accounts payable provided cash of $0.65 billion. Cash payments for income taxes were $1.23 billion during 2022.

During 2021, cash provided by income was offset in part by investments in working capital. Increases in accounts receivable and inventories used cash of $0.20 billion and $1.07 billion, respectively, primarily to support growth in sales. An increase in accounts payable provided cash of $0.48 billion. Changes in other assets and other liabilities used cash of $0.72 billion primarily due to the timing of tax and incentive compensation payments. Cash payments for income taxes were $2.18 billion during 2021.

The company is contingently liable with respect to certain legal proceedings and related matters. An unfavorable outcome that differs materially from current accrual estimates, if any, for one or more of the matters described under the heading "*Product Liability, Workers Compensation and Other Personal Injury Matters,*" in Note 12 could have a material adverse effect on the company's financial position as well as its results of operations and cash flows.

Investing Activities

During 2022, acquisitions used cash of $0.04 billion. The company's investing activities were principally for the purchase of property, plant and equipment for capacity and capability investments.

During 2021, acquisitions used cash of $19.40 billion. The company's investing activities also included the purchase of $2.52 billion of property, plant and equipment.

The company expects that for all of 2023, expenditures for property, plant and equipment, net of disposals, will be approximately $2.0 billion.

Financing Activities

During 2022, issuance of senior notes provided $3.19 billion in cash. Repayment of senior notes and net commercial paper activity used cash of $0.38 billion and $2.16 billion, respectively. The company's financing activities also included the repurchase of $3.00 billion of the company's common stock (5.3 million shares) and the payment of $0.46 billion in cash dividends. On September 23, 2021, the Board of Directors authorized the repurchase of up to $3.00 billion of the company's common stock. All of the shares of common stock repurchased by the company during the fourth quarter of 2022 were purchased under this program, depleting the 2021 authorization. On November 10, 2022, the Board of Directors authorized the repurchase of up to $4.00 billion of the company's common stock. Early in the first quarter of 2023, the company repurchased $3.00 billion of the company's common stock (5.2 million shares). At February 23, 2023, authorization remained for $1.00 billion of future repurchases of the company's common stock.

During 2021, issuance of senior notes provided $18.14 billion of cash. A net increase in commercial paper obligations provided cash of $2.51 billion. Repayment of debt used cash of $11.74 billion, including $4.30 billion to repay the debt assumed in the acquisition of PPD. The company's financing activities also included the repurchase of $2.00 billion of the company's common stock (4.1 million shares) and the payment of $0.40 billion in cash dividends.

In addition to the obligations on the balance sheet at December 31, 2022, which include, but are not limited to, debt (Note 10), unrecognized tax benefits (Note 8), operating leases (Note 11), pension obligations (Note 7) and contingent consideration (Note 14), the company has entered into unconditional purchase obligations, in the ordinary course of business, that include agreements to purchase goods, services or fixed assets and to pay royalties (Note 12).

Non-GAAP Measures

In addition to the financial measures prepared in accordance with generally accepted accounting principles (GAAP), we use certain non-GAAP financial measures such as organic revenue growth, which is reported revenue growth, excluding the impacts of revenues from acquired/divested businesses and the effects of currency translation. We report organic revenue growth because Thermo Fisher management believes that in order to understand the company's short-term and long-term financial trends, investors may wish to consider the impact of acquisitions/divestitures and foreign currency translation on

revenues. Thermo Fisher management uses organic revenue growth to forecast and evaluate the operational performance of the company as well as to compare revenues of current periods to prior periods.

We report adjusted operating income, adjusted operating income margin, adjusted other income/(expense), adjusted tax rate, and adjusted EPS. We believe that the use of these non-GAAP financial measures, in addition to GAAP financial measures, helps investors to gain a better understanding of our core operating results and future prospects, consistent with how management measures and forecasts the company's core operating performance, especially when comparing such results to previous periods, forecasts, and to the performance of our competitors. Such measures are also used by management in their financial and operating decision-making and for compensation purposes. To calculate these measures we exclude, as applicable:

- Certain acquisition-related costs, including charges for the sale of inventories revalued at the date of acquisition, significant transaction/acquisition-related costs, including changes in estimates of contingent acquisition-related consideration, and other costs associated with obtaining short-term financing commitments for pending/recent acquisitions. We exclude these costs because we do not believe they are indicative of our normal operating costs.
- Costs/income associated with restructuring activities and large-scale abandonments of product lines, such as reducing overhead and consolidating facilities. We exclude these costs because we believe that the costs related to restructuring activities and large-scale abandonment of product lines are not indicative of our normal operating costs.
- Equity in earnings/losses of unconsolidated entities; impairments of long-lived assets; and certain other gains and losses that are either isolated or cannot be expected to occur again with any predictability, including gains/losses on investments, the sale of businesses, product lines, and real estate, significant litigation-related matters, curtailments/settlements of pension plans, and the early retirement of debt. We exclude these items because they are outside of our normal operations and/or, in certain cases, are difficult to forecast accurately for future periods.
- The expense associated with the amortization of acquisition-related intangible assets because a significant portion of the purchase price for acquisitions may be allocated to intangible assets that have lives of up to 20 years. Exclusion of the amortization expense allows comparisons of operating results that are consistent over time for both our newly acquired and long-held businesses and with both acquisitive and non-acquisitive peer companies.
- The tax impacts of the above items and the impact of significant tax audits or events (such as changes in deferred taxes from enacted tax rate/law changes), the latter of which we exclude because they are outside of our normal operations and difficult to forecast accurately for future periods.

We report free cash flow, which is operating cash flow excluding net capital expenditures, to provide a view of the continuing operations' ability to generate cash for use in acquisitions and other investing and financing activities. The company also uses this measure as an indication of the strength of the company. Free cash flow is not a measure of cash available for discretionary expenditures since we have certain non-discretionary obligations such as debt service that are not deducted from the measure.

The non-GAAP financial measures of the company's results of operations and cash flows included in this Form 10-K are not meant to be considered superior to or a substitute for the company's results of operations prepared in accordance with GAAP. Reconciliations of such non-GAAP financial measures to the most directly comparable GAAP financial measures are set forth within the "Overview" and "Results of Operations" sections and below.

(Dollars in millions except per share amounts)	2022		2021	
Reconciliation of adjusted operating income and adjusted operating income margin				
GAAP operating income	$ 8,393	18.7 %	$ 10,028	25.6 %
Cost of revenues adjustments (a)	46	0.1 %	8	0.0 %
Selling, general and administrative expenses adjustments (b)	37	0.1 %	144	0.4 %
Restructuring and other costs (c)	114	0.3 %	197	0.5 %
Amortization of acquisition-related intangible assets	2,395	5.3 %	1,761	4.5 %
Adjusted operating income *(non-GAAP measure)*	$ 10,985	24.5 %	$ 12,138	31.0 %
Reconciliation of adjusted other income/(expense)				
GAAP other income/(expense)	$ (104)		$ (694)	
Adjustments (d)	117		732	
Adjusted other income/(expense) *(non-GAAP measure)*	$ 13		$ 38	

(Dollars in millions except per share amounts)	2022	2021
Reconciliation of adjusted tax rate		
GAAP tax rate	9.0 %	12.5 %
Adjustments (e)	4.0 %	2.1 %
Adjusted tax rate *(non-GAAP measure)*	13.0 %	14.6 %
Reconciliation of adjusted earnings per share		
GAAP diluted earnings per share (EPS) attributable to Thermo Fisher Scientific Inc.	$ 17.63	$ 19.46
Cost of revenues adjustments (a)	0.12	0.02
Selling, general and administrative expenses adjustments (b)	0.09	0.36
Restructuring and other costs (c)	0.29	0.50
Amortization of acquisition-related intangible assets	6.07	4.43
Other income/expense adjustments (d)	0.30	1.84
Provision for income taxes adjustments (e)	(1.70)	(1.49)
Equity in earnings/losses of unconsolidated entities	0.44	0.01
Adjusted EPS *(non-GAAP measure)*	$ 23.24	$ 25.13
Reconciliation of free cash flow		
GAAP net cash provided by operating activities	$ 9,154	$ 9,312
Purchases of property, plant and equipment	(2,243)	(2,523)
Proceeds from sale of property, plant and equipment	24	20
Free cash flow *(non-GAAP measure)*	$ 6,935	$ 6,809

(a) Adjusted results exclude charges for the sale of inventories revalued at the date of acquisition. Adjusted results in 2022 also exclude $27 million of inventory write-downs associated with large-scale abandonment of product lines.

(b) Adjusted results exclude certain third-party expenses, principally transaction/integration costs related to recent acquisitions, charges/credits for changes in estimates of contingent acquisition consideration, and charges associated with product liability litigation.

(c) Adjusted results exclude restructuring and other costs consisting principally of severance, impairments of long-lived assets, charges/credits for environmental-related matters, abandoned facility and other expenses of headcount reductions within several businesses and real estate consolidations. Adjusted results in 2022 also exclude $14 million of gain on the sale of intellectual property. Adjusted results in 2021 also exclude $122 million of charges for impairments of acquired intangible assets and $35 million of charges for compensation due to employees at recently acquired businesses at the date of acquisition.

(d) Adjusted results exclude net gains/losses on investments and losses on the early extinguishment of debt. Adjusted results in 2022 also exclude $67 million of net gains on derivative instruments to address certain foreign currency risks and $2 million of net settlement gains for pension plans. Adjusted results in 2021 also exclude $36 million of charges for amortization of bridge loan commitment fees related to a pending acquisition.

(e) Adjusted provision for income taxes excludes incremental tax impacts for the reconciling items between GAAP and adjusted net income, incremental tax impacts as a result of tax rate/law changes and the tax impacts from audit settlements (including a $658 million benefit from an audit settlement in 2022). Adjusted results in 2022 also exclude a $423 million charge for the impact of deferred tax realizability assessments as a result of audit settlements.

Critical Accounting Policies and Estimates

The company's discussion and analysis of its financial condition and results of operations is based upon its financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses and related disclosure of contingent liabilities. On an on-going basis, management evaluates its estimates, including those related to acquisition-related measurements and income taxes. Management believes the most complex and sensitive judgments, because of their significance to the consolidated financial statements, result primarily from the need to make estimates about the effects of matters that are inherently uncertain. Management bases its estimates on historical experience, current market and economic conditions and other assumptions that management believes are reasonable. The results of these estimates form the basis for judgments about the carrying value of assets and liabilities where the values are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

The company believes the following represent its critical accounting policies and estimates used in the preparation of its financial statements:

Acquisition-related Measurements

Business Combinations

The company uses assumptions and estimates in determining the fair value of assets acquired and liabilities assumed in a business combination. The determination of the fair value of intangible assets, which represent a significant portion of the purchase price in many of the company's acquisitions, requires the use of significant judgment with regard to (i) the fair value and (ii) whether such intangibles are amortizable or non-amortizable and, if the former, the period and the method by which the intangible asset will be amortized. The company estimates the fair value of acquisition-related intangible assets principally based on projections of cash flows that will arise from identifiable intangible assets of acquired businesses, which include estimates of customer attrition and technology obsolescence rates. The projected cash flows are discounted to determine the present value of the assets at the dates of acquisition. See Note 2 for additional information about our recent business combinations.

Goodwill and Indefinite-lived Intangible Assets

The company evaluates goodwill and indefinite-lived intangible assets for impairment annually and when events occur or circumstances change that would more likely than not reduce the fair value of an asset below its carrying amount. Events or circumstances that might require an interim evaluation include unexpected adverse business conditions, economic factors, unanticipated technological changes or competitive activities, loss of key personnel and acts by governments and courts, among others. Goodwill and indefinite-lived intangible assets totaled $41.20 billion and $1.24 billion, respectively, at December 31, 2022 (see Note 1 for additional information). Estimates of discounted future cash flows require assumptions related to revenue and operating income growth rates, discount rates and other factors. For the goodwill impairment tests, the company also considers (i) peer revenues and earnings trading multiples from companies that have operational and financial characteristics that are similar to the respective reporting units and (ii) estimated weighted average costs of capital. Different assumptions from those made in the company's analysis could materially affect projected cash flows and the company's evaluation of goodwill and indefinite-lived intangible assets for impairment.

Except as described below, the company performed the quantitative goodwill impairment test for all of its reporting units and indefinite-lived intangible assets. Determinations of fair value based on projections of discounted cash flows, which decreased from the prior year projections primarily due to higher discount rates, and based on peer revenues and earnings trading multiples, which also decreased from the prior year, were sufficient to conclude that no impairments of goodwill or indefinite-lived intangible assets existed at the end of the tenth fiscal month of 2022, the date of the company's annual impairment testing. There were no interim impairments of goodwill or indefinite-lived intangible assets in 2022. There can be no assurance, however, that adverse events or conditions will not cause the fair values of these assets to decline. Should the fair values of the company's reporting units or indefinite-lived intangible assets decline because of reduced operating performance, market declines, or other indicators of impairment, or as a result of changes in the discount rates, charges for impairment may be necessary.

With the completion of the PPD acquisition in December 2021, the company established two new reporting units that solely consist of the legacy PPD businesses, the book carrying values of which equaled their fair values as of the acquisition date. During its annual 2022 goodwill impairment assessments, the company performed qualitative assessments of these reporting units and determined that no events had occurred and no circumstances had changed that would more-likely-than-not reduce the fair values of the reporting units below their carrying amounts. As a result, the company did not perform the quantitative goodwill impairment tests for these reporting units. Given that the fair values of the reporting units were unlikely to be substantially in excess of their carrying values as of the annual 2022 assessment date, relatively small decreases in future cash flows versus anticipated results, decreases in peer trading multiples and/or increases in weighted average costs of capital could result in impairment of goodwill. The reporting units consisting of the legacy PPD businesses had $13.41 billion of goodwill, and an overall carrying value of $19.30 billion as of December 31, 2022.

Definite-lived Intangible Assets

Definite-lived intangible assets totaled $16.21 billion at December 31, 2022 (see Note 1 for additional information). Certain definite-lived intangible assets have largely independent cash flows. The company reviews these definite-lived intangible assets for impairment individually when indication of potential impairment exists, such as a significant reduction in cash flows associated with the assets. Actual cash flows arising from a particular intangible asset could vary from projected cash flows, which could imply different carrying values from those established at the dates of acquisition and which could result in impairment of such asset. Most of the company's definite-lived intangible assets are used in conjunction with other assets, such as property, plant and equipment and operating lease right-of-use assets. In these situations, the company considers

the asset groups to be the units of account for impairment testing. The company recorded impairments of $0.12 billion in 2021 (see Note 16).

Income Taxes

Unrecognized Tax Benefits

In the ordinary course of business there is inherent uncertainty in quantifying the company's income tax positions. The company assesses income tax positions and records tax benefits for all years subject to examination based upon management's evaluation of the facts, circumstances and information available at the reporting date. For those tax positions where it is more likely than not that a tax benefit will be sustained, the company has recorded the largest amount of tax benefit with a greater than 50 percent likelihood of being realized upon ultimate settlement with a taxing authority that has full knowledge of all relevant information. For those income tax positions where it is not more likely than not that a tax benefit will be sustained, no tax benefit has been recognized in the financial statements. Should tax return positions that the company expects are sustainable not be sustained upon audit, the company could be required to record an incremental tax provision for such taxes. The company's liability for these unrecognized tax benefits totaled $0.57 billion at December 31, 2022, compared to $1.12 billion at December 31, 2021, primarily as a result of an audit settlement (see Note 8).

The company operates in numerous countries under many legal forms and, as a result, is subject to the jurisdiction of numerous domestic and non-U.S. tax authorities, as well as to tax agreements and treaties among these governments. Determination of taxable income in any jurisdiction requires the company to interpret the related tax laws and regulations and the use of estimates and assumptions regarding significant future events, such as the amount, timing and character of deductions, permissible revenue recognition methods under the tax law and the sources and character of income and tax credits. Changes in tax laws, regulations, agreements and treaties, currency exchange restrictions or the company's level of operations or profitability in each taxing jurisdiction could have an impact upon the amount of current and deferred tax balances and hence the company's net income.

Valuation Allowances

The company estimates the degree to which tax assets will result in a benefit, after consideration of all positive and negative evidence, and provides a valuation allowance for tax assets that it believes will more likely than not go unused. In situations in which the company has been able to determine that its deferred tax assets will be realized, that determination generally relies on future reversals of taxable temporary differences and expected future taxable income. If it becomes more likely than not that a tax asset will be used, the company reverses the related valuation allowance. Any such reversals are recorded as a reduction of the company's tax provision. The company's tax valuation allowance totaled $1.32 billion at December 31, 2022, compared to $0.97 billion at December 31, 2021, primarily driven by the assessment of additional tax assets resulting from an audit settlement during the year (see Note 8). Should the company's actual future taxable income by tax jurisdiction vary from estimates, additional allowances or reversals thereof may be necessary.

Recent Accounting Pronouncements

A description of recently issued accounting standards is included under the heading "*Recent Accounting Pronouncements*" in Note 1.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

The company is exposed to market risk from changes in interest rates and currency exchange rates, which could affect its future results of operations and financial condition. The company manages its exposure to these risks through its regular operating and financing activities. The company has periodically hedged interest rate risks of fixed-rate instruments with offsetting interest rate swaps. Additionally, the company uses short-term forward and option contracts primarily to hedge certain balance sheet and operational exposures resulting from changes in currency exchange rates. Such exposures result from purchases, sales, cash and intercompany loans that are denominated in currencies other than the functional currencies of the respective operations. The currency-exchange contracts principally hedge transactions denominated in euro, British pounds sterling, Singapore dollars, Japanese yen, Hong Kong dollars, Czech koruna and Swedish krona. Income and losses arising from these derivative contracts are recognized as offsets to losses and income resulting from the underlying exposure being hedged. The company does not enter into speculative derivative agreements.

Interest Rates

The company is exposed to changes in interest rates while conducting normal business operations as a result of ongoing investing and financing activities, which affect the company's debt as well as cash and cash equivalents. As of December 31, 2022, the company's debt portfolio was comprised primarily of fixed rate borrowings. The fair market value of the company's fixed interest rate debt is subject to interest rate risk. Generally, the fair market value of fixed interest rate debt will increase as

interest rates fall and decrease as interest rates rise. The total estimated fair value of the company's debt at December 31, 2022 was $30.29 billion (Note 14). Fair values were determined from available market prices using current interest rates and terms to maturity. If interest rates were to decrease by 100 basis points, the fair value of the company's debt at December 31, 2022 would increase by approximately $2.00 billion. If interest rates were to increase by 100 basis points, the fair value of the company's debt at December 31, 2022 would decrease by approximately $1.75 billion.

In addition, interest rate changes would result in a change in the company's interest expense due to variable-rate debt instruments including swap arrangements. In 2022, a 100 basis point increase in interest rates on the swap arrangements and variable-rate debt would have increased the company's annual pre-tax interest expense by approximately $35 million.

Currency Exchange Rates

The company views its investment in international subsidiaries with a functional currency other than the U.S. dollar as permanent. The company's investment in international subsidiaries is sensitive to fluctuations in currency exchange rates. The functional currencies of the company's international subsidiaries are principally denominated in euro, British pounds sterling, Swedish krona, Canadian dollars, Norwegian kroner and Danish kroner. The effect of a change in the period ending currency exchange rates on the company's net investment in international subsidiaries is reflected in the "accumulated other comprehensive items" component of shareholders' equity. The company also uses foreign currency-denominated debt to partially hedge its net investments in foreign operations against adverse movements in exchange rates. A 10% depreciation in year-end 2022 functional currencies, relative to the U.S. dollar, would result in a reduction of shareholders' equity of approximately $1.45 billion.

The fair value of forward currency-exchange contracts is sensitive to changes in currency exchange rates. The fair value of forward currency-exchange contracts is the estimated amount that the company would pay or receive upon termination of the contract, taking into account the change in currency exchange rates. A 10% depreciation in year-end 2022 non-functional currency exchange rates related to the company's contracts would result in an additional unrealized loss on forward currency-exchange contracts of $9 million. A 10% appreciation in year-end 2022 non-functional currency exchange rates related to the company's contracts would result in an unrealized gain on forward currency-exchange contracts of $9 million. The unrealized gains or losses on forward currency-exchange contracts resulting from changes in currency exchange rates are expected to approximately offset losses or gains on the exposures being hedged.

Certain of the company's cash and cash equivalents are denominated in currencies other than the functional currency of the depositor and are sensitive to changes in currency exchange rates. A 10% depreciation in the related year-end 2022 non-functional currency exchange rates applied to such cash balances would result in a negative impact of $21 million on the company's net income.

Item 8. Financial Statements and Supplementary Data

This data is submitted as a separate section to this report. See Item 15 "Exhibits and Financial Statement Schedules."

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

Not applicable.

Item 9A. Controls and Procedures

Management's Evaluation of Disclosure Controls and Procedures

The company's management, with the participation of the company's chief executive officer and chief financial officer, has evaluated the effectiveness of the company's disclosure controls and procedures (as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered by this report. 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 such evaluation, the company's chief executive officer and chief financial officer concluded that, as of the end of such period, the company's disclosure controls and procedures were effective at the reasonable assurance level.

Changes in Internal Control over Financial Reporting

There have been no changes in the company's internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) during the fiscal quarter ended December 31, 2022, that have materially affected or are reasonably likely to materially affect the company's internal control over financial reporting.

Management's Annual Report on Internal Control Over Financial Reporting

The company's management, including the company's chief executive officer and chief financial officer, is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the company. Internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. The company's management conducted an assessment of the effectiveness of the company's internal control over financial reporting as of December 31, 2022 based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on this assessment, the company's management concluded that, as of December 31, 2022, the company's internal control over financial reporting was effective.

The company's independent registered public accounting firm, PricewaterhouseCoopers LLP, has audited the effectiveness of the company's internal control over financial reporting as of December 31, 2022, as stated in their report that appears on page F-2 of this Annual Report on Form 10-K.

Item 9B. Other Information

On February 22, 2023, the Board of Directors of the company amended and restated the company's By-Laws, effective immediately, to conform the By-laws to the Securities and Exchange Commission's universal proxy rules contained in Rule 14a-19 under the Securities Exchange Act of 1934, and certain 2022 amendments to the General Corporation Law of the State of Delaware (the DGCL). The amendments to the By-laws include additions to Article I, Section 9 to implement the requirements of Rule 14a-19 regarding the nomination and solicitation of proxies for director candidates. The amendments to the By-laws also include revisions to Article I, Sections 4 and 8 to conform with the 2022 DGCL amendments. The foregoing description of the amendments to the By-laws does not purport to be complete and is qualified in its entirety by reference to the full text of the By-laws, as amended and restated, a copy of which is attached as Exhibit 3.4 and incorporated by reference herein.

On February 22, 2023, the company entered into a consulting agreement with Mark P. Stevenson, former Executive Vice President and Chief Operating Officer of the company, relating to services that Mr. Stevenson will provide to the company. Under the consulting agreement, which has a term ending March 1, 2024, Mr. Stevenson will serve on the company's Scientific Advisory Board and will also provide ongoing advice and services as requested by the company. During the term of the consulting agreement, Mr. Stevenson will receive compensation of $8,000 per month. The agreement also contains provisions that restrict Mr. Stevenson's ability during the term of the consulting agreement (i) to work for or provide consulting services to, any competitor of the company, and (ii) to solicit for hire employees or consultants of the company or to solicit customers or clients of the company.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections

Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

The information with respect to directors required by this Item will be contained in our definitive proxy statement to be filed with the SEC not later than 120 days after the close of business of the fiscal year (2023 Definitive Proxy Statement) including under "Corporate governance," and is incorporated in this report by reference.

The information with respect to executive officers required by this Item is included in Item 1 of Part I of this report.

The other information required by this Item will be contained in our 2023 Definitive Proxy Statement including under "Corporate governance," and is incorporated in this report by reference.

Item 11. Executive Compensation

The information required by this Item will be contained in our 2023 Definitive Proxy Statement including under "Corporate governance," and "Executive compensation," and is incorporated in this report by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this Item will be contained in our 2023 Definitive Proxy Statement including under "Information about stock ownership," and is incorporated in this report by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by this Item will be contained in our 2023 Definitive Proxy Statement including under "Corporate governance," and is incorporated in this report by reference.

Item 14. Principal Accountant Fees and Services

The information required by this Item will be contained in our 2023 Definitive Proxy Statement including under "Audit matters," and is incorporated in this report by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a) The following documents are filed as part of this report:

(1) Consolidated Financial Statements (see Index on page F-1 of this report)

Report of Independent Registered Public Accounting Firm
Consolidated Balance Sheet
Consolidated Statement of Income
Consolidated Statement of Comprehensive Income
Consolidated Statement of Cash Flows
Consolidated Statement of Redeemable Noncontrolling Interest and Equity
Notes to Consolidated Financial Statements

(2) All schedules are omitted because they are not applicable or not required, or because the required information is included either in the consolidated financial statements or in the notes thereto.

(b) Exhibits

See the Exhibit Index on page 31.

Item 16. Form 10-K Summary

None.

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EXHIBIT INDEX

Exhibit Number	Description of Exhibit
2.1	Agreement and Plan of Merger, dated as of April 15, 2021, by and among Thermo Fisher Scientific Inc., Powder Acquisition Corp. and PPD, Inc. (filed as Exhibit 2.1 to the Registrant's Current Report on Form 8-K filed April 16, 2021 [File No. 1-8002] and incorporated in this document by reference).
3.1	Amended and Restated Certificate of Incorporation of the Registrant (filed as Exhibit 3.1 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2005 [File No. 1-8002] and incorporated in this document by reference).
3.2	Amendment to Thermo Fisher Scientific Inc.'s Third Amended and Restated Certificate of Incorporation (filed as Exhibit 3.1 to the Registrant's Current Report on Form 8-K filed November 14, 2006 [File No. 1-8002] and incorporated in this document by reference).
3.3	Certificate of Elimination of the Series B Junior Participating Preferred Stock of the Company, dated November 13, 2015 (filed as Exhibit 3.1 to the Registrant's Current Report on Form 8-K filed November 16, 2015 [File No. 1-8002] and incorporated in this document by reference).
3.4	Amended and Restated By-Laws of the Registrant, as amended and effective as of February 22, 2023
	The Registrant agrees, pursuant to Item 601(b)(4)(iii)(A) of Regulation S-K, to furnish to the Commission, upon request, a copy of each instrument with respect to long-term debt of the Registrant or its consolidated subsidiaries.
4.1	Indenture dated as of November 20, 2009 between the Company and The Bank of New York Mellon Trust Company, N.A. (filed as Exhibit 99.1 to the Registrant's Current Report on Form 8-K filed November 20, 2009 [File No. 1-8002] and incorporated in this document by reference).
4.2	Sixth Supplemental Indenture, dated as of December 11, 2013, between the Company and The Bank of New York Mellon Trust Company, N.A. (filed as Exhibit 99.2 to the Registrant's Current Report on Form 8-K filed December 11, 2013 [File No. 1-8002] and incorporated in this document by reference).
4.3	Eighth Supplemental Indenture, dated as of November 24, 2014, among the Company, The Bank of New York Mellon Trust Company, N.A., as trustee, and The Bank of New York Mellon, London Branch, as paying agent (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed November 24, 2014 [File No. 1-8002] and incorporated in this document by reference).
4.4	Thirteenth Supplemental Indenture, dated as of September 12, 2016, between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed September 12, 2016 [File No. 1-8002] and incorporated in this document by reference).
4.5	Fifteenth Supplemental Indenture, dated as of March 16, 2017, between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed March 16, 2017 [File No. 1-8002] and incorporated in this document by reference).
4.6	Sixteenth Supplemental Indenture, dated as of July 24, 2017, between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed July 24, 2017 [File No. 1-8002] and incorporated in this document by reference).
4.7	Seventeenth Supplemental Indenture, dated as of August 14, 2017, between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed August 14, 2017 [File No. 1-8002] and incorporated in this document by reference).
4.8	Eighteenth Supplemental Indenture, dated as of September 30, 2019, between the Company, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed September 30, 2019 [File No. 1-8002] and incorporated in this document by reference).
4.9	Nineteenth Supplemental Indenture, dated as of October 8, 2019, between the Company, and the Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed October 8, 2019 [File No. 1-8002] and incorporated in this document by reference).
4.10	Twenty-First Supplemental Indenture, dated as of April 2, 2020, between the Company, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed April 2, 2020 [File No. 1-8002] and incorporated in this document by reference).
4.11	Twenty-Second Supplemental Indenture, dated as of August 23, 2021, between the Company, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed August 23, 2021 [File No. 1-8002] and incorporated in this document by reference).
4.12	Twenty-Third Supplemental Indenture, dated as of October 22, 2021, between the Company, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed October 22, 2021 [File No. 1-8002] and incorporated in this document by reference).
4.13	Twenty-Fourth Supplemental Indenture, dated as of October 20, 2022, between the Company, as issuer, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed October 20, 2022 [File No. 1-8002] and incorporated in this document by reference).
4.14	Twenty-Fifth Supplemental Indenture, dated as of November 21, 2022, between the Company, as issuer, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed November 21, 2022 [File No. 1-8002] and incorporated in this document by reference).
4.15	Twenty-Sixth Supplemental Indenture, dated as of November 21, 2022, between the Company, as issuer, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.3 to the Registrant's Current Report on Form 8-K filed November 21, 2022 [File No. 1-8002] and incorporated in this document by reference).

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Exhibit Number	Description of Exhibit
4.16	Indenture, dated as of August 9, 2016, among Thermo Fisher International, as issuer, the Company, as guarantor, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.1 to the Registrant's Current Report on Form 8-K filed August 9, 2016 [File No. 1-8002] and incorporated in this document by reference).
4.17	Third Supplemental Indenture, dated as of October 18, 2021, among Thermo Fisher Scientific (Finance I) B.V. (Thermo Fisher International), as issuer, the Company, as guarantor, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed October 18, 2021 [File No. 1-8002] and incorporated in this document by reference).
4.18	Fourth Supplemental Indenture, dated as of November 18, 2021, among Thermo Fisher Scientific (Finance I) B.V. (Thermo Fisher International), as issuer, the Company, as guarantor, and The Bank of New York Mellon Trust Company, N.A., as trustee (filed as Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed August 9, 2016 [File No. 1-8002] and incorporated in this document by reference).
4.19	Description of the Registrant's Securities
10.1	Thermo Fisher Scientific Inc. Deferred Compensation Plan for Directors of the Registrant, as amended and restated effective November 10, 2006 (filed as Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended September 29, 2007 [File No. 1-8002] and incorporated in this document by reference).*
10.2	Thermo Electron Corporation Deferred Compensation Plan, effective November 1, 2001 (filed as Exhibit 10.13 to the Registrant's Annual Report on Form 10-K for the fiscal year ended December 29, 2001 [File No. 1-8002] and incorporated in this document by reference).*
10.3	Form of Amended and Restated Indemnification Agreement between the Registrant and its directors and officers (filed as Exhibit 10.2 to the Registrant's Registration Statement on Form S-4 [Reg. No. 333-90661] and incorporated in this document by reference).*
10.4	Summary of Thermo Fisher Scientific Inc. Annual Non-Management Director Compensation (filed as Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed February 24, 2022 [File No. 1-8002] and incorporated in this document by reference).*
10.5	Form of Noncompetition Agreement between the Registrant and certain key employees and executive officers, effective as of January 1, 2009 (filed as Exhibit 10.25 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2009 [File No. 1-8002] and incorporated in this document by reference).*
10.6	Retirement Plan for Non-Employee Directors of Fisher Scientific International Inc. (filed as Exhibit 10.12 to Fisher Scientific International Inc.'s Annual Report on Form 10-K for the year ended December 31, 1992 [File No. 1-10920] and incorporated in this document by reference).*
10.7	First Amendment to the Fisher Scientific International Inc. Retirement Plan for Non-Employee Directors (filed as Exhibit 10.04 to Fisher Scientific International Inc.'s Quarterly Report on Form 10-Q for the quarter ended March 31, 2005 [File No. 1-10920] and incorporated in this document by reference).*
10.8	Amendment to Retirement Plan for Non-Employee Directors of Fisher Scientific International Inc. (filed as Exhibit 10.02 to Fisher Scientific International Inc.'s Current Report on Form 8-K filed March 7, 2006 [File No. 1-10920] and incorporated in this document by reference).*
10.9	Thermo Fisher Scientific Inc. Amended and Restated 2005 Deferred Compensation Plan, effective January 1, 2020 (filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 27, 2020 [File No. 1-8002] and incorporated in this document by reference).*
10.10	2009 Restatement of Executive Severance Agreement, between Marc N. Casper and the Registrant, dated November 21, 2009 (filed as Exhibit 10.5 to the Registrant's Current Report on Form 8-K filed November 25, 2009 [File No. 1-8002] and incorporated in this document by reference).*
10.11	Executive Change In Control Retention Agreement, between Marc N. Casper and the Registrant, dated November 21, 2009 (filed as Exhibit 10.6 to the Registrant's Current Report on Form 8-K filed November 25, 2009 [File No. 1-8002] and incorporated in this document by reference).*
10.12	Noncompetition Agreement, between Marc N. Casper and the Registrant, dated November 21, 2009 (filed as Exhibit 10.7 to the Registrant's Current Report on Form 8-K filed November 25, 2009 [File No. 1-8002] and incorporated in this document by reference).*
10.13	Amendment No. 1 to 2009 Restatement of Executive Severance Agreement, dated February 25, 2010, between the Registrant and Marc N. Casper (filed as Exhibit 10.2 to the Registrant's Current Report on Form 8-K filed February 25, 2010 [File No. 1-8002] and incorporated in this document by reference).*
10.14	Amendment No. 2 to 2009 Restatement of Executive Severance Agreement, dated November 30, 2010, between the Registrant and Marc N. Casper (filed as Exhibit 10.55 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2010 [File No. 1-8002] and incorporated in this document by reference).*
10.15	Amendment No. 1 to Executive Change In Control Retention Agreement, dated November 30, 2010, between Marc N. Casper and the Registrant (filed as Exhibit 10.56 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2010 [File No. 1-8002] and incorporated in this document by reference).*
10.16	Amendment No. 2 to Executive Change in Control Retention Agreement, dated March 16, 2018, between Marc N. Casper and the Registrant (filed as Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended March 31, 2018 [File No. 1-8002] and incorporated in this document by reference).*

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Exhibit Number	Description of Exhibit
10.17	Form of Executive Change in Control Retention Agreement for Officers (other than Marc N. Casper) (filed as Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended March 31, 2018 [File No. 1-8002] and incorporated in this document by reference).*
10.18	Form of Thermo Fisher Scientific Inc.'s Restricted Stock Unit Agreement for Directors (filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended April 2, 2011 [File No. 1-8002] and incorporated in this document by reference).*
10.19	Form of Nonstatutory Stock Option Agreement between Thermo Fisher Scientific Inc. and Marc N. Casper effective February 26, 2013 (filed as Exhibit 10.5 to the Registrant's Current Report on Form 8-K filed February 27, 2013 [File No. 1-8002] and incorporated in this document by reference).*
10.20	Thermo Fisher Scientific Inc. 2013 Stock Incentive Plan (filed as Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed May 23, 2013 [File No. 1-8002] and incorporated in this document by reference).*
10.21	Supplemental Executive Retirement Plan effective as of December 31, 2005, as amended and restated as of August 28, 2006 (filed as Exhibit 10.3 to Applera Corporation's Quarterly Report on Form 10-Q for the quarter ended September 30, 2006 [File No. 1-04389] and incorporated in this document by reference).*
10.22	Amendment to Supplemental Executive Retirement Plan, effective as of January 1, 2010 (filed as Exhibit 10.1 to Life Technologies Corporation's Current Report on Form 8-K filed December 18, 2009 [File No. 000-25317] and incorporated in this document by reference).*
10.23	Noncompetition Agreement between the Registrant and Mark P. Stevenson, dated September 10, 2015 (filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended September 26, 2015 [File No. 1-8002] and incorporated in this document by reference).*
10.24	Form of Thermo Fisher Scientific Inc.'s Nonstatutory Stock Option Agreement for Officers (filed as Exhibit 10.44 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2016 [File No. 1-8002] and incorporated in this document by reference).*
10.25	Patheon N.V. 2016 Omnibus Incentive Plan (filed as Exhibit 10.2 to the Current Report on Form 8-K filed by Patheon N.V. on July 26, 2016 [File No. 001-37837] and incorporated in this document by reference).*
10.26	Amendment to Patheon N.V. 2016 Omnibus Incentive Plan, dated March 7, 2017 (filed as Exhibit 4.5 to the Registrant's Registration Statement on Form S-8 filed August 29, 2017 [File No. 1-8002] and incorporated in this document by reference).*
10.27	Amendment to Patheon N.V. 2016 Omnibus Incentive Plan, dated August 23, 2017 (filed as Exhibit 4.6 to the Registrant's Registration Statement on Form S-8 filed August 29, 2017 [File No. 1-8002] and incorporated in this document by reference).*
10.28	Credit Agreement, dated January 7, 2022, among Thermo Fisher Scientific Inc., certain Subsidiaries of Thermo Fisher Scientific Inc. from time to time party thereto, Bank of America, N.A., as Administrative Agent and each lender from time to time party thereto (filed as Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed January 7, 2022 [File No. 1-8002] and incorporated in this document by reference).
10.29	Letter Agreement between the Registrant and Michel Lagarde dated August 28, 2017 (filed as Exhibit 10.39 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.30	Option Agreement Under the Patheon N.V. 2016 Omnibus Incentive Plan between Patheon N.V. and Michel Lagarde dated July 20, 2016 (filed as Exhibit 10.40 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.31	Option Agreement Under the Patheon N.V. 2016 Omnibus Incentive Plan between Patheon N.V. and Michel Lagarde dated March 23, 2017 (filed as Exhibit 10.42 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.32	Thermo Fisher Scientific Inc. Executive Severance Policy (filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 29, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.33	Form of Noncompetition Agreement between the Registrant and certain key employees and executive officers (filed as Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended June 29, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.34	Form of Thermo Fisher Scientific Inc.'s Performance Restricted Stock Unit Agreement effective as of February 25, 2020 (filed as Exhibit 10.45 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.35	Form of Thermo Fisher Scientific Inc.'s Restricted Stock Unit Agreement effective as of February 25, 2020 (filed as Exhibit 10.46 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.36	Form of Thermo Fisher Scientific Inc.'s Nonstatutory Stock Option Agreement for Officers effective as of February 25, 2020 (filed as Exhibit 10.47 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*

THERMO FISHER SCIENTIFIC INC.

EXHIBIT INDEX

Exhibit Number	Description of Exhibit
10.37	Form of Performance Restricted Stock Unit Agreement between Thermo Fisher Scientific Inc. and Marc N. Casper effective as of February 25, 2020 (filed as Exhibit 10.48 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.38	Form of Restricted Stock Unit Agreement between Thermo Fisher Scientific Inc. and Marc N. Casper effective as of February 25, 2020 (filed as Exhibit 10.49 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.39	Form of Nonstatutory Stock Option Agreement between Thermo Fisher Scientific Inc. and Marc N. Casper effective as of February 25, 2020 (filed as Exhibit 10.50 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2019 [File No. 1-8002] and incorporated in this document by reference).*
10.40	Form of Restricted Stock Unit Agreement between Thermo Fisher Scientific Inc. and Marc N. Casper (filed as Exhibit 10.47 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2020 [File No. 1-8002] and incorporated in this document by reference).*
10.41	Form of Performance Restricted Stock Unit Agreement between Thermo Fisher Scientific Inc. and Marc N. Casper (filed as Exhibit 10.48 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2020 [File No. 1-8002] and incorporated in this document by reference).*
10.42	Form of Thermo Fisher Scientific Inc.'s Performance Restricted Stock Unit Agreement (filed as Exhibit 10.49 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2020 [File No. 1-8002] and incorporated in this document by reference).*
10.43	PPD, Inc. 2020 Omnibus Incentive Plan (filed as Exhibit 10.38 to PPD Inc.'s Form S-1/A filed January 27, 2020 [File No. 333-235860] and incorporated in this document by reference).*
10.44	Consulting Agreement between the Registrant and Mark P. Stevenson, dated February 24, 2022 (filed as Exhibit 10.49 to the Registrant's Annual Report on Form 10-K for the year ended December 31, 2021 [File No. 1-8002] and incorporated in this document by reference).*
10.45	Amendment to Nonstatutory Stock Option Agreements between Thermo Fisher Scientific Inc. and Marc N. Casper.*
10.46	Amendment to Restricted Stock Unit Agreements between Thermo Fisher Scientific Inc. and Marc N. Casper.*
10.47	Amendment to Performance Restricted Stock Unit Agreements between Thermo Fisher Scientific Inc. and Marc N. Casper.*
21	Subsidiaries of the Registrant.
22	Subsidiary Issuer of Guaranteed Securities.
23.1	Consent of PricewaterhouseCoopers LLP, an Independent Registered Public Accounting Firm.
31.1	Certification of Chief Executive Officer required by Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of Chief Financial Officer required by Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1	Certification of Chief Executive Officer required by Exchange Act Rules 13a-14(b) and 15d-14(b), as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.**
32.2	Certification of Chief Financial Officer required by Exchange Act Rules 13a-14(b) and 15d-14(b), as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.**
101.INS	XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.
101.SCH	XBRL Taxonomy Extension Schema Document.
101.CAL	XBRL Taxonomy Calculation Linkbase Document.
101.DEF	XBRL Taxonomy Definition Linkbase Document.
101.LAB	XBRL Taxonomy Label Linkbase Document.
101.PRE	XBRL Taxonomy Presentation Linkbase Document.
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101).

*Indicates management contract or compensatory plan, contract or arrangement.

** Certification is not deemed "filed" for purposes of Section 18 of the Exchange Act or otherwise subject to the liability of that section. Such certification is not deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act except to the extent that the registrant specifically incorporates it by reference.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) 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.

Date: February 23, 2023

THERMO FISHER SCIENTIFIC INC.

By: /s/ Marc N. Casper
Marc N. Casper
Chairman, President and Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities indicated, as of February 23, 2023.

By: /s/ Marc N. Casper
Marc N. Casper
Chairman, President and Chief Executive Officer
(Principal Executive Officer)

By: /s/ Stephen Williamson
Stephen Williamson
Senior Vice President and Chief Financial Officer
(Principal Financial Officer)

By: /s/ Joseph R. Holmes
Joseph R. Holmes
Vice President and Chief Accounting Officer
(Principal Accounting Officer)

By: /s/ Nelson J. Chai
Nelson J. Chai
Director

By: /s/ Ruby R. Chandy
Ruby R. Chandy
Director

By: /s/ C. Martin Harris
C. Martin Harris
Director

By: /s/ Tyler E. Jacks
Tyler E. Jacks
Director

By: /s/ R. Alexandra Keith
R. Alexandra Keith
Director

By: /s/ Jim P. Manzi
Jim P. Manzi
Director

By: /s/ James C. Mullen
James C. Mullen
Director

By: /s/ Lars R. Sørensen
Lars R. Sørensen
Director

By: /s/ Debora L. Spar
Debora L. Spar
Director

By: /s/ Scott M. Sperling
Scott M. Sperling
Director

By: /s/ Dion J. Weisler
Dion J. Weisler
Director

THERMO FISHER SCIENTIFIC INC.

INDEX OF CONSOLIDATED FINANCIAL STATEMENTS

The following Consolidated Financial Statements of the Registrant and its subsidiaries are required to be included in Item 15:

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Report of Independent Registered Public Accounting Firm (PCAOB ID 238)	F-2
Consolidated Balance Sheet as of December 31, 2022 and 2021	F-5
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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of Thermo Fisher Scientific Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheet of Thermo Fisher Scientific Inc. and its subsidiaries (the "Company") as of December 31, 2022 and 2021, and the related consolidated statements of income, of comprehensive income, of redeemable noncontrolling interest and equity and of cash flows for each of the three years in the period ended December 31, 2022, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2022 and 2021, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2022 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

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

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

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

Definition and Limitations of Internal Control over Financial Reporting

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

detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

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

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Income taxes

As described in Note 8 to the consolidated financial statements, the Company's provision for income taxes for the year ended December 31, 2022 was $703 million. The Company has deferred tax liabilities, net, of $1,984 million (including a valuation allowance of $1,322 million) and unrecognized tax benefits of $572 million as of December 31, 2022. As disclosed by management, the Company operates in numerous countries under many legal forms and, as a result, is subject to the jurisdiction of numerous domestic and non-U.S. tax authorities, as well as to tax agreements and treaties among these governments. Determination of taxable income in any jurisdiction requires management to interpret the related tax laws and regulations and to use estimates and assumptions regarding significant future events, such as the amount, timing and character of deductions, permissible revenue recognition methods under the tax law and the sources and character of income and tax credits. Management assesses income tax positions and records tax benefits for all years subject to examination based upon management's evaluation of the facts, circumstances and information available at the reporting date. For those tax positions where it is more likely than not that a tax benefit will be sustained, management has recorded the largest amount of tax benefit with a greater than 50 percent likelihood of being realized upon ultimate settlement with a taxing authority that has full knowledge of all relevant information. For those income tax positions where it is not more likely than not that a tax benefit will be sustained, no tax benefit has been recognized in the financial statements. Management estimates the degree to which tax assets will result in a benefit, after consideration of all positive and negative evidence, and provides a valuation allowance for tax assets that it believes will more likely than not go unused. In situations in which management has been able to determine that the Company's deferred tax assets will be realized, that determination generally relies on future reversals of taxable temporary differences and expected future taxable income. If it becomes more likely than not that a tax asset will be used, management reverses the related valuation allowance.

The principal considerations for our determination that performing procedures relating to income taxes is a critical audit matter are (i) the significant judgment by management when interpreting the numerous and complex tax laws and regulations as it relates to determining the provision for income taxes, deferred tax assets and liabilities, including the valuation allowance, and liabilities for unrecognized tax benefits, (ii) a high degree of auditor judgment, subjectivity, and effort in performing procedures and evaluating audit evidence related to the provision for income taxes, deferred tax assets and liabilities, including the valuation allowance, and liabilities for unrecognized tax benefits, and (iii) the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the provision for income taxes, deferred tax assets and liabilities, including the valuation allowance, and liabilities for unrecognized tax benefits. These procedures also included, among others (i) testing the accuracy of the provision for income taxes, including the rate reconciliation and permanent and temporary differences, (ii) evaluating whether the data utilized in the calculations of the provision for income taxes, deferred tax assets and liabilities, and liabilities for unrecognized tax benefits were appropriate and consistent with evidence obtained in other areas of the audit, (iii) evaluating management's assessment of the realizability of deferred tax assets on a jurisdictional basis, (iv)

evaluating the identification of liabilities for unrecognized tax benefits and the reasonableness of the more likely than not determination in consideration of court decisions, legislative actions, statutes of limitations, and developments in tax examinations by jurisdiction, (v) testing the calculation of the liability for unrecognized tax benefits by jurisdiction, including estimates of the amount of income tax benefit expected to be sustained, and (vi) evaluating the adequacy of the Company's disclosures. Professionals with specialized skill and knowledge were used to assist in evaluating the reasonableness of management's judgments and estimates related to the application of foreign and domestic tax laws and regulations.

/s/PricewaterhouseCoopers LLP
Boston, Massachusetts
February 23, 2023

We have served as the Company's auditor since 2002.

THERMO FISHER SCIENTIFIC INC.

CONSOLIDATED BALANCE SHEET

(In millions except share and per share amounts)	December 31, 2022	December 31, 2021
Assets		
Current assets:		
Cash and cash equivalents	$ 8,524	$ 4,477
Accounts receivable, less allowances of $189 and $150	8,115	7,977
Inventories	5,634	5,051
Contract assets, net	1,312	968
Other current assets	1,644	1,640
Total current assets	25,229	20,113
Property, plant and equipment, net	9,280	8,333
Acquisition-related intangible assets, net	17,442	20,113
Other assets	4,007	4,640
Goodwill	41,196	41,924
Total assets	$ 97,154	$ 95,123
Liabilities, redeemable noncontrolling interest and equity		
Current liabilities:		
Short-term obligations and current maturities of long-term obligations	$ 5,579	$ 2,537
Accounts payable	3,381	2,867
Accrued payroll and employee benefits	2,095	2,427
Contract liabilities	2,601	2,655
Other accrued expenses	3,354	2,950
Total current liabilities	17,010	13,436
Deferred income taxes	2,849	3,837
Other long-term liabilities	4,238	4,540
Long-term obligations	28,909	32,333
Commitments and contingencies (Note 12)		
Redeemable noncontrolling interest	116	122
Equity:		
Thermo Fisher Scientific Inc. shareholders' equity:		
Preferred stock, $100 par value, 50,000 shares authorized; none issued		
Common stock, $1 par value, 1,200,000,000 shares authorized; 440,668,112 and 439,154,741 shares issued	441	439
Capital in excess of par value	16,743	16,174
Retained earnings	41,910	35,431
Treasury stock at cost, 50,157,275 and 44,720,112 shares	(12,017)	(8,922)
Accumulated other comprehensive items	(3,099)	(2,329)
Total Thermo Fisher Scientific Inc. shareholders' equity	43,978	40,793
Noncontrolling interests	54	62
Total equity	44,032	40,855
Total liabilities, redeemable noncontrolling interest and equity	$ 97,154	$ 95,123

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

THERMO FISHER SCIENTIFIC INC.

CONSOLIDATED STATEMENT OF INCOME

(In millions except per share amounts)	Year Ended December 31, 2022	December 31, 2021	December 31, 2020
Revenues			
Product revenues	$ 28,548	$ 30,361	$ 25,306
Service revenues	16,367	8,850	6,912
Total revenues	44,915	39,211	32,218
Costs and operating expenses:			
Cost of product revenues	14,247	13,594	11,407
Cost of service revenues	11,697	5,979	4,807
Selling, general and administrative expenses	8,993	8,007	6,930
Research and development expenses	1,471	1,406	1,181
Restructuring and other costs	114	197	99
Total costs and operating expenses	36,522	29,183	24,424
Operating income	8,393	10,028	7,794
Interest income	272	43	65
Interest expense	(726)	(536)	(553)
Other income/(expense)	(104)	(694)	(76)
Income before income taxes	7,835	8,841	7,230
Provision for income taxes	(703)	(1,109)	(850)
Equity in earnings/(losses) of unconsolidated entities	(172)	(4)	(3)
Net income	6,960	7,728	6,377
Less: net income attributable to noncontrolling interests and redeemable noncontrolling interest	10	3	2
Net income attributable to Thermo Fisher Scientific Inc.	$ 6,950	$ 7,725	$ 6,375
Earnings per share attributable to Thermo Fisher Scientific Inc.			
Basic	$ 17.75	$ 19.62	$ 16.09
Diluted	$ 17.63	$ 19.46	$ 15.96
Weighted average shares			
Basic	392	394	396
Diluted	394	397	399

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

THERMO FISHER SCIENTIFIC INC.

CONSOLIDATED STATEMENT OF COMPREHENSIVE INCOME

(In millions)	Year Ended December 31, 2022	December 31, 2021	December 31, 2020
Comprehensive income			
Net income	$ 6,960	$ 7,728	$ 6,377
Other comprehensive items:			
Currency translation adjustment:			
Currency translation adjustment (net of tax provision (benefit) of $173, $231 and $(221))	(822)	373	(118)
Unrealized gains and losses on hedging instruments:			
Unrealized losses on hedging instruments (net of tax benefit of $0, $0 and $20)	—	—	(65)
Reclassification adjustment for losses included in net income (net of tax benefit of $1, $17 and $14)	2	56	45
Pension and other postretirement benefit liability adjustments:			
Pension and other postretirement benefit liability adjustments arising during the period (net of tax provision (benefit) of $9, $11 and $(1))	38	36	(8)
Amortization of net loss and prior service benefit included in net periodic pension cost (net of tax benefit of $3, $6 and $4)	5	13	18
Total other comprehensive items	(777)	478	(128)
Comprehensive income	6,183	8,206	6,249
Less: comprehensive income attributable to noncontrolling interests and redeemable noncontrolling interest	3	2	2
Comprehensive income attributable to Thermo Fisher Scientific Inc.	$ 6,180	$ 8,204	$ 6,247

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

THERMO FISHER SCIENTIFIC INC.

CONSOLIDATED STATEMENT OF CASH FLOWS

(In millions)	Year Ended December 31, 2022	December 31, 2021	December 31, 2020
Operating activities			
Net income	$ 6,960	$ 7,728	$ 6,377
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation of property, plant and equipment	986	831	658
Amortization of acquisition-related intangible assets	2,395	1,761	1,667
Change in deferred income taxes	(995)	(647)	(552)
Stock-based compensation	307	230	196
Loss on early extinguishment of debt	26	767	—
Other non-cash expenses	524	190	338
Changes in assets and liabilities, excluding the effects of acquisitions and disposition:			
Accounts receivable	(430)	(204)	(1,302)
Inventories	(825)	(1,065)	(508)
Accounts payable	648	479	59
Contributions to retirement plans	(41)	(34)	(96)
Other	(401)	(724)	1,452
Net cash provided by operating activities	9,154	9,312	8,289
Investing activities			
Acquisitions, net of cash acquired	(39)	(19,395)	(38)
Purchase of property, plant and equipment	(2,243)	(2,523)	(1,474)
Proceeds from sale of property, plant and equipment	24	20	8
Other investing activities, net	99	(34)	(6)
Net cash used in investing activities	(2,159)	(21,932)	(1,510)
Financing activities			
Net proceeds from issuance of debt	3,193	18,137	3,464
Repayment of debt	(375)	(11,738)	(710)
Proceeds from issuance of commercial paper	1,526	2,512	383
Repayments of commercial paper	(3,690)	—	(387)
Purchases of company common stock	(3,000)	(2,000)	(1,500)
Dividends paid	(455)	(395)	(337)
Other financing activities, net	(9)	65	46
Net cash (used in) provided by financing activities	(2,810)	6,581	959
Exchange rate effect on cash	(139)	194	176
Increase (decrease) in cash, cash equivalents and restricted cash	4,046	(5,845)	7,914
Cash, cash equivalents and restricted cash at beginning of year	4,491	10,336	2,422
Cash, cash equivalents and restricted cash at end of year	$ 8,537	$ 4,491	$ 10,336

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

CONSOLIDATED STATEMENT OF REDEEMABLE NONCONTROLLING INTEREST AND EQUITY

(In millions)	Redeemable Noncontrolling Interest	Common Stock Shares	Common Stock Amount	Capital in Excess of Par Value	Retained Earnings	Treasury Stock Shares	Treasury Stock Amount	Accumulated Other Comprehensive Items	Total Thermo Fisher Scientific Inc. Shareholders' Equity	Noncontrolling Interests	Total Equity
Balance at December 31, 2019	$ —	434	$ 434	$ 15,064	$ 22,092	36	$ (5,236)	$ (2,679)	$ 29,675	$ 9	$ 29,684
Cumulative effect of accounting changes	—	—	—	—	(1)	—	—	—	(1)	—	(1)
Issuance of shares under employees' and directors' stock plans	—	3	3	319	—	—	(82)	—	240	—	240
Stock-based compensation	—	—	—	196	—	—	—	—	196	—	196
Purchases of company common stock	—	—	—	—	—	4	(1,500)	—	(1,500)	—	(1,500)
Dividends declared ($0.88 per share)	—	—	—	—	(350)	—	—	—	(350)	—	(350)
Net income	—	—	—	—	6,375	—	—	—	6,375	2	6,377
Other comprehensive items	—	—	—	—	—	—	—	(128)	(128)	—	(128)
Contributions from (distributions to) noncontrolling interests	—	—	—	—	—	—	—	—	—	(1)	(1)
Balance at December 31, 2020	—	437	437	15,579	28,116	40	(6,818)	(2,807)	34,507	10	34,517
Issuance of shares under employees' and directors' stock plans	—	2	2	324	—	1	(104)	—	222	—	222
Stock-based compensation	—	—	—	230	—	—	—	—	230	—	230
Purchases of company common stock	—	—	—	—	—	4	(2,000)	—	(2,000)	—	(2,000)
Dividends declared ($1.04 per share)	—	—	—	—	(410)	—	—	—	(410)	—	(410)
Recognition upon acquisition	122	—	—	—	—	—	—	—	—	—	—
Net income	1	—	—	—	7,725	—	—	—	7,725	2	7,727
Other comprehensive items	(1)	—	—	—	—	—	—	478	478	—	478
Contributions from (distributions to) noncontrolling interests	—	—	—	—	—	—	—	—	—	50	50
Other	—	—	—	41	—	—	—	—	41	—	41
Balance at December 31, 2021	122	439	439	16,174	35,431	45	(8,922)	(2,329)	40,793	62	40,855
Issuance of shares under employees' and directors' stock plans	—	2	2	262	—	—	(95)	—	169	—	169
Stock-based compensation	—	—	—	307	—	—	—	—	307	—	307
Purchases of company common stock	—	—	—	—	—	5	(3,000)	—	(3,000)	—	(3,000)
Dividends declared ($1.20 per share)	—	—	—	—	(471)	—	—	—	(471)	—	(471)
Net income	15	—	—	—	6,950	—	—	—	6,950	(5)	6,945
Other comprehensive items	(6)	—	—	—	—	—	—	(770)	(770)	(1)	(771)
Contributions from (distributions to) noncontrolling interests	(15)	—	—	—	—	—	—	—	—	(2)	(2)
Balance at December 31, 2022	$ 116	441	$ 441	$ 16,743	$ 41,910	50	$ (12,017)	$ (3,099)	$ 43,978	$ 54	$ 44,032

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

Note 1. Nature of Operations and Summary of Significant Accounting Policies

Nature of Operations

Thermo Fisher Scientific Inc. (the company or Thermo Fisher) enables customers to make the world healthier, cleaner and safer by helping them accelerate life sciences research, solve complex analytical challenges, increase laboratory productivity, and improve patient health through diagnostics and the development and manufacture of life-changing therapies. Markets served include pharmaceutical and biotech, academic and government, industrial and applied, as well as healthcare and diagnostics.

Principles of Consolidation

The accompanying financial statements include the accounts of the company and its wholly and majority-owned subsidiaries. All material intercompany accounts and transactions have been eliminated. The company accounts for investments in businesses using the equity method when it has the ability to exercise significant influence but not control (generally between 20% and 50% ownership), is not the primary beneficiary and has not elected the fair value option. At December 31, 2022 and 2021, the company had such investments with carrying amounts of $369 million and $576 million, respectively. The company has elected the fair value option of accounting for certain of its investments with readily determinable fair values that would otherwise be accounted for under the equity method. At December 31, 2022 and 2021, the fair value of such investments was $7 million and $217 million, respectively.

Redeemable Noncontrolling Interest

The company owns 60% of its consolidated subsidiary PPD-SNBL K.K. The 40% ownership interest held by a third party is classified as a redeemable noncontrolling interest on the consolidated balance sheet due to certain put options under which the third party may require the company to purchase the remaining ownership interest at a premium upon the occurrence of certain events.

Presentation

Certain reclassifications of prior year amounts have been made to conform to the current year presentation.

Revenue Recognition

Consumables revenues consist of single-use products and are recognized at a point in time following the transfer of control of such products to the customer, which generally occurs upon shipment. Instruments revenues typically consist of longer-lived assets that, for the substantial majority of sales, are recognized at a point in time in a manner similar to consumables. Service revenues (primarily clinical research, pharmaceutical, and instrument and enterprise services) are recognized over time as customers receive and consume the benefits of such services. For revenues recognized over time, the company generally uses costs accumulated relative to total estimated costs to measure progress as this method approximates satisfaction of the performance obligation. For contracts that contain multiple performance obligations, the company allocates the consideration to which it expects to be entitled (i.e., the transaction price) to each performance obligation based on relative standalone selling prices and recognizes the related revenues when or as control of each individual performance obligation is transferred to customers. The company exercises judgment in determining the timing of revenue by analyzing the point in time or the period over which the customer has the ability to direct the use of and obtain substantially all of the remaining benefits of the asset. The company immediately expenses contract costs that would otherwise be capitalized and amortized over a period of less than one year.

Changes to the scope of services contracts generally also include changes in the transaction price. Typically, these contract modifications are not distinct from existing services provided under the contract, and result in cumulative adjustments to revenue on the modification date.

Payments from customers for most instruments and consumables are typically due in a fixed number of days after shipment or delivery of the product. Service arrangements commonly call for payments in advance of performing the work (e.g., extended service contracts), upon completion of the service (e.g., pharmaceutical services) or a mix of both. Some arrangements include variable amounts of consideration that arise from discounts, rebates, and other programs and practices. In such arrangements, the company estimates the amount by which to reduce the stated contract amount to reflect the transaction price. The company records reimbursement for third-party pass-through and out-of-pocket costs as revenues and the related expenses as costs of revenues.

Contract-related Balances

Accounts receivable include unconditional rights to consideration from customers, which generally represent billings that do not bear interest. The company maintains allowances for doubtful accounts for estimates of expected losses resulting from the inability of its customers to pay amounts due. The allowance for doubtful accounts is the company's best estimate of the amount of probable credit losses in existing accounts receivable. The company determines the allowance based on history of similarly aged receivables, the creditworthiness of the customer, reasons for delinquency, current economic conditions, expectations associated with future events and circumstances where reasonable and supportable forecasts are available and any other information that is relevant to the judgment. Receivables from academic and government customers as well as large, well-capitalized commercial customers have historically experienced less collectability risk. Account balances are charged off against the allowance when the company believes it is probable the receivable will not be recovered. The company does not have any off-balance-sheet credit exposure related to customers.

Contract assets include revenues recognized in advance of billings where the company's right to bill includes something other than the passage of time. Such amounts are recorded net of estimated losses resulting from the inability to invoice customers, which is primarily due to risk associated with the company's performance. Contract assets are classified as current or noncurrent based on the amount of time expected to lapse until the company's right to consideration becomes unconditional.

Contract liabilities include billings in excess of revenues recognized, such as those resulting from customer advances and deposits and unearned revenues on service contracts. Contract liabilities are classified as current or noncurrent based on the periods over which remaining performance obligations are expected to be transferred to customers. Contract assets and liabilities are presented on a net basis in the consolidated balance sheet if they arise from different performance obligations in the same contract.

Warranty Obligations

The company provides for the estimated cost of standard product warranties, primarily from historical information, in cost of product revenues at the time product revenues are recognized. The liability for warranties is included in other accrued expenses in the accompanying balance sheet. Extended warranty agreements are considered service contracts, which are discussed above. Costs of service contracts are recognized as incurred.

Leases

Operating leases that have commenced are included in other assets, other accrued expenses and other long-term liabilities in the consolidated balance sheet. Finance leases that have commenced are included in property, plant and equipment, net, current maturities of long-term obligations and long-term obligations in the consolidated balance sheet. Classification of lease liabilities as either current or noncurrent is based on the expected timing of payments due under the company's obligations.

Right-of-use (ROU) assets represent the company's right to use an underlying asset for the lease term and lease liabilities represent the company's obligation to make lease payments arising from the lease. Lease ROU assets and liabilities are recognized at the lease commencement date based on the present value of lease payments over the lease term. Leases with an initial term of 12 months or less are not recorded on the consolidated balance sheet. The company recognizes operating lease expense on a straight-line basis over the lease term. Finance lease expense includes depreciation, which is recognized on a straight-line basis over the expected life of the leased asset, and an immaterial amount of interest expense.

Because most of the company's leases do not provide an implicit interest rate, the company estimates incremental borrowing rates based on the information available at the commencement date in determining the present value of lease payments. The company uses the implicit rate when readily determinable. Lease terms include the effect of options to extend or terminate the lease when it is reasonably certain that the company will exercise that option. Operating lease expense is recognized on a straight-line basis over the lease term.

As a lessee, the company accounts for the lease and non-lease components as a single lease component.

Research and Development

The company conducts research and development activities to increase its depth of capabilities in technologies, software and services. Research and development costs include employee compensation and benefits, consultants, facilities related costs, material costs, depreciation and travel. Research and development costs are expensed as incurred.

Restructuring Costs

Accounting for the timing and amount of termination benefits provided by the company to employees is determined based on whether: (a) the company has a substantive plan to provide such benefits, (b) the company has a written employment

contract with the affected employees that includes a provision for such benefits, (c) the termination benefits are due to the occurrence of an event specified in an existing plan or agreement, or (d) the termination benefits are a one-time benefit. In certain circumstances, employee termination benefits may meet more than one of the characteristics listed above and therefore, may have individual elements that are subject to different accounting models.

From time to time when executing a restructuring or exit plan, the company also incurs costs other than termination benefits, such as lease termination costs, that are not associated with or will not be incurred to generate revenues. These include costs that represent amounts under contractual obligations that exist prior to the restructuring plan communication date and will either continue after the restructuring plan is completed with no economic benefit or result in a penalty to cancel a contractual obligation. Such costs are recognized when incurred, which generally occurs at the contract termination or over the period from when a plan to abandon a leased facility is approved through the cease-use date but charges may continue over the remainder of the original contractual period.

Income Taxes

The company recognizes deferred income taxes based on the expected future tax consequences of differences between the financial statement basis and the tax basis of assets and liabilities, calculated using enacted tax rates in effect for the year in which the differences are expected to be reflected in the tax return. A valuation allowance is provided for tax assets that will more likely than not go unused.

The financial statements reflect expected future tax consequences of uncertain tax positions that the company has taken or expects to take on a tax return presuming the taxing authorities' full knowledge of the positions and all relevant facts, but without discounting for the time value of money.

Earnings per Share

Basic earnings per share has been computed by dividing net income attributable to Thermo Fisher Scientific Inc. by the weighted average number of shares outstanding during the year. Except where the result would be antidilutive to net income attributable to Thermo Fisher Scientific Inc., diluted earnings per share has been computed using the treasury stock method for outstanding stock options and restricted units.

Cash and Cash Equivalents

Cash equivalents consists principally of money market funds, commercial paper and other marketable securities purchased with an original maturity of three months or less. These investments are carried at cost, which approximates market value.

Inventories

Inventories are valued at the lower of cost or net realizable value, cost being determined by the first-in, first-out (FIFO) method. As discussed below, prior to the third quarter of 2021 certain of the company's businesses utilized the last-in, first-out (LIFO) method. The company periodically reviews quantities of inventories on hand and compares these amounts to the expected use of each product or product line. In addition, the company has certain inventory that is subject to fluctuating market pricing. The company records a charge to cost of sales for the amount required to reduce the carrying value of inventory to net realizable value. Costs associated with the procurement of inventories, such as inbound freight charges, purchasing and receiving costs, and internal transfer costs, are included in cost of revenues in the accompanying statement of income. The components of inventories are as follows:

(In millions)	December 31, 2022	December 31, 2021
Raw materials	$ 2,405	$ 1,922
Work in process	660	676
Finished goods	2,569	2,453
Inventories	$ 5,634	$ 5,051

Prior to the third quarter of 2021, certain of the company's businesses utilized the LIFO method of accounting for inventories. During the third quarter of 2021, these businesses, which comprised approximately 5% of consolidated inventories, changed from the LIFO method to the FIFO method. The company believes this change is preferable as it will provide a consistent, uniform costing method for all inventories across the company, better reflect the current value of inventories, and improve comparability with peers. Prior financial statements have not been retrospectively adjusted due to immateriality. The cumulative pre-tax effect of this change in accounting principle of $33 million was recorded as an increase to inventories and a decrease to cost of product revenues in the third quarter of 2021. This change was recorded in the Laboratory Products and

Biopharma Services ($20 million) and Specialty Diagnostics ($13 million) segments. Reductions to cost of revenues as a result of the liquidation of LIFO inventories were nominal during 2020 and the first half of 2021.

Property, Plant and Equipment

Property, plant and equipment are recorded at cost. The costs of additions and improvements are capitalized, while maintenance and repairs are charged to expense as incurred. The company generally provides for depreciation and amortization using the straight-line method over the estimated useful lives of the property as follows: buildings and improvements, 25 to 40 years; machinery and equipment (including software), 3 to 10 years; and leasehold improvements, the shorter of the term of the lease or the life of the asset. When assets are retired or otherwise disposed of, the assets and related accumulated depreciation are eliminated from the accounts and the resulting gain or loss is reflected in the accompanying statement of income. Property, plant and equipment consists of the following:

(In millions)	December 31, 2022	December 31, 2021
Land	$ 454	$ 431
Buildings and improvements	3,153	2,575
Machinery, equipment and leasehold improvements	7,967	7,020
Construction in progress	2,695	2,567
Property, plant and equipment, at cost	14,269	12,593
Less: Accumulated depreciation and amortization	4,989	4,260
Property, plant and equipment, net	$ 9,280	$ 8,333

Acquisition-related Intangible Assets

Acquisition-related intangible assets include the costs of acquired customer relationships, product technology, tradenames, backlog and other specifically identifiable intangible assets, and are being amortized using the straight-line method over their estimated useful lives, which range up to 20 years. The company reviews these intangible assets for impairment when indication of potential impairment exists, such as a significant reduction in cash flows associated with the assets. When impairment indicators exist, the company determines whether the carrying value of its intangible assets exceeds the related undiscounted cash flows. In these situations, the carrying value is written down to fair value.

In addition, the company has tradenames and in-process research and development that have indefinite lives and which are not amortized. Intangible assets with indefinite lives are reviewed for impairment annually or whenever events or changes in circumstances indicate they may be impaired. The company may perform an optional qualitative assessment. If the company determines that the fair value of the indefinite-lived intangible asset is more likely than not greater than its carrying amount, no additional testing is necessary. If not, or if the company bypasses the optional qualitative assessment, it writes the carrying value down to the fair value, if applicable.

Acquisition-related intangible assets are as follows:

	Balance at December 31, 2022			Balance at December 31, 2021		
(In millions)	Gross	Accumulated Amortization	Net	Gross	Accumulated Amortization	Net
Definite lived:						
Customer relationships	$ 21,792	$ (8,330)	$ 13,462	$ 22,802	$ (7,792)	$ 15,010
Product technology	5,882	(4,360)	1,522	6,041	(3,977)	2,064
Tradenames	1,635	(1,008)	627	1,722	(919)	803
Backlog	1,038	(442)	596	1,060	(59)	1,001
	30,347	(14,140)	16,207	31,625	(12,747)	18,878
Indefinite lived:						
Tradenames	1,235	N/A	1,235	1,235	N/A	1,235
Acquisition-related intangible assets	$ 31,582	$ (14,140)	$ 17,442	$ 32,860	$ (12,747)	$ 20,113

The estimated future amortization expense of acquisition-related intangible assets with definite lives as of December 31, 2022 is as follows:

(In millions)	
2023	$ 2,279
2024	1,863
2025	1,582
2026	1,322
2027	1,296
2028 and thereafter	7,865
Estimated future amortization expense of definite-lived intangible assets	$ 16,207

Other Assets

Other assets in the accompanying balance sheet include operating lease right-of-use assets, investments, deferred tax assets, pension assets, cash surrender value of life insurance, insurance recovery receivables related to product liability matters, certain intangible assets and other assets.

At December 31, 2022 and 2021, the company had $36 million and $33 million, respectively, of intangible assets not derived from acquisitions, net of accumulated amortization, which are being amortized using the straight-line method over their estimated useful lives, which range up to 20 years.

Equity investments that do not have readily determinable fair values and are not eligible for the net asset value (NAV) practical expedient are measured at cost minus impairment, if any, plus or minus changes resulting from observable price changes in orderly transactions for the identical or similar investments of the same issuer. The company performs qualitative assessments to identify impairments of these investments. At December 31, 2022 and 2021, the company had such investments with carrying amounts of $55 million and $22 million, respectively, and investments measured at NAV of $22 million and $16 million, respectively, which are included in other assets.

Goodwill

The company assesses goodwill for impairment at the reporting unit level annually and whenever events occur or circumstances change that would more likely than not reduce the fair value of a reporting unit below its carrying amount. Such events or circumstances generally include the occurrence of operating losses or a significant decline in earnings associated with one or more of the company's reporting units. The company is permitted to first assess qualitative factors to determine whether the quantitative goodwill impairment test is necessary. If the qualitative assessment results in a determination that the fair value of a reporting unit is more likely than not less than its carrying amount, the company performs a quantitative goodwill impairment test. The company may bypass the qualitative assessment for the reporting unit in any period and proceed directly to the goodwill impairment test. The company estimates the fair value of its reporting units by using forecasts of discounted future cash flows and peer market multiples. The company would record an impairment charge based on the excess of a reporting unit's carrying amount over its fair value (limited to the amount of goodwill). The company determined that no impairments existed in 2022, 2021 or 2020.

The changes in the carrying amount of goodwill by segment are as follows:

(In millions)	Life Sciences Solutions	Analytical Instruments	Specialty Diagnostics	Laboratory Products and Biopharma Services	Total
Balance at December 31, 2020	$ 8,590	$ 5,079	$ 3,370	$ 9,002	$ 26,041
Acquisitions	1,560	56	8	14,400	16,024
Currency translation	(7)	(92)	(101)	59	(141)
Balance at December 31, 2021	10,143	5,043	3,277	23,461	41,924
Acquisitions	—	24	—	—	24
Finalization of purchase price allocations for 2021 acquisitions	9	—	—	168	177
Currency translation	(6)	(102)	(186)	(635)	(929)
Balance at December 31, 2022	$ 10,146	$ 4,965	$ 3,091	$ 22,994	$ 41,196

Loss Contingencies

Accruals are recorded for various contingencies, including legal proceedings, environmental, workers' compensation, product, general and auto liabilities, self-insurance and other claims that arise in the normal course of business. The accruals are based on management's judgment, historical claims experience, the probability of losses and, where applicable, the consideration of opinions of internal and/or external legal counsel and actuarial estimates. Additionally, the company records receivables from third-party insurers up to the amount of the loss when recovery has been determined to be probable. Certain liabilities acquired in acquisitions have been recorded at readily determinable fair values and, as such, were discounted to present value at the dates of acquisition.

Currency Translation

All assets and liabilities of the company's subsidiaries operating in non-U.S. dollar currencies are translated at period-end exchange rates. Resulting translation adjustments are reflected in the "accumulated other comprehensive items" component of shareholders' equity. Revenues and expenses are translated at average exchange rates for the period. Currency transaction gains are included in the accompanying statement of income and in aggregate were $62 million, $25 million and $24 million in 2022, 2021 and 2020, respectively.

Derivative Contracts

The company is exposed to certain risks relating to its ongoing business operations including changes to interest rates and currency exchange rates. The company uses derivative instruments primarily to manage currency exchange and interest rate risks. The company recognizes derivative instruments as either assets or liabilities and measures those instruments at fair value. If a derivative is a hedge, depending on the nature of the hedge, changes in the fair value of the derivative are either offset against the change in fair value of the hedged item through earnings or recognized in other comprehensive items until the hedged item is recognized in earnings. Derivatives that are not designated as hedges are recorded at fair value through earnings.

The company uses short-term forward and option currency exchange contracts primarily to hedge certain balance sheet and operational exposures resulting from changes in currency exchange rates, predominantly intercompany loans and cash balances that are denominated in currencies other than the functional currencies of the respective operations. The currency-exchange contracts principally hedge transactions denominated in euro, British pounds sterling, Singapore dollars, Japanese yen, Hong Kong dollars, Czech koruna and Swedish krona. The company does not hold or engage in transactions involving derivative instruments for purposes other than risk management.

Cash flow hedges. For derivative instruments that are designated and qualify as a cash flow hedge, the gain or loss on the derivative is reported as a component of other comprehensive items and reclassified into earnings in the same period or periods during which the hedged transaction affects earnings and is presented in the same income statement line item as the earnings effect of the hedged item.

Fair value hedges. For derivative instruments that are designated and qualify as a fair value hedge, the gain or loss on the derivative, as well as the offsetting loss or gain on the hedged item attributable to the hedged risk, are recognized in earnings.

Net investment hedges. The company uses foreign currency-denominated debt, certain foreign-denominated payables, and cross-currency interest rate swaps to partially hedge its net investments in foreign operations against adverse movements in exchange rates. A portion of the company's euro-denominated senior notes, certain foreign-denominated payables, and its cross-currency interest rate swaps have been designated as, and are effective as, economic hedges of part of the net investment in a foreign operation. Accordingly, foreign currency transaction gains or losses due to spot rate fluctuations on the euro-denominated debt instruments and certain foreign-denominated payables, and contract fair value changes on the cross-currency interest rate swaps, excluding interest accruals, are included in currency translation adjustment within other comprehensive items and shareholders' equity.

Government Assistance

From time to time, the company receives assistance from various governmental agencies generally in the form of cash or non-income tax credits. These programs help offset the costs of certain research and development activities, facility construction and expansion efforts, or hiring objectives. When the company believes that it is probable that it will meet the conditions tied to the assistance, it offsets the associated expense in the consolidated income statement. Such amounts were not material to the consolidated financial statements as of and for the year ended December 31, 2022.

Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period.

The company's estimates include, among others, asset reserve requirements as well as the amounts of future cash flows associated with certain assets and businesses that are used in assessing the risk of impairment. Risks and uncertainties associated with the ongoing COVID-19 global pandemic materially adversely affected certain of the company's businesses in 2020, particularly in the Analytical Instruments segment and, to a lesser extent, some businesses within the other three segments. The negative impacts significantly lessened in 2021 and 2022. The extent and duration of negative impacts in the future, which may include inflationary pressures and supply chain disruptions, are uncertain and may require changes to estimates. Actual results could differ from those estimates.

Recent Accounting Pronouncements

In September 2022, the FASB issued new guidance to require entities to disclose information about supplier finance programs. Among other things, the new guidance requires expanded disclosure about key program terms, payment terms, and amounts outstanding for obligations under these programs for each period presented. The company will adopt some aspects of this guidance in 2023 using a retrospective method and other aspects in 2024 using a prospective method. The adoption of this guidance is not expected to have a material impact on the company's disclosures; however, the impact in future periods will be dependent on the extent of arrangements of this nature entered into by the company

In November 2021, the FASB issued new guidance to require entities to disclose information about certain types of government assistance they receive, including cash grants and tax credits. Among other things, the new guidance requires expanded disclosure regarding the qualitative and quantitative characteristics of the nature, amount, timing, and significant terms and conditions of transactions with a government arising from a grant or other forms of assistance accounted for under a contribution model. The company adopted this guidance in the fourth quarter of 2022 using a prospective method. The adoption of this guidance did not have a material impact on the company's disclosures; however, the impact in future periods will be dependent on the extent of future transactions of this nature entered into by the company.

In October 2021, the FASB amended guidance to recognize and measure contract assets and contract liabilities acquired in a business combination. Generally, this new guidance will result in the company recognizing contract assets and contract liabilities at the same amounts recorded by the acquiree. The company adopted this guidance in the fourth quarter of 2021 retrospectively to all business combinations completed in the first three quarters of 2021 and prospectively to all future business combinations. The adoption of this guidance did not have a material impact on the company's consolidated financial statements for acquisitions that closed in 2021 and 2022; however, the impact in future periods will be dependent on the contract assets and contract liabilities acquired in future business combinations.

In July 2021, the FASB amended guidance to require lessors to classify leases as operating leases if they have certain variable lease payment structures and would have selling losses if they were classified as sales-type or direct financing leases. The company adopted the guidance in the third quarter of 2021 using a prospective method. The adoption of this guidance did not have a material impact on the company's consolidated financial statements.

In December 2019, the FASB issued new guidance to simplify the accounting for income taxes. Among other things, the new guidance requires the effects of enacted changes in tax laws or rates to be reflected in the annual effective tax rate computation in the interim period that includes the enactment date. The company adopted this guidance in 2021 using a prospective method. The adoption of this guidance did not have a material impact on the company's consolidated financial statements; however, the impact in future periods will be dependent on the extent of future events or conditions that would be affected such as enacted changes in tax laws or rates.

In June 2016, the FASB issued new guidance to require a financial asset measured at amortized cost basis, such as accounts receivable, to be presented at the net amount expected to be collected based on relevant information about past events, including historical experience, current conditions, and reasonable and supportable forecasts that affect the collectability of the reported amount. During 2018 and 2019, the FASB issued additional guidance and clarification. The company adopted the guidance in 2020 using a modified retrospective method. The adoption of this guidance reduced accounts receivable and retained earnings by $1 million on January 1, 2020.

Note 2. Acquisitions

The company's acquisitions have historically been made at prices above the determined fair value of the acquired identifiable net assets, resulting in goodwill, primarily due to expectations of the synergies that will be realized by combining

the businesses and the benefits that will be gained from the assembled workforces. These synergies include the elimination of redundant facilities, functions and staffing; use of the company's existing commercial infrastructure to expand sales of the acquired businesses' products and services; and use of the commercial infrastructure of the acquired businesses to cost-effectively expand sales of company products and services.

Acquisitions have been accounted for using the acquisition method of accounting, and the acquired companies' results have been included in the accompanying financial statements from their respective dates of acquisition. Acquisition transaction costs are recorded in selling, general and administrative expenses as incurred.

2023

On January 3, 2023, the company acquired, within the Specialty Diagnostics segment, The Binding Site Group, a U.K.-based provider of specialty diagnostic assays and instruments to improve the diagnosis and management of blood cancers and immune system disorders. The acquisition expands the segment's portfolio with the addition of pioneering innovation in diagnostics and monitoring for multiple myeloma. The goodwill recorded as a result of this business combination is not expected to be tax deductible.

The components of the purchase price and net assets acquired are as follows:

(In billions)		The Binding Site
Purchase price		
Cash paid	$	2.42
Debt settled		0.31
Cash acquired		(0.02)
	$	2.71
Net assets acquired		
Definite-lived intangible assets	$	1.07
Goodwill		1.77
Net tangible assets		0.15
Deferred tax assets (liabilities)		(0.28)
	$	2.71

The weighted-average amortization period for definite-lived intangible assets is 17 years.

The preliminary allocation of the purchase price for the acquisition of The Binding Site is based on estimates of the fair value of the net assets acquired and is subject to adjustment upon finalization, largely with respect to acquired intangible assets and the related deferred taxes. Measurements of these items inherently require significant estimates and assumptions.

2022

In 2022, the company acquired, within the Analytical Instruments segment, a U.S.-based developer of Fourier-transform infrared gas analysis technologies.

2021

On January 15, 2021, the company acquired, within the Laboratory Products and Biopharma Services segment, the Belgium-based European viral vector manufacturing business of Groupe Novasep SAS. The European viral vector manufacturing business provides manufacturing services for vaccines and therapies to biotechnology companies and large biopharma customers. The acquisition expands the segment's capabilities for cell and gene vaccines and therapies. The goodwill recorded as a result of this business combination is not tax deductible.

On February 25, 2021, the company acquired, within the Life Sciences Solutions segment, Mesa Biotech, Inc., a U.S.-based molecular diagnostic company. Mesa Biotech has developed and commercialized a polymerase chain reaction (PCR) based rapid point-of-care testing platform available for detecting infectious diseases including COVID-19. The acquisition enables the company to accelerate the availability of reliable and accurate advanced molecular diagnostics at the point of care. The goodwill recorded as a result of this business combination is not tax deductible.

On September 30, 2021, the company assumed operating responsibility, within the Laboratory Products and Biopharma Services segment, of a new state-of-the-art biologics manufacturing facility in Lengnau, Switzerland from CSL Limited to perform pharma services for CSL with capacity to serve other customers as well. The goodwill recorded as a result of this business combination is not tax deductible.

On December 8, 2021, the company acquired, within the Laboratory Products and Biopharma Services segment, PPD, Inc., a U.S.-based global provider of clinical research services to the pharma and biotech industry. The addition of PPD's clinical research services enhances our offering to biotech and pharma customers by enabling them to accelerate innovation and increase their productivity within the drug development process. The goodwill recorded as a result of this business combination is not tax deductible.

On December 30, 2021, the company acquired, within the Life Sciences Solutions segment, PeproTech, Inc., a U.S.-based developer and manufacturer of recombinant proteins. PeproTech provides bioscience reagents known as recombinant proteins, including cytokines and growth factors. The acquisition expands the segment's bioscience offerings. The goodwill recorded as a result of this business combination is not tax deductible.

In addition, in 2021, the company acquired, within the Life Sciences Solutions segment, cell sorting technology assets, an Ireland-based life sciences distributor and a developer of a digital PCR platform; within the Analytical Instruments segment, a Belgium-based developer of micro-chip based technology for liquid chromatography columns; and within the Specialty Diagnostics segment, a transplant diagnostics information system provider.

The components of the purchase price and net assets acquired for 2021 acquisitions are as follows:

(In millions)	PPD	PeproTech	European Viral Vector Business	Mesa Biotech	Lengnau biologics manufacturing facility	Other
Purchase price						
Cash paid	$ 17,237	$ 1,946	$ 848	$ 421	$ 17	$ 298
Fair value of equity awards exchanged	43	—	—	—	—	—
Fair value of contingent consideration	—	—	—	65	1	117
Cash acquired	(1,244)	(83)	(18)	(14)	—	(12)
	$ 16,036	$ 1,863	$ 830	$ 472	$ 18	$ 403
Net assets acquired						
Current assets	$ 2,477	$ 58	$ 39	$ 54	$ —	$ 12
Property, plant and equipment	527	18	59	2	93	2
Definite-lived intangible assets:						
Customer relationships	6,257	510	302	—	—	2
Product technology	—	282	25	279	—	224
Tradenames	594	—	—	2	—	2
Backlog	1,038	—	—	—	—	—
Goodwill	13,949	1,198	600	237	18	198
Other assets	1,060	11	3	3	364	2
Contract liabilities	(1,539)	—	(59)	—	—	(1)
Deferred tax assets (liabilities)	(1,782)	(192)	(80)	(72)	—	(27)
Finance lease liabilities	(90)	—	(24)	—	(82)	—
Debt assumed	(4,299)	—	—	—	—	—
Other liabilities assumed	(2,034)	(22)	(35)	(33)	(375)	(11)
Redeemable noncontrolling interest	(122)	—	—	—	—	—
	$ 16,036	$ 1,863	$ 830	$ 472	$ 18	$ 403

During 2022, we finalized the allocations of the purchase price for the Lengnau biologics manufacturing facility, PPD, Inc. and PeproTech, Inc., largely with respect to definite-lived intangible assets, property, plant and equipment, contract liabilities,

equity method investments, asset retirement obligations, defined benefit pension plans, assumed contingent consideration and the related deferred taxes. The adjustments to the income statement recorded during 2022 were not material.

The weighted-average amortization periods for definite-lived intangible assets acquired in 2021 are 17 years for customer relationships, 11 years for product technology, 7 years for tradenames and 3 years for backlog. The weighted average amortization period for all definite-lived intangible assets acquired in 2021 is 14 years.

Unaudited Pro Forma Information

The following unaudited pro forma information provides the effect of the company's 2021 acquisition of PPD as if the acquisition had occurred on January 1, 2020:

	Year Ended	
(In millions)	December 31, 2021	December 31, 2020
Revenues	$ 44,886	$ 36,887
Net income attributable to Thermo Fisher Scientific Inc.	$ 7,369	$ 5,361

The historical consolidated financial information of the company and PPD has been adjusted in the pro forma information to give effect to pro forma events that are directly attributable to the acquisitions and related financing arrangements and are factually supportable.

To reflect the acquisition of PPD as if it had occurred on January 1, 2020, the unaudited pro forma results include adjustments to reflect, among other things, the incremental intangible asset amortization to be incurred based on the preliminary values of each identifiable intangible asset and the interest expense from debt financings obtained to partially fund the cash consideration transferred. Pro forma adjustments were tax effected at the company's historical statutory rates in effect for the respective periods. The unaudited pro forma amounts are not necessarily indicative of the combined results of operations that would have been realized had the acquisitions and related financings occurred on the aforementioned dates, nor are they meant to be indicative of any anticipated combined results of operations that the company will experience after the transaction. In addition, the amounts do not include any adjustments for actions that may be taken following the completion of the transaction, such as expected cost savings, operating synergies, or revenue enhancements that may be realized subsequent to the transaction.

Pro forma net income attributable to Thermo Fisher Scientific Inc. for the year ended December 31, 2021, excludes $312 million of transaction costs, initial restructuring costs, and debt extinguishment costs directly attributable to the PPD acquisition that were included in the determination of net income attributable to Thermo Fisher Scientific Inc. for that period. These items have reduced pro forma net income attributable to Thermo Fisher Scientific Inc. for the year ended December 31, 2020, by $197 million.

The company’s results would not have been materially different from its pro forma results had the company’s other 2021 acquisitions occurred at the beginning of 2020.

PPD’s revenues and losses attributable to Thermo Fisher Scientific Inc. in 2021, subsequent to the acquisition date, were $378 million and $(60) million, respectively. The loss includes non-recurring transaction and compensation costs.

2020

In 2020, the company acquired, within the Life Sciences Solutions segment, a U.S.-based provider of a spectral dye platform for high-resolution biology applications which will extend the company’s existing tools for protein and cell analysis applications.

Note 3. Revenues and Contract-related Balances

Disaggregated Revenues

Revenues by type are as follows:

(In millions)	2022	2021	2020
Revenues			
Consumables	$ 20,624	$ 22,608	$ 18,527
Instruments	7,924	7,753	6,779
Services	16,367	8,850	6,912
Consolidated revenues	$ 44,915	$ 39,211	$ 32,218

Revenues by geographic region based on customer location are as follows:

(In millions)	2022	2021	2020
Revenues			
North America	$ 24,594	$ 19,659	$ 17,081
Europe	10,762	11,134	8,284
Asia-Pacific	8,115	7,218	5,822
Other regions	1,444	1,200	1,031
Consolidated revenues	$ 44,915	$ 39,211	$ 32,218

Each reportable segment earns revenues from consumables, instruments and services in North America, Europe, Asia-Pacific and other regions. See Note 4 for revenues by reportable segment and other geographic data.

Remaining Performance Obligations

The aggregate amount of the transaction price allocated to the remaining performance obligations for all open customer contracts as of December 31, 2022 was $26.97 billion. The company will recognize revenues for these performance obligations as they are satisfied, approximately 55% of which is expected to occur within the next twelve months. Amounts expected to occur thereafter generally relate to contract manufacturing, clinical research and extended warranty service agreements, which typically have durations of three to five years.

Contract-related Balances

Noncurrent contract assets and noncurrent contract liabilities are included within other assets and other long-term liabilities in the accompanying balance sheet, respectively. Contract asset and liability balances are as follows:

(In millions)	December 31, 2022	December 31, 2021
Current contract assets, net	$ 1,312	$ 968
Noncurrent contract assets, net	7	9
Current contract liabilities	2,601	2,655
Noncurrent contract liabilities	1,179	1,238

Substantially all of the current contract liabilities balance at December 31, 2021 and 2020 was recognized in revenues during 2022 and 2021, respectively.

Note 4. Business Segment and Geographical Information

The company's financial performance is reported in four segments. A description of each segment follows.

Life Sciences Solutions: provides an extensive portfolio of reagents, instruments and consumables used in biological and medical research, discovery and production of new drugs and vaccines as well as diagnosis of infection and disease. These products and services are used by customers in pharmaceutical, biotechnology, agricultural, clinical, healthcare, academic, and government markets.

Analytical Instruments: provides a broad offering of instruments and the supporting consumables, software and services that are used for a range of applications in the laboratory and in the field. These products and services are used by customers in

pharmaceutical, biotechnology, academic, government, environmental and other research and industrial markets, as well as the clinical laboratory.

Specialty Diagnostics: offers a wide range of diagnostic test kits, reagents, culture media, instruments and associated products to serve customers in healthcare, clinical, pharmaceutical, industrial, and food safety laboratories. Our healthcare products are used to increase the speed and accuracy of diagnoses, which improves patient care in a more cost-efficient manner.

Laboratory Products and Biopharma Services: offers virtually everything needed for the laboratory. Our unique combination of self-manufactured and sourced products and extensive service offering enables our customers to focus on their core activities and helps them to be more efficient, productive and cost-effective. The segment also includes a comprehensive offering of outsourced services used by the pharmaceutical and biotech industries for drug development, clinical research, clinical trials services and commercial drug manufacturing.

The company's management evaluates segment operating performance based on operating income before certain charges/credits to cost of revenues and selling, general and administrative expenses, principally associated with acquisition accounting; restructuring and other costs/income including costs arising from facility consolidations such as severance and abandoned lease expense and gains and losses from the sale of real estate and product lines as well as from significant litigation-related matters; and amortization of acquisition-related intangible assets. The company uses this measure because it helps management understand and evaluate the segments' core operating results and facilitates comparison of performance for determining compensation.

Business Segment Information

(In millions)	2022	2021	2020
Revenues			
Life Sciences Solutions	$ 13,532	$ 15,631	$ 12,168
Analytical Instruments	6,624	6,069	5,124
Specialty Diagnostics	4,763	5,659	5,343
Laboratory Products and Biopharma Services	22,511	14,862	12,245
Eliminations	(2,515)	(3,010)	(2,662)
Consolidated revenues	44,915	39,211	32,218
Segment Income			
Life Sciences Solutions	5,582	7,817	6,109
Analytical Instruments	1,507	1,197	808
Specialty Diagnostics	1,024	1,280	1,368
Laboratory Products and Biopharma Services	2,872	1,844	1,271
Subtotal reportable segments	10,985	12,138	9,556
Cost of revenues adjustments	(46)	(8)	(6)
Selling, general and administrative expenses adjustments	(37)	(144)	10
Restructuring and other costs	(114)	(197)	(99)
Amortization of acquisition-related intangible assets	(2,395)	(1,761)	(1,667)
Consolidated operating income	8,393	10,028	7,794
Interest income	272	43	65
Interest expense	(726)	(536)	(553)
Other income/(expense)	(104)	(694)	(76)
Consolidated income before taxes	$ 7,835	$ 8,841	$ 7,230
Depreciation			
Life Sciences Solutions	$ 214	$ 197	$ 140
Analytical Instruments	83	83	76
Specialty Diagnostics	75	128	100
Laboratory Products and Biopharma Services	614	423	342
Consolidated depreciation	$ 986	$ 831	$ 658

Cost of revenues charges included in the above table consist of charges for the sale of inventories revalued at the date of acquisition, inventory write-downs associated with large-scale abandonments of product lines, and accelerated depreciation on fixed assets to estimated salvage value in connection with the consolidation of operations. Selling, general and administrative charges/credits included in the above table consist of significant transaction/integration costs (including reimbursement thereof) related to recent/terminated acquisitions, charges/credits for changes in estimates of contingent acquisition consideration, and charges/credits related to product liability litigation.

(In millions)	2022	2021	2020
Total assets			
Life Sciences Solutions	$ 21,848	$ 22,751	$ 20,209
Analytical Instruments	10,019	9,692	9,773
Specialty Diagnostics	5,542	6,010	6,534
Laboratory Products and Biopharma Services	51,281	52,639	22,711
Corporate/other (a)	8,464	4,031	9,825
Consolidated total assets	$ 97,154	$ 95,123	$ 69,052
Capital expenditures			
Life Sciences Solutions	$ 490	$ 810	$ 392
Analytical Instruments	140	79	74
Specialty Diagnostics	112	167	175
Laboratory Products and Biopharma Services	1,403	1,327	772
Corporate/other	98	140	61
Consolidated capital expenditures	$ 2,243	$ 2,523	$ 1,474

(a) Corporate assets consist primarily of cash and cash equivalents and property and equipment at the company's corporate offices.

Geographical Information

(In millions)	2022	2021	2020
Revenues (b)			
United States	$ 23,820	$ 18,907	$ 16,435
China	3,793	3,444	2,797
Other	17,302	16,860	12,986
Consolidated revenues	$ 44,915	$ 39,211	$ 32,218
Long-lived Assets (c)			
United States	$ 6,308	$ 5,578	$ 3,686
Other	4,565	4,286	3,001
Consolidated long-lived assets	$ 10,873	$ 9,864	$ 6,687

(b) Revenues are attributed to countries based on customer location.
(c) Includes property, plant and equipment, net, and operating lease ROU assets.

Note 5. Other Income/(Expense)

In all periods, other income/(expense) includes currency transaction gains and losses on non-operating monetary assets and liabilities and net periodic pension benefit cost/income, excluding the service cost component which is included in operating expenses on the accompanying statement of income. In 2022, other income/(expense) includes $161 million of net losses on investments, $67 million of net gains on derivative instruments to address certain foreign currency risks, $26 million of losses on the early extinguishment of debt (Note 10), and $2 million of net settlement gains on pension plans.

In 2021, other income/(expense) includes $767 million of losses on the early extinguishment of debt (Note 10), $36 million of financing costs associated with obtaining bridge financing commitments in connection with the agreement to acquire PPD (Note 2), offset in part by $66 million of net gains on investments. The company had a cash outlay of $36 million in 2021 associated with obtaining the bridge financing commitments, included in other financing activities, net, in the accompanying statement of cash flows.

In 2020, other income/(expense) includes $81 million of financing costs for a terminated acquisition, primarily for loan commitment fees and entering into hedging contracts and $42 million reclassified from accumulated other comprehensive items related to a hedge arrangement (Note 14), offset in part by $10 million of net gains on investments. The company had a cash outlay of $51 million in 2020 associated with obtaining the loan commitments included in other financing activities, net, in the accompanying statement of cash flows.

Note 6. Stock-based Compensation Expense

The company has stock-based compensation plans for its key employees, directors and others. These plans permit the grant of a variety of stock and stock-based awards, including restricted stock units, stock options or performance-based shares, as determined by the compensation committee of the company's Board of Directors or, for certain non-officer grants, by the company's employee equity committee, which consists of its chief executive officer. The company generally issues new shares of its common stock to satisfy option exercises and restricted unit vesting. Grants of stock options and restricted units generally provide that in the event of both a change in control of the company and a qualifying termination of an option or unit holder's employment, all options and service-based restricted unit awards held by the recipient become immediately vested (unless an employment or other agreement with the employee provides for different treatment).

Compensation cost is based on the grant-date fair value and is recognized ratably over the requisite vesting period or to the date based on qualifying retirement eligibility, if earlier, and is primarily included in selling, general and administrative expenses.

Stock Options

The company's practice is to grant stock options at fair market value. Options vest over 3-5 years with terms of 7-10 years, assuming continued employment with certain exceptions. Vesting of the option awards is contingent upon meeting certain service conditions. The fair value of most option grants is estimated using the Black-Scholes option pricing model. For option grants that require the achievement of both service and market conditions, a lattice model is used to estimate fair value. The fair value is then amortized on a straight-line basis over the requisite service periods of the awards, which is generally the vesting period. Use of a valuation model requires management to make certain assumptions with respect to selected model inputs. Expected volatility was calculated based on the historical volatility of the company's stock. Historical data on exercise patterns is the basis for estimating the expected life of an option. The risk-free interest rate is based on U.S. Treasury zero-coupon issues with a remaining term which approximates the expected life assumed at the date of grant. The expected annual dividend rate was calculated by dividing the company's annual dividend, based on the most recent quarterly dividend rate, by the closing stock price on the grant date. The compensation expense recognized for all stock-based awards is net of estimated forfeitures. Forfeitures are estimated based on an analysis of actual option forfeitures.

The weighted average assumptions used in the Black-Scholes option pricing model are as follows:

	2022	2021	2020
Expected stock price volatility	26 %	26 %	22 %
Risk free interest rate	2.0 %	0.8 %	1.1 %
Expected life of options (years)	4.7	4.3	4.3
Expected annual dividend	0.2 %	0.2 %	0.3 %

The weighted average per share grant-date fair values of options granted during 2022, 2021 and 2020 were $135.07, $123.97 and $61.19, respectively. The total intrinsic value of options exercised during the same periods was $336 million, $501 million and $457 million, respectively. The intrinsic value is the difference between the market value of the shares on the exercise date and the exercise price of the option.

A summary of the company's option activity for the year ended December 31, 2022 is presented below:

	Shares (in millions)	Weighted average exercise price	Weighted average remaining contractual term (in years)	Aggregate intrinsic value (in millions)
Outstanding at December 31, 2021	6.0	$ 319.95		
Granted	0.8	530.48		
Exercised	(0.9)	199.85		
Canceled/expired	(0.3)	503.76		
Outstanding at December 31, 2022	5.6	$ 359.27	4.2	$ 1,125
Vested and unvested expected to vest at December 31, 2022	5.3	$ 351.97	4.7	$ 1,114
Exercisable at December 31, 2022	2.9	$ 251.44	2.8	$ 891

As of December 31, 2022, there was $228 million of total unrecognized compensation cost related to unvested stock options granted. The cost is expected to be recognized through 2026 with a weighted average amortization period of 2.4 years.

Restricted Share/Unit Awards

Awards of restricted units convert into an equivalent number of shares of common stock. The awards generally vest over 3-4 years, assuming continued employment, with some exceptions. Vesting of the awards is contingent upon meeting certain service conditions and may also be contingent upon meeting certain performance and/or market conditions. The fair market value of the award at the time of the grant is amortized to expense over the requisite service period of the award, which is generally the vesting period. Recipients of restricted units have no voting rights but are entitled to accrue dividend equivalents. The fair value of service- and performance-based restricted unit awards is determined based on the number of units granted and the market value of the company's shares on the grant date. For awards with market-based vesting conditions, the company uses a lattice model to estimate the grant-date fair value of the award.

A summary of the company's restricted unit activity for the year ended December 31, 2022 is presented below:

	Units (in millions)	Weighted average grant-date fair value
Unvested at December 31, 2021	0.8	$ 425.39
Granted	0.4	520.83
Vested	(0.4)	375.77
Forfeited	(0.1)	510.37
Unvested at December 31, 2022	0.7	$ 495.39

The total fair value of shares vested during 2022, 2021 and 2020 was $163 million, $151 million and $126 million, respectively.

As of December 31, 2022, there was $200 million of total unrecognized compensation cost related to unvested restricted stock unit awards. The cost is expected to be recognized through 2026 with a weighted average amortization period of 1.9 years.

Employee Stock Purchase Plans

Qualifying employees are eligible to participate in an employee stock purchase plan sponsored by the company. Shares may be purchased under the program at 95% of the fair market value at the end of the purchase period and the shares purchased are not subject to a holding period. Shares are purchased through payroll deductions of up to 10% of each participating employee's qualifying gross wages. The company issued 0.2 million, 0.1 million and 0.2 million shares, respectively, of its common stock in 2022, 2021 and 2020 under the employee stock purchase plan.

Note 7. Pension and Other Postretirement Benefit Plans

401(k) Savings Plan and Other Defined Contribution Plans

The company's 401(k) savings and other defined contribution plans cover the majority of the company's eligible U.S. and certain non-U.S. employees. Contributions to the plans are made by both the employee and the company. Company contributions are based on the level of employee contributions. Company contributions to these plans are based on formulas determined by the company. In 2022, 2021 and 2020, the company charged to expense $402 million, $299 million and $254 million, respectively, related to its defined contribution plans.

Defined Benefit Pension Plans

Employees of a number of the company's non-U.S. and certain U.S. subsidiaries participate in defined benefit pension plans covering substantially all full-time employees at those subsidiaries. Some of the plans are unfunded, as permitted under the plans and applicable laws. The company also maintains postretirement healthcare programs at several acquired businesses where certain employees are eligible to participate. The liabilities and costs associated with the company's postretirement healthcare programs are generally funded on a self-insured and insured-premium basis and are not material for any period presented.

The company recognizes the funded status of defined benefit pension and other postretirement benefit plans as an asset or liability. This amount is defined as the difference between the fair value of plan assets and the benefit obligation. The company is required to recognize as a component of other comprehensive items, net of tax, the actuarial gains/losses and prior service costs/credits that arise but were not previously required to be recognized as components of net periodic benefit cost. Other comprehensive items is adjusted as these amounts are later recognized in income as components of net periodic benefit cost.

When a company with a pension plan is acquired, any excess of projected benefit obligation over the plan assets is recognized as a liability and any excess of plan assets over the projected benefit obligation is recognized as an asset. The recognition of a new liability or a new asset results in the elimination of (a) previously existing unrecognized net gain or loss and (b) unrecognized prior service cost or credits.

The company funds annually, at a minimum, the statutorily required minimum amount as actuarially determined. During 2022, 2021 and 2020, the company made cash contributions of approximately $41 million, $34 million and $96 million, respectively. Contributions to the plans included in the following table are estimated at between $30 and $50 million for 2023.

The following table provides a reconciliation of benefit obligations and plan assets of the company's domestic and non-U.S. pension plans:

	Domestic pension benefits		Non-U.S. pension benefits	
(In millions)	2022	2021	2022	2021
Accumulated benefit obligation	$ 995	$ 1,260	$ 1,016	$ 1,475
Change in projected benefit obligations				
Projected benefit obligation at beginning of year	$ 1,260	$ 1,302	$ 1,552	$ 1,486
Acquisitions	—	—	51	170
Service costs	—	—	34	27
Interest costs	27	23	20	11
Settlements	—	—	(31)	(7)
Plan participants' contributions	—	—	9	6
Actuarial (gains) losses	(210)	20	(447)	(57)
Benefits paid	(82)	(85)	(19)	(30)
Currency translation and other	—	—	(100)	(54)
Projected benefit obligation at end of year	$ 995	$ 1,260	$ 1,069	$ 1,552

(In millions)	Domestic pension benefits 2022	Domestic pension benefits 2021	Non-U.S. pension benefits 2022	Non-U.S. pension benefits 2021
Change in fair value of plan assets				
Fair value of plan assets at beginning of year	$ 1,226	$ 1,267	$ 1,302	$ 1,160
Acquisitions	—	—	14	158
Actual return on plan assets	(212)	37	(347)	14
Employer contributions	5	7	36	27
Settlements	—	—	(31)	(7)
Plan participants' contributions	—	—	9	6
Benefits paid	(82)	(85)	(19)	(30)
Currency translation and other	—	—	(96)	(26)
Fair value of plan assets at end of year	$ 937	$ 1,226	$ 868	$ 1,302
Funded status	$ (58)	$ (34)	$ (201)	$ (250)
Amounts recognized in balance sheet				
Noncurrent assets	$ —	$ 32	$ 81	$ 205
Current liability	(6)	(7)	(11)	(10)
Noncurrent liabilities	(52)	(59)	(271)	(445)
Net amount recognized	$ (58)	$ (34)	$ (201)	$ (250)
Amounts recognized in accumulated other comprehensive items				
Net actuarial loss	$ 200	$ 157	$ 74	$ 167
Prior service credits	—	—	(4)	(3)
Net amount recognized	$ 200	$ 157	$ 70	$ 164

For domestic pension plans, actuarial gains experienced in 2022 were driven by increases in the weighted average discount rates used to determine the projected benefit obligation, as well as differences between actual and expected returns on plan assets for certain portions of plan benefits indexed to asset returns. For non-U.S. pension plans, actuarial gains experienced in 2022 were principally driven by increases in the weighted average discount rates used to determine the projected benefit obligation.

For domestic pension plans, actuarial losses experienced in 2021 were driven by differences between actual and expected returns on plan assets for certain portions of plan benefits indexed to asset returns, which were partially offset by actuarial gains due to increases in the weighted average discount rates used to determine the projected benefit obligation differences. For non-U.S. pension plans, actuarial gains experienced in 2021 were principally driven by increases in the weighted average discount rates used to determine the projected benefit obligation.

The actuarial assumptions used to compute the funded status for the plans are based upon information available as of December 31, 2022 and 2021 and are as follows:

	Domestic pension benefits 2022	Domestic pension benefits 2021	Non-U.S. pension benefits 2022	Non-U.S. pension benefits 2021
Weighted average assumptions used to determine projected benefit obligations				
Discount rate for determining benefit obligation	5.01 %	2.70 %	3.91 %	1.45 %
Interest crediting rate for cash balance plans	4.96 %	2.58 %	2.19 %	1.25 %
Average rate of increase in employee compensation	N/A	N/A	2.78 %	2.73 %

The actuarial assumptions used to compute the net periodic pension benefit cost (income) are based upon information available as of the beginning of the year, as presented in the following table:

	Domestic pension benefits			Non-U.S. pension benefits		
	2022	2021	2020	2022	2021	2020
Weighted average assumptions used to determine net benefit cost (income)						
Discount rate - service cost	N/A	N/A	N/A	1.00 %	0.65 %	1.21 %
Discount rate - interest cost	2.70 %	2.33 %	3.13 %	1.36 %	0.80 %	1.44 %
Average rate of increase in employee compensation	N/A	N/A	N/A	2.73 %	2.30 %	2.27 %
Expected long-term rate of return on assets	4.75 %	4.25 %	5.00 %	2.33 %	2.02 %	2.33 %

The discount rate reflects the rate the company would have to pay to purchase high-quality investments that would provide cash sufficient to settle its current pension obligations. The discount rate is determined based on a range of factors, including the rates of return on high-quality, fixed-income corporate bonds and the related expected duration of the obligations or, in certain instances, the company has used a hypothetical portfolio of high quality instruments with maturities that mirror the benefit obligation in order to accurately estimate the discount rate relevant to a particular plan.

The company utilizes a full yield curve approach in the estimation of these components by applying the specific spot-rates along the yield curve used in the determination of the benefit obligation to the relevant projected cash flows.

The expected long-term rate of return on plan assets reflects the average rate of earnings expected on the funds invested, or to be invested, to provide for the benefits included in the projected benefit obligations. In determining the expected long-term rate of return on plan assets, the company considers the relative weighting of plan assets, the historical performance of total plan assets and individual asset classes and economic and other indicators of future performance. In addition, the company may consult with and consider the opinions of financial and other professionals in developing appropriate return benchmarks.

Asset management objectives include maintaining an adequate level of diversification to reduce interest rate and market risk and providing adequate liquidity to meet immediate and future benefit payment requirements.

The expected rate of compensation increase reflects the long-term average rate of salary increases and is based on historic salary increase experience and management’s expectations of future salary increases.

The projected benefit obligation and fair value of plan assets for the company’s qualified and non-qualified pension plans with projected benefit obligations in excess of plan assets are as follows:

	Pension plans	
(In millions)	2022	2021
Pension plans with projected benefit obligations in excess of plan assets		
Projected benefit obligation	$ 1,636	$ 2,010
Fair value of plan assets	1,296	1,521

The accumulated benefit obligation and fair value of plan assets for the company's qualified and non-qualified pension plans with accumulated benefit obligations in excess of plan assets are as follows:

	Pension plans	
(In millions)	2022	2021
Pension plans with accumulated benefit obligations in excess of plan assets		
Accumulated benefit obligation	$ 1,583	$ 1,937
Fair value of plan assets	1,294	1,521

The measurement date used to determine benefit information is December 31 for all plan assets and benefit obligations.

The net periodic pension benefit cost (income) includes the following components:

	Domestic pension benefits			Non-U.S. pension benefits		
(In millions)	2022	2021	2020	2022	2021	2020
Components of net benefit cost (income)						
Service cost	$ —	$ —	$ —	$ 34	$ 27	$ 24
Interest cost on benefit obligation	27	23	35	20	11	18
Expected return on plan assets	(45)	(40)	(47)	(26)	(19)	(19)
Amortization of actuarial net loss	4	7	6	7	12	10
Amortization of prior service benefit	—	—	—	(1)	—	(1)
Settlement/curtailment loss	—	—	—	(2)	—	8
Net periodic benefit cost (income)	$ (14)	$ (10)	$ (6)	$ 32	$ 31	$ 40

Expected benefit payments are estimated using the same assumptions used in determining the company's benefit obligation at December 31, 2022. Benefit payments will depend on future employment and compensation levels, average years employed and average life spans, among other factors, and changes in any of these factors could significantly affect these estimated future benefit payments. Estimated future benefit payments during the next five years and in the aggregate for the five fiscal years thereafter, are as follows:

(In millions)	Domestic pension benefits	Non-U.S. pension benefits
Expected benefit payments		
2023	$ 85	$ 47
2024	81	48
2025	81	51
2026	80	55
2027	79	55
2028-2032	373	313

Domestic Pension Plan Assets

The company's overall objective is to manage the assets in a liability framework where investments are selected that are expected to have similar changes in fair value as the related liabilities will have upon changes in interest rates. The company invests in a portfolio of both return-seeking and liability-hedging assets, primarily through the use of institutional collective funds, to achieve long-term growth and to insulate the funded position from interest rate volatility. The strategic asset allocation uses a combination of risk controlled and index strategies in fixed income and global equities. The target allocations for the investments are approximately 10% to funds investing in U.S. equities, approximately 10% to funds investing in international equities and approximately 80% to funds investing in fixed income securities. The portfolio maintains enough liquidity at all times to meet the near-term benefit payments.

Non-U.S. Pension Plan Assets

The company maintains specific plan assets for many of the individual pension plans outside the U.S. The investment strategy of each plan has been uniquely established based on the country specific standards and characteristics of the plans. Several of the plans have contracts with insurance companies whereby the market risks of the benefit obligations are borne by the insurance companies. When assets are held directly in investments, generally the objective is to invest in a portfolio of diversified assets with a variety of fund managers. The investments may include equity funds, fixed income funds, hedge funds, multi-asset funds, alternative investments and derivative funds with the target asset allocations ranging from approximately 0% - 25% for equity funds, 30% - 90% for fixed income funds, 0% - 35% for multi-asset funds, and 0% - 45% for funds holding derivatives. The derivatives held by the funds are primarily interest rate swaps intended to match the movements in the plan liabilities. Each plan maintains enough liquidity at all times to meet the near-term benefit payments.

The fair values of the company's plan assets at December 31, 2022 and 2021, by asset category are as follows:

(In millions)	December 31, 2022	Quoted prices in active markets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)	Not subject to leveling (a)
Domestic pension plan assets					
U.S. equity funds	$ 89	$ —	$ —	$ —	$ 89
International equity funds	91	—	—	—	91
Fixed income funds	739	—	—	—	739
Money market funds	18	—	—	—	18
Total domestic pension plans	$ 937	$ —	$ —	$ —	$ 937
Non-U.S. pension plan assets					
Equity funds	$ 8	$ —	$ —	$ —	$ 8
Fixed income funds	299	—	—	—	299
Multi-asset funds	56	—	—	—	56
Derivative funds	190	—	—	—	190
Insurance contracts	306	—	306	—	—
Cash / money market funds	9	4	—	—	5
Total non-U.S. pension plans	$ 868	$ 4	$ 306	$ —	$ 558

(a) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

(In millions)	December 31, 2021	Quoted prices in active markets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)	Not subject to leveling (a)
Domestic pension plan assets					
U.S. equity funds	$ 124	$ —	$ —	$ —	$ 124
International equity funds	117	—	—	—	117
Fixed income funds	966	—	—	—	966
Money market funds	19	—	—	—	19
Total domestic pension plans	$ 1,226	$ —	$ —	$ —	$ 1,226
Non-U.S. pension plan assets					
Equity funds	$ 17	$ —	$ —	$ —	$ 17
Fixed income funds	651	—	—	—	651
Hedge funds	3	—	—	—	3
Multi-asset funds	73	—	—	—	73
Derivative funds	253	—	—	—	253
Alternative investments	1	—	—	—	1
Insurance contracts	295	—	295	—	—
Cash / money market funds	9	5	—	—	4
Total non-U.S. pension plans	$ 1,302	$ 5	$ 295	$ —	$ 1,002

(a) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

The tables above present the fair value of the company's plan assets in accordance with the fair value hierarchy (Note 14). Certain investments that are measured at fair value using the net asset value per share practical expedient have not been classified in the fair value hierarchy. The fair value amounts of these investments presented in the above tables are intended to permit reconciliation of the fair value hierarchy to the amounts presented for the total pension plan assets. These investments were also redeemable at the balance sheet date or within limited time restrictions.

Note 8. Income Taxes

The components of income before provision for income taxes are as follows:

(In millions)	2022	2021	2020
U.S.	$ 3,859	$ 3,340	$ 4,762
Non-U.S.	3,976	5,501	2,468
Income before income taxes	$ 7,835	$ 8,841	$ 7,230

The components of the provision for income taxes are as follows:

(In millions)	2022	2021	2020
Current income tax provision			
Federal	$ 813	$ 446	$ 521
Non-U.S.	633	1,148	423
State	254	160	175
	1,700	1,754	1,119
Deferred income tax provision (benefit)			
Federal	$ (611)	$ (227)	$ (237)
Non-U.S.	(314)	(399)	(18)
State	(72)	(19)	(14)
	(997)	(645)	(269)
Provision for income taxes	$ 703	$ 1,109	$ 850

The provision for income taxes in the accompanying statement of income differs from the provision calculated by applying the statutory federal income tax rate to income before income taxes due to the following:

(In millions)	2022	2021	2020
Statutory federal income tax rate	21 %	21 %	21 %
Provision for income taxes at statutory rate	$ 1,645	$ 1,857	$ 1,518
Increases (decreases) resulting from:			
Foreign rate differential	(329)	(255)	(223)
Income tax credits	(202)	(315)	(335)
Global intangible low-taxed income	96	76	86
Foreign-derived intangible income	(149)	(119)	(156)
Excess tax benefits from stock options and restricted stock units	(80)	(124)	(114)
Provision for (reversal of) tax reserves, net	(544)	(17)	(26)
Intra-entity transfers	(18)	(284)	—
Domestication transaction	—	—	(263)
Valuation allowances	344	36	379
Withholding taxes	84	164	115
Tax return reassessments and settlements	(210)	1	(196)
State income taxes, net of federal tax	111	82	147
Other, net	(45)	7	(82)
Provision for income taxes	$ 703	$ 1,109	$ 850

The company has operations and a taxable presence in approximately 70 countries outside the U.S. The company's effective income tax rate differs from the U.S. federal statutory rate each year due to certain operations that are subject to tax incentives, state and local taxes, and foreign taxes that are different than the U.S. federal statutory rate.

During 2022, the company settled an IRS audit relating to the 2017 and 2018 tax years. The company recorded a $208 million net tax benefit primarily from this settlement and related impacts, which resulted in a decrease in the company’s unrecognized tax benefits of $658 million. The company recorded $49 million of charges for expired tax credits and other related components of the settlement. The company recorded a charge of $395 million to establish a valuation allowance against

certain U.S. foreign tax credits which the company believes will more likely than not expire unutilized. The company also recorded $101 million of additional net unrecognized tax benefit liabilities related to other tax audits.

During 2021, the company recorded a $188 million income tax benefit related to the deferred tax implications of an intra-entity transfer of assets. Also in 2021, the company recorded a $96 million income tax benefit related to a capital loss resulting from certain intra-entity transactions.

During 2020, the company settled an IRS audit relating to the 2014, 2015, and 2016 tax years. The company recorded a $25 million net tax benefit primarily from this settlement and related impacts, which resulted in a decrease in the company's unrecognized tax benefits of $378 million, of which $144 million was reclassified to income taxes payable. The company recorded $53 million of charges for expired tax credits and other related components of the settlement. The company recorded a charge of $156 million to establish a valuation allowance against certain U.S. foreign tax credits which the company believes will more likely than not expire unutilized.

In 2020, the company recorded a $263 million income tax benefit related to a domestication transaction involving the transfer of certain non-U.S. subsidiaries to the U.S., including interest expense of those subsidiaries. The company also recorded a valuation allowance of $212 million against the amount of interest expense that the company believes will more likely than not go unused.

The foreign tax credits discussed below are the result of foreign earnings and profits remitted or deemed remitted to the U.S. during the reporting year and the U.S. treatment of taxes paid in the foreign jurisdictions in the years those profits were originally earned.

In 2020, the company implemented foreign tax credit planning in Sweden which resulted in $96 million of foreign tax credits, with no related incremental U.S. income tax expense.

The company generally receives a tax deduction upon the exercise of non-qualified stock options by employees, or the vesting of restricted stock units held by employees, for the difference between the exercise price and the market price of the underlying common stock on the date of exercise. The company uses the incremental tax benefit approach for utilization of tax attributes. These excess tax benefits reduce the tax provision. In 2022, 2021 and 2020, the company's tax provision was reduced by $80 million, $124 million and $114 million, respectively, of such benefits.

Net deferred tax asset (liability) in the accompanying balance sheet consists of the following:

(In millions)	2022	2021
Deferred tax asset (liability)		
Depreciation and amortization	$ (4,277)	$ (4,687)
Net operating loss and credit carryforwards	1,951	1,652
Reserves and accruals	140	162
Accrued compensation	259	318
Inventory basis difference	364	181
Deferred interest	445	295
Research and development and other capitalized costs	220	—
Unrealized (gains) losses on hedging instruments	(199)	(33)
Other, net	435	251
Deferred tax liabilities, net before valuation allowance	(662)	(1,861)
Less: Valuation allowance	1,322	968
Deferred tax liabilities, net	$ (1,984)	$ (2,829)

The company estimates the degree to which tax assets and loss and credit carryforwards will result in a benefit based on expected profitability by tax jurisdiction and provides a valuation allowance for tax assets and loss and credit carryforwards that it believes will more likely than not expire unutilized. At December 31, 2022, all of the company's valuation allowance relates to deferred tax assets, primarily net operating losses and disallowed interest expense carryforward, for which any subsequently recognized tax benefits will reduce income tax expense.

The changes in the valuation allowance are as follows:

	Year Ended December 31,		
(In millions)	2022	2021	2020
Beginning balance	$ 968	$ 933	$ 408
Additions (reductions) charged to income tax provision, net	344	24	514
Additions due to acquisitions	14	30	—
Currency translation and other	(4)	(19)	11
Ending balance	$ 1,322	$ 968	$ 933

At December 31, 2022, the company had net federal, state and non-U.S. net operating loss carryforwards of $68 million, $97 million and $1.16 billion, respectively. Use of the carryforwards is limited based on the future income of certain subsidiaries. Of the federal net operating loss carryforwards, $33 million expire in the years 2023 through 2037, and the remainder do not expire. The state net operating loss carryforwards expire in the years 2023 through 2042. Of the net non-U.S. net operating loss carryforwards, $422 million expire in the years 2025 through 2042, and the remainder do not expire.

At December 31, 2022, the company had foreign tax credit carryforwards of $551 million and deferred interest carryforwards of $445 million. The foreign tax credit carryforwards will expire in the years 2025 through 2032 while deferred interest carryforwards do not expire.

U.S. federal taxes have been recorded on approximately $29 billion of undistributed foreign earnings as of December 31, 2022. A provision has not been made for certain U.S. state income taxes or additional non-U.S. taxes that would be due when cash is repatriated to the U.S. as the company's undistributed foreign earnings are intended to be reinvested outside of the U.S. indefinitely. The determination of the amount of the unrecognized deferred tax liability related to the undistributed foreign earnings is not practicable due to the uncertainty in the manner in which these earnings will be distributed. The company's intent is to only make distributions from non-U.S. subsidiaries in the future when they can be made at no net tax cost.

Unrecognized Tax Benefits

As of December 31, 2022, the company had $0.57 billion of unrecognized tax benefits substantially all of which, if recognized, would reduce the effective tax rate.

A reconciliation of the beginning and ending amounts of unrecognized tax benefits is as follows:

(In millions)	2022	2021	2020
Beginning balance	$ 1,124	$ 1,091	$ 1,552
Additions due to acquisitions	15	26	—
Additions for tax positions of current year	104	32	8
Additions for tax positions of prior years	24	60	—
Reductions for tax positions of prior years	(659)	(5)	(296)
Closure of tax years	(4)	(27)	—
Settlements	(32)	(53)	(173)
Ending balance	$ 572	$ 1,124	$ 1,091

Substantially all of the unrecognized tax benefits are classified as long-term liabilities. The company does not expect its unrecognized tax benefits to change significantly over the next twelve months.

During 2022, the company's unrecognized tax benefits increased by $143 million as a result of uncertain tax positions relating to foreign tax positions and decreased $610 million relating to U.S. federal and state tax positions which included $658 million from the settlement of the IRS audit of the 2017 and 2018 tax years. The company also assumed $15 million of uncertain tax benefits as part of the acquisition of PPD.

During 2021, the company's unrecognized tax benefits increased by $80 million as a result of uncertain tax positions relating to foreign tax positions and decreased $75 million relating to U.S. federal and state tax positions. The company also assumed $26 million of uncertain tax benefits as part of the acquisition of PPD.

During 2020, the company's unrecognized tax benefits decreased $51 million as a result of uncertain tax positions relating to foreign tax positions and $410 million relating to U.S. federal and state tax positions which included $378 million from the settlement of the IRS audit of the 2014, 2015 and 2016 tax years.

The company classified interest and penalties related to unrecognized tax benefits as income tax expense. The total amount of interest and penalties related to uncertain tax positions and recognized in the balance sheet as of December 31, 2022 and 2021 was $74 million and $59 million, respectively.

The company conducts business globally and, as a result, Thermo Fisher or one or more of its subsidiaries files income tax returns in the U.S. federal jurisdiction and various state and foreign jurisdictions. In the normal course of business, the company is subject to examination by taxing authorities throughout the world, including such major jurisdictions as Australia, Canada, China, Denmark, Finland, France, Germany, Japan, Singapore, Sweden, the United Kingdom and the United States. With few exceptions, the company is no longer subject to U.S. state and local or non-U.S. income tax examinations for years before 2012 and no longer subject to U.S. federal income tax examinations for years before 2019.

Note 9. Earnings per Share

(In millions except per share amounts)	2022	2021	2020
Net income attributable to Thermo Fisher Scientific Inc.	$ 6,950	$ 7,725	$ 6,375
Basic weighted average shares	392	394	396
Plus effect of: stock options and restricted stock units	2	3	3
Diluted weighted average shares	394	397	399
Basic earnings per share	$ 17.75	$ 19.62	$ 16.09
Diluted earnings per share	$ 17.63	$ 19.46	$ 15.96
Antidilutive stock options excluded from diluted weighted average shares	2	1	1

Note 10. Debt and Other Financing Arrangements

(Dollars in millions)	Effective interest rate at December 31, 2022	December 31, 2022	December 31, 2021
Commercial Paper	2.60 %	$ 310	$ 2,522
Floating Rate (SOFR + 0.35%) 1.5-Year Senior Notes, Due 4/18/2023		1,000	1,000
Floating Rate (SOFR + 0.39%) 2-Year Senior Notes, Due 10/18/2023		500	500
0.797% 2-Year Senior Notes, Due 10/18/2023	1.03 %	1,350	1,350
Floating Rate (EURIBOR + 0.20%) 2-Year Senior Notes Due 11/18/2023 (euro-denominated)	1.85 %	1,819	1,933
0.000% 2-Year Senior Notes Due 11/18/2023 (euro-denominated)	0.06 %	589	625
0.75% 8-Year Senior Notes, Due 9/12/2024 (euro-denominated)	0.93 %	1,071	1,137
Floating Rate (SOFR + 0.53%) 3-Year Senior Notes, Due 10/18/2024		500	500
1.215% 3-Year Senior Notes, Due 10/18/2024	1.42 %	2,500	2,500
0.125% 5.5-Year Senior Notes, Due 3/1/2025 (euro-denominated)	0.40 %	857	910
2.00% 10-Year Senior Notes, Due 4/15/2025 (euro-denominated)	2.09 %	686	728
0.853% 3-Year Senior Notes, Due 10/20/2025 (yen-denominated)	1.05 %	170	—
0.000% 4-Year Senior Notes Due 11/18/2025 (euro-denominated)	0.15 %	589	625
3.65% 10-Year Senior Notes, Due 12/15/2025		—	350
3.20% 3-Year Senior Notes, Due 1/21/2026 (euro-denominated)	3.38 %	535	—
1.40% 8.5-Year Senior Notes, Due 1/23/2026 (euro-denominated)	1.52 %	749	796
1.45% 10-Year Senior Notes, Due 3/16/2027 (euro-denominated)	1.65 %	535	568
1.75% 7-Year Senior Notes, Due 4/15/2027 (euro-denominated)	1.96 %	642	682
1.054% 5-Year Senior Notes, Due 10/20/2027 (yen-denominated)	1.18 %	221	—
4.80% 5-Year Senior Notes, Due 11/21/2027	5.00 %	600	—
0.50% 8.5-Year Senior Notes, Due 3/1/2028 (euro-denominated)	0.77 %	857	910

(Dollars in millions)	Effective interest rate at December 31, 2022	December 31, 2022	December 31, 2021
1.375% 12-Year Senior Notes, Due 9/12/2028 (euro-denominated)	1.46 %	642	682
1.750% 7-Year Senior Notes, Due 10/15/2028	1.89 %	700	700
1.95% 12-Year Senior Notes, Due 7/24/2029 (euro-denominated)	2.07 %	749	796
2.60% 10-Year Senior Notes, Due 10/1/2029	2.74 %	900	900
1.279% 7-Year Senior Notes, Due 10/19/2029 (yen-denominated)	1.44 %	36	—
0.80% 9-Year Senior Notes, Due 10/18/2030 (euro-denominated)	0.88 %	1,873	1,990
0.875% 12-Year Senior Notes, Due 10/1/2031 (euro-denominated)	1.13 %	963	1,023
2.00% 10-Year Senior Notes, Due 10/15/2031	2.23 %	1,200	1,200
2.375% 12-Year Senior Notes, Due 4/15/2032 (euro-denominated)	2.54 %	642	682
1.49% 10-Year Senior Notes, Due 10/20/2032 (yen-denominated)	1.60 %	48	—
4.95% 10-Year Senior Notes, Due 11/21/2032	5.09 %	600	—
1.125% 12-Year Senior Notes, Due 10/18/2033 (euro-denominated)	1.20 %	1,606	1,706
3.65% 12-Year Senior Notes, Due 11/21/2034 (euro-denominated)	3.76 %	803	—
2.875% 20-Year Senior Notes, Due 7/24/2037 (euro-denominated)	2.94 %	749	796
1.50% 20-Year Senior Notes, Due 10/1/2039 (euro-denominated)	1.73 %	963	1,023
2.80% 20-Year Senior Notes, Due 10/15/2041	2.90 %	1,200	1,200
1.625% 20-Year Senior Notes, Due 10/18/2041 (euro-denominated)	1.77 %	1,339	1,421
2.069% 20-Year Senior Notes, Due 10/20/2042 (yen-denominated)	2.13 %	111	—
5.30% 30-Year Senior Notes, Due 2/1/2044	5.37 %	400	400
4.10% 30-Year Senior Notes, Due 8/15/2047	4.23 %	750	750
1.875% 30-Year Senior Notes, Due 10/1/2049 (euro-denominated)	1.98 %	1,071	1,137
2.00% 30-Year Senior Notes, Due 10/18/2051 (euro-denominated)	2.06 %	803	853
2.382% 30-Year Senior Notes, Due 10/18/2052 (yen-denominated)	2.43 %	254	—
Other		79	76
Total borrowings at par value		34,561	34,971
Unamortized discount		(112)	(117)
Unamortized debt issuance costs		(171)	(184)
Total borrowings at carrying value		34,278	34,670
Finance lease liabilities		210	200
Less: Short-term obligations and current maturities		5,579	2,537
Long-term obligations		$ 28,909	$ 32,333

SOFR - Secured Overnight Financing Rate
EURIBOR - Euro Interbank Offered Rate

The effective interest rates for the fixed-rate debt include the stated interest on the notes, the accretion of any discounts/premiums and the amortization of any debt issuance costs.

See Note 14 for fair value information pertaining to the company’s long-term borrowings.

As of December 31, 2022, the annual repayment requirements for debt obligations are as follows:

(In millions)	Borrowings	Finance Lease Liabilities
2023	$ 5,583	$ 11
2024	4,071	16
2025	2,298	12
2026	1,285	11
2027	1,999	10
2028 and thereafter	19,325	150
	$ 34,561	$ 210

In addition to available borrowings under the company's revolving credit agreements, discussed below, the company had unused lines of credit of $72 million as of December 31, 2022. These unused lines of credit generally provide for short-term unsecured borrowings at various interest rates.

Credit Facilities

The company has a revolving credit facility (the Facility) with a bank group that provides for up to $5.00 billion of unsecured multi-currency revolving credit. The Facility expires on January 7, 2027. The revolving credit agreement calls for interest at either a Term SOFR, a EURIBOR-based rate (for funds drawn in euro) or a rate based on the prime lending rate of the agent bank, at the company's option. The agreement contains affirmative, negative and financial covenants, and events of default customary for facilities of this type. The covenants in the Facility include a Consolidated Net Interest Coverage Ratio (Consolidated EBITDA to Consolidated Net Interest Expense), as such terms are defined in the Facility. Specifically, the company has agreed that, so long as any lender has any commitment under the Facility, any letter of credit is outstanding under the Facility, or any loan or other obligation is outstanding under the Facility, it will maintain a minimum Consolidated Net Interest Coverage Ratio of 3.5:1.0 as of the last day of any fiscal quarter. As of December 31, 2022, no borrowings were outstanding under the Facility, although available capacity was reduced by immaterial outstanding letters of credit.

Commercial Paper Programs

The company has commercial paper programs pursuant to which it may issue and sell unsecured, short-term promissory notes (CP Notes). Under the U.S. program, a) maturities may not exceed 397 days from the date of issue and b) the CP Notes are issued on a private placement basis under customary terms in the commercial paper market and are not redeemable prior to maturity nor subject to voluntary prepayment. Under the euro program, maturities may not exceed 183 days and may be denominated in euro, U.S. dollars, Japanese yen, British pounds sterling, Swiss franc, Canadian dollars or other currencies. Under both programs, the CP Notes are issued at a discount from par (or premium to par, in the case of negative interest rates), or, alternatively, are sold at par and bear varying interest rates on a fixed or floating basis. As of December 31, 2022, there were $0.31 billion of outstanding borrowings under these programs.

Senior Notes

Interest is payable quarterly on the floating rate senior notes, annually on the euro-denominated fixed rate senior notes and semi-annually on all other senior notes. Each of the fixed rate senior notes may be redeemed at a redemption price of 100% of the principal amount plus a specified make-whole premium and accrued interest. Except for the euro-denominated floating rate senior notes, which may not be redeemed early, the floating rate senior notes may be redeemed in whole or in part on or after their applicable call dates at a redemption price of 100% of the principal amount plus accrued interest. The company is subject to certain affirmative and negative covenants under the indentures governing the senior notes, the most restrictive of which limits the ability of the company to pledge principal properties as security under borrowing arrangements. The company was in compliance with all covenants at December 31, 2022.

In 2022 the company completed the full allocation of an amount equal to the net proceeds from the 0.000% senior notes due 2025 to finance or refinance, in whole or in part, certain COVID-19 response projects.

In 2022, the company redeemed all of its 3.650% Senior Notes due 2025. In connection with the redemption, the company incurred $26 million of losses on the early extinguishment of debt included in other income/(expense) on the accompanying statement of income.

In 2021, the company redeemed some of its existing senior notes. In connection with these redemptions, the company incurred $767 million of losses on the early extinguishment of debt included in other income/(expense) on the accompanying statement of income. Upon redemption of the senior notes, the company terminated the related fixed to floating rate interest rate

swap arrangements and received $22 million, included in other financing activities, net, in the accompanying statement of cash flows.

Thermo Fisher Scientific (Finance I) B.V. (Thermo Fisher International), a wholly-owned finance subsidiary of the company, issued each of the Floating Rate Senior Notes due 2023, the 0.00% Senior Notes due 2023, the 0.00% Senior Notes due 2025, the 0.80% Senior Notes due 2030, the 1.125% Senior Notes due 2033, the 1.625% Senior Notes due 2041, and the 2.00% Senior Notes due 2051 included in the table above (collectively, the "Euronotes") in registered public offerings. The company has fully and unconditionally guaranteed all of Thermo Fisher International's obligations under the Euronotes and all of Thermo Fisher International's other debt securities, and no other subsidiary of the company will guarantee these obligations. Thermo Fisher International is a "finance subsidiary" as defined in Rule 13-01(a)(4)(vi) of the Exchange Act, with no assets or operations other than those related to the issuance, administration and repayment of the Euronotes and other debt securities issued by Thermo Fisher International from time to time. The financial condition, results of operations and cash flows of Thermo Fisher International are consolidated in the financial statements of the company.

Note 11. Leases

As a lessee, the company leases certain logistics, office, and manufacturing facilities, as well as vehicles, copiers, and other equipment. These operating leases generally have remaining lease terms between 1 month and 30 years, and some include options to extend (generally for 1 to 10 years) or have options to terminate the arrangement within 1 year.

The company has guaranteed the residual value of three leased operating facilities with lease terms ending in 2023, 2024 and 2025. The company has agreed with the lessor to comply with certain financial covenants consistent with its other debt arrangements (Note 10). The aggregate maximum guarantee under these three lease arrangements is $147 million. Operating lease ROU assets and lease liabilities for these lease arrangements are recorded on the consolidated balance sheet as of December 31, 2022, but exclude any amounts for residual value guarantees.

As a lessee, the consolidated financial statements include the following relating to operating leases:

(Dollars in millions)	2022	2021	2020
Statement of income			
Operating lease costs	$ 351	$ 254	$ 224
Variable lease costs	109	66	49
Statement of cash flows			
Cash used in operating activities for payments of amounts included in the measurement of operating lease liabilities	$ 289	$ 288	$ 222
Operating lease ROU assets obtained in exchange for new operating lease liabilities	430	293	202
Balance sheet			
ROU assets	$ 1,593	$ 1,531	
Operating lease liabilities - current	272	266	
Operating lease liabilities - noncurrent	1,313	1,203	
Weighted average at end of year			
Remaining operating lease term	9.4 years	9.9 years	
Discount rate	3.2 %	2.6 %	

ROU assets are classified in other assets in the consolidated balance sheet. Operating lease liabilities are classified in other accrued expenses and other long-term liabilities, respectively, in the consolidated balance sheet.

Lease costs arising from finance leases, short-term leases, and sublease income are not material. See Note 10 for additional information relating to finance leases.

As of December 31, 2022, future payments of operating lease liabilities are as follows:

(In millions)	
2023	$ 321
2024	293
2025	220
2026	172
2027	136
2028 and thereafter	730
Total lease payments	1,872
Less: imputed interest	287
Total operating lease liability	$ 1,585

As a lessor, operating leases, sales-type leases and direct financing leases are not material.

Note 12. Commitments and Contingencies

Purchase Obligations

The company has entered into unconditional purchase obligations, in the ordinary course of business, that include agreements to purchase goods, services or fixed assets and to pay royalties that are enforceable and legally binding and that specify all significant terms including: fixed or minimum quantities to be purchased; fixed, minimum or variable price provisions; and the approximate timing of the transaction. Purchase obligations exclude agreements that are cancelable at any time without penalty. The aggregate amount of the company's unconditional purchase obligations totaled $2.40 billion at December 31, 2022 and the majority of these obligations are expected to be settled during 2023.

The Analytical Instruments segment recorded a charge to cost of product revenues for $108 million in 2020 related to an existing supply contract for components of electron microscopy instruments. The agreement requires the company to make future minimum purchases through 2025. The company developed and launched an alternative product beginning in 2020 and based on the expected demand for the internally developed product vs. the third-party product, the company does not expect to use all of the product it will be required to buy, resulting in a loss on the purchase commitment.

Letters of Credit, Guarantees and Other Commitments

Outstanding letters of credit and bank guarantees totaled $297 million at December 31, 2022. Substantially all of these letters of credit and guarantees expire before 2040.

Outstanding surety bonds and other guarantees totaled $84 million at December 31, 2022. The expiration of these bonds and guarantees ranges through 2024.

The letters of credit, bank guarantees and surety bonds principally secure performance obligations, and allow the holder to draw funds up to the face amount of the letter of credit, bank guarantee or surety bond if the applicable business unit does not perform as contractually required.

The company is a guarantor of pension plan obligations of a divested business. The purchaser of the divested business has agreed to pay for the pension benefits, however the company was required to guarantee payment of these pension benefits should the purchaser fail to do so. The amount of the guarantee at December 31, 2022 was $28 million.

In connection with the sale of businesses of the company, the buyers have assumed certain contractual obligations of such businesses and have agreed to indemnify the company with respect to those assumed liabilities. In the event a third-party to a transferred contract does not recognize the transfer of obligations or a buyer defaults on its obligations under the transferred contract, the company could be liable to the third-party for such obligations. However, in such event, the company would be entitled to seek indemnification from the buyer.

Indemnifications

In conjunction with certain transactions, primarily divestitures, the company has agreed to indemnify the other parties with respect to certain liabilities related to the businesses that were sold or leased properties that were abandoned (e.g., retention of certain environmental, tax, employee and product liabilities). The scope and duration of such indemnity obligations vary from transaction to transaction. Where probable, an obligation for such indemnifications is recorded as a liability. Generally, a

maximum obligation cannot be reasonably estimated. Other than obligations recorded as liabilities at the time of divestiture, historically the company has not made significant payments for these indemnifications.

In connection with the company's efforts to reduce the number of facilities that it occupies, the company has vacated some of its leased facilities or sublet them to third parties. When the company sublets a facility to a third-party, it remains the primary obligor under the master lease agreement with the owner of the facility. As a result, if a third-party vacates the sublet facility, the company would be obligated to make lease or other payments under the master lease agreement. The company believes that the financial risk of default by sublessors is individually and in the aggregate not material to the company's financial position or results of operations.

In connection with the sale of products in the ordinary course of business, the company often makes representations affirming, among other things, that its products do not infringe on the intellectual property rights of others and agrees to indemnify customers against third-party claims for such infringement. The company has not been required to make material payments under such provisions.

Environmental Matters

The company is currently involved in various stages of investigation and remediation related to environmental matters. The company cannot predict all potential costs related to environmental remediation matters and the possible impact on future operations given the uncertainties regarding the extent of the required cleanup, the complexity and interpretation of applicable laws and regulations, the varying costs of alternative cleanup methods and the extent of the company's responsibility. Expenses for environmental remediation matters related to the costs of installing, operating and maintaining groundwater-treatment systems and other remedial activities related to historical environmental contamination at the company's domestic and international facilities were not material in any period presented. The company records accruals for environmental remediation liabilities, based on current interpretations of environmental laws and regulations, when it is probable that a liability has been incurred and the amount of such liability can be reasonably estimated. The company calculates estimates based upon several factors, including input from environmental specialists and management's knowledge of and experience with these environmental matters. The company includes in these estimates potential costs for investigation, remediation and operation and maintenance of cleanup sites. At December 31, 2022, the company's total environmental liability was approximately $75 million. While management believes the accruals for environmental remediation are adequate based on current estimates of remediation costs, the company may be subject to additional remedial or compliance costs due to future events such as changes in existing laws and regulations, changes in agency direction or enforcement policies, developments in remediation technologies or changes in the conduct of the company's operations, which could have a material adverse effect on the company's financial position, results of operations and cash flows.

Litigation and Related Contingencies

The company is involved in various disputes, governmental and/or regulatory inspections, inquiries, investigations and proceedings, and litigation matters that arise from time to time in the ordinary course of business. The disputes and litigation matters include product liability, intellectual property, employment and commercial issues. The company determines the probability and range of possible loss based on the current status of each of these matters. A liability is recorded in the financial statements if it is believed to be probable that a loss has been incurred and the amount of the loss can be reasonably estimated. The company establishes a liability that is an estimate of amounts expected to be paid in the future for events that have already occurred. The company accrues the most likely amount or at least the minimum of the range of probable loss when a range of probable loss can be estimated. The accrued liabilities are based on management's judgment as to the probability of losses for asserted and unasserted claims and, where applicable, actuarially determined estimates. Accrual estimates are adjusted as additional information becomes known or payments are made. The amount of ultimate loss may differ from these estimates. Due to the inherent uncertainties associated with pending litigation or claims, the company cannot predict the outcome, nor, with respect to certain pending litigation or claims where no liability has been accrued, make a meaningful estimate of the reasonably possible loss or range of loss that could result from an unfavorable outcome. The company has no material accruals for pending litigation or claims for which accrual amounts are not disclosed below, nor are material losses deemed probable for such matters. It is reasonably possible, however, that an unfavorable outcome that exceeds the company's current accrual estimate, if any, for one or more of the matters described below could have a material adverse effect on the company's results of operations, financial position and cash flows.

Product Liability, Workers Compensation and Other Personal Injury Matters

The company is involved in various proceedings and litigation that arise from time to time in connection with product liability, workers compensation and other personal injury matters. The range of probable loss for product liability, workers compensation and other personal injury matters of the company's continuing operations at December 31, 2022, was

approximately $223 million to $384 million on an undiscounted basis. The portion of these liabilities assumed in the 2006 merger with Fisher was recorded at its fair (present) value at the date of merger. The company's accrual for all such matters in total, including the discounted liabilities, was $229 million at December 31, 2022 (or $232 million undiscounted). The accrual includes estimated defense costs and is gross of estimated amounts due from insurers of $95 million at December 31, 2022 (or $98 million undiscounted) that are included in other assets in the accompanying balance sheet. The portion of these insurance assets assumed in the merger with Fisher was also recorded at its fair value at the date of merger. In addition to the above accrual, as of December 31, 2022, the company had a product liability accrual of $17 million (undiscounted) relating to divested businesses.

Although the company believes that the amounts accrued and estimated recoveries are probable and appropriate based on available information, including actuarial studies of loss estimates, the process of estimating losses and insurance recoveries involves a considerable degree of judgment by management and the ultimate amounts could vary, which could have a material adverse effect on the company's results of operations, financial position, and cash flows. Insurance contracts do not relieve the company of its primary obligation with respect to any losses incurred. The collectability of amounts due from its insurers is subject to the solvency and willingness of the insurer to pay, as well as the legal sufficiency of the insurance claims. Management monitors the payment history as well as the financial condition and ratings of its insurers on an ongoing basis.

Note 13. Comprehensive Income and Shareholders' Equity

Comprehensive Income (Loss)

Changes in each component of accumulated other comprehensive items, net of tax are as follows:

(In millions)	Currency translation adjustment	Unrealized losses on hedging instruments	Pension and other postretirement benefit liability adjustment	Total
Balance at December 31, 2021	$ (2,065)	$ (35)	$ (229)	$ (2,329)
Other comprehensive items before reclassifications	(822)	—	38	(784)
Amounts reclassified from accumulated other comprehensive items	7	2	5	14
Net other comprehensive items	(815)	2	43	(770)
Balance at December 31, 2022	$ (2,880)	$ (33)	$ (186)	$ (3,099)

Shareholders' Equity

At December 31, 2022, the company had reserved 22 million unissued shares of its common stock for possible issuance under stock-based compensation plans.

Early in the first quarter of 2023, the company repurchased $3.00 billion of the company's common stock (5.2 million shares).

Note 14. Fair Value Measurements and Fair Value of Financial Instruments

Fair Value Measurements

The company uses the market approach technique to value its financial instruments and there were no changes in valuation techniques during 2022. The company's financial assets and liabilities carried at fair value are primarily comprised of investments in publicly traded securities, insurance contracts, investments in derivative contracts, mutual funds holding publicly traded securities and other investments in unit trusts held as assets to satisfy outstanding deferred compensation and retirement liabilities; and acquisition-related contingent consideration.

Assets and liabilities carried at fair value are classified and disclosed in one of the following three categories:

Level 1: Quoted market prices in active markets for identical assets or liabilities that the company has the ability to access.

Level 2: Observable market based inputs or unobservable inputs that are corroborated by market data such as quoted prices, interest rates and yield curves.

Level 3: Inputs are unobservable data points that are not corroborated by market data.

The following tables present information about the company's financial assets and liabilities measured at fair value on a recurring basis:

(In millions)	December 31, 2022	Quoted prices in active markets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Assets				
Cash equivalents	$ 5,804	$ 5,804	$ —	$ —
Investments	25	25	—	—
Warrants	12	—	12	—
Insurance contracts	162	—	162	—
Derivative contracts	79	—	79	—
Total assets	$ 6,082	$ 5,829	$ 253	$ —
Liabilities				
Derivative contracts	$ 101	$ —	$ 101	$ —
Contingent consideration	174	—	—	174
Total liabilities	$ 275	$ —	$ 101	$ 174

(In millions)	December 31, 2021	Quoted prices in active markets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Assets				
Cash equivalents	$ 2,210	$ 2,210	$ —	$ —
Investments	298	298	—	—
Warrants	15	—	15	—
Insurance contracts	181	—	181	—
Derivative contracts	36	—	36	—
Total assets	$ 2,740	$ 2,508	$ 232	$ —
Liabilities				
Derivative contracts	$ 1	$ —	$ 1	$ —
Contingent consideration	317	—	—	317
Total liabilities	$ 318	$ —	$ 1	$ 317

The company uses the Black-Scholes model to value its warrants. The company determines the fair value of its insurance contracts by obtaining the cash surrender value of the contracts from the issuer. The fair value of derivative contracts is the estimated amount that the company would receive/pay upon liquidation of the contracts, taking into account the change in interest rates and currency exchange rates. The company initially measures the fair value of acquisition-related contingent consideration based on amounts expected to be transferred (probability-weighted) discounted to present value. Changes to the fair value of contingent consideration are recorded in selling, general and administrative expense.

The following table provides a rollforward of the fair value, as determined by level 3 inputs (such as likelihood of achieving production or revenue milestones, as well as changes in the fair values of the investments underlying a recapitalization investment portfolio), of the contingent consideration.

(In millions)	2022	2021
Contingent consideration		
Beginning balance	$ 317	$ 70
Acquisitions (including assumed balances)	(18)	403
Payments	(66)	(109)
Changes in fair value included in earnings	(59)	(47)
Ending balance	$ 174	$ 317

Derivative Contracts

The following table provides the aggregate notional value of outstanding derivative contracts.

(In millions)	December 31, 2022	December 31, 2021
Notional amount		
Cross-currency interest rate swaps - designated as net investment hedges	$ 2,100	$ 900
Currency exchange contracts	2,434	2,149

While certain derivatives are subject to netting arrangements with counterparties, the company does not offset derivative assets and liabilities within the balance sheet. The following tables present the fair value of derivative instruments in the accompanying balance sheet and statement of income.

	Fair value – assets		Fair value – liabilities	
(In millions)	December 31, 2022	December 31, 2021	December 31, 2022	December 31, 2021
Derivatives designated as hedging instruments				
Cross-currency interest rate swaps (a)	$ 77	$ 25	$ 85	$ —
Derivatives not designated as hedging instruments				
Currency exchange contracts (b)	2	11	16	1
Total derivatives	$ 79	$ 36	$ 101	$ 1

(a) The fair value of the cross-currency interest rate swaps is included in the accompanying balance sheet under the caption other assets or other long-term liabilities.
(b) The fair value of the currency exchange contracts is included in the accompanying balance sheet under the captions other current assets or other accrued expenses.

	Gain (loss) recognized	
(In millions)	2022	2021
Fair value hedging relationships		
Cross-currency interest rate swaps		
Hedged long-term obligations - included in other income/(expense)	$ 77	$ —
Derivatives designated as hedging instruments - included in other income/(expense)	(81)	—
Interest rate swaps		
Hedged long-term obligations - included in other income/(expense)	—	25
Derivatives designated as hedging instruments - included in other income/(expense)	—	(3)
Derivatives designated as cash flow hedges		
Interest rate swaps		
Amount reclassified from accumulated other comprehensive items to other income/(expense)	(3)	(73)

(In millions)	Gain (loss) recognized 2022	2021
Financial instruments designated as net investment hedges		
Foreign currency-denominated debt and other payables		
Included in currency translation adjustment within other comprehensive items	695	922
Cross-currency interest rate swaps		
Included in currency translation adjustment within other comprehensive items	52	71
Included in other income/(expense)	19	8
Derivatives not designated as hedging instruments		
Currency exchange contracts		
Included in cost of product revenues	6	12
Included in other income/(expense)	102	162

Gains and losses recognized on currency exchange contracts and the interest rate swaps designated as fair value hedges are included in the accompanying statement of income together with the corresponding, offsetting losses and gains on the underlying hedged transactions.

The company uses foreign currency-denominated debt, certain foreign-denominated payables, and cross-currency interest rate swaps to partially hedge its net investments in foreign operations against adverse movements in exchange rates. A portion of the company's euro-denominated senior notes, certain foreign-denominated payables, and its cross-currency interest rate swaps have been designated as, and are effective as, economic hedges of part of the net investment in a foreign operation. Accordingly, foreign currency transaction gains or losses due to spot rate fluctuations on the euro-denominated debt instruments and certain foreign-denominated payables, and contract fair value changes on the cross-currency interest rate swaps, excluding interest accruals, are included in currency translation adjustment within other comprehensive items and shareholders' equity.

See Note 1 and Note 10 for additional information on the company's risk management objectives and strategies.

Cash Flow Hedge Arrangements

In 2020 the company entered into interest rate swap arrangements to mitigate the risk of interest rates rising prior to completion of debt offerings. Based on the company's conclusion that the debt offerings were probable, the swaps hedged the cash flow risk for each of the interest payments on the planned fixed-rate debt issues. The aggregate fair value of the terminated hedges, net of tax, has been classified as a reduction to accumulated other comprehensive items and will be amortized to interest expense over the term of the related debt issuances. The company had cash outlays aggregating $85 million in 2020 associated with termination of the arrangements, included in other financing activities, net, in the accompanying statement of cash flows.

In late 2020, the company determined that the previously anticipated debt offerings were probable of not occurring and reclassified $42 million from accumulated other comprehensive items to other income/(expense). During 2021, in connection with the extinguishment of debt (Note 10), the company reclassified $65 million from accumulated other comprehensive items to other income/(expense).

Fair Value of Other Financial Instruments

The carrying value and fair value of the company's debt instruments are as follows:

(In millions)	December 31, 2022 Carrying value	Fair value	December 31, 2021 Carrying value	Fair value
Senior notes	$ 33,889	$ 29,901	$ 32,072	$ 33,449
Commercial paper	310	310	2,522	2,522
Other	79	79	76	76
	$ 34,278	$ 30,290	$ 34,670	$ 36,047

The fair value of debt instruments was determined based on quoted market prices and on borrowing rates available to the company at the respective period ends, which represent level 2 measurements.

Note 15. Supplemental Cash Flow Information

(In millions)	2022	2021	2020
Cash paid for:			
Interest	$ 667	$ 555	$ 471
Income taxes	1,234	2,182	1,324
Non-cash investing and financing activities			
Acquired but unpaid property, plant and equipment	393	379	347
Fair value of equity awards exchanged	—	43	—
Fair value of acquisition contingent consideration	—	183	—
Finance lease ROU assets obtained in exchange for new finance lease liabilities	33	15	5
Declared but unpaid dividends	119	104	89
Issuance of stock upon vesting of restricted stock units	241	265	217

Cash, cash equivalents and restricted cash is included in the consolidated balance sheet as follows:

(In millions)	December 31, 2022	December 31, 2021
Cash and cash equivalents	$ 8,524	$ 4,477
Restricted cash included in other current assets	12	13
Restricted cash included in other assets	1	1
Cash, cash equivalents and restricted cash	$ 8,537	$ 4,491

Amounts included in restricted cash primarily represent funds held as collateral for bank guarantees and incoming cash in China awaiting government administrative clearance.

Note 16. Restructuring and Other Costs

Restructuring and other costs in 2022 primarily included impairment of long-lived assets and continuing charges for headcount reductions and facility consolidations in an effort to streamline operations. In 2022, severance actions associated with facility consolidations and cost reduction measures affected less than 2% of the company's workforce.

Restructuring and other costs in 2021 primarily included charges for impairments of an acquired technology asset and a tradename asset, and, to a lesser extent, compensation due to employees at acquired businesses on the date of acquisition. In 2021, severance actions associated with facility consolidations and cost reduction measures affected less than 1% of the company's workforce.

Restructuring and other costs in 2020 primarily included continuing charges for headcount reductions and facility consolidations in an effort to streamline operations, and charges for the write-off of acquired technology. In 2020, severance actions associated with facility consolidations and cost reduction measures affected approximately 1% of the company's workforce.

As of February 23, 2023, the company has identified restructuring actions that will result in additional charges of approximately $60 million, primarily in 2023, and expects to identify additional actions in future periods which will be recorded when specified criteria are met, such as communication of benefit arrangements or when the costs have been incurred.

Restructuring and other costs by segment are as follows:

(In millions)	2022	2021	2020
Life Sciences Solutions	$ 30	$ 129	$ 34
Analytical Instruments	1	6	26
Specialty Diagnostics	68	18	9
Laboratory Products and Biopharma Services	12	35	23
Corporate	3	9	7
	$ 114	$ 197	$ 99

The following table summarizes the changes in the company's accrued restructuring balance. Other amounts reported as restructuring and other costs in the accompanying statement of income have been summarized in the notes to the table. Accrued restructuring costs are included in other accrued expenses in the accompanying balance sheet.

(In millions)	Total (a)
Balance at December 31, 2019	$ 34
Net restructuring charges incurred in 2020 (b)	51
Payments	(57)
Currency translation	(7)
Balance at December 31, 2020	21
Net restructuring charges incurred in 2021 (c)	37
Payments	(40)
Currency translation	(1)
Balance at December 31, 2021	17
Net restructuring charges incurred in 2022 (d)	68
Payments	(44)
Balance at December 31, 2022	$ 41

(a) The movements in the restructuring liability principally consist of severance and other costs such as relocation and moving expenses associated with facility consolidations, as well as employee retention costs which are accrued ratably over the period through which employees must work to qualify for a payment.

(b) Excludes $48 million of charges, principally $32 million for impairment of acquired technology in the Life Sciences Solutions segment resulting from a reduction in expected cash flows and, to a lesser extent, charges across the company's segments for fixed asset writedowns and costs associated with environmental remediation at abandoned/previously owned facilities.

(c) Excludes $160 million of charges, principally $122 million for impairments of an acquired technology asset and a tradename asset in the Life Sciences Solutions and Laboratory Products and Biopharma Services segment, principally resulting from a reduction in expected cash flows, and $35 million of charges for compensation contractually due to employees of acquired businesses at the date of acquisition in the Life Sciences Solutions and Laboratory Products and Biopharma Services segments.

(d) Excludes $46 million of net charges, primarily charges for impairment of long-lived assets in the Specialty Diagnostic segment.

The company expects to pay accrued restructuring costs primarily through 2023.

Exhibit 3.4

As amended and restated effective as of February 22, 2023

Thermo Fisher Scientific Inc.

BY-LAWS

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THERMO FISHER SCIENTIFIC INC.

BY-LAWS

ARTICLE I - STOCKHOLDERS

Section 1. Annual Meeting. The annual meeting of the stockholders, for the election of directors to succeed those whose terms expire and for the transaction of such other business as may properly come before the meeting, shall be held at such place, if any, on such date, and at such time as the Board of Directors may each year fix. The Board of Directors may postpone, reschedule or cancel any previously scheduled annual meeting.

Section 2. Special Meetings.

1. Except as otherwise provided in paragraph 2 of Section 2 of this Article I, special meetings of stockholders may be called only by the Board of Directors, the Chairman of the Board of Directors, or the Chief Executive Officer. Business transacted at any special meeting of stockholders called pursuant to this paragraph 1 of Section 2 of Article I shall be limited to matters relating to the purpose or purposes stated in the notice of meeting.

2. A special meeting of stockholders shall be called by the Secretary upon written request (a "Special Meeting Request") of one or more holders of record representing not less than 15% of the outstanding shares of Common Stock of the Corporation (the "Requisite Percentage"), provided that such shares have been "Owned" (as defined in paragraphs 7 and 8 of Section 10 of this Article I) continuously by such holders for at least one year prior to the date of the Special Meeting Request (the "One Year Period"), who have complied in full with the requirements set forth in these By-laws.

(i) A Special Meeting Request must be delivered to the attention of the Secretary at the principal executive offices of the Corporation. A Special Meeting Request shall be valid only if it is signed and dated by each stockholder of record submitting the Special Meeting Request and the beneficial owners, if any, on whose behalf the Special Meeting Request is being made, or such stockholder's or beneficial owner's duly authorized agent (each, a "Requesting Stockholder") collectively representing the Requisite Percentage, and includes (A) a statement of the specific purpose(s) of the special meeting and the reasons for conducting such business at the special meeting; (B) as to any director nominations proposed to be presented at the special meeting and any matter (other than a director nomination) proposed to be conducted at the special meeting and as to each Requesting Stockholder, the information, statements, representations, agreements and other documents that would be required to be set forth in or included with a stockholder's notice of a nomination pursuant to Section 9 of this Article I (including any nominee's written consent to being named in the Corporation's proxy statement as a nominee and to serving as a director if elected) and/or a stockholder's notice of business proposed to be brought before a meeting pursuant to Section 9 of this Article I, as applicable; (C) a representation that a Requesting Stockholder or a qualified representative (as defined in Section 9 of this Article I) thereof intends to appear in person or by proxy at the special meeting to present the nomination(s) or business to be brought before the special meeting; (D) an agreement by each Requesting Stockholder to notify the Corporation promptly

in the event of any disposition prior to the date of the special meeting of shares of the Corporation owned beneficially or of record and an acknowledgement that any such disposition shall be deemed to be a revocation of such Special Meeting Request with respect to such disposed shares; and (E) documentary evidence that each Requesting Stockholder has Owned continuously for the One Year Period the Requisite Percentage; provided, however, that if the Requesting Stockholders are not the beneficial owners of the shares representing the Requisite Percentage, then to be valid, the Special Meeting Request must also include documentary evidence (or, if not simultaneously provided with the Special Meeting Request, such documentary evidence must be delivered to the Secretary within 10 days after the date on which the Special Meeting Request is delivered to the Secretary) that the beneficial owners on whose behalf the Special Meeting Request is made beneficially have Owned the Requisite Percentage continuously for the One Year Period. In addition, each Requesting Stockholder shall (x) further update and supplement the information provided in the Special Meeting Request, if necessary, so that the information provided or required to be provided therein shall be true and correct as of the record date for the special meeting and as of the date that is 10 business days prior to the special meeting or any adjournment or postponement thereof, and such update and supplement shall be delivered to the Secretary at the principal executive offices of the Corporation not later than five business days after the later of the record date for the meeting or the date notice of the record date is first publicly disclosed in the case of the update and supplement required to be made as of the record date and not later than 10 business days prior to the date of the special meeting or any adjournment or postponement thereof in the case of the update and supplement required to be made as of 10 business days prior to the special meeting or any adjournment or postponement thereof and (y) promptly provide any other information reasonably requested by the Corporation.

(ii) A Special Meeting Request shall not be valid, and a special meeting requested by stockholders shall not be held, if (A) the Special Meeting Request does not comply with this Section 2; (B) the Special Meeting Request relates to an item of business that is not a proper subject for stockholder action under applicable law (as determined in good faith by the Board of Directors); (C) the Special Meeting Request is delivered during the period commencing 90 days prior to the first anniversary of the date of the immediately preceding annual meeting of stockholders and ending on the earlier of the date of the next annual meeting of stockholders and the date that is 90 days after the first anniversary of the date of the immediately preceding annual meeting of stockholders; (D) an identical or substantially similar item (as determined in good faith by the Board of Directors, a "Similar Item"), other than the election of directors, was presented at an annual or special meeting of stockholders held not more than 12 months before the Special Meeting Request is delivered; (E) a Similar Item was presented at an annual or special meeting of stockholders held not more than 120 days before the Special Meeting Request is delivered (and, for purposes of this clause (E), the election of directors shall be deemed to be a "Similar Item" with respect to all items of business involving the election or removal of directors, changing the size of the Board of Directors and the filling of vacancies and/or newly created directorships resulting from any increase in the authorized number of directors); (F) a Similar Item is included in the Corporation's notice of meeting as an item of business to be brought before an annual or special meeting of stockholders that has been called but not yet held or that is called for a date within 90 days of the receipt by the Corporation of a Special Meeting Request; or (G) the Special Meeting Request was made in a manner that involved a violation of Regulation 14A under the Exchange Act or other applicable law.

(iii) Special meetings of stockholders called pursuant to this Section 2 shall be held at such place, if any, on such date, and at such time as the Board of Directors shall fix; provided, however, that the special meeting shall not be held more than 90 days after receipt by the Corporation of a valid Special Meeting Request.

(iv) The Requesting Stockholders may revoke a Special Meeting Request by written revocation delivered to the Secretary at the principal executive offices of the Corporation at any time prior to the special meeting. If, at any point after 60 days of the first date on which a Special Meeting Request is delivered to the Corporation the unrevoked requests from Requesting Stockholders (whether by specific written revocation or deemed revocation pursuant to clause (D) of paragraph 2(i) of this Section 2) represent in the aggregate less than the Requisite Percentage, the Board of Directors, in its discretion, may cancel the special meeting.

(v) In determining whether a special meeting of stockholders has been requested by the Requesting Stockholders representing in the aggregate at least the Requisite Percentage, multiple Special Meeting Requests delivered to the Secretary of the Corporation will be considered together only if (A) each Special Meeting Request identifies substantially the same purpose or purposes of the special meeting and substantially the same matters proposed to be acted on at the special meeting, in each case as determined by the Board of Directors (which, if such purpose is the election or removal of directors, changing the size of the Board of Directors and/or the filling of vacancies and/or newly created directorships resulting from any increase in the authorized number of directors, will mean that the exact same person or persons are proposed for election or removal in each relevant Stockholder Meeting Request), and (B) such Special Meeting Requests have been dated and delivered to the Secretary of the Corporation within 60 days of the first date on which a Special Meeting Request is delivered to the Corporation.

(vi) If none of the Requesting Stockholders appear or send a qualified representative (as defined in Section 9 of this Article I) to present the nomination and/or business to be presented for consideration as specified in the Special Meeting Request, the Corporation need not present such nomination and/or business for a vote at the special meeting, notwithstanding that proxies in respect of such nomination and/or business may have been received by the Corporation.

(vii) Business transacted at any special meeting called pursuant to this paragraph 2 of Section 2 shall be limited to (A) the purpose(s) stated in the valid Special Meeting Request received from the Requisite Percentage of record holders and (B) any additional matters that the Board of Directors determines to include in the Corporation's notice of the special meeting.

3. The Board of Directors may postpone, reschedule or cancel any previously scheduled special meeting.

Section 3. Notice of Meetings. Notice of the place, date, and time of all meetings of the stockholders and the means of remote communications, if any, by which stockholders and proxy holders may be deemed to be present in person and vote at such meeting shall be given, not less than ten (10) nor more than sixty (60) days before the date on which the meeting is to be held, to each stockholder entitled to vote at such meeting, except as otherwise required by the Delaware General Corporation Law (meaning, here and hereinafter, the General Corporation Law of the State of Delaware, as amended and in effect from time to time, the "*Delaware General Corporation Law*").

Section 4. Quorum; Adjournments. At any meeting of the stockholders, the holders of a majority in voting power of all of the shares of the stock entitled to vote at the meeting, present in person, present by means of remote communication in a manner, if any, authorized by the Board of Directors in its sole discretion, or represented by proxy, shall constitute a quorum for all purposes, unless or except to the extent that the presence of a larger number may be required by the Certificate of Incorporation or the Delaware General Corporation Law. Where a separate vote by a class or classes or series is required, a majority of the shares of such class or classes or series present in person, present by means of remote communication in a manner, if any, authorized by the Board of Directors in its sole discretion, or represented by proxy shall constitute a quorum entitled to take action with respect to that vote on that matter. A quorum, once established at a meeting, shall not be broken by the withdrawal of enough votes to leave less than a quorum.

Any meeting of stockholders may be adjourned from time to time to reconvene at any other time and to any other place at which a meeting of stockholders may be held under these Bylaws by the presiding officer. When a meeting is adjourned to another place or time (including an adjournment taken to address a technical failure to convene or continue a meeting using remote communication), notice need not be given of the adjourned meeting if the place, if any, and time thereof and the means of remote communications, if any, by which stockholders and proxy holders may be deemed to be present in person and vote at such meeting are (i) announced at the meeting at which the adjournment is taken, (ii) displayed, during the time scheduled for the meeting, on the same electronic network used to enable stockholders and proxy holders to participate in the meeting by means of remote communication or (iii) set forth in the notice of meeting given in accordance with Section 3 hereof; provided, however, that if the date of any adjourned meeting is more than thirty (30) days after the date for which the meeting was originally noticed, or if a new record date is fixed for the adjourned meeting, notice of the place, if any, date, and time of the adjourned meeting and the means of remote communications, if any, by which stockholders and proxy holders may be deemed to be present in person and vote at such meeting shall be given in conformity herewith. At any adjourned meeting, any business may be transacted that could have been transacted at the original meeting.

Section 5. Voting; Proxies. Each stockholder shall have one vote for each share of stock entitled to vote held of record by such stockholder unless otherwise provided by the Delaware General Corporation Law or the Certificate of Incorporation. Each stockholder of record entitled to vote at a meeting of stockholders, or to express consent or dissent to corporate action in writing without a meeting, may vote or express such consent or dissent in person or may authorize another person or persons to vote or act for the stockholder by proxy authorized by an instrument in writing or by a transmission permitted by law, delivered in accordance with the procedure established for the meeting. No such proxy shall be voted or acted upon after three years from the date of its execution, unless the proxy expressly provides for a longer period.

When a quorum is present at any meeting, the affirmative vote of holders of a majority in voting power of the stock present or represented and entitled to vote and voting affirmatively or negatively on a matter (or if there are two or more classes or series of stock entitled to vote as separate classes, then in the case of each such class or series, the holders of a majority of the stock of that class present or represented and voting affirmatively or negatively on a matter) shall constitute stockholder action on any matter to be voted upon by the stockholders at such meeting, except when a different or minimum vote is required by the Delaware General Corporation Law, the Certificate of Incorporation, these By-laws, the rules and regulations of any stock exchange applicable to the Corporation, or any law or regulation application to the Corporation or its securities, in which case, such different or minimum vote shall be the applicable vote on the matter. Except as may be otherwise required by the Certificate of Incorporation, a nominee for director shall be elected to the Board of Directors if the votes cast for such nominee's election exceed the votes cast against such nominee's election (with "abstentions" and "broker nonvotes" not counted as a vote cast either "for" or "against" that director's election), provided that if, on the tenth business day before the Corporation first mails its notice of meeting for such meeting to the stockholders, the number of nominees exceeds the number of directors to be elected, the directors shall be elected by the vote of a plurality of the shares represented in person or by proxy at any such meeting and entitled to vote on the election of directors. If directors are to be elected by a plurality of the votes cast, stockholders shall not be permitted to vote against a nominee.

Section 6. Inspectors of Elections. The Corporation shall, in advance of any meeting of the stockholders, appoint one or more inspectors to act at the meeting and make a written report thereof and perform the other duties of inspectors at meetings of stockholders as set forth in the Delaware General Corporation Law. The Corporation may designate one or more persons as alternate inspectors to replace any inspector who fails to act. If no inspector or alternate is able to act at a meeting of stockholders, the person presiding at the meeting shall appoint one or more persons to act as inspector at the meeting. Each inspector, before entering the discharge of the inspector's duties, shall take and sign an oath faithfully to execute the duties of inspector with strict impartiality and according to the best of the inspector's ability.

Section 7. Presiding Officer and Secretary. The Chairman of the Board, or in the Chairman's absence, the Chief Executive Officer, or in the Chief Executive Officer's absence, the President, or in the President's absence, the Chief Financial Officer, in such order, or, in the absence of all of them, any person designated by the Board of the Directors, shall call meetings of the stockholders to order, and shall act as presiding officer of such meeting. The Board of Directors may adopt by resolution such rules and regulations for the conduct of the meeting of stockholders as it shall deem appropriate. Except to the extent inconsistent with such rules and regulations as adopted by the Board of Directors, the presiding officer shall have the power to convene and (for any or no reason) to recess or adjourn meetings to another place, if any, or time, to prescribe such rules, regulations and procedures and to do all such acts as, in the judgment of such presiding officer, are appropriate for the proper conduct of the meeting. Such rules, regulations or procedures, whether adopted by the Board of Directors or prescribed by the presiding officer, may include, without limitation, the following: (i) the establishment of an agenda or order of business for the meeting; (ii) rules and procedures for maintaining order at the meeting and the safety of those present; (iii) limitations on attendance at or participation in the meeting to stockholders entitled to vote at the meeting, their duly authorized and constituted

proxies or such other persons as the presiding officer shall determine; (iv) restrictions on entry to the meeting after the time fixed for the commencement thereof; and (v) limitations on the time allotted to questions or comments by participants. The presiding officer, in addition to making any other determinations that may be appropriate to the conduct of the meeting, shall, if the facts warrant, determine and declare to the meeting that a matter or business was not properly brought before the meeting and if such presiding officer should so determine, such presiding officer shall so declare to the meeting and any such matter or business not properly brought before the meeting shall not be transacted or considered. Unless and to the extent determined by the Board of Directors or the presiding officer, meetings of stockholders shall not be required to be held in accordance with the rules of parliamentary procedure. The date and time of the opening and closing of the polls for each matter upon which the stockholders will vote at a meeting shall be announced at the meeting. The Secretary of the Corporation, or in the Secretary's absence, any Assistant Secretary, shall act as the secretary at all meetings of the stockholders, but in the absence of the Secretary and any Assistant Secretary, the presiding officer may appoint any person to act as secretary of the meeting.

Section 8. List of Stockholders. The Corporation shall prepare, at least 10 days before every meeting of stockholders, a complete list of the stockholders entitled to vote at the meeting, arranged in alphabetical order, and showing the address of each stockholder and the number of shares registered in the name of each stockholder. Such list shall be open to the examination of any stockholder, for any purpose germane to the meeting for a period of 10 days ending on the day before the meeting date (i) on a reasonably accessible electronic network, provided that the information required to gain access to such list is provided with the notice of meeting or (ii) during ordinary business hours at the principal place of business of the Corporation.

Section 9. Advance Notice of Stockholder Nominations and Proposals.

1. Nominations of persons for election to the Board of Directors and the proposal of business to be transacted by the stockholders may be made at an annual meeting of stockholders only (a) pursuant to the Corporation's notice with respect to such meeting, (b) by or at the direction of the Board, (c) by any stockholder of record of the Corporation who was a stockholder of record at the time of the giving of the notice provided for in the following paragraph, who is entitled to vote at the meeting and who has complied with the notice procedures set forth in this Section 9 or (d) by an Eligible Stockholder (as defined in Section 10 of this Article I) whose Stockholder Nominee (as defined in Section 10 of this Article I) is included in the Corporation's proxy materials for the relevant annual meeting of stockholders pursuant to Section 10 of this Article I.

2. For nominations or other business to be properly brought before an annual meeting by a stockholder pursuant to clause (c) of the foregoing paragraph, (1) the stockholder must have given timely notice thereof in writing to the Secretary of the Corporation, (2) such business must be a proper matter for stockholder action under the Delaware General Corporation Law, (3) if the stockholder, or the beneficial owner on whose behalf any such proposal or nomination is made, and/or the respective affiliates and associates of, or others acting in concert with, such stockholder and such beneficial owner (each, a "*Stockholder Associated Person*"), has provided the Corporation with a Solicitation Notice, as that term is defined in subclause (c)(iii) of this paragraph, such stockholder, beneficial owner and/or Stockholder Associated Person must, in the case of a proposal, have delivered a proxy statement and form of proxy to holders of at least the percentage of the Corporation's voting shares required under the Delaware General Corporation Law to carry any such proposal, or, in the case of a

nomination or nominations, have delivered a proxy statement and form of proxy to holders of a percentage of the Corporation's voting shares reasonably believed by such stockholder, beneficial owner and/or Stockholder Associated Person to be sufficient to elect the nominee or nominees proposed to be nominated by such stockholder or such beneficial owner, and must, in either case, have included in such materials the Solicitation Notice, and (4) if no Solicitation Notice relating thereto has been timely provided pursuant to this Section 9, the stockholder or beneficial owner proposing such business or nomination must not have solicited a number of proxies or votes sufficient to have required the delivery of such a Solicitation Notice under this Section 9. To be timely, a stockholder's notice shall be delivered to the Secretary at the principal executive offices of the Corporation not less than 60 or more than 75 days prior to the first anniversary (the "*Anniversary*") of the date on which the Corporation first mailed its proxy materials for the preceding year's annual meeting of stockholders; *provided, however*, that if the date of the annual meeting is advanced more than 30 days prior to or delayed (other than as a result of adjournment) by more than 30 days after the anniversary of the preceding year's annual meeting, notice by the stockholder to be timely must be so delivered not later than the close of business on the later of (i) the 90th day prior to such annual meeting or (ii) the 10th day following the day on which public announcement of the date of such meeting is first made. In no event shall the adjournment or postponement of an annual meeting (or the public announcement thereof) commence a new time period (or extend any time period) for the giving of a stockholder's notice as described above. The number of nominees a stockholder may nominate for election at the annual meeting (or in the case of a stockholder giving the notice on behalf of a beneficial owner, the number of nominees a stockholder may nominate for election at the annual meeting on behalf of such beneficial owner) shall not exceed the number of directors to be elected at such annual meeting. Such stockholder's notice shall set forth (a) as to each person whom the stockholder proposes to nominate for election or reelection as a director all information relating to such person as would be required to be disclosed in solicitations of proxies for the election of such nominees as directors pursuant to Regulation 14A under the Securities Exchange Act of 1934, as amended (the "*Exchange Act*"), and such person's written consent to being named in the Corporation's proxy statement as a nominee of the stockholder and to serve as a director if elected; (b) as to any other business that the stockholder proposes to bring before the meeting, a brief description of such business, the text of the proposal or business (including the exact text of any resolutions proposed for consideration and in the event that such business includes a proposal to amend the By-laws, the exact text of the proposed amendment), the reasons for conducting such business at the meeting and any material interest in such business of such stockholder, such beneficial owner, and/or any Stockholder Associated Person; (c) as to the stockholder giving the notice and the beneficial owner, if any, on whose behalf the nomination is made (i) the name and address of such stockholder, as they appear on the Corporation's books, and of such beneficial owner, (ii) the class, series and number of shares of the Corporation that are, directly or indirectly, owned beneficially and of record by such stockholder and such beneficial owner, (iii) whether either such stockholder, beneficial owner and/or Stockholder Associated Person intends to deliver a proxy statement and form of proxy to holders of, in the case of a proposal, at least the percentage of the Corporation's voting shares required under the Delaware General Corporation Law to carry the proposal or, in the case of a nomination or nominations, a sufficient number of holders of the Corporation's voting shares to elect such nominee or nominees (an affirmative statement of such intent, a "*Solicitation Notice*"), (iv) a representation as to whether or not such stockholder, such beneficial owner and/or any Stockholder Associated Person intends to solicit proxies in support of any director nominees other than the Corporation's nominees in accordance with Rule 14a-19 promulgated under the Exchange Act, and, where such stockholder, beneficial owner, and/or Stockholder

Associated Person intends to so solicit proxies, the notice and information required by Rule 14a-19(b) under the Exchange Act, and a statement that such stockholder, beneficial owner, and/or Stockholder Associated Person has otherwise complied or will otherwise comply with the requirements of Rule 14a-19 under the Exchange Act, (v) a description of any agreement, arrangement or understanding with respect to the nomination or proposal between or among such stockholder, such beneficial owner, and/or any Stockholder Associated Person, including, in the case of a nomination, the nominee, (vi) a description of any agreement, arrangement or understanding (including any derivative or short positions, profit interests, options, warrants, convertible securities, stock appreciation or similar rights, hedging transactions, and borrowed or loaned shares) that has been entered into as of the date of the stockholder's notice by, or on behalf of, such stockholder, such beneficial owners, and/or any Stockholder Associated Person, whether or not such instrument or right shall be subject to settlement in underlying shares of capital stock of the Corporation, the effect or intent of which is to mitigate loss to, manage risk or benefit of share price changes for, or increase or decrease the voting power of, such stockholder, such beneficial owner, and/or any Stockholder Associated Person, with respect to securities of the Corporation, (vii) a representation that the stockholder is a holder of record of stock of the Corporation entitled to vote at such meeting and intends to appear in person or by proxy at the meeting to propose such business or nomination, (viii) a representation that such stockholder, such beneficial owner, and/or any Stockholder Associated Person has complied, and will comply, with all applicable requirements of state law and the Exchange Act with respect to matters set forth in this Section 9 and (ix) any other information relating to such stockholder, beneficial owner, and/or Stockholder Associated Person required to be disclosed in a proxy statement or other filings required to be made in connection with solicitations of proxies for, as applicable, the proposal and/or for the election of directors in an election contest pursuant to and in accordance with Section 14(a) of the Exchange Act and the rules and regulations promulgated thereunder. The foregoing notice requirements of this paragraph 2 of Section 9 shall be deemed satisfied by a stockholder with respect to business other than a nomination if the stockholder has notified the Corporation of his, her or its intention to present a proposal at an annual meeting in compliance with applicable rules and regulations promulgated under the Exchange Act and such stockholder's proposal has been included in a proxy statement that has been prepared by the Corporation to solicit proxies for such annual meeting. The Corporation may require any proposed nominee to furnish such other information as the Corporation may reasonably require, to determine the eligibility of such proposed nominee to serve as a director of the Corporation.

3. Notwithstanding anything in the second sentence of the second paragraph of this Section 9 to the contrary, in the event that the number of directors to be elected to the Board at the annual meeting is increased effective after the time period for which nominations would otherwise be due under the second paragraph of this Section 9 and there is no public announcement naming the nominees for additional directorships at least 70 days prior to the Anniversary, a stockholder's notice required by this By-law shall also be considered timely, but only with respect to nominees for the additional directorships, if it shall be delivered to the Secretary at the principal executive offices of the Corporation not later than the close of business on the 10th day following the day on which such public announcement is first made by the Corporation.

4. Only persons nominated in accordance with the procedures set forth in this Section 9 or Section 10, as applicable, shall be eligible to serve as directors and only such business shall be conducted at an annual meeting of stockholders as shall have been brought before the meeting in accordance with the procedures set forth in this Section 9. The presiding officer of the meeting (and, in advance of the meeting, the Board of Directors) shall have the power and the duty to determine whether a nomination or any business proposed to be brought before the meeting has been made in accordance with the procedures set forth in these By-laws (including whether the stockholder, beneficial owner and/or any Stockholder Associated Person did or did not solicit, as the case may be, proxies or votes in support of such stockholder's nominee in compliance with the representations with respect thereto required by this Section 9), and, if any proposed nomination or business is not in compliance with these By-laws, to declare that such defective proposed business or nomination shall not be presented for stockholder action at the meeting and shall be disregarded. Notwithstanding the foregoing provisions of this Section 9, unless otherwise required by law, if the stockholder (or a qualified representative of the stockholder) does not appear at the annual or special meeting of stockholders of the Corporation to present a nomination or proposed business, such nomination shall be disregarded and such proposed business shall not be transacted, notwithstanding that proxies in respect of such vote may have been received by the Corporation. For purposes of this Section 9 and Section 10 of these By-laws, to be considered a qualified representative of the stockholder, a person must be a duly authorized officer, manager or partner of such stockholder or must be authorized by a writing executed by such stockholder or an electronic transmission delivered by such stockholder to act for such stockholder as proxy at the meeting of stockholders and such person must produce such writing or electronic transmission, or a reliable reproduction of the writing or electronic transmission, at the meeting of stockholders.

5. Only such business shall be conducted at a special meeting of stockholders as shall have been brought before the meeting pursuant to the Corporation's notice of meeting. Nominations of persons for election to the Board may be made at a special meeting of stockholders at which directors are to be elected pursuant to the Corporation's notice of meeting (a) by or at the direction of the Board or stockholders pursuant to Section 2 of this Article I or (b) provided that the Board or stockholders pursuant to Section 2 of this Article I have determined that directors shall be elected at such meeting, by any stockholder of record of the Corporation who is a stockholder of record at the time of giving of notice provided for in this paragraph, who shall be entitled to vote at the meeting and who complies with the procedures set forth in this Section 9, including, without limitation, the procedures regarding Solicitation Notices. The proposal by stockholders of other business to be conducted at a special meeting of stockholders may be made only in accordance with Section 2 of this Article I. The number of nominees a stockholder may nominate for election at the special meeting (or in the case of a stockholder giving the notice on behalf of a beneficial owner, the number of nominees a stockholder may nominate for election at the special meeting on behalf of such beneficial owner) shall not exceed the number of directors to be elected at such special meeting. In the event the Corporation calls a special meeting of stockholders for the purpose of electing one or more directors to the Board, nominations by stockholders of persons for election to such positions as specified in the Corporation's notice of meeting may be made at such a special meeting of stockholders if the stockholder's notice required by Section 9 shall be delivered to the Secretary at the principal executive offices of the Corporation not later than the close of business on the later of the 90th day prior to such special

meeting or the 10th day following the day on which the Corporation first makes a public announcement of the date of the special meeting at which directors are to be elected. In no event shall the adjournment or postponement of a special meeting (or the public announcement thereof) commence a new time period (or extend any time period) for the giving of a stockholder's notice as described above.

6. For purposes of this Section 9 and Section 10 of this Article I, "*public announcement*" shall mean disclosure in a press release reported by the Dow Jones News Service, Associated Press or a comparable national news service or in a document publicly filed by the Corporation with the Securities and Exchange Commission pursuant to Section 13, 14 or 15(d) of the Exchange Act.

7. Notwithstanding the foregoing provisions of this Section 9, a stockholder shall also comply with all applicable requirements of the Exchange Act and the rules and regulations thereunder with respect to matters set forth in this Section 9. Nothing in this Section 9 shall be deemed to affect any rights of stockholders to request inclusion of proposals in the Corporation's proxy statement pursuant to Rule 14a-8 under the Exchange Act.

8. Notwithstanding anything to the contrary in these By-laws, unless otherwise required by law, (1) no stockholder, beneficial owner, and/or any Stockholder Associated Person shall solicit proxies in support of director nominees, other than the Corporation's nominees, unless such stockholder, beneficial owner, and/or Stockholder Associated Person has complied with Rule 14a-19(b) promulgated under the Exchange Act in connection with the solicitation of such proxies, including the requirement to provide the Corporation with the notices required thereunder in a timely manner and (2) if any stockholder, beneficial owner, and/or Stockholder Associated Person (A) provides notice pursuant to Rule 14a-19(b) promulgated under the Exchange Act and (B) subsequently fails to comply with the requirements of Rule 14a-19(a)(2) or Rule 14a-19(a)(3) promulgated under the Exchange Act or fails to timely provide reasonable evidence sufficient to satisfy the Corporation that such stockholder, beneficial owner, or Stockholder Associated Person has met the requirements of Rule 14a-19(a)(3) promulgated under the Exchange Act in accordance with the following sentence, then the nomination of each such director nominee shall be disregarded notwithstanding that proxies or votes in respect of the election of such proposed nominees may have been received by the Corporation (which proxies and votes shall be disregarded). If any stockholder, beneficial owner, and/or Stockholder Associated Person provides notice pursuant to Rule 14a-19(b) promulgated under the Exchange Act, such stockholder, beneficial owner, or Stockholder Associated Person shall deliver to the Corporation, no later than five (5) business days prior to the applicable meeting, reasonable documentary evidence that such person has met the requirements of Rule 14a-19 promulgated under the Exchange Act, including clause (a)(3) thereof, together with a representation that such person has complied with the requirements of Rule 14a-19 promulgated under the Exchange Act.

9. Any person directly or indirectly soliciting proxies from stockholders of the Corporation must use a proxy card color other than white, which shall be reserved for exclusive use by the Board of Directors.

10. Unless the Corporation elects otherwise, a stockholder's notice to the Corporation shall be in writing exclusively (and not in an electronic transmission) and shall be delivered exclusively by hand (including, without limitation, overnight courier service) or by certified or registered mail, return receipt requested, and the Corporation shall not be required to accept delivery of any document not in such written form or so delivered.

Section 10. Proxy Access.

1. Subject to the provisions of this Section 10, the Corporation shall include in its proxy statement (including its form of proxy) for an annual meeting of stockholders the name of any stockholder nominee for election to the Board of Directors submitted pursuant to this Section 10 (each a "*Stockholder Nominee*") *provided* (a) timely written notice of such Stockholder Nominee satisfying this Section 10 ("*Notice*") is delivered to the Corporation by or on behalf of a stockholder or stockholders that, at the time the Notice is delivered, satisfy the ownership and other requirements of this Section 10 (such stockholder or stockholders, and any person on whose behalf they are acting, the "*Eligible Stockholder*"), (b) the Eligible Stockholder expressly elects in writing at the time of providing the Notice to have its nominee included in the Corporation's proxy statement pursuant to this Section 10, and (c) the Eligible Stockholder and the Stockholder Nominee otherwise satisfy the requirements of this Section 10 and the director qualifications requirements set forth in the Corporation's Corporate Governance Guidelines and any other document(s) setting forth qualifications for directors.

2. To be timely, an Eligible Stockholder's notice must be received in writing by the Secretary of the Corporation at the principal executive offices of the Corporation not less than 120 days nor more than 150 days prior to the first anniversary of the preceding year's annual meeting; *provided*, *however*, that in the event that the date of the annual meeting is advanced by more than 30 days, or delayed (other than as a result of adjournment) by more than 60 days, from the first anniversary of the preceding year's annual meeting, or if no annual meeting was held in the preceding year, a stockholder's notice must be so received not earlier than the 150th day prior to such annual meeting and not later than the close of business on the later of (a) the 120th day prior to such annual meeting and (b) the tenth day following the day on which notice of the date of such annual meeting was mailed or public announcement (as defined in Section 9 of this Article I) of the date of such annual meeting was made, whichever first occurs. In no event shall the adjournment or postponement of an annual meeting (or the public announcement thereof) commence a new time period (or extend any time period) for the giving of an Eligible Stockholder's notice as described above.

3. In addition to including the name of the Stockholder Nominee in the Corporation's proxy statement for the annual meeting, the Corporation also shall include (a) the information concerning the Stockholder Nominee and the Eligible Stockholder that is required to be disclosed in the Corporation's proxy statement pursuant to Section 14 of the Exchange Act and the rules and regulations promulgated thereunder and (b) if the Eligible Stockholder so elects, a Statement (defined below) (collectively, the "*Required Information*"). Nothing in this Section 10 shall limit the Corporation's ability to solicit against and include in its proxy statement its own statements relating to any Stockholder Nominee.

4. The number of Stockholder Nominees (including Stockholder Nominees that were submitted by an Eligible Stockholder for inclusion in the Corporation's proxy statement pursuant to this Section 10 but either are subsequently withdrawn or that the Board of Directors decides to nominate (the latter a "*Board Nominee*")) appearing in the Corporation's proxy statement with respect to an annual meeting of stockholders shall not exceed the greater of (a) two or (b) 20% of the number of directors in office as of the last day on which notice of a nomination may be received pursuant to this Section 10 (the "*Final Proxy Access Nomination Date*") or, if such amount is not a whole number, the closest whole number below 20% (such greater number the "*Permitted Number*"); *provided*, *however*, that the Permitted Number shall be reduced by (i) the number of director candidates for which the Corporation shall have received one or more valid notices that a stockholder intends to nominate director candidates at the annual meeting of stockholders pursuant to Section 9 of this Article I; *provided further*, that in no event shall the Permitted Number be less than one, (ii) any number of director candidates who will be included in the Corporation's proxy materials with respect to the annual meeting as an unopposed (by the Corporation) nominee pursuant to any agreement, arrangement or other understanding with any stockholder or group of stockholders (other than any such agreement, arrangement or understanding entered into in connection with an acquisition of shares of capital stock of the Corporation, by such stockholder or group of stockholders, from the Corporation); *provided*, that in no event shall the Permitted Number be less than one, and (iii) any number of directors in office as of the nomination deadline who were included in the Corporation's proxy statement as a Stockholder Nominee for any of the two preceding annual meetings and whom the Board of Directors decides to nominate for election to the Board of Directors. In the event that one or more vacancies for any reason occurs on the Board of Directors at any time after the Final Proxy Access Nomination Date and before the date of the applicable annual meeting of stockholders and the Board of Directors resolves to reduce the size of the Board of Directors in connection therewith, the Permitted Number shall be calculated based on the number of directors in office as so reduced.

5. In the event that the number of Stockholder Nominees submitted by Eligible Stockholders pursuant to this Section 10 exceeds the Permitted Number, each Eligible Stockholder shall select one Stockholder Nominee for inclusion in the Corporation's proxy statement until the Permitted Number is reached, going in order of the amount (greatest to least) of the Corporation's capital stock entitled to vote on the election of directors as disclosed in the Notice. If the Permitted Number is not reached after each Eligible Stockholder has selected one Stockholder Nominee, this selection process shall continue as many times as necessary, following the same order each time, until the Permitted Number is reached.

6. An Eligible Stockholder must have owned (as defined below) continuously for at least three years a number of shares that represents 3% or more of the Corporation's outstanding shares of capital stock entitled to vote in the election of directors (the "*Required Shares*") as of both the date the Notice is received by the Corporation in accordance with this Section 10 and the record date for determining stockholders entitled to vote at the annual meeting and must continue to own the Required Shares through the annual meeting date. For purposes of satisfying the ownership requirement under this Section 10, the shares of the Corporation's capital stock owned by one or more stockholders, or by the person or persons who own shares of the Corporation's capital stock and on whose behalf any stockholder is acting, may be aggregated, *provided that* (a) the number of stockholders and other persons whose ownership of shares is aggregated for such purpose shall not exceed 20, (b) each

stockholder or other person whose shares are aggregated shall have held such shares continuously for at least three years, and (c) a group of two or more funds that are (i) under common management and investment control, (ii) under common management and funded primarily by the same employer (or by a group of related employers that are under common control), or (iii) a "group of investment companies," as such term is defined in Section 12(d)(1)(G)(ii) of the Investment Company Act of 1940, as amended, shall be treated as one stockholder or person for this purpose. Whenever an Eligible Stockholder consists of a group of stockholders and/or other persons, any and all requirements and obligations for an Eligible Stockholder set forth in this Section 10 must be satisfied by and as to each such stockholder or other person, except that shares may be aggregated to meet the Required Shares as provided in this Section 10. With respect to any one particular annual meeting, no stockholder or other person may be a member of more than one group of persons constituting an Eligible Stockholder under this Section 10.

7. For purposes of this Section 10, an Eligible Stockholder shall be deemed to "own" only those outstanding shares of the Corporation's capital stock as to which the person possesses both (a) the full voting and investment rights pertaining to the shares and (b) the full economic interest in (including the opportunity for profit and risk of loss on) such shares; *provided that* the number of shares calculated in accordance with clauses (a) and (b) shall not include any shares (x) sold by such person or any of its affiliates in any transaction that has not been settled or closed, (y) borrowed by such person or any of its affiliates for any purposes or purchased by such person or any of its affiliates pursuant to an agreement to resell, or (z) subject to any option, warrant, forward contract, swap, contract of sale, other derivative or similar agreement entered into by such person or any of its affiliates, whether any such instrument or agreement is to be settled with shares or with cash based on the notional amount or value of outstanding shares of the Corporation's capital stock, in any such case which instrument or agreement has, or is intended to have, the purpose or effect of (A) reducing in any manner, to any extent or at any time in the future, such person's or affiliates' full right to vote or direct the voting of any such shares, and/or (B) hedging, offsetting or altering to any degree gain or loss arising from the full economic ownership of such shares by such person or affiliate. A person shall "own" shares held in the name of a nominee or other intermediary so long as the person retains the right to instruct how the shares are voted with respect to the election of directors and possesses the full economic interest in the shares.

8. A person's ownership of shares shall be deemed to continue during any period in which (a) the person has loaned such shares, *provided that* the person has the power to recall such loaned shares on five business days' notice and provides a representation that it will promptly recall, and promptly recalls, such loaned shares upon being notified that any of its Stockholder Nominees will be included in the Corporation's proxy statement, or (b) the person has delegated any voting power by means of a proxy, power of attorney or other instrument or arrangement that is revocable at any time by the person. The terms "owned," "owning" and other variations of the word "own" shall have correlative meanings. For purposes of this Section 10, the term "affiliate" shall have the meaning ascribed thereto in the regulations promulgated under the Exchange Act.

9. An Eligible Stockholder must provide with its Notice the following in writing to the Secretary: (a) one or more written statements from the record holder of the shares (and from each intermediary through which the shares are or have been held during the requisite three-year holding period) verifying that, as of a date within seven calendar days prior to the date the Notice is received

by the Corporation, the Eligible Stockholder owns, and has owned continuously for the preceding three years, the Required Shares, and the Eligible Stockholder's agreement to provide (i) within five business days after the record date for the annual meeting, written statements from the record holder and intermediaries verifying the Eligible Stockholder's continuous ownership of the Required Shares through the record date and (ii) immediate notice if the Eligible Stockholder ceases to own any of the Required Shares prior to the date of the applicable annual meeting of stockholders; (b) documentation satisfactory to the Corporation demonstrating that a group of funds qualifies to be treated as one stockholder or person for purposes of this Section 10, if applicable; (c) a representation that the Eligible Stockholder (including each member of any group of stockholders and/or persons that together is an Eligible Stockholder hereunder) (i) intends to continue to own the Required Shares through the date of the annual meeting, (ii) acquired the Required Shares in the ordinary course of business and not with the intent to change or influence control of the Corporation, and does not presently have such intent, (iii) has not nominated and will not nominate for election to the Board of Directors at the annual meeting any person other than the Stockholder Nominee(s) being nominated pursuant to this Section 10, (iv) has not engaged and will not engage in, and has not and will not be, a "participant" in another person's "solicitation" within the meaning of Rule 14a-1(l) under the Exchange Act in support of the election of any individual as a director at the annual meeting other than its Stockholder Nominee(s) or a Board Nominee, (v) will not distribute to any stockholder any form of proxy for the annual meeting other than the form distributed by the Corporation, and (vi) has provided and will provide facts, statements and other information in all communications with the Corporation and its stockholders that are or will be true and correct in all material respects and do not and will not omit to state a material fact necessary in order to make the statements made, in light of the circumstances under which they were made, not misleading; (d) the written consent of each Stockholder Nominee to be named in the Corporation's proxy statement as a nominee and to serve as a director if elected; (e) a copy of the Schedule 14N that has been filed with the Securities and Exchange Commission as required by Rule 14a-18 under the Exchange Act; (f) the information required to be provided by Section 9 of this Article I, as applicable; (g) in the case of a nomination by a group of stockholders that together is an Eligible Stockholder, the designation by all group members of one group member that is authorized to act on behalf of all members of the nominating stockholder group with respect to the nomination and matters related thereto, including withdrawal of the nomination; and (h) an undertaking that the Eligible Stockholder agrees to (i) assume all liability stemming from any legal or regulatory violation arising out of the Eligible Stockholder's communications with the Corporation's stockholders or out of the information that the Eligible Stockholder provides to the Corporation, (ii) indemnify and hold harmless the Corporation and each of its directors, officers and employees individually against any liability, loss or damages in connection with any threatened or pending action, suit or proceeding, whether legal, administrative or investigative, against the Corporation or any of its directors, officers or employees in connection with the Eligible Stockholder's nomination and/or efforts to elect its Stockholder Nominee(s) pursuant to this Section 10, (iii) file with the Securities and Exchange Commission any solicitation or other communication with the Corporation's stockholders relating to the annual meeting at which the Stockholder Nominee will be nominated, regardless of whether any such filing is required under Section 14 of the Exchange Act and the rules and regulations promulgated thereunder or whether any exemption from filing is available for such solicitation or other communication under Section 14 of the Exchange Act and the rules and regulations promulgated thereunder, and (iv) comply with all other applicable laws, rules, regulations and listing standards with respect to any solicitation in connection with the annual meeting.

10. The Eligible Stockholder may include with its Notice, a written statement for inclusion in the Corporation's proxy statement for the annual meeting, not to exceed 500 words per Stockholder Nominee, in support of each Stockholder Nominee's candidacy (the "*Statement*"). Notwithstanding anything to the contrary contained in this Section 10, the Corporation may omit from its proxy statement any information or Statement that it believes would violate any applicable law, rule, regulation or listing standard.

11. Each Stockholder Nominee must (a) provide within five business days of the Corporation's request an executed agreement, in a form deemed satisfactory to the Corporation, that (i) the Stockholder Nominee has read and agrees to adhere to the Corporation's Corporate Governance Guidelines and all other Corporation policies and guidelines applicable to directors, including with regard to securities trading, (ii) the Stockholder Nominee is not and will not become a party to (A) any agreement, arrangement or understanding with, and has not given any commitment or assurance to, any person or entity as to how such person, if elected as a director of the Corporation, will act or vote on any issue or question (a "*Voting Commitment*") that has not been disclosed to the Corporation or (B) any Voting Commitment that could limit or interfere with such person's ability to comply, if elected as a director of the Corporation, with such person's fiduciary duties under applicable law, and (iii) the Stockholder Nominee is not and will not become a party to any agreement, arrangement or understanding with any person or entity other than the Corporation with respect to any direct or indirect compensation, reimbursement or indemnification (a "*Compensation Arrangement*") in connection with such person's nomination or candidacy for director and/or service as a director that has not been disclosed to the Corporation; (b) complete, sign and submit all questionnaires required of the Corporation's Board of Directors within five business days of receipt of each such questionnaire from the Corporation; and (c) provide within five business days of the Corporation's request such additional information as the Corporation determines may be necessary to permit the Board of Directors to determine whether such Stockholder Nominee meets the requirements of this Section 10 and/or the Corporation's requirements with regard to director qualifications and policies and guidelines applicable to directors, including whether (i) such Stockholder Nominee is independent under the listing standards of any U.S. exchange upon which the Corporation's capital stock is listed, any applicable rules of the Securities and Exchange Commission, and any publicly disclosed standards used by the Board of Directors in determining and disclosing the independence of the directors (collectively, the "*Independence Standards*"), (ii) such Stockholder Nominee has any direct or indirect relationship with the Corporation, and (iii) such Stockholder Nominee has been subject to (A) any event specified in Item 401(f) of Regulation S-K under the Securities Act of 1933, as amended (the "*Securities Act*") or (B) any order of the type specified in Rule 506(d) of Regulation D under the Securities Act.

12. In the event that any information or communications provided by the Eligible Stockholder or Stockholder Nominee to the Corporation or its stockholders ceases to be true and correct in any respect or omits a fact necessary to make the statements made, in light of the circumstances under which they were made, not misleading, each Eligible Stockholder or Stockholder Nominee, as the case may be, shall promptly notify the Secretary of any such inaccuracy or omission in such previously provided information and of the information that is required to make such information or communication true and correct; it being understood that

providing any such notification shall not be deemed to cure any defect or limit the Corporation's right to omit a Stockholder Nominee from its proxy materials as provided in this Section 10.

13. The Corporation shall not be required to include, pursuant to this Section 10, a Stockholder Nominee in its proxy statement (or, if the proxy statement has already been filed, to allow the nomination of a Stockholder Nominee, notwithstanding that proxies in respect of such vote may have been received by the Corporation) (a) if the Eligible Stockholder who has nominated such Stockholder Nominee has nominated for election to the Board of Directors at the annual meeting any person other than pursuant to this Section 10, or has or is engaged in, or has been or is a "participant" in another person's, "solicitation" within the meaning of Rule 14a-1(l) under the Exchange Act in support of the election of any individual as a director at the annual meeting other than its Stockholder Nominee(s) or a Board Nominee, (b) who is not independent under the Independence Standards, (c) whose election as a member of the Board of Directors would violate or cause the Corporation to be in violation of these By-laws, the Corporation's certificate of incorporation, the Corporation's Corporate Governance Guidelines or other document setting forth qualifications for directors, the listing standards of any U.S. exchange upon which the Corporation's capital stock is listed, or any applicable state or federal law, rule or regulation, (d) if the Stockholder Nominee is or becomes a party to any undisclosed or prohibited Voting Commitment, (e) if the Stockholder Nominee is or becomes a party to any undisclosed Compensation Arrangement, (f) who is or has been, within the past three years, an officer or director of a competitor, as defined in Section 8 of the Clayton Antitrust Act of 1914, (g) whose then-current or prior business or personal interests place such Stockholder Nominee in a conflict of interest with the Corporation or any of its subsidiaries that would cause such Stockholder Nominee to violate any fiduciary duties of directors established pursuant to Delaware law, including but not limited to the duty of loyalty and duty of care, (h) who is a named subject of a pending criminal proceeding (excluding traffic violations and other minor offenses) or has been convicted in such a criminal proceeding within the past ten years, (i) who is subject to any order of the type specified in Rule 506(d) of Regulation D under the Securities Act, or (j) if such Stockholder Nominee or the applicable Eligible Stockholder shall have provided information to the Corporation in respect of such nomination that was untrue in any material respect or omitted to state a material fact necessary in order to make the statement made, in light of the circumstances under which they were made, not misleading or shall have breached any of its or their agreements, representations, undertakings and/or obligations pursuant to this Section 10.

14. Notwithstanding anything to the contrary set forth herein, if (a) the Stockholder Nominee and/or the applicable Eligible Stockholder shall have breached its or their agreements, representations, undertakings and/or obligations pursuant to this Section 10, as determined by the Board of Directors or the person presiding at the annual meeting, or (b) the Eligible Stockholder (or a qualified representative thereof) does not appear at the annual meeting to present any nomination pursuant to this Section 10, (x) the Board of Directors or the person presiding at the annual meeting shall be entitled to declare a nomination by an Eligible Stockholder to be invalid, and such nomination shall be disregarded notwithstanding that proxies in respect of such vote may have been received by the Corporation and (y) the Corporation shall not be required to include in its proxy statement any successor or replacement nominee proposed by the applicable Eligible Stockholder or any other Eligible Stockholder.

15. Any Stockholder Nominee who is included in the Corporation's proxy statement for a particular annual meeting of stockholders but either (a) withdraws from or becomes ineligible or unavailable for election at the annual meeting or (b) does not receive a number of votes cast in favor of his or her election at least equal to 25% of the shares present in person or represented by proxy at the annual meeting and entitled to vote on the Stockholder Nominee's election, shall be ineligible to be included in the Corporation's proxy statement as a Stockholder Nominee pursuant to this Section 10 for the next two annual meetings of stockholders following the annual meeting for which the Stockholder Nominee has been nominated for election. This Section 10 shall be the exclusive method for stockholders to include nominees for director election in the Corporation's proxy materials, except to the extent required by Rule 14a-19 under the Exchange Act.

Section 11. Action Without Meeting. Unless otherwise provided in the Certificate of Incorporation, any action required or permitted to be taken by stockholders for or in connection with any corporate action may be taken without a meeting, without prior notice and without a vote, if a consent or consents, setting forth the action so taken, shall be signed by the holders of outstanding stock having not less than the minimum number of votes that would be necessary to authorize or take such action at a meeting at which all shares entitled to vote thereon were present and voted and shall be delivered to the Corporation in accordance with Section 228 of the Delaware General Corporation Law. No consent shall be effective to take the corporate action referred to therein unless consents signed by a number of stockholders sufficient to take such action are delivered to the Corporation in the manner specified in this paragraph within sixty (60) days of the first date on which a consent is so delivered to the Corporation.

If action is taken by consent of stockholders and in accordance with the foregoing, there shall be filed with the records of the meetings of stockholders such consent or consents.

If action is taken by less than unanimous consent of stockholders, prompt notice of the taking of such action without a meeting shall be given to those who have not consented and a certificate signed and attested to by the Secretary of the Corporation that such notice was given shall be filed with the records of the meetings of stockholders.

In the event that the action consented to is such as would have required the filing of a certificate under any provision of the Delaware General Corporation Law, if such action had been voted upon by the stockholders at a meeting thereof, the certificate filed under such provision shall state, in lieu of any statement required by such provision concerning a vote of stockholders, that consent has been given under Section 228 of the Delaware General Corporation Law.

Section 12. Meetings by Remote Communication. If authorized by the Board of Directors, in its sole discretion, and subject to such guidelines and procedures as the Board of Directors may adopt, stockholders and proxy holders not physically present at a meeting of stockholders may by means of remote communication, to the fullest extent permitted by law: (a) participate in a meeting of stockholders, and (b) be deemed present in person and vote at a meeting of stockholders whether such meeting is to be held at a designated place or solely by means of remote communication.

Section 13. Delivery to the Corporation. Whenever Section 2, 9 or 10 of this Article I of these By-laws requires one or more persons (including a record or beneficial owner of stock of the Corporation) to deliver a document or information to the Corporation or any officer, employee or agent thereof (including any notice, request, questionnaire, revocation, representation or other document or agreement), such document or information shall be in writing exclusively (and not in an electronic transmission) and shall be delivered exclusively by hand (including, without limitation, overnight courier service) or by certified or registered mail, return receipt requested and the Corporation shall not be required to accept delivery of any document not in such written form or so delivered. For the avoidance of doubt, with respect to any notice from any stockholder of record or beneficial owner of the Corporation's capital stock under the Certificate of Incorporation, these By-laws or the Delaware General Corporation Law, to the fullest extent permitted by law, the Corporation expressly opts out of Section 116 of the Delaware General Corporation Law.

ARTICLE II - DIRECTORS

Section 1. General Powers. The business and affairs of the Corporation shall be managed by or under the direction of a Board of Directors, who may exercise all of the powers of the Corporation except as otherwise provided by the Certificate of Incorporation or the Delaware General Corporation Law. In the event of a vacancy in the Board of Directors, the remaining directors, except as otherwise provided by the Certificate of Incorporation or the Delaware General Corporation Law, may exercise the powers of the full Board of Directors until the vacancy is filled. The Board of Directors may appoint a Chairman of the Board. The Chairman of the Board shall preside at all meetings of the Board of Directors and shall perform such duties and possess such powers as are assigned to the Chairman by the Board of Directors.

Section 2. Number and Qualification. Except as otherwise required by the Certificate of Incorporation, the number of directors that shall constitute the whole Board of Directors shall be determined by resolution of the Board of Directors, but in no event shall be less than three (3). The number of directors may be increased at any time by resolution of the Board of Directors. The number of directors may be decreased at any time and from time to time by a majority of the directors then in office (so long as a quorum is present), but only to eliminate vacancies existing by reason of the death, resignation, removal or expiration of the term of one or more directors. The Board of Directors shall be comprised of a majority of directors who are determined by the Board of Directors to be independent directors as such term is defined by Section 303A(2) of the New York Stock Exchange Listed Company Manual.

Section 3. Terms of Office. Each director shall be elected for a term expiring at the next annual meeting of stockholders following such director's election and shall remain in office until a successor is elected and qualified, or until such director's earlier death, resignation or removal; provided, however, that the foregoing shall not shorten the term of any incumbent director as of such date.

Section 4. Removal. Except as otherwise provided by the Certificate of Incorporation or the Delaware General Corporation Law, any one or more or all of the directors of the Corporation may be

removed, with or without cause, by the holders of a majority of the voting power of the shares entitled to vote thereon.

Section 5. Vacancies. Except as otherwise required by the Certificate of Incorporation or the Delaware General Corporation Law, any vacancy in the Board of Directors, however occurring, or any newly-created directorship resulting from an enlargement of the size of the Board of Directors, shall be filled only by vote of a majority of the directors then in office, even if less than a quorum, or by the sole remaining director and not by the stockholders. A director elected to fill a vacancy or a newly-created directorship shall serve for a term expiring at the next annual meeting of stockholders following such director's election, and shall remain in office until the election and qualification of the director's successor or the director's earlier death, resignation or removal.

Section 6. Resignations. Any director may resign by delivering a resignation to the Corporation at its principal office or to the Chief Executive Officer or Secretary. Such resignation shall be effective upon receipt unless it is specified to be effective at some other time or upon the happening of some other event.

Section 7. Meetings. Regular meetings of the Board of Directors may be held without notice at such time and place, either within or without the State of Delaware, as shall be determined from time to time by the Board of Directors. A regular meeting of the Board of Directors may be held without notice immediately after and at the same place as the annual meeting of stockholders. Special meetings of the Board of Directors may be called by the Chairman of the Board, the Chief Executive Officer, a majority of the total number of the whole Board of Directors, or by one director in the event that there is only a single director in office and may be held at any time and place, within or without the State of Delaware, as specified by the person(s) calling the meeting.

Section 8. Notice of Meetings. No notice of the annual or other regular meetings of the Board of Directors need be given. Notice of any special meeting of directors shall be given to each director by the Secretary. Notice to each director shall be duly given by mailing the same not later than the second business day before the meeting, or by giving notice in person, by fax, by telephone, or by any other electronic means not later than four hours before the meeting. No notice of a meeting need be given if all directors are present in person. Any business may be transacted at any meeting of the Board of Directors, whether or not specified in a notice of the meeting.

Section 9. Quorum. A majority of the total number of the whole Board of Directors shall constitute a quorum at all meetings of the Board of Directors. In the absence of a quorum at any such meeting, a majority of the directors present may adjourn the meeting from time to time to a different date, place, or time without further notice (or waiver of notice) other than announcement at the meeting, until a quorum shall be present.

Section 10. Action at Meeting. At any meeting of the Board of Directors at which a quorum is present, the vote of a majority of the directors present shall be sufficient to take any action, unless a different vote is specified by the Delaware General Corporation Law, the Certificate of Incorporation or these By-laws.

Section 11. Action by Consent. Any action required or permitted to be taken at any meeting of the Board of Directors or of any committee of the Board of Directors may be taken without a meeting, if all members of the Board of Directors or committee, as the case may be, consent to the action in writing or by electronic transmission. After an action is taken, the consent or consents relating thereto shall be filed with the minutes of proceedings of the Board of Directors or committee in the same paper or electronic form as the minutes are maintained.

Section 12. Meetings by Telephone Conference Call. Directors or any members of any committee designated by the directors may participate in a meeting of the Board of Directors or such committee by means of conference telephone or other communications equipment by means of which all persons participating in the meeting can hear each other, and participation by such means shall constitute presence in person at such meeting.

Section 13. Compensation of Directors. Directors may be paid such compensation for their services and such reimbursement for expenses of attendance at meetings of the Board of Directors or committees of the Board of Directors as the Board of Directors or any committee to which the Board has delegated responsibility for establishing director compensation may from time to time determine. No such payment shall preclude any director from serving the Corporation or any of its parent, subsidiary, or affiliate corporations in any other capacity and receiving compensation for such service.

Section 14. Committees. The Board of Directors may designate one or more committees, each committee to consist of one or more of the directors of the Corporation. In addition to other committees that the Board of Directors may designate from time to time, the Board of Directors shall designate a Compensation Committee, an Audit Committee and a Nominating and Corporate Governance Committee each of which shall be comprised only of directors of the Corporation who are determined by the Board of Directors (i) to be "independent directors" as such term is defined by Section 303A(2) of the New York Stock Exchange Listed Company Manual and (ii) with respect to members of the Audit Committee only, to also be "independent" as such term is defined by Rule 10A-3(b)(1) of the Securities and Exchange Commission. The Board of Directors may designate one or more directors as alternate members of any committee, who may replace any absent or disqualified member at any meeting of the committee. In the absence or disqualification of a member of a committee, the member or members of the committee present at any meeting and not disqualified from voting, whether or not the member or members constitute a quorum, may unanimously appoint another member of the Board of Directors to act at the meeting in the place of any such absent or disqualified member. Any such committee, to the extent provided in the resolution of the Board of Directors and subject to the provisions of the Delaware General Corporation Law, shall have and may exercise all the powers and authority of the Board of Directors in the management of the business and affairs of the Corporation and may authorize the seal of the Corporation to be affixed to all papers that may require it. Each such committee shall keep minutes and make such reports as the Board of Directors may from time to time request. Except as the Board of Directors may otherwise determine, any committee may make rules for the conduct of its business, but unless otherwise provided by the directors or in such rules, its business shall be conducted as nearly as possible in the same manner as is provided in these By-laws for the Board of Directors. A majority of the members of a committee shall constitute a quorum unless the committee consist of one or two members, in which event, one member shall constitute a quorum. All matters shall be determined by a majority vote of the committee members present assuming a quorum is present.

Section 15. Emergency Bylaws. In the event of any emergency, disaster, catastrophe or other similar emergency condition of a type described in Section 110(a) of the Delaware General Corporation Law (an "Emergency"), notwithstanding any different or conflicting provisions in Delaware General Corporation Law, the Certificate of Incorporation or these By-laws, during such Emergency:

1. Notice. A meeting of the Board of Directors or a committee thereof may be called by any director, the Chairman of the Board, the Chief Executive Officer, the President or the Secretary by such means as, in the judgment of the person calling the meeting, may be feasible at the time, and notice of any such meeting of the Board of Directors or any committee may be given, in the judgment of the person calling the meeting, only to such directors as it may be feasible to reach at the time and by such means as may be feasible at the time. Such notice shall be given at such time in advance of the meeting as, in the judgment of the person calling the meeting, circumstances permit.

2. Quorum. The director or directors in attendance at a meeting called in accordance with Section 15 shall constitute a quorum.

3. Liability. No officer, director or employee acting in accordance with this Section 15 shall be liable except for willful misconduct. No amendment, repeal or change to this Section 15 shall modify the prior sentence with regard to actions taken prior to the time of such amendment, repeal or change.

ARTICLE III - OFFICERS

Section 1. General Provisions; Qualification. The officers of the Corporation shall be a Chief Executive Officer, a President, a Chief Financial Officer, a General Counsel, a Treasurer and a Secretary, and may include one or more Vice Presidents, one or more Assistant Treasurers and one or more Assistant Secretaries and such other officers as the Board of Directors may deem appropriate. Any two or more offices may be held by the same person.

Section 2. Election. Officers of the Corporation shall be elected annually by the Board of Directors.

Section 3. Tenure. Except as otherwise provided by the Delaware General Corporation Law, by the Certificate of Incorporation or by these By-laws, each officer shall hold office until such officer's successor is elected and qualified, unless a different term is specified in the vote choosing or appointing such officer, or until such officer's earlier death, resignation or removal.

Section 4. Resignation and Removal. Any officer may resign by delivering a resignation to the Corporation at its principal office or to the Chief Executive Officer or the Secretary. Such resignation shall be effective upon receipt unless it is specified to be effective at some other time or upon the happening of some other event. Any officer may be removed at any time, with or without cause by vote of the Board of Directors.

Section 5. Vacancies. The Board of Directors may at any time fill any vacancy occurring in any office for any reason. Each such successor shall hold office for the unexpired term of such successor's predecessor and until such successor's successor is elected and qualified, or until such successor's earlier death, resignation or removal.

Section 6. The Chief Executive Officer. The Chief Executive Officer shall be the principal executive officer of the Corporation. Subject to the control of the Board of Directors, the Chief Executive Officer shall have general charge of the business and affairs of the Corporation. The Chief Executive Officer shall employ and discharge employees and agents of the Corporation, except such as shall hold their offices by appointment of the Board of Directors, but the Chief Executive Officer may delegate these powers to other officers as to employees under their immediate supervision. The Chief Executive Officer shall have such other powers and perform such other duties as may be prescribed by the Board of Directors.

Section 7. The President. The Board of Directors may appoint an officer of the Corporation to serve as the President of the Corporation. The President shall perform such of the duties of the Chief Executive Officer of the Corporation on behalf of the Corporation as may be assigned to the President from time to time by the Board of Directors or the Chief Executive Officer. In the absence or inability of the Chief Executive Officer to act, the President shall have and possess all of the powers and discharge all of the duties of the Chief Executive Officer, subject to the control of the Board of Directors.

Section 8. Vice Presidents. Each Vice President shall have such powers and perform such duties as the Board of Directors, the Chief Executive Officer, or the President may from time to time prescribe.

Section 9. Chief Financial Officer. The Board of Directors shall appoint an officer to serve as the Chief Financial Officer of the Corporation. The Chief Financial Officer shall be responsible for the Corporation's public financial reporting obligations and shall have such further powers and duties as are incident to the position of Chief Financial Officer, subject to the direction of the Chief Executive Officer and the Board of Directors.

Section 10. General Counsel. The Board of Directors shall appoint an officer to serve as the General Counsel of the Corporation. The General Counsel shall be the chief legal officer of the Corporation and shall be responsible for all legal affairs of the Corporation, and shall have such further powers and duties as are incident to the position of General Counsel.

Section 11. The Treasurer. The Treasurer shall perform such duties and shall have such powers as may from time to time be assigned to the Treasurer by the Board of Directors, the Chief Executive Officer or the Chief Financial Officer. In addition, subject to the direction of the Board of Directors, the Treasurer shall perform such duties and have such powers as are incident to the office of treasurer, including, without limitation, the duty and power to keep and be responsible for all funds and securities of the Corporation, to deposit funds of the Corporation in depositories, to disburse such funds, to make proper accounts of such funds, and to render statements of all such transactions and of the financial condition of the Corporation.

Section 12. The Secretary. The Secretary shall keep the minutes of all meetings of the Board of Directors and of the stockholders and shall attend to the giving and serving of all notices of the Corporation.

The Secretary shall have custody of the seal of the Corporation and shall affix the seal to all certificates of shares of stock of the Corporation and to such other papers or documents as may be proper and, when the seal is so affixed, the Secretary shall attest the same by the Secretary's signature wherever required. The Secretary shall have charge of the stock certificate book, transfer book, and stock ledger, and such other books and papers as the Board of Directors may direct. The Secretary shall, in general, perform all the duties of secretary, subject to the control of the Board of Directors.

Section 13. Assistant Treasurers. In the absence or inability of the Treasurer to act, any Assistant Treasurer may perform all the duties and exercise all of the powers of the Treasurer, subject to the control of the Board of Directors. An Assistant Treasurer shall also perform such other duties as the Board of Directors, the Chief Executive Officer, or the Treasurer may from time to time prescribe.

Section 14. Assistant Secretaries. In the absence or inability of the Secretary to act, any Assistant Secretary may perform all the duties and exercise all the powers of the Secretary, subject to the control of the Board of Directors. An Assistant Secretary shall also perform such other duties as the Board of Directors, the Chief Executive Officer, or the Secretary may from time to time prescribe.

Section 15. Other Officers. Other officers shall perform such duties and have such powers as may from time to time be assigned to them by the Board of Directors.

Section 16. Delegation of Duties. In case of the absence of any officer of the Corporation, or for any other reason that the Board of Directors may deem sufficient, the Board of Directors may confer, for the time being, the powers or duties, or any of them, of such officer upon any other officer, or upon any director.

Section 17. Salaries. Officers of the Corporation shall be entitled to such salaries, compensation, or reimbursement as shall be fixed or allowed from time to time by the Board of Directors.

ARTICLE IV - CAPITAL STOCK

Section 1. Shares of Stock. The shares of capital stock of the Corporation shall be uncertificated and shall not be represented by certificates, except to the extent as may be required by applicable law or as otherwise authorized by the Board of Directors. The preceding sentence shall not apply to shares represented by a certificate until such certificate is surrendered to the Corporation. Every holder of capital stock of the Corporation represented by certificates shall be entitled to have a certificate for shares of capital stock of the Corporation signed by, or in the name of the Corporation by two authorized officers of the Corporation (it being understood that each of the Chairman of the Board, the Vice-Chairman of the Board, the Chief Executive Officer, the President, any Vice President, the Secretary, any Assistant Secretary, the Treasurer and any Assistant Treasurer shall be an authorized person for these purposes), certifying the class and number of shares of record owned by such stockholder in the Corporation. Any or all of the signatures may be a facsimile.

Section 2. Transfer of Shares of Stock. Stock of the Corporation shall be transferable in the manner prescribed by applicable law and in these By-Laws. Transfers of stock shall be made on the books of the Corporation, and in the case of certificated shares of stock, only by the person named in the certificate or by such person's attorney lawfully constituted in writing and upon the surrender of

the certificate therefor, properly endorsed for transfer and payment of all necessary transfer taxes; or, in the case of uncertificated shares of stock, upon receipt of proper transfer instructions from the registered holder of the shares or by such person's attorney lawfully constituted in writing, and upon payment of all necessary transfer taxes and compliance with appropriate procedures for transferring shares in uncertificated form; provided, however, that such surrender and endorsement, compliance or payment of taxes shall not be required in any case in which the officers of the Corporation shall determine to waive such requirement. No transfer of stock shall be valid as against the Corporation for any purpose until it shall have been entered in the books of the Corporation by an entry showing from and to whom transferred.

Section 3. Lost, Stolen or Destroyed Certificates. In the event of the loss, theft or destruction of any certificate of stock, another may be issued in its place pursuant to such regulations as the Board of Directors or transfer agent may establish concerning proof of such loss, theft, or destruction and concerning the giving of a satisfactory bond or bonds of indemnity.

Section 4. Record Date.

(a) In order that the Corporation may determine the stockholders entitled to notice of or to vote at any meeting of stockholders, or to receive payment of any dividend or other distribution or allotment of any rights or to exercise any rights in respect of any change, conversion, or exchange of stock or for the purpose of any other lawful action, the Board of Directors may, except as otherwise required by the Delaware General Corporation Law, fix a record date, which record date shall not precede the date on which the resolution fixing the record date is adopted and which record date shall not be more than sixty (60) nor less than ten (10) days before the date of any meeting of stockholders, nor more than sixty (60) days prior to the time for such other action as hereinbefore described; *provided, however*, that if no record date is fixed by the Board of Directors, the record date for determining stockholders entitled to notice of or to vote at a meeting of stockholders shall be at the close of business on the day next preceding the day on which notice is given or, if notice is waived, at the close of business on the day next preceding the day on which the meeting is held, and, for determining stockholders entitled to receive payment of any dividend or other distribution or allotment of rights or to exercise any rights of change, conversion, or exchange of stock or for any other purpose, the record date shall be at the close of business on the day on which the Board of Directors adopts a resolution relating thereto. A determination of stockholders of record entitled to notice of or to vote at a meeting of stockholders shall apply to any adjournment of the meeting; *provided, however*, that the Board of Directors may fix a new record date for the adjourned meeting.

(b) In order that the Corporation may determine the stockholders entitled to consent to corporate action without a meeting, the Board of Directors may fix a record date, which record date shall not precede the date upon which the resolution fixing the record date is adopted by the Board of Directors, and which date shall not be more than ten (10) days after the date upon which the resolution fixing the record date is adopted by the Board of Directors. Any stockholder of record seeking to have the stockholders authorize or take corporate action by consent shall, by written notice to the Secretary of the Corporation, request the Board of Directors to fix a record date.

The Board of Directors shall promptly, but in all events within ten (10) days after the date on which such a request is received by the Secretary, adopt a resolution fixing the record date. If no record date has been fixed by the Board of Directors within ten (10) days of the date on which such a request is received, the record date for determining stockholders entitled to consent to corporate action without a meeting, when no prior action by the Board of Directors is required by applicable law, shall be the first date on which a consent setting forth the action taken or proposed to be taken is delivered to the Corporation in accordance with Section 228 of the Delaware General Corporation Law. If no record date has been fixed by the Board of Directors and prior action by the Board of Directors is required by applicable law, the record date for determining stockholders entitled to consent to corporate action without a meeting shall be at the close of business on the date on which the Board of Directors adopts the resolution taking such prior action.

Section 5. Regulations. The issue, transfer, conversion and registration of shares of stock shall be governed by such other regulations as the Board of Directors may establish.

ARTICLE V - GENERAL PROVISIONS

Section 1. Fiscal Year. Except as from time to time otherwise designated by the Board of Directors, the fiscal year of the Corporation shall end on December 31.

Section 2. Corporate Seal. The corporate seal shall be in such form as may be approved by the Board of Directors. The corporate seal may be altered from time to time by the Board.

Section 3. Waiver of Notice. Whenever any notice whatsoever is required to be given by the Delaware General Corporation Law, by the Certificate of Incorporation or by these By-laws, a waiver of such notice given by the person entitled to such notice or such person's duly authorized attorney, whether before or after the time of the event for which notice is to be given shall be deemed equivalent to the notice required to be given to such person. Neither the business nor the purpose of any meeting need be specified in such a waiver. The appearance of such person at such meeting in person or by proxy, shall constitute waiver of notice except attendance for the sole purpose of objecting at the beginning of the meeting to the timeliness or lack of notice.

Section 4. Voting of Securities. Unless otherwise provided by resolution adopted by the Board of Directors, the Chairman of the Board, the President, any Vice President or the Secretary may from time to time appoint an attorney or attorneys or agent or agents of the Corporation, in the name and on behalf of the Corporation, to cast the votes which the Corporation may be entitled to cast as the holder of stock or other securities in any other corporation or other entity, any of whose stock or other securities may be held by the Corporation, at meetings of the holders of the stock or other securities of such other corporation or other entity, or to consent in any manner permitted under applicable law, in the name of the Corporation as such holder, to any action by such other corporation or other entity, and may instruct the person or persons so appointed as to the manner of casting such votes or giving such consents, and may execute or cause to be executed in the name and on behalf of the Corporation and under its corporate seal or otherwise, all such proxies or other instruments as he or she may deem necessary or proper. Any of the rights set forth in this Section 4 which may be delegated to an attorney or agent may also be exercised directly by the Chairman of the Board, the President, any Vice President or the Secretary.

Section 5. Evidence of Authority. A certificate by the Secretary, or an Assistant Secretary as to any action taken by the stockholders, directors, a committee or any officer or representative of the Corporation shall as to all persons who rely on the certificate in good faith be conclusive evidence of such action.

Section 6. Certificate of Incorporation. All references in these By-laws to the Certificate of Incorporation shall be deemed to refer to the Third Amended and Restated Certificate of Incorporation of the Corporation, as amended, restated and in effect from time to time.

Section 7. Transactions with Interested Parties. No contract or transaction between the Corporation and one or more of the directors or officers, or between the Corporation and any other corporation, partnership, association or other organization in which one or more of the directors or officers are directors or officers, or have a financial interest, shall be void or voidable solely for this reason, or solely because the director or officer is present at or participates in the meeting of the Board of Directors or a committee of the Board of Directors that authorizes the contract or transaction or solely because the interested directors' votes are counted for such purpose, if:

(1) The material facts as to the director's or officer's relationship or interest and as to the contract or transaction are disclosed or are known to the Board of Directors or the committee, and the Board of Directors or committee in good faith authorizes the contract or transaction by the affirmative votes of a majority of the disinterested directors, even though the disinterested directors be less than a quorum;

(2) The material facts as to the director's or officer's relationship or interest and as to the contract or transaction are disclosed or are known to the stockholders entitled to vote thereon, and the contract or transaction is specifically approved in good faith by vote of the stockholders; or

(3) The contract or transaction is fair as to the Corporation as of the time it is authorized, approved or ratified, by the Board of Directors, a committee of the Board of Directors, or the stockholders.

Common or interested directors may be counted in determining the presence of a quorum at a meeting of the Board of Directors or of a committee that authorizes the contract or transaction.

Section 8. Severability. Any determination that any provision of these By-laws is for any reason inapplicable, illegal, or ineffective shall not affect or invalidate any other provision of these By-laws.

Section 9. Limitation on Stock Option Repricing. No stock option granted to an officer or director of the Corporation shall, after issuance, be repriced to a lower exercise price (other than adjustments for stock splits, stock dividends, spinoffs, recapitalizations and like events), without the prior affirmative vote of the holders of a majority in voting power of the shares of capital stock of the Corporation present at a stockholders meeting in person or by proxy and entitled to vote thereon.

ARTICLE VI - AMENDMENTS

Section 1. By the Board of Directors. In furtherance and not in limitation of the powers conferred by the Delaware General Corporation Law and the Certificate of Incorporation, the Board of Directors is expressly authorized to alter, amend or repeal any provision of these By-laws or make new by-laws.

Section 2. By the Stockholders. Except as otherwise provided in Section 3 of this Article VI, the stockholders of the Corporation shall have the power to alter, amend or repeal any provision of these By-laws or make new by-laws by affirmative vote of the holders of a majority in voting power of the shares of capital stock of the Corporation issued and outstanding and entitled to vote, voting together as a single class; *provided, however*, that the power of the stockholders to, alter, amend or repeal any provision of these By-laws or make any new by-laws is further subject to any affirmative vote of the holders of any particular class or series of capital stock of the Corporation as may be required by the Delaware General Corporation Law, the Certificate of Incorporation, or these By-laws.

Section 3. Certain Provisions. Notwithstanding any other provision of the Delaware General Corporation Law, the Certificate of Incorporation, or these By-laws (including Section 2 of this Article VI), the affirmative vote of the holders of at least sixty-six and two-thirds percent (66 2/3%) of the voting power of the shares of capital stock of the Corporation issued and outstanding and entitled to vote shall be required for the stockholders to alter, amend or repeal, or make any new by-laws inconsistent with, Article II or this Article VI of these By-laws. This Section 3 is not intended to abrogate or otherwise affect the power of the Board of Directors to amend Article II or Article VI pursuant to Section 1 of this Article VI.

Exhibit 4.19

Description of Registrant's Securities

The following description of registered securities of Thermo Fisher Scientific Inc. is intended as a summary only and therefore is not a complete description. As used in this "Description of Registrant's Securities," the terms "Thermo Fisher," "Company," "we," "our" and "us" refer to Thermo Fisher Scientific Inc. and do not, unless the context otherwise indicates, include our subsidiaries.

Our authorized capital stock consists of 1.2 billion shares of common stock, $1.00 par value per share, and 50,000 shares of preferred stock, $100 par value per share. Our common stock is registered under Section 12(b) of the Securities Exchange Act of 1934, as amended (the "*Exchange Act*"). We also have several classes of debt securities registered under Section 12(b) of the Exchange Act.

COMMON STOCK

This description of our common stock is based upon, and qualified by reference to, our Third Amended and Restated Certificate of Incorporation, as amended (our "*certificate of incorporation*"), our amended and restated by-laws (our "*bylaws*"), and applicable provisions of Delaware corporate law (the "*DGCL*"). You should read our certificate of incorporation and bylaws, which are incorporated by reference as Exhibits 3.1 to 3.3 and Exhibit 3.4, respectively, to the Annual Report on Form 10-K for the year ended December 31, 2022, of which this Exhibit 4.19 is a part, for the provisions that are important to you.

General

Annual Meeting. Annual meetings of our stockholders are held on the date designated in accordance with our bylaws. Written notice must be given to each stockholder entitled to vote not less than ten nor more than 60 days before the date of the meeting. The presence in person or by proxy of the holders of record of a majority of our issued and outstanding shares entitled to vote at such meeting constitutes a quorum for the transaction of business at meetings of the stockholders, unless or except to the extent that the presence of a larger number may be required by our certificate of incorporation or the DGCL. Special meetings of the stockholders may only be called by our board of directors, the chairman of the board of directors or the chief executive officer or, solely to the extent required by our bylaws, by our secretary at the written request in proper form of one or more stockholders who have continuously held as stockholders of record not less than 15% of the outstanding shares of our common stock for at least one year prior to the date such request is delivered to our secretary. Except as may be otherwise provided by applicable law, our certificate of incorporation or our bylaws, all matters shall be decided by a majority of the votes cast by stockholders entitled to vote thereon at a duly held meeting of stockholders at which a quorum is present. Except as may be otherwise provided by our certificate of incorporation, a nominee shall be elected to our board of directors if the votes cast for such nominee's election exceed the votes cast against, *provided* that if, on the 10th business

day before we mail our notice of meeting to the stockholders, the number of nominees exceeds the number of directors to be elected, the election shall be decided by a plurality.

Voting Rights. Each holder of common stock is entitled to one vote for each share held on all matters to be voted upon by stockholders.

Dividends. The holders of common stock, after any preferences of holders of any preferred stock are entitled to receive dividends when and if declared by our board of directors out of legally available funds.

Liquidation, Dissolution and Winding Up. In the event of our liquidation, dissolution or winding up, the holders of the common stock will be entitled to share in our assets available for distribution to stockholders in proportion to the amount of common stock they own. The amount available for common stockholders is calculated after payment of liabilities. Holders of any preferred stock will receive a preferential share of our assets before the holders of the common stock receive any assets.

Other Rights. Holders of the common stock have no right to:

- convert the stock into any other security;
- have the stock redeemed; or
- purchase additional stock or to maintain their proportionate ownership interest.

The common stock does not have cumulative voting rights. Holders of shares of the common stock are not required to make additional capital contributions.

Provisions of Our Certificate of Incorporation and Bylaws and Delaware Law That May Have Anti-Takeover Effects

Certain provisions of our certificate of incorporation and bylaws may have the effect of making it more difficult for a third party to acquire, or of discouraging a third party from attempting to acquire, control of us. Such provisions could limit the price that certain investors might be willing to pay in the future for shares of our common stock and may limit the ability of stockholders to remove current management or directors or approve transactions that stockholders may deem to be in their best interest and, therefore, could adversely affect the price of our common stock.

Removal of Directors by Stockholders. Our bylaws provide that, except as otherwise provided by our certificate of incorporation or the DGCL, any one or more or all of the members of our board of directors may be removed, with or without cause, by the holders of a majority of the voting power of the shares entitled to vote thereon.

Board Vacancies Filled Only by Majority of Directors Then in Office. Our bylaws provide that, except as otherwise provided by our certificate of incorporation or the DGCL, vacancies and newly created seats on our board may be filled only by our board of directors. Further, only our board of directors may determine the number of directors on our board. The inability of

stockholders to determine the number of directors or to fill vacancies or newly created seats on the board makes it more difficult to change the composition of our board of directors.

Stockholder Nomination of Directors and Proposals. Our bylaws provide that a stockholder must notify us in writing of any stockholder nomination of a director or proposal for other business not less than 60 days and not more than 75 days prior to the first anniversary of the date on which we first mailed our proxy materials for the preceding year's annual meeting; *provided*, that if the date of the annual meeting is advanced or delayed by more than 30 days from such anniversary date, notice by the stockholder to be timely must be so delivered not later than the close of business on the later of (x) the 90th day prior to the date of such meeting or (y) the 10th day following the day on which public announcement of the date of such annual meeting is first made by us.

Proxy Access. Our bylaws provide for proxy access, which permits a stockholder, or a group of up to 20 stockholders, owning 3% or more of our outstanding common stock continuously for at least three years, to nominate and include in our proxy materials qualifying director nominees constituting up to the greater of (i) 20% of our board of directors or (ii) two directors. To be timely, any proxy access notice must be delivered in writing to our secretary not less than 120 days and not more than 150 days prior to the first anniversary of the preceding year's annual meeting; *provided* that in the event that the date of the annual meeting is advanced by more than 30 days or delayed (other than as a result of adjournment) by more than 60 days from the first anniversary of the preceding year's annual meeting, or if no annual meeting was held in the preceding year, a stockholder's notice must be received not earlier than 150 days prior to such annual meeting and not later than the close of business on the later of (a) the 120th day prior to such annual meeting and (b) the 10th day following the day on which notice of the date of such annual meeting was mailed or publicly announced. The complete proxy access provisions for director nominations are set forth in our bylaws.

"Blank Check" Preferred Stock. Our board of directors is authorized, without further action by our stockholders, to issue up to 50,000 shares of "blank check" preferred stock of the par value of $100 per share in one or more series possessing such specific terms, including dividend rates, conversion prices, voting rights, redemption prices, maturity dates and other special rights, preferences, qualifications, limitations, and restrictions thereof, as shall be determined in the resolution or resolutions providing for the issue of such preferred stock adopted by our board of directors. The issuance of preferred stock could impede the completion of a merger, tender offer or other takeover attempt.

These provisions of Delaware law, our certificate of incorporation, and our bylaws may have the effect of deterring hostile takeovers or delaying changes in our control or in our management. These provisions are intended to enhance the likelihood of continued stability in the composition of our board of directors and in the policies they implement, and to discourage certain types of transactions that may involve an actual or threatened change of our control. These provisions are designed to reduce our vulnerability to an unsolicited acquisition proposal. The provisions also are intended to discourage certain tactics that may be used in proxy fights. However, such provisions could have the effect of discouraging others from making tender offers for our shares

and, as a consequence, they also may inhibit fluctuations in the market price of our shares that could result from actual or rumored takeover attempts.

Delaware Business Combination Statute. We are subject to Section 203 of the DGCL ("*Section 203*"), which prohibits a Delaware corporation from engaging in business combinations with an interested stockholder. An interested stockholder is generally defined as an entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation or any entity or person affiliated with or controlling or controlled by such entity or person ("*interested stockholder*"). Section 203 provides that an interested stockholder may not engage in business combinations with the corporation for a period of three years after the date that such stockholder became an interested stockholder, with the following exceptions:

- before such date, the board of directors of the corporation approved either the business combination or the transaction that resulted in the stockholder becoming an interested stockholder;
- upon completion of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction began, excluding for purposes of determining the voting stock outstanding (but not the outstanding voting stock owned by the interested stockholder) those shares owned (i) by persons who are directors and also officers and (ii) employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- on or after such date, the business combination is approved by the board of directors and authorized at an annual or special meeting of the stockholders, and not by written consent, by the affirmative vote of at least 66 2/3% of the outstanding voting stock that is not owned by the interested stockholder.

In general, Section 203 defines business combinations to include the following:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, lease, transfer, pledge or other disposition of 10% or more of the assets of the corporation to or with the interested stockholder;
- subject to certain exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- any transaction involving the corporation that has the effect of increasing the proportionate share of the stock or any class or series of the corporation beneficially owned by the interested stockholder; or
- the receipt by the interested stockholder of the benefit of any loss, advances, guarantees, pledges or other financial benefits by or through the corporation.

DEBT SECURITIES

This description of our registered debt securities is based upon, and qualified by reference to the 2009 Base Indenture, the Eighth Supplemental Indenture, the Thirteenth Supplemental Indenture,

the Fifteenth Supplemental Indenture, the Sixteenth Supplemental Indenture, the Eighteenth Supplemental Indenture, the Twenty-First Supplemental Indenture, and the Twenty-Fifth Supplemental Indenture (each as hereinafter defined). You should read the 2009 Base Indenture, the Eighth Supplemental Indenture, the Thirteenth Supplemental Indenture, the Fifteenth Supplemental Indenture, the Sixteenth Supplemental Indenture, the Eighteenth Supplemental Indenture, the Twenty-First Supplemental Indenture, and the Twenty-Fifth Supplemental Indenture, which are incorporated by reference as Exhibits 4.1, 4.3, 4.4, 4.5, 4.6, 4.8, 4.10, and 4.14, respectively, to the Annual Report on Form 10-K of which this Exhibit 4.19 is a part, for the provisions that are important to you.

As used in this description of registered debt securities, the term "*Issuer*" refers to Thermo Fisher, the term "*Fixed Rate Notes*" refers collectively to the 2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 3.200% Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2034 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes (each as hereinafter defined), and the term "*indenture*" means the 2009 Base Indenture as supplemented by the applicable supplemental indenture for the particular series of Fixed Rate Notes being described.

General

We currently have the following series of senior notes issued and outstanding under an Indenture (the "*2009 Base Indenture*"), dated as of November 20, 2009, by and between Thermo Fisher, as issuer, and The Bank of New York Mellon Trust Company, N.A. (the "*Trustee*"), as trustee, as supplemented by the Eighth Supplemental Indenture (the "*Eighth Supplemental Indenture*"), dated as of November 24, 2014, by and among Thermo Fisher, as issuer, the Trustee, as trustee, and The Bank of New York Mellon, London Branch ("*BNY London Branch*"), as London paying agent: 2.000% Senior Notes due 2025 (the "*April 2025 Notes*").

We currently have the following series of senior notes issued and outstanding under the 2009 Base Indenture, as supplemented by the Thirteenth Supplemental Indenture (the "*Thirteenth Supplemental Indenture*"), dated as of September 12, 2016, by and between Thermo Fisher, as issuer, and the Trustee, as trustee: 0.750% Senior Notes due 2024 (the "*2024 Notes*") and 1.375% Senior Notes due 2028 (the "*September 2028 Notes*").

We currently have the following series of senior notes issued and outstanding under the 2009 Base Indenture, as supplemented by the Fifteenth Supplemental Indenture (the "*Fifteenth Supplemental Indenture*"), dated as of March 16, 2017, by and between Thermo Fisher, as issuer, and the Trustee, as trustee: 1.450% Senior Notes due 2027 (the "*March 2027 Notes*").

We currently have the following series of senior notes issued and outstanding under the 2009 Base Indenture, as supplemented by the Sixteenth Supplemental Indenture (the "*Sixteenth Supplemental Indenture*"), dated as of July 24, 2017, by and between Thermo Fisher, as issuer, and the Trustee, as trustee: 1.400% Senior Notes due 2026 (the "*January 2026 1.400% Notes*"), 1.950% Senior Notes due 2029 (the "*2029 Notes*"), and 2.875% Senior Notes due 2037 (the "*2037 Notes*").

We currently have the following series of senior notes issued and outstanding under the 2009 Base Indenture, as supplemented by the Eighteenth Supplemental Indenture (the "*Eighteenth Supplemental Indenture*"), dated as of September 30, 2019, by and between Thermo Fisher, as issuer, and the Trustee, as trustee: 0.125% Senior Notes due 2025 (the "*March 2025 Notes*"), 0.500% Senior Notes due 2028 (the "*March 2028 Notes*"), 0.875% Senior Notes due 2031 (the "*2031 Notes*"), 1.500% Senior Notes due 2039 (the "*2039 Notes*"), and 1.875% Senior Notes due 2049 (the "*2049 Notes*").

We currently have the following series of senior notes issued and outstanding under the 2009 Base Indenture, as supplemented by the Twenty-First Supplemental Indenture (the "*Twenty-First Supplemental Indenture*"), dated as of April 2, 2020, by and between Thermo Fisher, as issuer, and the Trustee, as trustee: 1.750% Senior Notes due 2027 (the "*April 2027 Notes*") and 2.375% Senior Notes due 2032 (the "*2032 Notes*").

We currently have the following series of senior notes issued and outstanding under the 2009 Base Indenture, as supplemented by the Twenty-Fifth Supplemental Indenture (the "*Twenty-Fifth Supplemental Indenture*"), dated as of November 21, 2022, by and between Thermo Fisher, as issuer, and the Trustee, as trustee: 3.200% Senior Notes due 2026 (the "*January 2026 3.200% Notes*") and 3.650% Senior Notes due 2034 (the "*2034 Notes*").

The Fixed Rate Notes are general unsecured obligations of the Issuer. Each series of Fixed Rate Notes ranks equally in right of payment with existing and any future unsecured indebtedness of Thermo Fisher, and is junior in right of payment to the Issuer's senior indebtedness (including senior debt securities). Each series of Fixed Rate Notes is also effectively subordinated to any existing and future secured indebtedness of Thermo Fisher to the extent of the assets securing such indebtedness, and will be structurally subordinated to all existing and any future indebtedness and any other liabilities of their respective subsidiaries. Each series of Fixed Rate Notes is senior in right of payment to any of our existing and future indebtedness that is subordinated to such Fixed Rate Notes.

Aside from the restrictions set forth under "Certain Covenants" below, neither the Fixed Rate Notes nor the indentures restrict our ability or the ability of our subsidiaries to incur additional debt, repurchase securities, recapitalize, or pay dividends or make distributions to shareholders, or require us to maintain interest coverage or other current ratios. We may from time to time, without notice to or the consent of the holders of any series of Fixed Rate Notes, create and issue further notes of any such series ranking equally with the Fixed Rate Notes of such series, and having the same terms as such series (or the same terms other than (1) the payment of interest accruing prior to the issue date of such further notes or (2) the first payment of interest following the issue date of such further notes). Such further notes may be consolidated and form a single series with the notes of such series and have the same terms as to status, redemption, or otherwise as the notes of such series.

Maturity

Each series of Fixed Rate Notes will mature and bear interest as provided in the following table:

Series	*Maturity*	*Interest Rate*	*Interest Payment Dates*	*Record Dates*	*Aggregate Principal Amount Issued/ Authorized/ Outstanding*
2024 Notes	September 12, 2024	0.750%	Annually in arrears on September 12 of each year, commencing on September 12, 2017	August 28	€ 1,000,000,000
March 2025 Notes	March 1, 2025	0.125%	Annually in arrears on March 1 of each year, commencing on March 1, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 800,000,000
April 2025 Notes	April 15, 2025	2.000%	Annually in arrears on April 15 of each year, commencing on April 15, 2015	April 1	€ 640,000,000
January 2026 3.200% Notes	January 21, 2026	3.200%	Annually in arrears on January 21 of each year, commencing on January 21, 2023	Business day immediately preceding the applicable interest payment date	€ 500,000,000
January 2026 1.400% Notes	January 23, 2026	1.400%	Annually in arrears on January 23 of each year, commencing on January 23, 2018	January 8	€ 700,000,000
March 2027 Notes	March 16, 2027	1.450%	Annually in arrears on March 16 of each year, commencing on March 16, 2018	March 1	€ 500,000,000
April 2027 Notes	April 15, 2027	1.750%	Annually in arrears on April 15 of each year, commencing on April 15, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 600,000,000
March 2028 Notes	March 1, 2028	0.500%	Annually in arrears on March 1 of each year, commencing on March 1, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 800,000,000
September 2028 Notes	September 12, 2028	1.375%	Annually in arrears on September 12 of each year, commencing on September 12, 2017	August 28	€ 600,000,000
2029 Notes	July 24, 2029	1.950%	Annually in arrears on July 24 of each year, commencing on July 24, 2018	July 9	€ 700,000,000

Series	*Maturity*	*Interest Rate*	*Interest Payment Dates*	*Record Dates*	*Aggregate Principal Amount Issued/ Authorized/ Outstanding*
2031 Notes	October 1, 2031	0.875%	Annually in arrears on October 1 of each year, commencing on October 1, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 900,000,000
2032 Notes	April 15, 2032	2.375%	Annually in arrears on April 15 of each year, commencing on April 15, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 600,000,000
2034 Notes	November 21, 2034	3.650%	Annually in arrears on November 21 of each year commencing on November 21, 2023	Business day immediately preceding the applicable interest payment date	€ 750,000,000
2037 Notes	July 24, 2037	2.875%	Annually in arrears on July 24 of each year, commencing on July 24, 2018	July 9	€ 700,000,000
2039 Notes	October 1, 2039	1.500%	Annually in arrears on October 1 of each year, commencing on October 1, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 900,000,000
2049 Notes	October 1, 2049	1.875%	Annually in arrears on October 1 of each year, commencing on October 1, 2020	Fifteenth calendar day prior to the applicable interest payment date	€ 1,000,000,000

The Fixed Rate Notes are not subject to any sinking fund.

Interest

The Fixed Rate Notes bear interest, which is paid annually in arrears, at the rates and from the respective dates set forth in the table above.

Interest on an interest payment date is paid to the persons, or "holders" in whose names the Fixed Rate Notes are registered in the security register on the immediately preceding record date noted in the table above, whether or not a business day, as the case may be (each such date being a "*regular record date*"). Interest on the Fixed Rate Notes will be computed on the basis of an ACTUAL/ACTUAL (ICMA) (as defined in the rulebook of the International Capital Markets Association) day count convention.

If any interest payment date, maturity date, or earlier date of redemption falls on a day that is not a business day, the required payment on the Fixed Rate Notes shall be made on the next business day as if it were made on the date the payment was due and no interest shall accrue on the amount so payable for the period from and after that interest payment date, that maturity date, or that date of redemption, as the case may be, until the next business day.

For purposes of the Fixed Rate Notes, "business day" means any day, other than a Saturday or Sunday, (1) which is not a day on which banking institutions in The City of New York or London are authorized or required by law, regulation, or executive order to close and (2) on which the Trans-European Automated Real-Time Gross Settlement Express Transfer system (the TARGET2 system), or any successor thereto, is open.

Optional Redemption

We have the option to redeem the 2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes, in whole at any time or in part from time to time, on at least 15 days but no more than 60 days prior written notice transmitted to the registered holders of such Fixed Rate Notes to be redeemed. We have the option to redeem the January 2026 3.200% Notes and the 2034 Notes, in whole at any time or in part from time to time, on at least 10 days but no more than 60 days prior written notice transmitted to the registered holders of such Fixed Rate Notes to be redeemed. With respect to the March 2025 Notes, the January 2026 3.200% Notes, the April 2027 Notes, the March 2028 Notes, the 2031 Notes, the 2032 Notes, the 2034 Notes, the 2039 Notes, and the 2049 Notes, any notice may, at our discretion, be subject to the satisfaction or waiver of one or more conditions precedent. In such case, the notice shall state the nature of such condition precedent.

Prior to the applicable Par Call Date, upon redemption of the Fixed Rate Notes of any series, we will pay a redemption price equal to the greater of:

(1) 100% of the principal amount of the Fixed Rate Notes to be redeemed, and

(2) the sum of the present values of the Remaining Scheduled Payments (as defined below) of the Fixed Rate Notes to be redeemed, discounted to the date of redemption on an annual basis (ACTUAL/ACTUAL (ICMA)) using a discount rate equal to the Comparable Bond Rate (as defined below) plus 19 basis points in the case of the April 2025 Notes, 20 basis points in the case of the 2024 Notes, the March 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, and the March 2028 Notes, 20 basis points in the case of the January 2026 3.200% Notes, 25 basis points in the case of the September 2028 Notes, the 2029 Notes, the 2031 Notes, and the 2034 Notes, 30 basis points in the case of the 2037 Notes and the 2039 Notes, 35 basis points in the case of the 2049 Notes, 40 basis points in the case of the April 2027 Notes, and 45 basis points in the case of the 2032 Notes,

plus, in each case, accrued and unpaid interest thereon, if any, to, but excluding, the redemption date.

On and after the applicable Par Call Date, upon redemption of the Fixed Rate Notes of any series, we will pay a redemption price equal to 100% of the principal amount of the Fixed Rate Notes to be redeemed, plus, in each case, accrued and unpaid interest thereon, if any, to, but excluding, the redemption date.

Notwithstanding the foregoing, installments of interest on the Fixed Rate Notes that are due and payable on an interest payment date falling on or prior to a redemption date will be payable on the interest payment date to the registered holders as of the close of business on the relevant record date in accordance with the Fixed Rate Notes and the applicable indenture.

If less than all of the March 2025 Notes, the January 2026 3.200% Notes, the April 2027 Notes, the March 2028 Notes, the 2031 Notes, the 2032 Notes, the 2034 Notes, the 2039 Notes, or the 2049 Notes are to be redeemed, the Fixed Rate Notes of such series to be redeemed, shall be selected, in the case of global securities, in accordance with applicable depositary procedures and, in the case of definitive securities, in a manner the Trustee deems to be fair and appropriate, unless otherwise required by law or applicable stock exchange requirements. If less than all of the 2024 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the 2029 Notes, the September 2028 Notes, or the 2037 Notes are to be redeemed, the Fixed Rate Notes of such series to be redeemed shall be selected by the Trustee, in a manner that it deems fair and appropriate in accordance with applicable depositary procedures, unless otherwise required by law or applicable stock exchange requirements. Fixed Rate Notes may be redeemed in part in the minimum authorized denomination for Fixed Rate Notes or in any integral multiple of such amount. Unless we default in payment of the redemption price, on and after the redemption date, interest will cease to accrue on the Fixed Rate Notes or portions thereof called for redemption.

"*Comparable Bond Rate*" means, for any redemption date, the rate per annum equal to the annual equivalent yield to maturity or interpolated yield to maturity (on a day count basis), computed as of the third business day immediately preceding that redemption date, of the Comparable Government Issue (as defined below), assuming a price for the Comparable Government Issue (expressed as a percentage of its principal amount) equal to the Comparable Price (as defined below) for that redemption date.

"*Comparable Government Issue*" means the euro-denominated security issued by the German government selected by an Independent Investment Banker (as defined below) as having an actual or interpolated maturity comparable to the remaining term of the Fixed Rate Notes to be redeemed (assuming in the case of the 2024 Notes, the March 2025 Notes, the January 2026 3.200% Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2034 Notes, the 2037 Notes, the 2039 Notes, or the 2049 Notes to be redeemed matured on their applicable Par Call Date) that would be utilized, at the time of selection and in accordance with customary financial practice, in pricing new issues of corporate debt securities of comparable maturity to the remaining term of the Fixed Rate Notes to be redeemed.

"*Comparable Price*" means, with respect to any redemption date, (a) the average of the Reference Dealer Quotations (as defined below) for such redemption date, after excluding the highest and lowest of the Reference Dealer Quotations, (b) if we obtain fewer than four Reference Dealer Quotations, the arithmetic average of those quotations, or (c) if we obtain only one Reference Dealer Quotation, such Reference Dealer Quotation.

"*Independent Investment Banker*" means

(a) with respect to the 2024 Notes, the April 2027 Notes, the September 2028 Notes, and the 2032 Notes, each Reference Dealer appointed by us as Independent Investment Banker (initially, J.P. Morgan Securities plc);
(b) with respect to the March 2025 Notes, the March 2028 Notes, the 2031 Notes, the 2039 Notes, and the 2049 Notes, any Reference Dealer appointed by us as Independent Investment Banker (initially, Merrill Lynch International);
(c) with respect to the April 2025 Notes, each Reference Dealer appointed by us as Independent Investment Banker (initially, HSBC Bank plc, Deutsche Bank AG, London Branch and The Royal Bank of Scotland plc);
(d) with respect to the January 2026 1.400% Notes, the 2029 Notes, and the 2037 Notes, each Reference Dealer appointed by us as Independent Investment Banker (initially, Goldman Sachs & Co. LLC);
(e) with respect to the March 2027 Notes, each Reference Dealer appointed by us as Independent Investment Banker (initially, HSBC Bank plc); and
(f) with respect to the January 2026 3.200% Notes and the 2034 Notes, each Reference Dealer appointed by us as Independent Investment Banker (initially, Citigroup Global Markets Limited, Deutsche Bank AG, London Branch and Merrill Lynch International).

"*Par Call Date*" means June 12, 2024 in the case of the 2024 Notes; January 15, 2025 in the case of the April 2025 Notes; February 1, 2025 in the case of the March 2025 Notes; December 21, 2025 in the case of the January 2026 3.200% Notes; November 23, 2025 in the case of the January 2026 1.400% Notes; December 16, 2026 in the case of the March 2027 Notes; February 15, 2027 in the case of the April 2027 Notes; December 1, 2027 in the case of the March 2028 Notes; June 12, 2028 in the case of the September 2028 Notes; April 24, 2029 in the case of the 2029 Notes; July 1, 2031 in the case of the 2031 Notes; January 15, 2032 in the case of the 2032 Notes; August 21, 2034 in the case of the 2034 Notes; April 24, 2037 in the case of the 2037 Notes; April 1, 2039 in the case of the 2039 Notes; and April 1, 2049 in the case of the 2049 Notes.

"*Reference Dealer*" means

(a) with respect to the 2024 Notes and the September 2028 Notes, each of (i) J.P. Morgan Securities plc, Barclays Bank PLC, Mizuho International plc, and Morgan Stanley & Co. International plc and their respective affiliates or successors and (ii) one other nationally recognized investment banking firm (or its respective affiliates) that is a broker or dealer of, and/or a market maker in, German government bonds (each, for purposes of this clause "a", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and their respective successors;

(b) with respect to the March 2025 Notes, the March 2028 Notes, the 2031 Notes, the 2039 Notes, and the 2049 Notes, each of (i) Merrill Lynch International, Goldman Sachs & Co. LLC, Citigroup Global Markets Limited, and J.P. Morgan Securities plc and their respective affiliates or successors and (ii) one other nationally recognized investment banking firm (or its affiliate) that is a broker or dealer of, and/or market maker in, German government bonds (each, for purposes of this clause "b", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and its successors;

(c) with respect to the April 2025 Notes, each of (i) HSBC Bank plc, Deutsche Bank AG, London Branch and The Royal Bank of Scotland plc, and their respective affiliates or successors and (ii) two other nationally recognized investment banking firms (or their respective affiliates) that are brokers or dealers of, and/or market makers in, German government bonds (each, for purposes of this clause "c", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and their respective successors;

(d) with respect to the January 2026 1.400% Notes, the 2029 Notes, and the 2037 Notes, each of (i) Goldman Sachs & Co. LLC, Merrill Lynch International, Barclays Bank PLC, and HSBC Bank plc and their respective affiliates or successors and (ii) one other nationally recognized investment banking firm (or its affiliate) that is a broker or dealer of, and/or a market maker in, German government bonds (each, for purposes of this clause "d", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and its successors;

(e) with respect to the March 2027 Notes, each of (i) Credit Suisse Securities (Europe) Limited and HSBC Bank plc and their respective affiliates or successors and (ii) three other nationally recognized investment banking firms (or their respective affiliates) that are brokers or dealers of, and/or market makers in, German government bonds (each, for purposes of this clause "e", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and their respective successors;

(f) with respect to the April 2027 Notes and the 2032 Notes, each of (i) J.P. Morgan Securities plc, Morgan Stanley & Co. International plc, Merrill Lynch International, and Citigroup Global Markets Limited and their respective affiliates or successors and (ii) one other nationally recognized investment banking firm (or its affiliate) that is a broker or dealer of, and/or market maker in, German government bonds (each, for purposes of this clause "f", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and its successors; and

(g) with respect to the January 2026 3.200% Notes and the 2034 Notes, each of (i) Citigroup Global Markets Limited, Deutsche Bank AG, London Branch and Merrill Lynch International and their respective affiliates or successors and (ii) one other nationally recognized investment banking firm (or its affiliate) that is a broker or dealer of, and/or market maker in, German government bonds (each, for purposes of this clause "g", a "*Primary Bond Dealer*") that we select in connection with the particular redemption, and its successors;

provided, in each case, that if at any time any of the above is not a Primary Bond Dealer, we will substitute that entity with another nationally recognized investment banking firm that we select that is a Primary Bond Dealer.

"*Reference Dealer Quotations*" means, with respect to each Reference Dealer and any redemption date, the arithmetic average, as determined by the Independent Investment Banker, of the bid and asked prices for the Comparable Government Issue (expressed, in each case, as a percentage of its principal amount) quoted in writing to the Independent Investment Banker by such Reference Dealer at 11:00 a.m., London time, on the third business day preceding such redemption date.

"*Remaining Scheduled Payments*" means,

(a) with respect to each 2024 Note, March 2025 Note, January 2026 3.200% Note, January 2026 1.400% Note, March 2027 Note, April 2027 Note, March 2028 Note, September 2028 Note, 2029 Note, 2031 Note, 2032 Note, 2034 Note, 2037 Note, 2039 Note, and 2049 Note to be redeemed, the remaining scheduled payments of the principal thereof and interest thereon that would be due after the related redemption date but for such redemption (assuming that such notes to be redeemed matured on their applicable Par Call Date); and

(b) with respect to each April 2025 Note to be redeemed, the remaining scheduled payments of the principal thereof and interest thereon that would be due after the related redemption date for such redemption;

provided, however, that, if any such redemption date is not an interest payment date with respect to such note, the amount of the next succeeding scheduled interest payment thereon will be reduced by the amount of interest accrued thereon to such redemption date.

Redemption Upon Tax Event

2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes

We may redeem at our option the 2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes in whole, but not in part, on at least 15 days' but not more than 60 days' notice, at a redemption price equal to 100% of their principal amount (plus any accrued interest and additional amounts then payable with respect to such Fixed Rate Notes to be redeemed), if we determine that (A) as a result of any change or amendment to the laws, treaties, regulations or rulings of the United States or any political subdivision or taxing authority thereof, which change or amendment is announced or becomes effective on or after the date of the applicable prospectus supplement pursuant to which such Fixed Rate Notes of such series were issued, there is a material probability that we have or will become obligated to pay additional amounts as described under "Payment of Additional Amounts" on any Fixed Rate Notes of such series or (B) on or after the date of the applicable prospectus supplement pursuant to which the Fixed Rate Notes of such series were issued, any change in the official application, enforcement or interpretation of those laws, treaties, regulations or rulings, including a holding by a court of competent jurisdiction in the United States or any other action, taken by any taxing

authority or a court of competent jurisdiction in the United States, whether or not such action was taken or made with respect to us, results in a material probability that we have or will become obligated to pay additional amounts as described under "Payment of Additional Amounts" on any Fixed Rate Notes of such series; *provided* that we determine, in our business judgment, that the obligation to pay such additional amounts cannot be avoided by use of reasonable measures available to us, not including substitution of the obligor under the Fixed Rate Notes. Prior to the mailing of any notice of such a redemption, we will deliver to the Trustee (1) an officer's certificate stating that we are entitled to effect such a redemption and setting forth a statement of facts showing that the conditions precedent to the right of our company to so redeem have occurred and (2) an opinion of counsel to that effect based on that statement of facts.

January 2026 3.200% Notes and 2034 Notes

We may redeem all, but not less than all, of the January 2026 3.200% Notes and 2034 Notes at a redemption price equal to 100% of the principal amount thereof, together with accrued and unpaid interest, if any, to the redemption date under the following conditions:

- if there is an amendment to, or change in, the laws, regulations, rulings or treaties of the United States or any other jurisdiction in which we or any successor (including a continuing corporation, partnership, limited liability company, joint venture, joint-stock company, association, trust or unincorporated organization formed by a consolidation with us, into which we are merged, or that acquires or leases all or substantially all of our property and assets) may be organized, as applicable, or any political subdivision thereof or therein having the power to tax (a "*Taxing Jurisdiction*"), or any change in the application or official interpretation of such laws, regulations, rulings or treaties, including any action taken by, or a change in published administrative practice of, a taxing authority or a holding by a court of competent jurisdiction, regardless of whether such action, change or holding is with respect to us;
- as a result of such amendment or change, we become, or there is a material probability that we will become, obligated to pay Additional Amounts on the next interest payment date with respect to the notes; and
- the obligation to pay such Additional Amounts cannot be avoided through our commercially reasonable measures, not including substitution of the obligor of the notes;

Prior to effecting any such redemption, we will deliver to the Trustee:

- a certificate stating that we cannot avoid the obligation to pay Additional Amounts after taking commercially reasonable measures available to us;
- a written opinion of our independent tax counsel of recognized standing to the effect that we have or there is a material probability that we will, become obligated, to pay Additional Amounts as a result of a change, amendment, official interpretation or application described above and that we cannot avoid the payment of such Additional Amounts by taking commercially reasonable measures available to us; and
- a notice of redemption to be delivered to the holder of record of the January 2026 3.200% Notes and/or 2034 Notes.

Such notice of redemption shall be delivered not less than 10 days, but not more than 90 days, prior to the date of redemption. The notice of redemption cannot be given more than 90 days before the earliest date on which we would otherwise be, or there is a material probability that we would otherwise be, required to pay Additional Amounts.

Payment of Additional Amounts

2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes

We will pay to a holder of the 2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes who is not a United States person (as defined below) additional amounts as may be necessary so that every net payment of the principal of and premium, if any, and interest on such holder's Fixed Rate Notes, after deduction or withholding for or on account of any present or future tax, assessment or other governmental charge imposed upon that holder by the United States or any taxing authority thereof or therein, will not be less than the amount provided in such holder's Fixed Rate Notes to be then due and payable. We will not be required, however, to make any payment of additional amounts for or on account of:

(a) any tax, assessment or other governmental charge that would not have been imposed but for (1) the existence of any present or former connection (other than a connection arising solely from the ownership of those Fixed Rate Notes or the receipt of payments in respect of those Fixed Rate Notes) between that holder (or the beneficial owner for whose benefit such holder holds such Fixed Rate Notes), or between a fiduciary, settlor, beneficiary of, member or shareholder of, or possessor of a power over, that holder or beneficial owner, if that holder or beneficial owner is an estate, trust, partnership or corporation, and the United States, including that holder or beneficial owner, or that fiduciary, settlor, beneficiary, member, shareholder or possessor, being or having been a citizen or resident or treated as a resident of the United States or being or having been engaged in trade or business or present in the United States or having had a permanent establishment in the United States or (2) the presentation of a debt security for payment on a date more than 30 days after the later of the date on which that payment becomes due and payable and the date on which payment is duly provided for;

(b) any estate, inheritance, gift, sales, transfer, excise, personal property, wealth, capital gains, interest equalization or similar tax, assessment or other governmental charge;

(c) any tax, assessment, or other governmental charge imposed on foreign personal holding company income or by reason of a holder (or the beneficial owner for whose benefit such holder holds such Fixed Rate Notes), or a fiduciary, settlor, beneficiary of, member or shareholder of, or possessor of a power over, the holder or beneficial owner, if that holder or beneficial owner is an estate, trust, partnership, or corporation, being or having been a passive foreign investment company, a controlled foreign corporation, a foreign tax exempt organization, or a personal holding company with respect to the

United States or a corporation that accumulates earnings to avoid U.S. federal income tax;

(d) any tax, assessment or other governmental charge which is payable otherwise than by withholding from payment of principal of or premium, if any, or interest on such holder's Fixed Rate Notes;

(e) any tax, assessment, or other governmental charge required to be withheld by any paying agent from any payment of principal of and premium, if any, or interest on any note if that payment can be made without withholding by any other paying agent;

(f) any tax, assessment, or other governmental charge which would not have been imposed but for the failure of a holder (or the beneficial owner for whose benefit such holder holds the Fixed Rate Notes), or a fiduciary, settlor, beneficiary of, member or shareholder of, or possessor of power over, the holder or beneficial owner, if that holder or beneficial owner is an estate, trust, partnership or corporation, or any intermediary through which a beneficial owner holds Fixed Rate Notes to comply with our request to comply with certification, information, documentation or other reporting requirements concerning the nationality, residence, identity, or connections with the United States of the beneficial owner or any holder of the Fixed Rate Notes (including, but not limited to, the requirement to provide Internal Revenue Service Forms W-8BEN, Forms W-8BEN-E, Forms W-8ECI, or any subsequent versions thereof or successor thereto, and including, without limitation, any documentation requirement under an applicable income tax treaty);

(g) any tax, assessment, or other governmental charge imposed as a result of a holder (or the beneficial owner for whose benefit such holder holds such Fixed Rate Notes), or a fiduciary, settlor, beneficiary of, member or shareholder of, or possessor of a power over, the holder or beneficial owner, if that holder or beneficial owner is an estate, trust, partnership or corporation, being or having been (1) a 10% shareholder (as defined in Section 871(h)(3)(B) of the U.S. Internal Revenue Code of 1986, as amended (the "*Code*"), and the regulations that may be promulgated thereunder) of our company or (2) a controlled foreign corporation that is related to us within the meaning of Section 864(d)(4) of the Code, or (3) a bank receiving interest described in Section 881(c)(3)(A) of the Code;

(h) any tax, assessment, or other governmental charge that would not have been imposed but for a change in law, regulation, or administrative or judicial interpretation that becomes effective more than 15 days after the payment becomes due or is duly provided for, whichever occurs later;

(i) any taxes payable under Sections 1471 through 1474 of the Code (or any amended or successor version of such Sections), any current or future regulations or other guidance thereunder, or any agreement (including any intergovernmental agreement) entered into in connection therewith;

(j) any combination of items (a), (b), (c), (d), (e), (f), (g), (h), and (i); or

(k) with respect to the April 2025 Notes, any withholding or deduction that is imposed on a payment to an individual and is required to be made pursuant to European Council Directive 2003/48/EC relating to the taxation of savings or any law implementing or complying with, or introduced in order to conform to, such Directive (or any successor

version that is substantively comparable) or any combination of items (a), (b), (c), (d), (e), (f), (g), (h), (i), and this item (k);

nor will we pay any additional amounts to any holder that is not the sole beneficial owner of the Fixed Rate Notes, or a portion of the Fixed Rate Notes, or that is a fiduciary, partnership, or limited liability company to the extent that a beneficial owner with respect to the holder, a beneficiary, or settlor with respect to the fiduciary or a member of that partnership, limited liability company, or a beneficial owner thereof would not have been entitled to the payment of those additional amounts had that beneficiary, settlor, member, or beneficial owner received directly its beneficial or distributive share of the payment.

As used in the preceding paragraph, the term "*United States person*" means any individual who is a citizen or resident of the United States for U.S. federal income tax purposes, a corporation, partnership, or other entity created or organized in or under the laws of the United States, any state of the United States, or the District of Columbia (other than a partnership that is not treated as a United States person under any applicable Treasury Regulations), or any estate or trust the income of which is subject to United States federal income taxation regardless of its source. As used under this heading "Payment of Additional Amounts" and under the heading "Redemption Upon Tax Event", the term "*United States*" means the United States of America, the states of the United States, and the District of Columbia.

The Fixed Rate Notes are subject in all cases to any tax, fiscal, or other law or regulation or administrative or judicial interpretation applicable to the Fixed Rate Notes. Except as specifically provided under this heading "Payment of Additional Amounts," we will not be required to make any payment for any tax, assessment, or other governmental charge imposed by any government or a political subdivision or taxing authority of or in any government or political subdivision.

January 2026 3.200% Notes and 2034 Notes

Unless otherwise required by law, we will not deduct or withhold from payments made under or with respect to the January 2026 3.200% Notes and the 2034 Notes for or on account of any present or future taxes, duties, levies, imposts, assessments or governmental charges of whatever nature imposed or levied by or on behalf of any Taxing Jurisdiction ("*Taxes*"). In the event that we are required to withhold or deduct any amount for or on account of any Taxes from any payment made under or with respect to the January 2026 3.200% Notes or the 2034 Notes, we will pay such additional amounts so that the net amount received by each holder of the January 2026 3.200% Notes and the 2034 Notes (including additional amounts) after such withholding or deduction will equal the amount that such holder would have received if such Taxes had not been required to be withheld or deducted.

Additional amounts will not be payable with respect to a payment made to a holder of the January 2026 3.200% Notes and the 2034 Notes or a holder of beneficial interests in global securities representing such notes where such holder is subject to taxation on such payment by a relevant Taxing Jurisdiction for any reason other than such holder's mere ownership of the January 2026 3.200% Notes or the 2034 Notes or for or on account of:

- any Taxes that are imposed or withheld solely because such holder (or the beneficial owner for whose benefit such holder holds the January 2026 3.200% Notes or the 2034 Notes) or a fiduciary, settlor, beneficiary, member, shareholder or other equity owner of, or possessor of a power over, such holder (or beneficial owner) if such holder (or beneficial owner) is an estate, trust, partnership, limited liability company, corporation or other entity:
  - is or was present or engaged in, or is or was treated as present or engaged in, a trade or business in the Taxing Jurisdiction or has or had a permanent establishment in the Taxing Jurisdiction (in each cash, other than the mere fact of ownership of such securities, without another presence or business in such Taxing Jurisdiction);
  - has or had any present or former connection (other than the mere fact of ownership of the January 2026 3.200% Notes or the 2034 Notes) with the Taxing Jurisdiction imposing such Taxes, including being or having been a national citizen or resident thereof, being treated as being or having been a resident thereof or being or having been physically present therein;
  - with respect to any withholding Taxes imposed by the United States, is or was with respect to the United States a personal holding company, a passive foreign investment company, a controlled foreign corporation, a foreign private foundation or other foreign tax exempt organization or corporation that has accumulated earnings to avoid United States federal income tax;
  - actually or constructively owns or owned 10% or more of the total combined voting power of all of our classes of stock within the meaning of section 871(h)(3) of the Code; or
  - is or was a bank receiving payments on an extension of credit made pursuant to a loan agreement entered into in the ordinary course of its trade or business within the meaning of section 881(c)(3) of the Code;
- any estate, inheritance, gift, sales, transfer, excise, personal property or similar Taxes imposed with respect to the January 2026 3.200% Notes or the 2034 Notes, except as otherwise provided in the indenture;
- any Taxes imposed solely as a result of the presentation of the January 2026 3.200% Notes or the 2034 Notes (where presentation is required) for payment on a date more than 15 days after the date on which such payment became due and payable or the date on which payment thereof is duly provided for, whichever is later, except to the extent that the beneficiary or holder thereof would have been entitled to the payment of additional amounts had the January 2026 3.200% Notes or the 2034 Notes been presented for payment on any date during such 15-day period;
- any Taxes imposed or withheld solely as a result of the failure of such holder or any other person to comply with applicable certification, information, documentation or other reporting requirements concerning the nationality, residence, identity or connection with the Taxing Jurisdiction of such holder, if such compliance is required by statute, regulation, ruling or administrative practice of the relevant Taxing Jurisdiction or by any applicable tax treaty to which the relevant Taxing Jurisdiction is a party as a precondition to relief or exemption from such Taxes;

- with respect to withholding Taxes imposed by the United States, any such Taxes imposed by reason of the failure of such holder to fulfill the statement requirements of sections 871(h) or 881(c) of the Code;
- any Taxes that are payable by any method other than withholding or deduction by us or any paying agent from payments in respect of the January 2026 3.200% Notes and the 2034 Notes;
- any Taxes required to be withheld by any paying agent from any payment in respect of the January 2026 3.200% Notes and the 2034 Notes if such payment can be made without such withholding by at least one other paying agent;
- any withholding or deduction for Taxes which would not have been imposed if the January 2026 3.200% Notes or the 2034 Notes had been presented to another paying agent in a member state of the European Union as of the date of the indenture;
- any withholding or deduction required pursuant to sections 1471 through 1474 of the Code, any regulations or agreements thereunder, official interpretations thereof, any intergovernmental agreement, or any law, rule, guidance or administrative practice implementing an intergovernmental agreement entered into in connection with such sections of the Code; or
- any combination of the above conditions.

Additional amounts also will not be payable to any holder of the January 2026 3.200% Notes and the 2034 Notes or the holder of a beneficial interest in a global security representing such notes that is a fiduciary, partnership, limited liability company or other fiscally transparent entity, or to such holder that is not the sole holder of such security or holder of such beneficial interests in such security, as the case may be. The exception, however, will apply only to the extent that a beneficiary or settlor with respect to the fiduciary, or a beneficial owner or member of the partnership, limited liability company or other fiscally transparent entity, would not have been entitled to the payment of an additional amount had the beneficiary, settlor, beneficial owner or member received directly its beneficial or distributive share of the payment.

We also:

- will make such withholding or deduction of Taxes;
- will remit the full amount of Taxes so deducted or withheld to the relevant Taxing Jurisdiction in accordance with all applicable laws;
- will use our commercially reasonable efforts to obtain from each Taxing Jurisdiction imposing such Taxes certified copies of tax receipts evidencing the payment of any Taxes so deducted or withheld; and
- upon request, will make available to the holders of the January 2026 3.200% Notes and the 2034 Notes, within 90 days after the date the payment of any Taxes deducted or withheld is due pursuant to applicable law, certified copies of tax receipts evidencing such payment by us or if, notwithstanding our efforts to obtain such receipts, the same are not obtainable, other evidence of such payments.

At least 30 days prior to each date on which any payment under or with respect to the January 2026 3.200% Notes or the 2034 Notes is due and payable for which we will be obligated to pay

additional amounts, with respect to such payment, we will deliver to the Trustee an officers' certificate stating the fact that such additional amounts will be payable, the amounts so payable and such other information as is necessary to enable the trustee to pay such Additional Amounts to holders of such series of notes on the payment date.

In addition, we will pay any stamp, issue, registration, documentary or other similar taxes and duties, including interest, penalties and additional amounts with respect thereto, payable in the United States or any political subdivision or taxing authority of or in the United States in respect of the creation, issue, offering, enforcement, redemption or retirement of the January 2026 3.200% Notes or the 2034 Notes.

The foregoing provisions shall survive any termination or the discharge of the indenture governing the January 2026 3.200% Notes and the 2034 Notes and shall apply to any jurisdiction in which we or any successor to us is organized or is engaged in business for tax purposes or any political subdivisions or taxing authority or agency thereof or therein.

Repurchase Upon a Change of Control

If a Change of Control Triggering Event (as defined below) occurs with respect to any series of Fixed Rate Notes, unless the Issuer has redeemed such series of Fixed Rate Notes in full, as described above, has defeased such series of Fixed Rate Notes, or has satisfied and discharged such series of Fixed Rate Notes as described below, the Issuer will make an offer to each holder of the applicable series of Fixed Rate Notes (the "*Change of Control Offer*") to repurchase any and all of such holder's Fixed Rate Notes of such series at a repurchase price in cash equal to 101% of the aggregate principal amount of such Fixed Rate Notes (such principal amount to be equal to €100,000 or an integral multiple of €1,000 in excess thereof), plus accrued and unpaid interest, if any, thereon, to, but excluding, the date of repurchase (the "*Change of Control Payment*"). Within 30 days following any Change of Control Triggering Event, notice shall be delivered to holders of Fixed Rate Notes of such series describing the transaction or transactions that constitute the Change of Control Triggering Event and offering to repurchase such Fixed Rate Notes on the date specified in the notice, which date will be, (a) for the 2024 Notes, the March 2025 Notes, the April 2025 Notes, the January 2026 1.400% Notes, the March 2027 Notes, the April 2027 Notes, the March 2028 Notes, the September 2028 Notes, the 2029 Notes, the 2031 Notes, the 2032 Notes, the 2037 Notes, the 2039 Notes, and the 2049 Notes, no earlier than 15 days and no later than 60 days from the date such notice is delivered and (b) for the January 2026 3.200% Notes and the 2034 Notes, no earlier than 10 days and no later than 60 days from the date such notice is delivered (as applicable, the "*Change of Control Payment Date*"), pursuant to the procedures required by the Fixed Rate Notes and described in such notice. Notwithstanding the foregoing, installments of interest on any series of Fixed Rate Notes that are due and payable on interest payment dates falling on or prior to the Change of Control Payment Date will be payable on such interest payment dates to the registered holders as of the close of business on the relevant record dates in accordance with such series of Fixed Rate Notes and the applicable indenture. The Issuer must comply in all material respects with the requirements of Rule 14e-1 under the Exchange Act, and any other securities laws and regulations thereunder to the extent those laws and regulations are applicable in connection with

the repurchase of the Fixed Rate Notes as a result of a Change of Control Triggering Event. To the extent that the provisions of any such securities laws or regulations conflict with the Change of Control repurchase provisions of the Fixed Rate Notes, the Issuer will be required to comply with the applicable securities laws and regulations and will not be deemed to have breached its obligations under the Change of Control repurchase provisions of the Fixed Rate Notes by virtue of such conflicts.

On the Change of Control Payment Date, the Issuer will be required, to the extent lawful, to:

- accept for payment all Fixed Rate Notes or portions of Fixed Rate Notes of the applicable series properly tendered pursuant to the Change of Control Offer;
- deposit with the Trustee or a paying agent an amount equal to the Change of Control Payment in respect of all Fixed Rate Notes or portions of Fixed Rate Notes of the applicable series properly tendered; and
- deliver or cause to be delivered to the Trustee the Fixed Rate Notes properly accepted, together with an officer's certificate stating the principal amount of Fixed Rate Notes or portions of Fixed Rate Notes of such series being repurchased, and solely for the January 2026 3.200% Notes and the 2034 Notes, that all conditions precedent contained in the indenture to make a Change of Control Offer have been complied with and that the Change of Control Offer has been made in compliance with the indenture.

"*Below Investment Grade Rating Event*" means, with respect to a series of Fixed Rate Notes, such Fixed Rate Notes are downgraded below Investment Grade Rating (as defined below) by any two of the Rating Agencies (as defined below) on any date during the period (the "*Trigger Period*") commencing 60 days prior to the first public announcement by Thermo Fisher of the occurrence of a Change of Control (or pending Change of Control) and ending 60 days following consummation of such Change of Control (which Trigger Period shall be extended so long as the rating of such Fixed Rate Notes is under publicly announced consideration for possible downgrade by at least two of such Rating Agencies on such 60th day, such extension to last with respect to each such Rating Agency until the date on which such Rating Agency considering such possible downgrade either (x) rates such Fixed Rate Notes below Investment Grade or (y) publicly announces that it is no longer considering such Fixed Rate Notes for possible downgrade, *provided* that no such extension will occur if on such 60th day such Fixed Rate Notes are rated Investment Grade by at least two of such Rating Agencies in question and are not subject to review for possible downgrade by such Rating Agencies).

"*Change of Control*" means the occurrence of any of the following:

(1) the direct or indirect sale, transfer, conveyance or other disposition (other than by way of merger or consolidation), in one or a series of related transactions, of all or substantially all of the properties or assets of Thermo Fisher and its subsidiaries taken as a whole to any "person" (as that term is used in Section 13(d)(3) of the Exchange Act) other than Thermo Fisher or one of its direct or indirect wholly-owned subsidiaries;

(2) the consummation of any transaction (including, without limitation, any merger or consolidation) as a result of which any "person" (as that term is used in Section 13(d)(3) of the Exchange Act) becomes the "beneficial owner" (as defined in Rules 13d-3 and 13d-5 under the Exchange Act), directly or indirectly, of more than 50% of Thermo Fisher's outstanding voting stock or other voting stock into which Thermo Fisher's voting stock is reclassified, consolidated, exchanged, or changed, measured by voting power rather than number of shares;

(3) Thermo Fisher consolidates with, or merges with or into, any "person" or "group" (as that term is used in Section 13(d)(3) of the Exchange Act), or any "person" or "group" consolidates with, or merges with or into, Thermo Fisher, in any such event pursuant to a transaction in which any of Thermo Fisher's voting stock or the voting stock of such other person is converted into or exchanged for cash, securities, or other property, other than any such transaction where the shares of Thermo Fisher's voting stock outstanding immediately prior to such transaction constitute, or are converted into or exchanged for, a majority of the voting stock of the surviving person or any direct or indirect parent company of the surviving person immediately after giving effect to such transaction;

(4) with respect to the April 2025 Notes, the first day on which a majority of the members of Thermo Fisher's board of directors are not Continuing Directors (as defined below); or

(5) the adoption of a plan relating to Thermo Fisher's liquidation or dissolution.

Notwithstanding the foregoing, a transaction will not be deemed to involve a Change of Control if (a) Thermo Fisher becomes a direct or indirect wholly-owned subsidiary of a holding company (which shall include a parent company) and (b)(i) the holders of the voting stock of such holding company immediately following that transaction are substantially the same as the holders of Thermo Fisher's voting stock immediately prior to that transaction or (ii) no "person" (as that term is used in Section 13(d)(3) of the Exchange Act) (other than a holding company satisfying the requirements of this sentence) becomes the "beneficial owner" (as defined in Rules 13d-3 and 13d-5 under the Exchange Act), directly or indirectly, of more than 50% of the voting power of the voting stock of such holding company immediately following such transaction.

For purposes of this definition, "*voting stock*" means with respect to any specified person (as that term is used in Section 13(d)(3) of the Exchange Act) capital stock of any class or kind the holders of which are ordinarily, in the absence of contingencies, entitled to vote for the election of directors (or persons performing similar functions) of such person, even if the right to vote has been suspended by the happening of such a contingency.

The definition of Change of Control includes a phrase relating to the direct or indirect sale, lease, transfer, conveyance, or other disposition of "all or substantially all" of the properties or assets of Thermo Fisher and its subsidiaries taken as a whole. Although there is a limited body of case law interpreting the phrase "substantially all," there is no precise established definition of the phrase under applicable law. Accordingly, the applicability of the requirement that Thermo Fisher offer to repurchase the Fixed Rate Notes as a result of a sale, lease, transfer, conveyance, or other disposition of less than all of the assets of Thermo Fisher and its subsidiaries taken as a whole to another person or group may be uncertain.

"*Change of Control Triggering Event*" means, with respect to any series of Fixed Rate Notes, the occurrence of both a Change of Control and a Below Investment Grade Rating Event.

"*Continuing Directors*" means, as of any date of determination, any member of the board of directors of Thermo Fisher who (1) was a member of the board of directors of Thermo Fisher on the date of the issuance of the April 2025 Notes; or (2) was nominated for election or elected to the board of directors of Thermo Fisher with the approval of a majority of the Continuing Directors who were members of such board of directors of Thermo Fisher at the time of such nomination or election (either by specific vote or by approval of Thermo Fisher's proxy statement in which such member was named as a nominee for election as a director, without objection to such nomination).

"*Fitch*" means Fitch Ratings Limited, and any successor to its rating agency business.

"*Investment Grade Rating*" means a rating by Moody's equal to or higher than Baa3 (or the equivalent under a successor rating category of Moody's) or a rating by S&P equal to or higher than BBB- (or the equivalent under any successor rating category of S&P) or a rating by Fitch equal to or higher than BBB- (or the equivalent under any successor rating category of Fitch).

"*Moody's*" means Moody's Investors Service, Inc., and any successor to its rating agency business.

"*Rating Agencies*" means (1) Moody's, S&P and Fitch; and (2) if any of Moody's, S&P or Fitch ceases to rate the applicable series of Fixed Rate Notes or fails to make a rating of such Fixed Rate Notes publicly available for any reason, a "nationally recognized statistical rating organization" within the meaning of Section 3(a)(62) of the Exchange Act, selected by Thermo Fisher (as certified by a resolution of its board of directors) as a replacement agency for any of Moody's, S&P or Fitch, or all of them, as the case may be.

"*S&P*" means S&P Global Ratings, a division of S&P Global, Inc., and any successor to its rating agency business.

Certain Covenants

Limitations on Liens. The Issuer will not, and will not permit any of its subsidiaries to, create, incur, assume, or otherwise cause to become effective any Lien (as defined below) (other than permitted Liens) on any Principal Property (as defined below) or upon shares of stock of any Principal Subsidiary (as defined below) (whether such Principal Property or shares are now existing or owned or hereafter created or acquired), to secure any indebtedness of the Issuer, any of its subsidiaries or any indebtedness of any other Person (as defined below), unless the Issuer or such subsidiary also secures all payments due under the Fixed Rate Notes and all senior debt securities of any series having the benefit of this covenant (together with, if the Issuer shall so determine, any other indebtedness of the Issuer or any subsidiary of the Issuer then existing or thereafter created ranking equally with the Fixed Rate Notes), on an equal and ratable basis with such other indebtedness so secured (or, in the case of indebtedness subordinated to the Fixed Rate Notes, prior or senior thereto, with the same relative priority as the Fixed Rate Notes will

have with respect to such subordinated indebtedness) for so long as such other indebtedness shall be so secured. The indentures contain the following exceptions to the foregoing prohibition:

(a) Liens existing on the date when the Issuer first issued the applicable series of Fixed Rate Notes pursuant to the applicable indenture;

(b) Liens on property owned or leased by a Person existing at the time such Person is merged with or into or consolidated with the Issuer or any subsidiary of the Issuer or the Issuer or one or more of its subsidiaries acquires directly or indirectly all or substantially all of the stock or assets of such Person; *provided* that such Liens were in existence prior to the contemplation of such merger, consolidation or acquisition and do not extend to any assets other than those of the Person merged into, consolidated with, or acquired by the Issuer or such subsidiary;

(c) Liens on property existing at the time of acquisition thereof by the Issuer or any subsidiary of the Issuer, *provided* that such Liens were in existence prior to the contemplation of such acquisition and do not extend to any property other than the property so acquired by the Issuer or such subsidiary;

(d) Liens to secure indebtedness incurred prior to, at the time of or within 18 months after the later of the acquisition of any property and the completion of the construction, alteration, repair, or improvement of any property, as the case may be, for the purpose of financing all or a part of the purchase price thereof or cost of the construction, alteration, repair, or improvement thereof and Liens to the extent they secure indebtedness in excess of such purchase price or cost and for the payment of which recourse may be had only against such property;

(e) Liens in favor of the United States or any state, territory, or possession thereof (or the District of Columbia), or any department, agency, instrumentality, or political subdivision of the United States or any state, territory, or possession thereof (or the District of Columbia), to secure partial, progress, advance or other payments pursuant to any contract or statute or to secure any indebtedness incurred for the purpose of financing all or any part of the purchase price or the cost of constructing or improving the property subject to such Liens;

(f) any Lien securing indebtedness of a subsidiary owing to the Issuer or to one or more of its subsidiaries;

(g) Liens incurred or assumed in connection with the issuance of revenue bonds the interest on which is exempt from federal taxation pursuant to Section 103 of the Code;

(h) Liens created, incurred or assumed in connection with an industrial revenue bond, pollution control bond, or similar financing between the Issuer or any subsidiary of the Issuer and any federal, state, or municipal government or other government body or quasi-governmental agency;

(i) any extension, renewal, or replacement (or successive extensions, renewals, or replacements) in whole or in part of any Lien referred to in clauses (a) through (h) above, inclusive, so long as (1) the principal amount of the indebtedness secured thereby does not exceed the principal amount of indebtedness so secured at the time of the extension, renewal, or replacement (except that, where an additional principal amount of indebtedness is incurred to provide funds for the completion of a specific project, the additional principal amount, and any related financing costs, may be

secured by the Lien as well) and (2) the Lien is limited to the same property subject to the Lien so extended, renewed or replaced (and improvements on the property); and

(j) any Lien on a Principal Property or the shares of stock of a Principal Subsidiary that would not otherwise be permitted by clauses (a) through (i) above, inclusive, securing indebtedness which, together with:
- the aggregate outstanding principal amount of all other indebtedness of the Issuer and its subsidiaries secured by Liens on a Principal Property or the shares of stock of a Principal Subsidiary that is permitted solely pursuant to this clause (j), and
- the aggregate Value (as defined below) of existing Sale and Leaseback Transactions (as defined below) that are permitted solely pursuant to clause (c) of "Limitation on Sale and Leaseback Transactions" and are still in existence, does not exceed 10% of Consolidated Net Assets (as defined below).

Limitation on Sale and Leaseback Transactions. The Issuer will not, and will not permit any of its subsidiaries to, enter into any Sale and Leaseback Transaction with respect to any Principal Property unless:

(a) the Issuer or such subsidiary could incur indebtedness, in a principal amount at least equal to the Value of such Sale and Leaseback Transaction, secured by a Lien on the Principal Property to be leased (without equally and ratably securing debt securities of any series having the benefit of this covenant) pursuant to clauses (a) through (i) under "Limitations on Liens" above;

(b) the Issuer applies, during the six months following the effective date of the Sale and Leaseback Transaction, an amount equal to the Value of the Sale and Leaseback Transaction to either (or a combination of) the voluntary retirement of Funded Debt (as defined below) or to the acquisition of property; or

(c) the aggregate Value of such Sale and Leaseback Transaction plus the Value of all other Sale and Leaseback Transactions of Principal Properties entered into after the date of the issuance of the Fixed Rate Notes permitted solely by this clause (c) and still in existence, plus the aggregate amount of all indebtedness secured by Liens permitted solely by clause (j) of "Limitations on Liens" does not exceed 10% of Consolidated Net Assets.

Certain Other Covenants. The indentures contain certain other covenants regarding, among other matters, corporate existence and reports to holders of Fixed Rate Notes. The Fixed Rate Notes do not contain any additional financial or restrictive covenants, including covenants relating to total indebtedness, interest coverage, stock repurchases, recapitalizations, dividends and distributions to shareholders or current ratios. The provisions of the indentures do not afford holders of Fixed Rate Notes issued thereunder protection in the event of a sudden or significant decline in the Issuer's credit quality or in the event of a takeover, recapitalization or highly leveraged or similar transaction involving the Issuer or any of its affiliates that may adversely affect such holders.

Consolidation, Merger and Sale of Assets. The Issuer will not consolidate with, merge with or into, or sell, convey, transfer, lease or otherwise dispose of all or substantially all of its and its

subsidiaries' property and assets taken as a whole (in one transaction or a series of related transactions) to any Person, or permit any Person to merge with or into the Issuer, unless:

- the Issuer shall be the continuing Person, or the Person (if other than the Issuer) formed by such consolidation or into which the Issuer is merged or that acquired or leased such property and assets (the "*Surviving Person*"), shall be a Person organized and validly existing under the laws of the United States of America or any jurisdiction thereof, or, subject to certain conditions (including an obligation to pay additional amounts in respect of withholding taxes), a jurisdiction outside the United States, and shall expressly assume, by a supplemental indenture, executed and delivered to the Trustee, all of the Issuer's obligations under each applicable indenture and the Fixed Rate Notes;

- immediately after giving effect to such transaction, no default or event of default (each as defined in each applicable indenture) shall have occurred and be continuing; and

- the Issuer delivers to the Trustee an officer's certificate and opinion of counsel, in each case stating that such consolidation, merger, or transfer and such supplemental indenture complies with this provision and that all conditions precedent provided for herein relating to such transaction have been complied with.

The Surviving Person will succeed to, and be substituted for, the Issuer under each applicable indenture and the Fixed Rate Notes and, except in the case of a lease, the Issuer shall be released of all obligations under the indenture and the Fixed Rate Notes.

Definition of Certain Terms. The following are the meanings of terms that are important in understanding the covenants described above with respect to the Fixed Rate Notes.

"*Capital Lease Obligation*" means, at the time any determination thereof is to be made, the amount of the liability in respect of a capital lease that would at that time be required to be capitalized on a balance sheet in accordance with U.S. GAAP (as defined below) as in effect on the date of the applicable indenture.

"*Consolidated Net Assets*" means the consolidated total assets of the Issuer and its subsidiaries as reflected in its most recent balance sheet prepared in accordance with U.S. GAAP as in effect at the time of such determination, less (a) all current liabilities (excluding any notes and loans payable, current maturities of long-term debt, the current portion of deferred revenue and obligations under capital leases) and (b) acquisition-related intangible assets in accordance with U.S. GAAP in effect at the time of such determination. Consolidated Net Assets includes goodwill of the Issuer and its subsidiaries.

"*Funded Debt*" means, as of any date of determination, the Issuer's indebtedness or the indebtedness of a subsidiary maturing by its terms more than one year after its creation and indebtedness classified as long-term debt under U.S. GAAP as in effect on the date of the applicable indenture, and in each case ranking at least *pari passu* with the senior debt securities.

"*indebtedness*" means, with respect to any specified Person, any indebtedness of such Person, whether or not contingent:

(1) in respect of borrowed money;
(2) evidenced by bonds, notes, debentures, or similar instruments or letters of credit (or reimbursement agreements in respect thereof); and
(3) in respect of Capital Lease Obligations.

In addition, the term "*indebtedness*" includes (x) all indebtedness (as defined above) of others secured by a Lien on any asset of the specified Person (whether or not such indebtedness is assumed by the specified Person), *provided* that the amount of such indebtedness will be the lesser of (A) the fair market value of such asset at such date of determination and (B) the amount of such indebtedness, and (y) to the extent not otherwise included, the guarantee by the specified Person of any indebtedness (as defined above) of any other Person.

"*Lien*" means, with respect to any asset, any mortgage, lien, pledge, charge, security interest, or encumbrance of any kind in respect of such asset, whether or not filed, recorded, or otherwise perfected under applicable law, including any conditional sale or other title retention agreement.

"*Original Issue Discount Security*" means any debt security which provides for an amount less than the principal amount thereof to be due and payable upon a declaration of acceleration of maturity thereof pursuant to the applicable indenture.

"*Person*" means any individual, corporation, partnership, limited liability company, joint venture, joint-stock company, association, trust, unincorporated organization, or government or any agency or political subdivision of a government or governmental agency.

"*Principal Property*" means any single parcel of real property or any permanent improvement thereon (i) owned by the Issuer or any of its subsidiaries located in the United States, including the Issuer's principal corporate office, any manufacturing facility or plant, or any portion thereof and (ii) having a book value, as of the date of determination, in excess of 3% of the Issuer's Consolidated Net Assets, as calculated most recently prior to the applicable issue due of the applicable series of Fixed Rate Notes. Principal Property does not include any property that the Issuer's board of directors has determined not to be of material importance to the business conducted by the Issuer and its subsidiaries, taken as a whole.

"*Principal Subsidiary*" means any direct or indirect subsidiary of the Issuer that owns a Principal Property.

"*Sale and Leaseback Transaction*" means any arrangement with any Person providing for the leasing by the Issuer or any subsidiary of any Principal Property which has been or is to be sold or transferred by the Issuer or such subsidiary to such Person, excluding (1) temporary leases for a term, including renewals at the option of the lessee, of not more than three years, (2) leases between the Issuer and a subsidiary or between subsidiaries of the Issuer, (3) leases of a Principal Property executed by the time of, or within 12 months after the latest of, the acquisition, the completion of construction or improvement, or the commencement of commercial operation of

the property, and (4) arrangements pursuant to any provision of law with an effect similar to the former Section 168(f)(8) of the Internal Revenue Code of 1954, as amended.

"*U.S. GAAP*" means generally accepted accounting principles set forth in the FASB Accounting Standards Codification or in such other statements by such other entity as have been approved by a significant segment of the accounting profession, which are in effect from time to time.

"*Value*" means, with respect to a Sale and Leaseback Transaction, an amount equal to the net present value of the lease payments (other than amounts required to be paid on account of property taxes, maintenance, repairs, insurance, water rates and other items that do not constitute payments for property rights) with respect to the term of the lease remaining on the date as of which the amount is being determined, without regard to any renewal or extension options contained in the lease, discounted at the weighted average interest rate on the debt securities of all series (including the yield to maturity on any Original Issue Discount Securities) which are outstanding on the effective date of such Sale and Leaseback Transaction.

Events of Default

Each indenture defines an Event of Default with respect to any series of Fixed Rate Notes issued pursuant to the applicable indenture. Events of Default on the Fixed Rate Notes are any of the following:

- Default in the payment of the principal or any premium on Fixed Rate Notes when due (whether at maturity, upon acceleration, redemption or otherwise);
- Default for 30 days in the payment of interest on Fixed Rate Notes when due;
- Failure to comply with the provisions described under the caption "-Repurchase Upon a Change of Control" with respect to any series of Fixed Rate Notes.
- Failure by Thermo Fisher to observe or perform any other term of the applicable indenture for a period of 90 days after it receives a notice of default stating that it is in breach. The notice must be sent by either the Trustee or holders of 25% of the principal amount of the Fixed Rate Notes of the affected series;
- (1) Failure by Thermo Fisher to pay indebtedness for money it borrowed or guaranteed the payment of in an aggregate principal amount of at least $100 million, in the case of the 2024 Notes, the April 2025 Notes, the January 2026 3.200% Notes, the January 2026 1.400% Notes, the March 2027 Notes, the September 2028 Notes, the 2029 Notes, the 2034 Notes, or the 2037 Notes, or $150 million, in the case of the March 2025 Notes, the April 2027 Notes, the March 2028 Notes, the 2031 Notes, the 2032 Notes, the 2039 Notes, or the 2049 Notes, at the later of final maturity and the expiration of any related applicable grace period and such defaulted payment shall not have been made, waived or extended within 30 days or (2) acceleration of the maturity of any indebtedness for money that the Issuer borrowed or guaranteed the payment of in an aggregate principal amount of at least $100 million, in the case of the 2024 Notes, the April 2025 Notes, the

January 2026 3.200% Notes, the January 2026 1.400% Notes, the March 2027 Notes, the September 2028 Notes, the 2029 Notes, the 2034 Notes, or the 2037 Notes, or $150 million, in the case of the March 2025 Notes, the April 2027 Notes, the March 2028 Notes, the 2031 Notes, the 2032 Notes, the 2039 Notes, or the 2049 Notes, if such indebtedness has not been discharged in full or such acceleration has not been rescinded or annulled within 30 days; *provided, however*, that, if the default under the instrument is cured by the Issuer, or waived by the holders of the indebtedness, in each case as permitted by the governing instrument, then the Event of Default under the applicable indenture governing the Fixed Rate Notes caused by such default will be deemed likewise to be cured or waived; and

- Certain events in bankruptcy, insolvency or reorganization with respect to Thermo Fisher.

Each indenture provides that the Trustee may withhold notice to the holders of any series of debt securities issued thereunder of any default if the Trustee's board of directors, executive committee, or a trust committee of directors or trustees and/or certain officers of the Trustee in good faith determine it in the interest of such holders to do so.

Remedies if an Event of Default Occurs. Each indenture provides that if an Event of Default has occurred with respect to the applicable series of Fixed Rate Notes and has not been cured, the Trustee or the holders of not less than 25% in principal amount of the Fixed Rate Notes of that series then outstanding may declare the entire principal amount of all the Fixed Rate Notes of that series, and accrued interest, if any, to be due and immediately payable. This is called a declaration of acceleration of maturity. If an Event of Default occurs because of certain events in bankruptcy, insolvency, or reorganization with respect to the Issuer, the principal amount of all the Fixed Rate Notes will be automatically accelerated, without any action by the Trustee or any holder. The holders of a majority in aggregate principal amount of the Fixed Rate Notes of the affected series may by written notice to the Issuer and the Trustee, on behalf of the holders of the Fixed Rate Notes of the affected series, rescind an acceleration or waive any existing Default or Event of Default and its consequences under the applicable indenture, if the rescission would not conflict with any judgment or decree, except a continuing Default or Event of Default in the payment of principal of, premium on, if any, or interest, if any, on, such Fixed Rate Notes.

Except as may otherwise be provided in the applicable indenture in cases of default, where the Trustee has some special duties, the Trustee is not required to take any action under such indenture at the request of any holders unless the holders offer the Trustee protection from expenses and liability (called an "*indemnity*"). If indemnity satisfactory to the Trustee is provided, the holders of a majority in principal amount of the outstanding Fixed Rate Notes of the affected series may direct the time, method and place of conducting any lawsuit or other formal legal action seeking any remedy available to the Trustee. Subject to certain exceptions contained in the applicable indenture, these majority holders may also direct the Trustee in performing any other action under the applicable indenture.

Before a holder of Fixed Rate Notes bypasses the Trustee and brings its own lawsuit or other formal legal action or takes other steps to enforce its rights or protect its interests relating to the applicable series of Fixed Rate Notes, the following must occur:

- The holder must give the Trustee written notice that an Event of Default has occurred and remains uncured.
- The holders of 25% in principal amount of all outstanding Fixed Rate Notes of the affected series must make a written request that the Trustee take action because of the Event of Default and must offer reasonable indemnity to the Trustee against the cost and other liabilities of taking that action.
- The Trustee must have failed to take action for 60 days after receipt of the above notice and offer of indemnity and, during such 60-day period, the Trustee has not received a contrary instruction from holders of a majority in principal amount of all outstanding Fixed Rate Notes of such series.

However, a holder of Fixed Rate Notes is entitled at any time to bring a lawsuit for the payment of money due on its Fixed Rate Notes on or after the due date of that payment.

The Issuer will furnish to the Trustee every year a written statement of one to two of its officers certifying that to their knowledge the Issuer is in compliance with the applicable indenture and the Fixed Rate Notes, or else specifying any default.

Satisfaction and Discharge

The applicable indenture will cease to be of further effect with respect to a series of Fixed Rate Notes and the Trustee, upon the Issuer's demand and at its expense, will execute appropriate instruments acknowledging the satisfaction and discharge of the applicable indenture upon compliance with certain conditions, including:

- the Issuer having paid all sums payable by it under such indenture, as and when the same shall be due and payable;
- the Issuer having delivered to the Trustee for cancellation all Fixed Rate Notes theretofore authenticated under such indenture;
- all Fixed Rate Notes of any series outstanding under such indenture not theretofore delivered to the Trustee for cancellation shall have become due and payable or are by their terms to become due and payable within one year and the Issuer shall have deposited with the Trustee sufficient cash or U.S. government or U.S. government agency notes or bonds that will generate enough cash to pay, at maturity or upon redemption, all such Fixed Rate Notes of any series outstanding under such indenture; or
- the Issuer having delivered to the Trustee an officer's certificate and an opinion of counsel, each stating that these conditions have been satisfied.

Defeasance

Full Defeasance. The Issuer can legally release itself from any payment or other obligations on the Fixed Rate Notes of any series (called "*full defeasance*") if the following conditions are met:

- The Issuer deposits in trust for the benefit of holders of Fixed Rate Notes of the same series a combination of money and U.S. government or U.S. government agency notes or bonds that will generate enough cash to make interest, principal, any premium and any other payments on the Fixed Rate Notes of that series on their various due dates.
- There is a change in current U.S. federal tax law or an Internal Revenue Service ruling that lets the Issuer make the above deposit without causing holders of Fixed Rate Notes to be taxed on the Fixed Rate Notes any differently than if the Issuer did not make the deposit and instead repaid the Fixed Rate Notes itself when due. Under current U.S. federal tax law, the deposit and the Issuer's legal release from the Fixed Rate Notes would be treated as though the Issuer took back a holder's Fixed Rate Notes and gave such holder its share of the cash and debt securities or bonds deposited in trust. In that event, a holder of Fixed Rate Notes could recognize gain or loss on the Fixed Rate Notes it give back to the Issuer.
- The Issuer delivers to the Trustee a legal opinion of its counsel confirming the tax law change or ruling described above.

If the Issuer ever did accomplish full defeasance, as described above, a holder of Fixed Rate Notes would have to rely solely on the trust deposit for repayment of the Fixed Rate Notes. Such holders could not look to the Issuer for repayment in the event of any shortfall.

However, even if the Issuer makes the deposit in trust and opinion delivery arrangements discussed above, a number of its obligations relating to the Fixed Rate Notes will remain. These include the Issuer's obligations:

- to register the transfer and exchange of Fixed Rate Notes;
- to replace mutilated, destroyed, lost or stolen Fixed Rate Notes;
- to maintain paying agencies; and
- to hold money for payment in trust.

Covenant Defeasance. Without any change of current U.S. federal tax law, the Issuer can make the same type of deposit described above and be released from some of the covenants on the Fixed Rate Notes of any series. This is called "*covenant defeasance*." In that event, holders of Fixed Rate Notes would lose the protection of those covenants but would gain the protection of having money and securities set aside in trust to repay the Fixed Rate Notes. In order to achieve covenant defeasance, the Issuer must do the following:

- The Issuer must deposit in trust for the benefit of holders of Fixed Rate Notes of the same series a combination of money and U.S. government or U.S. government agency notes or bonds that will generate enough cash to make interest, principal, any premium and any other payments on the Fixed Rate Notes of that series on their various due dates.
- The Issuer must deliver to the Trustee a legal opinion of its counsel confirming that under current U.S. federal income tax law the Issuer may make the above deposit without causing holders of such series of Fixed Rate Notes to be taxed on the Fixed Rate Notes any differently than if it did not make the deposit and instead repaid the Fixed Rate Notes itself when due.

If the Issuer accomplishes covenant defeasance, a holder of such Fixed Rate Notes can still look to it for repayment of the Fixed Rate Notes if there were a shortfall in the trust deposit. In fact, if one of the Events of Default occurred (such as the Issuer's bankruptcy) and the Fixed Rate Notes become immediately due and payable, there may be such a shortfall. Depending on the event causing the default, a holder of such Fixed Rate Notes may not be able to obtain payment of the shortfall.

Modification and Waiver

There are three types of changes the Issuer can make to the indentures and the Fixed Rate Notes.

Changes Requiring Approval of the Holder. First, there are changes that cannot be made to a series of Fixed Rate Notes without specific approval of each holder of Fixed Rate Notes of such series. The following is a list of those types of changes:

- change the stated maturity of the principal or interest on Fixed Rate Notes of any series;
- reduce any amounts due on any Fixed Rate Notes of such series;
- reduce the amount of principal payable upon acceleration of the maturity of the Fixed Rate Notes following an Event of Default;
- change the place or currency of payment for such series of Fixed Rate Notes;
- impair the holder's right to sue for the enforcement of any payment on or with respect to the Fixed Rate Notes;
- reduce the percentage in principal amount of the Fixed Rate Notes, the approval of whose holders is needed to modify or amend the applicable indenture or the Fixed Rate Notes;
- reduce the percentage in principal amount of the Fixed Rate Notes, the approval of whose holders is needed to waive compliance with certain provisions of the applicable indenture or to waive certain defaults; and
- modify any other aspect of the provisions dealing with modification and waiver of the applicable indenture, except to increase the percentage required for any modification or to provide that other provisions of such indenture may not be modified or waived without consent of the holder of each Fixed Rate Note of such series affected by the modification.

Changes Not Requiring Approval. The second type of change does not require any vote by holders of the Fixed Rate Notes. The following is a list of those types of changes:

- cure any ambiguity, defect, or inconsistency;
- evidence the succession of another entity to the Issuer's obligations under the indentures;
- provide for uncertificated Fixed Rate Notes in addition to or in place of certificated Fixed Rate Notes;
- add to the covenants for the benefit of holders of outstanding Fixed Rate Notes or to surrender any right or power the Issuer has under the applicable indenture;
- add additional events of default;
- secure Fixed Rate Notes of any series;
- make any change that does not adversely affect the rights of any holder of Fixed Rate Notes in any material respect;
- issue additional Fixed Rate Notes of any series;

- evidence and provide for a successor Trustee and add to or change the provisions of an indenture to provide for or facilitate the administration of the trusts under the applicable indenture; or
- comply with requirements of the SEC in order to effect or maintain the qualification of the applicable indenture under the Trust Indenture Act of 1939, as amended (the "*Trust Indenture Act*").

Changes Requiring a Majority Vote. Any other change to an indenture and the Fixed Rate Notes would require the following approval:

- If the change affects only Fixed Rate Notes of one series, it must be approved by the holders of a majority in principal amount of the Fixed Rate Notes of that series.
- If the change affects a series of Fixed Rate Notes as well as the senior debt securities of one or more other series issued under the indentures, it must be approved by the holders of a majority in principal amount of the Fixed Rate Notes of such series and each other series of senior debt securities affected by the change.
- In each case, the required approval must be given by written consent.

The same vote would be required for the Issuer to obtain a waiver of a past default. However, the Issuer cannot obtain a waiver of a payment default or a waiver with respect to any other aspect of the applicable indenture and the Fixed Rate Notes listed in the first category described previously under "Changes Requiring Approval of the Holder" unless the Issuer obtains a holder's individual consent to the waiver.

Further Details Concerning Voting

Any series of Fixed Rate Notes will not be considered outstanding, and therefore not eligible to vote, if the Issuer has deposited or set aside in trust for holders of such series of Fixed Rate Notes money for their payment or redemption. The Fixed Rate Notes of any series will also not be eligible to vote if they have been fully defeased as described above under "Full Defeasance."

The Issuer generally is entitled to set any day as a record date for the purpose of determining the holders of outstanding Fixed Rate Notes that are entitled to vote or take other action under the applicable indenture. In certain limited circumstances, the Trustee is entitled to set a record date for action by holders. If the Issuer or the Trustee sets a record date for a vote or other action to be taken by holders of Fixed Rate Notes, that vote or action may be taken only by persons who are holders of outstanding Fixed Rate Notes on the record date and must be taken within 180 days following the record date or another period that the Issuer may specify (or as the Trustee may specify, if it set the record date). The Issuer may shorten or lengthen (but not beyond 180 days) this period from time to time.

No Personal Liability of Incorporators, Stockholders, Officers, Directors

The indentures provide that no recourse shall be had under any obligation, covenant, or agreement of the Issuer in the indentures or in any of the Fixed Rate Notes or because of the creation of any indebtedness represented thereby, against any of its incorporators, stockholders,

officers, or directors, past, present, or future, or of any predecessor or successor entity thereof under any law, statute, or constitutional provision or by the enforcement of any assessment or by any legal or equitable proceeding or otherwise. Each holder, by accepting the Fixed Rate Notes, waived and released all such liability.

Concerning the Trustee

The Bank of New York Mellon Trust Company, N.A. is the trustee under the indentures. The Bank of New York Mellon, London Branch, has been appointed as paying agent with respect to the April 2025 Notes. The Trustee or its affiliates may from time to time in the future provide banking and other services to the Issuer in the ordinary course of its business.

The indentures provide that, prior to the occurrence of an Event of Default with respect to the Fixed Rate Notes of a series and after the curing or waiving of all such Events of Default with respect to that series, the Trustee will not be liable except for the performance of such duties as are specifically set forth in the applicable indenture. If an Event of Default has occurred and has not been cured or waived, the Trustee will exercise such rights and powers vested in it under the applicable indenture and will use the same degree of care and skill in its exercise as a prudent person would exercise under the circumstances in the conduct of such person's own affairs.

The indentures and the provisions of the Trust Indenture Act incorporated by reference therein contain limitations on the rights of the Trustee thereunder, should it become a creditor of the Issuer or any of its subsidiaries, to obtain payment of claims in certain cases or to realize on certain property received by the Trustee in respect of any such claims, as security or otherwise. The Trustee is permitted to engage in other transactions, *provided* that if it acquires any conflicting interest (as defined in the Trust Indenture Act), it must eliminate such conflict or resign.

Unclaimed Funds

All funds deposited with the Trustee or any paying agent for the payment of principal, interest, premium, or additional amounts in respect of Fixed Rate Notes that remain unclaimed for one year after the date upon which the principal of, premium, if any, or interest on such Fixed Rate Notes shall have become due and payable will be repaid to the Issuer. Thereafter, any right of any holder of Fixed Rate Notes to such funds shall be enforceable only against the Issuer, and the Trustee and paying agents will have no liability therefor.

Book-Entry; Delivery and Form

The Fixed Rate Notes are issued in the form of one or more global notes in fully registered form, without coupons, and have been deposited with, or on behalf of, a common depositary, and registered in the name of the nominee of the common depositary, for, and in respect of interests held through, Euroclear Bank SA/NV ("*Euroclear*") and Clearstream Banking, S.A. ("*Clearstream*"). Except as described herein, certificates will not be issued in exchange for beneficial interests in the global notes. Except as set forth below, the global notes may be

transferred, in whole and not in part, only to Euroclear or Clearstream or their respective nominees.

Beneficial interests in the global notes are represented, and transfers of such beneficial interests are effected, through accounts of financial institutions acting on behalf of beneficial owners as direct or indirect participants in Euroclear or Clearstream. Those beneficial interests must be in denominations of €100,000 and integral multiples of €1,000 in excess thereof. Investors may hold Fixed Rate Notes directly through Euroclear or Clearstream, if they are participants in such systems, or indirectly through organizations that are participants in such systems.

For so long as the Fixed Rate Notes are represented by global notes deposited with, and registered in the name of a nominee for, a common depositary for Euroclear and/or Clearstream, each person (other than Euroclear or Clearstream) who is for the time being shown in the records of Euroclear or of Clearstream as the holder of a particular nominal amount of the Fixed Rate Notes (in which regard any certificate or other document issued by Euroclear or Clearstream as to the nominal amount of the Fixed Rate Notes standing to the account of any person shall be conclusive and binding for all purposes save in the case of manifest error) shall upon their receipt of a certificate or other document be treated by Thermo Fisher and the Trustee as the holder of such nominal amount of the Fixed Rate Notes and the registered holder of the global notes shall be deemed not to be the holder for all purposes other than with respect to the payment of principal or interest on such nominal amount of the Fixed Rate Notes, for which purpose the registered holder of the relevant global note shall be treated by Thermo Fisher and the Trustee as the holder of such nominal amount of the Fixed Rate Notes in accordance with and subject to the terms of the global notes and the expressions “noteholder” and “holder of notes” and related expressions shall be construed accordingly.

Certificated Notes

If the depositary for any of the securities represented by a global security is at any time unwilling or unable to continue as depositary or ceases to be a clearing agency registered under the Exchange Act, and a successor depositary registered as a clearing agency under the Exchange Act is not appointed by us within 90 days, we will issue securities in definitive form in exchange for the global security that had been held by the depositary. Any securities issued in definitive form in exchange for a global security will be registered in the name or names that the depositary gives to the Trustee or other relevant agent of ours or theirs. It is expected that the depositary’s instructions will be based upon directions received by the depositary from participants with respect to ownership of beneficial interests in the global security that had been held by the depositary.

Governing Law

The indentures and the Fixed Rate Notes are governed by, and construed in accordance with, the laws of the State of New York.

THERMO FISHER SCIENTIFIC INC.

AMENDMENT TO NONSTATUTORY STOCK OPTION AGREEMENTS

Granted under 2013 Stock Incentive Plan

1. Reference is made to the letter agreement (the "Letter Agreement") dated as of November 10, 2022 between Thermo Fisher Scientific Inc. (the "Company") and Marc N. Casper (the "Executive") providing for the addition of retirement vesting provisions to certain of the Executive's outstanding equity awards.

2. In accordance with the Letter Agreement, this amendment shall apply to the following nonstatutory stock option agreements granted to the Executive (each, a "Listed Award"):

    a. Stock Option Award granted February 23, 2022
    b. Stock Option Award granted February 23, 2021
    c. Stock Option Award granted February 25, 2020
    d. Stock Option Award granted February 26, 2019
    e. Stock Option Award granted February 27, 2018
    f. Stock Option Award granted February 28, 2017

3. A new paragraph (g) is added to the end of Section 3 of the Listed Awards a. through c. above to read in its entirety as follows:

    "(g) Retirement. If the Participant "retires" from the Company or a Subsidiary prior to the Final Exercise Date then, subject to Section 3(e) above, this Option shall vest and become 100% exercisable upon the date of such retirement and the right to exercise this Option shall terminate on the Final Exercise Date, provided that the retirement date occurs at least two years after the Grant Date. For the purposes of this Agreement, the Participant shall be deemed to have "retired" (i) in the event of a non-employee director of the Company, when the Participant ceases to be a director of the Company or (ii) in the event of an employee of the Company or a Subsidiary, upon the Participant's resignation from employment with the Company or a Subsidiary either (A) after the age of fifty-five (55) and the completion of ten (10) continuous years of service to the Company or a Subsidiary comprising at least twenty (20) hours per week or (B) after the age of sixty (60) and the completion of five (5) continuous years of service to the Company or a Subsidiary comprising at least twenty (20) hours per week. For purposes of this Agreement and for the sake of clarity, subject to execution of a release of claims in a form acceptable to the Company, the Participant may seek to re-characterize any termination of employment initiated by the Company, or a Subsidiary, that is not a termination for "Cause" (as defined in Section 1.2 of the Severance Agreement) as a voluntary termination by reason of retirement, in which case the Participant shall not be entitled to receive any severance or other benefits that would have otherwise been provided by the Company to the Participant pursuant to any agreement between the Company and the Participant or any Company policy. Any such determination shall be made by the Committee in its sole discretion."

4. A new paragraph (g) is added to the end of Section 3 of the Listed Awards d. through f. above to read in its entirety as follows:

"(g) Retirement. If the Participant "retires" from the Company or a Subsidiary prior to the Final Exercise Date then, subject to Section 3(e) above, this Option shall vest and become 100% exercisable upon the date of such retirement and the right to exercise this Option shall terminate on the Final Exercise Date, provided that the retirement date occurs at least two years after the Grant Date. For the purposes of this Agreement, the Participant shall be deemed to have "retired" (i) in the event of a non-employee director of the Company, when the Participant ceases to be a director of the Company or (ii) in the event of an employee of the Company or a Subsidiary, upon the Participant's resignation from employment with the Company or a Subsidiary either (A) after the age of fifty-five (55) and the completion of ten (10) continuous years of service to the Company or a Subsidiary comprising at least twenty (20) hours per week or (B) after the age of sixty (60) and the completion of five (5) continuous years of service to the Company or a Subsidiary comprising at least twenty (20) hours per week."

5. In each Listed Award, conforming changes are made to Section 2 and Section 3(b) by replacing the words "paragraphs (c) through (f)" with the words "paragraphs (c) through (g)".

THERMO FISHER SCIENTIFIC INC.

By: /s/ Lisa P. Britt
Name: Lisa P. Britt
Title: Senior Vice President and
Chief Human Resources Officer

Acknowledged and agreed:

/s/ Marc N. Casper
Marc N. Casper

THERMO FISHER SCIENTIFIC INC.

AMENDMENT TO RESTRICTED STOCK UNIT AGREEMENTS

Granted under 2013 Stock Incentive Plan

1. Reference is made to the letter agreement (the "Letter Agreement") dated as of November 10, 2022 between Thermo Fisher Scientific Inc. (the "Company") and Marc N. Casper (the "Executive") providing for the addition of retirement vesting provisions to certain of the Executive's outstanding equity awards.

2. In accordance with the Letter Agreement, this amendment shall apply to the following restricted stock unit agreements granted to the Executive (each, a "Listed Award"):

    a. Time Based Restricted Stock Unit Award granted February 23, 2022
    b. Time Based Restricted Stock Unit Award granted February 23, 2021
    c. Time Based Restricted Stock Unit Award granted February 25, 2020

3. A new paragraph (g) is added to the end of Section 3 of each Listed Award to read in its entirety as follows:

    "(g) Retirement. If the Participant Retires from the Company prior to the Final Vesting Date, the RSUs that have not previously vested shall vest 100% upon the effective date of such Retirement, provided that the Retirement date occurs at least two years after the Award Date."

4. Section 4(a) of each Listed Award is amended in its entirety to read as follows:

    "(a) The Company shall deliver Shares that become issuable pursuant to an RSU within the sixty (60) day period following the date the RSUs vest pursuant to Section 2 or 3 above, except that any RSUs that vest pursuant to Section 3(g) shall be delivered at the time such RSUs would have been delivered under Section 2 had the Participant remained an Eligible Participant."

5. A new Section 15 is added to read in its entirety as follows:

    "15. Retirement. For the purposes of this Agreement, the Participant shall be deemed to have "retired" from the Company (i) in the event of a non-employee director of the Company, when the Participant ceases to be a director of the Company or (ii) in the event of an employee of the Company, upon the Participant's resignation from employment with the Company either (A) after the age of fifty-five (55) and the completion of ten (10) continuous years of service to the Company comprising at least twenty (20) hours per week or (B) after the age of sixty (60) and the completion of five (5) continuous years of service to the Company comprising at least twenty (20) hours per week. For purposes of this Agreement and for the sake of clarity, subject to execution of a release of claims in a form acceptable to the Company, the Participant may seek to re-characterize any termination of employment initiated by the Company, or a subsidiary of the Company, that is not a termination for "Cause" (as defined in Section 1.2 of the

Severance Agreement) as a voluntary termination by reason of Retirement, in which case the Participant shall not be entitled to receive any severance or other benefits that would have otherwise been provided by the Company to the Participant pursuant to any agreement between the Company and the Participant or any Company policy. Any such determination shall be made by the Committee in its sole discretion."

6. In each Listed Award, conforming changes are made to Section 2 and Section 3(a) by replacing the words "paragraphs (b) through (f)" with the words "paragraphs (b) through (g)". Conforming changes are made to Section 5 by replacing the words "paragraphs (b), (c), (e) or (f) of Section 3 above" with the words "paragraphs (b), (c), (e), (f) or (g) of Section 3 above".

THERMO FISHER SCIENTIFIC INC.

By: /s/ Lisa P. Britt
Name: Lisa P. Britt
Title: Senior Vice President and Chief Human Resources Officer

Acknowledged and agreed:

/s/ Marc N. Casper
Marc N. Casper

THERMO FISHER SCIENTIFIC INC.

AMENDMENT TO PERFORMANCE RESTRICTED STOCK UNIT AGREEMENTS

Granted under 2013 Stock Incentive Plan

1. Reference is made to the letter agreement (the "Letter Agreement") dated as of November 10, 2022 between Thermo Fisher Scientific Inc. (the "Company") and Marc N. Casper (the "Executive") providing for the addition of retirement vesting provisions to certain of the Executive's outstanding equity awards.

2. In accordance with the Letter Agreement, this amendment shall apply to the following restricted stock unit agreements granted to the Executive (each, a "Listed Award"):

    a. Performance Based Restricted Stock Unit Award granted February 23, 2022
    b. Performance Based Restricted Stock Unit Award granted February 23, 2021
    c. Performance Based Restricted Stock Unit Award granted February 25, 2020

3. A new paragraph (g) is added to the end of Section 3 of each Listed Award to read in its entirety as follows:

    "(g) Retirement. If the Participant Retires from the Company after the later of (i) the Performance Certification Date or (ii) the second anniversary of the Award Date, then nevertheless the Participant shall become vested in the remaining RSUs to be delivered (calculated based on the units earned as of the Performance Certification Date, as adjusted pursuant to the provisions of Schedule A)."

4. Section 4 of each Listed Award is amended in its entirety to read as follows:

    "4. Delivery of Shares.

    (a) Except as provided in (b) below, the Company shall deliver the Shares that become issuable upon the vesting of an RSU (i) to the Participant as soon as administratively practicable or (ii) in the event that the Participant's employment with the Company is terminated by reason of death, to the Participant's estate as soon as administratively practicable, but in no event later than the last day of the period specified in Treas. Reg. section 1.409A-1(b)(4)(i)(A).

    (b) In the event that the Participant Retires under the conditions of Section 3(g) above, the Company shall deliver the Shares that become issuable pursuant to an RSU, to the extent not previously delivered, within the sixty (60) day period following the date such RSUs would have vested had the Participant remained employed with the Company.

    (c) The Company shall not be obligated to deliver Shares to the Participant unless the issuance and delivery of such Shares shall comply with all relevant provisions of law and other legal requirements including, without limitation, any applicable federal or state securities laws and the requirements of any stock exchange upon which shares of Common Stock may then be listed."

5. A new Section 15 is added to read in its entirety as follows:

   "15. Retire or Retirement. For the purposes of this Agreement, the Participant shall be deemed to have "retired" from the Company (i) in the event of a non-employee director of the Company, when the Participant ceases to be a director of the Company or (ii) in the event of an employee of the Company, upon the Participant's resignation from employment with the Company either (A) after the age of fifty-five (55) and the completion of ten (10) continuous years of service to the Company comprising at least twenty (20) hours per week or (B) after the age of sixty (60) and the completion of five (5) continuous years of service to the Company comprising at least twenty (20) hours per week. For purposes of this Agreement and for the sake of clarity, subject to execution of a release of claims in a form acceptable to the Company, the Participant may seek to re-characterize any termination of employment initiated by the Company, or a subsidiary of the Company, that is not a termination for "Cause" (as defined in Section 1.2 of the Severance Agreement) as a voluntary termination by reason of Retirement, in which case the Participant shall not be entitled to receive any severance or other benefits that would have otherwise been provided by the Company to the Participant pursuant to any agreement between the Company and the Participant or any Company policy. Any such determination shall be made by the Committee in its sole discretion

6. In each Listed Award, conforming changes are made to Section 2 and Section 3(a) by replacing the words "paragraphs (b) through (f)" with the words "paragraphs (b) through (g)". Conforming changes are made to Section 5 by replacing the words "paragraphs (b), (c), (e) or (f) of Section 3 above" with the words "paragraphs (b), (c), (e), (f) or (g) of Section 3 above". The references in the first sentence of Schedule A, referring to additional vesting conditions, are corrected to "paragraphs (b), (c), (f) or (g) of Section 3".

7. For the Listed Awards granted February 23, 2021 and February 23, 2022, a new paragraph is added to Schedule A, Vesting Schedule for Performance-Based Restricted Stock Units, immediately below the table relating to the TMO TSR CAGR Performance Adjustment, to read in its entirety as follows:

   "In the case of the Participant who Retires pursuant to Section 3(g), the number of Shares deliverable under Section 4(b) pursuant to an RSU that would have vested on the Final Vesting Date had the Participant remained employed with the Company shall be determined taking into account the above long-term performance adjustment based on the TMO TSR CAGR for the full Measurement Period (as if the Participant had remained employed with the Company through the Final Vesting Date)."

THERMO FISHER SCIENTIFIC INC.

By: /s/ Lisa P. Britt
Name: Lisa P. Britt
Title: Senior Vice President and Chief Human Resources Officer

Acknowledged and agreed:

/s/ Marc N. Casper
Marc N. Casper

THERMO FISHER SCIENTIFIC INC.

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Operating Company LLC	Delaware	100
Thermo Fisher Scientific Senior Financing LLC	Delaware	100
Thermo Fisher Scientific (DE) Holding S.a.r.l.	Luxembourg	100
Laboratory Management Systems, Inc.	Delaware	100
Thermo Fisher Scientific Peru S.R.L. [1% by Fisher Clinical Services (Peru) LLC]	Peru	99
Thermo Fisher Scientific Malaysia Sdn. Bhd.	Malaysia	100
Fisher Clinical Logistics LLC	Delaware	100
Fisher Clinical Services (Suzhou) Co., Ltd.	China	100
Fisher Clinical Services Limited Liability Company [1% by Thermo Fisher Scientific Inc.]	Russia	99
Fisher Clinical Services (Korea) Co., Ltd	Korea	100
Cohesive Technologies Inc.	Delaware	100
Cohesive Technologies (UK) Limited	England	100
Thermo Hypersil-Keystone LLC	Delaware	100
Thermo Electron A/S	Denmark	100
Phitonex, Inc.	North Carolina	100
TWX, LLC [22.5% by Thermo Scientific Portable Analytical Instruments Inc.]	Massachusetts	77.5
Thermo Fisher GP LLC	Delaware	100
Thermo Fisher Scientific C.V. [1% by TFLP LLC]	Netherlands	99
Phadia GmbH	Germany	100
Thermo Dutch Holdings Limited Partnership [1% by Thermo Finland Holdings LLC]	England	99
Fisher Clinical Services Mexico, S. de R.L. de C.V. [1% by Fisher Clinical Services (Mexico) LLC]	Mexico	99
Fisher Clinical Services (Mexico) LLC	Delaware	100
D-finitive Technologies, Inc.	South Carolina	100
Thermo Fisher Scientific Africa Proprietary Ltd	South Africa	100
Thermo Fisher Scientific Middle East Holdings Inc.	Delaware	100
Thermo Portable Holdings LLC	Delaware	100
TSP Holdings I LLC	Delaware	100
Thermo Scientific Portable Analytical Instruments Inc.	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Germany B.V.	Netherlands	100
NovaWave Technologies, Inc.	California	100
Thermo Fisher RE I Corporation [20% by Thermo Fisher Insurance Holdings Inc.]	Delaware	80
Thermo Fisher RE II Corporation	Delaware	100
Thermo Fisher Scientific Re Ltd.	Bermuda	100
Thermo Finland Holdings LLC	Delaware	100
Pelican Acquisition Corporation	Delaware	100
Priority Air Holdings Corp	Delaware	100
Priority Air Express, LLC	Delaware	100
Priority Air Express UK Limited	England	100
Priority Air Express Pte. Ltd.	Singapore	100
PAX – DSI Acquisition LLC	Delaware	100
Distribution Solutions International, Inc.	Michigan	100
Thermo EGS Gauging LLC	Delaware	100
EGS Gauging Technical Services Company	Delaware	100
EGS Gauging Ltd.	England	100
Thermo Asset Management Services Inc.	Delaware	100
Thermo CRS Holdings Ltd.	Canada	100
Thermo CRS Ltd. [Series 1 Preferred Shares held by Oxoid Company, Diagnostix Ltd. and Thermo Fisher Scientific (Mississauga) Inc.]	Canada	100
Robocon Labor- und Industrieroboter Gesellschaft m.b.H	Austria	100
Thermo Fisher Scientific West Palm Holdings LLC	Delaware	100
Thermo Electron North America LLC	Delaware	100
picoSpin, LLC	Colorado	100
Loftus Furnace Company	Pennsylvania	100
NAPCO, Inc.	Connecticut	100
Fisher Clinical Services (Colombia) LLC	Delaware	100
Fisher Clinical Services Colombia S.A.S.	Colombia	100
Fisher Servicios Clinicos (Chile) LLC	Delaware	100
Fisher Servicios Clinicos Chile Ltda [1% by Thermo Fisher Scientific Inc.]	Chile	99
Staten Island Cogeneration Corporation	New York	100
Doe & Ingalls Investors, Inc.	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Doe & Ingalls Management, LLC [47% by Thermo Fisher Scientific Inc.]	Delaware	53
Doe & Ingalls of California Operating LLC	North Carolina	100
Doe & Ingalls of Florida Operating LLC	Florida	100
Doe & Ingalls of Maryland Operating LLC	North Carolina	100
Doe & Ingalls of Massachusetts Operating LLC	North Carolina	100
Doe & Ingalls of North Carolina Operating LLC	North Carolina	100
Doe & Ingalls Properties II, LLC	North Carolina	100
Doe & Ingalls Properties, LLC	North Carolina	100
Thermo Electron Export Inc.	Barbados	100
Thermo Fisher Scientific (Mexico City) LLC	Delaware	100
Odyssey Luxembourg Holdings S.C.S. [1% by Odyssey Holdings LLC]	Luxembourg	99
Fisher Worldwide Gene Distribution SPV	Cayman Islands	100
Thermo Fisher Scientific Odyssey Financing (Barbados) SRL	Barbados	100
Thermo Fisher Scientific Odyssey Holdings Limited	England	100
Odyssey Venture Corporation	Delaware	100
Odyssey Holdings Corporation	Delaware	100
One Lambda, Inc	California	100
SystemLink, Inc.	Virginia	100
Linkage Biosciences, Inc.	California	100
Thermo Fisher Scientific TDI S.a.r.l [.26% by Applied Biosystems International, Inc., .06% by Thermo Fisher Scientific (Finance II) S.a.r.l., and 16.81% by Thermo Fisher Scientific (Finance III) S.a.r.l.]	Luxembourg	82.87
Thermo Fisher (CN) Malta Holdings Limited [.0000001% by Thermo Fisher Scientific (Finance III) LLC	Malta	99.9999999
Thermo Fisher Scientific (Finance III) LLC	Delaware	100
Thermo Fisher Scientific TDI 2 S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Remel Luxembourg S.a.r.l.	Luxembourg	100
ABII 2 Limited	England	100
Remel Europe Limited	England	100
Odyssey Luxembourg IP Holdings 1 S.à r.l.	Luxembourg	100
Odyssey Luxembourg IP Holdings 2 S.à r.l.	Luxembourg	100
Thermo Foundation, Inc.	Massachusetts	100
Thermo Fisher Financial Services Inc.	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Chemicals Inc.	Delaware	100
Thermo Keytek LLC	Delaware	100
Thermo Finland Holdings MT2 B.V. [10% by Thermo Finland Holdings LLC]	Netherlands	90
Thermo Cayman Holdings Ltd. [21.26% by Thermo Cambridge Limited]	Cayman Islands	78.73
European Laboratory Holdings Limited	Ireland	100
Thermo Fisher Investments (Cayman) Ltd.	Cayman Islands	100
Thermo Fisher Scientific Investments (Luxembourg) II S.a.r.l.	Luxembourg	100
Thermo Suomi Holding B.V. [33.33% by Life Sciences International Holdings BV]	Netherlands	66.67
Thermo Fisher (Finland Holdings 2) LLC	Delaware	100
Thermo Fisher (Finland Holdings) Limited Partnership [.5% by Thermo Fisher (Finland Holdings 2) LLC]	England	99.5
Thermo Finland Holdings MT1 B.V. [.5% by Thermo Fisher (Finland Holdings 2) LLC]	Netherlands	99.5
Thermo Fisher Scientific Oy	Finland	100
Thermo Electron Manufacturing Limited	England	100
G V Instruments Limited	England	100
GV Instruments Inc	Delaware	100
GV Instruments Canada Ltd.	Canada	100
Thermo Fisher India Holding B.V. [6.13% by Thermo Fisher Scientific Inc., .68% by Thermo Gamma-Metrics LLC and 30.74% by Thermo Fisher Scientific (Asheville) LLC]	Netherlands	62.45
Thermo Fisher Scientific India Pvt Ltd [.00161 % by Thermo Fisher Scientific Inc., .00320% by Thermo Electron LED GmbH, 2.66891% by Phadia Holding AB, .00001% by Phadia AB, and 22.23825% by Dionex Corporation]	India	75.08802
JSC “Thermo Fisher Scientific”	Russia	100
Thermedics Detection de Argentina S.R.L [10% by Thermo Ramsey LLC]	Argentina	90
Fisher Clinical Services Latin America S.R.L. [10% by Thermo Ramsey LLC]	Argentina	90
Thermo Detection de Mexico S. de R.L. de C.V. [.00815586% by Thermo Environmental Instruments LLC and .02975898% by Thermo Fisher Scientific (Mexico City) LLC]	Mexico	99.96208516
Thermo Fisher Scientific eCommerce Solutions, LLC	Delaware	100
Goring Kerr Detection Limited	England	100
Thermo Sentron Canada Inc. [10% by Thermo Fisher Scientific Inc.]	Canada	90

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Ramsey S.A.	Spain	100
Thermo Ramsey LLC	Massachusetts	100
Thermo Fisher Project Cyprus LLC	Delaware	100
Thermo Fisher Scientific Brasil Instrumentos de Processo Ltda. [.01% by Thermo Ramsey LLC]	Brazil	99.99
IntegenX, Inc.	California	100
IntegenX Ltd	England	100
Thermo Re, Ltd.	Bermuda	100
Thermo Fisher Scientific Clinical Services Ireland Limited	Ireland	100
Thermo Electron (Proprietary) Limited	South Africa	100
Odyssey Holdings LLC	Delaware	100
TFS Group Holding I LLC [12.51% by Thermo Luxembourg Holding LLC, 4.70% by Molecular BioProducts, Inc., 20.48% by Fisher Scientific Worldwide Inc., .37% by Fisher Clinical Services Inc., .70% by Liberty Lane Investment LLC, .15% by Fisher Scientific International LLC, 7.40% by Thermo Fisher Scientific Life Investments US Financing II LLC, 13.37% by Erie LP Holding LLC, preferred shares held by Thermo Fisher Scientific Life Investments US Financing I LLC, Fisher Scientific Worldwide Holdings I C.V., and Thermo Fisher Scientific Investments (Sweden) S.a.r.l.]	Delaware	40.32
Thermo Fisher Scientific Luxembourg Sweden Holdings I S.à r.l	Luxembourg	100
TFS Group Holdings IV LLC [12.39% by Thermo Fisher Scientific Life Holdings III C.V. LLC and 100% of the preferred shares held by TFS Group Holdings III LLC]	Delaware	87.61
Thermo Fisher Scientific Life UK Holdings LP [.01% by Thermo Fisher Scientific Life Holdings 2 Limited]	England	99.99
Thermo Fisher Scientific Life Holdings 2 Limited	England	100
Thermo Fisher Scientific AU LLC	Delaware	100
Thermo Fisher Scientific AU C.V. [1% by Thermo Fisher Scientific AU LLC]	Netherlands	99
Thermo Fisher Scientific Life Technologies Investment I LLC	Delaware	100
Thermo Fisher Scientific Life Technologies Investment II LLC	Delaware	100
Thermo Fisher Scientific Life Technologies Investments Holding LP [.10% by Thermo Fisher Scientific Life Technologies Investment I LLC]	England	99.90
Thermo Electron Australia Pty Limited	Australia	100
Thermo Trace Pty Ltd.	Australia	100
Thermo Fisher Scientific Australia Pty Ltd	Australia	100
Lomb Scientific (Aust) Pty Limited	Australia	100
Technology Design Solutions Pty Ltd	Australia	100
App-Tek International Pty Ltd	Australia	100
Thermo Fisher Scientific New Zealand Holdings	New Zealand	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific New Zealand Limited	New Zealand	100
Thermo Gamma-Metrics Holdings Pty Ltd.	Australia	100
Thermo Gamma-Metrics Pty Ltd	Australia	100
Thermo Electron (Chile) S.p.A.	Chile	100
Thermo Fisher Scientific Life Financing (Cayman)	Cayman Islands	100
Thermo Fisher Scientific Life Financing (Barbados) SRL	Barbados	100
Thermo Fisher Scientific Life Technologies Investment UK II Limited	England	100
Thermo Fisher Scientific Life Holdings Limited	England	100
Thermo Fisher Scientific Pakistan (Private) Limited [50% by Life Technologies Limited]	Pakistan	50
Thermo Fisher Scientific Life Financing Limited	England	100
Thermo Fisher Scientific AU Limited	England	100
Life Technologies Limited	Scotland	100
Thermo Fisher Scientific Life Financing 2 Limited	England	100
Thermo Fisher Scientific Life UK Holdings 2 LP [.01% by Life Technologies Limited]	England	99.99
Matrix MicroScience Ltd.	England	100
Thermo Fisher Scientific Matrix Holding Limited	England	100
Thermo Fisher Scientific Blade I Limited	England	100
Thermo Fisher Scientific Blade II Limited	England	100
Thermo Fisher Scientific Blade III Limited	England	100
Thermo Fisher Scientific Blade IV Limited	Engalnd	100
Thermo Fisher Scientific Blade V Limited	England	100
Thermo Fisher Scientific Blade VI Limited	England	100
Thermo Fisher Scientific Blade VII Limited	England	100
The Binding Site Corporation Limited	England	100
The Nettleton Gate Limited	England	100
The Binding Site Group Limited	England	100
The Binding Site Pty Limited	Australia	100
The Binding Site Limited	New Zealand	100
The Binding Site Ireland Limited	Ireland	100
The Binding Site s.r.o.	Czech Republic	100
The Binding Site Holding GmbH	Germany	100
The Binding Site GmbH	Germany	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
The Binding Site Benelux BV	Belgium	100
The Binding Site France SAS	France	100
The Binding Site S.r.l.	Italy	100
The Binding Site Denmark ApS	Denmark	100
The Binding Site Spain (Specialist Protein Company) S.L.	Spain	100
The Binding Site Portugal, Specialist Protein Company, Unip Lda	Portugal	100
The Binding Site Group Limited	Jordan	100
The Binding Site KK	Japan	100
The Binding Site Pte Ltd.	Singapore	100
TBS Group (Shanghai) Trade Co. Ltd	China	100
The Binding Site S. de R.L. de C.V.	Mexico	100
The Binding Site Brazil Comercio De Produtos Para Laboratorio Ltda.	Brazil	100
The Binding Site Holding Inc.	Delaware	100
The Binding Site Inc.	California	100
The Binding Site VT, Inc.	Vermont	100
TBS Howard Hill LLC	Vermont	100
TFS Group Holding II LLC	Delaware	100
TFS Life Holding LLC [6.19% by Thermo Fisher Scientific Life Technologies Investment UK I Limited, .02% by Thermo Fisher Scientific Life Investments US Financing II LLC, preferred shares held by Thermo Fisher Scientific Investments (Sweden) S.a.r.l. , Thermo Fisher Scientific Sweden Holdings LLC, and TFS Group Holding II LLC]	Delaware	93.80
FSWH II LLC	Delaware	100
Thermo Patheon Holdings LLC	Delaware	100
FSWH I LLC	Delaware	100
Thermo CIDTEC Inc. [2.01% by Thermo Fisher Scientific Inc. and 1.44% by FSWH II LLC]	New York	96.55
Thermo Fisher Scientific Canada Holdings LLC	Delaware	100
Thermo Fisher Scientific Canada Financing 1 ULC	Canada	100
Thermo Fisher Scientific Senior Holdings US LP [.01% by Thermo Fisher Scientific Canada Financing 3 ULC]	Delaware	99.99
Thermo Fisher Scientific Canada Financing 2 ULC	Canada	100
Thermo Fisher Scientific Senior Holdings LP [.01% held by Thermo Fisher Scientific Canada Financing 2 ULC]	Canada	99.99

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Life Technologies Inc. [109,472 Class B by Thermo Fisher Scientific Life Canada Holding ULC and 690,000 Class A by Fisher Scientific Company]	Canada	100
Thermo Fisher Scientific Canada Financing 3 ULC	Canada	100
Thermo Fisher (CN) Luxembourg Holding S.a.r.l. [19% by TFS Life Holding LLC] [Domesticated in the State of Delaware under the name of Thermo Fisher (CN) Luxembourg Holding S.a.r.l. LLC]	Luxembourg	81
TFS Venture Holdings I LLC	Delaware	100
Thermo Fisher Scientific Luxembourg Venture Holdings I S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Panama I Cayman Ltd	Cayman Islands	100
Thermo Fisher Senior Canada Holdings LLC	Delaware	100
Thermo Fisher (CN-I) Luxembourg LLC	Delaware	100
Thermo Fisher (CN-II) Luxembourg LLC	Delaware	100
Thermo Fisher Scientific (PN-II) SRL	Barbados	100
Thermo Fisher (CN) Luxembourg S.a.r.l.	Luxembourg	100
TFS Venture Holdings III S.C.S. [.01 % by Thermo Fisher Scientific Luxembourg Venture Holdings I S.a.r.l.]	Luxembourg	99.99
Thermo Fisher Scientific PN2 C.V [1% by Thermo Fisher Scientific PN2 LLC]	Netherlands	99
Thermo Fisher Scientific PN2 LLC	Delaware	100
Thermo Fisher Scientific PN2 (Malta) Limited [.04% by Thermo CN Luxembourg LLC]	Malta	99.96
DPI Newco LLC	Delaware	100
Thermo Fisher Scientific FLC LLC [36.68% by Thermo Fisher Scientific Inc.]	Delaware	63.32
Patheon Manufacturing Services LLC	Delaware	100
Patheon Development Services Inc.	Delaware	100
REP GBP I-B Blocker, Inc.	Delaware	100
Patheon Biologics LLC [24% by REP GBP I-B Blocker, Inc.]	Delaware	76
Patheon Biologics (NJ) LLC	Delaware	100
Patheon API Inc.	South Carolina	100
Patheon API Services Inc.	South Carolina	100
Patheon API Manufacturing Inc.	South Carolina	100
DSM Pharmaceutical Products, Inc.	Delaware	100
Percivia LLC [50% held privately]	Delaware	50

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific (Finance I) S.a.r.l. [1.26% by Thermo Luxembourg Holding S.a.r.l.]	Luxembourg	98.74
Thermo Fisher Insurance Holdings Inc.	Delaware	100
Thermo Fisher Insurance Holdings LLC [45.62% by Thermo Fisher Scientific Re Ltd.]	Delaware	54.38
Thermo Scientific Microbiology Sdn Bhd	Malaysia	100
Thermo Scientific Microbiology Pte Ltd.	Singapore	100
TFS FEI Holding LLC [12.07% by Thermo Fisher Scientific (Finance I) S.a.r.l., 5.09% by Thermo Fisher (CN) Luxembourg S.a.r.l., and 21.22% Thermo Fisher (CN) Luxembourg Holding S.a.r.l]	Delaware	61.61
Thermo CN Luxembourg LLC	Delaware	100
Thermo Fisher Scientific Luxembourg Venture Holdings II S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific (DPI) Limited Partnership [.00000001% by Thermo CN Luxembourg LLC]	Canada	99.99999999
Thermo Fisher Scientific (CP1) Limited	England	100
Thermo Fisher Scientific PN2 (Luxembourg) S.à.r.l	Luxembourg	100
Fisher Canada Holding ULC 1	Canada	100
Fisher Canada Holding ULC 2	Canada	100
Fisher CLP Holding Limited Partnership [2.65574447% by Fisher Canada Holding ULC 2]	Canada	97.34425553
Fisher Canada Holding ULC 3	Canada	100
Fisher Scientific Company	Canada	100
Thermo Fisher Scientific (CP2) Limited	England	100
Patheon Inc.	Canada	100
Patheon KK	Japan	100
Patheon U.S. Holdings LLC	Delaware	100
Thermo Fisher Scientific PNM Limited Liability Partnership [50% by Patheon Inc.]	England	50
Thermo Fisher Scientific (PN-I) SRL	Barbados	100
Thermo Fisher Scientific PNM S.a.r.l	Luxembourg	100
Patheon I B.V.	Netherlands	100
Patheon Softgels B.V.	Netherlands	100
Patheon Holdings SAS	France	100
Patheon France SAS	France	100
Patheon Italia S.p.A.	Italy	100
Thermo Fisher Scientific (PN1) UK Ltd	England	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Patheon UK Limited	England	100
Patheon Calculus Merger LLC	Delaware	100
Patheon Puerto Rico, Inc.	Puerto Rico	100
Patheon Puerto Rico Acquisitions Corporation	Puerto Rico	100
CEPH International Corporation	Puerto Rico	100
Patheon U.S. Holdings Inc.	Delaware	100
Patheon Pharmaceuticals Services Inc.	Delaware	100
Patheon Pharmaceuticals Inc.	Delaware	100
Patheon Banner U.S. Holdings Inc.	Delaware	100
Patheon Softgels Inc.	Delaware	100
Pharmacaps Mexicana S.A. de C.V. [.2% by Patheon Banner U.S. Holdings Inc.]	Mexico	99.8
Thermo Fisher Scientific (PN) UK LLC	Delaware	100
Patheon UK Pension Trustees Limited	England	100
Thermo Fisher Scientific (PN) UK Limited Partnership [1% by Thermo Fisher Scientific (PN) UK LLC]	England	99
Thermo Fisher Scientific FSUKHCO Financing (Barbados) SRL	Barbados	100
Diagnostix Ltd.	Canada	100
Fisher Scientific Oxoid Holdings Ltd.	England	100
Oxoid Company	Canada	100
Fisher Scientific Luxembourg S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific UK Holding Company Financing Limited	England	100
Perbio Science (Canada) Company	Canada	100
Fisher Scientific UK Holding Company Limited	England	100
Fisher Scientific Oy	Finland	100
Fisher Scientific Norway AS	Norway	100
Fisher Scientific A/S	Norway	100
Doublecape Holding Limited	England	100
I.Q. (BIO) Limited	England	100
Oxoid (ELY) Limited	England	100
Doublecape Limited	England	100
Fisher Scientific Ireland Limited	Ireland	100
Doe & Ingalls Limited	Ireland	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Fisher Scientific Holding U.K., Limited	England	100
Fisher Scientific U.K., Limited	England	100
FSUK Holdings Limited	England	100
Sterilin Limited	England	100
Fisher Scientific UK Holding Company 2	England	100
Fisher Clinical Services U.K. Limited	England	100
Fisher Clinical Services Pte Ltd.	Singapore	100
Fisher Clinical Services (Beijing) Co., Ltd.	China	100
Fisher Scientific Europe Holdings B.V.	Netherlands	100
Perbio Science International Netherlands B.V.	Netherlands	100
Fisher Scientific The Hague III B.V. [35.00095% by Fisher Scientific Europe Holdings B.V.]	Netherlands	64.99905
Acros Organics BV [.3333 by Fisher Scientific The Hague II B.V.]	Belgium	99.6667
Fisher Scientific AG [17.55% by Fisher Scientific S.A.S.]	Switzerland	82.45
Fisher Scientific The Hague V B.V.	Netherlands	100
Fisher Clinical Services GmbH	Switzerland	100
Patheon Logistics Switzerland GmbH	Switzerland	100
Fisher BioPharma Services (India) Private Limited [.315% by Fisher Clinical Services U.K. Limited]	India	99.685
Fisher Scientific Ireland Investments Unlimited [.10% by Fisher Scientific Europe Holdings B.V.]	Ireland	99.90
Fisher Emergo B.V.	Netherlands	100
Fisher Scientific The Hague II B.V.	Netherlands	100
Fisher Scientific Jersey Island Limited	Jersey	100
Fisher Maybridge Holdings Limited	England	100
Maybridge Chemical Holdings Limited	England	100
Maybridge Limited	England	100
Fisher Bioblock Holding II SNC [.99% by Fisher Scientific The Hague II BV]	France	99.01
Thermo Electron Holdings SAS [22.12% by Fisher Scientific Company]	France	77.88
Inel SAS	France	100
Inel Inc.	Delaware	100
Thermo Electron SAS	France	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Electron LED S.A.S.	France	100
Jouan Limited	England	100
Thermo Electron Industries	France	100
S.C.I. du 10 rue Dugay Trouin [2% by Thermo Electron Industries]	France	98
Thermo Fisher Scientific Milano Srl [.05% by Thermo Electron Industries]	Italy	99.95
Fisher Scientific S.A.S.	France	100
Fisher Scientific SRL [.1% by Fisher Bioblock Holding II SNC]	Belgium	99.9
SCI Inno 92 [.0004% by Fisher Bioblock Holding II SNC]	France	99.9996
Fisher Scientific S.L.	Spain	100
Fisher Scientific, Unipessoal, Lda.	Portugal	100
Oxoid Holding SAS	France	100
Thermo Fisher Diagnostics SAS	France	100
Oxoid Senior Holdings Limited	England	100
Oxoid UKH LLC	Delaware	100
Oxoid 2000 Limited	England	100
Oxoid Holdings Limited	England	100
Oxoid International Limited	England	100
Oxoid Australia Pty. Limited	Australia	100
OXOID CZ s.r.o. [1% by Oxoid Limited]	Czech Republic	99
Thermo Fisher Diagnostics AS	Norway	100
Thermo Fisher Diagnostics AB	Sweden	100
Thermo Fisher Diagnostics AG	Switzerland	100
Thermo Fisher Diagnostics B.V.	Netherlands	100
Oxoid Inc.	Delaware	100
Oxoid NV [.01% by Oxoid Holdings Limited]	Belgium	99.99
Thermo Fisher Diagnostics S.p.A.	Italy	100
Oxoid Limited	England	100
Thermo Fisher (Heysham) Limited	England	100
Avocado Research Chemicals Limited	England	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
G & M Procter Limited	Scotland	100
Oxoid Limited	Ireland	100
Oxoid Pension Trustees Limited	England	100
Thermo Fisher Scientific Beteiligungsverwaltungs GmbH	Germany	100
Thermo Fisher Diagnostics Aps	Denmark	100
Phadia s.r.o. [1% by Phadia AB]	Czech Republic	99
Phadia Taiwan Inc.	Taiwan	100
Thermo Fisher Diagnostics Limited	England	100
Thermo Fisher Diagnostics K.K.	Japan	100
Thermo Fisher Diagnostics Austria GmbH	Austria	100
Thermo Fisher Diagnostics NV [.0016% by Thermo Fisher Diagnostics Limited]	Belgium	99.9984
Thermo Fisher Diagnostics, Sociedade Unipessoal Lda	Portugal	100
Thermo Fisher Diagnostics, S.L.U.	Spain	100
Thermo Fisher Diagnostics Oy	Finland	100
Fiberlite Centrifuge LLC	Delaware	100
Thermo MF Physics LLC [3.02% by Thermo Fisher Scientific Spectra-Physics Holdings Luxembourg II S.à r.l.]	Delaware	96.98
Thermo Fisher Investments (Cayman) LLC [4.37% by Thermo Fisher Scientific Investments (Luxembourg) II S.a.r.l. Fisher Biosciences Japan GK owns 100% of the Class A and Class B preferred shares]	Delaware	95.63
Thermo Fisher Scientific CMN LLC [5.61% by Thermo Fisher Scientific Investments (Luxembourg) S.a.r.l.]	Delaware	94.39
Thermo Fisher Scientific Worldwide Investments LLC [10.10% by Thermo Fisher Scientific Worldwide Investments (Luxembourg) S.a.r.l.]	Delaware	89.90
Thermo USC I LLC [5.2589% by Thermo Fisher Scientific Inc. and 9.9573% by Thermo Fisher Scientific (IVGN) Limited]	Delaware	84.7838
Phadia International LLC [15.28% by Phadia International Holdings LP]	Delaware	84.72
Thermo Fisher Scientific Investments (Sweden) II LLC [13.19% by Thermo Fisher Scientific Investments (Sweden) S.a.r.l.]	Delaware	86.81
Thermo Fisher Scientific (Cayman) LLC [14.12% by Thermo Fisher Scientific (Luxembourg) II S.a.r.l.]	Delaware	85.88
Thermo Fisher Scientific Sweden Holdings S.a.r.l [1% by Thermo Fisher Scientific Sweden Holdings LLC]	Luxembourg	99
FSII Sweden Holdings I AB	Sweden	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
FSII Sweden Holdings II AB	Sweden	100
CB Diagnostics I AB	Sweden	100
Power Sweden Holdings I AB	Sweden	100
FSII Sweden Holdings AB	Sweden	100
Thermo Fisher Scientific Life Canada Holding ULC	Canada	100
Life Technologies Japan Ltd.	Japan	100
Pasteur U.S. Corporation	Delaware	100
Life Technologies GmbH	Germany	100
Thermo Fisher Scientific GENEART GmbH	Germany	100
LTC Tech South Africa PTY Ltd. [25% by The Thermo Fisher Scientific Phambili Trust]	South Africa	75
The Thermo Fisher Scientific Phambili Trust	South Africa	100
Power Sweden Holdings II AB	Sweden	100
Perbio Science AB	Sweden	100
Thermo Fisher Scientific PRB S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Investments (Luxembourg) S.a.r.l. [1% by FSII Sweden Holdings AB]	Luxembourg	99
Thermo Fisher Scientific Life Investments II S.à r.l.	Luxembourg	100
Thermo Fisher Scientific Life Investments US Financing II LLC [1% by Perbio Science Sweden Holdings AB]	Delaware	99
Perbio Science Sweden Holdings AB	Sweden	100
Fisher Scientific GTF AB	Sweden	100
Fisher Scientific Biotech Line ApS	Denmark	100
CB Diagnostics Holding AB	Sweden	100
CB Diagnostics AB	Sweden	100
Phadia Holding AB	Sweden	100
Phadia Diagnosticos Ltda [1% by Phadia AB]	Brazil	99
Beijing Phadia Diagnostics Co Ltd	China	100
Allergon AB	Sweden	100
Laboratory Specialties Proprietary Ltd.	South Africa	100
Phadia AB	Sweden	100
Phadia Real Property AB	Sweden	100
Phadia US Inc.	Delaware	100
Life Technologies BPD UK Limited	England	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Perbio Science UK Limited	England	100
Thermo Fisher Scientific (Finance III) S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific (Finance II) S.a.r.l.	Luxembourg	100
Thermo Fisher CM II LLC	Delaware	100
Thermo Fisher Scientific Falcon Senior Holdings Inc.	Delaware	100
FEI Company	Oregon	100
ASPEX Corporation	Pennsylvania	100
FEI Korea Ltd.	Korea	100
FEI Houston, Inc.	Delaware	100
FEI Melbourne Pty Ltd.	Australia	100
FEI Saudi Arabia LLC [10% by FEI Europe B.V.]	Saudi Arabia	90
FEI Technologies, Inc.	Oregon	100
FEI EFA, Inc.	Delaware	100
Thermo Fisher Scientific FLC Hong Kong Limited	Hong Kong	100
Thermo Fisher Scientific Dutch Senior Holdings B.V.	Netherlands	100
Thermo Fisher Scientific FLC B.V.	Netherlands	100
Thermo Fisher Scientific FLC II B.V. [Domesticated in the State of Delaware under the name of Thermo Fisher Scientific FLC II B.V.]	Netherlands	100
Thermo Fisher Scientific B.V.	Netherlands	100
Thermo Fisher Financial Services B.V.	Netherlands	100
Thermo Fisher Scientific (Panama) B.V.	Netherlands	100
Thermo Fisher Scientific (Panama) II B.V.	Netherlands	100
Thermo Fisher Scientific (Panama) Dutch LLC	Delaware	100
Patheon B.V.	Netherlands	100
Patheon Holdings B.V.	Netherlands	100
Patheon Holdings I B.V.	Netherlands	100
Patheon Holdings II B.V.	Netherlands	100
Fisher Bioservices Netherlands B.V.	Netherlands	100
Patheon Biologics Australia Pty Ltd	Australia	100
Patheon Biologics B.V.	Netherlands	100
Patheon Regensburg GmbH	Germany	100
Patheon Life Science Products International GmbH	Austria	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Patheon I Holding GmbH	Austria	100
Patheon Austria GmbH & Co. KG [0% by Patheon I Holding GmbH]	Austria	100
Thermo Fisher Scientific Dutch Holdings B.V.	Netherlands	100
FEI Electron Optics International B.V.	Netherlands	100
Thermo Fisher (FEI) Ireland Ltd	Ireland	100
FEI Microscopy Solutions Ltd	Israel	100
FEI CPD B.V.	Netherlands	100
FEI EFA International Pte. Ltd.	Singapore	100
DCG Systems G.K.	Japan	100
FEI Company of USA (S.E.A.) Pte Ltd.	Singapore	100
FEI Europe B.V.	Netherlands	100
FEI Electron Optics B.V.	Netherlands	100
FEI Hong Kong Company Limited	Hong Kong	100
Thermo Fisher Electronic Technology Research and Development (Shanghai) Co., Ltd	China	100
FEI Trading (Shanghai) Co., Ltd.	China	100
Thermo Fisher Scientific Brno s.r.o.	Czech Republic	100
FEI Asia Pacific Co., Ltd.	China	100
FEI Technology de Mexico S.A. de C.V. [2% by FEI Company]	Mexico	98
FEI UK Limited	England	100
FEI France SAS	France	100
FEI Italia Srl	Italy	100
FEI SAS	France	100
FEI Company Japan Ltd.	Japan	100
FEI Norway Holding AS	Norway	100
FEI Australia Pty Ltd	Australia	100
Thermo Fisher Scientific Dutch Holdings II B.V.	Netherlands	100
Thermo Fisher Scientific Luxembourg Sweden Holdings II S.à r.l.	Luxembourg	100
TFS Breda B.V. [.25% by Thermo Fisher Scientific C.V.]	Netherlands	99.75
Thermo Fisher Scientific Switzerland B.V.	Netherlands	100
SwissAnalytic Group GmbH	Switzerland	100
Thermo Fisher Scientific (Ecublens) SARL	Switzerland	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Holdings Europe Limited	England	100
Thermo Fisher Scientific SpA	Italy	100
Fisher Luxembourg Danish Holdings SARL	Luxembourg	100
Nunc A/S	Denmark	100
Proxeon Biosystems ApS	Denmark	100
Kendro Laboratory Products Ltd	England	100
Kendro Containment & Services Limited	England	100
Thermo Fisher Scientific (Johannesburg) (Proprietary) Limited	South Africa	100
Thermo Fisher Scientific (Schweiz) AG	Switzerland	100
Thermo Fisher Scientific Wissenschaftliche Geräte GmbH	Austria	100
Thermo Fisher Scientific (Praha) s.r.o.	Czech Republic	100
Thermo Electron Sweden Forvaltning AB [10.08% by Dionex Corporation]	Sweden	89.92
Spectra-Physics AB	Sweden	100
Thermo Fisher Scientific Spectra S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Spectra-Physics Holdings Luxembourg II S.à r.l.	Luxembourg	100
Thermo Fisher Scientific Spectra-Physics Holdings Luxembourg I S.à r.l.	Luxembourg	100
Spectra-Physics Holdings Limited	England	100
Thermo Fisher Scientific Japan Holdings III B.V.	Netherlands	100
Thermo Fisher Scientific K.K. [0% by TFS Breda B.V. – preferred shares]	Japan	100
Saroph Sweden AB	Sweden	100
Thermo Electron Sweden AB	Sweden	100
Thermo Life Sciences AB	Sweden	100
Thermo Fisher Scientific Norway US Investments LLC	Delaware	100
Thermo Fisher Scientific Norway Holdings AS	Norway	100
Thermo Fisher Scientific Life Senior Holdings, Inc. [15.37% by Thermo Fisher Scientific Norway Holdings AS]	Delaware	84.63
Erie UK 1 LLC	Delaware	100
Thermo Fisher Scientific Invitrogen Financing (Barbados) SRL	Barbados	100
Invitrogen Holdings Ltd.	Scotland	100
Invitrogen Europe Limited	Scotland	100
Erie N2 LLC	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Powder UK Holdings Limited	England	100
Erie N10 LLC	Delaware	100
Erie UK 4 Limited	England	100
Thermo Fisher Scientific AU II Limited	England	100
Erie Finance LLC	Delaware	100
Applied Biosystems International Inc.	Delaware	100
Erie N2 UK Limited	England	100
Thermo Fisher Scientific Powder Financing 2 LLC	Delaware	100
Thermo Fisher Scientific Powder Finance LLC	Delaware	100
Life Technologies Corporation	Delaware	100
Combinati Incorporated	Delaware	100
Affymetrix, Inc	Delaware	100
Affymetrix Japan K.K.	Japan	100
Bender MedSystems GmbH	Austria	100
eBioscience, Ltd	England	100
Panomics, L.L.C.	California	100
USB Corporation	Ohio	100
Thermo Fisher Scientific Life Technologies Israel Investment I Limited	England	100
Thermo Fisher Scientific Life Technologies Israel Investment II Limited	England	100
Thermo Fisher Israel Ltd.	Israel	100
STC Bio Manufacturing, Inc.	Illinois	100
Thermo Fisher Scientific Colombia S.A.S.	Colombia	100
HyClone International Trade (Tianjin) Co., Ltd	China	100
Invitrogen Argentina SA [0.18% by Invitrogen Holdings LLC]	Argentina	99.82
Invitrogen BioServices India Private Limited [1% by Invitrogen Holdings LLC]	India	99
Invitrogen IP Holdings, Inc.	Delaware	100
Ion Torrent Systems, Inc.	Delaware	100
Molecular Probes, Inc.	Oregon	100
Acoustic Cytometry Systems, Inc.	Delaware	100
Matrix MicroScience Inc.	Delaware	100
Gold Cattle Standard Testing Labs, Inc.	Texas	100
Westover Scientific, Inc.	Washington	100

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Kettlebrook Insurance Co. ltd. [32.5% by Invitrogen Europe Limited]	Hawaii	67.5
Invitrogen Finance Corporation	Delaware	100
CellzDirect, Inc.	Delaware	100
Applied Biosystems, LLC	Delaware	100
NewcoGen PE, LLC	Delaware	100
BioTrove Corporation	Delaware	100
BioTrove International, Inc.	Delaware	100
Life Technologies Clinical Services Lab, Inc.	Delaware	100
Compendia Bioscience, Inc.	Michigan	100
Ambion, Inc.	Delaware	100
CHK Holdings Inc.	Delaware	100
Thermo Fisher Scientific Norway Senior Holding AS	Norway	100
Applied Biosystems de Mexico S. de R.L. de C.V. [.002% by Applied Biosystems, LLC]	Mexico	99.998
Thermo Fisher Scientific (IVGN) Luxembourg S.a.r.l. [.83% by Ambion, Inc.]	Luxembourg	99.17
Thermo Fisher Scientific (IVGN) Limited	Hong Kong	100
Applied Biosystems B.V.	Netherlands	100
Invitrogen Hong Kong Limited	Hong Kong	100
Life Technologies Limited [23.5% by Applied Biosystems BV]	Hong Kong	76.5
Life Technologies Holdings PTE Ltd.	Singapore	100
Affymetrix Biotech Shanghai Ltd	China	100
Affymetrix UK Ltd	England	100
Life Technologies Magyarorszag Kft	Hungary	100
Life Technologies Czech Republic s.r.o.	Czech Republic	100
Life Technologies Polska Sp z.o.o. [.08% by Invitrogen Holdings LLC]	Poland	99.92
Life Technologies Europe B.V.	Netherlands	100
Bio-Sciences Ltd	Ireland	100
Prionics USA Inc.	Delaware	100
Prionics Lelystad B.V.	Netherlands	100
Prionics France SAS	France	100
Life Technologies SA	Spain	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Stokes Bio Ltd.	Ireland	100
Life Technologies s.r.o [2.1% by Applied Biosystems BV]	Slovakia	97.9
Life Technologies AS	Norway	100
Life Technologies Norway Investments US LLC	Delaware	100
Nihon Dynal K.K. [40% held privately]	Japan	60
Dynal Biotech Beijing Limited	China	100
Life Technologies SAS	France	100
Perbio Science France SAS	France	100
eBioscience SAS	France	100
Laboratoire Service International - L.S.I	France	100
BAC BV	Netherlands	100
BAC IP BV	Netherlands	100
Thermo Fisher Scientific (IVGN) B.V.	Netherlands	100
Thermo Fisher Scientific Life Tech Korea Holdings LLC	Delaware	100
Life Technologies Brasil Comercio e Industria de Produtos para Biotecnologia Ltda [3.45% by Thermo Fisher CHK Holding LLC]	Brazil	96.55
Thermo Fisher CHK Holding LLC	Delaware	100
Invitrogen Holdings LLC	Delaware	100
Thermo Fisher Bioprocessing Research and Development (Shanghai) Co., Ltd.	China	100
Invitrogen (Shanghai) Investment Co., Ltd.	China	100
Thermo Fisher Scientific (Guangzhou) Biotechnology Co., Ltd.	China	100
Thermo Fisher Scientific (Guangzhou) Co., Ltd	China	100
Thermo Fisher Scientific Life Technologies Luxembourg Holding LLC	Delaware	100
Thermo Fisher Scientific Luxembourg Life Technologies UK Holding S.à r.l	Luxembourg	100
Thermo Fisher Scientific Life Technologies Enterprise Holding Limited	England	100
Thermo Fisher Scientific Luxembourg Enterprise Holdings S.à r.l.	Luxembourg	100
Thermo Fisher Scientific One Limited	England	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Life International Holdings II LP [.00000004% by Thermo Fisher Scientific One Limited and .55383943% by Thermo Fisher Scientific Life Investments IV S.a.r.l.]	England	99.44616054
Thermo Fisher Scientific Life Technologies Investment UK I Limited	England	100
Thermo Fisher Scientific Holdings (Cayman) I [37.88% by Thermo Fisher Scientific Life Technologies Investment I LLC and 23.42% by Thermo Fisher Scientific Life Technologies Investments Holding LP]	Cayman Islands	38.70
Thermo Fisher Scientific Holdings (Cayman) II	Cayman Islands	100
Thermo Fisher Scientific Cayman Investments LLC	Delaware	100
Thermo Fisher Scientific (Luxembourg) II S.a.r.l.	Luxembourg	100
Invitrogen Trading (Shanghai) Co., Ltd.	China	100
Life Technologies DaAn Diagnostic (Guangzhou) Co., Ltd. [42.5% held privately]	China	57.5
Life Technologies Finance Ltd.	Scotland	100
Thermo Fisher Scientific (Thailand) Co., Ltd.	Thailand	100
Thermo Fisher Scientific Solutions LLC [20% by Thermo Fisher Scientific Life Tech Korea Holdings LLC]	Korea	80
Applied Biosystems Trading (Shanghai) Company Ltd.	China	100
Shanghai Life Technologies Biotechnology Co. Limited	China	100
Applied Biosystems Taiwan LLC	Delaware	100
Life Technologies Co., Ltd. [42.6% by Applied Biosystems BV]	Taiwan	57.4
Life Technologies Chile SpA	Chile	100
Thermo Fisher Scientific Sweden Holdings LLC [.2936% by Thermo Fisher Scientific Investments (Sweden) S.a.r.l.]	Delaware	99.7064
Princeton Gamma-Tech Instruments LLC	Delaware	100
TPI Real Estate Holdings LLC	Delaware	100
Comtest Limited	England	100
Thermo Electron Metallurgical Services, Inc.	Texas	100
ONIX Systems Inc.	Delaware	100
Thermo Process Instruments GP, LLC	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Process Instruments, L.P. [.10% by Thermo Process Instruments GP, LLC]	Texas	99.90
Thermo Measuretech Canada Inc.	Canada	100
Onix Holdings Limited	England	100
CAC Limited	England	100
Thermo Onix Limited	England	100
Phadia US Market Holdings LLC	Delaware	100
Thermo Electron Scientific Instruments LLC	Delaware	100
Thermo Fisher Scientific Japan Holdings I B.V.	Netherlands	100
Thermo Fisher Scientific Japan Holdings I LP [10% by Thermo Fisher Scientific Japan 1 LLC]	Delaware	90
Thermo Fisher Scientific Japan 1 LLC	Delaware	100
Fuji Partnership [17.8184% by Thermo Fisher Scientific Japan Holdings II B.V. and 10.1634% by Thermo Fisher Scientific Japan Holdings III B.V.]	Japan	72.0182
TK Partnership (aka Silent Partnership) [44.66% by Thermo Fisher Scientific K.K.]	Japan	55.34
Thermo Fisher Scientific (NK) LLC	Delaware	100
Thermo Fisher Eurobonds Ltd.	Cayman Islands	100
Thermo Fisher Scientific LSI Financing (Barbados) SRL	Barbados	100
Thermo Fisher Scientific (Mississauga) Inc. [Thermo Finnigan LLC owns 100 Series A Preferred shares]	Canada	100
Life Sciences International Limited	England	100
Hybaid Limited	England	100
Thermo Optek Limited	England	100
Thermo Cambridge Limited	England	100
VG Systems Limited	England	100
Thermo Electron Limited	England	100
Thermo Electron Weighing & Inspection Limited	England	100
Thermo Electron (Management Services) Limited	England	100
Life Sciences International Holdings BV	Netherlands	100
Thermo Ramsey Italia S.r.l.	Italy	100
Helmet Securities Limited	England	100
Life Sciences International LLC	Delaware	100
Thermo Fisher Scientific (Asheville) LLC	Delaware	100
Thermo Neslab LLC	New Hampshire	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Japan Holdings II B.V.	Netherlands	100
Thermo Fisher Scientific Japan Holdings II LP [10% by Thermo Fisher Scientific Japan 2 LLC]	Delaware	90
Thermo Fisher Scientific Japan 2 LLC	Delaware	100
Lab-Line Instruments, Inc.	Delaware	100
Thermo Scientific Services, Inc.	California	100
Thermo Fisher Scientific (Fuji) LLC	Delaware	100
Jouan LLC	Delaware	100
Thermo Kevex X-Ray LLC	Delaware	100
Thermo Gamma-Metrics LLC	Delaware	100
Thermo Fisher Scientific Cork Ltd	Ireland	100
Laser Analytical Systems, Inc.	California	100
Thermo Finnigan LLC	Delaware	100
TMOI Inc.	Delaware	100
Thermo Fisher Scientific (China) Holding Limited	England	100
Thermo Fisher Scientific Baltics UAB [18.24% by Thermo Fisher Scientific (IVGN) Luxembourg S.a.r.l.]	Lithuania	81.70
Fermentas China Co., Ltd	China	100
TFS Singapore HK Limited	Hong Kong	100
Thermo Fisher Scientific NHK Limited	Hong Kong	100
Thermo Fisher Scientific TR Limited	Hong Kong	100
Thermo Fisher Scientific BHK (I) Limited	Hong Kong	100
Thermo Fisher Scientific BHK (II) Limited	Hong Kong	100
Thermo Fisher Scientific (China-HK) Holding Limited	Hong Kong	100
Thermo Fisher Scientific (Shanghai) Supply Chain Management Co., Ltd	China	100
Thermo Fisher Scientific (Suzhou) Research and Development Co., Ltd.	China	100
Alfa Aesar (Hong Kong) Limited	Hong Kong	100
Alfa Aesar (China) Chemical Co. Ltd.	China	100
Thermo Fisher Scientific (Shanghai) Instruments Co., Ltd.	China	100
Thermo Fisher Scientific (Suzhou) Instruments Co., Ltd	China	100
Thermo Fisher Scientific (China) Co., Ltd.	China	100
Thermo Fisher Biopharma Services (Hangzhou) Ltd. [49 % held privately]	China	51
Thermo Fisher Scientific (Shanghai) Management Co., Ltd.	China	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific (Hong Kong) Limited	Hong Kong	100
Thermo Life Science International Trading (Tianjin) Co., Ltd.	China	100
Thermo Fisher Scientific SL	Spain	100
Thermo Fisher (Cayman) Holdings I Ltd.	Cayman Islands	100
Thermo Fisher (Gibraltar) Limited [50% by Thermo Fisher (Cayman) Holdings II Ltd.]	Gibraltar	50
Thermo Fisher (Gibraltar) II Limited	Gibraltar	100
Navaho Acquisition Corp.	Delaware	100
NanoDrop Technologies LLC	Delaware	100
Thermo Fisher (Cayman) Holdings II Ltd.	Cayman Islands	100
Thermo BioAnalysis LLC [5.1% by Life Sciences International Limited and 9.4% by Life Sciences International LLC]	Delaware	85.5
Thermo Fisher Scientific Senior Holdings Australia LLC	Delaware	100
Thermo Fisher German Holdings LLC	Delaware	100
Thermo Holding European Operations LLC	Delaware	100
Thermo DMA Inc.	Texas	100
Thermo BioAnalysis Limited	England	100
Thermo Projects Limited	England	100
Thermo LabSystems Inc.	Massachusetts	100
InnaPhase Limited	England	100
Core Informatics, LLC	Connecticut	100
Core Informatics UK Ltd.	England	100
Thermo Environmental Instruments LLC	California	100
27 Forge Parkway LLC	Delaware	100
Thermo Electron (Calgary) Limited	Canada	100
Thermo Orion Inc.	Massachusetts	100
Thermo Fisher Scientific Aquasensors LLC	Delaware	100
Thermo Electron Puerto Rico, Inc.	Puerto Rico	100
Thermo Power Corporation	Massachusetts	100
ACI Holdings Inc.	New York	100
Thermo Securities Corporation	Delaware	100
Thermo Eberline Holdings I LLC [49% by Thermo Fisher Scientific Inc.]	Delaware	51
Thermo Eberline Holdings II LLC	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Eberline LLC	Delaware	100
Thermo Instrument Controls de Mexico, S.A. de C.V. [2% by Thermo Fisher Scientific Inc.]	Mexico	98
ThermoLase LLC	Delaware	100
Trex Medical Corporation	Delaware	100
Fermentas Inc.	Maryland	100
TFS LLC	Massachusetts	100
Thermo Corporation	Delaware	100
Fisher Scientific GmbH	Germany	100
Fisher Scientific Germany Beteiligungs GmbH	Germany	100
Fisher Scientific, spol. S.r.o	Czech Republic	100
Fisher Scientific (Austria) GmbH	Austria	100
Thermo Fisher Scientific Germany BV & Co. KG [0% by Thermo Fisher Germany B.V.]	Germany	100
Thermo Fisher Scientific C.F. GmbH	Germany	100
Fisher Clinical Services GmbH	Germany	100
Fisher Clinical Services Rheinfelden GmbH	Germany	100
Thermo Fisher Scientific (Holding II) B.V. & Co. KG [0% by Thermo Fisher Germany B.V.]	Germany	100
FEI Deutschland GmbH	Germany	100
Thermo Fisher Diagnostics GmbH	Germany	100
Microgenics Corporation [100% of the preferred shares held by Thermo Fisher Scientific Vector Holdings 2 LLC]	Delaware	100
AcroMetrix LLC	California	100
Consolidated Technologies, Inc.	Wisconsin	100
Remel Inc.	Wisconsin	100
Trek Diagnostic Systems LLC	Delaware	100
Trek Holding Company Ltd.	England	100
Trek Holding Company II Ltd.	England	100
Trek Diagnostic Systems Ltd.	England	100
Thermo Luxembourg Holding S.a.r.l. [Domesticated in the State of Delaware under the name of Thermo Luxembourg Holding LLC]	Luxembourg	100
Thermo MT II Limited [.0000003% by Thermo MT II LLC]	Malta	99.9999997
Thermo MT II LLC	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Luxembourg U.S. S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Asset Management 1 GmbH	Germany	100
Thermo Fisher Scientific Asset Management 2 GmbH	Germany	100
Thermo Fisher Scientific Vector Senior Holdings II UAB	Lithuania	100
Thermo Fisher Scientific Vector Senior Holdings I UAB	Lithuania	100
Thermo Fisher Scientific Vector Holdings UAB	Lithuania	100
Thermo Fisher Scientific Vector Holdings LLC	Delaware	100
Thermo Fisher Scientific Vector Holdings 2 LLC	Delaware	100
FB2 Blocker, LLC	Delaware	100
TFS Brammer Holding Corporation [43.18% by Thermo Fisher Scientific Vector Holdings LLC]	Delaware	56.82
Brammer Bio Holding Company, LLC	Delaware	100
Brammer Bio, LLC	Delaware	100
Brammer Bio MA, LLC	Delaware	100
Thermo Fisher Scientific Biosciences Corp.	Canada	100
Oxoid Investments GmbH	Germany	100
B.R.A.H.M.S. GmbH [5.025% by Phadia GmbH]	Germany	94.975
B.R.A.H.M.S. Biotech GmbH [6% held privately]	Germany	94
Cezanne S.A.S.	France	100
B.R.A.H.M.S. UK Ltd	England	100
Thermo Fisher Scientific Luxembourg German Holdings S.a.r.l.	Luxembourg	100
Dionex (UK) Limited [.10% by Dionex Corporation]	England	99.90
Thermo Fisher Scientific Chromatography Holdings S.à r.l. [5.28% by Oxoid Investments GmbH]	Luxembourg	94.72
Thermo Fisher Scientific Chromatography Holdings Aps	Denmark	100
Dionex Corporation	Delaware	100
Thermo Fisher Scientific Pte. Ltd.	Singapore	100
Dionex Sweden AB	Sweden	100
Dionex I, LLC	Delaware	100
Dionex (Switzerland) AG	Switzerland	100
Dionex Canada Ltd.	Canada	100
Dionex Austria GmbH	Austria	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Dionex Benelux B.V.	Netherlands	100
Dionex Holding GmbH	Germany	100
Dionex Softron GmbH	Germany	100
Dionex Singapore Pte Ltd.	Singapore	100
Thermo Fisher Scientific Korea Ltd.	Korea	100
Dionex S.A.	France	100
Thermo Fisher Diagnostics (Ireland) Limited	Ireland	100
Dionex S.p.A. [.08% held privately]	Italy	99.92
Dionex China Limited	Hong Kong	100
Thermo Fisher (China) Analytical Ltd.	China	100
Thermo Fisher Scientific Taiwan Co., Ltd.	Taiwan	100
Dionex Denmark A/S	Denmark	100
Thermo Fisher Scientific (Breda) Holding BV	Netherlands	100
Thermo Luxembourg S.a.r.l.	Luxembourg	100
Thermo TLH L.P. [.01% by Thermo TLH (U.K.) Limited]	Delaware	99.99
Thermo TLH (UK) Limited	England	100
Thermo TLH (MT) Limited [.000003% by Thermo TLH L.P.]	Malta	99.999997
Thermo TLH Luxembourg S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific IT Services GmbH	Germany	100
Thermo Fisher Scientific GmbH	Germany	100
BmT GmbH Laborprodukte	Germany	100
Thermo Fisher Scientific (Real Estate 1) S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Messtechnik GmbH [10.04% by Thermo Fisher Scientific (Real Estate 1) GmbH & Co. KG]	Germany	89.96
Thermo Electron (Karlsruhe) GmbH [10% by Thermo Fisher Scientific (Real Estate 1) GmbH & Co. KG]	Germany	90
Thermo Electron Pension Trust GmbH	Germany	100
Thermo Fisher Scientific (Real Estate 1) GmbH & Co. KG [0% by Fisher Scientific Germany Beteiligungs GmbH as the General Partner]	Germany	100
Thermo Fisher Scientific (Bremen) GmbH [10% by Thermo Fisher Scientific (Real Estate 1) GmbH & Co. KG]	Germany	90
La-Pha-Pack GmbH	Germany	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Electron LED GmbH [10% by Thermo Fisher Scientific (Real Estate 1) GmbH & Co. KG]	Germany	90
Oxoid Deutschland GmbH	Germany	100
Thermo Fisher (Kandel) GmbH	Germany	100
Thermo Fisher Diagnostics sp. z o.o	Poland	100
Microgenics B.V. & Co. KG [.01% by Thermo Fisher Germany B.V.]	Germany	99.9
Advanced Scientifics International, Inc.	Pennsylvania	100
Advanced Scientifics, Inc.	Pennsylvania	100
Avances Cientificos de Mexico, S. de R.L. de C.V. [1.005% by Advanced Scientifics International, Inc.]	Mexico	98.995
Barnstead Thermolyne LLC	Delaware	100
Thermo Fisher Scientific China Holdings I B.V.	Netherlands	100
Thermo Fisher Scientific China Holdings II B.V.	Netherlands	100
Thermo Fisher Scientific China Holdings III B.V.	Netherlands	100
Thermo Fisher China Business Trust [1% by Thermo Fisher Scientific China Holdings IV B.V.]	China	99
Thermo Fisher Scientific China Holdings IV B.V.	Netherlands	100
Fisher Scientific International LLC	Delaware	100
TFS (Barbados) I Srl	Barbados	100
Thermo Fisher Scientific Powder Holdings III	Cayman Islands	100
Thermo Fisher Scientific Powder Holdings IV	Cayman Islands	100
NERL Diagnostics LLC	Wisconsin	100
FHP LLC	Delaware	100
Alchematrix, Inc.	Delaware	100
Fisher Internet Minority Holdings L.L.C.	Delaware	100
Alchematrix LLC	Delaware	100
Apogent Technologies Inc.	Wisconsin	100
Apogent Holding Company	Delaware	100
Niton Asia Limited	Hong Kong	100
Matrix Technologies LLC	Delaware	100
Molecular BioProducts, Inc.	California	100
Intrinsic BioProbes, Inc.	Arizona	100
Labomex MBP, S. de R. L. De C.V. [.04% by Apogent Technologies Inc.]	Mexico	99.96

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
National Scientific Company	Wisconsin	100
Lab-Chrom-Pack LLC	New York	100
Robbins Scientific LLC	California	100
Apogent Transition Corp.	Delaware	100
Erie Scientific LLC	Delaware	100
Thermo Fisher TDI Holding LLC	Delaware	100
TFLP LLC [.061140% by Thermo Fisher Scientific Inc., .000001% by Apogent Technologies Inc., .000060% by Fisher Scientific Worldwide Inc., and 9.993898% by Fisher WWD Holding L.L.C.]	Delaware	89.944901
Thermo Fisher Scientific AL-1 LLC	Delaware	100
Thermo Fisher Scientific Life Holdings III C.V. LLC [33.19378799% by Erie Scientific LLC, 22.31855864% by Thermo Fisher Scientific Inc., and .00000002% by Thermo Fisher Scientific AL-1 LLC]	Delaware	44.48765335
TFS Group Holdings III LLC	Delaware	100
Metavac LLC	Delaware	100
Abgene Inc.	Delaware	100
Apogent Finance Company	Delaware	100
Capitol Vial, Inc.	Alabama	100
Capitol Scientific Products, Inc.	New York	100
Chase Scientific Glass, Inc. [50% by Apogent Holding Company]	Wisconsin	50
EP Scientific Products LLC	Delaware	100
Erie Scientific Company of Puerto Rico	Delaware	100
Erie Scientific Hungary Ipari és Szolgáltató Kft	Hungary	100
Erie UK Holding Company	Delaware	100
Erie LP Holding LLC	Delaware	100
Fisher Scientific Investments (Cayman), Ltd.	Cayman Islands	100
Thermo Fisher Scientific Erie Financing (Barbados) SRL	Barbados	100
Erie U.K. Limited	England	100
Nalge Nunc International Corporation	Delaware	100
Epsom Glass Industries Limited	England	100
Thermo Fisher Scientific (Monterrey), S. De R.L. De C.V. [1% by Nalge Nunc International (Monterrey) LLC]	Mexico	99
236 Perinton Parkway, LLC	New York	100
ARG Services LLC	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Owl Separation Systems LLC	Wisconsin	100
Nalge Nunc International (Monterrey) LLC	Delaware	100
Erie UK Senior Holding Limited [1.01% by Erie LP Holding LLC]	England	98.99
LambTrack Limited	England	100
Erie UK 2 Limited	England	100
Thermo BioSciences Holdings LLC	Delaware	100
Pierce Biotechnology, Inc.	Delaware	100
Perbio Science, Inc.	Delaware	100
Pierce Milwaukee, Inc.	Delaware	100
Pierce Milwaukee Holding Corp.	Delaware	100
Thermo Fisher Scientific (Milwaukee) LLC [1% by Pierce Milwaukee, Inc.]	Delaware	99
Advanced Biotechnologies Limited	England	100
Abgene Limited	England	100
Apogent U.K. Limited	England	100
Matrix Technologies Corporation Limited	England	100
Chromacol Limited	England	100
Ever Ready Thermometer Co., Inc.	Wisconsin	100
Samco Scientific LLC	Delaware	100
Samco Scientific (Monterrey) LLC	Delaware	100
Seradyn Inc.	Delaware	100
Applied Scientific Corporation	California	100
Cellomics, Inc.	Delaware	100
CTPS LLC	Delaware	100
Clintrak Pharmaceutical Services, LLC	Delaware	100
Fisher Clinical Services (Bristol), LLC	Delaware	100
Clintrak Clinical Labeling Services, LLC	Delaware	100
Columbia Diagnostics, Inc.	Delaware	100
Drakeside Real Estate Holding Company LLC	Delaware	100
Duke Scientific Corporation	California	100
Fisher Clinical Services Inc.	Pennsylvania	100
Eutech Instruments Pte Ltd.	Singapore	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific Brasil Serviços de Logística Ltda [.001% by Fisher BioServices Inc.]	Brazil	99.999
Fisher BioServices Inc.	Virginia	100
Southern Trials (Pty) Ltd.	South Africa	100
Schantz Road LLC	Pennsylvania	100
Specialty (SMI) Inc.	California	100
Fisher Hamilton China Inc.	Delaware	100
Fisher Scientific Brazil Inc.	Delaware	100
Systems Manufacturing Corporation	Delaware	100
Fisher Scientific Central America Inc.	Delaware	100
Fisher Scientific Chile Inc.	Delaware	100
Consultores Fisher Scientific Chile Ltd [50% by Fisher Scientific Worldwide Inc.]	Chile	50
Fisher Scientific Colombia Inc.	Delaware	100
Fisher Scientific Company L.L.C.	Delaware	100
Fisher Scientific Costa Rica Sociedad de Responsabilidad Limitada	Costa Rica	100
Thermo Fisher Scientific Brahms LLC	Delaware	100
Biochemical Sciences LLC	Delaware	100
Fisher Scientific de Mexico S.A.	Mexico	100
Medical Analysis Systems, Inc.	Delaware	100
Medical Analysis Systems International, Inc.	California	100
Medical Diagnostics Systems, Inc.	California	100
United Diagnostics, Inc.	Delaware	100
Fisher Scientific Latin America Inc.	Delaware	100
Fisher Scientific Mexico Inc.	Delaware	100
FS Mexicana Holdings LLC [.01% by Fisher Scientific Mexicana, S. de R.L. de C.V]	Delaware	99.99
Fisher Alder S. de R.L. de C.V. [.0020% by Fisher Scientific International LLC]	Mexico	99.9980
Fisher Hamilton Mexico LLC	Delaware	100
Fisher Scientific Mexicana, S. de R.L. de C.V. [.01% by Fisher Scientific Worldwide Inc.]	Mexico	99.99
FS Casa Rocas Holdings LLC [1% by Fisher Mexico, S. de R.L. de C.V]	Delaware	99
Fisher Mexico, S. de R.L. de C.V. [.0000269% by FS Casa Rocas Holdings LLC]	Mexico	99.9999731

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Fisher Scientific Middle East and Africa Inc.	Delaware	100
Fisher Scientific Operating Company	Delaware	100
Fisher Scientific Venezuela Inc.	Delaware	100
Fisher Scientific Worldwide (Shanghai) Co., Ltd.	China	100
FRC Holding Inc., V	Delaware	100
Golden West Indemnity Company Limited	Bermuda	100
Liberty Lane Real Estate Holding Company LLC	Delaware	100
New FS Holdings Inc.	Delaware	100
Hangar 215, Inc.	Delaware	100
Fisher Scientific Worldwide Inc.	Delaware	100
Spectra-Physics Holdings USA, LLC	Delaware	100
Thermo Fisher Scientific Powder Holdings I	Cayman Islands	100
Thermo Fisher Scientific Powder Holdings II [11.76% by Thermo Fisher Scientific Powder Holdings IV]	Cayman Islands	88.24
Thermo Fisher Scientific Powder SRL	Barbados	100
Thermo Fisher Scientific Powder US Holdings Limited	England	100
Thermo Fisher Scientific Powder US Holdings Corp.	Delaware	100
Thermo Fisher Scientific Japan Holdings II LLC	Delaware	100
Thermo Fisher Scientific Japan Holdings I LLC	Delaware	100
PPD, Inc.	Delaware	100
Eagle Holding Company II, LLC	Delaware	100
Jaguar Holding Company I, LLC	Delaware	100
Jaguar Holding Company II	Delaware	100
Jaguar (Barbados) Finance SRL	Barbados	100
Wildcat Acquisition Holdings (UK) Limited	England	100
Pharmaceutical Product Development, LLC	Delaware	100
Synexus Clinical Research Topco Limited	England	100
PPD Vaccines and Biologics, LLC	Pennsylvania	100
Synexus Compass, Inc. (fmr. Synarc Inc.)	Delaware	100
MediciGroup, Inc.	Pennsylvania	100
Compass Research, LLC	Florida	100
The Compass Clinic, LLC	Florida	100
Compass NeuroHealth, LLC	Florida	100
NeuroHealth, Inc.	Florida	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Center for Clinical and Basic Research A/S	Denmark	100
UAB Center for Clinical and Basic Research	Lithuania	100
UAB DDF Properties LT	Lithuania	100
CCBR (Beijing) Company Limited	China	100
PPD Services, Inc.	North Carolina	100
PPD Investigator Services, LLC	Delaware	100
Synexus Clinical Research US, Inc.	Arizona	100
Optimal Research, LLC	Maryland	100
PPD Global Central Labs, LLC	Kentucky	100
Applied Bioscience International, LLC	Delaware	100
PPD GP, LLC	Delaware	100
PPD Holdings, LLC	Delaware	100
PPD Development, L.P. [.1% by PPD GP, LLC]	Delaware	99.9
PPD Aeronautics Corporation	Delaware	100
PPD Aeronautics, LLC	North Carolina	100
River Ventures, LLC	North Carolina	100
Pharmaco Investments, Inc.	Delaware	100
Acurian, Inc.	Delaware	100
Panoply Health Limited	England	100
APBI Finance Corporation	Delaware	100
PPD CT Investments LLP [20% by PPD International Holdings, LLC]	England	80
ATP, LLC	North Carolina	100
Evidera, Inc.	Delaware	100
0972792 B.C. LTD	Canada	100
Evidera Holdings Ltd	England	100
Evidera Access Consulting Ltd	England	100
Evidera Ltd	England	100
PPD International Holdings, LLC	Delaware	100
PPD Scandinavia AB	Sweden	100
PPD Pharmaceutical Development Japan K.K.	Japan	100
PPD-SNBL K.K. [40% by Shin Nippon Biomedical Laboratories, Ltd.]	Japan	60

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
PPD Peru S.A.C. [.01% by Applied Bioscience International, LLC]	Peru	99.99
PPD Mexico S.A. de C.V. [.002% by PPD Development, L.P.]	Mexico	99.998
PPD Italy S.r.l	Italy	100
PPD International Holdings, Inc. y Compania Limitada [1 % Applied Bioscience International, LLC]	Chile	99
PPD International Holdings (UK) Ltd	England	100
PPD Switzerland GmbH	Switzerland	100
PPD International Investments Limited [.4% by AbC.R.O., Inc.]	England	99.6
LLC PPD Ukraine	Ukraine	100
Clinical Technology Centre (International) Limited	England	100
Synexus Clinical Research Midco No1 Limited	England	100
Synexus Clinical Research Acquisitions Limited	England	100
Synexus Clinical Research Limited	England	100
Synexus Clinical Research South Africa (Pty) Limited	South Africa	100
Synexus Clinical Research GmbH	Germany	100
Synexus Czech s.r.o.	Czech Republic	100
Synexus Limited	England	100
Synexus Magyarorszg Egszsggyi Szolgltat Korltolt Felelssg Trsasg	Hungary	100
Synexus Polska Sp. Z o.o	Poland	100
Synexus Ukraine Limited Liability Company [1% by Synexus Clinical Research Acquisitions Limited]	Ukraine	99
Synexus Bulgaria EOOD	Bulgaria	100
Medical Centre Synexus Sofia EOOD	Bulgaria	100
PPD UK Holdings Limited	England	100
PPD Slovak Republic s.r.o. [15% by PPD Global Ltd]	Slovak Republic	85
PPD Pharmaceutical Development Vietnam Company Limited	Vietnam	100
PPD Pharmaceutical Development India Private Limited [.01% by PPD Global Ltd.]	India	99.99

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
PPD Serbia D.O.O. Beograd	Serbia	100
PPD Latvia SIA	Latvia	100
PPD Global Ltd.	England	100
PPD Global Central Labs BVBA [.1% by PPD Global Ltd]	Belgium	99.9
PPD Laboratories (Suzhou) Co., Ltd.	China	100
PPD Global Central Labs (S) Pte. Ltd.	Singapore	100
PPD Development Ireland Limited	Ireland	100
PPD Development (S) Pte. Ltd.	Singapore	100
PPD Pharmaceutical Development (Beijing) Co., Ltd.	China	100
PPD Development (HK) Limited. [50% by Applied Bioscience International, LLC]	Hong Kong	50
PPD Colombia S.A.S	Colombia	100
PPD Bulgaria EOOD	Bulgaria	100
PPD (Netherlands) B.V.	Netherlands	100
PPD Pharmaceutical Development Philippines Corp. [.0001% held privately]	Philippines	99.9999
Shorecloud Corporation [.0001% held privately]	Philippines	99.9999
PPD International Holdings GmbH	Germany	100
PPD Poland Sp.Z o.o.	Poland	100
PPD Hungary Research and Development Ltd. [3.33% by PPD International Holdings, LLC]	Hungary	96.67
PPD Germany GmbH & Co. KG [28% by PPD Germany GmbH]	Germany	72
PPD Germany GmbH	Germany	100
PPD Czech Republic S.R.O. [2.22% by PPD International Holdings, LLC]	Czech Republic	97.78
PPD France SAS	France	100
Greenbird Limited	Cyprus	100
Limited Liability Company PPD Development (Smolensk)	Russia	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Limited Liability Company Contract Research Organisation Innopharm	Ukraine	100
Excel PharmaStudies Inc.	Cayman Islands	100
Clinical Technology Centre (Ireland) Limited	Ireland	100
PPD Guatemala, S.A. [1.0% by Applied Biosciences International, LLC]	Guatemala	99
PPD do Brasil- Suporte a Pesquisa Clinica Ltd [.00002% by Pharmaceutical Product Development, LLC]	Brazil	99.99998
Medimix Latam Pesquisa de Mercado Ltda	Brazil	100
PPD Development (Thailand) Co., Ltd. [.0025% by PPD Development (S) Pte. Ltd. and .0025% by PPD UK Holdings Limited]	Thailand	99.995
PPD Canada	Canada	100
PPD Australia Pty Limited	Australia	100
PPD Argentina S.A. [5% by Applied Bioscience International, LLC]	Argentina	95
Pharmaceutical Product Development Spain SL [.763% by PPD Development, L.P.]	Spain	99.237
Pharmaceutical Product Development South Africa (Proprietary) Ltd	South Africa	100
AbC.R.O., Inc.	Virginia	100
PPD Romania SRL [.67% by PPD Bulgaria EOOD]	Romania	99.33
PPD Hrvatska d.o.o.	Croatia	100
FSIR Holdings (US) Inc. [1.265% by Fisher Clinical Services Inc.]	Delaware	98.735
Liberty Lane Investment LLC	Delaware	100
Fisher Scientific Holding Company LLC	Delaware	100
Fisher Manufacturing (Malaysia) Sdn Bhd	Malaysia	100
Bumi-Sans Sendirian Berhad	Malaysia	100
Fisher Scientific (M) Sdn Bhd	Malaysia	100
General Scientific Company Sdn Bhd (M)	Malaysia	100
Fisher Scientific Holdings (S) Pte Ltd	Singapore	100
Fisher Scientific Pte. Ltd. [16.57% by Fisher Scientific International LLC]	Singapore	83.43
Fisher Scientific (SEA) Pte. Ltd.	Singapore	100
Fisher Scientific Australia Pty Limited	Australia	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
FSIR Holdings (UK) Limited	England	100
FSWH Company LLC	Delaware	100
FSI Receivables Company LLC	Delaware	100
Fisher Bermuda Holdings Limited	Bermuda	100
Thermo Fisher Scientific FSIR Financing (Barbados) SRL	Barbados	100
Thermo Fisher Scientific FSIR Financing S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific FSIR Holdings (UK) Financing Limited	England	100
Fisher Scientific Worldwide Holdings I C.V. [12% by Fisher Scientific Worldwide Inc.]	Netherlands	88
Finesse Solutions, Inc.	Delaware	100
Finesse Scientific Equipment (Shanghai) Co., Ltd.	China	100
FSWH International Holdings LLC	Delaware	100
Thermo Fisher Scientific Life Investments US Financing I LLC [1% by FSIR Holdings (US) Inc.]	Delaware	99
Phadia International Holdings LP [10% by FSIR Holdings (US) Inc.]	England	90
Thermo Fisher Scientific BV	Belgium	100
PharmaFluidics NV	Belgium	100
Thermo Fisher Scientific Worldwide Investments (Cayman)	Cayman Islands	100
Thermo Fisher Scientific Worldwide Investments (Luxembourg) S.a.r.l.	Luxembourg	100
Thermo Fisher Scientific Investments (Sweden) S.a.r.l. [16.086% by CHK Holdings Inc.]	Luxembourg	83.914
Thermo Fisher Scientific Denmark Senior Holdings ApS	Denmark	100
Fisher Scientific Holding HK Limited [.01% by Fisher Scientific Holding Company LLC]	Hong Kong	99.99
Fisher Scientific (Hong Kong) Limited [.022% Fisher Scientific Holding Company LLC]	Hong Kong	99.978
Fisher Scientific Japan, Ltd.	Japan	100
Fisher Scientific Korea Ltd	Korea	100
Fisher WWD Holding L.L.C.	Delaware	100
Kyle Jordan Investments LLC	Delaware	100
Pacific Rim Far East Industries LLC	Delaware	100
Pacific Rim Investment, LLC	Delaware	100
Marketbase International Limited	Hong Kong	100
Thermo-Fisher Biochemical Product (Beijing) Co., Ltd.	China	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
HighChem s.r.o.	Slovakia	100
Thermo Fisher Scientific HR Services Mexico, S. de R.L. de C.V. [1% by Fisher Clinical Services (Mexico) LLC]	Mexico	99
Thermo Fisher Scientific China (C-I) LLC	Delaware	100
Shanghai Thermo Fisher (C-I) Trading Co. Ltd	China	100
Pasteur Acquisition SRL	Barbados	100
Thermo Fisher Scientific China (S) LLC	Delaware	100
Shanghai Thermo Fisher (S) Trading Co. Ltd	China	100
Molecular Transfer, Inc.	Delaware	100
Thermo Fisher Scientific Cyprus I Ltd	Cayman Islands	100
Thermo Fisher Scientific Cyprus II Ltd	Cayman Islands	100
Thermo Fisher Scientific India Holding LLC	Delaware	100
Thermo Fisher Scientific Cyprus III Ltd	Cayman Islands	100
Thermo Fisher Scientific PSG Corporation	Delaware	100
Fisher BioSciences Japan G.K.	Japan	100
Fisher Clinical Services Japan K.K.	Japan	100
Thermo Fisher Detection Mexico LLC	Delaware	100
Thermo Fisher Costa Rica Sociedad de Responsabilidad Limitada [1% by Fisher Scientific Company L.L.C.]	Costa Rica	99
Thermo Fisher Scientific South Africa Proprietary Ltd	South Africa	100
Thermo Fisher Biopharma Services Pte. Ltd.	Singapore	100
Thermo Services (Hungary) Kft	Hungary	100
Erie UK 1 Limited	England	100
Erie UK 5 Limited	England	100
Erie UK 6 Limited	England	100
Erie US II LLC	Delaware	100
Erie Finance Holding Limited	England	100
Erie Finance Limited	England	100
Erie Finance 2 Limited	England	100
Erie Finance 1 Limited	England	100
Erie (GC) Holding Limited [1% by Erie US III LLC]	England	99
Erie UK 3 Limited	England	100
Erie GC Holding LLC	Delaware	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Erie GC Limited	England	100
Erie US III LLC	Delaware	100
Quebec Court B.V. [5.71% by Erie Finance Limited]	Netherlands	94.29
Quebec B.V.	Netherlands	100
Thermo Fisher Scientific Powder LLC	Delaware	100
Thermo Fisher Scientific (Finance I) B.V.	Netherlands	100
Thermo Fisher Scientific Erie Financing S.a r.l	Luxembourg	100
Erie Luxembourg LLC	Delaware	100
Thermo Fisher Scientific Erie 1 Financing (Barbados) SRL	Barbados	100
Thermo Fisher Scientific EMEA Limited	Ireland	100
Oncomine Molecular Inc.	Delaware	100
Oncomine LLC	Delaware	100
Oncomine India Private Limited [.01% by Oncomine Molecular Inc.	India	99.99
Oncomine	France	100
Oncomine Limited	England	100
Oncomine ULC	Canada	100
Oncomine Pte. Ltd	Singapore	100
Oncomine Molecular, S.L	Spain	100
Oncomine S.r.l	Italy	100
Oncomine K.K.	Japan	100
Thermo FLC LP [42.78% By Thermo Fisher Scientific FLC LLC]	Delaware	57.22
Thermo Fisher Scientific Brussels B.V.	Belgium	100
Mesa Biotech, Inc.	Delaware	100
Fisher Clinical Services (Peru) LLC	Delaware	100
Fisher Clinical Services Peru S.R.L [1% by Thermo Fisher Scientific Inc.]	Peru	99
Henogen SRL	Belgium	100
Ginko Park SA	Belgium	100
Thermo USC II LLC	Delaware	100
Thermo Fisher Scientific Life Sciences COE Corporation	Delaware	100
Thermo Fisher Scientific Life Investments IV S.a.r.l	Luxembourg	100

NAME	STATE OR JURISDICTION OF ORGANIZATION	PERCENT OF OWNERSHIP
Thermo Fisher Scientific PRB Malta Limited [.03997% by Thermo Fisher Scientific PRB LLC]	Malta	99.96003
Thermo Fisher Scientific PRB LLC	Delaware	100
Thermo Fisher Scientific Spectra Malta Limited [.03997% by Thermo Fisher Scientific Spectra LLC]	Malta	99.96003
Thermo Fisher Scientific Spectra LLC	Delaware	100
Thermo Fisher Scientific Spectra-Physics Investments Malta Limited [.0000011% by Spectra-Physics Holdings USA, LLC]	Malta	99.9999989
PeproTech, Inc.	New Jersey	100
PeproTech EC Ltd.	England	100
PeproTech France	France	100
PeproTech GmbH	Germany	100
PeproTech Asia Ltd	Israel	100
PeproTech BioTech (Suzhou) Co., Ltd.	China	100
PeproTech Korea	Korea	100
MLS ACQ, Inc.	Delaware	100

Exhibit 22

Subsidiary Issuer of Guaranteed Securities

Thermo Fisher Scientific Inc. (the "Registrant") is the guarantor of the senior secured registered notes listed below issued by Thermo Fisher Scientific (Finance I) B.V., a wholly-owned finance subsidiary of the Registrant.

Thermo Fisher Scientific (Finance I) B.V.

0.800% Senior Notes due 2030

1.125% Senior Notes due 2033

1.625% Senior Notes due 2041

2.000% Senior Notes due 2051

Floating Rate Senior Notes due 2023

0.000% Senior Notes due 2023

0.000% Senior Notes due 2025

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-3 (No. 333-263034) and Form S-8 (Nos. 33-51189, 33-54347, 333-146068, 333-152344, 333-161939, 333-188846, 333-220231 and 333-261548) of Thermo Fisher Scientific Inc. of our report dated February 23, 2023 relating to the financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts
February 23, 2023

Exhibit 31.1

THERMO FISHER SCIENTIFIC INC.

CERTIFICATION REQUIRED BY EXCHANGE ACT RULES 13a-14(a) and 15d-14(a),
AS ADOPTED PURSUANT TO
SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Marc N. Casper, certify that:

1. I have reviewed this Annual Report on Form 10-K of Thermo Fisher Scientific Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 23, 2023

/s/ Marc N. Casper

Marc N. Casper
Chairman, President and Chief Executive Officer

Exhibit 31.2

THERMO FISHER SCIENTIFIC INC.

CERTIFICATION REQUIRED BY EXCHANGE ACT RULES 13a-14(a) and 15d-14(a),
AS ADOPTED PURSUANT TO
SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Stephen Williamson, certify that:

1. I have reviewed this Annual Report on Form 10-K of Thermo Fisher Scientific Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 23, 2023

/s/ Stephen Williamson

Stephen Williamson
Senior Vice President and Chief Financial Officer

Exhibit 32.1

THERMO FISHER SCIENTIFIC INC.

CERTIFICATION REQUIRED BY EXCHANGE ACT RULES 13a-14(b) and 15d-14(b),
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report on Form 10-K of Thermo Fisher Scientific Inc. (the "Company") for the period ended December 31, 2022 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Marc N. Casper, Chairman, President and Chief Executive Officer of the Company, hereby certifies, pursuant to Securities Exchange Act of 1934 Rules 13a-14(b) and 15d-14(b), that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

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

Dated: February 23, 2023

/s/ Marc N. Casper

Marc N. Casper
Chairman, President and Chief Executive Officer

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to Thermo Fisher Scientific Inc. and will be retained by Thermo Fisher Scientific Inc. and furnished to the Securities and Exchange Commission or its staff upon request.

Exhibit 32.2

THERMO FISHER SCIENTIFIC INC.

CERTIFICATION REQUIRED BY EXCHANGE ACT RULES 13a-14(b) and 15d-14(b),
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report on Form 10-K of Thermo Fisher Scientific Inc. (the "Company") for the period ended December 31, 2022 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Stephen Williamson, Senior Vice President and Chief Financial Officer of the Company, hereby certifies, pursuant to Securities Exchange Act of 1934 Rules 13a-14(b) and 15d-14(b), that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

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

Dated: February 23, 2023

/s/ Stephen Williamson

Stephen Williamson
Senior Vice President and Chief Financial Officer

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to Thermo Fisher Scientific Inc. and will be retained by Thermo Fisher Scientific Inc. and furnished to the Securities and Exchange Commission or its staff upon request.