Combined Management Report*

* The management report of Merck KGaA, Darmstadt, Germany, has been combined with the Group management report and published in the 2023 Annual Report of Merck KGaA, Darmstadt, Germany, as well as in the annual financial statements of Merck KGaA, Darmstadt, Germany. The management report also contains the combined non-financial (Group) statement of Merck KGaA, Darmstadt, Germany, which we issue pursuant to sections 289b–289e and 315b–315c HGB. The 2023 Annual Report is an additional, non-official publication, which does not comply with the requirements of the European Single Electronic Format (ESEF). The official annual financial report for fiscal 2023, prepared in accordance with the ESEF format, has been filed with the electronic German Federal Gazette (elektronischer Bundesanzeiger) and is available on the **website of the German company register**.
This combined management report contains certain financial indicators such as operating result (EBIT), EBITDA, EBITDA pre, net financial debt and earnings per share pre, which are not defined by International Financial Reporting Standards (IFRS). These financial indicators should not be taken into account in order to assess the performance of the Group in isolation or used as an alternative to the financial indicators presented in the consolidated financial statements and determined in accordance with IFRSs.
The figures presented in this combined management report have been rounded. This may lead to individual values not adding up to the totals presented.
The Statement of Corporate Governance according to section 315d HGB in conjunction with section 289f (1) sentence 2 HGB is available at **https://www.emdgroup.com/en/investors/corporate-governance/reports.html**.
It is our aim to ensure that our communication is inclusive and so we strive to use language that is both non-discriminatory and easy to read. This report attempts to use gender-neutral language, which may not yet be consistent in all instances. Even if masculine forms are used, all genders are explicitly meant.

[1] German Commercial Code.

Fundamental information about the Group

The Group

We are a science and technology company. We are pioneers of human progress, driven by our curiosity. We are working toward a better future in a special organizational setup and are bringing together different disciplines under one roof with the three business sectors Life Science, Healthcare and Electronics.

Our Life Science business sector provides the tools, high-grade chemicals and consumables that accelerate scientific breakthroughs and enable the biopharmaceutical industry to ensure that medicines are safe and effective for a global population.

In our Healthcare business sector, we advance innovation through our research, enable life-changing therapies for serious illnesses, treat patients with cancer, cardiovascular, diabetes, thyroid disorders, and multiple sclerosis, and help people to realize their wish to have a child.

In our Electronics business sector, we are the company behind the companies, advancing digital living. Our semiconductor and display solutions are used in the manufacture of many components for electronic devices. We are thus changing the way in which information is processed and made accessible.

In addition, our specialists also explore visionary new solutions at the interfaces of our three diversified business sectors.

Ever since we were established in 1668, we have continuously reinvented ourselves and adopted a long-term mindset. This approach is rooted in responsibility, care and respect: for our work, our employees, our customers, patients, society, and our planet. We want to become the global 21st century science and technology pioneer and are committed to working towards a better future: sustainable progress for humankind.

The founding family, now in the 13th generation, is still the majority owner. This is made possible by our company structure: a corporation with general partners (Kommanditgesellschaft auf Aktien – KGaA). In a KGaA, the total capital is divided between general partners and limited partners. The founding family holds a 70.274% stake in the listed Merck Kommanditgesellschaft auf Aktien, Darmstadt, Germany (Merck KGaA, Darmstadt, Germany), as general partner via the Group's ultimate parent company, E. Merck Kommanditgesellschaft, Darmstadt, Germany. The remaining 29.726% of the share capital of Merck KGaA, Darmstadt, Germany, is traded on the regulated market of the Frankfurt Stock Exchange and other stock exchanges.

The assessment of business development and the allocation of financial resources are carried out by the entire management of the company for the Life Science, Healthcare and Electronics business sectors as well as the supporting corporate functions. In addition to the Chair of the Executive Board and CEO Belén Garijo, the Members of the Executive Board are Matthias Heinzel, CEO Life Science, Peter Guenter, CEO Healthcare, Kai Beckmann, CEO Electronics, and Helene von Roeder, Chief Financial Officer (CFO). Helene von Roeder was appointed CFO as of July 1, 2023, succeeding Marcus Kuhnert on the Executive Board of the Group.

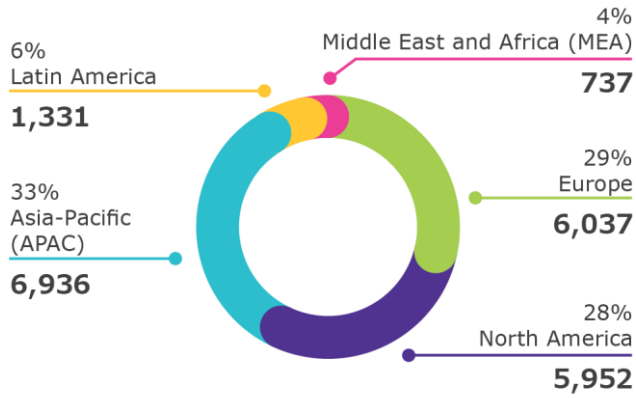
Merck KGaA, Darmstadt, Germany, holds the global rights to the company name and brand. The only exceptions are Canada and the United States. In these countries, we operate as MilliporeSigma in the Life Science business, as EMD Serono in the Healthcare business and as EMD Electronics in the Electronics business.

Apart from our three business sectors, our financial reporting presents five regions: Europe, North America, Asia-Pacific, Latin America, the Middle East and Africa. As of December 31, 2023, we had 62,908 employees[1] worldwide. The figure as of December 31, 2022, was 64,232 employees[1]. We have summarized further details on our employee structure and important aspects such as Diversity, Equity, and Inclusion in the "**Non-Financial Statement**".

For fiscal 2023, we exercise the option of publishing the Statement on Corporate Governance on the Group's website in accordance with section 315d HGB in conjunction with section 289f (1) sentence 2 HGB. It is available at **https://www.emdgroup.com/en/investors/corporate-governance/reports.html**.

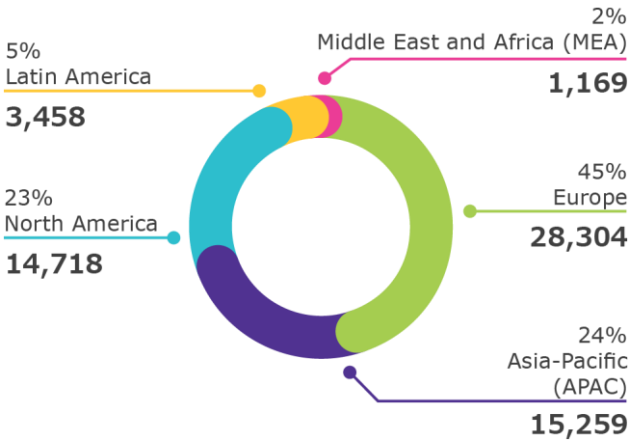
Group

Net sales by region
€ million/in % of net sales



Group

Employees by region as of December 31, 2023[1]
Number/in %



[1] Our company also employs people at sites of subsidiaries that are not fully consolidated. This number refers to people employed in fully consolidated subsidiaries.

Life Science

We are a leading global provider of products and services for a wide range of customers, including research labs, biotech and pharmaceutical companies, diagnostic labs, and the industrial sector.

Across our Life Science business sector, we collaborate with the global scientific community to deliver innovations and to this end, we offer a broad and deep product portfolio as well as global Contract Testing Development Manufacturing Organization (CTDMO) services ranging from process development to commercialization. In 2023, we continued to execute our strategy as a diversified life science company to strengthen our three business units, Process Solutions, Life Science Services, and Science & Lab Solutions. Our R&D teams in the three business units have launched more than 8,500 products to respond to growth trends, including those launched through our "faucet program" for antibodies, reference materials and nanomaterials.

In 2023, Life Science generated 44% of Group sales and 45% of EBITDA pre (excluding Corporate and Other). In recent years, we have steadily expanded our presence in growth markets. Europe and North America generated 70% of Life Science's sales in 2023; Asia-Pacific and Latin America accounted for 29% of sales.

Process Solutions

The Process Solutions business unit continued to focus on delivering its product offering for the pharmaceutical development and manufacture of filtration devices, chromatography resins, single-use assemblies and systems, processing chemicals, and excipients.

Life Science Services

The Life Science Services business unit offers traditional and novel modalities, including monoclonal antibodies, high-potency active pharmaceutical ingredients (HPAPIs) and antibody-drug conjugates as well as viral and gene therapies, including mRNA. In addition to manufacturing, Life Science Services includes sales and marketing, research and development and supply chain operations. Our integrated CTDMO services support clients from preclinical phases to commercial production.

Science & Lab Solutions

The Science & Lab Solutions business unit serves customers in the pharmaceutical, biotech industries and other industries in production, testing and research, as well as public authorities and research institutions. We provide customers with access to a broad portfolio including reagents, consumables, devices, instruments, software, and services for scientific discovery in addition to lab water instruments, consumables and services, microbiology and biomonitoring products, test assays, analytical reagents, and flow cytometry kits and instruments.

In March, we opened a lateral flow assay development lab in St. Louis, Missouri, USA, an innovative space where customers collaborate with our technical experts to troubleshoot point-of-care testing.

Investments to expand capabilities and production

- We have started building a new € 30 million expansion in Allentown, Pennsylvania, USA, which will join the existing facility to create a two-building "distribution campus".
- In May, we announced an investment of € 35 million in biosafety testing facilities at our Glasgow and Stirling sites in Scotland. Biosafety testing is a step in the drug development and manufacturing process to ensure that drugs are safe, effective and compliant with regulatory requirements. Through the expansion, we plan to create nearly 500 new jobs, bringing our Life Science workforce to over 1,200 employees across the two sites.

- The investment includes a new facility in Glasgow, which will house molecular biology and sequencing services. Testing capacity in current buildings will be expanded to include biosafety testing, analytical development and viral clearance suites. The latest investment follows our recent testing expansions in Rockville, Maryland, USA, and Shanghai, China. With its BioReliance® testing services portfolio, Life Science performs more than 20,000 studies annually in the United Kingdom for more than 400 customers globally. BioReliance® contract testing services and the recently formed Millipore® CTDMO Services are part of the Life Science Services business unit.
- Also in May, we signed a non-binding memorandum of understanding with the Korean Ministry of Trade, Industry and Energy and Daejeon City, Korea, for a new Asia-Pacific bioprocessing center aimed at supporting the region's healthcare ecosystem. The planned bioprocessing facility would support commercial manufacturing for biotech and pharmaceutical customers in this region.
- In June, we announced the expansion of production capacity for highly purified reagents at the site in Nantong, China, a major transportation hub in the Yangtze River Delta region. The approximate € 70 million investment will enable large-scale manufacturing of high-purity reagents for quality control and testing for biopharma customers.
- In July, Life Science announced a € 23 million expansion of its facility in Lenexa, Kansas, USA, adding lab space and production capacity to manufacture cell culture media. Cell culture media is used in processes as varied as vaccine manufacturing, gene therapy and monoclonal antibody manufacturing. The company's strategic investments to expand capacity in existing production facilities in the Lenexa, Kansas, USA, and Nantong, China, sites with dry powder media manufacturing lines will increase both local and global production capacity.
- Since September, CTDMO can offer integrated services for all critical stages of mRNA development, manufacturing and commercialization, including products and testing, with the opening of two new GMP-grade mRNA drug substance manufacturing sites in Darmstadt and Hamburg, Germany. The new sites are part of the company's ongoing € 1 billion investment to advance mRNA technologies and build its global mRNA network and capabilities in addition to key acquisitions such as AmpTec and Exelead. With this € 28 million investment, we can provide mRNA services at different scales and applications from preclinical to commercial.
- In November, we completed the second phase of our new € 29 million Biologics Testing Center in Shanghai, China, expanding our first biosafety laboratories, which we inaugurated in 2022, in this market. This expansion enables us to provide local access to a broad range of testing for cell line characterization and lot release, from preclinical development to commercialization.

Sustainable packaging solutions*

Four years after its inception in 2019, the SMASH Packaging plan has entered its next generation, called SMASH 2.0. So far, more than 100 packaging improvement projects have been completed or are underway, removing tens of thousands of metric tons of CO_2 without sacrificing safety, quality, or performance. Key achievements include avoiding more than 300 metric tons of packaging and achieving a 23% reduction of expanded polystyrene (EPS), also known as Styrofoam. 72.5% of the paper-based materials sourced directly for packing and shipping products therefore aligns with the so-called zero deforestation standards.

Digitalization

In March, Life Science launched its open-source code library for Palantir Foundry on GitHub®. Our source code, "Foundry DevTools", was published under an open-source license in collaboration with Palantir. We have been partnering with Palantir since 2017 to build our data and analytics capabilities and contribute to the digital product portfolios of our Life Science, Healthcare and Electronics business sectors. The source code is freely accessible to all Foundry developers worldwide.

* The contents of this chapter or section are voluntary and therefore not audited. However, our auditor has read the text critically.

Healthcare

In Healthcare, we operate as a global specialty innovator in the Neurology & Immunology and Oncology franchises as well as in the therapeutic areas of fertility and cardiovascular, metabolic and endocrinological disorders. The Healthcare business sector discovers, develops, manufactures, and markets pharmaceutical and biological prescription drugs to treat cancer, multiple sclerosis (MS), infertility, and growth disorders as well as certain cardiovascular and metabolic diseases. Our R&D pipeline is focused on strengthening our position in the fields of oncology, neurology and immunology.

In 2023, Healthcare generated 38% of Group sales and 41% of EBITDA pre (excluding Corporate and Other). Europe and North America generated 53% of Healthcare's net sales in 2023. In recent years, we have steadily expanded our presence in growth markets. In 2023, Asia-Pacific and Latin America accounted for 40% of sales.

Oncology

Erbitux® (cetuximab) remains our best-selling cancer drug with € 1 billion in sales in 2023. The drug is a standard of care for patients with epidermal growth factor receptor (EGFR)-expressing, RAS wild-type metastatic colorectal cancer (mCRC) as well as both recurrent and/or metastatic and locally advanced squamous cell carcinoma of the head and neck (SCCHN). With more than 200 active clinical trials involving Erbitux®, including more than 15 Phase III studies, we are also continuously advancing our broad-based lifecycle management strategy.

We have made progress in changing the standard of care globally for patients with locally advanced or metastatic urothelial carcinoma (UC) as we continue to obtain additional regulatory approvals and reimbursement decisions for our anti-PD-L1 antibody Bavencio® (avelumab) (for further details see "**Research and Development**"). Bavencio® is approved as a first-line maintenance treatment for advanced UC in 71 countries. It has become a standard of care in the treatment of this disease based on the results of the JAVELIN Bladder 100 trial, the only Phase III study of an immunotherapy to demonstrate a significant overall survival benefit in the first-line maintenance setting.

Through our subsidiary Ares Trading SA, we regained exclusive worldwide rights to develop, manufacture and commercialize Bavencio® from Pfizer as of June 30, 2023.

Bavencio® is also approved in the first-line treatment of advanced renal cell carcinoma in combination with axitinib and it is a standard of care as a monotherapy in metastatic Merkel cell carcinoma (MCC), a rare form of skin cancer.

In September 2023, we received U.S. Food and Drug Administration approval of a supplemental Biologics Licensing Application for Bavencio®, converting the MCC indication from accelerated approval into full approval approximately four years earlier than anticipated. As a result, Bavencio® is the first MCC treatment to receive full approval in the U.S. market.

In 2023, we also continued to expand the availability of Tepmetko® (tepotinib), our oral MET inhibitor designed to inhibit the oncogenic MET receptor signaling caused by MET (gene) alterations, with additional regulatory approvals. Tepmetko® is now available in 43 markets globally.

In the therapeutic area of SCCHN, we advanced our global Phase III development program for xevinapant, an IAP (inhibitor of apoptosis protein) inhibitor in 2023, with enrollment completed in the TrilynX study. The recruitment of patients in the XRay Vision study is ongoing (for further details see "**Research and Development**").

In fiscal 2023, we also continued to advance our efforts in novel medicines. For the first antibody-drug conjugate (ADC) developed in our labs, the anti-CEACAM5 ADC M9140, we completed the dose-finding portion of our Phase I study (for further details see "**Research and Development**").

Beyond our ADC platform, we are also evaluating small-molecule DNA damage response (DDR) inhibitors as this therapeutic class has the potential for better outcomes in patients with cancer.

Within our DDR portfolio, we continue to advance the development of our potent and selective inhibitor of ataxia telangiectasia and Rad3-related (ATR), tuvusertib (M1774). We initiated the Phase Ib/IIa DDRiver NSCLC 322 study of tuvusertib in combination with cemiplimab in participants with non-squamous non-small cell lung cancer (NSCLC) (for further details see "**Research and Development**").

Neurology & Immunology

In Neurology & Immunology, we aim to provide transformative treatment solutions to support people living with neurological and immune-mediated conditions while significantly improving quality of life for them and their caregivers. With over two decades of experience in MS, our current portfolio includes two approved products for the treatment of relapsing MS (RMS) – Rebif® (interferon beta-1a) and Mavenclad® (cladribine tablets).

Rebif®, a disease-modifying drug, has been a standard treatment in RMS for over 20 years with more than 1.9 million patient-years of therapy since approval.

Mavenclad®, a short-course oral therapy for the treatment of adults with various forms of highly active RMS, reached blockbuster status in fiscal 2023 with total net sales of more than US$ 1 billion, and is approved in 95 countries worldwide, including those of the European Union, Switzerland, Australia, Canada, and the United States.

With evobrutinib, we had originally aimed to commercialize a first-in-class Bruton's tyrosine kinase (BTK) inhibitor for RMS. In December, we shared the outcome from the EVOLUTION clinical trials, which showed that the investigational drug did not meet its primary endpoint of annualized relapse rate for up to 156 weeks compared to oral teriflunomide.

Fertility

Our Fertility franchise is a global market leader in fertility drugs and treatments.

Infertility is an increasing challenge globally due to demographic changes and lifestyle adjustments such as delayed childbearing. Based on the latest data from WHO, one in six people worldwide is affected by infertility.

According to the latest data, more than five million babies have been born worldwide with the help of Gonal-f®, a therapeutic within our Fertility portfolio. It contains the active ingredient follitropin alfa (r-hFSH alfa), which is a recombinant form of the natural hormone FSH and is available in a convenient and ready-to-use pre-filled injection pen. Treatment with Gonal-f® can result in increased follicles, oocytes, and embryos compared to urinary gonadotropins, thereby improving the chances of pregnancy and live birth.

To support and meet the needs of a variety of patients, in addition to Gonal-f®, we offer another key product called Pergoveris®. It is a product that combines recombinant human follicle-stimulating hormone (r-hFSH) and recombinant human luteinizing hormone (r-hLH). This represents another treatment option for women with severe FSH and LH deficiency. Pergoveris® is also available in a ready-to-use liquid version in a pre-filled injection pen, eliminating the need for mixing.

In September 2023, we announced our new employee "Fertility Benefit" program. The new offer is available to our employees in a number of countries and to their partners, regardless of their marital status. Apart from financial assistance, we offer employees facing fertility issues additional information services related to fertility disorders.

Cardiovascular, Metabolism & Endocrinology

Cardiovascular, Metabolism & Endocrinology (CM&E), which includes the medicines Glucophage®, Euthyrox®, Concor®, and Saizen®, is the largest franchise of the Healthcare business sector in terms of sales.

Concor®/Concor Cor®, containing bisoprolol, is a beta-blocker for treating hypertension and cardiovascular diseases such as coronary heart disease and chronic heart failure. In addition to Concor®/Concor Cor®, the Concor® family includes fixed-dose combinations such as Concor Plus®/Lodoz® (bisoprolol with hydrochlorothiazide).

Euthyrox®, with the active ingredient levothyroxine, is a leading medicine for the treatment of hypothyroidism, a disease with high prevalence but still low diagnosis rates in most emerging markets.

Glucophage®, containing the active ingredient metformin, is a drug for first-line treatment of type 2 diabetes and is available in more than 100 countries. In recent financial years, Glucophage® has been approved by further health authorities for use in prediabetes when intensive lifestyle changes failed.

Saizen®, containing the active ingredient somatropin, is our main endocrinology product and is indicated for the treatment of multiple growth hormone disorders in children and adults. Saizen® can be delivered with the Easypod® electromechanical injection device, the only growth hormone injection device able to wirelessly transfer data such as injection times, dates and doses to the web-based software system Growzen® Connect. Aluetta® (the Saizen® pen) is now available in 67 countries with the objective of expanding the reach of Saizen®, offering additional options for healthcare practitioners and patients and expanding our devices portfolio.

In endocrinology, we build evidence in the digital health space and leverage technology to provide new solutions for patient engagement, partnership with healthcare practitioners and better payer value proposition.

Minimizing the ecological footprint of our operations*

We are continuously taking action to further reduce the negative ecological impact of our operations on our planet with a holistic approach that includes our locations, products, logistics and patients. A portfolio-related activity to reduce the ecological footprint of our operations is the partnership we entered in May with Novo Nordisk, Eli Lilly and Sanofi to pioneer the world's first cross-industry solution for recycling materials from injection pens after use by patients.

Denmark was chosen because of the existing recycling infrastructure in the country. Today, the four companies involved in this partnership account for around six million injection pens used in Denmark annually. The ambitious target for the first 12 months is for 25% of all injection pens distributed by the four companies in Denmark to be recycled, amounting to more than 25 metric tons of plastic.

Electronics

We are a major supplier of materials and solutions for the semiconductor and display industries. We have a portfolio of materials, systems and services as well as R&D and a global production network close to our customers. We have built our portfolio to cater to the continued digitalization and the unabated growth of data. The demand for increasingly sophisticated semiconductor chips and displays will continue to rise, not least thanks to developments such as Artificial Intelligence (AI), 5G (fifth-generation mobile networks) and autonomous driving. In recent years, we have developed into a relevant player in the global electronic materials market. In addition, we offer decorative and functional solutions for surfaces of all kinds.

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In 2021, we started our “Level Up” growth program and are continuing to invest significantly more than € 3 billion in innovation and capacity expansion. Despite difficult market conditions in 2023, we plan to continue our “Level Up” growth program and will adjust the timeframe of our investments in line with market demand.

The Electronics business sector consists of three business units: Semiconductor Solutions, Display Solutions and Surface Solutions. Three cross-functional boards support the business units: Technology Leadership Board, Supply Chain Leadership Board, and Commercial Leadership Board. They define cross-sector standards, steer portfolio management, drive forward the exchange on good practice, and promote transparency.

Electronics accounted for 18% of Group sales in 2023, and its share of EBITDA pre (excluding Corporate and Other) was 15%. In 2023, Asia-Pacific generated 67% of Electronics’ net sales, Europe and North America accounted for 30% of sales.

Semiconductor Solutions

Semiconductor Solutions is the largest business unit in terms of sales within Electronics. It comprises our product and service offering for the semiconductor industry. We are developing materials and solutions to make the next generation of devices – we help make chips smaller, faster, more powerful and more sustainable.

Semiconductor Solutions supplies products for major production steps in wafer processing, including doping, patterning, deposition, planarization, etching, and cleaning. It also supplies delivery equipment for semiconductor manufacturing. Specialty cleans, photoresists, and conductive pastes for semiconductor packaging complement the portfolio. Intermolecular is our center for complex material solutions in Electronics, located in San Jose, California, USA. There, we explore, test, and develop combinations of different materials for next-generation electronics.

Our Semiconductor Solutions business unit consists of the following business fields: Formulations, Thin Films, Specialty Gases and Delivery Systems & Services.

- The Formulations business field comprises the Patterning and Planarization production steps. This includes lithography products for surface treatment such as photoresists and the associated auxiliaries, anti-reflective coatings and materials for directed self-assembly (DSA). The Planarization business comprises CMP materials (chemical-mechanical planarization).
- The Thin Films business field supplies solutions and productions for our customers in the fields of dielectrics (organosilanes and spin-on dielectrics) and metallics product offerings. Many of our materials are used for leading edge nodes, which is the enabler of advanced chips for generative AI.
- The Specialty Gases business field provides high-purity gases for semiconductor manufacturing. These gases are crucial for precise deposition, doping, etching, and cleaning during wafer fabrication. With a strong commitment to meeting the semiconductor industry’s stringent requirements, our Specialty Gases business supports the industry in the development of advanced electronic devices.
- The Delivery Systems & Services (DS&S) business field, with its systems business, develops and installs reliable delivery equipment to ensure the safe and responsible handling of specialty chemicals and gases for semiconductor manufacturing. At many sites of the industry, production facilities and delivery systems are operated and maintained by our MEGASYS® Total Gas and Chemical Services employees.

In 2023, the semiconductor market was impacted by a cyclical downturn, mainly due to advance spending on consumer electronics (PCs, smartphones, game consoles) in previous years due to the Covid-19 pandemic. The situation was amplified by inflation and high interest rates during the fiscal year. These developments prompted consumers to postpone purchases of electronic devices.

Semiconductor manufacturers continue to invest at a high level. This is also evidenced by the strong growth of our equipment business (part of DS&S) in 2023 despite the currently weak semiconductor market. In view of the expected long-term increase in demand, we continue to expand global production capacity for our specialty gas, liquid chemical and slurry delivery systems.

In fiscal 2023, we integrated the chemical business of Mecaro Co. Ltd., which we acquired in 2022, into our Semiconductor Solutions business. We also strengthened our business in thin films technology and our footprint in Korea. In February 2023, we broke ground for a new integrated facility in Kaohsiung, Taiwan. Here we will produce a comprehensive portfolio of semiconductor materials in one single site.

In April 2023, we announced our plans to expand manufacturing capacities at our site in Hometown, Pennsylvania, USA, thus increasing domestic production capacity for electronics components. The roughly € 300 million investment in the Hometown site is intended to further develop our largest integrated specialty gases facility. In June 2023, we commissioned a new production facility for DS&S in Chandler, Arizona, USA.

Display Solutions

Our Display Solutions business unit includes the businesses with liquid crystals (LC), display patterning materials (materials for surface treatment), organic light-emitting diodes (OLED), photoresists, reactive mesogens, smart antenna (LC-based antennas), and liquid crystal glazing (LC-based windows). We support our customers in developing novel display technologies for TV, IT, mobile devices, automotive, gaming, and other applications. Together with our customers we are working in the field of AR/VR to expand the application scenarios of LC & OLED materials and enhance the user experience in small and micro-sized displays. We are working very closely with leading panel makers to develop next-generation products with LCD (liquid crystal display) technology for the electronics market.

While lockdowns and working from home pulled forward demand for TVs and IT devices during the Covid-19 pandemic, this trend has meanwhile reversed. The industry saw a significant reduction in demand during 2023, resulting in a decline in customer factory utilization.

The Covid-19 pandemic has accelerated the shift of the liquid crystals industry towards China and increased competition. In 2023, we maintained our position as manufacturer of innovative LC materials with our XtraBright™ products, winning new projects for large-area displays as well as high-resolution mobile devices. Our OLED and photoresist materials are used in multiple free-form display products. In addition, we are actively working with customers on both LC-on-silicon (LCoS) and OLED-on-silicon solutions for AR/VR displays.

With our OLED materials, we are also supporting our customers in making sustainable OLED structures, which are important for new OLED applications such as IT screens. In 2023, we developed deuterated materials for next-generation OLED displays. They have the potential to more than double the lifetime of OLED stacks without compromising on efficiency and voltage, enabling displays with higher brightness.

Real estate investors use our product eyrise® s350 solar shading (sun protection at the touch of a button) to deliver on ESG (environment, social, governance) objectives. For example, a large real estate investor in Switzerland has already installed eyrise® on all facades of its flagship project in the center of Zurich. More commercial projects are currently in installation.

Surface Solutions

In our Surface Solutions business, we provide our customers with solutions that help them to create functional and decorative surfaces of all kinds. We focus on markets for automotive coatings, cosmetics, and, to a smaller extent, industrial applications. With our portfolio of active ingredients, we enable cosmetics manufacturers to enrich their skin care products with moisturizing, protecting and anti-aging effects. Moreover, our functional solutions serve many innovative applications, from dirt-repellent and easy-care surfaces to laser markings of plastic parts and cables.

Despite the current challenging economic environment, Surface Solutions is continuing to implement its strategic transformation. We continued to invest in digitalizing and modernizing our production plants around the globe while adjusting our capacities to the changing demands in our different markets.

Strategy*

Strategy fundamentals and ambition

We are curious minds dedicated to human progress. We believe that scientific exploration and responsible entrepreneurship are key to technological advances that benefit us all. Our values – courage, achievement, responsibility, respect, integrity, and transparency – guide us in every step we take and in every decision we make. Our company has a firm foundation with convictions and principles that the Merck family has lived by for generations. We always take them into consideration when discussing and deciding on our enterprise strategy.

Compared to last year, we face greater challenges as the increasingly complex global situation has also impacted some of our end markets. This poses challenges for the global economy and society. With a history of more than 355 years and a truly global footprint today, we have established a solid, resilient foundation that continues to bolster our confidence in our ambition for the future – to become the global 21st century science and technology pioneer. To achieve this, we continue to focus on our key growth drivers: Process Solutions, Life Science Services, Science & Lab Solutions, and Semiconductor Solutions as well as developing specialty drugs in our Healthcare business. Our must-win battles include building an organization with comprehensive data expertise and strengthening our ability to innovate. For instance, in our “Data & Digital” initiatives, we focus on identifying, prioritizing, and implementing technical capabilities across our businesses to promote future growth.

Through our multi-industry business model, we serve attractive global markets with secular growth trends as a trusted partner to advance human progress. Our diversified portfolio benefits from key megatrends. In Life Science, this includes a growing market for complex and novel modalities. In Healthcare, we develop and commercialize specialty pharmaceuticals in the Oncology and Neurology & Immunology franchises. These include the medicines Erbitux® (cancer), Bavencio® (cancer) and Mavenclad® (multiple sclerosis). In addition, we are conducting clinical trials with late-stage xevinapant (head and neck cancer) and further drug candidates in oncology, neurology and immunology in earlier stages of clinical development. With our comprehensive portfolio of semiconductor materials, we expect to benefit in the medium and long term from continuously increasing demand for chips due to the exponential growth of data volumes as well as the further implementation of artificial intelligence (AI) and the Internet of Things (IoT).

We strive to make a positive impact in our communities and on the planet while assessing and considering the ESG (environmental, social, governance) impact of our growth ambition. Since the launch of our sustainability strategy, we have achieved essential milestones in integrating sustainability as a foundational element of our overall governance and decision-making frameworks. We are diligently striving to achieve human progress for more than one billion people through sustainable science and technology by 2030. Fully integrating sustainability into our value chains by 2030 is at the forefront of our priorities. In addition, we are committed to achieving climate neutrality and minimizing resource consumption by 2040.

Active portfolio management is an integral part of our strategy. This has enabled us to transform over the last decades and our evolution into a global science and technology pioneer. In this sense, inorganic growth is a relevant element to accelerate strategic plans and to leverage business opportunities in our attractive end markets. Strengthening our key growth businesses remains the highest priority for which mergers and acquisitions (M&A) could serve as appropriate tools.

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Business strategies

Life Science

Our Life Science business sector is a global leader in the approximately € 230 billion life sciences industry. We continue to consistently deliver long-term profitable growth despite near-term headwinds, including a decline in Covid-19-pandemic-related demand, destocking by key customers and softening of funding for early-stage biotech companies. Our long-term market growth outlook remains unchanged at approximately 5% to 7% C AGR, fueled by increasing demand for commercial medicines and the essential nature of R&D across customer segments. We are well-positioned to weather challenging market conditions and emerge as an even more integral partner to our customers.

Our strategy builds on the transformation we began last year, with a sharpened focus on differentiating both our core and high-growth portfolios and capitalizing on the unique capabilities of our company. We are doing this by leveraging our distinctive breadth of offerings to customers in academia, the biopharmaceutical industry and the industrial sector, including food & beverage, to advance leading edge science. We aspire to comprehensively address customers' scientific needs and serve as a partner across products and services with a focus on enabling novel modalities. We amplify customer value by proactively addressing future customer needs to create lasting differentiation beyond the breadth and performance of our offerings. Our multichannel commercial approach, e-commerce platform and focus on sustainability set us apart. We enhance competitiveness by pursuing operational and commercial excellence and building future-oriented capabilities and ways of working.

This course we have set directs our focus and resources to pursuing opportunities that financially and technologically "move the needle" while deprioritizing those that may distract from our focused ambition to continue to be a global science & technology leader. For example, our Process Solutions business unit is optimizing its go-to-market approaches to address shifting customer behaviors, including expanding access to Process Solutions products via sigmaaldrich.com, our e-commerce platform. Our growing Life Science Services Contract Testing and Development Manufacturing Organization (CTDMO) business is building an end-to-end offering for novel modalities with a focus on anti-drug conjugates (ADCs), mRNA and viral vectors, where customers are seeking greater technical expertise and collaboration.

The diverse customer and portfolio base of our Science and Lab Solutions business provides a stable foundation while continuing to build positions in higher-growth segments. Our Integrated Supply Chain Organization's evolution to become more agile, resilient, and customer-centric is an essential foundation for continued profitable growth. To this end, we have implemented new processes to more closely connect our sales and production plans, using digital tools to align with customers on lead times and other supply expectations, standardizing operations across sites and regionalizing our network – especially in Asia-Pacific (APAC) – to meet local needs and balance risk. We have also embedded sustainability criteria in R&D and operations, providing customers with an expanded range of greener alternatives and data, such as product carbon footprints, to help reach their sustainability goals.

Our strategy reflects our purpose – to impact life and health with science – and allows us to deliver customer and shareholder value now and into the future. We are prepared to address short-term challenges and emerge from the post-Covid-19-pandemic era with deeper customer relationships, high-value innovations and a more resilient and cost-effective operating network.

Healthcare

Despite external volatility in recent years, the pharmaceutical industry has proven its resilience and remains attractive with solid growth expectations. Global megatrends such as growing and aging populations as well as better access to healthcare continue to drive the need for our products. At the same time, the macroeconomic and geopolitical environment has become more uncertain. Our mixed portfolio and our diverse geographic footprint build a resilient foundation to meet these demands and respond appropriately to the dynamics of our markets, paving the way for the future success of our Healthcare business.

Following our successes over the past years, we continue to drive pipeline projects with the aim of bringing groundbreaking medicines to patients, maximizing our existing portfolio and continuing our expansion in growth markets. We are resolute in our ambition to become a global specialty innovator with a high-growth future in oncology as well as neurology and immunology. This ambition is built on a firm foundation and continues to foster sustainable and profitable growth in the Cardiovascular, Metabolism & Endocrinology franchise while further strengthening our leadership position in fertility. We pursue this ambition with a focused leadership approach, concentrating investments on decorrelated opportunities in our pipeline and across therapeutic areas, regions and payer types.

The first pillar of our strategy is to reinforce and expand our global footprint, bringing the innovation of our pipeline to patients and growing our presence in the United States and in China, for example. Driven by well-known demographic trends, the expected absolute global pharma market growth contribution will remain highest in established markets, while the emerging markets are expected to grow faster than developed markets in relative terms as a result of rapidly developing pharma infrastructure. With our diversified portfolio of specialty and mature product businesses, we are benefiting from these trends. While our solid base within established markets (France, Germany, Italy, Japan, Spain, the United Kingdom, and the United States) enables us to achieve growth with our specialty portfolio, the emerging markets will be a large growth driver for many of our established products in the future. Managing the balance between delivering innovative new medicines with first-in-class and/or best-in class potential while leveraging our strengths in other markets and ensuring the profitable growth of the existing business will be one of the strategic imperatives.

The second pillar of our strategy is the focus on specialty medicine franchises. Here, we expect the oncology, neurology and immunology markets to remain highly attractive in terms of size, growth prospects and profitability. Within each specialty franchise, our approach is to develop deep internal expertise and insight, from internal research to commercialization, through external talent searches and strategic partnerships. In order to optimize the holistic value and focus of our pipeline, we continuously monitor and assess the potential of our pipeline candidates, based on clinical data, strategic fit and financial criteria, to determine the best way forward.

The third strategic pillar is innovation. We aim to develop potential first-in-class and best-in-class therapies. We have streamlined our pipeline and expanded our innovation capabilities with strong investigational drug candidates and technologies. In order to maximize the output of our R&D investments and to ensure long-term sustainability, we are focusing our expertise on specific franchises. Further, we increase our intake of external innovation, in line with industry practice, to meet our ambition of launching a new product every 18 months. We are investing in assets with the most promising value generation outlook as well as digital technologies and novel modalities such as antibody-drug conjugates to drive pipeline growth.

Electronics

We are an innovation leader within the electronics industry, targeting the most critical materials segments of the semiconductor wafer processing as well as OLED and LC display panels. Our diversified portfolio proves to be resilient in a dynamic market environment. We partner with leading experts around the world to enable the next generation of electronic devices, innovating with leading-edge customers and being a local partner for their global presence.

The long-term growth prospects of the industry remain very attractive, despite the current downcycle. We believe in the long-term growth drivers of digitalization and its visualization, fueled by an exponential increase in data volumes. Semiconductors will thus continue to be a critical component in many industries. The main accelerator in the industry is and will remain AI. Although the number of AI chips is still small, the high growth rates and the high value of these chips as well as the required materials will fuel the growth of the semiconductor industry. This trend will be supported by technologies such as 5G networks, autonomous driving, electric vehicles, and IoT. We will benefit from the high material requirements of these AI chips in terms of value and volume.

In the short term, AI alone cannot offset the current market decline in the electronics industry, which results from weak demand after the Covid-19 pandemic and associated excess inventory along the value chain. However, in the medium and long term, the fundamental growth drivers, such as AI, are expected to accelerate the market development through the next decade. To produce ever more powerful and energy-efficient chips, innovation in novel materials will be even more essential.

To benefit from the strong electronics industry growth, we are continuously expanding our capacities and our capabilities. We are continuing to invest significantly more than € 3 billion in innovation and capacities, which are aligned with the customers and regions we serve. These investments are an essential part of our ongoing Level Up growth program, which we kicked off at the end of 2021. The investments are made in lockstep with the capacity expansions of our customers in order to support their growth and new fabs with a reliable supply of innovative materials and systems. We will continue to invest in our geographic proximity to our customers while boosting R&D and innovation. Electronics also seeks to exploit attractive external growth opportunities through acquisitions.

Our ability to systematically use data and digital methods across the entire value chain differentiates in the market, enabling us to meet and exceed the increasing requirements regarding quality, speed and reliability. Furthermore, we are accelerating important initiatives to transform the industry towards sustainability and investing even further in safety.

After substantial investments in improving our processes and expanding our production capacities in Surface Solutions, we remain confident of successfully implementing our strategic transformation within that business.

Data & Digital strategy

Going forward, we will further identify transformative technologies to serve as pivotal enablers for our growth and innovation ambition. Therefore, we will look into novel technologies beyond our core products and markets while maintaining strategic proximity to our business sectors so as to leverage our existing assets and core competencies. Our Group Science & Technology Office and our newly established Data & AI Organization are leading the implementation of our combined strategy for innovation and “data & digital”. They promote innovation within and between business areas by bringing transformative technology trends into the company and exploiting the potential of high-quality data and state-of-the-art digital capabilities. In addition, we are investing in building smart manufacturing capabilities, across our business sectors thus leveraging synergies across business sectors while also exploring digital business models as a separate growth opportunity.

Furthermore, we are deploying a company-wide harmonized data and analytics operating model and ecosystem. This enables us to derive actionable insights from data, support informed decision-making and scale related activities across the company to solve real business challenges with machine learning and AI.

Data culture is fundamental for our digital transformation. Through targeted measures to improve data literacy activities, we are strengthening the ability of our employees to identify, understand, create, model, analyze, interpret data as well as, communicate and argue with data. We foster generative AI literacy by giving employees the possibility to test AI in a secure environment. With myGPT of Merck KGaA, Darmstadt, Germany, our employees have access to an AI assistant to use when working with confidential and internal information.

Sustainability strategy

Leveraging science and technology

In our view, sustainable entrepreneurship and profitable growth go hand in hand; we can remain competitive only by creating added value for society. Through our innovative and high-quality products, we want to help meet global challenges. At the same time, these types of products secure our financial performance capability. Responsible action is an integral part of our company culture. This also includes respecting the interests of our employees, customers, investors, and society.

Safety and ethics matter just as much to us as business success. We mitigate ethical, economic, environmental, and social risks as far as possible. From the early stages of development through to disposal, we keep an eye on the entire life cycle of a product. We apply strict sustainability standards to our procurement activities. During product manufacture, it is important to us to keep the environmental impact as low as possible, which is why safe production, high environmental standards and strict quality management are of course so important to us. By supplying products that meet extensive sustainability criteria, we also help other companies to achieve their sustainability goals.

Sustainability is an essential element of our enterprise strategy. We have set ourselves three strategic sustainability goals: In 2030, we will achieve progress for more than one billion people through sustainable science and technology. By 2030, we will fully integrate sustainability into our value chains. By 2040, we will be climate neutral and reduce our resource consumption. With these goals, we are helping to achieve the UN Sustainable Development Goals (SDGs). Overall, our sustainability strategy is centered on seven focus areas within which we are realizing numerous initiatives and projects today and tomorrow, measuring our progress as we go.

Refining the sustainability strategy

In 2023, we revised our sustainability strategy, which we had communicated in 2020. In particular, we sharpened the second goal: Under the new heading “Partnering for sustainable business impact”, we want to strengthen our focus on the social aspects in our value chains and embed sustainability more comprehensively into our decision-making processes. Therefore, in addition to the existing focus area “Sustainable and transparent supply chain”, we are now also working on the new focus areas “Sustainability in our ways of working and decision-making” and “Our people and communities; providing a diverse and inclusive environment”. For the third goal, “Reducing our ecological footprint”, we modified two of our key indicators for waste and water. The two new indicators, which are valid as of 2024, use more common metrics and also include circular economy criteria.

We use 14 key indicators to record and assess our progress towards achieving our sustainability goals. Our annual Long-Term Incentive Plan (LTIP) for Executive Board members and senior executives contains a sustainability factor. We use it to measure performance over a period of three years based on selected key indicators for each of our three sustainability goals. Details on how this sustainability factor is calculated can be found in the “**Compensation Report**”. In 2023, the company tied 15% of variable employee compensation to sustainability parameters for the first time.

We are in the process of transforming the company and are integrating sustainability into the innovation process and all parts of the value chain. It is our aim to decouple the growth of our businesses from negative environmental impacts. More information on sustainability topics can be found in the “**Non-Financial Statement**”, which is also part of the management report.

Strategic finance and dividend policy

We pursue a conservative financial policy characterized by the following aspects:

Financial flexibility and a conservative funding strategy

We ensure that we meet our obligations at all times and adhere to a conservative and proactive funding strategy that involves the use of various financial instruments. Our diversified and profitable business activities form the basis for our strong and sustainable cash flow generation capacity. Moreover, we have several funding resources in place. A € 2.5 billion syndicated loan facility is in place until 2028 to cover unexpected cash needs. This credit line is a backup facility that is intended to be used in exceptional circumstances only.

We also agreed upon several bilateral loan facilities. In addition, we have a commercial paper program with a volume of € 2.5 billion at our disposal. Within the scope of this program, we can issue short-term commercial paper with a maturity of up to one year.

The bond market also represents an important source of financing. The most recent bond issue took place in June 2022 (€ 1.0 billion bond issue). The use of various instruments provides a broad financing basis and addresses different investor groups.

Maintaining long-term and reliable business relations with a core group of banks

We work mainly with a well-diversified, financially stable, and reliable group of banks. Due to our long-term business approach, bank relationships typically last for many years and are characterized by professionalism and trust. The banking group consists of banks with strong capabilities and expertise in various products and geographical regions. We regard these banks as strategic partners and involve them in important financing transactions accordingly.

Strong investment-grade rating

The rating of our creditworthiness by external rating agencies is an important indicator of financial stability. A strong investment-grade rating is an important cornerstone of our financial policy as it safeguards access to attractive financial conditions on the capital markets.

In November 2023, our ratings were confirmed by Moody’s (A3, stable outlook) and Standard & Poor’s (A, stable outlook). We discontinued our Scope rating (previously: A, stable outlook) in December 2023.

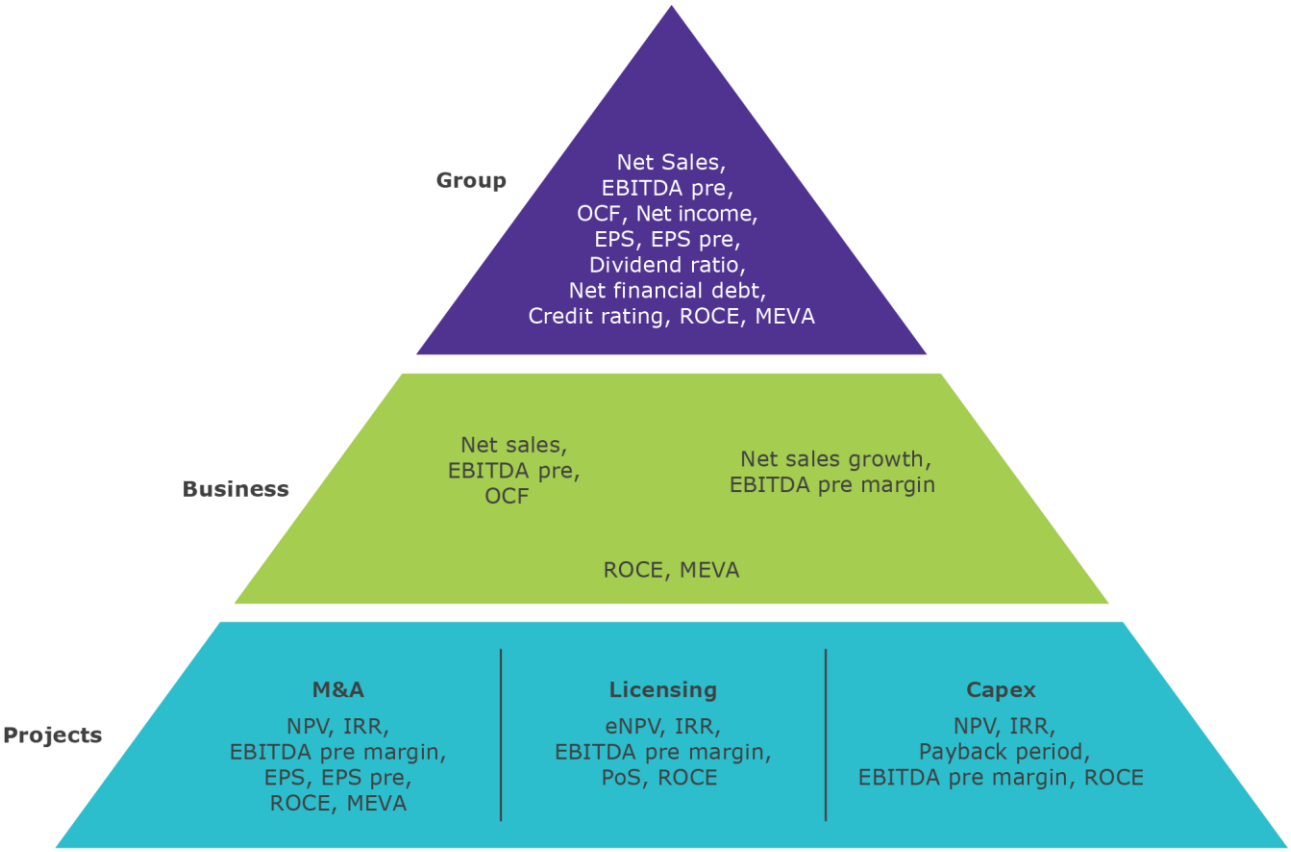
Sustainable dividend policy

We are pursuing a sustainable dividend policy. Provided the economic environment develops in a stable manner, the current dividend represents the minimum level for future dividend proposals. Our dividend policy will follow business development and earnings increases over the coming years. However, dividend growth could deviate, for example, within the scope of restructuring or in the event of significant global economic developments. We aim for a target corridor of 20% to 25% of earnings per share pre.

Internal Management System

As a global company with a diverse portfolio of products and services, we use a comprehensive framework of indicators to manage performance. The most important key performance indicator (KPI) for measuring performance is EBITDA pre[1].

The Value Creation and Financial KPI Pyramid, which summarizes our important financial performance measures, reflects the comprehensive framework of financial KPIs to steer the businesses and prioritize the allocation of cash resources. It consists of three managerial dimensions: Group, Business, and Projects, each of which requires the use of different indicators.



Abbreviations
EBITDA pre[1] = Earnings before interest, income tax, depreciation and amortization as well as adjustments.
EBITDA pre-margin[1] = Earnings before interest, income tax, depreciation and amortization as well as adjustments in percent of the net sales.
EPS = Earnings per share.
EPS pre[1] = Earnings per share before adjustments.
MEVA[1] = Value added of the Group.
OCF[1] = Operating cash flow.
ROCE[1] = Return on capital employed.
NPV[1] = Net present value.
IRR[1] = Internal rate of return.
eNPV[1] = Expected net present value.
PoS[1] = Probability of success.
M&A = Mergers and acquisitions.

[1] Not defined by International Financial Reporting Standards (IFRS).

Key performance indicators of the Group and its businesses

The three key performance indicators of net sales, EBITDA pre, and operating cash flow (OCF) are the most important financial factors for assessing operational performance. Accordingly, we refer to these KPIs in the "**Report on Economic Position**", the "**Report on Risks and Opportunities**", and the "**Report on Expected Developments**". As the most important indicators of financial business performance, the KPIs are key elements of our performance management system.

Net sales

Net sales are defined as the revenues from the sale of goods, services rendered to external customers, and commission income and profit sharing from collaborations, net of value-added-tax, and after sales deductions such as rebates or discounts. Net sales are the main indicator of our business growth and therefore an important parameter of external as well as internal performance measurement. In addition, organic sales growth compared with the target is used for internal performance management. Organic sales growth shows the percentage change in net sales versus a comparative period, adjusted for exchange rate and portfolio effects. Exchange rate effects may arise as a result of foreign exchange fluctuation between the functional non-euro currency of a consolidated company and the reporting currency (euro). By contrast, portfolio effects reflect sales changes due to acquisitions and divestments of consolidated companies or businesses.

Group

Net sales

			Change	
€ million	**2023**	2022	€ million	%
Net sales	**20,993**	**22,232**	**-1,239**	**-5.6%**

EBITDA pre

EBITDA pre is the main performance indicator measuring ongoing operational profitability and is used internally and externally. To permit a better understanding of the underlying operational performance, the operating result is adjusted to exclude depreciation and amortization, impairment losses and reversals of impairment losses, as well as adjustments. These adjustments are restricted to the following categories: integration expenses, IT expenses for certain projects, restructuring expenses, gains/losses on the divestment of businesses, acquisition expenses, and other adjustments. The classification of specific income and expenses as adjustments follows clear rules and is subject to strict governance at the Group level. Within the scope of internal performance management, EBITDA pre permits process efficiency increases without influencing the performance of the operating business through exceptional items or restructuring expenses. The following table shows the composition of EBITDA pre in fiscal 2023 compared with the previous year. The IFRS figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Group

Reconciliation EBITDA pre[1]

	2023			2022[2]			Change
€ million	IFRS	Elimination of adjustments	pre[1]	IFRS	Elimination of adjustments	pre[1]	pre[1]
Net sales	**20,993**	**–**	**20,993**	**22,232**	**–**	**22,232**	**-5.6%**
Cost of sales	-8,600	43	-8,558	-8,527	32	-8,496	0.7%
Gross profit	**12,392**	**43**	**12,435**	**13,705**	**32**	**13,737**	**-9.5%**
Marketing and selling expenses	-4,510	44	-4,466	-4,714	32	-4,681	-4.6%
Administration expenses	-1,392	246	-1,146	-1,306	115	-1,191	-3.8%
Research and development costs	-2,445	7	-2,438	-2,521	75	-2,446	-0.3%
Impairment losses and reversal of impairment losses on financial assets (net)	-51	–	-51	-6	0	-6	>100.0%
Other operating income and expenses	-385	138	-247	-685	323	-361	-31.6%
Operating result (EBIT)[1]	**3,609**			**4,474**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	1,880	-87	1,792	2,030	-232	1,798	-0.3%
EBITDA[2]	**5,489**			**6,504**			
Restructuring expenses	249	-249	–	198	-198	–	
Integration expenses/IT expenses	118	-118	–	88	-88	–	
Gains (-)/losses (+) on the divestment of businesses	-51	51	–	-38	38	–	
Acquisition-related adjustments	18	-18	–	29	-29	–	
Other adjustments	56	-56	–	68	-68	–	
EBITDA pre[1]	**5,879**	**–**	**5,879**	**6,849**	**–**	**6,849**	**-14.2%**
thereof: organic growth[1]							-9.0%
thereof: exchange rate effects							-4.9%
thereof: acquisitions/divestments							-0.3%

[1] Not defined by International Financial Reporting Standard (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Operating cash flow (OCF)

Operating cash flow results from the Group's current business activities and describes the cash generated from operating activities. It is influenced mainly by EBITDA pre, income tax, the financial result and changes in net working capital.

Group

Operating cash flow

			Change	
€ million	**2023**	2022	€ million	%
EBITDA pre[1]	**5,879**	**6,849**	**-970**	**-14.2%**
Adjustments[1]	-390	-345	-45	13.1%
Finance result[2]	-125	-187	62	-33.0%
Income tax[2]	-650	-948	298	-31.4%
Changes in working capital[1]	-141	-917	776	-84.7%
thereof: Changes in inventories[3]	-89	-604	516	-85.3%
thereof: Changes in trade accounts receivable[3]	-8	-413	405	-98.0%
thereof: Changes in trade accounts payable/refund liabilities[3]	-43	101	-144	>100.0%
Changes in provisions[3]	188	279	-91	-32.5%
Changes in other assets and liabilities[3]	-755	-445	-310	69.6%
Neutralization of gains/losses on disposal of fixed assets and other disposals[3]	-150	-48	-102	>100.0%
Other non-cash income and expenses[3]	-72	21	-93	>100.0%
Operating cash flow	**3,784**	**4,259**	**-475**	**-11.2%**

[1] Not defined by International Financial Reporting Standard (IFRS). Adjustments according to definition above.

[2] According to Consolidated Income Statement.

[3] According to the Consolidated Cash Flow Statement.

[4] As of January 1, 2023, the tranche of the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, to be paid out in the months following the balance sheet date is disclosed under other current non-financial liabilities and no longer under current provisions for employee benefits. For better comparability, the previous year's figures have been adjusted.

Investments and value management

Sustainable value creation is essential to secure the long-term success of the company. To optimize the allocation of financial resources, we use a defined set of parameters as criteria for prioritizing investment opportunities and portfolio decisions.

Net present value (NPV)

The main criterion for prioritizing investment opportunities is net present value. It is based on the discounted cash flow method and is calculated as the sum of the discounted free cash flows over the duration of a project. The weighted average cost of capital (WACC), representing the weighted average of the cost of equity and cost of debt, is used as the discount rate. Different markups are applied to the WACC depending on the nature and location of the respective project.

Internal rate of return (IRR)

The internal rate of return is a further important criterion for the assessment of acquisition projects and investments in property, plant and equipment, as well as intangible assets. It is the discount rate that makes the present value of all future free cash flows equal to the initial investment or the purchase price of an acquisition. A project adds value if the internal rate of return is higher than the weighted cost of capital including markups.

Return on capital employed (ROCE)

In addition to NPV and IRR, return on capital employed is an important metric for the assessment of investment projects when looking at individual accounting periods. It is calculated as the adjusted operating result pre (EBIT pre) divided by the sum of property, plant and equipment, intangible assets, trade accounts receivable, trade accounts payable, and inventories.

Payback period

An additional parameter for assessing investments in property, plant & equipment, and intangible assets is the payback period, which indicates the time in years after which an investment will generate positive net cash flow.

Value added of the Group (MEVA)

Value added of the Group gives information about the financial value created over a period of time. Added value is created when the return on capital employed (ROCE) of the company or the business is higher than the weighted average cost of capital (WACC). MEVA metrics provide us with a powerful tool to weigh investment and spending decisions against capital requirements and investors’ expectations.

Capital market-related parameters

Net income, earnings per share (EPS) and earnings per share pre (EPS pre)

Earnings per share are calculated by dividing profit after tax attributable to the shareholders of Merck KGaA, Darmstadt, Germany (net income) by the weighted average number of theoretical shares outstanding. The use of a theoretical number of shares takes into account the fact that the general partner's capital is not represented by shares. As an alternative comparison, we also report earnings per share pre, which are adjusted for the effects of integration expenses, IT expenses for selected projects, restructuring expenses, profits/losses from the divestment of businesses, acquisition expenses, and other adjustments. Amortization of acquired intangible assets is also adjusted for. The adjustment excludes impairment losses on intangible assets for acquired research and development (R&D) projects below a threshold value of € 50 million. Income tax is calculated on the basis of the Group's underlying tax rate. The following table presents the reconciliation of net income to net income pre for the calculation of EPS pre.

Reconciliation net income to net income pre[1]

			Change	
€ million	**2023**	2022	€ million	in %
Net income	**2,824**	**3,326**	**-502**	**-15.1%**
Non-controlling interest	10	14	-3	-25.6%
Income tax	650	948	-298	-31.4%
Amortization of acquired intangible assets	783	830	-47	-5.6%
Adjustments[1]	477	577	-99	-17.2%
Income tax on the basis of the underlying tax rate[1]	-1,044	-1,310	266	-20.3%
Non-controlling interests to be adjusted	-10	-14	3	-25.6%
Net income pre[1]	**3,691**	**4,371**	**-680**	**-15.6%**
Earnings per share pre[1] in €	**8.49**	**10.05**	**-1.56**	**-15.5%**

[1] Not defined by International Financial Reporting Standards (IFRS).

Dividend ratio

We pursue a reliable dividend policy with a target payout ratio based on EPS pre (see definition above) with the aim of ensuring an attractive return for our shareholders.

Credit rating

The rating of our creditworthiness by external agencies is an important indicator of our ability to raise debt capital at attractive market conditions. The capital market makes use of the assessments published by independent rating agencies in order to assist debt providers in estimating the risks associated with a financial instrument. We are currently assessed by Moody's and Standard & Poor's. The most important factor for the credit rating is the ability to repay debt, which is determined in particular by the ratio of operating cash flow to net- or gross financial debt.

Relevant non-financial performance measures

Along with the indicators of the financial performance of the businesses, non-financial measures also play an important role in furthering the success of the company.

High-Impact Culture

Our culture should embody what unites us as well as the way in which we collaborate, lead and work as a team to achieve human progress and drive the company forward. We live our high-impact culture and through this, we measure our ability to attract, develop and retain the right people.

Sustainability

According to our sustainability strategy, which was revised in 2023, we aim to achieve human progress through sustainable science and technology, fully integrate sustainability into our value chains and reduce our ecological footprint. We are pursuing these goals in seven focus areas, within which we are realizing numerous initiatives and projects and measuring our progress.

Diversity, equity and inclusion

We know that diversity drives progress. It strengthens our ability to innovate and makes an essential contribution to our success in science and technology. We actively promote and measure the diversity of our leaders to create an inclusive culture that reflects our values and enables every employee to fulfill their potential.

Research and Development

We conduct research and development (R&D) worldwide to develop new products and services to improve the quality of life of patients and meet the needs of our customers. Further optimizing the relevance and efficiency of our research and development activities – either on our own or in collaboration with third parties – is one of our top priorities. In addition, we are continuously improving the fulfilment of our sustainability criteria and integrating them into our R&D processes starting with our product development stage. In 2023, we evaluated almost all relevant R&D projects, thereby increasing transparency regarding the sustainability performance of our global R&D portfolio.

Around 6,500 employees (2022: approximately 7,300) worked in R&D and related support functions in 2023. They dealt with innovations to address long-term health and technology trends in both established and growth markets.

Expenditure for R&D amounted to € 2.4 billion in 2023 (2022: € 2.5 billion).

The organizational setup of our R&D activities reflects our structure with three business sectors. In the Life Science business sector, our research activities focus on developing innovative technologies for laboratory and life science applications in government and academic labs, the biopharmaceutical industry, and the industrial sector. Our Life Science Technology Office, established in 2022, continues to drive long-term innovation and ensures that R&D investments are aligned with our growth strategy. Our goal is to accelerate and impact scientific discovery across our Life Science business units and the Group as a whole. We focus on digital and automated labware, the factory of the future and novel modalities as well as providing more sustainable products for the lab. In addition, our teams remain dedicated to delivering advancements in our core portfolios, such as filtration, pure water for use in laboratories and diagnostic solutions.

With our Healthcare business sector’s R&D pipeline, we aspire to make a positive difference for patients. Our main research areas include oncology and immunology, including multiple sclerosis. The main focus of our Electronics business sector's research is on developing innovative materials and technologies required for the manufacture of ever smaller, faster, more powerful, and more sustainable processors and memory chips. Furthermore, Electronics develops novel materials for next-generation displays and functional and decorative effect pigments for use in the automotive and cosmetics industries and other industrial applications.

We are firmly convinced that science should not be conducted in silos. We believe that a modern, multidisciplinary approach to science will power the next wave of human progress. We call this approach “bioconvergence” because it leverages synergies across digital and material science as well as biotechnology. Success depends on the ability to combine a broad mix of competencies and technologies across several disciplines to create novel market solutions. We are a diversified science and technology company with leading positions across the life science, healthcare and electronics industries. Our goal is to harness synergies not only within our business sectors, but across them.

Examples of opportunities we are developing at the intersection of our business sectors and converging technologies include:

- Continuing to build our automated design-make-test-analyze platform powered by state-of-the-art artificial intelligence (AI) and lab automation. This will accelerate the discovery of new and better drug candidates and in turn expedite timelines for new therapies to reach patients.
- Using our capabilities across the Group in messenger ribonucleic acid (mRNA) synthesis, lipid nanoparticle (LNP) synthesis and formulation and targeted delivery as well as AI to enable the development of “smarter” LNPs that can more effectively target different tissue types including hard-to-reach biological targets in various disease areas.
- Developing digital twins in smart manufacturing. As virtual models designed to accurately replicate a physical object or organism, they can help to improve the time, cost, quality, and sustainability of manufacturing, process optimization and product development. Examples include making pharma supply chains more traceable and trustworthy. We developed a model for primary packaging in the pharmaceutical industry, and in cooperation with a partner provided proof-of-concept.

- Advanced microphysiological systems based on human cell culture models promise to deliver faster and more accurate drug testing results compared with today's two-dimensional approaches and might reduce animal testing. We are currently looking into this next generation of organoids based on chip technology, bringing our Life Science, Healthcare and Electronics colleagues together to work on this area of innovation.

In our R&D, AI and machine learning have demonstrated their ability to predict the properties of new materials. However, our applications of AI and machine learning go beyond just internal use. One example of AI and machine learning being commercialized is the progress made on AIDDISON™. This AI-powered drug discovery software uses generative AI based on two decades of historic data. The software, which had been in development since 2020, was launched by Life Science in 2023. In addition to external commercialization, we also use it in our Healthcare business sector for internal early drug discovery.

High-quality, interoperable data combined with analytics and AI offer unprecedented potential for new digital business models adjacent to our current product offering and unlock additional growth opportunities. Examples include Syntropy and Athinia™, which are partnerships with Palantir.

Syntropy provides a data integration and analytics environment wherein healthcare organizations can contextualize and analyze infinitely a wide variety of data types across their entire ecosystem in an unlimited and secure manner. In 2023, Syntropy announced a partnership with Evidium to develop an AI operating system for healthcare: This alliance will make it easier for clinicians to contextualize clinical data at the source and for scientists to securely collaborate on that data. In the era of increasingly prevalent generative AI, it is crucial for AI to be trustworthy and responsible, especially in healthcare.

Athinia™ is targeting the semiconductor industry and is a collaborative data ecosystem where multiple companies leverage AI to solve critical challenges by utilizing data to improve supply chain transparency, quality and reliability of materials and to accelerate time to market. In July 2023, Athinia™ expanded its partnerships to include Tokyo Electron for real-time collaborative analysis of the performance of semiconductor manufacturing equipment. As a cloud solution, Athinia™ is an independent platform that provides a secure and specific data analytics tool for the industry. In the context of a sustainability application, data from various sources can be integrated to facilitate seamless collaboration in modeling, exchanging, and calculating carbon emissions data. As a founding member of the Semiconductor Climate Consortium, Athinia™ is leading the way in establishing sustainability standards on a digital platform. Companies can use this platform to benchmark their emissions performance against their industry peers, identify areas for improvement and participate in collaborative initiatives aimed at reducing emissions.

Research and Development Costs

			Change	
€ million	**2023**	2022	€ million	%
Life Science	396	399	-3	-0.7%
Healthcare	1,657	1,694	-37	-2.2%
Electronics	297	308	-11	-3.5%
Corporate and Other	94	119	-24	-20.5%
Total	**2,445**	**2,521**	**-75**	**-3.0%**

The ratio of research expenditure to Group sales was 11.6% (2022: 11.3%). The increase is due to the negative sales development.

Life Science

Across our three business units Process Solutions, Life Science Services, and Science & Lab Solutions, our R&D teams continue to bring expertise and a diversified and relevant portfolio of products and services to our customers around the world.

As the fields of preventive and personalized medicine evolve, it will be essential to set the standard with robust, scalable, efficient processes for viral vector production, next-generation sequencing and autologous cell therapies. This in turn will support the expansion of disruptive cell and gene therapies to treat the most challenging and chronic conditions, including cancer, heart disease, diabetes, and muscular dystrophy.

To this end, a large number of engineers, chemists and biologists across five global hubs are focused on six strategic innovation vectors: building our core portfolio, factories and labs of the future, novel modalities, next generation biology, AI and digital, and sustainability. In 2023, we launched more than 8,500 products including products under our “faucet program” for antibodies, reference materials, chemicals, and nanomaterials.

Process Solutions*

In January, we introduced the Pellicon® Capsule with Ultracel® membrane, which meets the single-use tangential flow filtration (TFF) device requirements for the antibody-drug conjugate (ADC) manufacturing process. Engineered with operator safety in mind, the Pellicon® Capsule features for easy connection to a single-use TFF system. The capsules are resistant to organic solvents commonly used in the ADC manufacturing process.

In April, we launched Ultimus® single-use process container film, designed to provide extreme durability and leak resistance for single-use assemblies used for bioprocessing liquid applications. Ultimus® film is designed with a proprietary woven nylon structure and provides enhanced bag strength and resilience. This technology is now available in Mobius® 3D process containers.

In July, the Mobius® iFlex Bioreactor was launched as the latest addition to the BioContinuum™ Production and Harvest Platform, our integrated solution for perfusion process development and manufacturing. Alongside our portfolio of EX-CELL® Advanced HD Perfusion, Mobius® Breez Microbioreactor and Cellicon® Cell Retention Solution, the Mobius® iFlex Bioreactor enables customers to realize the efficiency gains and cost savings of production intensification and continuous monoclonal antibody (mAb) manufacturing.

In March, Medicine Maker recognized the Process Solutions business unit with its Best Biopharma Equipment Company award.

Life Science Services*

One key R&D investment for Life Science Services was the expansion of Contract Testing Development and Manufacturing Organization (CTDMO) Services with two new GMP-grade mRNA drug substance manufacturing sites in Darmstadt and Hamburg, Germany. Consequently, our offering is the first to encompass all key stages of mRNA technologies, lipids, lipid nanoparticles (LNP), and fill & finish, including key products and biosafety testing.

Life Science Services received three awards in 2023. In March, it was recognized at Life Science Leader’s 2023 CDMO Leadership Awards in five categories: capabilities, compatibility, expertise, quality, and service. In September, it received the API Development Award for ChetoSensar™ at the 2023 CPHI Pharma Awards as well as the Best Biologics CMO Award at the 2023 Asia Pacific Biologics CMO Excellence Awards 2023.

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Science & Lab Solutions*

From nanomaterials enhancing battery performance to optimal media culture for producing lab-cultivated meat, the breadth, and depth of our Science & Lab Solutions portfolio highlights how life science innovation improves important aspects of our daily lives.

The lab of the future

One important driver for the Science &Lab Solutions business innovation is digitalizing the lab of future, with workflows through AI, machine learning, automation, and other solutions. It supports scientists at all stages with tools that can increase efficiency, safety and success rates of delivering new, safer therapies for patients. By combining expertise in small molecules, biologics and new modalities with AI and other digital tools, we are helping to redefine how drugs are discovered, developed and produced.

In December, we launched AIDDISON™ drug discovery software, the first AI-powered software-as-a-service platform that bridges the gap between virtual molecule design and real-world manufacturability through Synthia™ retrosynthesis software Application Programming Interface (API) integration. It combines generative AI, machine learning, and computer-aided drug design to speed up drug screening. Trained on more than two decades of experimentally validated datasets from pharmaceutical R&D, AIDDISON™ identifies compounds from more than 60 billion possibilities that have key properties of a promising active ingredient, such as non-toxicity, solubility, and stability in the body. The platform then proposes ways to best synthesize these drugs.

In February, we launched M-TRACE® All-in-One Computer solution, another example of how we are digitalizing the lab. M-TRACE® offers a cleanroom-friendly way to create test records used during sterility testing and other quality control workflows. Compliant with the QC sterility testing environment, it enables full data traceability.

In November, we launched ChemisTwin™, an online digital reference materials platform. It is a digital reference materials platform that can perform automatic analysis of samples' purity, identity, and degradation of compounds through over 1,500 calibrated algorithm-based digital references. Reference materials ensure the quality and safety of medicines and other products (such as water, food and beverage) from the earliest stages of research and development through quality control and quality assurance testing.

Efficiency and productivity-enhancing tools

We continued to offer incremental and sustainable technologies that improve productivity challenges to address customers' key challenges. In June, we launched mPAGE® Lux electrophoresis gel, a product that decreases, from 90 to three minutes, the time-consuming and key step of gel casting for western blotting, a method for protein separation.

In December, we launched the Milli-Q® SQ-2 series systems. With eight patents for its innovative features, this ultrapure lab water equipment offers greater flexibility, autonomy and sustainability – with less energy and water consumption. The system does not require a direct connection to a water pipe, so researchers can draw ultrapure water via the equipment at the point of use without any intermediate installations.

The next frontier in cell culture

The launch of 3dGRO™ Patient-Derived Organoids (PDOs) is also opening up new possibilities for researchers. During 2023, we launched 20 pancreatic and 20 colorectal organoids, along with 3dGRO™Wnt3a conditioned media supplement used for organoids. These complex, multicellular 3-dimensional in vitro cell models used in biomedical research that closely mimic in vivo organs are a powerful way to study drug responses, disease progression, and more. An important tool in cancer research, organoids provide a more relevant, phenotypic model of cancer than traditional 2D cell culture models.

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Healthcare

With our Healthcare research, we aspire to make a positive difference for patients. Our business sector-wide "Focused Leadership" approach to pipeline enrichment builds on our established expertise in the underlying disease biology of our core therapeutic areas of oncology, neurology and immunology as well as technological capabilities. By building on our existing strengths and maximizing synergies within our pipeline of compounds discovered in-house and with external assets, we will secure sustainable R&D productivity in order to provide innovative medicines to patients in need. In November 2022, we announced that we would aim to launch one new product or indication every 1.5 years on average, bolstered by external innovation.

Oncology*

In Oncology, our scientific curiosity and dedication to patients are at the heart of our efforts to improve the future of people living with cancer. In this core focus area of our R&D portfolio, we aim to deliver transformative treatments. Translational research is embedded into the whole R&D process, with several projects addressing unmet needs in difficult-to-treat cancers through innovative treatment approaches and novel combinations.

We are committed to bringing new standards of care for multiple tumor types to as many patients as possible worldwide. Therefore, in 2023 we continued to explore the impact of our marketed therapies through continued analysis of data from our pivotal studies and the generation of real-world evidence. We are assessing these treatments in new settings as well.

Bavencio®

To date, Bavencio® (avelumab), an anti-PD-L1 antibody, has been approved in 66 countries as a first-line maintenance treatment for locally advanced or metastatic urothelial carcinoma (UC) in adult patients whose disease has not progressed following platinum-based chemotherapy. At the 2023 American Society of Clinical Oncology (ASCO) Genitourinary Cancers Symposium, we presented long-term follow-up data from the Phase III JAVELIN Bladder 100 trial. The data demonstrated median overall survival from start of chemotherapy of 29.7 months among patients receiving Bavencio® who did not progress on first-line platinum-based chemotherapy, thus establishing a new benchmark for treatment outcomes in clinical studies.

We continue to evaluate whether optimization of first-line maintenance treatment by adding a novel therapy to avelumab could improve outcomes for patients with advanced UC whose disease did not progress with first-line platinum-based chemotherapy in the Phase II JAVELIN Bladder Medley study. Initiated in 2022, this randomized umbrella study is assessing avelumab monotherapy versus the combination of avelumab with our investigational anti-TIGIT antibody M6223, avelumab in combination with Nektar Therapeutics' interleukin-15 (IL-15) receptor agonist, NKTR-255, and avelumab in combination with Gilead Sciences' Trodelvy® (sacituzumab govitecan-hziy).

Bavencio® is also approved as a monotherapy for the treatment of metastatic Merkel cell carcinoma (MCC) in 63 countries. In September 2023, we received U.S. Food and Drug Administration approval of a supplemental Biologics Licensing Application for Bavencio®, converting the MCC indication from accelerated approval into full approval. This makes it the first MCC treatment to receive full approval in the U.S. market.

Additionally, Bavencio® is approved for the treatment of advanced renal cell carcinoma (RCC) in combination with axitinib in 60 countries.

Tepmetko®

In 2023, we shared multiple analyses of studies of the oral MET inhibitor Tepmetko® (tepotinib) in advanced non-small cell lung cancer (NSCLC). In a long-term follow-up analysis of the Phase II VISION study published in JAMA Oncology, Tepmetko® showed robust and durable clinical activity across therapy lines in patients with METex14-skipping NSCLC, particularly in previously untreated patients with METex14 skipping confirmed by

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tissue biopsy. An additional subgroup analysis presented at the 2023 World Congress on Lung Cancer (WCLC) in September demonstrated the robust and durable clinical activity of Tepmetko®, particularly as a first-line treatment, with stability in health-related quality of life and a manageable safety profile in Asian patients with advanced NSCLC with METex14 skipping. Tepmetko® is now available for the treatment of METex14-skipping NSCLC in 23 markets globally.

We also shared results of the primary analysis of the Phase II INSIGHT 2 study at the WCLC. These findings suggest the potential of tepotinib plus osimertinib as a chemotherapy-sparing oral targeted therapy option for patients with EGFR-mutant NSCLC with MET amplification who have developed resistance to prior EGFR tyrosine kinase inhibitor therapy.

Novel medicines

As we work towards our vision of creating a world where more cancer patients can become cancer survivors, we continue to pioneer novel medicines, advancing promising molecules in our pipeline that build on our expertise and leadership in core mechanisms and tumor types.

Our Phase III development program for xevinapant, the potentially first-in-class IAP (inhibitor of apoptosis protein) inhibitor, in the treatment of squamous cell carcinoma of the head and neck (SCCHN) continues to progress. Patient enrollment for the TrilynX study (NCT04459715) was completed in 2023. This international, randomized, double-blind, placebo-controlled Phase III study evaluates the efficacy and safety of xevinapant compared to placebo when administered in addition to definitive chemoradiotherapy in patients with unresected, locally advanced SCCHN. Patient recruitment continues in the international, randomized, double-blind, placebo-controlled Phase III XRay Vision (NCT05386550) study, which is evaluating the efficacy and safety of xevinapant versus placebo in combination with adjuvant, post-operative radiotherapy in patients with resected LA SCCHN who are at high risk for relapse and are ineligible for cisplatin treatment.

Additional progress in our pipeline in 2023 includes completion of Phase Ia for our anti-CEACAM5 antibody-drug conjugate (ADC), M9140, with the identification of two doses for evaluation in Phase Ib. M9140 is the first ADC based on our proprietary technology to enter clinical development.

We also continued to advance our pipeline of DNA damage response inhibition (DDRi) assets, exploring multiple hypotheses to determine which regimens may provide the most value to patients. In 2023, we initiated the Phase Ib/IIa DDRiver NSCLC 322 study of tuvusertib (M1774), our potentially best-in-class, potent and selective inhibitor of ataxia telangiectasia and Rad3-related (ATR), in combination with Regeneron Pharmaceutical's PD-1 inhibitor cemiplimab in patients with non-squamous NSCLC that has progressed on prior anti-PD-(L)1 and platinum-based therapies. The first dose was administered in October to a person requiring treatment.

In July 2023, our collaboration partner Telix Pharmaceuticals announced the administration of the first dose in the Phase Ib STARSTRUCK trial. This open-label, single-arm, multicenter dose-escalation and dose-expansion study will evaluate the safety profile, dosing and activity of our DNA-dependent protein kinase (DNA-PK) inhibitor candidate, peposertib (M3814), in combination with Telix's investigational targeted radiation therapy, TLX250, in patients with solid tumors expressing carbonic-anhydrase IX (CAIX).

To diversify our robust internal pipeline in our focus areas of DNA damage response inhibition and antibody-drug conjugates, in October 2023 we announced a strategic collaboration with Jiangsu Hengrui Pharmaceuticals Co. Ltd. (Hengrui). The partnership includes an exclusive global license (excluding mainland China) to develop, manufacture and commercialize Hengrui's next-generation potent and selective PARP1 (poly (ADP-ribose) polymerase 1) trapping inhibitor HRS-1167. The agreement also includes an option for exclusive global development, manufacturing and commercialization (excluding mainland China) of Hengrui's Claudin-18.2 antibody-drug conjugate (ADC) SHR-A1904.

In December, we announced a license agreement with Abbisko Therapeutics Co. Ltd, Shanghai, China, for pimicotinib (ABSK021), which is currently being evaluated in a Phase III study for the treatment of tenosynovial giant cell tumor (TGCT). TGCT is a benign tumor of the joints that can cause swelling, pain, stiffness, and limited mobility of the affected joints. The agreement grants us a license to commercialize pimicotinib in mainland China, Hong Kong, Macau and Taiwan, with an option for rest of world.

Highlights of congress publications in 2023

We shared additional new data for our marketed and investigational oncology medicines at major oncology congresses.

In June, 43 abstracts featuring new data for the medicines Bavencio® (avelumab), Erbitux® (cetuximab) and Tepmetko® (tepotinib) and drug candidates from our pipeline including the first-in-class investigational IAP inhibitor xevinapant were presented at the ASCO Annual Meeting.

Highlights included:

- Clinical data for Bavencio® that reinforce its role as a standard of care in first-line maintenance for advanced urothelial carcinoma in patients without disease progression following first-line platinum-based chemotherapy. Poster discussions, including long-term safety analyses and an analysis of quality-adjusted survival from the Phase III JAVELIN Bladder 100 study, confirm the acceptable long-term benefit-risk profile as well as the net benefit estimate of Bavencio® in first-line maintenance and further support its use.
- Long-term outcomes from the VISION study, the largest study of a MET inhibitor in patients with METex14-skipping advanced NSCLC (N=313). Detection was carried out via liquid and/or tissue biopsy. The results demonstrate the robust and sustained clinical activity of Tepmetko®, particularly in the first-line setting: with a median follow-up time of 32.6 months, the overall response rate in 164 people treated with first-line therapy was 57.3% (95% CI: 49.4, 65.0) and the median duration of response 46.4 months (13.8, cannot be estimated).
- Additional presentations for Tepmetko® that included analyses of the INSIGHT 2 study in NSCLC with epidermal growth factor receptor (EGFRm) mutation and MET amplification during treatment with Tepmetko® plus osimertinib.
- Erbitux® data that add to the growing body of evidence supporting the role of cetuximab-based therapies across the continuum of care in the treatment of RAS wild-type metastatic colorectal cancer and as a backbone of treatment in SCCHN.

At the European Society for Medical Oncology (ESMO) Congress 2023, we presented 28 abstracts featuring the latest research on our oncology portfolio addressing unmet treatment needs across bladder, head and neck, lung, colorectal, and other cancers.

Highlights included:

- New analyses and real-world evidence that reinforce the role of Bavencio® first-line maintenance in the treatment of advanced UC in patients with varying characteristics. These include long-term efficacy and safety outcomes from the Phase III JAVELIN Bladder 100 study that confirm the prolonged overall survival (OS), progression-free survival (PFS) and tolerability of first-line maintenance with Bavencio® in patients older than 65 years with advanced UC. Further evidence from France and the United States, including initial data from the French AVENANCE study on patients with advanced UC whose tumors have histological variants, support the findings of JAVELIN Bladder 100 in real-world settings.
- Additional real-world analyses reinforcing the use of Bavencio® as a treatment for advanced/metastatic MCC. After a median follow-up of approximately 29 months, data from the MCC TRIM study showed a median OS of 52 months for patients with metastatic MCC treated with Bavencio® in a real-world setting in Germany. Most patients (approximately 86%) received first-line Bavencio®.
- Updated findings from the Phase II VISION trial, which is the largest study of a MET inhibitor in METex14-skipping NSCLC and served as the basis for regulatory approvals, continue to show clinically meaningful long-term efficacy in patients treated with Tepmetko® regardless of line of therapy (2L, 2L+ and 3L+).
- A new analysis of real-world survival outcomes and survival risk factors in elderly patients with locally advanced SCCHN that highlights poor survival outcomes, especially in patients aged 70 years and older with advanced disease stage and comorbidities, underscoring the need for innovative effective treatments for this population.

Neurology & Immunology*

With a commitment of more than 25 years to people living with multiple sclerosis (MS), our ongoing dedication to science drives us to discover cutting-edge therapies through our research in neurological and immune-mediated disease areas.

Beyond our portfolio in MS, we have a pipeline focusing on discovering new therapies that have potential in other neuroinflammatory and immune-mediated diseases, including systemic lupus erythematosus (SLE), cutaneous lupus erythematosus (CLE) and generalized myasthenia gravis (gMG).

Enpatoran, an investigational highly specific potential first-in-class immune modulator blocking the activation of toll-like receptors (TLR7 and TLR8), is being developed as a new oral therapy for SLE and CLE. It aims to overcome limitations of currently available lupus therapies by providing selective inhibition of lupus-relevant disease drivers, which may increase efficacy while preserving immunity against infections. We anticipate data from our Phase II clinical trials for enpatoran in the first half of 2024.

We are also exploring the potential of oral cladribine beyond MS, developing it for the treatment of gMG, which affects an estimated 700,000 people and where a high unmet need remains, particularly as regards oral treatment options. Cladribine is believed to work by affecting the pathogenic pathways involved in the development of autoimmunity (auto-antibody producing B cells and T cells). In June 2023, the FDA granted Orphan Drug Designation for cladribine for the treatment of myasthenia gravis. We anticipate the initiation of a global Phase III clinical trial program in the second quarter of 2024.

In February 2023, we entered a preclinical licensing and strategic research partnership with Aqilion, a biotech company focused on developing innovative treatments for immune-mediated and neurological diseases.

New data for our existing therapy Mavenclad® (cladribine tablets), as well as for our investigational drug evobrutinib, were presented at key congresses in 2023, including the Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS) Forum in February, the American Academy of Neurology (AAN) Annual Meeting in April and the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) Congress in October.

At ACTRIMS 2023, we presented data that included analyses of the CLARIFY-MS study, showing the potential of Mavenclad® to improve outcomes in an impactful way for people living with RMS. In addition, we showed updated long-term efficacy and safety data from our Phase II program for the investigational drug evobrutinib. In December we shared that the phase III pivotal study did not meet its primary endpoint of annualized relapse rate for up to 156 weeks compared to oral teriflunomide.

At AAN 2023, we presented data from the M AGNIFY-MS study, showing sustained reductions in the memory B-cell numbers, with changes towards anti-inflammatory phenotypes in circulating B- and T-cell types for study participants taking Mavenclad® and provided updated efficacy and safety data from our Phase II program for the investigational drug evobrutinib.

At ECTRIMS 2023, we presented 31 abstracts in total, including long-term efficacy and neurofilament light chain data (from the M AGNIFY-MS study) for Mavenclad® as well as new real-world evidence data highlighting naïve use of the treatment. In addition, we shared updated five-year safety and efficacy data from the Phase II Open Label Extension for investigational evobrutinib as well as baseline demographic data of our Phase III EVOLUTION trials.

Fertility*

As the global market leader in fertility drugs and treatments, our Fertility franchise plays a crucial role in our Healthcare business.

Infertility is an increasing challenge globally due to demographic changes and lifestyle adjustments such as delayed childbearing. Based on the latest data from WHO, one in six people worldwide are affected by infertility.

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According to updated data, more than five million babies have been born worldwide with the help of Gonal-f®, a leading therapeutic within our fertility portfolio. It contains the active ingredient follitropin alfa (r-hFSH alfa), which is a recombinant form of the natural hormone FSH and is available in a convenient and ready-to-use pre-filled injection pen. Treatment with Gonal-f® can result in increased follicles, oocytes and embryos compared with urinary gonadotropins, thereby improving the chances of pregnancy and live birth. Recent real-world evidence studies based on key European registries (D.I.R., SNDS) showed increased likelihood of live birth with Gonal-f® compared with urinary gonadotropins and biosimilar preparations of follitropin alfa.

Cardiovascular, Metabolism & Endocrinology*

In view of the significant and growing impact of chronic diseases such as diabetes, prediabetes, hypertension, and cardiovascular disease, growth hormone disorders and thyroid disorders on health and society in the 21st century, we are committed to helping patients with these conditions.

The new formulation of Euthyrox® (levothyroxine) for the treatment of hypothyroidism obtained further regulatory approvals in 2023, resulting in a total of 101 countries where this incremental innovation is registered. With its characteristics of delivering precise, fine-tuned and stable T4 doses, Euthyrox® may help optimize disease management, making it a good choice for healthcare providers and patients.

Glucophage®, containing the active ingredient metformin, is the most widely prescribed non-insulin diabetes treatment worldwide for first-line treatment of type 2 diabetes for which we achieved a successful label extension in Europe in 2022. The label update on the mechanism of action is evidence of the still growing body of knowledge and opportunities for metformin in the diabetes continuum. Those label updates are currently being rolled out in all other countries outside Europe where the Glucophage® family of products is available.

Concor®/Concor Cor®, containing bisoprolol, is a beta-blocker for treating hypertension and cardiovascular diseases such as coronary heart disease and chronic heart failure. In addition to Concor®/Concor Cor®, the Concor® franchise includes fixed-dose combinations such as Concor Plus®/Lodoz® (bisoprolol with hydrochlorothiazide) and Concor® AM (bisoprolol with amlodipine). Concor® AM has been registered in 71 countries.

Investments to speed up the availability of new medicines*

Our declared aim is to bring more medicines to more patients faster. In 2023, we supported this aim by reaching key milestones for two transformational investments focusing on complementary therapeutic modalities:

- In June, we inaugurated our Biotech Development Center at our site in Corsier-sur-Vevey, Switzerland. This investment of over € 250 million aims to ensure that our next generations of innovative large-molecule medicines (biotech therapies and potential other new therapeutic modalities) are available for clinical trials on time and in the required quality and quantity with an accelerated process compared with the past. The Biotech Development Center is expected to be fully operational in early 2024 following validation by regulatory authorities.
- In September, we celebrated the topping-out for our Launch and Technology Center at our site in Darmstadt, Germany. This investment of approximately € 160 million is intended to ensure that our next generations of innovative small-molecule medicines (including high-potency compounds) are available for clinical trials, global launches and commercial supply on time and in the required quality and quantity, with accelerated processes compared with the past. The Launch and Technology Center is anticipated to be fully operational by the end of 2025 following validation by regulatory authorities.

Collaborations to strengthen AI-driven drug discovery*

On September 20, we announced two strategic collaborations with Benevolent AI and Exscientia to drive accelerated drug discovery with higher probability of success. Access to end-to-end AI platform capabilities is expected to generate several novel development candidates in oncology, neurology and immunology. AI-powered R&D is an integral part of delivering on our ambition to bring more medicines to more patients, faster.

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Our pipeline

As of December 31, 2023		
Therapeutic area		
Compound	**Indication**	**Status**
Immunology		
Enpatoran (TLR7/8 antagonist)	Systemic lupus erythematosus[1]	Phase II
Enpatoran (TLR7/8 antagonist)	Cutaneous lupus erythematosus[1]	Phase II
Enpatoran (TLR7/8 antagonist)	Idiopathic inflammatory myopathies (DM and PM)[2]	Phase II
Oncology		
Xevinapant (IAP inhibitor)	Locally advanced squamous cell carcinoma of the head and neck – Unresected, cisplatin-eligible[3]	Phase III
Xevinapant (IAP inhibitor)	Locally advanced squamous cell carcinoma of the head and neck – Resected, cisplatin-ineligible[4]	Phase III
Avelumab (anti-PD-L1 mAb) + combinations	Locally Advanced or Metastatic Urothelial Carcinoma[5]	Phase II
Tuvusertib/M1774 (ATR inhibitor)	Solid tumors[6]	Phase Ib
M4076 (ATM inhibitor)	Solid tumors[7]	Phase Ib
M9140 (anti-CEACAM5 Antibody drug conjugate)	Solid tumors	Phase Ia
M6223 (anti-TIGIT mAb)	Solid tumors[8]	Phase Ib
M9466 (HRS-1167; Selective PARPi)	Solid tumors[9]	Phase I
Global Health		
Arpraziquantel (anthelmintic)	Pediatric schistosomiasis[10]	Registration
M5717 (PeEF2 inhibitor)	Malaria	Phase II

On December 04, 2023, we announced a license agreement with Abbisko Therapeutics Co. Ltd, China, for pimicotinib (ABSK021), which is currently being evaluated in a Phase III study for the treatment of tenosynovial giant cell tumor (TGCT). The agreement grants us a license to commercialize pimicotinib in mainland China, Hong Kong, Macau and Taiwan, with an option for rest of world.

End of December 2023, we entered into a licensing agreement with Inspirna, Inc., United States, for ompenaclid (RGX-202), a first-in-class oral inhibitor of the creatine transport channel SLC6A8, and SLC6A8-targeting follow-on compounds. Ompenaclid is currently being evaluated in a Phase II study for the second-line treatment of RAS-mutated (RASmut) advanced or metastatic colorectal cancer (mCRC).

Unless noted otherwise, clinical programs conducted in collaboration with external partners are not shown unless we have co-ownership of data. More information on the ongoing clinical trials can be found at **www.clinicaltrials.gov**. Pipeline products are under clinical investigation and have not been proven to be safe and effective. There is no guarantee any product will be approved in the sought-after indication.

[1] Clinical trial passed futility analysis.

[2] Dermatomyositis and Polymyositis.

[3] In combination with cisplatin and radiotherapy in unresected LA SCCHN patients eligible for the treatment with cisplatin.

[5] In combination with radiotherapy in resected LA SCCHN patients ineligible for the treatment with cisplatin.

[5] Combinations include Sacituzumab Govitecan, NKTR-255 and M6223.

[6] Studies as monotherapy and in combination with cemiplimab, niraparib, avelumab or M4076 ATMi. Includes studies (phase I/II) in collaboration with/ sponsored by external partners, e.g. US National Cancer Institute (NCI).

[7] Administered in combination with Tuvusertib/M1774 (ATRi).

[8] Administered in combination, including combinations other than avelumab.

[9] On October 30, 2023, we announced a collaboration with Jiangsu Hengrui Pharmaceuticals Co. Ltd., China, including an exclusive license worldwide (excluding China) to develop, manufacture and commercialize the next-generation potent and selective PARP1 trapping inhibitor HRS-1167.

[10] On 14 December, 2023, the Committee for Medicinal Products for Human Use (CHMP) of the European Medicines Agency (EMA) adopted a positive scientific opinion for arpraziquantel for the treatment of schistosomiasis in children aged 3 months to 6 years. The application was submitted by us, on behalf of the Pediatric Praziquantel Consortium, under the EU-M4all procedure for high-priority medicines for human use intended for countries outside the European Union.

ATM: ATM serine/threonine kinase
ATR: Ataxia telangiectasia and Rad3-related
BTK: Bruton's tyrosine kinase
CEACAM5: Carcinoembryonic antigen-related cell adhesion molecule 5
IAP: Inhibitor of apoptosis proteins
mAb: Monoclonal antibody
PARP1: poly (ADP-ribose) polymerase 1
Phase Ia: Dose finding
Phase Ib: Dose escalation/expansion and signal seeking
PD-L1: Programmed cell death ligand 1
PeEF2: Plasmodium eukaryotic elongation factor 2
TIGIT: T cell immunoreceptor with Ig and ITIM domains
TLR7/8: Toll-like receptors 7 and 8

Electronics

As a science and technology company, we strive to offer leading-edge products, services, and solutions.

Our R&D strategy follows our overall Electronics technology strategy, which aims to enhance and expand our capabilities, drive organic growth and enable new technology platforms. Our Chief Technology Office (CTO) is identifying trends and vetting technologies that are beyond the time horizon or scope of our business units. As a dedicated technology organization, the CTO is managing research partnerships, shaping our technology roadmaps, and managing our long-term R&D portfolio. Our Technology Leadership Board reviews and optimizes our technology investment across the business sector.

Our R&D is aligned to strengthen our existing position in the industry across many key material and innovation areas, with the addition of artificial intelligence (AI), data services, analytics, and sustainability to enhance our portfolio offering. As an essential part of our “Level Up“ growth program, we are continuing to invest significantly more than € 3 billion in innovation and capacity expansion. With our R&D investments within “Level Up”, we are also scaling up our research and development capabilities for next-generation semiconductor and display materials to further strengthen our position as one of the leading suppliers to the electronics industry.

Our R&D is focused on finding solutions for the needs that drive our industry: increase energy efficiency of devices, enhance performance of materials, reduce environmental impact on the planet. Consequently, sustainability, and the use of AI and machine learning are key focus areas of our R&D.

Sustainable technologies and materials*

We are continuing to drive sustainability in R&D to address the increasing push for lower emissions along the value chains. Ongoing key programs focus on, e.g. NF_3 abatement and more sustainable processes and manufacturing technologies as well as green solvents, sustainable etch gases and PFAS replacement.

NF_3 abatement

Nitrogen trifluoride (NF_3) accounts for about 60% of our global emissions, mainly from our specialty gases business. We developed and tested an abatement solution using a modified commercial thermal destruction technology and demonstrated the ability to destroy NF_3 with 99% efficiency.

PFAS

PFAS, a generic term that covers about 10,000 per- and polyfluoralkyl substances, is used for several critical applications in the manufacture of microchips, e.g. photolithography, plasma etching and wafer cleaning. While it is currently not possible to manufacture semiconductors without PFAS, we have already developed several alternative products for some applications in Electronics. One area in which we are highly advanced is the replacement of PFAS surfactants with non-PFAS alternatives in photoresists and related ancillary products such as rinse solutions.

Scorecard

To embed sustainable design into R&D and steer our portfolio in a more sustainable direction in the long term, we have developed a scorecard that focuses on sustainable criteria in the development of new products and solutions. The scorecard is a tool for driving a sustainability culture in R&D and considers every step of the value chain to identify opportunities and risks at an early stage and act accordingly.

* The contents of this chapter or section are voluntary and therefore not audited. However, our auditor has read the text critically.

Academic research program

With the objective of enabling more sustainable semiconductor manufacturing solutions, we have joined forces with the Intel Corporation to jointly fund an academic research program over three years. The program will specifically leverage AI and machine learning technologies to achieve innovative breakthroughs in sustainable semiconductor manufacturing processes and technologies. Potential solutions include environmentally friendlier materials, more efficient use of resources, AI-based solutions for modeling chemical processes, and opportunities for reducing waste and emissions. The focus is on building open-source tools for the benefit of the entire scientific and industrial community.

R&D activities in the business units*

Semiconductor Solutions

In our R&D we are addressing critical material needs through every step of the wafer manufacturing process. Top R&D programs for our Semiconductor Solutions business units include:

Business field Thin Films

Our Thin Films business field is actively developing new dielectrics (organosilanes and spin-on dielectrics) and metallics offerings. Many of these new products are qualified by multiple customers and we are developing new materials for leading-edge nodes that will enable chips and chiplets used for generative AI. The integration of the chemical business of Mecaro into our business enables us to develop new precursors for high performance DRAM and provides us with unique capabilities to expand our development in Asia. In addition, we continued to expand our metallics portfolio to support our customers' roadmaps, providing innovative solutions for ALD (atomic layer deposition) and CVD (chemical vapor deposition). We achieved significant advancements in high-performance, conformal dielectric ALD films which address key customer pain points. Our spin-on-dielectrics platform focuses on developing new formulations for gap-fill applications in increasingly deep and narrow insulating features with the improved performance needed to enable next-generation V-NAND (vertical flash memory) and DRAM (dynamic random-access memory).

Business field Specialty Gases

Our etch gas technology program continues to develop new chemistries to enable more than 100-layer, single-stack etching for advanced memory devices such as V-NAND (vertical flash memory). We are also seeing good progress in our etch gas development work for new low-GWP (global warming potential) gases for etching applications and in our cooperation with customers to develop low-GWP gas solutions used in the production of semiconductors.

Business field Formulations (patterning and planarization)

The main driver of our R&D engagements in patterning is the manufacturing capability and costs associated with extreme ultraviolet (EUV) lithography systems. We are increasing our efforts in the development of EUV lithography materials to directly help our key customers address these challenges. Our Patterning Solutions team achieved a breakthrough in PFAS-free EUV rinse development, paving the way for a sustainable solution to prevent the collapse of structures in EUV lithography.

We are also investing in directed self-assembly (DSA) capabilities as we support customers' integration of DSA into advanced nodes, and we are beginning to sample photoresists and rinse materials from our PFAS-free portfolio development.

Our Planarization business is driving new product development across advanced oxide and metal segments. For example, we are achieving technical progress using dielectric high-performance cerium dioxide particles for advanced oxide CMP (chemical mechanical planarization).

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Display Solutions

With the proliferation of multiple applications and display trends, the display industry's technological requirements are significantly expanding. Our display materials are enabling the fast-growing market of innovative displays for current and future applications such as foldable smartphones, flexible displays for automotive or AR/VR (augmented reality/virtual reality) devices.

As our liquid crystals business remains a strong focus area, our R&D team is continuously working to develop new liquid crystal mixtures for our customers who need differentiated performance such as high transmittance, high contrast ratio, and high reliability to realize displays for new applications. We are working with our customers in the field of AR/VR to expand the application scenarios of liquid crystals and continue to enhance the user experience in small and micro-sized displays. We remain fully committed to advancing LCD technology and are working very closely with leading panel makers to develop next-generation products for the electronics market.

In the display industry, OLED is regarded as state-of-the-art technology for its excellent visual experience. It is also considered as the technology of the future of displays as it enables the production of flexible, foldable, rollable, and even transparent displays. We introduced new barrier materials that offer superior flexibility, higher reliability and a longer lifetime in flexible OLED devices compared with existing solutions. Devices with fully flexible OLED displays are one of the fastest-growing trends in data-driven electronics. Our innovative ALD material won the "Display Component of The Year 2023" award from Society for Information Display (SID), the world's largest display association. In addition, our innovative deuterated material won the "Technology Innovation Award" from LG Displays in September 2023.

Surface Solutions

In our Surface Solutions business, we offer our customers solutions for designing surfaces that meet their specific requirements. Together with our customers, we are consistently developing new formulations that, in combination with existing products and product innovations, provide customized solutions across various industries.

In our automotive pigments business, we are continuously expanding our portfolio of Colorstream® multicolor-effect pigments. A recent example is the development of Colorstream® F20-52 SW Mineral Red pigment, a new silica-based pigment that extends the red color palette of Surface Solutions into a more blueish-red range.

In our cosmetics business, we are further developing our range of high-color intensity pigments with metallic optical effects entirely without the use of metals. These Ronaflux® pigments are based on an entirely new proprietary technology employing fluidized bed processes for depositing ultrathin and highly stable carbon layers onto pearlescent pigments – a major precondition for spectacular shine effects. The carbon layers intensify the colors of the effect pigments, thus enabling brilliant shades of blue and green without the addition of chrome oxides, Prussian blue or other colorants. This new offering enables manufacturers of eye makeup and lipsticks to meet the strict regulatory requirements while offering brilliant metallic blue and green shades that do not contain any metal-based pigments.

To produce realistic color effects on electronic devices, we are focusing on methodologies to transfer coloristic measuring data into 3D visible effects. As a first step, we have introduced the first digital tool for visualizing car colors in various light conditions in a realistic way. Under controlled, calibrated conditions, color data, measured state-of-the-art technology, can be used to produce a realistic display.

Report on Economic Position

Macroeconomic and Sector-Specific Environment

In its latest World Economic Outlook published on January 30, 2024, the International Monetary Fund (IMF) predicts that the global economic recovery will prove surprisingly resilient despite numerous crises, but the speed of the recovery will vary depending on the economy. Global gross domestic product (GDP) growth slowed from 3.5% in 2022 to a projection of 3.1% in 2023. Overall, economic activity remains below pre-pandemic levels. Major impediments to economic recovery are long-term consequences of the pandemic and geopolitical tensions as well as cyclical factors such as inflation and tightened monetary policy. The ongoing war in Ukraine and the resurgent conflict in the Middle East are weighing on the economic development by accelerating the geoeconomic fragmentation and hindering the flow of commodities, which could lead to food or energy price peaks.

Overall, the IMF expects global inflation to decline more than expected in 2023 but remained above target levels. The persistently high inflation rates prompted central banks to increase interest rates and high debt levels led to tighter fiscal policies in some countries. China's property sector crisis still poses a risk as it could deepen and cause global spillovers.

The development of gross domestic product (GDP) in selected countries and regions was as follows:

Annual change in %	**2023[1]**	2022
World	3.1	3.5
Advanced Economics	1.6	2.6
USA	2.5	1.9
Euro Area	0.5	3.4
Japan	1.9	1.0
Emerging Markets and Developing Economies	4.1	4.1
Emerging Markets and Developing Economies Asia	5.4	4.5
India	6.7	7.2
China	5.2	3.0

[1] Figures for fiscal 2023 estimated

The development of selected sector specific environments was as follows:

	Change 2023[1]	Change 2022
Life Science		
Growth in market for laboratory products[2]	-5.6%	4.2%
Growth in global sales of biopharmaceutical drugs[3]	16.9%	14.5%
Share of biopharmaceutical sales in the global pharmaceutical market[3]	38.2%	35.8%
Early clinical monoclonal antibody (mAb) pipeline growth[4]	17.4%	7.7%
Healthcare		
Global pharmaceutical market	9.2%	7.8%
Market for multiple sclerosis therapies[5]	-2.3%	2.5%
Market for type 2 diabetes therapies[5]	19.1%	18.1%
Market for fertility treatment[5]	10.9%	4.2%
Market for the treatment of colorectal cancer[6]	-0.1%	4.5%
Electronics		
Growth of wafer area for semiconductor chips	-14.1%	3.9%
Growth of display surface area[7]	-1.5%	-3.9%
Global sales of cosmetics and care products	4.2%	12.2%
Global number of produced light vehicles	10.1%	7.1%

[1] Predicted development. Final development rates for 2023 were not available for all industries when this report was prepared.

[2] Global Market for Laboratory Products, October 2023, Frost & Sullivan.

[3] Global pharmaceutical spending at a constant exchange rate. IQVIA market data based on the past 12 months as of the third quarter 2023.

[4] Number of programs in Phase I or Phase II clinical trials, Cortellis.

[5] Growth rates based on market data in local currency, translated at a constant euro exchange rate. The IQVIA market data on the growth of indications are based on current figures, including the third quarter of 2023. Annual growth based on the values for the past 12 months. The type 2 diabetes market excludes the United States since this market is insignificant to us.

[6] Growth rates based on market data stated in US dollars. Market data from EvaluatePharma on the growth of indications are based on published company reports and are subject to exchange rate fluctuations.

[7] Growth of display area is a pure volume indicator.

Life Science

Our Life Science business sector is one of the leading global suppliers of products, tools and services for research laboratories, pharma and biotech production, as well as industrial and testing laboratories. The convergence of several adverse developments (macroeconomics, capital constraints, declining Covid-19 pandemic demand, and high customer inventory) has challenged growth of life science companies compared with previous years.

Accordingly, the markets in which our Life Science business sector operates slowed down in 2023 compared with 2022. According to the market research firm Frost & Sullivan, the market for laboratory products, which is relevant to our Science & Lab Solutions business unit, declined by -5.6% in 2023 (2022: 4.2%). This decline is due to a challenging macroeconomic outlook (declining GDP growth and persistent inflation) and a sustained slowdown of investment in early stage biotech companies (according to Citi Research, venture capital and IPOs remain below pandemic highs).

Once capital markets stabilize, spending on laboratory products is likely to increase again. In the pharma and biotech production market, in which our Process Solutions and Life Science Services business units are active, demand is driven by the development and manufacture of therapeutics and vaccines. According to the pharmaceutical market research firm IQVIA, the end market for biopharmaceuticals grew by 16.9% in 2023 (2022: 14.5%) to € 496 billion (or 38.2% of the global pharmaceutical market). The number of monoclonal antibodies (mAbs) in phase I or II development grew by 17.4% (2022: 7.7%). While the biopharmaceutical market grew in 2023, laboratory consumables and materials used in manufacturing were pre-purchased to a significant extent in 2022, resulting in high inventories among our customers.

Healthcare

In its latest study from September, IQVIA forecasts growth of 9.2% in 2023 (2022: 7.8%) for the global overall pharmaceutical market. After the recovery from the Covid-19 pandemic, the pharmaceutical market is expected to see still high growth rates benefitting from accelerated approval pathways and increased access to innovative medicines globally. This is balanced by further increasing cost containment measures and policies driving biosimilar and generics uptake as well as stricter price reviews and prescription controls.

The developments at a regional level follow the described trend. EMEA (Europe, Middle East and Africa) grew by 9.2% in 2023 (2022: 8.2%) with the EU5 (Germany, France, UK, Italy, and Spain) growing by 7.8% (2022: 8.0%). North America grew by 10.2% (2022: 9.6%) with the United States growing at a rate of 10.3% (2022: 9.5%). In absolute terms, the pharmaceutical market in the United States remains the biggest and most important market by far. Latin America achieved double-digit growth of 19.2% (2022: 12.5%) impacted by high inflation. This is followed by the Asia-Pacific region (excluding China and Japan) with 8.2% growth (2022: 9.6%). Despite continued extension of price regulations (for example, volume-based procurement), China returned to growth with 4.3% in 2023 (2022: -0.8%) due to the lifting of Covid-19 pandemic measures, increased access to innovative products and growing healthcare infrastructure).

Not only the growth of the pharmaceutical sector as a whole, but also the market development for biotechnologically produced active ingredients is relevant to our business. According to IQVIA, these products accounted for 38.2% of the global pharmaceutical market in 2023 (2022: 35.8%), thus continuing the increase in market share of recent years. The most important market for biological pharmaceuticals remains the United States, with a 64.2% share of global biopharmaceutical market volumes.

The developments in the therapeutic areas of relevance to the Group saw differing trends in the reporting year. The global market for type 2 diabetes, excluding the United States, followed the growth trend of previous years and accelerated growth, achieving 19.1% in 2023 (2022: 18.1%). The therapeutic area of infertility grew 10.9% in the reporting year (2022: 4.2%). Colorectal cancer declined by -0.1% in 2023 (2022: increase of 4.5%) due to biosimilar penetration. The growth trend in the market for multiple sclerosis therapies declined slightly compared with previous year level by -2.3% (2022: 2.5%), as new product launches are counteracted by the effect of generic competition.

Electronics

The semiconductor industry is the most important market for our business with materials, solutions and services for the production of integrated circuits (Semiconductor Solutions). In particular, the growth in demand for semiconductor materials depends mainly on the wafer area produced for semiconductors. The silicon wafers required as raw materials are used as an indicator to estimate the demand for semiconductor materials overall.

According to the global industry association SEMI (forecast as of Q3 2023), the delivered silicon wafer area experienced a -14.1% decline in 2023, following moderate growth in 2022 (3.9%). The current cyclical industry downturn is amplified by macroeconomic challenges such as high interest rates and changing consumer buying behaviors with a preference for services. Semiconductor manufacturers have responded by reducing utilization rates to address excess inventory, resulting in declining demand for silicon wafers and related materials and services.

Despite the current downturn, we foresee a positive outlook for the Electronics business sector. We anticipate that the semiconductor market will regain momentum in 2024, driven by AI solutions, the Internet of Things, and the increase in data volumes related to big data.

With our Display Solutions business, we are a significant producer of liquid crystal mixtures and OLED materials for the display industry. After the Covid-19-pandemic-induced “stay at home boom,” the display industry underwent demand normalization in 2022. There are several indications that display market is slowly recovering after supply inventory adjustments. Due to sluggish demand in the fourth quarter of 2023, however, the market research company OMDIA (forecast as of Q3 2023) forecasted a slight decline in growth for 2023. In the medium to long term, liquid crystals will continue to play a key role in the display industry in the future. OLED technology, for which we have a strong position as material supplier, is becoming increasingly important in high-end display applications.

The markets for automotive coatings and cosmetics are crucial to our Surface Solutions business. According to the December 2023 report from GlobalData (formerly LMC), a leading global provider of automotive forecasts, global automobile production grew significantly by 10.1% in 2023 compared with growth of 7.1% in 2022. Underlying drivers include an unmet global demand, with China continuing to be one of the most important markets. According to Euromonitor’s report from October 2023, the market for cosmetics and care products grew more slowly in 2023 after a very strong development in 2022 with an overall growth of 4.2% in 2023 (2022: 12.2%).

Review of Forecast against Actual Business Developments

The forecast of the Group for fiscal 2023 published in the Annual Report for fiscal 2022 comprised the forecast for the Group as well as the forecast for the three business sectors: Life Science, Healthcare, and Electronics.

Net sales

We forecast slight to solid organic net sales growth for the Group in 2023. In particular, the macroeconomic, geopolitical and industry-specific conditions changed over the course of the year. Furthermore, the Life Science business sector saw sustained high inventory levels and a reluctance to invest on the part of customers, while the Electronics business sector was affected by the ongoing weakness of the market for semiconductor materials.

Waning demand for products in connection with the Covid-19 pandemic meant that, as expected, net sales declined sharply in fiscal 2023. All in all, we reported an organic decline in net sales of -1.6% in fiscal 2023, which fell within the forecast range of between -2% and +2% that we revised in the second quarter and confirmed in the third quarter. At the start of the year, we anticipated a negative exchange rate effect totaling between -1% and -4%, especially as a result of the expected development of the U.S. dollar and the Chinese renminbi. Several currencies, including the U.S. dollar and the Chinese renminbi as well as some currencies of emerging economies, saw less favorable development than expected as the year progressed. The negative exchange rate effect in 2023 as a whole was -4.1%, thus falling within the range of -3% to -6% which we most recently revised in the second quarter and confirmed in the third quarter. The slightly positive portfolio effect was negligible at +0.1%. All in all, net sales amounted to € 20,993 million, representing a year-on-year decrease of -5.6%. This was below the mid-point of the forecast range of € 20,500 million to € 21,900 million and thus was consistent with the more specific forecast issued together with the figures for the third quarter (trending slightly below the mid-point).

Life Science

Our Life Science business sector reported an organic decline in net sales of -7.9% in fiscal 2023. This was at the lower end of the forecast range of between -8% and -2%, which we adjusted in the second quarter and confirmed in the third quarter, meaning that Life Science fell below our original forecast of slight to moderate organic growth. All of the business units – Process Solutions, Life Science Services and Science & Lab Solutions – recorded a downturn in organic net sales. As expected, Process Solutions and Life Science Services saw the most pronounced organic decline in net sales, whereas the downturn in the Science & Lab Solutions business unit was only slight. All in all, net sales in the Life Science business sector fell by -10.6% to € 9,281 million including a negative exchange rate effect of -2.7% and a positive portfolio effect of 0.1%. This was in the lower half of the forecast range of € 9,100 million to € 9,950 million, which is consistent with the more specific forecast issued at the end of the third quarter (trending in the lower half of the forecast range).

Healthcare

We originally forecast moderate to solid organic sales growth for our Healthcare business sector compared with the previous year. We then quantified this organic sales growth forecast at between +5% and +9% when we published the figures for the first quarter. We raised this forecast range to between +6% and +9% with the publication of the figures for the second quarter and confirmed this at the end of the third quarter. With full-year organic growth of +8.5%, the business sector achieved the forecast for fiscal 2023. This development was driven in particular by the significant growth of the oncology business and, above all, the strong performance of our recently approved product Bavencio®. Neurology & Immunology made a substantial contribution to full-year organic sales growth in fiscal 2023 thanks to our recently approved product Mavenclad® in particular. Sales growth was also driven by our established portfolio, especially fertility products. Taking into account the negative exchange rate effect of -5.8%, net sales in the Healthcare business sector increased by +2.7% to € 8,053 million in fiscal 2023, thereby falling within the upper half of the forecast range. This was consistent with the more specific forecast issued together with the report on the third quarter (trending slightly above the mid-point).

Electronics

Despite the economically and geopolitically difficult conditions in the market for semiconductor materials, we forecast slight to solid organic net sales growth for our Electronics business sector at the start of the year based on the assumption that the semiconductor market would recover in the second half of 2023. We quantified our organic sales growth forecast at between -2% and +3% when we published the figures for the first quarter. Compared with the previous forecast, we anticipated an even more pronounced weakening of the market followed by a delayed but stronger recovery which should now only occur later in the second half of the year. We adjusted this forecast with the publication of the figures for the second quarter, stating that we expected an organic decline in net sales of between -6% and -1% in light of the further delay in the recovery of the semiconductor market. We then confirmed this forecast at the end of the third quarter. The organic decline in net sales for fiscal 2023 as a whole was -5.1%, which is in line with the lower end of the forecast range. Due to negative exchange rate effects of -4.1% and taking into account a portfolio effect of +0.3%, net sales in the Electronics business sector declined by -8.8% year-on-year to € 3,659 million, thereby falling within the forecast range of between € 3,500 million and € 3,800 million. This was consistent with the more specific forecast issued together with the report on the third quarter (trending around the mid-point).

EBITDA pre

Our original forecast for the Group's EBITDA pre for 2023 ranged from a moderate decline to roughly stable organic development compared with the previous year. This assumption was based on the expectation of a moderate decline to roughly stable organic development in the Life Science business sector, slight to moderate organic growth in the Healthcare business sector, and a slight to strong organic decline in the Electronics business sector. We originally expected negative exchange rate effects to impact EBITDA pre by between -1% and -4% compared with the prior year. With the presentation of the figures for the first quarter, we quantified our forecast at organic development of between -5% and 0%. In response to inflation-related cost increases and the underutilization of our production capacities, especially in the Life Science and Electronics business sector, we revised our forecast to between -9% and -3% at the end of the second quarter. This forecast was confirmed with the publication of the figures for the third quarter. Due to negative exchange rate effects, we revised our forecast for the impact of exchange rate effects twice in the course of fiscal 2023, ultimately ending with a forecast of between -6% and -3%. EBITDA pre amounted to € 5,879 million in fiscal 2023, representing an overall decline of -14.2% compared with the previous year (-9.0% organic, -4.9% from currency effects, -0.3% from portfolio effects). This is in the lower half of the forecast range of between € 5,800 million and € 6,400 million, and hence is consistent with the more specific forecast range (trending in the lower half of the range).

Life Science

In contrast to the expected net sales development, we originally expected EBITDA pre in Life Science to be in a range from a moderate decline to organically about stable in fiscal 2023 due to inflation-driven price increases weighing more heavily on earnings. At the end of the first quarter, we quantified our forecast for the organic decline in EBITDA pre at between -8% and -4%. In response to the underutilization of our production capacities, we then lowered this to between -21% and -12% with the publication of the figures for the second quarter. Along with the exchange rate effect that was most recently forecast at between -6% and -2% (originally: slightly negative exchange rate effect), this resulted in a forecast range for EBITDA pre in the Life Science business sector of between € 2,750 million and € 3,200 million. The business sector achieved this forecast with EBITDA pre of € 2,820 million in fiscal 2023 (2022: € 3,760 million). This corresponded to a decline of -25.0% compared with the previous year (-21.4% organic, -3.3% due to exchange rate effects). EBITDA pre therefore also fell within the more specific forecast range issued at the same time as the report on the third quarter (trending in the lower half of the range of € 2,750 million to € 3,200 million).

Healthcare

With our new products expected to continue to deliver a substantial earnings contribution, especially Mavenclad® and Bavencio®, we forecast slight to moderate organic growth in EBITDA pre for our Healthcare business sector. Largely because of the sustained high level of prices due to inflation, this original forecast was slightly below the expected organic growth in net sales (moderate to solid organic sales growth). With the publication of the figures for the first quarter, we quantified our forecast for organic growth in EBITDA pre at between +8% and +12% in fiscal 2023. We then raised this forecast to between +14% and +19% at the end of the second quarter, especially as business performance was expected to be stronger. We confirmed this forecast range at the end of the third quarter. Along with the exchange rate effect that was most recently forecast at between -17% and -13% (originally: negative exchange rate effect in a high single-digit to low double-digit percentage range), this resulted in a forecast range for EBITDA pre in the Healthcare business sector of between € 2,450 million and € 2,600 million. With EBITDA pre of € 2,543 million in fiscal 2023 (2022: € 2,477 million), the business sector came in at the upper end of this range. This was also consistent with the more specific forecast issued together with the report on the third quarter (trending at the upper end of the range). This corresponded to an increase of +2.7% compared with the previous year (+17.1% organic, -14.4% due to exchange rate effects, -0.7% from portfolio).

Electronics

We originally anticipated a slight to strong organic decrease in EBITDA pre for our Electronics business sector in fiscal 2023. We expected inflation-driven cost increases to have a particularly pronounced impact on material costs, and that we would only be able to pass on cost increases to a limited extent in the coming quarters due to the price pressure faced by our customers. With the presentation of the figures for the first quarter, we quantified our forecast for the organic decline in EBITDA pre as ranging from -12% to -3%. Having lowered our forecast considerably to between -18% and -10% with the report on the second quarter in response to inflation-related cost increases and the underutilization of our production capacities, we reiterated this guidance at the end of the third quarter. Along with the exchange rate effect that was most recently forecast at between -10% and -7% (originally: significantly negative exchange rate effect), this resulted in a forecast range for EBITDA pre in the Electronics business sector of between € 870 million and € 980 million. EBITDA pre of € 913 million in fiscal 2023 (2022: € 1,192 million) was in the lower half of the forecast range. This was consistent with the more specific forecast issued along with the report on the third quarter (trending in the lower half of the range) and corresponded to a decline of -23.4% compared with the previous year (-17.1% organic, -5.6% due to exchange rate effects).

Corporate and Other

The expenses for Corporate and Other in EBITDA pre amounted to € -397 million in fiscal 2023. This meant that EBITDA pre was slightly below the original forecast range of between € -370 million and € -330 million. However, we specified our forecast with the presentation of the figures for the third quarter. Due to substantially lower expected income from currency hedging transactions, we have forecast that EBITDA pre for corporate costs and other is expected to be slightly below the forecast range of -330 to -370 million €. The original forecast for fiscal 2023 provided for a significant decline in the expenses in this area. Compared with the prior-year figure of € -579 million, the expenses decreased significantly by -31.5%.

Operating cash flow

We originally anticipated a moderate decline to roughly stable development for the operating cash flow of the Group in 2023 (2022: € 4,259 million). We then specified the forecast range at between € 3,700 million and € 4,300 million with the publication of the figures for the first quarter. As we expected the development of operating cash flow to be largely in line with operating performance, we lowered our forecast to between € 3,500 million and € 4,100 million at the end of the second quarter and confirmed this forecast in our report on the third quarter. The operating cash flow amounted to € 3,784 million in fiscal 2023, which was within the most recent forecast range of between € 3,500 million and € 4,100 million. This corresponded to a decline of -11.2% compared with the previous year (2022: € 4,259 million). The decisive factor for this was the development of EBITDA pre.

Course of Business and Economic Position

Group

Group

Key figures

			Change	
€ million	**2023**	2022	€ million	%
Net sales	20,993	22,232	-1,239	-5.6%
Operating result (EBIT)[1]	3,609	4,474	-865	-19.3%
Margin (% of net sales)[1]	17.2%	20.1%		
EBITDA[2]	5,489	6,504	-1,015	-15.6%
Margin (% of net sales)[1]	26.1%	29.3%		
EBITDA pre[1]	5,879	6,849	-970	-14.2%
Margin (% of net sales)[1]	28.0%	30.8%		
Profit after tax	2,834	3,339	-505	-15.1%
Earnings per share (€)	6.49	7.65	-1.16	-15.2%
Earnings per share pre (€)[1]	8.49	10.05	-1.56	-15.5%
Operating cash flow	3,784	4,259	-475	-11.2%

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

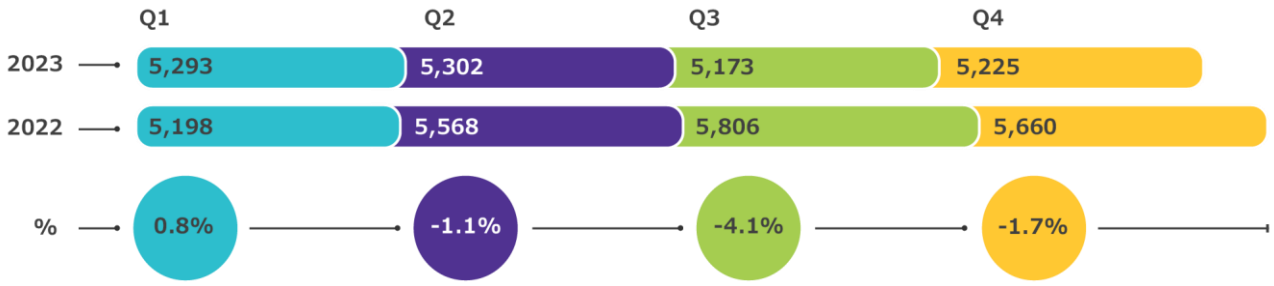
Development of sales and results of operations

The net sales in the individual quarters as well as the respective organic growth rates in 2023 are presented in the following graph:

Group

Net sales and organic growth[1] by quarter[2]

€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Quarterly breakdown unaudited.

In fiscal 2023, the net sales by business sector developed as follows:

Group

Net sales by business sector

€ million	**2023**	**Share**	**Organic growth[1]**	**Exchange rate effects**	**Acquisitions/ divestments**	**Total change**	2022	Share
Life Science	9,281	44%	-7.9%	-2.7%	0.1%	-10.6%	10,380	47%
Healthcare	8,053	38%	8.5%	-5.8%	–	2.7%	7,839	35%
Electronics	3,659	18%	-5.1%	-4.1%	0.3%	-8.8%	4,013	18%
Group	**20,993**	**100%**	**-1.6%**	**-4.1%**	**0.1%**	**-5.6%**	**22,232**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

In fiscal 2023, the Group recorded the following regional sales performance:

Group

Net sales by region

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2022	Share
Europe	6,037	29%	-1.3%	-2.1%	–	-3.4%	6,248	28%
North America	5,952	28%	-3.8%	-2.7%	0.1%	-6.4%	6,361	29%
Asia-Pacific (APAC)	6,936	33%	-4.3%	-5.8%	0.2%	-9.9%	7,697	35%
Latin America	1,331	6%	18.6%	-10.5%	–	8.1%	1,231	5%
Middle East and Africa (MEA)	737	4%	8.8%	-2.7%	–	6.1%	695	3%
Group	**20,993**	**100%**	**-1.6%**	**-4.1%**	**0.1%**	**-5.6%**	**22,232**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

- In fiscal 2023, the Group generated net sales of € 20,993 million (2022: € 22,232 million), representing a year-on-year decline of € 1,239 million or -5.6%. Negative exchange rate effects served to reduce net sales by € 902 million or -4.1% in fiscal 2023. These effects largely resulted from the exchange rate development of the Chinese renminbi, the US dollar, and the Argentinian peso. Net sales fell by € 357 million or -1.6% organically. Net sales in the Life Science and Electronics business sectors declined, while the Healthcare business sector recorded organic growth. The portfolio-related net sales increase of € 19 million mainly resulted from the acquisition of M Chemicals Inc., Korea.
- Net sales in the Life Science business sector decreased by € 1,100 million or -10.6% year-on-year to € 9,281 million (2022: € 10,380 million). This development was mainly attributable to organic effects, which amounted to € 821 million or -7.9%. Exchange rate effects of € 285 million or -2.7% also contributed to the downturn in net sales. The Life Science business sector accounted for the largest share of Group net sales at 44% (2022: 47%), followed by Healthcare at 38% (2022: 35%). Net sales in the Healthcare business sector increased by € 214 million or 2.7% year-on-year to € 8,053 million (2022: € 7,839 million). Negative exchange rate effects of -5.8% were offset by organic growth of 8.5%. The € 354 million decline in net sales in the Electronics business sector to € 3,659 million (2022: € 4,013 million) was driven by organic effects of -5.1% and exchange rate effects of -4.1%. This was offset by a positive effect of 0.3% from the acquisition of M Chemicals Inc., Korea. The percentage contribution of Electronics to Group net sales was unchanged year-on-year at 18%.
- Orders already received by the reporting date that will result in net sales in future periods amounted to around € 4 billion as of December 31, 2023 (December 31, 2022: around € 6 billion), of which around € 3 billion related to the Life Science business sector (December 31, 2022: around € 4 billion).

The Consolidated Income Statement of the Group is as follows:

Group

Consolidated Income Statement

					Change	
€ million	2023	%	2022	%	€ million	%
Net sales	**20,993**	**100.0%**	**22,232**	**100.0%**	**-1,239**	**-5.6%**
Cost of sales	-8,600	-41.0%	-8,527	-38.4%	-73	0.9%
Gross profit	**12,392**	**59.0%**	**13,705**	**61.6%**	**-1,313**	**-9.6%**
Marketing and selling expenses	-4,510	-21.5%	-4,714	-21.2%	203	-4.3%
Administration expenses	-1,392	-6.6%	-1,306	-5.9%	-86	6.6%
Research and development costs	-2,445	-11.6%	-2,521	-11.3%	75	-3.0%
Impairment losses and reversals of impairment losses on financial assets (net)	-51	-0.2%	-6	–	-45	>100%
Other operating income and expenses	-385	-1.8%	-685	-3.1%	300	-43.8%
Operating result (EBIT)[1]	**3,609**	**17.2%**	**4,474**	**20.1%**	**-865**	**-19.3%**
Financial result	-125	-0.6%	-187	-0.8%	62	-33.0%
Profit before income tax	**3,484**	**16.6%**	**4,287**	**19.3%**	**-803**	**-18.7%**
Income tax	-650	-3.1%	-948	-4.3%	298	-31.4%
Profit after tax	**2,834**	**13.5%**	**3,339**	**15.0%**	**-505**	**-15.1%**
Non-controlling interests	-10	–	-14	-0.1%	3	-25.6%
Net income	**2,824**	**13.5%**	**3,326**	**15.0%**	**-502**	**-15.1%**

[1] Not defined by International Financial Reporting Standards (IFRS).

Group

Research and development costs by business sector[1] - 2023
€ million/%

[1] Not presented: research and development costs of € 94 million allocated to Corporate and Other.

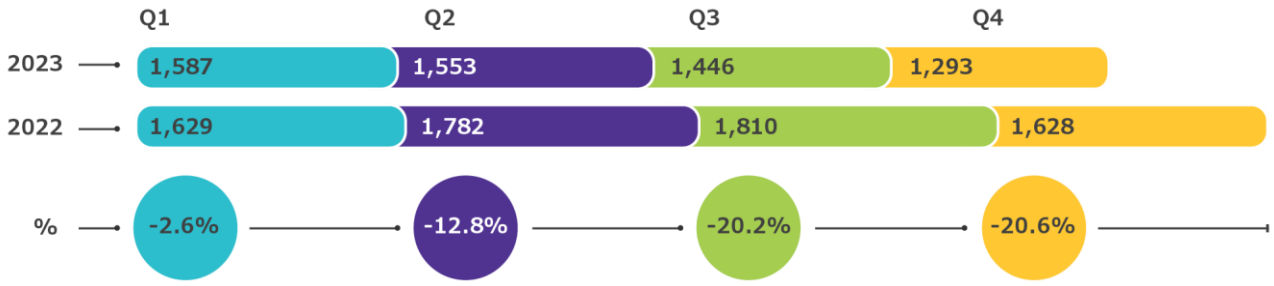
There was a year-on-year decline in the operating result (EBIT) in fiscal 2023. This was largely due to the lower level of gross profit, which was only partially offset by a reduction in operating expenses. In particular, the year-on-year decline in the gross margin was due to lower sales of high-margin products in the Life Science business sector that had experienced strong demand in conjunction with the Covid-19 pandemic. In addition, as a result of the agreement terminating the strategic alliance with Pfizer Inc., United States, the cost of sales included royalties for the Bavencio® product for the first time from July 1, 2023, which in turn reduced the gross margin.

- Marketing and selling expenses declined on the back of lower logistics costs in particular.
- Administration expenses increased as a result of a program to continuously improve processes and align the Group Functions more closely with the businesses in particular.
- Accounting for a 70% (2022: 70%) share of Group R&D spending (excluding research and development cost allocated to Corporate and Other), Healthcare was the most research-intensive business sector of the Group. Further information can be found in the "**Research and Development**" chapter.
- Other operating income and expenses fell compared with the previous year, mainly as a result of lower profit transfer expenses in the Healthcare business sector. Impairment losses on non-financial assets also declined.
- Overall, the aforementioned developments led to a reduction in the EBIT margin by around three percentage points, from 20.1% in the previous year to 17.2%.
- Compared to the previous year, EBITDA pre, the key financial indicator used to steer operating business, fell by € 970 million or -14.2% to € 5,879 million (2022: € 6,849 million).
- The financial result improved by 33.0% to € -125 million (2022: € -187 million). This was due in particular to the positive development of net interest income. Details about financial income and expenses can be found in Note (40) "**Finance income and expenses/Net gains and losses from financial instruments**" in the Notes to the Consolidated Financial Statements.
- Income tax expense amounted to € 650 million (2022: € 948 million) and resulted in a tax rate of 18.7% (2022: 22.1%). The downturn in earnings was accompanied by a corresponding reduction in taxes. Furthermore, a non-recurring deferred tax income had a reducing effect on the tax rate.
- The net income attributable to shareholders of Merck KGaA, Darmstadt, Germany, declined by 15.1% to € 2,824 million (2022: € 3,326 million) and resulted in a reduction in earnings per share to € 6.49 (2022: € 7.65).

The development of EBITDA pre in the individual quarters in comparison with 2022 as well as the respective growth rates are presented in the following overview:

Group

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Group

EBITDA pre[1] by business sector[2] - 2023
€ million/%

[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Not presented: Decline in Group EBITDA pre by € -397 million due to Corporate and Other.

Net assets and financial position

Group

Balance sheet structure

	Dec. 31, 2023		Dec. 31, 2022		Change	
	€ million	**%**	€ million	%	€ million	%
Non-current assets[1]	**36,102**	**74.4%**	**36,334**	**74.9%**	**-232**	**-0.6%**
thereof:						
Goodwill[1]	17,845		18,389		-544	
Other intangible assets[1]	6,551		7,335		-784	
Property, plant and equipment[1]	9,056		8,204		852	
Other non-current assets	2,650		2,406		244	
Current assets	**12,393**	**25.6%**	**12,201**	**25.1%**	**192**	**1.6%**
thereof:						
Inventories	4,637		4,632		5	
Trade and other current receivables	4,004		4,114		-110	
Other current financial assets	499		321		178	
Other current assets	1,271		1,280		-9	
Cash and cash equivalents	1,982		1,854		128	
Total assets[1]	**48,495**	**100.0%**	**48,535**	**100.0%**	**-40**	**-0.1%**
Equity	**26,754**	**55.2%**	**26,005**	**53.6%**	**749**	**2.9%**
Non-current liabilities[1]	**13,042**	**26.9%**	**13,015**	**26.8%**	**26**	**0.2%**
thereof:						
Non-current provisions for employee benefits	2,192		2,030		162	
Other non-current provisions	277		299		-22	
Non-current financial debt	9,239		9,200		39	
Other non-current liabilities[1, 2]	1,333		1,486		-153	
Current liabilities[1]	**8,699**	**17.9%**	**9,514**	**19.6%**	**-815**	**-8.6%**
thereof:						
Current provisions[2]	658		453		205	
Current financial debt	702		1,228		-526	
Trade and other current payables/ refund liabilities[1]	3,422		3,411		11	
Other current liabilities[2]	3,918		4,422		-504	
Total equity and liabilities[1]	**48,495**	**100.0%**	**48,535**	**100.0%**	**-40**	**-0.1%**

[1] Previous year's figures have been adjusted, see Note (6) "**Acquisitions and Divestments**" in the Notes to the Consolidated Financial Statements.

[2] Previous year's figures have been adjusted, see Note (2) "**Reporting principles**" in the Notes to the Consolidated Financial Statements.

- The total assets of the Group were essentially unchanged at € 48,495 million as of December 31, 2023 (December 31, 2022: € 48,535 million).
- Goodwill was down as against the previous year as a result of the depreciation of the U.S. dollar against the euro in particular.
- Other intangible assets were reduced by amortization and currency effects, in particular stemming from the U.S. dollar. Slightly higher investment than in the previous year, in particular from in-licensing in the Healthcare business sector (further information can be found under "**Other intangible assets**" in the Notes to the Consolidated Financial Statements), was not enough to offset this development.
- The year-on-year increase in property, plant and equipment was attributable to additions of € 1,981 million (2022: € 1,730 million), which significantly exceeded depreciation and disposals in the reporting period.
- Of the additions to property, plant and equipment in 2023, € 391 million (2022: € 279 million) related to strategic investments in Germany, including € 329 million for the expansion of the Darmstadt site. At the Darmstadt site, the Healthcare business sector invested € 51 million in a new research center and the Life Science business sector invested € 31 million in a new membrane production facility. Furthermore, the Life Science business sector invested € 50 million in a new filling and logistics center in Schnelldorf. Outside Germany, there were high levels of investment in strategic projects in the United States (€ 330 million), Ireland (€ 157 million) and China (€ 90 million) in particular. In the United States, the Life Science business sector invested € 69 million in expanding its capacities for biosafety testing and analytical development services in Rockville, while the Electronics business sector invested € 30 million in a new production facility for specialty gases for the semiconductor industry in Hometown. In Ireland, the Life Science business sector invested € 149 million in the expansion of membrane production capacities and the construction of a new filtration plant in Cork. In China, the Electronics business sector invested € 34 million in the establishment of a site for advanced semiconductor solutions in Zhangjiagang.
- Trade and other current receivables mainly developed in line with the business volume. At the same time, this item was reduced by exchange rate effects.
- In fiscal 2023, the equity of the Group rose by 2.9% to € 26,754 million (December 31, 2022: € 26,005 million). Profit after tax (€ 2,834 million) contributed to this development. By contrast, a negative currency translation difference (€ 1,003 million) and the dividend payments and profit distribution in the reporting year served to reduce equity (see "**Consolidated Statement of Changes in Net Equity**" in the Consolidated Financial Statements). Partially as a result of the ongoing reduction in net financial debt, the equity ratio improved by more than one percentage point to 55.2% (December 31, 2022: 53.6%).
- The increase in non-current provisions for employee benefits essentially resulted from actuarial losses in connection with the discount rate.
- Current provisions increased as a result of follow-on obligations in connection with the discontinuation of the development program for evobrutinib and ongoing efficiency programs (further information can be found in Note (27) "**Other provisions**" in the Notes to the Consolidated Financial Statements).
- Current financial liabilities were reduced by the repayment of a bond in the amount of € 600 million and an early partial repayment of hybrid bonds in the amount of € 275 million.

The composition and the development of net financial debt were as follows:

Group

Net financial debt[1]

			Change	
€ million	**Dec. 31, 2023**	Dec. 31, 2022	€ million	%
Bonds	7,802	8,726	-924	-10.6%
Bank loans	283	203	80	39.4%
Liabilities to related parties	1,196	919	276	30.1%
Loans from third parties and other financial debt	68	59	9	15.7%
Liabilities from derivatives (financial transactions)	77	30	47	>100.0%
Lease liabilities	515	491	24	5.0%
Financial debt	**9,941**	**10,428**	**-487**	**-4.7%**
less:				
Cash and cash equivalents	1,982	1,854	128	6.9%
Other current financial assets[2]	459	247	212	85.9%
Net financial debt[1]	**7,500**	**8,328**	**-828**	**-9.9%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

[2] Excluding current derivatives (operational) and contingent considerations, which are recognized in the context of business combinations according to IFRS 3.

Bonds were reduced by the repayment of a bond in the amount of € 600 million in December 2023 and the partial repurchase of a nominal volume of € 275 million of hybrid bonds issued in 2019 and 2020.

Group

Reconciliation of net financial debt[1]

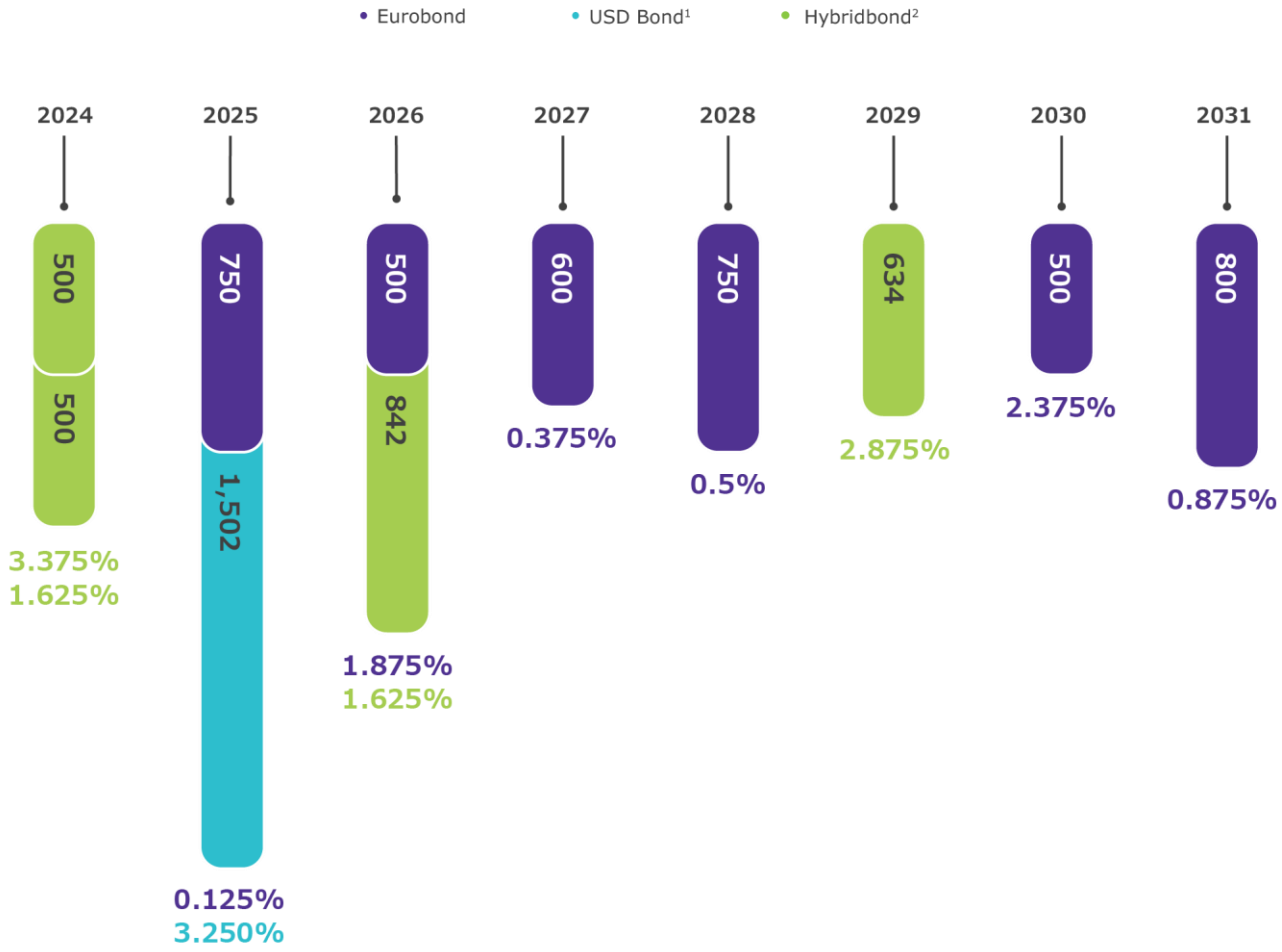
€ million	**2023**	**2022**
January 1	**8,328**	**8,753**
Operating Cash Flow	-3,784	-4,259
Payments for investments in intangible assets[2]	216	275
Payments from the disposal of intangible assets[2]	-136	-38
Payments for investments in property, plant and equipment[2]	1,807	1,531
Payments from the disposal of property, plant and equipment[2]	-19	-21
Acquisitions[2]	12	854
Payments from divestments[2]	–	-4
Change in lease liabilities	201	187
Dividend payments/profit withdrawals[2]	1,164	967
Currency translation difference	-30	86
Other	-258	-3
December 31	**7,500**	**8,328**

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] As reported in the Consolidated Cash Flow Statement.

- Traditionally, the capital market represents a major source of financing for the Group, for instance via bond issues. As of December 31, 2023, there were liabilities of € 3.9 billion from a debt issuance program most recently renewed in fiscal 2023 (December 31, 2022: € 4.5 billion).
- Loan agreements represent a further source of financing for the Group. A € 2.5 billion syndicated loan facility is in place until 2028 to cover unexpected cash needs. This credit line is a backup facility that is intended to be used in exceptional circumstances only. The Group also agreed upon several bilateral loan facilities.

- In addition, the Group has a commercial paper program with a volume of € 2.5 billion at its disposal. Within the scope of this program, the Group can issue short-term commercial paper with a maturity of up to one year.
- The maturities of our financial liabilities are aligned with our planned free cash flow. The repayment profile of the issued bonds was as follows:



[1] The nominal volumes of bonds denominated in U.S. dollars were converted into euros at the closing rate on December 31, 2023.
[2] For the hybrid bonds, repayment is assumed at the earliest possible date.

- The capital market uses the assessments published by rating agencies to help lenders assess the risks of a financial instrument used by the Group. The Group currently rated by Standard & Poor's and Moody's. Standard & Poor's has issued a long-term credit rating of A with a stable outlook, while Moody's has issued a rating of A3 with a stable outlook. An overview of the development of our rating in recent years is presented in the "**Report on Risks and Opportunities**".
- The financial debt was not secured by liens or similar forms of collateral. The loan agreements do not contain any financial covenants. There were no indications that the availability of extended credit lines was restricted. Cash and cash equivalents included restricted cash amounting to € 404 million (December 31, 2022: € 456 million). We pursue a sustainable dividend policy and aim for a target corridor of 20% to 25% of earnings per share pre when determining the amount of the dividend. The average borrowing cost on December 31, 2023, was 2.1% (December 31, 2022: 1.9%).

The development of key balance sheet figures was as follows:

Group

Key balance sheet figures

%		Dec. 31, 2023	Dec. 31, 2022	Dec. 31, 2021	Dec. 31, 2020	Dec. 31, 2019
Equity ratio[1]	Total equity / Total assets	55.2%	53.6%	47.2%	40.7%	40.9%
Asset ratio[1]	Non-current assets / Total assets	74.4%	74.9%	75.8%	77.8%	79.4%
Asset coverage[1]	Total equity / Non-current assets	74.1%	71.6%	62.3%	52.3%	51.5%
Finance structure[1]	Current liabilities / Liabilities (total)	40.0%	42.2%	43.6%	37.3%	45.7%

[1] Not defined by International Financial Reporting Standards (IFRS).

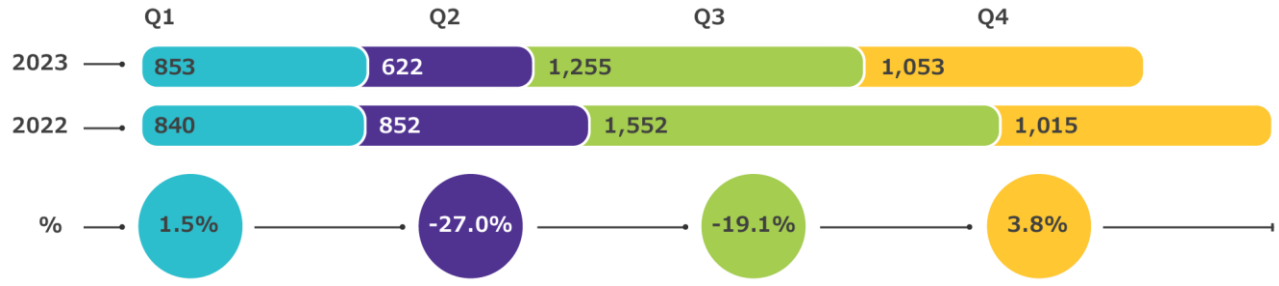
In the area of financial risks and opportunities, the Group uses an active management strategy to reduce the effects of fluctuations in exchange and interest rates. This also includes the use of derivative financial instruments. Further details on liquidity, counterparty and financial market risks and opportunities are presented in the "**Report on Risks and Opportunities**" in the "**Financial risks and opportunities**" section.

In fiscal 2023, operating cash flow, which is one of the three most important key performance indicators alongside net sales and EBITDA pre, decreased by -11.2% to € 3,784 million (2022: € 4,259 million). This was mainly due to the development of EBITDA pre. This was countered by a reduction in working capital and lower tax payments. Further information about the development of the operating cash flow can be found in the "**Internal Management System**" chapter in this Combined Management Report, under "**Consolidated Cash Flow Statement**" in the Consolidated Financial Statements and in Note (16) "**Operating cash flow**" in the Notes to the Consolidated Financial Statements.

The distribution of operating cash flow across the individual quarters and the percentage changes in comparison with 2022 were as follows:

Group

Operative cash flow[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Overall assessment of business performance and economic situation

- Despite the challenging macroeconomic environment and headwinds in individual markets, the Group can look back on a predominantly steady fiscal 2023 thanks to the diversified nature of its business sectors. As anticipated, Life Science business declined as a result of the forecast downturn in demand for products in connection with the Covid-19 pandemic and the slower than expected reduction in customer inventories in the Process Solutions business unit. Additionally, the economic slowdown in the semiconductor industry led to weak business performance in the Electronics business sector. However, Healthcare achieved strong organic growth that partially offset the negative development in the other business sectors.
- All in all, the Group's net sales declined by -5.6% or € -1.2 billion to € 21 billion in fiscal 2023. Our most important key performance indicator, EBITDA pre, fell by -14.2% to € 5.9 billion. Earnings were adversely affected by the challenging market conditions and exchange rate effects. We will propose to the Annual General Meeting an unchanged dividend payment of € 2.20 per share for fiscal 2023.
- The solid financing policies of the Group were reflected in its consistently good key balance sheet figures. The equity ratio remained at 55.2% as of December 31, 2023 (December 31, 2022: 53.6%). Net financial debt was reduced further, amounting to € 7.5 billion at the end of the fiscal year (2022: € 8.3 billion).
- Based on our solid net assets and financial position as well as our diversified operations, we view the economic situation of the Group as positive overall. Thanks to our resilient business model and our clear positioning as a science and technology company, we are well positioned even in economically challenging times.

Life Science

Life Science

Key figures

€ million	2023	2022	Change € million	Change %
Net sales	9,281	10,380	-1,100	-10.6%
Operating result (EBIT)[1]	1,850	2,808	-958	-34.1%
Margin (% of net sales)[1]	19.9%	27.1%		
EBITDA[2]	2,731	3,678	-946	-25.7%
Margin (% of net sales)[1]	29.4%	35.4%		
EBITDA pre[1]	2,820	3,760	-940	-25.0%
Margin (% of net sales)[1]	30.4%	36.2%		

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

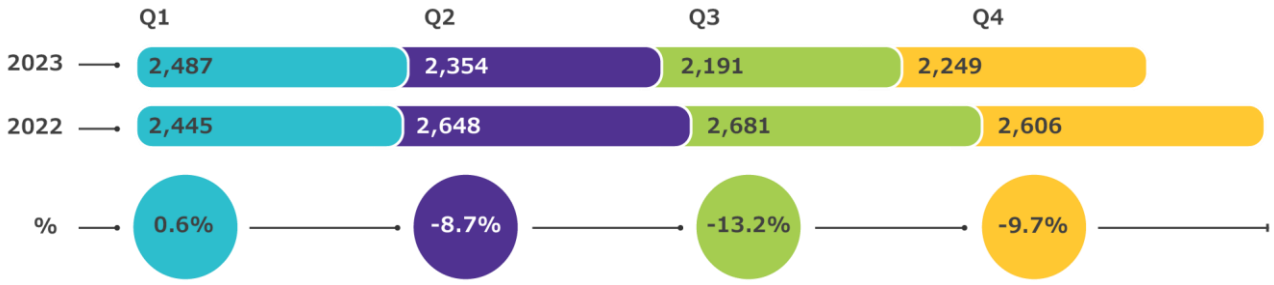
Development of sales and results of operations

The development of sales in the individual quarters in comparison with 2022 as well as the respective organic growth rates are presented in the following graph:

Life Science

Net sales and organic growth[1] by quarter[2]

€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Life Science

Net sales by business unit

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Acquisitions / divestments	Total change	2022[2]	Share
Science & Lab Solutions	4,706	51%	-0.6%	-3.3%	–	-3.9%	4,898	47%
Process Solutions	3,782	41%	-14.4%	-2.3%	–	-16.7%	4,540	44%
Life Science Services	792	8%	-14.6%	-2.0%	0.6%	-15.9%	943	9%
Life Science	**9,281**	**100%**	**-7.9%**	**-2.7%**	**0.1%**	**-10.6%**	**10,380**	**100%**

[1] Not defined by International Financial Accounting Standards (IFRS).

[2] Previous year's figures were adjusted due to internal restructuring in the Life Science division.

- The Science & Lab Solutions business unit, which provides products and services to support life science research for pharmaceutical, biotechnology, academic research laboratories and researchers, and scientific and industrial laboratories, had organically stable sales in 2023. While the core business[1] generated organic growth in the first half of 2023, sales saw an organic decline in the second half of 2023 amid further decreasing pandemic-related demand as well as decreasing demand in China due to the current economic environment. Including an unfavorable foreign exchange effect of -3.3%, net sales decreased to € 4,706 million in 2023 (2022: € 4,898 million). Science & Lab Solutions accounted for 51% of Life Science net sales (2022: 47%). Geographically, Europe showed organic growth in 2023, while net sales in North America and Asia-Pacific (APAC) declined organically.

- The Process Solutions business unit, which markets products and services for the entire pharmaceutical production value chain, saw an organic mid-teens percentage decrease in sales for 2023. This was attributable to the continued decline in pandemic-related sales and a slowdown of the core business in 2023, driven mainly by the effects of destocking by key customers. Including an unfavorable foreign exchange effect of -2.3%, net sales decreased across all core regions (North America, Europe, Asia-Pacific (APAC)) with exception to Latin America and Middle East and Africa (MEA) to € 3,782 million in 2023 (2022: € 4,540 million). The percentage contribution of the Process Solutions business unit to Life Science net sales was 41% (2022: 44%).

- The Life Science Services business unit, which offers fully integrated Contract Development and Manufacturing Organization (CDMO) and contract testing services, recorded a significant organic sales decline in the mid-teens for 2023.This was driven by decreasing pandemic-related sale partially offset by growth in the core business. Including an unfavorable foreign exchange effect of -2.0%, net sales decreased across all regions to € 792 million (2022: € 943 million).

Net sales of the business sector by region developed as follows:

Life Science

Net sales by region

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2022	Share
Europe	3,178	34%	-7.6%	-0.2%	–	-7.8%	3,445	33%
North America	3,372	36%	-12.0%	-2.3%	0.1%	-14.2%	3,931	38%
Asia-Pacific (APAC)	2,263	25%	-5.1%	-5.6%	–	-10.7%	2,536	25%
Latin America	352	4%	10.3%	-10.8%	0.1%	-0.3%	353	3%
Middle East and Africa (MEA)	116	1%	5.3%	-5.5%	–	-0.1%	116	1%
Life Science	**9,281**	**100%**	**-7.9%**	**-2.7%**	**0.1%**	**-10.6%**	**10,380**	**100%**

[1] Not defined by International Financial Accounting Standards (IFRS).

[1] The core business consists of "Net sales excluding the Covid-19 pandemic business". This is a financial indicator that is not defined by International Financial Reporting Standards (IFRS). It should not be taken into account in order to assess the performance of our company in isolation or as an alternative to the financial indicators presented in the consolidated financial statements and determined in accordance with IFRS.

The following table presents the composition of EBITDA pre for 2023 in comparison with 2022. The International Financial Reporting Standards (IFRS) figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Life Science

Reconciliation EBITDA pre[1]

	2023			2022			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**9,281**	**–**	**9,281**	**10,380**	**–**	**10,380**	**-10.6%**
Cost of sales	-4,236	6	-4,230	-4,280	7	-4,273	-1.0%
Gross profit	**5,044**	**6**	**5,050**	**6,100**	**7**	**6,107**	**-17.3%**
Marketing and selling expenses	-2,245	12	-2,232	-2,400	16	-2,384	-6.3%
Administration expenses	-425	53	-372	-400	22	-377	-1.4%
Research and development costs	-396	3	-393	-399	-0	-399	-1.5%
Impairment losses and reversals of impairment losses on financial assets (net)	-2	–	-2	-9	–	-9	-75.5%
Other operating income and expenses	-126	48	-78	-85	61	-24	>100.0%
Operating result (EBIT)[1]	**1,850**			**2,808**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	881	-34	848	870	-24	845	0.3%
EBITDA[2]	**2,731**			**3,678**			
Restructuring expenses	30	-30	–	41	-41	–	
Integration expenses/IT expenses	53	-53	–	24	-24	–	
Gains (-)/losses (+) on the divestment of businesses	–	–	–	–	–	–	
Acquisition-related adjustments	6	-6	–	18	-18	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[2]	**2,820**	**–**	**2,820**	**3,760**	**–**	**3,760**	**-25.0%**
of which: organic growth[1]							-21.4%
of which: exchange rate effects							-3.3%
of which: acquisitions/ divestments							-0.3%

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

- Adjusted gross profit for the Life Science business sector was lower in 2023 in comparison with 2022. This was attributable to the organic sales decline following the continued decrease in pandemic-related sales combined with a slowdown of the core business as well as plant fix costs. At 54.4%, the adjusted gross margin in 2023 was below the year-earlier period (2022: 58.8%).

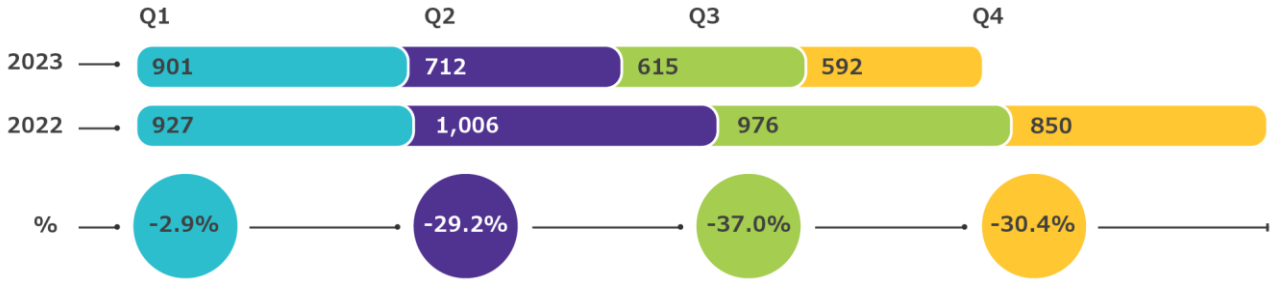
- The decrease in marketing and selling expenses in 2023 was largely driven by lower logistics costs following lower sales volume and a decline in personnel costs. In 2023, administration expenses and Research & Development costs remained organically largely stable in comparison to 2022. In addition to our organic development, positive foreign exchange effects impacted the development of costs compared to 2022. The net position of other operating income and expenses decreased compared to 2022 due to one-off effects in 2022 which did not repeat in 2023. Among other items, there was one-off income from a contractual arrangement with a supplier.

- In 2023, EBITDA pre saw an organic mid-twenties percentage decline compared to 2022, resulting in an EBITDA pre margin of 30.4% (2022: 36.2%).

The development of EBITDA pre in the individual quarters in comparison with 2022 is presented in the following overview:

Life Science

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Healthcare

Healthcare

Key figures

€ million	2023	2022	Change € million	Change %
Net sales	8,053	7,839	214	2.7%
Operating result (EBIT)[1]	2,225	1,895	330	17.4%
Margin (% of net sales)[1]	27.6%	24.2%		
EBITDA[2]	2,545	2,385	160	6.7%
Margin (% of net sales)[1]	31.6%	30.4%		
EBITDA pre[1]	2,543	2,477	66	2.7%
Margin (% of net sales)[1]	31.6%	31.6%		

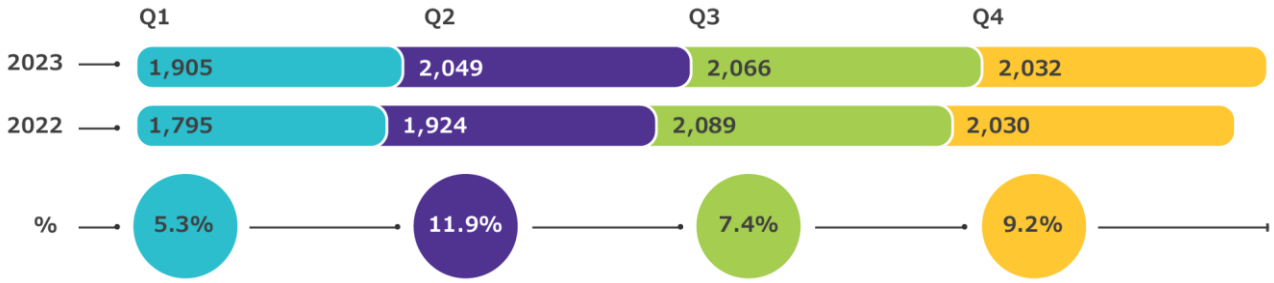
[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Development of sales and results of operations

The net sales in the individual quarters as well as the respective organic growth rates in 2022 are presented in the following graph:

Healthcare

Net sales and organic growth[1] by quarter[2]
€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Net sales of the key product lines and products developed as follows in 2023:

Healthcare

Net sales by major product lines/products

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Total change	2022	Share
Oncology	**1,819**	**22%**	**17.3%**	**-9.2%**	**8.1%**	**1,683**	**22%**
thereof: Erbitux®	1,025	13%	10.9%	-10.6%	0.3%	1,023	13%
thereof: Bavencio®	713	9%	23.4%	-6.8%	16.6%	611	8%
Neurology & Immunology	**1,665**	**21%**	**-0.9%**	**-3.5%**	**-4.5%**	**1,743**	**22%**
thereof: Mavenclad®	956	12%	15.9%	-4.3%	11.7%	856	11%
thereof: Rebif®	709	9%	-17.2%	-2.9%	-20.1%	887	11%
Fertility	**1,547**	**19%**	**14.9%**	**-7.8%**	**7.0%**	**1,446**	**18%**
thereof: Gonal-f®	847	11%	10.5%	-7.8%	2.7%	825	11%
Cardiovascular, Metabolism & Endocrinology	**2,786**	**35%**	**4.0%**	**-4.6%**	**-0.7%**	**2,805**	**36%**
thereof: Glucophage®	882	11%	-0.5%	-4.6%	-5.1%	930	12%
thereof: Concor®	571	7%	1.6%	-4.9%	-3.3%	590	8%
thereof: Euthyrox®	565	7%	5.4%	-3.2%	2.2%	553	7%
thereof: Saizen®	332	4%	35.7%	-10.6%	25.1%	266	3%
Other	**235**	**3%**				**161**	**2%**
Healthcare	**8,053**	**100%**	**8.5%**	**-5.8%**	**2.7%**	**7,839**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

- The cancer drug Erbitux® (cetuximab) saw low double-digit percentage organic net sales growth in 2023, largely on the back of increased demand in the Asia-Pacific (APAC), Latin America and Europe regions. By contrast, organic net sales performance in the Middle East and Africa region in the reporting period was negative.

- In immuno-oncology, net sales of the oncology drug Bavencio® (avelumab) saw organic growth in the low-twenties percentage range in the reporting period. This was driven by all regions, with Europe, North America and Asia-Pacific (APAC) enjoying particularly strong performance with double-digit organic growth rates. The main driver of this development was the continued growth in the drug's market share for first-line maintenance treatment for patients with locally advanced or metastatic urothelial carcinoma (UC).

- Mavenclad®, for the oral short-course treatment of highly active relapsing multiple sclerosis, recorded encouraging organic net sales growth in the mid-teen percentage range in the past fiscal year and reached blockbuster status with total net sales of more than US$ 1 billion. The North America region made a particularly strong contribution to the positive sales performance, but Latin America, Europe and the Middle East and Africa region also saw organic growth in net sales. Net sales in the Asia-Pacific (APAC) region remained essentially unchanged year-on-year in organic terms.

- The reporting period saw a high-teens percentage decline in net sales of Rebif®, which is used to treat relapsing forms of multiple sclerosis (MS). The sustained downturn in sales was anticipated and largely reflects the momentum on the interferon market, which is expected to remain negative in the future due to the persistently difficult competitive situation and the competition from oral dosage forms and high-efficacy MS therapies.

- The Fertility franchise recorded strong organic net sales growth in the mid-teen percentage range in the reporting period. Gonal-f®, a leading recombinant hormone used in the treatment of infertility, saw low double-digit percentage growth in net sales on the back of higher demand as well as supply bottlenecks affecting a rival product. Other Fertility products also contributed to the strong growth in the franchise with organic net sales growth in the mid-teen percentage range in some cases. This development was also attributable to supply bottlenecks affecting a rival product as well as higher demand.

- The Cardiovascular, Metabolism and Endocrinology franchise, which includes drugs for the treatment of cardiovascular, thyroid and growth disorders and diabetes, recorded solid year-on-year growth in net sales in the past financial year. Net sales of the diabetes drug Glucophage® were largely stable, with organic sales growth in Europe and Latin America not quite offsetting the organic downturn in the Asia-Pacific (APAC) and Middle East and Africa (MEA) regions. Net sales of the beta-blocker Concor® increased slightly in organic terms in the reporting period, while the thyroid product Euthyrox® enjoyed solid organic growth compared with the previous year. The franchise also benefited from encouraging organic growth in the net sales of Saizen® in the mid-thirty percentage range, which was due to rising demand as well as supply bottlenecks affecting a rival product.

Healthcare

Product sales and organic growth[1] of Erbitux®, Mavenclad® and Glucophage® by region – 2023

		Total	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
	€ million	1,025	421	–	464	87	53
Erbitux®	Organic growth[1]	10.9%	2.4%	–	14.2%	54.4%	-12.8%
	Share	100%	41%	–	45%	9%	5%
	€ million	956	360	490	20	45	41
Mavenclad®	Organic growth[1]	15.9%	3.4%	23.2%	-0.7%	62.6%	28.5%
	Share	100%	38%	51%	2%	5%	4%
	€ million	882	128	–	467	203	84
Glucophage®	Organic growth[1]	-0.5%	2.9%	–	-4.0%	14.9%	-12.8%
	Share	100%	14%	–	53%	23%	10%

[1] Not defined by International Financial Reporting Standards (IFRS).

Net sales in the Healthcare business sector by region in 2023 developed as follows:

Healthcare

Net sales by region

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2022	Share
Europe	2,541	31%	9.6%	-5.1%	–	4.5%	2,433	31%
North America	1,793	22%	3.9%	-3.2%	–	0.6%	1,781	23%
Asia-Pacific (APAC)	2,232	28%	6.4%	-7.7%	–	-1.3%	2,261	29%
Latin America	941	12%	23.1%	-10.8%	–	12.3%	838	10%
Middle East and Africa (MEA)	546	7%	5.1%	-1.3%	–	3.8%	527	7%
Healthcare	**8,053**	**100%**	**8.5%**	**-5.8%**	**–**	**2.7%**	**7,839**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

The following table presents the composition of EBITDA pre in fiscal 2023 in comparison with 2022. The IFRS figures have been modified to reflect the elimination of adjustments included in the functional costs.

Healthcare

Reconciliation EBITDA pre[1]

	2023			2022			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**8,053**	**–**	**8,053**	**7,839**	**–**	**7,839**	**2.7%**
Cost of sales	-2,029	-1	-2,030	-1,925	4	-1,921	5.7%
Gross profit	**6,024**	**-1**	**6,023**	**5,914**	**4**	**5,917**	**1.8%**
Marketing and selling expenses	-1,668	29	-1,639	-1,644	13	-1,631	0.5%
Administration expenses	-314	20	-294	-313	18	-296	-0.7%
Research and development costs	-1,657	2	-1,655	-1,694	73	-1,622	2.0%
Impairment losses and reversals of impairment losses on financial assets (net)	-41	–	-41	2	–	2	>100.0%
Other operating income and expenses	-120	-41	-161	-370	172	-198	-18.7%
Operating result (EBIT)[1]	**2,225**			**1,895**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	320	-10	310	490	-187	303	2.3%
EBITDA[2]	**2,545**			**2,385**			
Restructuring expenses	32	-32	–	91	-91	–	
Integration expenses/IT expenses	20	-20	–	16	-16	–	
Gains (-)/losses (+) on the divestment of businesses	-53	53	–	-15	15	–	
Acquisition-related adjustments	–	–	–	–	–	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[1]	**2,543**	**–**	**2,543**	**2,477**	**–**	**2,477**	**2.7%**
of which: organic growth[1]							17.1%
of which: exchange rate effects							-14.4%
of which: acquisitions/ divestments							–

[1] Not defined by International Financial Reporting Standards (IFRS).

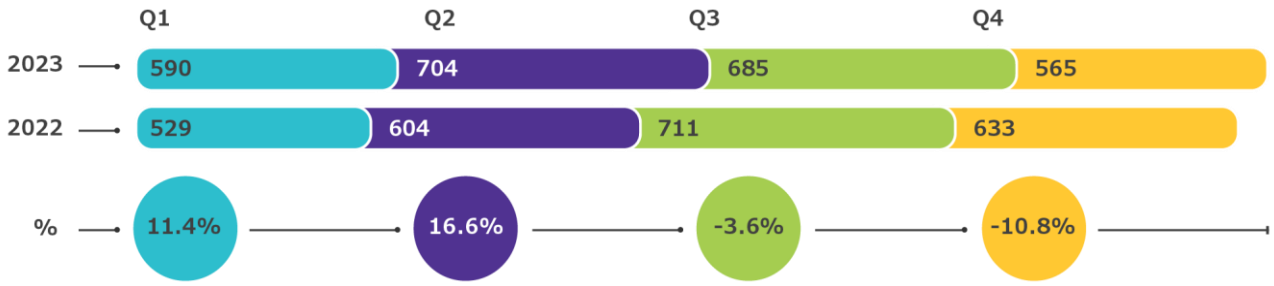
[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

- Adjusted gross profit increased slightly in fiscal 2023, while the gross margin declined slightly to 74.8% (2022: 75.5%).
- Marketing and sales costs and administrative expenses were essentially unchanged year-on-year in the reporting period. The adjusted research and development costs increased slightly compared with the previous year, which was largely due to the provisions recognized for follow-on obligations in connection with the discontinuation of the development program for evobrutinib, a BTK inhibitor used in the treatment of relapsing multiple sclerosis (RMS).
- Net adjusted other operating expenses and income were negative but declined in fiscal 2023. This positive development was mainly driven by the end of the strategic alliance with Pfizer Inc., United States, on the co-development and co-commercialization of the oncology drug Bavencio® effective June 30, 2023. The royalties paid to Pfizer Inc., United States, instead of the profit share previously reported in other operating expenses have been reported in the cost of sales since July 2023, leading to a corresponding increase in this item. This development outweighed the year-on-year reduction in license income, meaning that the net figure improved as a result.
- The moderate increase in EBITDA pre in fiscal 2023 meant that the EBITDA pre margin amounted to 31.6% (2022: 31.6%).

The development of EBITDA pre in the individual quarters in comparison with 2022 is presented in the following overview:

Healthcare

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Electronics

Electronics

Key figures

€ million	2023	2022	Change € million	Change %
Net sales	3,659	4,013	-354	-8.8%
Operating result (EBIT)[1]	248	572	-325	-56.8%
Margin (% of net sales)[1]	6.8%	14.3%		
EBITDA[2]	816	1,138	-322	-28.3%
Margin (% of net sales)[1]	22.3%	28.3%		
EBITDA pre[1]	913	1,192	-279	-23.4%
Margin (% of net sales)[1]	25.0%	29.7%		

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

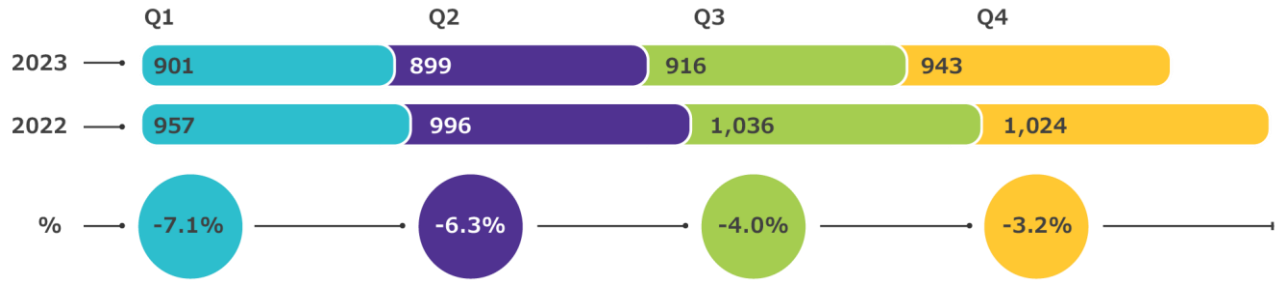
Development of net sales and results of operations

The net sales in the individual quarters as well as the respective organic growth rates in 2023 are presented in the following graph:

Electronics

Net sales and organic growth[1] by quarter[2]

€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Quarterly breakdown unaudited.

Electronics

Net sales by business unit

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2022	Share
Semiconductor Solutions	2,479	68%	-3.9%	-3.9%	0.5%	-7.3%	2,674	67%
Display Solutions	770	21%	-9.2%	-5.3%	–	-14.5%	900	22%
Surface Solutions	411	11%	-3.6%	-2.9%	–	-6.5%	439	11%
Electronics	**3,659**	**100%**	**-5.1%**	**-4.1%**	**0.3%**	**-8.8%**	**4,013**	**100%**

[1] Not defined by International Financial Accounting Standards (IFRS).

- The Semiconductor Solutions business unit, which comprises two businesses, namely Semiconductor Materials and Delivery Systems & Services (DS&S), reported a moderate decline in net sales in organic terms in fiscal 2023. The cyclical slow-down in the semiconductor industry, which has significantly impacted the sales volumes of the Semiconductor Materials business, is proving to be both longer and more severe than the industry initially expected and affected every quarter of 2023. DS&S partially compensated for the decline in Semiconductor Materials due to the strong demand for equipment and projects throughout 2023 as our key customers continue to invest in long-term capacity increases. The portfolio effect was due to the acquisition of the chemical business of Mecaro Co. Ltd., Korea, trading as M Chemicals Inc., Korea, on December 30, 2022.

- Net sales of the Display Solutions business unit, consisting mainly of the business with liquid crystals, photoresists for display applications as well as OLED materials, decreased sharply in organic terms in 2023. Even though utilization at key customers in Liquid Crystals improved in the second half of 2023, this was more than offset by the combined impact of lower first-half utilization, weaker pricing stemming from continued competitive pressure, and an unfavorable product mix.

- The Surface Solutions business unit reported a moderate organic net sales decline in 2023. While the Cosmetics business continued to show strength again in 2023, especially in Asia and EMEA, these gains were more than offset by weaker demand for Industrials and Coatings across all regions.

Net sales of the Electronics business sector by region developed as follows:

Electronics

Net sales by region

€ million	2023	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2022	Share
Europe	318	9%	-13.6%	-0.6%	–	-14.2%	371	9%
North America	787	21%	25.2%	-3.8%	–	21.3%	649	16%
Asia-Pacific (APAC)	2,440	67%	-11.8%	-4.5%	0.4%	-15.9%	2,901	72%
Latin America	39	1%	-2.3%	-1.6%	–	-3.9%	40	1%
Middle East and Africa (MEA)	75	2%	53.6%	-11.2%	–	42.4%	53	2%
Electronics	**3,659**	**100%**	**-5.1%**	**-4.1%**	**0.3%**	**-8.8%**	**4,013**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

The following table presents the composition of EBITDA pre for 2023 in comparison with 2022. The IFRS figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Electronics

Reconciliation EBITDA pre[1]

	2023			2022			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**3,659**	**–**	**3,659**	**4,013**	**–**	**4,013**	**-8.8%**
Cost of sales	-2,332	37	-2,295	-2,314	21	-2,292	0.1%
Gross profit	**1,327**	**37**	**1,364**	**1,700**	**21**	**1,721**	**-20.7%**
Marketing and selling expenses	-591	3	-588	-662	3	-659	-10.9%
Administration expenses	-147	29	-118	-128	8	-120	-1.0%
Research and development costs	-297	1	-297	-308	2	-306	-3.2%
Impairment losses and reversals of impairment losses on financial assets (net)	–	–	–	–	–	–	–
Other operating income and expenses	-44	70	26	-28	40	12	>100.0%
Operating result (EBIT)[1]	**248**			**572**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	568	-42	526	565	-20	545	-3.5%
EBITDA[2]	**816**			**1,138**			
Restructuring expenses	60	-60	–	31	-31	–	
Integration expenses/IT expenses	24	-24	–	13	-13	–	
Gains (-)/losses (+) on the divestment of businesses	–	–	–	–	–	–	
Acquisition-related adjustments	13	-13	–	11	-11	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[1]	**913**	**–**	**913**	**1,192**	**–**	**1,192**	**-23.4%**
of which: organic growth[1]							-17.1%
of which: exchange rate effects							-5.6%
of which: acquisitions/ divestments							-0.7%

[1] Not defined by International Financial Reporting Standards (IFRS).

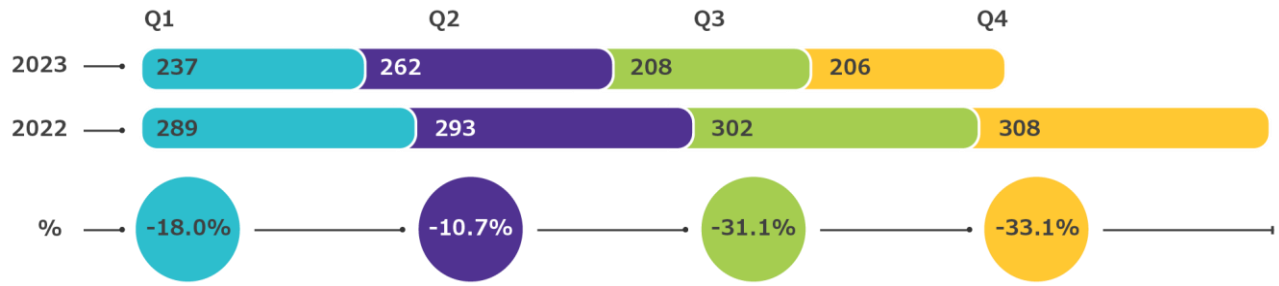
[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

- Adjusted gross profit for the Electronics business sector decreased in 2023 driven by the aforementioned sales decline. At 37.3%, the adjusted gross margin declined compared with the previous year (2022: 42.9%) owing mainly to lower volumes to cover fixed costs, unfavorable price and mix in Liquid Crystals, rising raw material costs and adverse foreign exchange effects.
- Marketing and selling expenses decreased versus prior year, primarily due to lower logistics costs along with favorable foreign exchange effects and tighter personal cost management. Research and development costs were also favorable due to tighter cost management and project scrutiny and favorable foreign exchange effects. Adjusted other operating income improved in 2023 compared to the prior year due to the sale of a patent portfolio in the second quarter of 2023.
- As a result, EBITDA pre was down year-on-year in fiscal 2023. The EBITDA pre margin declined to 25.0% in the reporting period (2022: 29.7%), as the volume-based margin reduction and other factors affecting gross profit outlined above were only partially compensated by good operating cost management, the sale of a patent portfolio and lower logistics expenses.

The development of EBITDA pre in the individual quarters in comparison with 2022 is presented in the following overview:

Electronics

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Corporate and Other

Corporate and Other comprises administrative expenses for central Group functions that cannot be directly allocated to the business sectors.

Corporate and other

Key figures

			Change	
€ million	**2023**	2022	€ million	%
Operating result (EBIT)[1]	-713	-801	88	-11.0%
EBITDA[2]	-603	-696	93	-13.4%
EBITDA pre[1]	-397	-579	182	-31.5%

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

The year-on-year improvement in the operating result, EBITDA and EBITDA pre in fiscal 2023 was due in particular to the positive currency result from cash flow hedging. Cross-business research and development costs amounting to € 94 million (2022: € 119 million) were allocated to Corporate.

Report on Risks and Opportunities

As a global science and technology enterprise, identifying risks and opportunities is an intrinsic part of making our businesses resilient and generating value. We operate in a highly complex, global and interconnected business environment that further necessitates the competent management of risks and opportunities. Therefore, managing risks and opportunities is an imperative and a core component of our internal business planning and forecasting. We have processes, tools and responsibilities in place to enable the early identification of risks and to supply effective and efficient mitigation strategies.

In our internal risk reporting framework, we define risks as potential future events or developments that could result in unfavorable deviations from our financial and non-financial targets. Risk parameters in this context are the probability of financial (quantitative) impact (EBITDA pre/Operating Cash Flow) or non-financial (qualitative) impact (reputation/brand, Environment, Social, Governance (ESG) including workforce and ethics, strategy, operations).

Opportunities imply favorable deviations from targets. Future events and expected developments are considered in internal planning if a likely occurrence can be assumed within the planning period. The following section presents the risks and opportunities that could result in favorable and unfavorable deviations from existing plans and targets.

The following report is relevant from the perspective of both Merck KGaA, Darmstadt, Germany, and the overarching Group. For additional information and details regarding the non-financial topics, please refer to the "**Non-Financial Statement**".

Three Lines of Defense

To organize risk management and controls, we use the well-established "Three Lines of Defense Model", which was developed by the Federation of European Risk Management Associations (FERMA), the European Confederation of Institutes of Internal Auditing (ECIIA) and the Institute of Internal Auditors (IIA). The model divides our company functions for controlling risks properly and effectively into three areas, the so-called lines of defense:

The first line of defense consists of all functions that are responsible for the operational business and whose day-to-day business risks can have an impact. Risk owners (i.e. the heads of the business units, enabling Group functions and local Managing Directors) establish processes in accordance with the requirements set by the second line of defense to identify, assess, and monitor risks and to develop measures for proper risk mitigation. Results of these assessments are regularly communicated to the Executive Board.

The second line of defense includes enabling functions at both Group and local level that control and monitor the operational business (first line of defense). This includes, among other things, the design and implementation of methods and procedures for risk management and the internal control system (financial and non-financial) as well as its regular monitoring.

The third line of defense is our Internal Auditing function. As an objective and independent auditing body, it examines both the operational business (first line of defense) and the controls and monitoring functions (second line of defense) to ensure that risks are effectively identified, evaluated and controlled vis-à-vis the Executive Board and the Supervisory Board.

Both the second and third line of defense functions regularly report to the Executive Board and the Audit Committee of the Supervisory Board.

Internal control system

Internal control system for the (Group) accounting process

The objective of the internal control system for the accounting process is to implement controls that provide assurance that the financial statements are prepared in compliance with the relevant accounting laws and standards. This system covers measures designed to ensure the complete, correct, and timely reporting and presentation of information that is relevant for the preparation of the Consolidated Financial Statements and the Combined Management Report.

Our internal control system for financial reporting is based on the COSO (Committee of Sponsoring Organizations of the Treadway Commission) framework, a globally recognized standard divided into five components: control environment, risk assessment, control activities, information and communication as well as monitoring activities. Each of these components is regularly documented, tested and/or assessed. This control system aims to ensure the accuracy of the consolidated accounting process through functioning internal controls with reasonable assurance.

The Group Accounting function centrally steers the preparation of the Consolidated Financial Statements of Merck KGaA, Darmstadt, Germany, as the parent company of the Group. This Group function defines the reporting requirements that all companies of the Group must meet. At the same time, this function steers and monitors the scheduling and process-related requirements of the Consolidated Financial Statements. Our Business Services organization manages all changes to the equity holding structure and correspondingly adapts the Group's scope of consolidation. The proper elimination of intragroup transactions within the scope of the consolidation process is ensured. Group-wide accounting guidelines form the basis for the preparation of the financial statements according to International Financial Reporting Standards (IFRS), which are reported to Group Accounting; the guidelines are adapted in a timely manner to reflect changes in the financial regulatory environment and are updated in accordance with internal reporting requirements. For special issues, such as the accounting treatment of intangible assets within the scope of business combinations in accordance with IFRS 3 or defined benefit obligations, external experts are additionally involved where necessary.

The individual legal entities, including Merck KGaA, Darmstadt, Germany, have a local internal control system within a global framework. Where financial processes are handled by our Business Services organization, the internal control system of our Business Services organization is additionally applied. Both ensure that accounting complies with IFRS and with the Group accounting guidelines.

Group Accounting provides support to the local contacts and ensures a consistently high quality of reporting throughout the entire reporting process.

For Group financial reporting purposes, most of our subsidiaries use standard SAP software. Consolidation software from SAP is also used for the elimination of intragroup transactions. A detailed authorization concept ensures the segregation of duties with respect to both single-entity reporting and the Consolidated Financial Statements. The accounting process is generally designed to ensure that all units involved adhere to the principle of dual control.

The operational effectiveness of our internal financial control system is regularly tested within the scope of self-assessments by our legal entities and enabling Group functions including our Business Services organization. The quality is systematically reviewed by a dedicated global financial control and governance team. Control deficiencies are properly recorded and, wherever necessary, adequate countermeasures are taken to remediate control deficiencies in a timely manner.

The overall effectiveness of our internal financial control system with regard to accounting and compliance with financial reporting on the part of the relevant individual companies is confirmed by both the local Managing Director and the local Chief Financial Officer by signing the single-entity reporting and a separate confirmation regarding the effectiveness of the financial control system (internal financial control system sign-off letter). For the accounting treatment of balance sheet items, Group Accounting closely cooperates with Group Risk Management to correctly present potential risks in the balance sheet.

All the structures and processes described in the foregoing relate to the Group Accounting procedures and are subject to regular review by Group Internal Auditing based on an annual audit plan set out by the Executive Board.

The results of the self-assessments, quality reviews, and internal audits are dealt with by the Executive Board, the Supervisory Board and the Audit Committee. Our internal financial control system makes it possible to lower the risk of material misstatements in accounting. However, residual risk cannot be entirely ruled out as no internal control system is infallible, irrespective of its design.

Non-financial internal control system and overall evaluation*

In the context of constantly evolving external and internal requirements for the management of non-financial risks, work continued in fiscal 2023 on the development of a procedural and organizational concept as well as a roadmap for expanding non-financial risk management. An important decision was to consolidate the management of financial and non-financial risks under unified organizational leadership (with the Chief Financial Officer being responsible commencing with fiscal 2024) to increase efficiency and quality. This also includes the non-financial internal control system.

For fiscal 2023, the Group Legal & Compliance function provides the organizational framework for the non-financial internal control system. In line with the risk situation of the Group and to ensure regulatory compliance, non-financial topics such as sustainability, cyber security and supply chain are core areas of the internal control system. We base this on international standards, such as the framework for the governance of Group Cyber Security, which includes organizational, process-related, and technical measures for information security. The existing process of Cyber Security Risk Management is designed pursuant to ISO 27005:2018. In comparison with the previous year, a monthly Group Security Forum has been established, where new risks from the risk register are reported, and actions are tracked.

Additionally, the non-financial internal control system aligns with the sustainability strategy and ongoing projects for implementing sustainability reporting (e.g. CSRD). The goal is to continuously improve regulatory compliance pursuant to CSRD requirements through the implementation of organization-wide measures and controls.

The aim of our internal control system as the entirety of all systematically defined controls is therefore to prevent and reduce the probability of potential risks occurring as well as actively steer risks in business processes. Thereby, it helps to ensure the compliance of the company’s activities with laws and regulations. The entire internal control system and the applied methods are continuously developed further. The responsibility for the effectiveness of the internal control system and the further development of the non-financial key metrics lies with the respective responsible senior leaders or risk and process owners.

Relevant representatives from the business sectors and the enabling Group functions reported to the Executive Board through the implemented control system in 2023. In this context, areas where potential for improvement and optimization had been identified and relevant ongoing projects were also presented to the Executive Board. Finally, the individual Group functions and business sectors issued an assessment to the Executive Board regarding the appropriateness and effectiveness of the control system, considering the recommended improvement opportunities, where applicable. Based on this as well as the review of the non-financial internal control system, and reporting by Internal Auditing, as of December 31, 2023, the Executive Board was not aware of any indications with regard to material issues that the system is not appropriate or effective.

Given the multi-layered process landscape and the high speed of change regarding the catalog of requirements for non-financial information, the degree of development of the non-financial internal control system does not yet match that of the (Group) accounting-related internal control system. Based on risk-based assessments of the financial and non-financial internal control system, compliance and risk management and reporting by Internal Auditing, as of December 31, 2023 the Executive Board was not aware of any indications with regard to material issues that this system is not appropriate or effective.

* The contents of this chapter or section are voluntary and therefore not audited. However, our auditor has read the text critically.

Risk and opportunity management

Group Controlling & Risk Management provides the organizational framework for risk management and reports to the Group Chief Financial Officer. We have established a holistic risk management system aimed at safeguarding the long-term achievement of our Group's goals and addressing risks to ensure our continued existence and future success. Within the scope of audits, Group Internal Auditing regularly reviews the performance of risk management processes within the units on local level and, at the same time, the communication of relevant risks from the operating businesses to Group Risk Management. Additionally, the external auditor examines the risk early warning system in accordance with section 317 (4) of the German Commercial Code (HGB) as part of the year-end audit of Merck KGaA, Darmstadt, Germany.

Our risk management activities aim to continuously and promptly identify, assess and manage risks so that appropriate measures can be implemented to mitigate their potential negative impact. The responsibilities, objectives, and procedures of risk management are outlined in our internal group standard for risk management. The designated risk owners, including business heads, managing directors of Group subsidiaries, and the heads of enabling Group functions, are responsible for overseeing and running local risk management processes. These processes encompass various requirements, such as identifying risks considering internal and external factors (impacting both financial and non-financial targets), analyzing risks, implementing appropriate mitigation actions, establishing preventive measures and contingency plans if applicable, and documenting risks and mitigation efforts.

The risk owners continuously assess the status of risks and report their risk portfolio to Group Risk Management twice a year. To facilitate and support these activities, we employ dedicated risk management tools. Group Risk Management coordinates and supervises the bottom-up risk reporting process. This includes validating the plausibility of the reported risks, assessing the effectiveness of mitigation measures and time frames, and determining the residual risk. The net risk is then presented in the internal risk report.

For the internal bottom-up risk reporting process, reporting is based on defined thresholds, and a variety of distribution functions are used to reflect scenarios with varied occurrence probabilities. Risks below the global reporting threshold are managed and monitored at a local level. The timeframe applied for internal risk and opportunity reporting is five years. It may extend beyond this timeframe in specific cases, such as for regulatory risks related to climate change. The outlined risks and their evaluation are based on respective annual values within the reporting period. The assessment of the risks presented relates to December 31, 2023. No significant changes occurred after the balance sheet date that would necessitate an amended presentation of the Group’s risk situation.

Group Risk Management analyzes the reported information to determine the current risk portfolio of the Group. This assessment is presented in a comprehensive report, accompanied by detailed explanations, to the Executive Board, the Supervisory Board, and relevant committees twice a year. This also encompasses a quantitative aggregation of risks at Group level, using a Monte Carlo simulation. Moreover, any notable changes in the assessment of existing risks or the identification of new significant risks can be reported at any time and promptly communicated to the Executive Board.

Our internal controlling processes incorporate the opportunity management process, which is aligned with the Group’s strategy within the operating units. As part of the strategy and planning processes, the business sectors analyze and evaluate possible business-related opportunities. In this context, investment opportunities are carefully examined and prioritized primarily in terms of their potential value proposition, ensuring optimal resource allocation. We target investment in growth markets to leverage the opportunities of dynamic development and customer proximity at a local level.

Identified opportunities that are deemed likely to occur are integrated into the business plans and forecasts. Additionally, trends and events that have the potential to positively impact EBITDA pre or Operating Cash Flow. These opportunities have the potential to have a positive effect on our medium-term prospects.

Risk and opportunity assessment

The significance of a risk is evaluated based on its potential unfavorable deviation from our financial and non-financial targets in conjunction with the probability of occurrence of the respective risk.

The underlying scales for measuring these factors are shown below:

Probability of occurrence

Probability of occurrence	Explanation
< 1%	Highly improbable
1 – 5%	Improbable
5 – 20%	Possible
20 – 50%	Likely
> 50%	More likely than not

Degree of impact

Degree of impact	Explanation
> € 500 million	Critical negative impact on EBITDA pre and/or Operating Cash Flow
€ 100 – 500 million	Significant negative impact on EBITDA pre and/or Operating Cash Flow
€ 25 – 100 million	Moderate negative impact on EBITDA pre and/or Operating Cash Flow
€ 10 – 25 million	Minor negative impact on EBITDA pre and/or Operating Cash Flow
< € 10 million	Immaterial negative impact on EBITDA pre and/or Operating Cash Flow

To enable a thorough evaluation of both financial and non-financial risks, a qualitative rating scale is available to evaluate the indirect financial impact. The use of this scale is mandatory for the assessment of non-quantifiable and qualitative risks such as Environmental, Social, and Governance (ESG), reputational, strategic, and operational risks as well as for material risks that also require a qualitative evaluation. The scale categorizes the risks as low, moderate, significant, or critical and provides a comprehensive reference for assessment.

Opportunities are assessed within their respective business environment. During short-term and strategic planning, general measures of business functions are quantified, typically in relation to EBITDA pre (earnings before interest, taxes, depreciation, and amortization), and operating cash flow. In addition, we identify and leverage opportunities as part of our regular business operations and through our daily observation of internal processes and markets.

Investment opportunities are primarily evaluated and prioritized using metrics such as net present value, internal rate of return, return on capital employed (ROCE), and the payback period of the investment. These indicators are used to assess the potential of investment projects and prioritize them accordingly. Similarly, scenarios are used to simulate the impact of possible fluctuations and changes in the respective parameters on results.

Business-related risks and opportunities

Political and regulatory risks and opportunities

As a global corporate group, we face political and regulatory changes in a large number of countries and markets.

Risk of more restrictive regulatory requirements regarding drug pricing and reimbursement as well as pricing-related opportunities

Our business is affected by numerous regulations that are continuously changing – and could even become more stringent. For example, in the Healthcare business sector, the known trend towards increasingly restrictive requirements in terms of drug pricing, reimbursement, and the expansion of rebate groups is continuing. With globally rising healthcare expenditures, both in absolute amounts and relative to GDP, healthcare budgets around the globe face increasing pressure. Specifically, in the United States, a pricing reform on prescription drugs is part of the agenda of the current administration. These requirements can negatively influence the profitability of our products, as can market referencing between countries, and the success of market launches. Foreseeable effects are considered as far as possible in the business sector's plans. Close communication with health and regulatory authorities serves as a preventive measure to avert such risks. The remaining risks beyond the current plans resulting from restrictive regulatory requirements are possible to likely with a moderate to significant impact. While we consider the possibility of resulting price cuts in our forecasts, there is also an opportunity that price pressure from healthcare systems worldwide is less pronounced than expected or materializes at a later point in time versus the base assumption. Additionally, as a global specialty innovator that pursues a focused leadership approach in attractive therapeutic areas, we are positioned to benefit from attractive pricing schemes for demonstrated major therapeutic improvements.

Risk of stricter regulations for the manufacturing, testing, and marketing of products

We must adhere to a multitude of regulatory requirements regarding the manufacturing, testing and marketing of many of our products. Specifically, in the European Union, we are subject to the EU chemicals regulation REACH. Similar regulations are emerging globally in relevant markets, particularly in Asia. These regulations demand comprehensive tests for chemicals. Moreover, the use of chemicals, such as per- and polyfluorinated alkyl substances (PFAS), in production and final products could be restricted, which would negatively impact the ability to manufacture and market certain products. With the EU Chemicals Strategy for Sustainability, an initiative of the European Green Deal, we expect increasing demands concerning the substitution of specific hazardous substances. We are constantly pursuing research and development (R&D) in substance characterization and the possible substitution of critical substances so as to mitigate this risk. Nevertheless, risks of stricter regulations are classified as possible to likely with moderate to significant impacts.

Risk of negative political and macroeconomic developments

The current political and macroeconomic situation, characterized by high uncertainty and volatile global developments, is a strategic factor for us as potential negative developments can also impact our businesses. The ongoing general trend of bloc building and reshoring of critical supplies and processes is leading to a further increase in the establishment of trade barriers and the general weaponization of trade to assert interests. While the global economy continues to gradually recover from the aftermath of the Covid-19 pandemic and Russia's invasion of Ukraine, the increased threat from armed conflicts including the resurgent conflict in the Middle East as well as the tensions between the United States and China could lead to further sanctions and economic measures that harm global trade and affect bilateral and multilateral relationships. For example, multiple countries have already implemented measures to restrict the export and transfer of technology to China, particularly in relation to advanced chips that could be utilized for AI, quantum computing and military applications.

These risks can have a negative impact on our supply chains and sales in our key countries and regions. Such risks are considered as fully as possible in the business plans of the affected countries and regions, and are mitigated through product, industry and regional diversification as well as measures to ensure resilience of supply chains and networks. For instance, in the Electronics business sector, a strong local presence in China enables us to remain competitive in the country while our global footprint could provide opportunities to capture

the demand shifting from Asia to other geographies (i.e. the United States and Europe). Also, given the considerable investments of several countries in the domestic chip industry (e.g. the U.S. Chips Act, EU Chips acts) to establish local supply of this critical component. Besides that, strategic geopolitical risk management is in place at the Group and business sector levels to continuously monitor and assess the global developments and to prepare us holistically for foreseeable risks.

Global economic growth is projected to slow down with growing regional divergences. Weak economic growth or even a recession could lead to less government spending or other cost-containment policies. Global inflation declined gradually in 2023, but remained significantly above target levels, keeping costs at an elevated level which could negatively impact our business. Persistently high inflation could increase our operating expenses (e.g. raw materials, operating costs and logistics) as well as capital expenditures. It could also prompt central banks to increase interest rates further and curb fiscal policy for some economies. In the course of 2022 and 2023, the European Central Bank as well as the U.S. Federal Reserve increased key interest rates significantly, which may affect our refinancing costs. Financial markets remain volatile, which could have numerous potential impacts.

The net risks of negative geopolitical and macroeconomic developments are seen as possible and might have significant to critical effects. However, our assumptions on geopolitical developments exclude extreme scenarios with severe escalation of tensions. The materialization of such scenarios would jeopardize entire industries and the balance of geopolitical and economic structures, posing a substantial challenge for us, as for any other company.

Further details on the macroeconomic development can be found under "**Macroeconomic and Sector-Specific Environment**".

Market risks and opportunities

We compete with numerous companies in the pharmaceutical, chemical, and life science sectors. Rising competitive pressure can have a significant impact on the quantities that can be sold and prices attainable for our products.

Risks and Opportunities in Life Science

The portfolio of our Process Solutions business unit encompasses a broad range of pharmaceutical development and manufacturing solutions, including filtration devices, chromatography resins, single-use assemblies and systems as well as processing chemicals and excipients. We have strategically positioned ourselves to capture numerous opportunities from the industry's shift towards biologics, coupled with the growing demand for bioproduction driven by many drug candidates and more regulatory approvals. In addition, we are well-prepared to benefit from our customers' investments in expanding bioreactor capacity. Our commitment to innovation and our customer-focused approach positions us to advance the field of biomanufacturing.

The growing use of biologics is creating a need for more efficient and higher-yield manufacturing processes. This represents an opportunity for us to enable continuous and intensified processing through our ongoing innovation in single-use technologies and advancements in bioproduction.

Consequently, faster market growth driven by the aforementioned industry shifts can lead to a more positive development compared with our latest plan.

Our Life Science Services business unit fully integrates Contract Testing, Development, and Manufacturing Organization (CTDMO) services to meet the evolving needs of our global customers across all stages of drug development, from preclinical to commercialization. Our CTDMO services cover a wide range of modalities, including monoclonal antibodies (mAbs), high-potency active pharmaceutical ingredients (HP-APIs), antibody-drug conjugates (ADCs), viral and gene therapies (VGTs), and end-to-end mRNA offerings. We continually invest in expanding our portfolio and production capabilities to offer specialized solutions for both traditional and innovative therapies. This positions us to capitilize on the potential of the growing biopharmaceutical market by providing leading CTDMO services to our customers. Through quicker establishment of model modalities on the market in combination with our broad and integrated portfolio, we can increase the potential beyond the assumptions reflected in our plan.

Our Science & Lab Solutions business unit serves customers in the pharmaceutical and biotech industries and other industries in production, testing and research, as well as public authorities and research institutions. Despite current headwinds – a complex macroeconomic environment, and softer market demand, especially in the United States and China – the business unit is well-positioned to deliver long-term, profitable growth. We aim to offer our customers a streamlined experience and a comprehensive portfolio of offerings to facilitate their research and analytical processes. This includes several customer solutions in the area of innovative digitalization and automation. A faster recovery from the aforementioned macroeconomic adverse development as well as greater commercial success of our innovative digital and automation solutions could imply an increased potential compared to our latest plans.

Further details on the industry, market developments and associated risks, such as the challenging market environment in the life science industry, can be found under "**Risks due to increased competition and customer technology changes as well as related opportunities**" and "**Macroeconomic and Sector-Specific Environment**".

Risks and opportunities in the semiconductor industry

Our Semiconductor Solutions business unit leverages a broad portfolio of independent technologies. This enables us to supply products for all essential production steps of wafer processing, helping our customers to achieve their technology roadmaps.

The underlying semiconductor industry is cyclical by nature. The current downturn has been exacerbated by a post-Covid-19 pandemic recession. The economic weakening has led to a temporary weakness of the traditional industry growth drivers such as PCs, smartphones and traditional data centers, while the new growth drivers such as AI and automotive are still too small to compensate for these effects. The multi-layered macro-economic effects and poor transparency throughout the supply chain cause a certain degree of uncertainty when estimating the timing and shape of the industry recovery. However, it may also imply upsides compared with our plan if the industry recovers faster and stronger than expected. The semiconductor cyclical correction risk is considered as likely with a significant impact.

Irrespective of the current turbulent macroeconomic situation, the positive medium- and long-term growth prospects of our markets remain unchanged. We see long-term growth opportunities in the semiconductor market due to the significantly accelerating global demand for innovative semiconductor materials with potential growth upside beyond the assumptions reflected in our plan, driven by a faster market adaptation and penetration. This demand is driven by exponential data growth and highly impactful technology trends such as autonomous driving, electric vehicles, Internet of Things (IoT) and 5G. We will benefit from the high material requirement of these AI chips and are working with our customers on almost all of these groundbreaking technological innovations in the semiconductor sector. That is why we are investing in our highly attractive growth markets and purposefully expanding production capacities with a smart localization of our footprint to further boost customer proximity and ensure supply stability. Having the right capacity in the right place to bring new products and higher volumes to our customers enables us to stay flexible about the timing of the market upswing and can serve as a competitive advantage.

The aforementioned trends and the continued announcements of major capacity expansions in the industry in the coming years also benefit our DS&S business. With this portfolio of gas and chemical cabinets and the potential to provide our largest customers with turnkey solutions for the delivery of bulk gases in the manufacturing process, we are well positioned to capture upcoming opportunities.

Risks due to increased competition and customer technology changes as well as related opportunities

In the Healthcare business sector, both our biopharmaceutical products and classic pharmaceutical business are exposed to increased competition from other rival products, especially in the form of biosimilars and generics but also in innovative R&D. We compete with other pharmaceutical companies in various therapeutic indications and rely on high quality data to successfully market our products. For this reason, we closely observe our competitive landscape and make assumptions with regard to future competitor entries that pose competition to our products. Due to the uncertainty that is inherent to clinical trials, there is the possibility that competitor trials fail to meet primary endpoints in their studies or deliver inferior data than we initially anticipated. If there

are no new competing products or if our competitors deliver less promising data, this could represent opportunities for us in therapeutic areas in which we are active.

In the Life Science and Electronics business sectors, risks are posed by not only cyclical business fluctuations but also changes in the technologies used or customer sourcing strategies. We use close customer relationships and in-house further developments as well as market proximity, including precise market analyses, as mitigating measures. Overall, the occurrence of these risks is possible to likely and could have a significant impact.

Further details on the industry and market development can be found under "**Macroeconomic and Sector-Specific Environment**", e.g. on the market challenging environment in the life science industry.

Risks and opportunities of research and development

Innovation driven by R&D is a major element of the Group strategy – including fostering innovation at the intersection of our business sectors – and is particularly important in the Healthcare business sector. In regular portfolio management reviews, we continually evaluate and, if necessary, realign research areas and R&D pipeline projects to focus our investments in areas where patient needs are served best. Nevertheless, R&D projects can experience delays, expected budgets can be exceeded, or targets can remain unmet. Sometimes, development projects are discontinued after high levels of investment at a late phase of clinical development. Decisions – such as those relating to the transition to the next clinical phase – are taken with a view to balance risks and opportunities.

In addition to in-house R&D efforts, strategic alliances with external partners and the in- and out-licensing of programs also form part of the catalog of measures to develop innovative medicine and ensure the efficient allocation of resources. Strategic alliances with partners as well as in- and out-licensing transactions always follow a stringent selection process along clear strategic and financial decision criteria. An example of such in-licensing deals is the recently announced partnership with Jiangsu Hengrui Pharmaceuticals Co. Ltd. for a next-generation selective PARP1 (poly (ADP-ribose) polymerase 1) inhibitor and ADC (antibody drug conjugate) which represents a strong strategic fit leveraging our internal DNA damage response expertise and in-house ADC capabilities. This agreement provides the opportunity to advance more therapeutic options for patients with difficult-to-treat cancers. However, in general, there is a possibility that we may not be able to identify a sufficient number of in-licensing assets on financially acceptable terms.

The aforementioned development opportunities are associated with different types of risks. There is the risk that regulatory authorities either do not grant or delay approval or grant only restricted approval. The risk that undesirable side effects of a pharmaceutical product could remain undetected until after approval or registration could result in a restriction of approval or withdrawal from the market. Furthermore, we cannot guarantee that all the assets we are currently developing will achieve the desired commercial success. The failure to meet targets in this area could have significant effects, for example due to lower net sales or the non-occurrence of milestone payments from collaboration agreements. These risks are evaluated with probabilities ranging from possible to likely.

Moreover, in Electronics, we will also continue to invest heavily in R&D in leading-edge material solutions. The aim is to seize growth opportunities arising from the increasing global demand for innovative semiconductors. Promising opportunities for innovation are constantly arising throughout our Semiconductor Solutions business. We work closely with our customers to exploit these. Technology inflection points bring opportunities to our material solutions and the chance to differentiate from competition. We are further developing new dielectric platforms in cooperation with our key customers for 3D NAND applications.

In addition, we see opportunities in organic light-emitting diode (OLED) materials in high-quality display applications. We have been conducting R&D in the area of OLED technology for more than 15 years and have grown into a well-positioned material supplier for OLEDs. Through our semiconductor and display knowledge, we will be able to contribute to the new display devices including foldable displays and Augmented Reality/ Virtual Reality applications, which require a broad set of materials.

More detailed descriptions on our R&D activities worldwide can be found under "**Research and Development**" in "**Fundamental Information about the Group**".

Risks and opportunities related to the quality and availability of products

Opportunities arising from capacity expansion

We make targeted investments worldwide to expand our regional capacities and drive sustainable growth in all three of our business sectors.

During the Covid-19 pandemic, supply chains experienced unprecedented disruption, with customers placing greater emphasis on supply security. In Life Science, we responded to this trend by actively diversifying our global presence by moving to a production network in the region and for the region to increase resiliency and meet the local needs of customers in North America, Europe and Asia-Pacific.

In fiscal 2023, we announced several new investments to expand capacity and product capabilities at facilities around the world. These include investments in biosafety testing, the expansion of our production for highly purified reagents and expanded lab space and production capability to manufacture cell culture media. Having the right capacity in the right place to ensure supply security, to bring new products to the market and to serve higher customer demand offers us the opportunity to capture higher market shares and can serve as a competitive advantage. However, market dynamics naturally influence our expansion activities as well as utilization. We therefore regularly review our expansion plans and adapt them accordingly.

Risks arising from project execution

In today's dynamic business environment, we prioritize innovation and growth. Projects are essential for achieving our strategic objectives, driving expansion, and promoting sustainable development. To effectively support further business growth and enhance efficiency, we continuously invest in projects, such as IT systems, distribution centers, office buildings and other projects. However, project execution involves significant capital expenditures, making effective project management crucial to avoid delays and higher spending. Inadequate planning, execution errors, and ineffective change management can lead to inefficiencies and disruptions, resulting in increased costs and lower sales.

In a rapidly evolving market, there is also a risk of missing out on market growth and development by delaying or deferring investments. To mitigate this risk, we actively monitor industry trends, conduct market research, and maintain a flexible project portfolio. By aligning our investment decisions with market dynamics, we aim to capture opportunities and minimize the risk of being left behind. This is particularly important in industries like semiconductors, where market cycles present substantial risks.

To proactively address project execution risks, we apply well-established project planning and internal control practices, collaborate closely with stakeholders, and conduct regular project reviews through teams and steering committees. This approach enables us to detect risks early on and implement corrective actions or discontinue projects that are unlikely to succeed. Through comprehensive planning, accurate cost estimations and re-evaluations, we monitor costs and ensure efficient resource allocation. Effective project governance and prioritization further contribute to desired project outcomes.

By employing these strategies, we mitigate project execution risks, ensuring successful project delivery, improved efficiency, and alignment with our strategic objectives. Overall, the possible risks could have a moderate to significant impact.

Risk of a temporary ban on products/production facilities or of non-registration of products due to non-compliance with quality standards

We are required to comply with the highest standards of quality in the manufacturing of pharmaceutical products (Good Manufacturing Practice or official pharmacopoeia). In this regard, we are subject to the supervision of the regulatory authorities. Conditions imposed by national regulatory authorities could result in a temporary ban on products/production facilities and possibly affect new registrations with the respective authority. We make the utmost effort to ensure compliance with regulations, regularly perform own internal audits, and carry out external inspections. Thanks to these quality assurance processes, the occurrence of a risk with a significant impact is improbable to possible; however, it cannot be entirely ruled out and depends on the product concerned and the severity of the objection.

Risks of production availability

Further risks include operational failures due to fire or force majeure, for example natural disasters such as floods, droughts or earthquakes, which could lead to a substantial interruption or restriction of business activities. As far as possible and economically viable, the Group limits its damage risks with insurance coverage, the nature and extent of which is constantly adapted to current requirements. Likewise, we are exposed to risks of production outages and the related supply bottlenecks that can be triggered by technical problems in production facilities with very high-capacity utilization. Furthermore, there are risks of supply bottlenecks due to a lack or disappearance of capacity. We work towards continual mitigation of such risks by making regular investments, setting up alternative sourcing options and maintaining sufficient inventory levels.

Although the occurrence of these risks is considered improbable, an individual event could have a critical negative effect.

Risks of dependency on suppliers and opportunities from supply reliability

Like many other market players in other industries, we have been exposed in the recent past to unprecedented events such as the Covid-19 pandemic and other geopolitical events. Throughout these challenging times, we have been able to avoid any major supply disruptions for our customers. A significant part of this success is rooted in our efforts to build resilient supply chains over the years with our strategic suppliers and reduce the probability of these risks. These strong and esteemed relationships have enabled us to respond to the changes in a difficult environment and adapt to the new circumstances quickly.

For example, the promise of our Healthcare business sector to reliably serve our patients is a top priority for us and requires a strong and resilient supply chain. In 2023, we proved that we could continue to reliably supply our patients with highly needed drugs while competitors in Fertility and Endocrinology ran out of stock. This stock-out situation faced by competitors could continue in the near future and would provide us with opportunities to gain additional market share by serving patient demand.

However, part of our supply chain remains vulnerable to certain events. Therefore, we continue to invest in the improvement of our supply chain, by for example, avoiding single-source situations wherever possible and economically sensible, and by increasing stock levels for essential materials in close collaboration with our suppliers. Through these measures we keep our dependencies on individual partnerships as low as possible within the highly regulatory environment we operate in. Overall, the likely risks might have a moderate to significant impact.

Risks due to product-related crime

As a leading global science and technology company and manufacturer of innovative products of the highest quality, we are exposed to various security- and crime-related risks. Due to the complexity of international trade and global supply chains, our products are at risk of being counterfeited, stolen, illegally diverted and misused. If left unaddressed, this would not only lead to financial loss, reputational damage and business disruption, but also compromise patient and customer safety. Consequently, we have implemented technical, operational and procedural measures aimed at protecting the integrity of our products and supply chains, while also ensuring that new threats are identified and managed appropriately.

Overall, the threat resulting from product-related crime is likely with a moderate impact.

Risks from the use of social media

We and our employees are active on numerous social media platforms. The consistent and legally compliant use of such platforms and their content is important in terms of increasing awareness of our brand, among other things. We take all necessary precautions and have implemented processes to ensure awareness regarding the proper handling of social media as well as actively manage and control our publications and communication.

Nevertheless, reputational risks could result, for instance through public dialogues on social media. On the qualitative rating scale, we thus rate this risk as significant.

Financial risks and opportunities

As we operate internationally, and due to our presence in the capital markets, we are exposed to various financial risks and opportunities. Above all, these are liquidity and counterparty risks, financial market risks and opportunities, and risks of fluctuations in the market values of operational tangible and intangible assets as well as risks and opportunities from pension obligations.

In the area of financial risks and opportunities, we use an active management strategy to reduce the effects of fluctuations in exchange and interest rates. The management of financial risks and opportunities by using derivatives is regulated through extensive guidelines. Speculation is prohibited, and derivative transactions are subject to constant risk controls. The strict separation of functions between trading, settlement, and control functions is ensured.

Liquidity risks

To ensure continued existence, we must be able to fulfill our commitments arising from operating and financial activities at any time. Therefore, to reduce potential liquidity risks, we have a central Group-wide liquidity management system in place, and a balanced maturity profile. The maturities of our financial liabilities are aligned with our planned free cash flow. Furthermore, we have a syndicated loan facility of € 2.5 billion with a term until 2028, which ensures continuing solvency if any liquidity bottlenecks occur. As our loan agreements do not contain any financial covenants, these agreed lines of credit can be accessed even if our credit rating should deteriorate. Additionally, we have a commercial paper program with a maximum volume of € 2.5 billion.

Counterparty risks

Counterparty risks arise from the potential default by a partner in connection with financial investments, loans, and financing commitments on the one hand and receivables in operating business on the other.

As for counterparty risks from financial transactions, we review all central positions relating to trading partners and their credit ratings daily. We manage financial risks of default by diversifying our financial positions and through the related active management of our trading partners. Significant financial transactions involving credit risk are entered into with banks and industrial companies that have a good credit rating. Moreover, our large banking syndicate – the renewed syndicated loan facility of € 2.5 billion was syndicated among 15 banks in 2023 – reduces possible losses in the event of default.

The solvency and operational development of trading partners are regularly reviewed as part of the management of operational counterparty risks. Sovereign risks are also analyzed. The volume of receivables of each customer is capped in line with their credit ratings. Risk-mitigating measures, such as credit insurance, are utilized as appropriate. Nevertheless, defaults by isolated trading partners, even those with outstanding credit ratings, cannot be entirely ruled out, although rated as unlikely.

Counterparty risks are classified as possible risks and might have moderate effects.

Financial market risks and opportunities

As a result of our international business activities and global corporate structure, we are exposed to risks and opportunities from fluctuations in exchange rates. These result from financial transactions, operating receivables, and liabilities as well as future cash flows from sales and costs in foreign currency. We use derivatives to manage and reduce these risks and opportunities (further information can be found under "**Derivative financial instruments**" in the "**Notes to the Consolidated Financial Statements**"). Foreign exchange rate risks are rated as possible with a significant effect on EBITDA pre or operating cash flow.

Variable interest and current financial liabilities are exposed to the risks and opportunities of interest rate fluctuations. Interest rate risks have a negative impact, are considered possible, and pose a minor negative risk overall.

Risks of impairment of balance sheet items

The carrying amounts of individual balance sheet items are subject to the risk of changing market and business conditions and thus to changes in fair values as well. Necessary impairments could have a significant negative non-cash impact on earnings and affect the accounting ratios. This applies specifically to the high level of intangible assets including goodwill, which mainly derive from the purchase price allocations made in connection with past acquisitions (further information can be found under "**Goodwill**" and "**Other intangible assets**" in the "**Notes to the Consolidated Financial Statements**"). This qualitative risk might have a significant effect on reputation.

Risks and opportunities from pension obligations

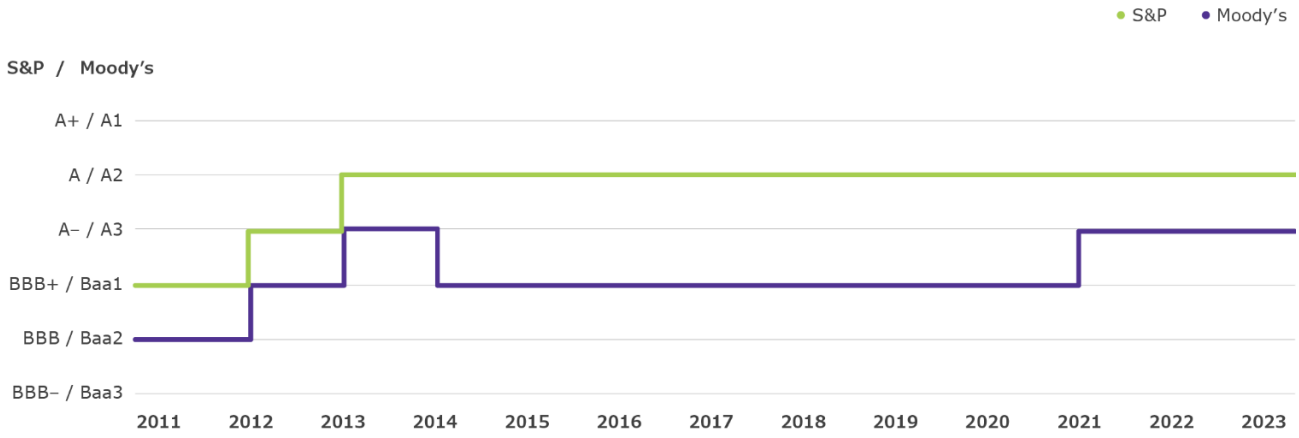
We have commitments in connection with pension obligations. The present value of defined benefit obligations can be significantly increased or reduced by changes in the relevant valuation parameters, for example the interest rate or future salary increases. Pension obligations are regularly assessed as part of annual actuarial reports. The obligations are covered by the pension provisions reported in the balance sheet based on the assumptions as of the balance sheet date. Some of these obligations are funded by plan assets (further information can be found under "**Provisions for pensions and other post-employment benefits**" in the "**Notes to the Consolidated Financial Statements**").

To the extent that pension obligations are covered by plan assets consisting of interest-bearing securities, shares, real estate, and other financial assets, decreasing or negative returns on these assets can adversely affect the fair value of plan assets and thus result in further additions to pension provisions. By contrast, rising returns increase the value of plan assets, thereby resulting in excess cover of plan liabilities. We increase the opportunities of fluctuations in the market value of plan assets on the one hand and reduce the risks on the other by using a diversified investment strategy. The possible risk due to pension obligations could have minor effects.

Assessment by independent rating agencies

The capital market uses the assessments published by rating agencies to help lenders assess the risks of financial instruments used by the Group. We are currently rated by Standard & Poor's and Moody's. Standard & Poor's has issued a long-term credit rating of A with a stable outlook and Moody's a rating of A3 with a stable outlook. In line with market procedures, our financing conditions are closely tied to our rating. The better the rating, the more favorably we can generally raise funds on the capital market or from banks.

Overview of Rating Development



Risks due to the divestment, acquisition and integration of companies and businesses

Successfully acquiring and subsequently integrating new businesses entails risks. These are primarily centered around the uncertainty of achieving business targets and synergy goals as well as remaining within the planned integration budget. Divestments, on the other hand, could lead to liabilities and additional expenses related to potential indemnifications and commitments guaranteed in the sale transaction. We leverage our solid acquisition track record to reduce the probability of any transaction-associated risks by integrating lessons learned from past transactions, strong due diligence, and closely managed integration processes. Currently, we are not aware of any significant risks in this area.

Tax risks

The Group and its subsidiaries operate worldwide and are consequently subject to different national tax laws and regulations. National tax audits of our entities are conducted on an ongoing basis by the tax authorities of the respective countries in which we operate. Tax risks originate particularly from the changes in national tax laws and regulations, and case laws and interpretations by national tax authorities as well as from significant transactions such as acquisitions, divestments and reorganizations.

Findings of the national audit authorities of the various countries may lead to higher tax expenses and payments and may also have an impact on the amount of tax receivables, and tax liabilities as well as on deferred tax assets and liabilities.

The Group's tax function regularly and systematically assesses the relevant tax risks. Appropriate standards are put in place to identify tax risks at an early stage in order to review, assess and mitigate them effectively and efficiently. Group Tax coordinates mitigation measures with the subsidiaries. Risks in addition to those already accounted for in the balance sheet are classified as improbable to possible with moderate to significant impact.

Information on the accounting and measurement policies for income taxes can be found under "**Income tax**" in the "**Notes to the Consolidated Financial Statements**".

Legal risks

Generally, we strive to minimize and control our legal risks. To this end, we have taken the necessary precautions to identify threats and defend our rights where necessary. Nevertheless, we are still exposed to risks from litigations or legal proceedings. In particular, these include risks in the areas of product liability, competition and antitrust law, pharmaceutical law, patent law, trademark law, data protection law, tax law, and environmental protection. As a research-based company, we have a valuable portfolio of industrial property rights, patents, and brands that could become the target of attacks and infringements. The outcome of future proceedings or those currently pending is difficult to foresee. For instance, we are currently involved in litigation with Merck & Co. Inc., Rahway, New Jersey (USA) (outside the United States and Canada: MSD), against whom we have filed lawsuits in various countries. This company has also sued us in the United States for trademark infringement, among other things.

Due to long statutes of limitations or in some cases the absence thereof, it is not possible to rule out that we will face third-party claims arising from the same issue despite the conclusion of legal proceedings. Court or official rulings or settlements that we consider as "highly improbable" to "more likely than not" could lead to expenses with a significant to critical impact on our business and earnings. Despite extensive precautionary measures, non-compliance with laws and regulations leading to related consequences can never be completely excluded. In our opinion, the lawsuits described below constitute the most significant legal risks. This should not be seen as an exhaustive list of all legal disputes currently ongoing.

Risks in connection with a settlement agreement concluded by the divested Generics group

Citalopram: In connection with the generics business that was divested in 2007, the Group was accused of breaching EU antitrust law through agreements entered into by its former subsidiary Generics (UK) Ltd., United Kingdom, relating to the antidepressant Citalopram patented by Lundbeck A/S, Denmark. The European Commission imposed a fine in June 2013. Appeals against the decision were unsuccessful. Following the payment of the fine of around € 18 million, British health authorities brought legal claims for damages against the Group and other companies in a mid-triple-digit million-euro amount in fiscal 2023 due to alleged infringements of competition law. In addition, there were further claimants from various other jurisdictions who have not yet quantified their claims. In response to the latest developments in the proceedings, the provision was adjusted as of December 31, 2023, and is now recognized in a high single-digit million-euro amount. A cash outflow within the next twelve months is considered possible.

Product liability risks

Operating in the chemical and pharmaceutical industries, we are exposed to product liability risks. Product liability risks can lead to considerable claims for damages, costs to avert damages, and potentially loss of reputation. In view of this, we have taken out standard liability insurance to mitigate such risks. However, it could be that the insurance coverage available is insufficient for individual cases. Although the occurrence of product liability claims in excess of the existing insurance coverage is considered improbable, individual cases could still have a critical effect.

Human resources risks

Our future growth is highly dependent on our innovative strength. Therefore, the expertise and engagement of employees in all business sectors in which we operate are crucial to our success. The markets relevant to the company are characterized by intense competition to recruit qualified specialists and talents, and by the challenge of being perceived by the public as an attractive employer. Fluctuation risks specific to countries and industries have to be identified ahead of time and specifically addressed in order to keep the skills and expertise critical to success and business within the company.

Recruiting as well as retaining specialists and talent are therefore key priorities for the company and are managed through the targeted use of, for instance, employer branding initiatives, global talent, and succession management processes as well as competitive compensation packages. Nevertheless, employee-related risks that affect business activities are possible; even though their impact is difficult to assess we evaluated a potential impact on the qualitative rating scale as moderate.

Information technology risks

We use a variety of IT systems and processes to optimally support our globalization. Trends in information technology offer various opportunities but also harbor risks.

Risks due to cybercrime and the failure of business-critical applications

Increasing international networking and the related possibility of IT system abuse are resulting in cybercrime risks for us, such as the failure of central IT systems, the loss of the data integrity or the disclosure of confidential data from R&D as well as business activities, the manipulation of IT systems in process control, or an increased burden or adverse impact on IT systems as a result of virus attacks.

We maintain and operate an information protection management system based on ISO 27001. Our governance framework contains organizational, process-related, and technical information security countermeasures based on recognized international standards. In addition, we employ harmonized electronic and physical security controls (e.g. access control and security monitoring) to bolster our ability to handle sensitive data, such as trade secrets.

Cyber Security is part of our Group Corporate Security Office. In addition, we have a Group Chief Information Security Officer and a network of Information Security Officers within the business sectors, each supported by dedicated networks. The individual sectors hold risk ownership and act as our first line of cyber security defense. Our Global Cyber Security function acts as a second line of defense and has responsibilities regarding cyber security risk governance and oversight. Our third line of defense consists of internal audits.

Globally used IT applications form the basis for the contractual delivery of products and solutions. The failure of business-critical IT applications could therefore have a direct influence on our ability to deliver and on the quality of our products. This also applies to the failure of a data center. To achieve the required service quality, we use a quality management system certified to ISO 9001 that also applies to the provision of IT. In addition, to reduce the risk of failure, we operate several redundantly designed data centers. Furthermore, insurance solutions for cybercrime offenses are in place at Group level.

Likewise, complications with the changeover of IT systems could negatively impact the earnings situation. Close monitoring of critical IT projects serves to mitigate this risk.

Despite the mitigation measures applied and functional continuity plans, the effects of cybercrime or the failure of business-critical IT applications and their influence on EBITDA pre and operating cash flow are considered to be possible and with a significant impact.

Environmental, climate-related, and safety risks

Risks arising from environment, climate as well as plant and equipment

As a company with global production operations, we are exposed to risks of possible damage to personnel, goods and our reputation. These include physical risks stemming from exposure to droughts, storms, and floods. Mitigation measures such as audits, consultations and trainings on environmental protection, occupational health and safety minimize these risks to people as well as the environment. In order to ensure the continuity of plant and equipment, we monitor these risks both at our own sites as well as at suppliers and contract manufacturers. By adhering to high technical standards, our rules of conduct, and all legal requirements in environmental protection as well as occupational health and safety, we ensure the preservation of goods and assets.

We have taken sufficient appropriate accounting measures for the environmental risks known to us. We monitor regulatory risks in connection with the transition to a low-carbon economy, which could materialize in the mid- and long-term through rising carbon prices through emissions trading systems, taxes or energy legislation. We mitigate those risks with our energy and CO_2 management measures. Mainly, we classify these as possible risks with moderate impacts. However, a critical impact on EBITDA pre or operating cash flow cannot fully be ruled out.

Risks due to climate change

In 2022, we performed a qualitative climate risk and vulnerability assessment to identify transitional and physical climate-related risks that are material to our activities. In 2023, in accordance with TCFD recommendations, we conducted a quantitative climate scenario analysis to identify climate-related risks and opportunities. Consequently, we conducted an evaluation in relation to impacts of transition risks and the exposure related to physical hazards.

During this assessment, we utilized two climate pathways (1.5°C and 4°C) considering different time horizons (2030 and 2050) to identify climate-related risks and opportunities. Based on our findings, we determined the potential effects of physical risks on our key sites and evaluated the impact of transitional risks on our business.

In line with our ongoing dedication to risk mitigation, we continuously develop innovative and sustainable approaches. As a result, we foresee no significant deviations from our expectations regarding impacts on EBITDA pre or operating cash flow.

For further details on climate-related risks, please see “**Increased uncertainty due to climate risks**” in the “**Notes to the Consolidated Financial Statements**”.

Overall view of the risk and opportunity situation and management assessment

The most significant individual risks or risk clusters have been outlined in this report, with business- and market-related risks being the most significant alongside IT and legal risks. Of particular significance are the still ongoing global macroeconomic and geopolitical developments, increasing existing risks related to more restrictive regulatory requirements regarding drug pricing and reimbursement, the demand for our products, business interruptions at our production sites, lack of availability of good quality materials or services, and risks related to R&D.

By implementing risk mitigation measures such as continually improving management actions (organizational responsibilities and process improvements), utilizing existing insurance coverage, and taking accounting precautions, we have successfully taken counteraction, particularly against significant individual risks.

The overall risk of the Group, which is derived from the probability-weighted aggregation of the identified risks, leads to the assessment that an existence-threatening risk-scenario, for which coverage and financing of the losses are questionable, is improbable. We are convinced that we will also successfully manage the aforementioned challenges in the future and benefit from diversification through our different products and markets.

Based on our assessment, we believe that the most promising opportunities arise from business-related opportunities. The activities described hold significant opportunities for us in the medium to long term, beyond the forecast period. We actively pursue the opportunities that arise and specify their expected effects in the forecast development of EBITDA pre and operating cash flow. Additionally, we proactively seek out new opportunities, assess their feasibility, and drive them forward where appropriate. If opportunities arise in addition to the forecast developments, or these occur more quickly than anticipated, this could have positive effects on our EBITDA pre or operating cash flow.

Report on Expected Developments

The following report provides a forecast for the development of net sales and EBITDA pre for the Group and the individual business sectors Life Science, Healthcare and Electronics as well as a forecast for Group operating cash flow in 2024.

€ million	Net Sales	EBITDA pre[1]	Operating cash flow
Group	• Slight to moderate organic growth • Negative foreign exchange effect 0% to -3%	• Slight to moderate organic growth • Negative foreign exchange effect -1% to -4%	• Moderate to strong growth
Life Science	• Slight organic decline to slight organic growth • About stable to slightly negative foreign exchange effect	• Moderate organic decline to slight organic growth • About stable to slightly negative foreign exchange effect	
Healthcare	• Moderate to solid organic growth • About stable to moderate negative foreign exchange effect	• Organic growth in the low teens percentage range • Slight to significant negative foreign exchange effect	
Electronics	• About stable organic development to moderate organic growth • About stable to slightly negative foreign exchange effect	• Moderate organic decline to moderate organic growth • About stable to moderate negative foreign exchange effect	
Corporate and Other		• Rise in costs due to lower currency hedging gains	

[1] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Fundamental assumptions

Against the backdrop of the ongoing highly dynamic development of macroeconomic, geopolitical and industry-specific conditions, the forecast is also subject to greater uncertainty and volatility in fiscal 2024 than is normally the case. In terms of expected inflation, we assume a slow normalization.

We also expect a persistently volatile environment as regards the development of foreign exchange rates. For 2024, we forecast an unfavorable foreign exchange development, albeit to a weaker extent than in fiscal 2023. The negative foreign exchange effects are expected to be primarily attributable to the development of the U.S. dollar as well as individual Asian currencies. For the average euro/U.S. dollar exchange rate, our full-year assumption ranges between 1.07 and 1.11 for 2024.

Net sales

For fiscal 2024, we expect to return to organic sales growth, which is likely to be slight to moderate. The Healthcare business sector is expected to be the strongest growth driver, with Mavenclad® and products from the Cardiovascular, Metabolism & Endocrinology franchise making the main contributions to growth. For Life Science, we assume that sales in the first half of the year will still be influenced by customer destocking of increased inventories and that the expected recovery will thus mainly set in during the second half of 2024. We do not expect any further significant contributions from demand for products in connection with Covid-19 in 2024. In the Electronics business sector, we forecast that the turnaround in the semiconductor materials market will come in the second half of the year, leading as expected to organic sales growth with products from the Semiconductor Materials business. The expected declining Display Solutions business will have a negative impact as will the project business within the Semiconductor Solutions business unit, which, as expected, is subject to stronger fluctuations owing to the dependency on major individual orders. Overall, we forecast foreign exchange effects of 0% to -3% for the Group.

EBITDA pre[1]

For Group EBITDA pre, we also forecast a slight to moderate organic increase, which is expected to be driven primarily by the Healthcare business sector. Apart from the expected sales growth, the termination of the alliance with Pfizer Inc., USA, effective June 30, 2023 and the subsequent regain of the exclusive rights to develop, manufacture and commercialize Bavencio® had a positive effect on EBITDA pre as did lower costs, especially in research and development, as a result of the failure of evobrutinib to meet its primary endpoint as demonstrated by the results of the clinical trials published on December 6, 2023. EBITDA pre of the Life Science business sector is expected to be adversely impacted by negative mix effects, which we will mitigate as far as possible with corresponding cost savings. In the Electronics business sector, a favorable mix effect on sales as well as positive effects from active cost management are expected; however, the sale of a portfolio of licenses and patents in fiscal 2023 will have an opposing effect. The rise in costs in Corporate and Other will be mainly attributable to lower foreign currency hedging gains. The forecast foreign exchange development is likely to lower Group EBITDA pre by between -1% and -4%.

Operating cash flow

The forecast for operating cash flow is generally subject to a higher fluctuation corridor than the forecast for EBITDA pre. We provide an estimate of the development of operating cash flow only for the Group as a whole.

The development of operating cash flow will be in line with the expected positive performance of the operating business. In addition, we expect positive effects from stringent management of working capital. Foreign exchange is expected to have a negative effect. Accordingly, for the Group, we forecast a moderate to strong increase in operating cash flow. As regards the composition of operating cash flow, we refer to the section entitled "**Internal Management System**" in the combined management report as well as the **Consolidated Cash Flow Statement** in the Consolidated Financial Statements.

[1] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Report in Accordance with Section 315a of the German Commercial Code (HGB)

The following information is provided in accordance with section 315a of the German Commercial Code (HGB) in connection with section 289a HGB and the explanatory report pursuant to section 176 (1) sentence 1 of the German Stock Corporation Act (AktG).

As of December 31, 2023, the company's subscribed capital is divided into 129,242,251 no-par value bearer shares plus one registered share. Each share therefore corresponds to € 1.30 of the share capital. The holder of the registered share is E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany. It is entitled and obliged to appoint one-third of the members of the Supervisory Board representing the limited liability shareholders. If the holder of the registered share is a general partner, he or she has no such right of appointment. The transfer of the registered share requires the company's approval. The approval is granted at the sole discretion of the personally liable general partner with an equity interest, namely E. Merck KG, Darmstadt, Germany.

Pursuant to the information on voting rights submitted to us in accordance with the German Securities Trading Act (WpHG), on December 31, 2023, no shareholders owned direct or indirect investments exceeding 10% of the voting rights.

According to the Articles of Association of the Group, the general partners not holding an equity interest who form the Executive Board are admitted by E. Merck KG, Darmstadt, Germany, with the consent of a simple majority of the other general partners. A person may be a general partner not holding an equity interest only if he or she is also a general partner of E. Merck KG, Darmstadt, Germany. In addition, at the proposal of E. Merck KG, Darmstadt, Germany, and with the approval of all general partners not holding an equity interest, further persons who are not general partners not holding an equity interest may be appointed to the Executive Board.

The Articles of Association can be amended by a resolution at the Annual Meeting that requires the approval of the general partners. Notwithstanding any statutory provisions to the contrary, the resolutions of the Annual General Meeting are adopted by a simple majority of the votes cast. Where the law requires a capital majority in addition to the voting majority, resolutions are adopted by a simple majority of the share capital represented in the vote. The Articles of Association of the company encompass authorized and contingent capital.

The Executive Board is authorized to increase the company's share capital with the approval of the Supervisory Board and of E. Merck KG, Darmstadt, Germany, on one or more occasions, up to and including April 21, 2027, by a total of up to € 56,521,124.19 by issuing new no-par value bearer shares in exchange for cash and/or non-cash contributions (Authorized Capital 2022). Limited liability shareholders are generally granted statutory rights to subscribe to the new shares. However, the Executive Board is authorized, with the approval of the Supervisory Board, to exclude limited liability shareholders' subscription rights, either in full or in part, in the case of a capital increase in exchange for cash contributions pursuant to or by analogous application of section 186 (3) sentence 4 AktG, if the issue price of the new shares is not substantially lower than the stock exchange price of the company's shares already listed and if the new shares issued under exclusion of these subscription rights do not exceed a proportional amount of 10% of the share capital either at the time of Authorized Capital 2022 taking effect or being utilized.

This restriction to 10% of the share capital shall include the proportional amount of the share capital that is attributable to shares that are issued under exclusion of subscription rights or sold during the term of Authorized Capital 2022, based on an authorization to issue new shares or sell own shares by direct or analogous application of section 186 (3) sentence 4 AktG. This restriction shall also include the proportional amount of the share capital that is attributable to shares which may or must be issued in order to service bonds carrying a conversion or option right or a conversion or option obligation, if the bonds are issued during the term of Authorized Capital 2022 under exclusion of limited liability shareholders' subscription rights by analogous application of section 186 (3) sentence 4 AktG.

It is likewise possible to exclude the subscription rights of limited liability shareholders with the approval of the Supervisory Board in the case of capital increases in exchange for non-cash contributions, particularly for the purpose of acquiring enterprises, parts of enterprises, or interests in enterprises. In addition, with the approval of the Supervisory Board, limited liability shareholders' subscription rights can be excluded in order to enable E. Merck KG, Darmstadt, Germany, to exercise its right pursuant to article 32 (3) of the company's Articles of Association to participate in a capital increase by issuing shares or freely transferable share subscription rights.

It is likewise possible to exclude, with the approval of the Supervisory Board, the subscription rights of limited liability shareholders in order to enable E. Merck KG, Darmstadt, Germany, to exercise its right pursuant to article 33 of the Articles of Association to convert its equity interest into share capital, either in full or in part.

Moreover, with the approval of the Supervisory Board, the subscription rights of limited liability shareholders can be excluded if and to the extent this is necessary to grant the holders or creditors of conversion or option rights, and/or the holders or creditors of financing instruments carrying conversion or option obligations, which were or are issued by the company or by a domestic or foreign company in which the company directly or indirectly holds the majority of the votes and capital, subscription rights to the extent to which they would be entitled after the exercise of the conversion or option rights or after the performance of a conversion or option obligation.

Finally, with the approval of the Supervisory Board, the subscription rights of limited liability shareholders can be excluded in order to offset any fractional amounts resulting from a capital increase.

The sum of shares issued on the basis of Authorized Capital 2022 under exclusion of limited liability shareholders' subscription rights must not exceed a proportional amount of 10% of the share capital, taking into account other shares of the company which, during the term of Authorized Capital 2022, are sold or issued under exclusion of subscription rights or which are to be issued under bonds issued after April 22, 2022, under exclusion of subscription rights; this limitation shall apply both at the time of this authorization taking effect and at the time of this authorization being exercised.

To the extent that subscription rights are not excluded under the above provisions, they may also be granted to limited liability shareholders by way of indirect subscription rights pursuant to section 186 (5) AktG or, in part, by way of direct subscription rights, and otherwise by way of indirect subscription rights pursuant to section 186 (5) AktG. Furthermore, the Executive Board is authorized, with the approval of the Supervisory Board, to determine the additional details of the capital increase and its implementation, including the content of rights attached to the shares as well as the terms and conditions of the share issue.

The Articles of Association also encompass contingent capital. The share capital is contingently increased by up to € 66,406,298.40 composed of 51,081,768 shares (Contingent Capital I). The contingent capital increase serves to grant exchange rights to E. Merck KG, Darmstadt, Germany, in accordance with article 33 of the Articles of Association to enable the conversion of its equity interest. The shares carry dividend rights from the beginning of the fiscal year following the year in which the conversion option is exercised.

Moreover, the share capital is contingently increased by up to € 16,801,491.20 composed of up to 12,924,224 no par value bearer shares (Contingent Capital II). This contingent capital increase is only to be implemented insofar as the bearers or creditors of option or conversion rights, or with an obligation to convert or exercise options on warrant bonds, option participation certificates, option participation bonds, convertible bonds, convertible participation certificates, or convertible participation bonds that are issued or guaranteed by the company or a subordinate Group company on the basis of the authorization resolution of the Annual General Meeting of April 28, 2023, to April 27, 2028, utilize their option or conversion rights, or to fulfill their conversion obligation or obligation to exercise options insofar as they are obliged to fulfill their conversion or option exercise obligation, or insofar as the company exercises an option, in full or in part, to grant shares in the company instead of paying the sum of money due, and to the extent that in each case a cash settlement is not granted, or own shares or other forms of fulfillment are used. Each issue of new shares shall take place at the determined option or conversion price, pursuant to the aforementioned authorization resolution. The new shares participate in the profit from the beginning of the fiscal year in which they are created; insofar as this is legally permissible, the Executive Board may, with the approval of the Supervisory Board, and in deviation from section 60 (2) AktG, stipulate that the new shares also participate in the profit for a past fiscal year. The Executive Board is authorized, with the approval of the Supervisory Board and of E. Merck KG, Darmstadt, Germany, to stipulate the further details of the implementation of the increase in contingent capital.

The company is not authorized to acquire its own shares.

The company has not entered into any material agreements subject to a change of control pursuant to a takeover offer, nor has it entered into any compensation agreements with the members of the Executive Board or employees in the event of a takeover offer.

Non-financial statement**

The combined management report of Merck KGaA, Darmstadt, Germany, and the Group for the fiscal year 2023 includes a combined non-financial statement in accordance with sections 315b and 315c in conjunction with 289b to 289e of the German Commercial Code (HGB) in the form of a separate chapter. The scope of consolidation of this non-financial statement corresponds to that of the Annual Report for 2023. The concepts and results presented relate to both Merck KGaA, Darmstadt, Germany, and the Group. We explicitly state when, in individual cases, the information provided deviates from this. Our non-financial statement orients towards the requirements of the Global Reporting Initiative (GRI) standards. It also includes our reporting in accordance with the EU taxonomy regulation.

Deloitte GmbH Wirtschaftsprüfungsgesellschaft conducted a limited assurance engagement of the combined non-financial statement. References to information not included in the management report are not part of the non-financial statement. The additional content provided on both the company's websites as well as external websites that are linked in this report are not part of the information assured by Deloitte. Our Sustainability Report 2023 is produced in accordance with GRI Standards. It will be available **online** as of April 11, 2024 and will also be subject to a separate limited assurance engagement by Deloitte. With this, we also disclose topics set forth by the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-related Financial Disclosures (TCFD).

Description of our business model

Our business model as well as our Group structure, governance and strategy are described under "**Fundamental Information about the Group**".

Governance

The requirements we place on responsible corporate governance are derived from our **company values** on the one hand and from the regulations, external initiatives, and international guidelines to which we are committed on the other hand. We have integrated these requirements into our **sustainability strategy** and our **Group-wide guidelines**. These guidelines comprise charters and principles that are valid for the entire company as well as specific standards and procedures for individual business sectors and sites.

Some examples: Our **Human Rights Charter** aligns with the **UN Guiding Principles** for Business and Human Rights. Our Group-wide **Social and Labor Standards Policy** reflects the labor standards of the International Labour Organization (**ILO**). Our **EHS Policy** (Corporate Environment, Health and Safety Policy) for environmental impact mitigation and health and safety forms the basis for implementing the chemical industry's **Responsible Care® Global Charter** within our company. Our standard entitled Corporate Chemicals Regulations Governance describes the processes and management structures required to ensure global compliance with the pertinent chemical and product safety regulations.

We endeavor to comply with all applicable laws as a matter of principle. Where necessary, we review our internal guidelines, standards and instruction manuals on compliant behavior and adapt them to reflect changes in the regulatory landscape.

** The summarized non-financial statement was not subject to a content review as part of the audit of the financial statements but was subject to a separate limited assurance audit by Deloitte.

Roles and responsibilities

Based on the requirements set forth in charters, principles and policies, our internal standards give specific guidance for operational processes. They are constantly updated by the relevant departments and are available on our intranet. Our managers implement these standards in their respective areas of responsibility and ensure that they are adhered to. In addition, we educate and train our employees on all guidelines that apply to them. We employ management systems to steer processes and define goals, actions, and responsibilities. These systems are based on standards such as the internationally recognized quality management standard ISO 9001, good working practices (GxP) in the pharmaceutical industry and ISO 14001 for environmental management. Our company regularly undergoes **ISO 14001** and **ISO 9001** certification, which are conducted by an independent auditing firm. We hold group certificates for both standards.

We support the following responsible governance initiatives:

- United Nations **Global Compact**,
- Chemical industry's **Responsible Care® Global Charter**,
- Company network Together for Sustainability (**TfS**),
- Pharmaceutical Supply Chain Initiative (**PSCI**),
- **Initiative Chemie**[3], a collaboration between the German Chemical Industry Association (**VCI**), the German Employers' Federation of the Chemical Industry (**BAVC**), and the German Mining, Chemical and Energy Industrial Union (**IG BCE**).

Strategic and organizational approach to sustainability

The world is facing numerous challenges that also affect us as a company. These include climate change, international conflicts and economic crises, for instance. Our ambition is to leverage science and technology to achieve sustainable progress for mankind.

We pursue three overarching sustainability goals. In 2023, we revised our sustainability strategy, which we had communicated in 2020. In particular, we sharpened the second goal.

- In 2030, we will achieve human progress for more than one billion people through sustainable science and technology.
- By 2030, we will fully integrate sustainability into our value chains.
- By 2040, we will achieve climate neutrality and reduce our resource consumption.

We describe our sustainability strategy in the "**Strategy**" section of the combined management report within this Annual Report for 2023 and, in more detail, in the Sustainability Report for 2023 in the chapter entitled "**Sustainability Strategy**".

Measuring progress made with the sustainability strategy

We use 14 key indicators to record and assess our progress towards achieving our sustainability goals. We defined these indicators back in 2021 and did not identify any significant non-financial performance indicators. The key indicator "Percentage of employees trained in sustainability" was dropped in 2023 because we had achieved the associated target. Instead, as of 2023, we began using several questions in our annual Employee Engagement Survey to measure how mature the sustainability culture is within our organization.

Moreover, our annual Long-Term Incentive Plan (LTIP) for Executive Board members and senior executives contains a sustainability factor. We use it to measure performance over a period of three years based on selected key indicators for each of our three sustainability goals. Consequently, target achievement based on the key financial performance indicators can increase or decrease by up to 20%. Details on how this sustainability factor is calculated can be found in the "**Compensation Report**", which is subject to both a formal audit and a separate content audit performed by Deloitte. In 2023 and for the first time, the company tied 15% of variable employee compensation to sustainability parameters. Details on this can be found under "**Sustainable innovation and technology**" within this non-financial statement.

Our key indicators

Goal 1: In 2030, we will achieve human progress for more than one billion people through sustainable science and technology.

Focus area	Sustainability key indicator	Further details
Sustainability innovation and technologies	• Percentage of newly published patent families with positive sustainability impact	**Sustainable innovation and technology**
Impact of our products on health and wellbeing	• People treated with our Healthcare products and pharma products enabled by our Life Science business sector[1]	Will be published in the SASB index within the Sustainability Report 2023 as of April 11, 2024

[1] The key indicator is used to determine the sustainability factor for the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany (LTIP).

Goal 2: By 2030, we will fully integrate sustainability into our value chains.

Focus area	Sustainability key indicator	Further details
Sustainability in our ways of working & decision making	• Result of the employee engagement survey on sustainability culture[2]	**Attracting and retaining talent**
Our people and communities; providing a diverse and inclusive environment	• Percentage of women in leadership positions	**Diversity, equity and inclusion**
	• Environment, Health and Safety (EHS) Incident Rate	**Plant, process and transport safety**
	• Lost Time Injury Rate (LTIR)	**Health and safety**
Sustainable and transparent supply chain	• Percentage of relevant suppliers (in terms of number and supplier spend) that are covered by a valid sustainability assessment[1]	**Responsible supply chain**
	• Violations of Global Social and Labor Standards Policy	**Human rights**

[1] The key indicator is used to determine the sustainability factor for the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany (LTIP).

[2] The key indicator "Percentage of employees trained on sustainability" is no longer applicable in 2023, as the target was achieved.

Goal 3: By 2040, we will achieve climate neutrality and reduce our resource consumption.

Focus area	Sustainability key indicator	Further details
Climate change and emissions	• Greenhouse gas emissions (Scope 1+2)[1]	**Climate action**
	• Indirect greenhouse gas emissions (Scope 3)	**Climate action**
	• Percentage of purchased electricity from renewable sources	**Climate action**
Water and resource intensity	• Waste Score[2]	Will be published in the Sustainability Report 2023 as of April 11, 2024
	• Water Intensity Score[2]	**Water management**
	• Wastewater quality	Will be published in the Sustainability Report 2023 as of April 11, 2024

[1] The key indicator is used to determine the sustainability factor for the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany (LTIP).

[2] A new key figure will replace this key figure from the 2024 reporting year.

Roles and responsibilities

Our Executive Board has Group-wide responsibility for our sustainability strategy. It has adopted our three strategic goals (details can be found under "**Strategy**").

The Group Corporate Sustainability unit is responsible for developing and shaping the sustainability strategy and it informs the Executive Board at least once a year about the progress made and the need for action. It is part of the Group function Corporate Sustainability, Quality and Trade Compliance (SQ), which reports to the Chair of the Executive Board. At Executive Board level, responsibility for Environment, Social, Governance (ESG) also lies with the Chair of the Executive Board.

Group Corporate Sustainability is also responsible for coordinating our Sustainability Board, which is chaired by the Head of SQ, who simultaneously serves as Chief Sustainability Officer. The committee consists of representatives from our business sectors and from key Group functions, such as Procurement, Communications and Controlling.

The Sustainability Board steers and monitors the Group-wide implementation of the sustainability strategy, defines priorities and stipulates globally applicable sustainability policies. In addition, the Sustainability Board ensures that the initiatives of our various business sectors, Group functions and subsidiaries align with our global sustainability strategy. Moreover, it recommends corresponding initiatives to the Executive Board. Within their respective area of responsibility, each Executive Board member is also responsible for sustainability, reviews the priorities that have been set, and decides on the implementation of initiatives.

In 2023, the Sustainability Board met 11 times by video conference. In addition to climate-related issues and new sustainability reporting requirements, it also addressed the adaptation of the strategy and new objectives for circular economy and water management.

Our Sustainability Advisory Panel (MSAP) supports our company as an external expert committee for sustainability. The panel is chaired by the Head of SQ. It comprises independent experts on sustainability-related topics from various institutions worldwide whom we invite on an ad hoc basis. The MSAP advises our company on selected issues and assesses planned activities. Moreover, the members apply their knowledge to help address societal and political challenges and developments that could be strategically relevant for our businesses.

Topics for the non-financial statement

Pursuant to section 289c (3) and section 315c (2) of the German Commercial Code (HGB), we are obligated to review topics for their double materiality. The principle of double materiality requires companies to disclose non-financial information as soon as the following two criteria are met: Firstly, the information makes it possible to understand how the company's activities affect non-financial aspects. And secondly, the information is necessary to understand the course of business, results of operations and economic position of Merck KGaA, Darmstadt, Germany, and the Group. In 2023, we examined the topics identified within the scope of a materiality analysis in accordance with the Global Reporting Initiative standards (GRI) for their double materiality.

The following topics achieved the relevance threshold for double materiality in 2023. They cover fiscal year 2023 and pertain to our entire Group. Any deviations from the reporting framework are indicated on a case-by-case basis.

Aspect	Topic
Environmental matters	• Environmental management • Climate action • Water management • Plant, process and transport safety • Chemical product safety
Employee-related matters	• Attracting and retaining talent • Diversity, equity and inclusion • Health and safety
Social matters	• Responsible supply chain (including the mica supply chain) • Patient safety • Prices of medicines • Clinical studies • Bioethics • Digital ethics • Data protection and cyber security
Respect for human rights	• Human rights
Anti-corruption and anti-bribery	• Governance and compliance (including anti-corruption anti-competitive behavior) • Interactions with health systems (including responsible marketing)
Other topics	• Sustainable innovation and research & development

As part of our approach to comprehensive risk and opportunity management, we also identify current and potential risks and opportunities resulting from environmental, social and governance aspects. This includes tracking information on the gross risks in terms of potential damage and probability, as well as the residual net risks remaining after mitigation measures have been executed. As of the reporting date and pursuant to the risk analysis of the material non-financial topics, no significant risks within the meaning of section 289c (3) sentence 1 no. 3 and 4 of the German Commercial Code (HGB) from the company's own business activities or from business relationships are known that are very likely to have or will have serious negative effects on non-financial aspects. Additional risks are described in the "**Report on Risks and Opportunities**" in the combined management report.

Environmental Matters

Environmental protection

Minimizing negative environmental impacts and taking meaningful climate action require a holistic approach while also constantly monitoring practices and performance. Our goal is to decouple business growth from negative environmental impacts wherever possible. Our production sites are located in established industrial and commercial zones. Before acquiring a company – and thus its facilities – we first conduct an environmental risk assessment.

Roles and responsibilities

The Chair of the Executive Board and CEO of our company is responsible for environmental protection, which also covers climate action, water management, waste and recycling, air emissions, biodiversity, and plant and process safety. Her duties include approving overarching Group-wide guidelines such as our Environment, Health and Safety (EHS) Policy. Furthermore, our Sustainability Board (MSB) monitors the Group-wide implementation of environmental protection goals.

The Group function Corporate Sustainability, Quality and Trade Compliance (SQ) is responsible for steering all the related measures globally. SQ senior leadership approves operational standards and regularly reports on environmental protection to our Sustainability Board. Every year, SQ prepares a comprehensive environment, health and safety report covering topics such as climate action, water management and waste and recycling as well as plant and process safety. Our Sustainability Board uses this report to steer the strategic direction and provide verification for our ISO 14001 and ISO 45001 certifications.

Across our business sectors, the Operations Leadership Committee (OLC) makes strategic decisions on issues pertaining to emissions, energy, water, and waste. This body comprises representatives from Life Science, Healthcare and Electronics as well as SQ. Decisions made by the OLC and any resulting actions are implemented by the respective business sector. Once per quarter, the OLC members update their leaders on matters relating to environmental protection and this information, if relevant, is then shared with the MSB.

Our commitment: Standards and standard operating procedure

Our approach to environmental management is founded on our **Group EHS (Environment, Health and Safety) Policy**, which has been approved by our Executive Board. Aligned with the requirements of the chemical industry's **Responsible Care® Global Charter** and the ISO 14001 environmental management standard, this policy underscores our leaders' responsibility for environmental protection and health and safety. It is also aimed at our suppliers, calling on them to likewise adopt high environmental sustainability and safety standards. Our EHS policy thus complements the **Supplier Code of Conduct** of our Group Procurement function. Through our Contractor EHS Management Standard, we aim to ensure that our contract partners also take environment, health and safety aspects into account.

Material investments in environmental impact mitigation

Efforts to prevent and monitor air, water and soil emissions entail significant expense on our part, as does proper waste disposal. Moreover, we set up provisions for groundwater and soil remediation to ensure that we can execute all the necessary measures. As of December 31, 2022, our provisions for environmental protection totaled € 149 million (2022: € 148 million), 96% (2022: 94%) of which was attributable to Merck KGaA, Darmstadt, Germany. For details see Notes to the Consolidated Financial Statements under (27) "**Other provisions**".

Assessing environmental impacts

As a matter of principle, we conduct risk-based assessments along with audits of all our production facilities every three years with the goal of analyzing and minimizing our environmental footprint. Conducted by SQ, these assessments serve to ensure that our requirements are being met, with appropriate corrective measures being implemented as needed. In our Group EHS audits, we assess our sites' performance on a five-tier scale ("excellent", "good", "fair", "poor", and "critical"), which in turn determines how frequently audits are conducted. If the findings are deemed to be good, we audit the facility less often, while incompliances can increase the frequency. In 2023, we commissioned a total of 34 audits (2022: 41), one of them "excellent", 23 of them "good" and 10 of them "fair".

Reporting incidents and violations

To review critical situations, near misses and environmental incidents as quickly as possible and take countermeasures, we have a set of reporting procedures in place that allow us to track the respective incident, its degree of severity and all risk mitigation efforts. We record all incidents Group-wide and report them to the Executive Board annually.

In the event of a major occurrence, our digital Rapid Incident Report System (RIRS) promptly notifies the SQ and Group Communications functions, which, if necessary, inform the Executive Board. Major incidents could include fatalities, accidents with multiple casualties, incidents that impact neighboring communities, or natural disasters such as earthquakes and flooding. Through the RIRS, we can quickly coordinate with all those involved and inform the other sites immediately of the respective event. In addition, employees as well as external stakeholders can report any violations of our standards to Group Compliance.

In 2023, we recorded no (2022: two) significant incident-related releases of substances.

ISO 14001:2015 Group certificate

Since 2009, our company has held an ISO 14001 Group certificate that requires all production sites with more than 50 employees to implement an environmental management system with predefined indicators such as greenhouse gas emissions and water consumption. Other facilities are not obligated to undergo certification. The annual internal audit reports and management reviews carried out under the Group certificate give us a better overview of how all our sites are performing. As in the previous year, 95 of our sites worldwide were covered by the ISO 14001 certificate in 2023.

Annual external audits are used to monitor our certifications. As part of a defined sample procedure for the Group certificate, a total of 34 sites were externally audited in 2023, with all audited facilities passing (2022: 12). In addition to external inspections, internal audits serve to ensure Group-wide compliance with our requirements.

Climate action

We want to do our part to preserve the climate and comply with the Paris Agreement on climate change. Therefore, we have set our own objectives:

By 2030, we intend to lower our direct (Scope 1) and indirect (Scope 2) greenhouse gas emissions by 50% compared with the base year 2020. We aim to achieve this mainly by reducing process-related emissions, implementing energy efficiency measures and purchasing more electricity from renewable sources.

In May 2022, this goal for 2030 was approved by the Science Based Targets initiative (**SBTi**), which independently assesses and approves company targets based on its strict climate science criteria. This approval by SBTi confirms that we are contributing to limiting global warming to 1.5 °C, thus complying with the requirements of the Paris Agreement.

We also aim to cover 80% of our purchased electricity with renewables by 2030.

Moreover, we aim to reduce our Scope 3 emissions across the entire value chain by 52% compared with 2020 (per euro of gross profit) by 2030. This target was also approved by SBTi.

By 2040, we intend to have achieved climate-neutral operations throughout our entire value chain; this target covers our Scope 1, 2 and 3 emissions.

Roles and responsibilities

Corporate Sustainability, Quality and Trade Compliance is responsible for overseeing all climate action efforts throughout the Group, with our individual sites and business sectors worldwide implementing the necessary measures at the local level. More information can be found under "**Environmental protection**".

Our commitment: Standards and legal frameworks

We have three EHS standards in place to manage energy and process-related emissions consistently across the Group, specifically "Energy Management", "Air Emissions" and "Emissions of Refrigerants". We use an internal audit process to randomly check compliance with all EHS standards.

Emissions reduced further

In 2023, we reduced our greenhouse gas emissions by nearly 17% compared with the previous year, emitting a total of approximately 1,463,000 metric tons of CO_2 equivalents (CO_2eq) (2022: 1,760,000).

Our direct emissions (Scope 1) totaled 1,236,000 metric tons of CO_2eq (2022: 1,518,000), with process-related emissions accounting for 990.000 metric tons of CO_2eq and fuel use accounting for the remainder. Indirect emissions (Scope 2) totaled roughly 227,000 metric tons of CO_2eq (2022: 242,000) calculated according to the market-based method (approximately 381,000 metric tons of CO_2eq according to the location-based method). Greenhouse gas emission intensity (Scope 1 and 2) amounted to 0.07 Kg of CO_2eq per € of net sales in this period (2022: 0.08).

The Greenhouse Gas Protocol defines 15 categories for Scope 3 emissions from upstream and downstream activities. In 2023, these emissions totaled around 4,594,000 metric tons of CO_2eq (2022: 6,680,000). Categories 1 and 2 (Purchased Goods and Services and Capital Goods) accounted for 62% (2022: 69%) of our total Scope 3 emissions in this period.

Total greenhouse gas emissions (Scope 1 and 2 of the GHG Protocol)[1,2]

metric kilotons	2020[3]	2021	2022	2023 Group	2023 thereof: Merck KGaA, Darmstadt, Germany
Total CO_2eq[3] emissions[4]	**2,152**	**1,951**	**1,760**	**1,463**	**22**
thereof:					
direct CO_2eq emissions (Scope 1)[5]	1,827	1,626	1,518	1,236	15
indirect CO_2eq emissions (Scope 2)[6]	325	325	242	227	7
Biogenic CO_2 emissions[7]	**14**	**15**	**14**	**14**	**0**

[1] In line with the Greenhouse Gas Protocol, for all previous years greenhouse gas emissions were calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).
[2] Baseline for our emission targets is 2020.
[3] eq = equivalent.
[4] In 2023, we adjusted our Scope 1 and Scope 2 calculations to reflect minor data corrections.
[5] In 2023, we adapted the Scope 1 calculations to the modified global warming potentials of the IPCC 6th assessment report (previously IPCC 5th assessment report) and restated previous years accordingly.
[6] The figures presented here have been calculated in accordance with the market-based method.
[7] We adapted the calculations to the complete Greenhouse Gas Protocol requirements.

We have included the following gases in our calculation of direct and indirect CO_2eq emissions:
Direct CO_2 emissions: CO_2, HFCs, PFCs, CH_4, N_2O, NF_3, SF_6.
Indirect CO_2 emissions: CO_2.

Other relevant indirect greenhouse gas emissions (Scope 3 of the GHG Protocol)[1]

	2020	2021	2022	2023
Total gross other indirect emissions (metric kilotons CO_2 equivalents)	**5,103**	**5,799**	**6,680**	**4,594**
Purchased goods & services (category 1)[2]	3,040	3,572	4,200	2,517[3]
Capital goods (Category 2)[2]	293	291	388	340[3]
Fuel- and energy-related emissions, not included in Scope 1 or 2 (category 3)	102	143	121	115
Upstream transportation & distribution (category 4)	264	264[4]	319	236[5]
Waste generated in operations (category 5)	85	79	57[6]	32[6]
Business travel (category 6)	32	26	78	86
Employee commuting (category 7)	90	94	99	76[7]
Upstream leased assets (category 8)[8]	-	-	-	-
Downstream transportation & distribution (category 9)	8	8[4]	6	10[5]
Processing of sold products (category 10)[9]	-	-	-	-
Use of sold products (category 11)[10]	1,164	1,296	1382[11]	1,137
End-of-life treatment of sold products (category 12)	23	23[4]	26[11]	42
Downstream leased assets (category 13)	2	2	2	2
Franchises (category 14)[12]	-	-	-	-
Investments (category 15)	0	1	2	1

[1] In line with the Greenhouse Gas Protocol, for all previous years, greenhouse gas emissions were calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).
[2] The reported figures contain 95-97% of our total spend. The difference stems from smaller sites that are not integrated in our Group-wide purchase volume data. 2020 data are slightly over-reported (approx. 3%) as the currency conversion factor (USD to EUR) from 2021 was used. Non-categorized spends are distributed pro rate to category 1 and 2.
[3] We updated environmentally extended input-output analysis (EEIO) factors, and we adjusted our emission calculation approach for service categories using primary supplier data.
[4] Due to high efforts for data preparation, we reference 2020 data for 2021.
[5] In 2023, we introduced a new and improved calculation methodology based on primary data from suppliers/logistics service providers and an energy-based bottom-up calculation approach.
[6] We adjusted our calculation methodology to remove non-GHG relevant waste streams.
[7] We adjusted our calculation methodology to take into account the results of an internal employee survey on home office use.
[8] Already covered under Scope 1 and 2 emissions.
[9] Our company produces a huge variety of intermediate products for various purposes. Due to their many applications and our customer structure, the associated greenhouse gas emissions cannot be tracked in a reasonable fashion.
[10] In 2023, we adapted the Category 11 calculations to the modified global warming potentials of the IPCC 6th assessment report (previously IPCC 5th assessment report) and restated previous years accordingly.
[11] Due to high efforts for data preparation, we partly use 2020 data for 2022.
[12] This category is not relevant for us as we do not operate franchises, i.e. businesses operating under a license to sell or distribute another company's goods or services. Out-licensing in the pharmaceutical sector is not regarded as franchising.

Biogenic emissions (Scope 3), if present, are not being recorded.

Transparency on CO_2 emissions and energy consumption

We report to **CDP** on an annual basis. This organization assesses the ways in which companies are working to lower greenhouse gas emissions and minimize the risks and consequences of climate change, along with their strategy for doing so. Companies are rated from A to D-, with A being the top score. In 2023, we scored A- (2022: B) for climate change.

Energy consumption and renewable energy

We consumed 2,337 gigawatt hours of energy in 2023 compared with 2,432 gigawatt hours in 2022. As in the previous year, our energy intensity relative to sales remained at 0.11 kWh/€ in 2023.

In 2023, we further strengthened our focus on purchasing electricity from renewable sources. In this period, we sourced 51% of our purchased electricity from renewable energies, meaning direct supply contracts and energy attribute certificates (2022: 47%). The share of our total energy consumption by renewable energies increased to 23% in 2023 (2022: 20%).

In 2023, we signed virtual power purchase agreements (VPPAs) in Europe for a total of around 300 gigawatt hours (GWh) of renewable energy per year. This means that 100% of our electricity currently purchased in the European Union (EU) and Switzerland will be covered with renewable energy certificates as of 2025.

Energy consumption[1]

In GWh	2020	2021	2022	2023 Group	2023 thereof: Merck KGaA, Darmstadt, Germany
Total energy consumption	**2,382**	**2,463**	**2,432**	**2,337**	**78**
Direct energy consumption	**1,269**	**1,321**	**1,294**	**1,245**	**68**
Natural gas	1,182	1,235	1,188	1,164	59
Liquid fossil fuels[2]	52	48	70	43	9
Biomass and self-generated renewable energy	35	38	36	38	0
Indirect energy consumption	**1,113**	**1,142**	**1,138**	**1,092**	**10**
Electricity	950	964	984	982	10
Steam, heat, cold	163	178	154	110	0
Total energy sold	**0.2**	**0.1**	**0.01**	**0.00**	**0.0**
Electricity	0.2	0.1	0.01	0.00	0.0
Steam, heat, cold	0.0	0.0	0.00	0.00	0.0

[1] In line with the Greenhouse Gas Protocol, for all previous years energy consumption has been calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

[2] Light and heavy fuel oil, liquefied petroleum gas (LPG), diesel, biodiesel, gasoline and kerosene.

We use photovoltaics to produce power at multiple sites.

We currently only record purchased secondary energy – this is primarily electricity and, to a lesser extent, heat, steam and cold. Details on the local energy mix, including the respective percentage of primary energy, renewable energy, etc. are not available. Data on local energy efficiency in electricity or heat generation are not available either. Our production sites are located in countries with a widely varying energy mix.

Water management

To us, sustainable water management means obtaining freshwater or discharging treated wastewater without negatively impacting aquatic ecosystems. We are also concerned with addressing water scarcity. To determine whether a site is in a water-stressed area, we apply a risk factor of the Aqueduct Water Risk Atlas of the World Resources Institute (**WRI**). We want to reduce the environmental impact of our wastewater and make our processes more water efficient. In the medium term, we will also consider water-related risks in our supply chain when purchasing important raw materials. In the long term, we aim to transparently map water use and environmental impacts throughout the entire life cycle of our products.

To this end, we have defined two targets: Firstly, we originally aimed to achieve a 10% reduction in our Water Intensity Score by 2025 compared with the baseline of 2020. In 2023, we met and surpassed this target, successfully lowering our Water Intensity Score by 25% in comparison with the baseline year 2020. Consequently, we have set a new target based on a new and more transparent calculation. By 2030, we strive to achieve a 50% reduction in our water efficiency ratio of water intake per revenues compared with the 2020 baseline. The new target covers the complete water intake of our company. Our 2020 baseline year was chosen to align this new target with other existing environmental goals. Our second objective focuses on mitigating our environmental impact. Specifically, we are committed to reducing potentially harmful residues in our wastewater to levels below the established no-effect threshold.

Our regular EHS audits at our production and development facilities also review site-specific water management practices. Our water management efforts focus more heavily on our manufacturing sites than our administrative facilities as production generally poses a higher risk to aquatic ecosystems.

Roles and responsibilities

The Group function Corporate Sustainability, Quality and Trade Compliance is responsible for water management. At our sites, engineers work closely with our EHS managers to reduce water consumption and treat wastewater. Further information can be found under "**Environmental protection**".

Our commitment: Standards and procedures

Our **Sustainable water management principles** set the framework for three Group-wide standards that detail how we integrate mechanisms of sustainable water management into our management system: Sustainable Water Management Part 1 – Wastewater; Sustainable Water Management Part 2 – Water Use; and Sustainable Management Part 3 – Water Risk Management. All three standards are based on the commitments we made under the **Responsible Care® initiative**.

Our Wastewater Standard defines criteria for assessing our wastewater discharges into ecosystems. It also helps us achieve our targets regarding trace substances in wastewater from our operations. The Water Use Standard sets out mandatory Group-wide requirements for the responsible consumption of water. The Water Risk Management standard establishes a way for us to manage the risks that arise from direct or indirect water extraction and covers risks such as contaminated rainwater and flooding. We perform internal EHS audits to verify that our sites comply with our three standards. All sites are required to measure and assess the risks and impacts of the hazardous substances in their wastewater. Moreover, they must also analyze withdrawal and wastewater risks and comply with the respective requirements of the local authorities.

Water withdrawals from our own wells and local suppliers

For the most part, we draw water used for our production processes from our own wells and source drinking water from local suppliers. In doing so, we do not want water extraction to impair any protected areas, sensitive ecosystems or habitats. We extract less water from our own wells than the amounts permitted. We simultaneously monitor potential trends that could lead to the reclassification of water sources, which involves assigning heightened levels of protection to specific regions.

The cooling water used in our production processes generally runs in a circular system. Depending on regulatory standards and the energy footprint, we sometimes use freshwater for cooling in a once-through system. However, this is only done in regions with high freshwater availability. For certain applications, we treat production wastewater and reuse it. In 2023, we recycled a total of 20.5 million m^3 of water (2022: 20.7).

Water withdrawal

millions of m^3	2020	2021	2022	2023 Group	2023 Water stress areas
Total water withdrawal	**14.0**	**13.5**	**13.2**	**12.1**	**0.162**
Surface water (rivers, lakes)	1.8	1.9	1.8	1.4	0.002
Groundwater	6.7	6.3	6.3	5.8	0.002
Drinking water (from local suppliers)	5.4	5.2	5.0	4.8	0.156
Rain water and other sources	0.06	0.06	0.06	0.06	0.002

These figures do not include the ground water that we use for safety measures at our Gernsheim site in Germany. Here, the water is fed back directly into natural circulation.

Using water more efficiently

We seek to minimize our impact on water availability in the vicinity of our sites. In 2023, we withdrew 12.1 million m^3 of water in total (2022: 13.2). We assess local conditions to determine whether a sufficient water supply is available. In our water conservation efforts, we pay particular attention to sites in water-scarce areas. To measure how we improve our water efficiency, we have defined our Water Intensity Score, which relates the amount of water either purchased or withdrawn from our own wells at a site to the number of hours worked, taking local water availability into account.

In 2023, we already exceeded our target set for 2025 to lower our Water Intensity Score by 10% (baseline year 2020). Initiatives that helped us reach our original goal include effects from shifts in product mix as well as initiatives such as recycling of wastewater in Rio de Janeiro (Brazil), St. Louis (USA) and Mollet del Valles (Spain).

We have therefore set ourselves a new target: By 2030 we will reduce our sales-normalized water intake by 50% compared with 2020 (2020: 792 m^3 per million € net sales (100%), 2023: 580 m^3 per million € net sales (-30%)).

In the past, our Gernsheim site in Germany was excluded from both the score and our water conservation efforts because we must extract a minimum water quantity from our own wells to meet regulatory requirements. Our new target will cover the entire Group, including Gernsheim.

Our wastewater

In 2023, we generated a total of 11.1 million m^3 of wastewater (2022: 12.4). This comprised around 7.6 million m^3 of "direct discharge" water (2022: 8.6) into surface waters. 3.4 million m^3 was classified as "indirect discharge" (2022: 3.8) water and treated at external treatment plants.

Wastewater volume

	2020	2021	2022	2023 Group	2023 Water stress areas
Total wastewater volume (millions of m^3)	**13.4**	**13.3**	**12.4**	**11.1**	**0.110**
Wastewater discharged directly	9.2	9.5	8.6	7.6	0.000
Wastewater discharged to third parties	4.1	3.8	3.8	3.4	0.100

We continuously work to optimize our production streams and purification processes to conserve water and minimize residues. We have appointed an expert for each of our business sectors to provide guidance for our sites. This approach aims to reduce the amount of pharmaceutically active ingredient residues as well as all substances with water-hazardous properties. All wastewater from relevant sites is processed in wastewater treatment plants before being discharged into the environment. This is done either in our own plants or by offsite third parties such as municipal wastewater treatment plants.

Assessing our water management practices

In addition to reporting on our climate action efforts, we also report water-related data to the CDP, which collects environmental data from companies once a year and evaluates their processes and performance on a scale from A to D-. As in the previous year, we were awarded a B for our water management practices in 2023.

Plant, process and transport safety

We seek to minimize manufacturing process hazards wherever possible in order to prevent workplace accidents, production outages and chemical spills. To this end, we regularly review our approach to plant and process safety and continuously gauge it using our EHS key indicators.

Moreover, all our shipments are to reach our customers and sites safely, undamaged and with the required safety information. Several of the materials we store and transport are classified as hazardous. The storage of such dangerous goods and the transport thereof – whether by road, rail, air, or water – are governed by global regulations. To minimize risks to people and the environment, we apply strict safety requirements across the Group that also comply with applicable laws. We conduct regular reviews to ensure our own warehouses as well as those of third parties comply with these regulations.

Roles and responsibilities

Overriding responsibility for plant, process and transport safety lies with the Group function Corporate Sustainability, Quality and Trade Compliance (SQ), which coordinates plant and process safety for the company and defines Group-wide EHS standards and regulations.

Our commitment: Internal standards and international rules

To ensure safe operation throughout the lifetime of a plant, our Group-wide EHS standards contain specific rules for production plants and processes. These include specifications that determine how special risk analyses and hazard assessments are to be carried out. We have also defined measures for the event of accidental release of chemical substances and for fire protection.

Our Group-wide EHS standards stipulate the safety levels for the storage of hazardous materials at our sites. Along with supplementary standard operating procedures and best practice documents, these EHS standards describe the technology, equipment and organizational infrastructure needed to achieve the appropriate safety levels. Contract warehouses must also adhere to our strict safety requirements. Before we sign a contract with an operator, they must submit a statement detailing how they meet our prerequisites. Our Group-wide EHS standards also define the technical and organizational requirements for such warehouses.

Our Group Transport Safety Standard is based on the United Nations Recommendations on the Transport of Dangerous Goods. This guideline is especially important for sites in countries with inadequate local regulations covering the conveyance of hazardous materials.

Assessing potential risks

Before commissioning a plant, we draft a safety concept, which is subject to continuous review throughout the entire lifetime of the facility. It is updated as needed until the facility is decommissioned. This safety concept contains an overview of potential risks and specifies corresponding protective measures. In the event that alterations are made to a plant, we reassess the hazard and risk situation. Our Risk Management Process guides all our sites in identifying and assessing risks and serves to devise further measures to minimize them.

We use internal EHS audits to complement the inspections conducted by our EHS and dangerous goods managers in order to ensure that our sites comply with process, plant, transport, and storage safety regulations. Normally, these audits are conducted every three years at production sites and every four years at warehouse and distribution sites. If major shortcomings are identified, we re-audit the respective site the following year. Conversely, we may decide to extend the period between audits at facilities where, based on the findings from previous audits, we deem the potential risk to be low. Our sites are required to rectify any deficiencies discovered during the audit, with the auditor subsequently checking whether the specified corrective actions have been taken. In 2023, we conducted 34 EHS audits (2022: 41) in accordance with our Group-wide EHS standards.

Keeping a close eye on safety

We track EHS performance indicators at all production and warehouse facilities, as well as at major research sites, including both accidents and near misses. We investigate each individual incident and then devise appropriate countermeasures in an effort to reduce the likelihood of such events reoccurring in the future. EHS performance indicator data are reported once a month within each business sector, with the Executive Board receiving reports on the topic once per year. Four indicators are particularly important to us:

- Under our EHS Incident Rate (EHS IR), we track and evaluate all major and minor accidents and incidents as well as further EHS-relevant incidents. The EHS IR covers both our own employees as well as those of contractors. To calculate it, we state the number of incidents and the severity of the event in relation to the number of hours worked. The lower the EHS Incident Rate, the safer the site is. In 2023, the ratio was 2.4 (2022: 2.8).
- The EHS IR also contains our Loss of Primary Containment (LoPC) indicator. In 2023, we did not record any significant incident-related releases of substances (2022: two).
- The EHS Leading Rate (EHS LR) reflects the number and the results of the analyses of near misses and hazardous conditions or behaviors, as well as other proactive safety activities such as risk assessments.
- For the **Lost Time Injury Rate (LTIR)** we set ourselves the goal of lowering our Group-wide LTIR to under 1.0 by 2025 (number of accidents Group-wide resulting in at least one missed day of work per million hours worked). In 2023, our LTIR was 1.3 (2022: 1.2).

Chemical product safety

Product safety is one of our top priorities. During the product development phase, we investigate the potential adverse impacts of chemical substances. Along the entire value chain of our products – from raw materials to manufacture and commercialization – we provide relevant information on their hazardous properties and how to deal with them. These instructions facilitate the safe handling and use of our products in line with pertinent regulatory requirements. We publish this information primarily on the relevant digital channels. As paper safety data sheets are still common in some countries, we can also provide these upon request through our customer service.

Roles and responsibilities

Our Life Science, Healthcare and Electronics business sectors have organizational structures in place to implement our product safety strategy in line with their respective business requirements and customer needs. This approach includes registering chemicals, classifying hazardous substances and highlighting risks using safety data sheets, labels and digital communication tools.

Our Group standard provides a framework for governing the setup of effective operational processes for product safety, hazard communication and chemical regulatory compliance throughout our business sectors. In addition, the Group Chemicals Regulations Council fosters cross-sectoral alignment of strategic regulatory activities required for existing and emerging chemicals regulations as well as sustainability and identifies potential impacts for our company.

This approach also applies to innovative fields of development such as nanomaterials, which we use with the greatest of care in line with the precautionary principle. Furthermore, our Group-wide **Policy for Use and Handling of Nanomaterials** provides the necessary guidance on the use of these materials.

Legal requirements and internal guidelines

Our internal standard defines the roles, responsibilities and basic processes required to comply with national and international regulations. In addition, we have also endorsed voluntary commitments of the chemical industry such as the **Responsible Care® Global Charter**.

Using the Globally Harmonized System for Classification and Labelling of Chemicals (**GHS**) for hazard communication enables us to streamline our internal processes and provide consistent, harmonized and high-quality information to our customers.

In 2023, there was one incident of non-compliance with regulations concerning potential health and safety impacts and the labeling of our chemical products. Some information and the REACH registration number was missing on a safety data sheet which resulted in a fine in Italy. In this regard, to the best of our knowledge, there were no negative impacts on human health or the environment.

Safety analysis of our products

Safe and sustainable by design implies that product safety starts during development. Therefore, at an early stage of our product development process, we analyze innovations in terms of their impacts on human health and the environment. We continuously evaluate the intrinsic hazards of both our existing and new products to create relevant product safety information in line with applicable rules.

Product safety information

Chemical product safety is all about protecting human health and the environment from adverse impacts resulting from the use of chemical products throughout their life cycle. To achieve this, we provide relevant information to our customers and the public, which helps to raise awareness of the hazards and build a greater understanding of how to mitigate risks and use the products safely.

To obtain the relevant information on hazard profiles, we employ industry-standard digital tools through which we gather information available on the substances we use.

Employee-Related Matters

Attracting and retaining talent

To ensure our ongoing success, we are focusing on the future by creating meaningful impacts and building needed capabilities. At the same time, we must respond to changing demographics and adapt to the behaviors and expectations of the highly competitive talent market. Therefore, in 2023, we continued to enhance our talent acquisition strategy with a more personal, employee-focused approach. Our talent sourcing approach aims to build inclusive pipelines and effectively recruit diverse talent with the needed competencies and capabilities to our organization. In addition, our talent retention approach is inclusive in targeting various employee groups. In 2023, we intensified our efforts to support internal mobility. For example, we launched a dedicated project to improve organizational agility, up-skilling and re-skilling, retention, and engagement. Specific modules went live in 2023, and we will roll out the complete platform with all functionalities during the course of 2024.

We have designed our compensation structure to provide valuable benefits to our employees and their families. Our benefits offerings recognize the diversity and uniqueness of our employees while providing flexibility wherever possible. Additionally, our international employee mobility programs create an environment suited to the needs of a rapidly evolving workforce.

Total number of employees

As of Dec. 31	2020	2021	2022	**2023 Group[1]**	**2023 thereof: Merck KGaA, Darmstadt, Germany[2]**
Total number of employees	58,127	60,348	64,243	62,908	3,924
Men	33,204	34,274	36,452	35,499	2,387
Women	24,923	26,074	27,791	27,409	1,537

[1] Our company also employs people at sites of subsidiaries that are not fully consolidated. For the 2023 reporting year, we have aligned the scope of consolidation also for the employee data in the non-financial reporting with the financial reporting. As of now, the figures relate to all employees who are employed in fully consolidated subsidiaries that manage personnel.

[2] The sharp decline in comparison with the previous year (8,485 employees) is attributable to the fact that in addition to Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany which was hived off in 2019, the two other business sectors, namely Life Science und Electronics, have now also been transferred to separate legal entities.

Employee age by region

As of Dec. 31

Number of employees	Worldwide	North America	Europe	Merck KGaA, Darmstadt, Germany	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2022							
Up to 29 years old	9,926	2,753	3,530	1,181	2,999	476	168
thereof: women	4,637	1,178	1,655	441	1,441	264	99
30 to 49 years old	38,423	7,811	16,216	4,549	11,174	2,333	890
thereof: women	16,909	3,278	7,528	1,664	4,498	1,196	409
50 or older	15,894	5,283	8,498	2,755	1,239	681	192
thereof: women	6,245	2,045	3,437	870	412	255	96
Average age	**41.6**	**43.3**	**43.1**	**43.1**	**37.3**	**41.1**	**40.3**
Total employees	**64,243**	**15,847**	**28,244**	**8,485**	**15,412**	**3,490**	**1,250**
2023							
Up to 29 years old	8,743	2,233	3,294	535	2,634	440	142
thereof: women	4,150	995	1,521	213	1,323	224	87
30 to 49 years old	38,006	7,352	16,304	2,085	11,218	2,301	831
thereof: women	16,798	3,084	7,565	857	4,562	1,203	384
50 or older	16,159	5,133	8,706	1,304	1,407	717	196
thereof: women	6,461	2,034	3,595	467	472	266	94
Average age	**41.5**	**43.5**	**42.9**	**43.0**	**37.4**	**40.8**	**40.5**
Total employees	**62,908**	**14,718**	**28,304**	**3,924**	**15,259**	**3,458**	**1,169**

Internationality of employees

As of Dec. 31	2020	2021	2022	**2023 Group**	**2023 thereof: Merck KGaA, Darmstadt, Germany**
Number of nationalities	141	142	139	141	70
Number of nationalities in management positions (Role 4 or above)	75	79	78	77	30
% of non-Germans in management positions (Role 4 or above)	66	66	66	66	12

New employees

As of Dec. 31	2020	2021	2022	2023 Group	2023 thereof: Merck KGaA, Darmstadt, Germany
Total number of new employee hires	**6,669**	**8,960**	**10,682**	**5,490**	**220**
by age group					
up to 29 years old	2,889	3,679	4,314	2,156	170
30 to 49 years old	3,347	4,610	5,397	2,944	45
50 or older	433	671	971	390	5
by gender					
Women	3,016	4,101	4,569	2,493	89
Men	3,653	4,859	6,113	2,997	131
by region					
Europe	2,160	2,567	3,015	2,028	220
North America	1,789	2,855	3,971	1,181	not applicable
Asia-Pacific (APAC)	2,206	2,803	3,071	1,710	not applicable
Latin America	396	579	460	445	not applicable
Middle East and Africa (MEA)	118	156	165	126	not applicable
Rate of new employee hires[1] (%)	**11**	**15**	**17**	**9**	**6**
by age group[2]					
up to 29 years old	43	41	40	39	77
30 to 49 years old	50	51	51	54	21
50 or older	7	8	9	7	2
by gender[2]					
Women	45	46	43	45	40
Men	55	54	57	55	60
by region[2]					
Europe	32	29	28	37	100
North America	27	32	37	22	not applicable
Asia-Pacific (APAC)	33	31	29	31	not applicable
Latin America	6	6	4	8	not applicable
Middle East and Africa (MEA)	2	2	2	2	not applicable

[1] Formula for calculating the rate of new employee hires: Total number of new employee hires divided by number of employees at the end of the fiscal year.

[2] Formula for calculating the rate of new employee hires by age/gender/region: New employee hires of the focus group divided by the total number of new employee hires.

Staff turnover[1,2]

	2020[3]	2021	2022	2023 Group	2023 thereof: Merck KGaA, Darmstadt, Germany
Total turnover rate	**8.22**	**10.82**	**10.16**	**9.96**	**3.48**
Turnover rate by gender					
Men	8.22	10.69	10.40	10.11	3.24
Women	8.22	11.00	9.93	9.76	3.87
Turnover rate by age group					
Up to 29 years old	11.30	16.64	15.91	14.39	5.79
30 to 49 years old	7.74	10.05	9.55	9.48	3.41
50 or older	7.52	9.22	8.05	8.49	2.62
Turnover rate by region					
Europe	5.64	6.00	5.91	5.52	3.48
North America	9.79	15.44	14.33	15.02	not applicable
Asia-Pacific (APAC)	10.60	14.66	12.84	11.90	not applicable
Latin America	11.40	12.95	13.38	13.19	not applicable
Middle East and Africa (MEA)	11.80	16.57	13.04	15.63	not applicable
Total number of leavers	**4,721**	**6,354**	**6,358**	**6,336**	**152**
by gender					
Men	2,697	3,575	3,673	3,639	87
Women	2,024	2,779	2,685	2,697	65
by age group					
Up to 29 years old	974	1,451	1,542	1,358	32
30 to 49 years old	2,677	3,545	3,569	3,624	82
50 or older	1,070	1,358	1,247	1,354	38
by region					
Europe	1,490	1,601	1,640	1,560	152
North America	1,281	2,078	2,182	2,305	not applicable
Asia-Pacific (APAC)	1,394	2,015	1,905	1,824	not applicable
Latin America	398	449	467	460	not applicable
Middle East and Africa (MEA)	158	211	164	187	not applicable

[1] The table contains unadjusted turnover rates. The rate excludes employees who pause due to parental leave or a long-term illness, as well as employees who are transitioning to the non-working phase of partial retirement.

[2] The employee turnover rate is calculated as follows: Total number of leavers from the past 12 months divided by the average employee headcount multiplied by 100.

[3] The figures do not reflect the approximately 500 Allergopharma employees, who were not included in the employee turnover rate due to the divestment of the business.

In 2023, the average length of service for employees Group-wide was 9.7 years (2022: 9.2 years), with 15.2 years (2022: 15.4 years) for employees of Merck KGaA, Darmstadt, Germany.

Roles and responsibilities

Group Human Resources (HR) supports and advises all business sectors and Group functions within our organization regarding our human capital, especially topics related to recruiting, vocational training and advanced training. Across all our sites, HR employees work with leaders from various functions and business sectors to employ strategies that engage our people in line with Group-wide HR guidelines and requirements, including attractive compensation models and benefits. In accordance with the audit plan, we conduct internal audits every two to three years to ensure that we implement our guidelines effectively.

The Chair of the Executive Board and CEO is responsible for Group Human Resources. Our Chief HR Officer, who leads the HR function and oversees all our HR activities, reports directly to the Chair of the Executive Board and CEO. Our Business Services unit oversees the operational tasks of HR work, such as drafting contracts and payroll accounting. The Chief Financial Officer is responsible for this unit.

Our commitment: Group-wide policies and guidelines

As set down in our **Social and Labor Standards Policy**, we will respect our employees' legal rights to form and join worker organizations of their own choosing, including labor organizations and trade unions, and will not discriminate based on an employee's decision to join or not join a labor organization.

Our High-Impact Culture is founded on six behaviors: obsessed with customers and patients; act as the owner; be curious and innovate boldly; simplify and act with urgency; raise the bar; disagree openly, decide and deliver. We regularly inform managers and employees about these behaviors through global campaigns.

Our People Development and Learning Policy provides a Group-wide framework that guides employees in managing their professional growth. It defines requirements for our development opportunities, roles and responsibilities.

A competitive compensation structure

We reward the performance of our employees in order to maintain a competitive edge in attracting and retaining the best talent. Within our Group, we base compensation on the requirements of each position and each employee's respective performance. We make no distinctions based on gender or any other diversity criteria. To ensure we maintain a competitive compensation structure, we regularly review our compensation policy based on data analyses and industry benchmarks. This enables us to compare internal factors and market requirements in equal measure. Before making changes to our compensation structure, we consult with key stakeholders such as employee representatives, as applicable.

In addition to individual performance, our annual incentive plan also measures company performance based on financial and non-financial key indicators in our scorecard. The non-financial key indicators focus on the company's priorities and are designed to support our High-Impact Culture as well as our sustainability strategy and progress in terms of diversity, equality and inclusion. Furthermore, since 2022, we have included a sustainability factor in our Long-Term Incentive Plan (LTIP). More information on the LTIP can be found in the **Notes of our Annual Report**.

Strengthening our sustainability culture

Since 2021, e-Learnings on our sustainability strategy are a mandatory training component for existing and new employees. While this was the first step of our upskilling journey, we have extended our offer with function- and hierarchy-specific educational activities. Furthermore, from 2023 on, we use the sustainability questions from our annual employee engagement survey to measure the impact of our activities. The survey results are only used internally. They help us to understand the maturity of a sustainability mindset in the company and to detect and address functional, regional or hierarchical differences. The corresponding key indicator "Result of the employee engagement survey on sustainability culture" replaces the previous year's achieved key indicator "Percentage of employees trained on sustainability".

Diversity, equity and inclusion

We are committed to promoting a strong sense of inclusion and belonging among our employees. Therefore, we approach diversity, equity and inclusion (DE&I) with the same purpose as our other global business objectives and aspirations. While we have always been a diverse organization – we currently span 65 countries and have about 63,000 employees from 141 nationalities – we recognize that our success depends on our ability to foster equity and inclusion. In addition, our DE&I approach fuels our efforts to make positive impacts in the communities where we live and work. We expect our leaders and managers to be mindful and considerate in how they attract, hire, retain, and promote their people. We aim to help every employee maximize their potential, regardless of their gender identity, culture, ethnicity, race, religion or creed, sexual orientation, nationality, socioeconomic and family status, language, disability status, age, mindset, faiths, military service, or political conviction.

We strive to create equitable outcomes and identify and eliminate any barriers that may hinder our employees' contributions or their access to opportunities or career advancement. Ultimately, we believe diversity inspires progress and strengthens our ability to innovate in all areas of our business.

Number of employees by hierarchical level

As of Dec. 31	2020	2021	2022	**2023 Group[1]**	**2023 thereof: Merck KGaA, Darmstadt, Germany**
Total employees	**58,127**	**60,348**	**64,243**	**62,908**	**3,924**
Senior management (Role 6+)	193	194	191	200	48
Middle management (Role 4 & 5)	3,637	3,831	4,018	4,139	600
Low management (Role 3)	10,286	10,880	11,877	11,907	1,275
Other employees (below Role 3)	44,011	45,443	48,157	46,662	2,001
% of women (total)	**43**	**43**	**43**	**44**	**39**
thereof: number of women in senior management (Role 6+)	42	49	51	58	15
thereof: number of women in middle management (Role 4 & 5)	1,284	1,413	1,550	1,622	214
thereof: number of women in low management (Role 3)	4,352	4,669	5,123	5,150	475
thereof: number of women in "other employees (below Role 3)"	19,245	19,943	21,067	20,579	833
% of men (total)	**57**	**57**	**57**	**56**	**61**
thereof: number of men in senior management (Role 6+)	151	145	140	142	33
thereof: number of men in middle management (Role 4 & 5)	2,353	2,418	2,468	2,517	386
thereof: number of men in low management (Role 3)	5,934	6,211	6,754	6,757	800
thereof: number of men in "other employees (below Role 3)"	24,766	25,500	27,090	26,083	1,168

Footnotes follow at the end of the table.

As of Dec. 31	2020	2021	2022	2023 Group[1]	2023 thereof: Merck KGaA, Darmstadt, Germany
by age group					
Up to 29 years old (%)	**15**	**15**	**15**	**14**	**14**
thereof: number of employees in senior management (Role 6+)	0	0	0	0	0
thereof: number of employees in middle management (Role 4 & 5)	6	8	12	8	2
thereof: number of employees in low management (Role 3)	199	241	263	249	39
thereof: number of employees in "other employees (below Role 3)"	8,365	8,880	9,651	8,484	494
30 to 49 years old (%)	**60**	**60**	**60**	**60**	**53**
thereof: number of employees in senior management (Role 6+)	68	63	58	65	19
thereof: number of employees in middle management (Role 4 & 5)	2,032	2,172	2,235	2,283	367
thereof: number of employees in low management (Role 3)	6,926	7,298	8,007	7,963	805
thereof: number of employees in "other employees (below Role 3)"	25,948	26,624	28,124	27,697	894
50 years or older (%)	**25**	**25**	**25**	**26**	**33**
thereof: number of employees in senior management (Role 6+)	125	131	133	135	29
thereof: number of employees in middle management (Role 4 & 5)	1,599	1,651	1,771	1,848	231
thereof: number of employees in low management (Role 3)	3,161	3,341	3,607	3,695	431
thereof: number of employees in "other employees (below Role 3)"	9,698	9,939	10,382	10,481	613

[1] The Group also employs people at sites of subsidiaries that are not fully consolidated. For the 2023 reporting year, we have aligned the scope of consolidation also for the employee data in the non-financial reporting with the financial reporting. As of now, the figures relate to all employees who are employed in fully consolidated subsidiaries that manage personnel.

[2] The sharp decline in comparison with the previous year (8,485 employees) is attributable to the fact that in addition to Healthcare KGaA, which was hived off in 2019, the two other business sectors, namely Life Science und Electronics, have now also been transferred to separate legal entities.

Roles and responsibilities

The Chief Diversity, Equity and Inclusion Officer is responsible for our global DE&I strategy and for steering its related activities. In this role, she reports directly to the Chair of the Executive Board, whose Board responsibilities include Group Human Resources. In addition, we have established a centralized Diversity Council comprising high-ranking executives from all our business sectors and selected Group functions.

Our commitment: Industry-wide initiatives and regulations

Our **Social and Labor Standards Policy** categorically states that our company does not tolerate any form of discrimination, physical or verbal harassment, or intolerance. To underscore our commitment to equality, fairness, inclusion, and tolerance in the workplace, we also participate in industry-wide initiatives:

- **Women's Empowerment Principles**
- Inclusion Action Plan of the German Mining, Chemical and Energy Industrial Union (IG BCE)
- Equal Opportunity Charter
- **German Diversity Charter association** (signatory of the Charter and member of the association)
- **CEO Letter on Disability Inclusion**

Strategy implementation

In 2023, we continued driving our global DE&I strategy. We accelerated the impact of our national DE&I advocates in our 18 major countries and developed tailored roadmaps for each market. We also published our **Premier DE&I Report**, providing detailed evidence of our strategy implementation and initiatives.

In 2021, we pledged to our people, partners, patients, and industry to intensify our DE&I efforts and set robust aspirations. In 2023, we demonstrated that we are on track to meeting our 2030 goals.

Gender equity

We developed measures to achieve a more balanced gender structure at various hierarchical levels of our business. We are making consistent progress and have increased the share of women in leadership (roles 4+) to 39% (2022: 38%) and senior management positions (roles 6+) to 29% (2022: 27%) while maintaining a 44% proportion of women in our global workforce (2022: 43%). This means our share of women in leadership has increased by 12 percentage points since 2015. Building on these efforts, we aim to achieve gender parity in leadership positions by 2030. Moreover, we are committed to fair and equitable pay for all employees. Our Executive Board comprises two female members (our CEO and CFO) and three male members, bringing the share of women to 40% (2022: 20%).

Culture and ethnicity

With 23% (2022: 24%) of our employees based in the United States and 27% (2022: 27%) of net sales coming from the United States it is crucial that we become an employer of choice among underrepresented racial and ethnic groups in this market. Therefore, we plan to increase the share of employees in U.S. leadership (roles 4+) who are members of underrepresented racial and ethnic groups from 23% (2022: 21%) to 30% by 2030.

Additionally, due to our current performance in Asia, Latin America and the Middle East and Africa (MEA), accounting for 39% (2022: 40%) of our Group sales, we aim to increase the global share of nationals from Asia, Latin America and MEA in leadership positions (roles 4+) from 17% (2022: 16%) to 30% by 2030.

In 2023, we developed an Action Plan on Culture, Nationality and Ethnicity as well as a toolkit for leaders and HR to accelerate our progress as regards these aspects.

Inclusion

Beyond our aspiration to foster specific types of diversity and equity, we are accelerating our efforts to create a genuinely inclusive culture for all employees. To achieve this, we rolled out training courses to help leaders reflect on how they can lead more inclusively. All leaders will be encouraged to complete these courses over the coming years. At the end of 2023, 92% (2022: 64%) of our leaders had participated in this training program.

Committed to fair and equitable pay

Our commitment to pay equity is a crucial aspect of our DE&I strategy. To create transparency around unexplained pay gaps and identify their underlying root causes, we started a gender pay equity analysis in 2021. In the first step, we analyzed ten of our largest countries, covering approximately 80% of our total workforce. In 2023, we extended the analysis to all countries, except North America which is planned in 2024. The identified adjusted gender pay gap continues to be less than 1.5%, which is below benchmarks in the industry. We have developed a plan for a recurring analysis to continuously monitor pay data and to take effective actions as needed. These include individual adjustments based on the results of the analysis, as well as educating our HR community on the topic and taking other steps to ensure we make equitable and unbiased pay decisions.

Ensuring fair treatment for all

We do not tolerate any form of discrimination in our company, as stipulated with binding effect in our **Code of Conduct** and **Social and Labor Standards Policy**. In January 2024, we published a new **position paper on disability inclusion** to complement our existing papers on **DE&I**, **non-discrimination** and **non-harassment**. In addition, we have established various reporting channels to ensure employees have a clear point of contact should they experience harassment or discrimination in the workplace or any other violations of our standards. Their first points of contact are their supervisors, HR or compliance teams, and they can also make anonymous calls to our **compliance hotline**. In the reporting year, our HR Business Partners involved in HR-related compliance case investigations participated in a training and upskilling program to equip them with enhanced employee relations and investigation skills. In 2023, 30 (2022: 20) alleged cases of discrimination or harassment were reported via the compliance hotline and other channels, seven (2022: seven) of which were confirmed on our global reporting platform and appropriate action was taken.

Health and safety

We seek to promote the health of our employees and sustain their long-term performance ability, which in turn necessitates a safe workplace. We are therefore constantly working to further strengthen our health and safety culture.

The lost time injury rate (LTIR) is an important indicator used to gauge the success of our occupational safety efforts. It comprises all accidents worldwide that have resulted in at least one day of missed work per one million hours worked. We determine the Group-wide LTIR both for our employees and supervised temporary staff. Our objective is to lower the LTIR to below 1.0 by 2025.

Generally, before starting any activity, we perform a hazard assessment to identify risks and do everything possible to eliminate them before commencing the activity or commissioning a plant. If this is not feasible, we put measures in place to minimize the likelihood of risks and their potential impacts. Hazard assessments are the responsibility of our individual sites and are therefore conducted by them.

In October 2023, we launched BeHealthy, our global employee health strategy, to our workforce. It is designed to further strengthen the physical, mental, social, and workplace health of our employees. Moreover, in 2023, we introduced a key indicator for health, planned to comprise our health index on the one hand and the implementation status of the BeHealthy strategy on the other hand.

Roles and responsibilities

Our Health and Safety management system is the responsibility of Corporate Sustainability, Quality and Trade Compliance, which in turn reports to the Chair of the Executive Board. This Group function sets objectives, oversees the respective initiatives globally and conducts internal EHS audits. Local EHS managers and their teams ensure that our individual sites comply with all occupational health and safety laws and regulations. They are also responsible for local projects, campaigns, and programs.

Employees concerned about their health or safety are permitted to temporarily step back from their work until the issue has been resolved. Globally, across the Group, they are encouraged to report such concerns via our **compliance hotline**.

Our commitment: Standards and policies

Our Corporate **EHS Policy** (Corporate Environment, Health and Safety Policy) describes our fundamental approach to occupational health and safety, among other things. It is part of our EHS management system and undergoes an external ISO 45001 audit every year. As part of a Group certificate, our occupational health and safety management system was ISO 45001-certified at 66 sites at the end of 2023.

Together with the Group-wide health strategy BeHealthy, we launched the newly developed Group Employee Health Standard in October 2023. It describes the fundamental requirements that a site must fulfill as regards employee health. In addition, the standard specifies our approach to ensuring workplace safety for our employees while also promoting their health and well-being. Furthermore, we set out our Group-wide approach to health and safety management, which is aimed at preventing workplace accidents and occupational illnesses.

We expect our contractors to comply with environmental as well as health and safety requirements throughout the entire process, from starting a job to completion. This objective is reflected in our Group-wide Contractor EHS Management Standard.

Accident rates

Our employees are required to immediately report any relevant occupational accidents to Corporate Sustainability, Quality and Trade Compliance, where these accidents are assessed. If necessary, we then implement additional safety measures. This procedure is common practice across all production facilities around the world. We document the following occupational safety data across our sites worldwide:

- The LTIR measures the accidents resulting in at least one day of missed work per one million hours worked. In comparison with the previous year, our LTIR increased slightly to 1.3 (2022: 1.2). The majority of incidents resulting in lost time were slips, trips and falls, along with contusions and lacerations from the operation of machinery and equipment. Once more, in 2023, we recorded no fatal accidents.
- We use our EHS Incident Rate (EHS IR) to document **incidents**.
- Alongside this indicator, in the United States, we also use the Occupational Illness Rate to monitor work-related illnesses and their long-term effects.

Work-related accidents[1]

	2020	2021	2022	2023 Group	2023 thereof: Merck KGaA, Darmstadt, Germany
Lost Time Injury Rate (LTIR = workplace accidents resulting in missed days of work per one million hours worked)	**1.3**	**1.2**	**1.2**	**1.3**	**1.6**
by region					
Europe	2.4	2.1	1.7	2.2	1.6
North America	0.8	1.2	1.7	1.4	not applicable
Asia-Pacific (APAC)	0.1	0.1	0.3	0.1	not applicable
Latin America	0.8	0.4	0.6	0.6	not applicable
Middle East and Africa (MEA)	0.4	0.0	1.1	0.4	not applicable
Number of deaths	**0**	**0**	**0**	**0**	**0**
by region					
Europe	0	0	0	0	0
North America	0	0	0	0	not applicable
Asia-Pacific (APAC)	0	0	0	0	not applicable
Latin America	0	0	0	0	not applicable
Middle East and Africa (MEA)	0	0	0	0	not applicable
by gender					
Women	0	0	0	0	0
Men	0	0	0	0	0

[1] Including supervised temporary staff.

Through the LTIR, we record work-related accidents that involve at least one day of missed work. A work-related accident is an injury that results from the type of work, in the course of doing said work, and that has no internal cause. Work-related accidents are considered relevant if they occur on the premises, on business trips, during goods transport, as a result of external influences (e.g. natural disasters), or due to criminal acts involving personal injury. Commuting accidents and accidents during company sporting activities are not included. First-aid incidents are generally not included in the LTIR since these usually do not result in more than one day of missed work.

Clear rules of conduct

Group-wide, all newly appointed site EHS managers must complete an EHS onboarding training that covers the topics of occupational health and safety as well as our “BeSafe!” safety culture program. Through the “BeSafe!” program, we raise employee awareness of occupational hazards and teach them rules for safe behavior. In addition, we regularly provide occupational safety training at our sites covering both legal requirements and the specific risks.

Social Matters and Respect for Human Rights

Responsible supply chain

With our supplier management endeavors, we aim for compliance with fundamental environmental and social standards in addition to high quality, reliable delivery and competitive prices. Therefore, we have introduced relevant strategies, processes and guidelines to prevent violations of supply chain standards and continuously improving our sustainability performance. Unless stated otherwise, the approaches presented apply to tier-1 suppliers, i.e. direct suppliers. Furthermore, our supplier management activities include special measures particularly for tier-n suppliers, i.e. indirect suppliers, working in the area of conflict minerals.

To achieve our sustainability goals, our Procurement team is working closely with our suppliers. We aim to create transparency in all our sourcing regions and fully integrate sustainability into all our value chains. To this end, we have defined two key indicators to measure our journey towards increasing this transparency by reviewing the sustainability performance of our relevant suppliers based on valid sustainability assessments. Our definition of valid sustainability assessment includes assessments carried out over the last three years and performed by a reliable, approved source. In accordance with our risk management approach, we define relevant suppliers as suppliers, which either indicate a specific country and/or industry risk or contribute to a significant percentage of our supplier spend (at least 50%). For the country risk evaluation, we have developed our own comprehensive country risk score.

In 2023, 66% (2022: 46%) of our relevant suppliers were covered by a valid sustainability assessment; 94% (2022: 82%) of our spend attributable to these suppliers was covered by suppliers with a valid sustainability assessment.

We consider all applicable legal requirements, such as the German Supply Chain Due Diligence Act, and initiate corresponding measures where necessary. Among other things and in conjunction with the implementation of the German Supply Chain Due Diligence Act, we have implemented a risk management approach focusing on human rights and environmental risks along our supply chain. This risk assessment is conducted annually and ad-hoc when required.

Risk management process

To ensure security of supply, we select our suppliers based on criteria such as country risk, material risk, supplier risk, and their strategic importance to the business. This process helps our Category Sourcing teams to identify potential mitigation actions with relevant suppliers and supports them in making improvements. Our risk management approach comprises four main elements:

- Supplier Risk Assessments: to capture the overarching risks at the supplier level we consider multiple risk domains.
- Alert system: to notify our Procurement organization about risk events arising with any of our suppliers.
- Material Risk Assessments: to identify and mitigate the risks of the materials used in our most significant finished products. This element focuses on our business sector Life Science. In 2023 we conducted assessments for more than 2,500 of our critical materials.
- Risk Response Tracker: a system to create and monitor risk mitigation activities in inter-disciplinary teams.

We calculate risk factors for suppliers and raw materials by multiplying risk probability and risk impact according to current human rights risk standards. We also include criteria for identifying supplier relationships impacted by key sustainability risks, such as mineral sourcing and animal welfare.

Due diligence process for responsible sourcing of minerals

We source and sell products that contain minerals commonly referred to as “3TG” (tin, tungsten, tantalum, gold – collectively also known as conflict minerals). These minerals involve the risk of being extracted, traded, handled, and exported from conflict-affected and high-risk areas (CAHRAs) where human rights are not always respected and violations thereof need to be prevented.

Our aim is to source materials in a responsible and conflict-free manner and not to contribute to adverse impacts through our activities. Therefore, we have a due diligence program that applies across all our business sectors and takes into account applicable laws and international standards. Additionally, we have engaged an external auditing firm to carry out an independent assessment in 2023 in order to **verify** our compliance with regard to the requirements of the EU Conflict Minerals Regulation (EU) 2017/821.

As part of our continuous improvement efforts, we worked on the recommendations from the audit and refined our procedures. Additionally, we established a supply chain traceability system that further increases our supply chain transparency. For our tin imports, which make up the majority of our conflict minerals imports, additional control mechanisms were implemented. These mechanisms include supply chain mapping, information on the country of origin of the mineral, request of audit reports from smelters and refiners, and the revision of agreements, including audit rights, with our suppliers. After careful analysis of the potential risks, no specific risks could be identified that would have required the development of an action plan. We remain in constant contact with our suppliers, industry colleagues and cross-company collaborations to improve the transparency and effectiveness of the framework.

Roles and responsibilities

Procurement is responsible for integrating sustainability requirements into the relevant stages of our sourcing and supplier management processes. Our Center of Excellence for Sustainability coordinates the relevant measures, such as updating our guidelines where necessary, examining processes and coordinating our participation in external initiatives.

Our commitment: Guidelines and standards

We expect all our suppliers and service providers to comply with our environmental and social standards, which are primarily derived from the **core labor standards** of the International Labour Organization (**ILO**) and the **UN Global Compact**. We expect our suppliers to ensure that their subcontractors respect the same rules. For this purpose, our **Supplier Code of Conduct** details our expectations towards suppliers and business partners regarding human rights, health and safety, business integrity, environmental protection, continuous improvement, and management of their respective suppliers.

Our **Responsible Minerals Sourcing Charter** demonstrates our commitment to responsible sourcing of minerals from conflict-affected and high-risk areas. It applies to all our legal entities and subsidiaries worldwide. The charter complements the requirements set out in our Supplier Code of Conduct.

To ensure that we work on the basis of industry standards and can rely on comparable data analytics and expert analysis, we collaborate with our peer companies in industry initiatives. For example, we are a member of Together for Sustainability (**TfS**), the Pharma Supply Chain Initiative (**PSCI**), the Responsible Mica Initiative, and the Responsible Minerals Initiative (**RMI**). We call on our suppliers to allow us or trusted partners to conduct assessments or audits to increase the transparency of our supply chain and identify fields of activity to improve sustainability performance or mitigate infringement risks.

Together for Sustainability supplier assessments and audits

Through the TfS initiative, suppliers are assessed either based on information obtained during audits or based on self-reported and publicly accessible information provided by **EcoVadis**, an independent rating agency. EcoVadis assesses suppliers from more than 175 countries and more than 200 sectors across the four categories of Environment, Labor and Human Rights, Ethics, and Sustainable Procurement. On top of the assessments, suppliers are also monitored through a 360-degree news watch. The results are shared among TfS member companies in compliance with all restrictions stipulated by antitrust law.

Through the TfS initiative alone, we have access to 1,860 valid scorecards on the assessment of our suppliers (2022: 1,700), almost 1,790 of which completed a new assessment or re-assessment in 2023 (2022: 1,100). In some cases, these were initiated by us and in other cases by other TfS members.

Supplier Decarbonization Program

Our Supplier Decarbonization Program is a key element of achieving our **Science Based Target**. Through this ten-year program that was defined as part of the decarbonization strategy in 2021, we aim to reduce greenhouse gas emissions associated with purchased goods and services as well as capital goods.

In order to manage the large quantities of data on the CO_2 emissions of our suppliers, we have an automated carbon accounting tool in place to which we continuously add new functionalities. We offer our suppliers access to solutions to reduce their Scope 2 emissions. In addition, we joined the **Energize program** as a new sponsor. Energize is a collective initiative by a group of industry-leading pharmaceutical and fine chemical companies that have committed themselves to engaging their suppliers to support the adoption of renewable energy and reduce greenhouse gas emissions within their common supply chains. We offer all our suppliers the opportunity to join the program for free and to find out more about renewable electricity options leading to reduced Scope 2 emissions.

Mica supply chain

Mica is an important raw material for our effect pigments, which are used in automotive, cosmetic and industrial coatings as well as plastics. We procure the majority of our mica from the Indian states of Jharkhand and Bihar. We have special measures in place to comply with high social and environmental standards in our mica supply chain.

Our mica suppliers are informed of our standards and have confirmed that they adhere to the principles of our **Human Rights Charter** as well as the requirements of our **Supplier Code of Conduct**. In the event of non-compliance with our standards, we work with suppliers to ensure the appropriate implementation of corrective measures.

We do not tolerate child labor and contractually prohibit our suppliers from employing children. If one of our suppliers were found to be using child labor, we would terminate the business relationship immediately. We are driving initiatives and taking measures to improve the conditions of mica sourcing based on our high standards. For example, we have contractually agreed with our suppliers to pay at least a living wage to mine workers and workers in the processing units. Furthermore, we continuously review our monitoring processes to improve their effectiveness.

Auditing our mica supply chain

We have implemented a series of oversight mechanisms using a system that monitors and audits conformity with our social and environmental standards. In addition to visits by our company's employees, regular inspections are conducted by third parties, who conduct comprehensive announced audits as well as frequent, unannounced monitoring.

Environmental Resources Management (**ERM**), a leading global provider of environmental, health, safety, risk, and social consulting services, conducts external audits of mines and processing plants, investigating working conditions as well as environmental, health and safety issues. The audit reports document any identified shortcomings in this respect and propose corrective actions. Findings concerning safety of electrical installations and installing proper emergency exit signs were successfully addressed. Our employees in Kolkata, India, and Darmstadt, Germany, take action to address any identified issues. If the corrective measures are not respected, we may suspend or even terminate our business relationship.

Since 2013, IGEP Consult, an Indian non-governmental organization, has conducted regular unannounced monitoring to review labor standards throughout our supply chain. During these visits, IGEP officials monitor occupational safety and compliance with laws preventing child labor. In 2023, its inspections focused on checking the availability of physical examinations for workers and conducting mock fire drills. Additionally, we regularly optimize the escalation process together with IGEP, which holds bi-weekly review meetings with representatives of our company to assess suppliers. These meetings help to identify any required actions, which our sourcing teams then discuss and implement with our suppliers. As a result, our suppliers have successfully improved the working conditions at these sites.

Evaluating and tracking mica sources

We use a tracking system to help ensure that the mica we purchase is derived from sources qualified by our company. We also use this tracking system to monitor the productivity of our mica sources. Based on written records of the daily extraction quantities, we review the volumes of mica reported and supplied to the processing facilities. Furthermore, we use a digital traceability solution to increase transparency in the mica supply chain.

To maintain accuracy, our processes undergo constant review and improvement. We are also evaluating other mica sources in accordance with our quality, social and environmental standards, both in India and other regions. For example, we source a considerable amount of mica from Brazil. To monitor our suppliers' adherence to these standards, we have conducted an audit through a third party.

Human rights

We are committed to upholding human rights, which is why we became a signatory to the **UN Global Compact** back in 2005. We endeavor to prevent the risk of human rights violations as far as possible, not only at our own sites but also along our entire supply chain. That is why we integrate human rights due diligence into our business processes.

We view our human rights due diligence as a continuous process, which we constantly adapt and improve. This also prompts us to continually review our approach. We closely monitor regulatory developments such as the planned EU directive on human rights due diligence.

Roles and responsibilities

Our Executive Board has ultimate responsibility for human rights within our sphere of influence. The Executive Board exercises this responsibility by requiring our Managing Directors to comply with human rights.

Our Human Rights Officer from the Group function Corporate Sustainability, Quality and Trade Compliance (SQ) is responsible for monitoring due diligence obligations concerning human rights and environmental matters. The Executive Board is informed at least once a year of the work of the Human Rights Officer and the implementation status of risk management and of the due diligence processes.

Those responsible for the issue in the Group functions, business sectors and local units are tasked with implementing our human rights due diligence processes in operations by integrating human rights due diligence into existing processes, for instance.

Our commitment: Guiding principles, charters and laws

Our **Human Rights Charter** aligns with the **UN Guiding Principles for Business and Human Rights**. It is our overarching human rights directive and defines the relevant requirements for our company. We expect our employees as well as our suppliers and all companies with which we have business ties to comply with this charter.

In 2023, our Executive Board approved our Group Policy Statement on Compliance with Human Rights and Environmental Due Diligence Obligations in accordance with the German Supply Chain Due Diligence Act. It applies to our own business operations, in other words to our entire workforces, as well as to our suppliers. The statement describes how we undertake to comply with our human rights and environmental due diligence obligations and provides information on the risks identified.

Identifying actual and potential impacts on human rights

We perform risk assessments to understand the potential impacts our operations and business relationships could have on human rights. For instance, we investigate human rights risks at our sites as well as risks related to product and service sourcing. These risk assessments enable us to derive the corresponding strategies and measures. We track human rights risks through our strategic supplier risk process. More information on how we engage with suppliers can be found under "**Responsible supply chain**".

Risk analyses to determine human rights and environmental risks

We conduct special analyses to identify human rights and certain environmental risks. This enables us to identify potential risks, weight them appropriately and prioritize them. These risk analyses are carried out annually and on an ad hoc basis for our own business operations.

Our **Social and Labor Standards Policy** defines the corresponding commitments and principles as they relate to specific topics and sites. We regularly check compliance with the requirements using a risk-based approach. Among other things, this takes into account risks that may arise if relevant laws and regulations change or if there are violations of internationally recognized labor rights by governments and companies, as assessed by the **International Trade Union Confederation** and documented in the annual ITUC Global Rights Index. If we identify a violation during the audit, we define remedial actions together with the responsible Managing Director and/or local HR staff.

We also assess human rights aspects at our sites through security audits and as part of the risk analysis. The audits are one control mechanism of our security governance framework. Through increased risk transparency and central follow-up of corrective and preventive actions (CAPA) we help ensure that our sites comply with safety-related human rights aspects. Through the Together for Sustainability (**TfS**) initiative, we determine whether our strategically important suppliers comply with human rights standards.

Creating awareness among our employees

An online course trains our Managing Directors and senior management in how to meet the requirements of our **Social and Labor Standards Policy** in their area of responsibility.

Our reporting practices

We inform the public about our approaches and measures as well as the results of our human rights due diligence. We provide information on this annually in our Sustainability Report. Under laws in Australia, the United Kingdom and Norway, we are additionally required to publish information in these countries on our measures to combat forced labor and human trafficking. Apart from the **UK Modern Slavery Statement** and our **Australia Modern Slavery Statement**, we also published the Norway Transparency Statement for the first time in 2023.

Our complaint mechanisms

We have set up a Group-wide whistleblowing and complaints system that can be used to report potential violations of human rights, legal provisions and environmental issues, among other things. Our compliance hotline is a central element of this. Our employees as well as external stakeholders can report suspected cases via this Group-wide whistleblowing system in their respective national language, free of charge and anonymously, either by telephone or a web-based application. We are committed to thoroughly investigate all complaints that we receive and take countermeasures if necessary. More information on the compliance hotline can be found under "**Compliance Management**".

In addition, we published **Rules of Procedure**. These apply to tips or complaints that refer to human rights and certain environmental risks or violations at our company and along the supply chain in line with the German Supply Chain Due Diligence Act. In the reporting year, 184 violations of the **Social and Labor Standards Policy** were reported to us in our own business operations, 60 of which were confirmed. Furthermore, based on the complaint channels specified in the Rules of Procedure, there were no indications of child or forced labor or violations of the right to collective bargaining or freedom of association in our own business operations or in the supply chain in 2023.

Human rights violations

	2020	2021	2022	**2023**
Number of reported violations of Social and Labor Standards Policy	108	121	136	184
Number of confirmed Violations of Social and Labor Standards Policy	29	41	68	60
thereof: number of incidents of discrimination	2	6	7	7[1]

[1] As of 2023, the incidents of discrimination also include cases of harassment as a specific form of discrimination.

Patient safety

Through a rigorous benefit-risk management process, we help to ensure that the benefits of our medicinal products always outweigh the risks for patients. Every new medicine goes through a series of precisely defined development stages. Before any medicinal product is administered to human subjects, we conduct extensive preclinical testing both in vitro and in vivo. During clinical development, we diligently use all the collected data to continuously evaluate the medicinal product's benefit-risk profile. If we consider the medicinal product's benefit-risk profile to be positive, we then submit an application for marketing authorization to the relevant regulatory authorities.

Continual monitoring of product safety risk profiles

Once we launch a new medicinal product, the number of patients being treated with the product increases significantly. In rare circumstances, there may be adverse and potentially serious effects that were not detected during clinical development, which is why we continuously monitor risks and assess the benefit-risk profiles of the products after their market launch. Pharmacovigilance includes the process of monitoring a medicinal product on an ongoing basis to detect and assess safety signals as part of signal management activities. Our pharmacovigilance system and our pharmacovigilance business continuity management help to ensure continuous monitoring of adverse effects, allowing us to proactively and transparently minimize and communicate any risks. Emergency response procedures for business continuity are managed in accordance with global and local business continuity plans, tested in regular, defined intervals or with mock scenarios. In addition, we provide healthcare professionals and patients with the latest information on the safety of our marketed medicinal products. The scope of continuous safety monitoring covers the entire life cycle of a product, ranging from development, market launch and commercialization to the expiration or cancellation of its marketing authorization.

By 2025, we aim to deliver product specific safety and benefit-risk strategies to support the execution of all key priority programs in line with internal and external stakeholders' expectations. These strategies will enable us to understand in greater detail the benefit-risk profiles at each stage of product development and post-marketing. During the reporting year, we worked toward achieving this goal by providing high-level safety and benefit-risk contributions for development programs with priority in oncology, neurology and immunology.

Roles and responsibilities

Our Global Patient Safety unit is responsible for drug safety. It continuously collects current safety data from a wide variety of sources across the globe, including clinical studies, early access programs, spontaneous reports on adverse effects, patient support programs, and articles published in medical and scientific journals. Our vision is to embed a deep knowledge of safety into early decision-making as we evolve to practice predictive safety.

Our experts help to ensure that all information on the risks and adverse effects of our medical products are properly documented, tracked and reported to the respective health authorities in accordance with regulatory requirements. Our Global Patient Safety unit analyzes all data and reassesses the benefit-risk profile based on these data, where required. We then inform regulatory authorities, healthcare professionals and patients about new risks, additional risk mitigation measures and potential changes in the benefit-risk profile. We convey this information through stipulated regulatory reports, safety communications (as applicable) and corresponding product label updates.

Our Global Patient Safety unit hosts a Pharmacovigilance Intelligence Council that focuses on changes in pharmacovigilance legislation and their impacts on our global and local pharmacovigilance systems. This council enables us to make strategic decisions and govern changes in pharmacovigilance requirements, which fosters our target to ensure continuous compliance with regulatory requirements.

Our Medical Safety and Ethics Board

Our Medical Safety and Ethics Board (MSEB) is the governance board that oversees the safety and benefit-risk assessments of our medicinal products throughout their clinical development and commercialization. This internal board is chaired by our Chief Medical Officer and comprises experienced physicians, scientists and

experts from our company. Throughout a medicinal product's entire life cycle, the MSEB reviews and assesses important medical safety risks and benefit-risk issues and endorses appropriate measures to minimize risks, such as updates to product information. The MSEB also assess human-related bioethical matters as appropriate and is accountable for the use of our medicinal products in early and post-study access.

Our commitment: Guidelines and statutory requirements

We rigorously aim to follow international guidance and standard procedures. These include the International Council for Harmonisation (ICH) guidelines, the Good Pharmacovigilance Practices (GVP) established by the European Medicines Agency (EMA), Title 21 of the Code of Federal Regulations governed by the U.S. Food and Drug Administration (FDA), and other pharmacovigilance regulations issued by national health authorities. We also aim to comply with relevant new statutory pharmacovigilance regulations in the countries where we market our products.

Inspections and audits for drug safety monitoring

Regulatory authorities conduct periodic inspections to verify that we comply with statutory requirements as well as our own internal pharmacovigilance standards. We follow up on the findings of health authority inspections and take necessary actions to ensure the ongoing compliance of our pharmacovigilance system. In 2023, we had five pharmacovigilance inspections (2022: four).

We also perform audits to our systems and processes to ensure that all our units and subsidiaries involved in pharmacovigilance consistently meet all global requirements. In 2023, we conducted a total of seven pharmacovigilance audits (2022: 19) and found no significant deviations in our pharmacovigilance systems from these requirements and standards. We also conducted twelve external audits (2022: 16) at our vendors and licensing partners involved in pharmacovigilance, helping us to improve our pharmacovigilance processes and to comply with regulatory requirements.

Applying our proactive safety strategy to benefit-risk assessments

Regarding product safety risk assessments, we have successfully implemented in the past years an improved benefit-risk management strategy to become a more proactive and benefit-risk-focused organization. This strategy firmly establishes the concepts and principles for conducting benefit-risk assessments at each stage of product development and post-marketing. In addition, our Benefit-Risk Action Team co-leadership model, created in 2022, enables us to understand in even greater detail the benefit-risk profiles of our products and enable early decision-making within our organization to protect patient safety. Ultimately, we aim to provide the right medicine to the right patient at the right time.

Up-to-date labeling and product information

Our product information explains to healthcare professionals and patients how to correctly use the respective product and make informed treatment decisions. We review and update product information documents, such as package leaflets, thereby, we want to ensure our medicinal products contain the latest information on safety, efficacy and pharmaceutical formulation. In accordance with regulatory requirements, we submit modifications to our leaflets to the respective regulatory authorities for approval. In 2023, there were no reportable incidents of non-compliance with regulations concerning the labeling of our medicinal products.

Internal and external training

Our pharmacovigilance experts are regularly trained so that they gain and maintain the required experience and knowledge to carry out their activities. We manage our training via a global learning platform and verify compliance with our training requirements by producing training completion reports.

Our approximately 25,000 internal and external Healthcare employees receive basic pharmacovigilance training once a year that covers the procedure for reporting adverse effects or special circumstances associated with the use of our medicinal products.

Prices of medicines

The prices of our products reflect the value they deliver to patients as well as broader society. We price our products responsibly and work to prevent costs from becoming a barrier to treatment. In doing so, we strive to deliver on our steadfast commitment to providing the broadest possible patient access. We also continue to invest in meaningful scientific innovation to address the high number of unmet medical needs still faced by many patients and their caregivers. Therefore, we adapt the prices of our medicines in different geographic and socioeconomic segments according to people's ability to pay.

We acknowledge the affordability challenges many healthcare systems face amid growing financial pressures. We recognize the unique characteristics of each health system and adapt our pricing based on local market considerations, including unmet medical and treatment needs, health system capacity, infrastructure, socioeconomic standards as well as affordability within the respective healthcare system and the ability of patients to pay. We apply intra-country and inter-country equitable pricing approaches to all our brands.

This approach involves working closely with governments and other stakeholders. In addition, we continuously monitor dynamic healthcare environments and markets, pricing and reimbursement systems as well as legal and regulatory guidelines, adjusting our prices as necessary. We conduct annual price analyses to validate price thresholds and provide guidance on local pricing to our subsidiaries for the following year. We aim to ensure that they meet patient access needs by taking a consistent, data-driven approach.

To increase the availability, accessibility and affordability of our medicines in Africa, Asia, Latin America, and the Middle East, we have adopted a new systematic approach known as the SHAPE program. This will enable us to address these access barriers for underserved patient populations in low- and middle-income countries.

Additionally, we support innovative risk-sharing agreements and are working to improve data efficiency in health systems to help distribute funds and resources more optimally.

Roles and responsibilities

Our Global Value Demonstration, Market Access & Pricing (GVAP) unit, formerly called GMAP, reporting directly to a member of our Healthcare Executive Committee, evaluates market launch prices in coordination with the respective franchises. In addition, the GVAP unit systematically evaluates our medicine portfolios and applies equal access initiatives to them. Our local affiliates are responsible for managing prices and adapting them to evolving local conditions in compliance with our pricing governance and the defined price approval process.

Our commitment: Medicine price guidelines and principles

The affordability of our health solutions is part of our broader patient value proposition. Our medicine pricing adheres to the stipulations of our overarching **Charter on Access to Health in Developing Countries** and is defined in detail in an internal guideline. Additionally, our Patient Access Programs Policy sets out standards for offering medicines at affordable prices.

Value-based contracting models

We are committed to advancing value-based healthcare through pricing and contracting mechanisms that comply with applicable local laws and regulations. In collaboration with payers, such as health insurance companies, we have developed various product- and market-specific reimbursement and contracting models. These help to provide patients with prompt access to our innovations.

In 2023, we continued to implement and maintain innovative risk-sharing agreements (RSAs) that provide immediate access to Mavenclad® for patients with multiple sclerosis (MS). We broadened access to this medicine through specific agreements in eligible countries across Europe, Latin America and the Middle East including Argentina, Hungary, Kuwait, South Africa and the United Arab Emirates.

Programs for low- and middle-income countries

We have set ambitious goals for our SHAPE program to improve access to our medicines for underserved patient populations in low- and middle-income countries. The program covers both existing and upcoming products, focusing on therapeutic areas such as head and neck, colorectal and bladder cancers as well as thyroid disorders.

In 2023 we served more than 57 million patients in low- and middle-income countries with our healthcare portfolio. Boosted by our SHAPE program, we aim to reach 80 million patients per year by 2030. As of 2023, 15 pilots have been initiated in countries such as Argentina, Brazil, Egypt, Indonesia, and Mexico as well as several countries of Central America.

Tenders constitute a significant percentage of our global sales and are a crucial growth driver for our established portfolio. We participate in government tenders for products used in public hospitals serving low-income patients, often in low- and middle-income countries.

For some of our existing high-quality products, we offer second brands at affordable prices, particularly in countries with a large percentage of low-income patients.

Patient access programs (PAPs) are self-sustaining commercial programs that provide registered medicinal products for underserved populations. They primarily seek to address affordability challenges. We operate PAPs in several countries.

Clinical studies

Our aim is to conduct high-caliber clinical research that is in compliance with applicable laws and regulations. We set Group-wide requirements that aim to ensure that high ethical and scientific standards are met when conducting clinical trials.

We only conduct clinical studies to investigate issues relevant to patients, healthcare professionals or society, and only when our established methodology finds the given medicines show significant therapeutic promise and a positive benefit-risk ratio. Accordingly, to ensure patient safety and avoid interrupting the development of promising products, we carefully select patients based on known risk factors. These include age and comorbidities, which we reflect in the design of our clinical studies. Notably, we only enroll the specific number of patients needed to answer the posed scientific and medical questions. We reconcile and review the safety reports from our clinical studies and marketed products and immediately address any unforeseen risks. Senior boards such as the Pharmacovigilance Advisory Board and the Medical Safety and Ethics Board maintain oversight of any emerging safety concerns. In addition, cross-functional Benefit Risk Assessment teams adapt the benefit-risk assessment and development strategy of each product to ensure it delivers maximum safety and efficacy to our patients. In addition, a sound, established scientific methodology must be available to investigate these scientific or medical questions.

Protecting the safety, well-being, dignity, and rights of the patients and healthy volunteers participating in our clinical studies is of utmost importance to us. We do not intentionally expose study participants to undue risk or irreversible harm. Data privacy is also very important to us, and we maintain a strong focus on data protection and confidentiality in compliance with statutory regulations.

Diversity, equity and inclusion in clinical trials

Based on our Standard on Human Research, we aim to conduct clinical studies that adequately represent the diverse patient populations expected to use our products once they are approved. To ensure fair, balanced and scientifically justified study representation, we cemented our commitment to Diversity, Equity and Inclusion in clinical trials by collaborating with healthcare providers and community advocates to eliminate common barriers to clinical trial participation.

Patient-focused drug development

We are improving our approach to research and development by committing to patient-focused drug development that more actively involves patients, caregivers, and their advocates in our work. Their valuable insights into disease and treatment management will help us make more informed decisions at each stage of the medicine development process. We aim to make our studies easy for patients to understand while ensuring all participants have positive experiences as they contribute to our understanding of the particular disease and its treatment. At every level of our organization and based on the function, we are additionally either offering or mandating to educate staff about the value of a close, more consistent patient interaction and the requirements to protect our patients' independence and privacy.

Roles and responsibilities

Clinical development, including clinical studies and their related governance processes, are the responsibility of our Global Development unit. The Head of Global Research & Development reports to the CEO Healthcare, who is a member of the Executive Board.

We have established two internal committees to oversee our clinical studies. The Integrated Protocol Review Committee is responsible for the studies performed by the company on products that are under clinical development, while the Global Medical Decision Board is responsible for our own studies with approved products as well as for all studies performed by independent investigators and supported by us (so-called investigator-sponsored studies). Both bodies consist of medical-scientific experts and executives with long-standing experience in clinical research.

Before administering a new product to humans, there must be sufficient evidence that it offers a potential therapeutic benefit, is sufficiently safe for use in humans and has a positive benefit-risk ratio. We only take the critical step of a first-in-human clinical trial after diligently conducting extensive preclinical testing. The decision lies with a separate committee, the Human Exposure Group, chaired by our Global Chief Medical Officer.

We continuously analyze potential risks for study participants before and during our clinical studies. Our Medical Safety and Ethics Board (MSEB) oversees the safety of the participants in our clinical studies and, as necessary, reviews the benefit-risk profiles of investigational products.

Our commitment: International guidelines and requirements

Our Quality Policy defines the strategic framework that ensures our products, services and systems deliver high quality, safety and efficacy to our patients. It details the most relevant laws and codes, criteria and guidance (e.g. for product development and manufacturing), and our senior management's responsibility to ensure quality is embedded in everything we do.

Our Standard on Human Research provides the framework for conducting clinical studies and helps ensure we adhere to all applicable legal, ethical and scientific standards. Further quality documents detail for instance the strategic direction of all quality related activities or disclose our position on data privacy. In addition to the relevant national laws and regulations, these documents also include:

- The **Good Clinical Practice** (GCP) guidelines of the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH),
- The **Declaration of Helsinki**, published by the World Medical Association,
- Good Pharmacovigilance/Laboratory/Manufacturing/Distribution Practices (GVP/GLP/GMP/GDP),
- The **International Ethical Guidelines for Health-related Research Involving Humans**, published by the Council for International Organizations of Medical Sciences (**CIOMS**),

- The **Joint Position on the Disclosure of Clinical Trial Information via Clinical Trial Registries and Databases** and the **Joint Position on the Publication of Clinical Trial Results in the Scientific Literature**, published by the International Federation of Pharmaceutical Manufacturers & Associations (**IFPMA**), the European Federation of Pharmaceutical Industries and Associations (**EFPIA**), and the Pharmaceutical Research and Manufacturers of America (**PhRMA**),
- The **Principles for Responsible Clinical Trial Data Sharing**, published by EFPIA and PhRMA, and the IFPMA Principles for Responsible Clinical Trial Data Sharing.

Regular supervision of clinical studies

Our clinical study processes and procedures are regularly inspected by relevant regulatory authorities to verify their compliance with applicable laws and guidelines.

The Research & Development Quality and Risk Management (RDQRM) unit applies a risk-based identification strategy to determine areas that need to be audited. Quality assurance audits are performed internally within Healthcare R&D (for example, process audits) and externally (e.g. investigator sites and vendor audits). We respond immediately to observations made during audits by investigating their root causes and, according to their criticality, defining and implementing corrective and preventive actions to improve processes, prevent reoccurrence of irregularities and ensure compliance. As planned, in 2023, RDQRM concluded most of the audits of the Annual Audit Plan.

Conducting clinical studies responsibly

Every clinical study follows defined procedures to ensure it is conducted to high quality standards in line with good working practices (GxP) for the development and manufacturing of drugs, the ethical principles of the **Declaration of Helsinki** and other international guidelines and regulations. As in the previous year, in 2023, none of the regulatory inspections conducted on our clinical research activities resulted in regulatory action.

Disclosure of clinical studies and publication of results

We are obligated to disclose findings from our clinical studies. We strive to do this publicly in a complete, accurate, balanced, transparent, and timely manner as laid out in our Standard on Clinical Trial Data Transparency. We publish results from our clinical studies in medical journals in line with applicable laws and industry codes. In particular, we adhere to the current version of the Good Publication Practice (**GPP3**) and align with the recommendations of the International Committee of Medical Journal Editors (**ICMJE**). Our **Standard on Clinical Trial Data Transparency** underscores our strong commitment in this area.

Enabling early access to new medicines

Not all patients have the opportunity to take part in a clinical study and must therefore wait for a new pharmaceutical product to be approved. Through our Early Access Program, we can, under specific circumstances, enable patients to gain early access to new, potentially life-saving products. The offer is aimed at people with serious conditions who have already received all available therapies without success. It allows them to be treated with products that have already been clinically tested but have not yet been approved. Furthermore, we offer patients who participated in one of our clinical studies post-study access to the investigational product, provided that certain conditions are met. Here, too, we meet stringent statutory, ethical and scientific standards. By performing a thorough assessment of all available data, we ensure that the potential benefits outweigh the potential risks for patients.

Bioethics

Our goal is to conduct research in a responsible manner, which is why we develop ethical guidelines – also in close collaboration with external experts – in order to make well-founded decisions for responsible research. Moreover, we discuss in our committees the ethical aspects of providing products such as organoids for both academic research purposes and the biopharmaceutical industry. We carefully evaluate our position when it comes to controversial topics. We always prioritize the well-being of and benefit for various groups of patients, whether in clinical studies or during treatment with our medicines.

Roles and responsibilities

Since 2010, our Ethics Advisory Panel for Science and Technology (MEAP) has been making clear recommendations on ethical questions in science and technology as well as on questions extending beyond the field of traditional bioethics, in line with our transformation into a science and technology company. The recommendations of the MEAP guide our actions and business activities.

The members of the MEAP are renowned international experts from the fields of bioethics, medicine, philosophy, law, and the natural sciences as well as technology and sustainability. The MEAP has its mandate from the Executive Board and is chaired jointly by the two members of the Executive Board with responsibility for the Healthcare and Life Science business sectors.

All employees may address their concerns to the Bioethics team via our **compliance hotline** and a dedicated e-mail address (accessible via the intranet).

A further board, the Stem Cell Oversight Committee (SCROC), reviews and decides on all planned in-house research activities involving the use of human embryonal or pluripotent stem cells, ensuring compliance with legal requirements as well as our ethical guidelines. This also applies to joint projects with external partners. Up until the end of 2022, the SCROC consisted of internal experts from our business sectors as well as external advisors from the fields of bioethics, medicine, and law. In 2023 and in line with a resolution by the MEAP, we transformed the SCROC into a primarily internal board. The reason for this is that research plans that call for separate committee approval pursuant to the SCROC charter are currently not being carried out within the company.

Furthermore, for ethical questions arising for instance in the context of forward-looking business decisions, targeted Ethics Foresight projects can be initiated. We specifically engage external experts to work on these projects. No Ethics Foresight projects were commissioned in 2023.

Our commitment to policies and standards

Our **Genome Editing Principle** provides a binding ethical and operational framework for our employees. Apart from our position on genome editing, it includes information on human germline editing. It sets clear boundaries for us both as a supplier of customized CRISPR/Cas nucleases and genetically modified cell lines and as a company that uses genome editing technologies in our research.

This is complemented by further guidelines that form the ethical framework of our research and business activities. Our **Stem Cell Principle** sets the ethical boundaries for the use of human stem cells in our research. Our **Fertility Principle** regulates our fertility treatment and in-vitro fertilization research activities.

Using genome-editing techniques

CRISPR/Cas opens up new possibilities in genetic engineering research that could bring about major advances in the treatment of serious diseases. Laws in different countries allow for a varying degree of latitude in applying this technique. Bioethical positions on germline editing have been evolving for years through academic and social discourse. Our position on human germline editing is as follows:

“In accordance with the German Embryo Protection Act, we do not support the use of genome editing in human embryos and clinical applications of germline interventions in humans. We recognize that there may be value in responsibly conducted related research.”

Stem cell research

We neither participate in clinical programs that utilize human embryonic stem cells or cloned human cells for the treatment of diseases, nor do we pursue such approaches ourselves. However, we use human embryonic stem cells in our research and offer our customers several select stem cell lines. In both applications, we allow the use of human embryonic stem cells only if clearly defined conditions have been met. For instance, we only utilize stem cells for research purposes if our SCROC has reviewed the respective project and given approval. In fiscal 2023, no projects required the approval of the SCROC (2022: one project). We exclusively make use of cell lines that have been approved by the United States National Institutes of Health (NIH) and are allowed under the German Embryo Protection Act as well as the German Stem Cell Law.

Digital ethics

As it is our aim is to develop and use new digital technologies responsibly, we evaluate ethical issues that may arise from algorithms, artificial intelligence (AI) and data-based business models in an early stage. Since 2021, our Digital Ethics Advisory Panel (DEAP) has been focusing on complex ethical issues surrounding digital technologies.

Roles and responsibilities

One of the main tasks of the DEAP is to support us in developing digital applications responsibly while addressing ethics questions that could result from collecting and processing data as well as from the use of these innovative technologies. It issues recommendations for our entrepreneurial activities.

The panel comprises external international science and industry experts from the fields of digital ethics, law, Big Data technologies, digital health, medicine, and data governance. In addition, we involve bioethics experts as well as representatives from patient organizations as needed. The DEAP has its mandate from the Executive Board; our employees may submit topics for the panel to discuss. As in the previous year, the panel held four meetings in 2023. These focused on issues concerning the use of generative AI. Summary minutes of the DEAP meetings have been accessible on our intranet since 2023 insofar as they do not contain any business secrets. They also document the recommendations issued.

Our commitment: Guidelines and standards

As a company, we want to position ourselves in the digital ethics sphere. We are therefore developing clear ethical standards in this new field, primarily for critical areas, for instance handling health data. In this effort, we collaborate with various stakeholders and experts.

Together with the DEAP, we apply our Code of Digital Ethics (**CoDE**) in order to address questions pertaining to the ethical use of data and algorithms. The CoDE serves as a guideline for our digital business models, as a tool for analyzing ethical challenges, and a basis for practical DEAP recommendations. As one of our overarching governance documents, it applies to all employees and is publicly accessible as well.

Developments in the field of generative AI, for instance ChatGPT, are growing in importance. All our business sectors are developing applications based on generative AI. To apply these innovative technologies responsibly and to the benefit of all, an ethical framework is currently being developed. The DEAP is intensively evaluating the guidelines. The aim is to roll out this framework company-wide in 2024.

Ethical use of data and algorithms

In June 2023, online training on the CoDE was assigned to approximately 12,000 managers with personnel responsibility who can access the training in eight languages via our internal training platform. In addition, an advanced training course is available specifically for employees working in the fields of data science, AI and other digital areas of specialization. The course serves to illustrate the importance of the CoDE and empowers participants to make responsible decisions concerning the ethical aspects of data use and algorithms in digital products and business models.

Since 2022, we have been looking at potential ethical risks that could result from projects by the Life Science Data Intelligence and Analytics unit of our Life Science business sector with the aim of developing suitable processes. The unit analyzes data from the business sector in order to obtain insights for our business.

Data privacy and cyber security

The mandate and goal of our Group Data Privacy unit is to mitigate risks and create a global framework for data privacy-compliant business operations. This unit helps train our employees to handle data responsibly and with clear accountability. It safeguards our company by providing data privacy risk assurance and ensuring compliance with relevant data privacy laws globally. Group Data Privacy also contributes to creating value for the development of digital business models.

It is of critical importance to our business to protect our information systems, their contents and our communication channels against any criminal or unwanted activities. These include e-crime and cyberattacks, such as unauthorized access, information leakage and misuse of data or systems.

Roles and responsibilities

Group Data Privacy is an independent function, organizationally integrated into Group Compliance and Data Privacy. We have a Group Data Privacy Officer and a network of local Data Privacy Officers at various sites Group-wide. In line with external regulations, the Data Privacy Officers and their respective teams act independently and without receiving internal or external instructions. Group Data Privacy regularly prepares data privacy updates and a comprehensive data privacy report. This report is submitted to the Executive Board and the Supervisory Board.

Cyber security is part of our Group Corporate Security Office. In addition, we have a Group Chief Information Security Officer and a network of Information Security Officers within the business sectors and Group functions who hold risk ownership, act as our first line of cyber security defense and are supported by dedicated networks. Our global Cyber Security function acts as a second line of defense and has responsibilities regarding cyber security risk governance and oversight. Our third line of defense consists of internal audits.

Our Cyber Security organization strengthens resilience against cyberattacks and data breaches. It defines policies and standards for cyber security (including data security) while providing oversight, tools and systems to manage and monitor our overall cyber security risk exposure. The organization is also responsible for providing cyber security monitoring and incident response capabilities across the entire company. Additionally, we train our employees on how to protect data properly.

Our commitment: Guidelines and standards

Our Data Privacy Policy and the corresponding standards and procedures define our principles for processing personal data. This approach allows us to achieve a high level of data protection for our employees, contract partners, customers, and suppliers as well as patients and participants in clinical studies. Our Group-wide understanding of data privacy is based on European legislation, in particular the European Union General Data Protection Regulation (EU GDPR). We are also taking steps to meet local data privacy requirements, where these are stricter than our Group-wide standards.

Our Group cyber security governance framework contains organizational, process-related and technical information security countermeasures based on recognized international standards. In addition, we apply harmonized electronic and physical security controls (e.g. access controls and security monitoring) to bolster our ability to securely handle sensitive data, such as trade secrets.

Training and IT tools

In line with the EU GDPR and our global approach to data privacy, we regularly conduct e-learning training courses in ten languages. In 2023, the completion rate for our e-learning courses was 99%.

We maintain a central IT tool to provide a single source for data privacy processes, such as registering data processing activities and reporting potential data privacy incidents. In 2023, we reported seven cases of minor personal data breaches to the supervisory authority. One of them related to identified data leaks, theft, or loss of customer data. However, none of these cases were sanctioned.

Data Privacy

	2020	2021	2022	**2023 Group**	**2023 thereof: Merck KGaA, Darmstadt, Germany**
Reported violations of Data Privacy Guidelines	3	3	4	7	0
Customer Privacy[1]					
Total number of substantiated complaints received from outside parties	0	0	0	0	0
Total number of complaints from regulatory bodies	0	0	0	0	0
Total number of identified leaks, thefts, or losses of customer data	0	0	0	1	0

[1] These data only reflect incidents classified as significant.

Anti-Corruption and Anti-Bribery

Compliance management

As a global company, we have stringent requirements for effective compliance management. Importantly, we seek to emphasize compliance by acting in line with our company values and believe that profitable business operations should go hand in hand with the highest ethical standards.

Roles and responsibilities

Our Group Compliance function is responsible for the framework of the following core topics: our Code of Conduct, anti-corruption and anti-bribery (including healthcare compliance, third-party due diligence, transparency reporting), anti-money laundering, and conflicts of interest.

To cover these topics, we have Group-wide policies, standards and procedures in place that ensure our business activities comply with the relevant laws, regulations and international ethical standards. Other compliance-related issues, including the respective internal regulations and guidelines, such as Pharmacovigilance, Export and Import Controls, and Environment, Health, Safety, Security, Quality, are managed by the responsible functions.

Our Group Compliance function is responsible for our compliance portfolio, which consists of the following elements:

- Risk Assessment: Identifying internal and external critical risks in regular business operations
- Policies & Procedures: Global policies, procedures and standards to mitigate identified risks
- Compliance Committee/Forums: Platform for compliance-related discussion and decision making, including relevant key functions
- Training & Awareness: Appropriate training and additional measures to educate and keep awareness high
- Programs & Tools: Comprehensive compliance programs and supporting tools contributing to internal controls and overall governance
- Monitoring & Reporting: Tracking of compliance-related data; perform internal and external reporting
- Case Management: Timely response to reports of misconduct and implementation of corrective actions
- Continuous Improvement: Based on and applicable to all compliance program elements

Our Chief Compliance Officer reports on the status of our compliance activities, potential risks and serious compliance violations to the Executive Board and Supervisory Board twice a year at a minimum. As part of our regular reporting processes, we compile a comprehensive compliance and data privacy report annually for the Executive Board. This includes the status of our compliance program, continuous improvement initiatives and key figures on compliance and data privacy cases. Additionally, we prepare a mid-year update to highlight ongoing developments and the status of relevant projects and initiatives.

Our Chief Compliance Officer oversees all Compliance departments and the subordinate Compliance Officers and Compliance experts around the world. The Compliance Officers implement our compliance program within their respective areas of responsibility (adapting to local regulations) and receive guidance from our Group Compliance Center of Expertise. This is a centralized body that drives the design and evolution of our compliance program across all business sectors and Group functions.

Our commitment: Guidelines and standards

Our compliance program builds on our company values and integrates these into our compliance framework, which consists of Group-wide policies, standards and procedures for entrepreneurial conduct. The following are mandatory for all our employees:

- **Code of Conduct**
- **Human Rights Charter**
- Anti-Corruption Standard
- Anti-Money Laundering Group Standard
- Conflict of Interest Policy
- Antitrust and Competition Law Policy
- Whistleblowing and Investigations Standard
- **Supplier Code of Conduct**

Risk assessment

Proper compliance risk management is crucial to identify undetected risks and ensure our company remains protected. For this purpose, we have a compliance risk assessment process covering all of our business sectors. The assessment is based on a comprehensive risk matrix that improves objectivity and enables a data-driven risk approach. It focuses on bribery and corruption risks, illustrated through in-depth risk categorization and risk scenarios. It also utilizes country risk segmentation, classifying countries where we actively operate in terms of their risk exposure regarding bribery and corruption by applying objective and consistent criteria. We use the outcome as a model to prioritize initiatives and intensify activities in countries with higher risk levels.

Conflicts of interest

We take all potential conflicts of interest seriously. Employees must avoid situations where their professional judgment could come into conflict with their personal interests. They must also disclose every potential conflict of interest to their supervisor and document the disclosure. Such issues are typically resolved directly between the employee and the supervisor but can also be routed to Human Resources, Legal, Compliance or other relevant functions.

Management and requirements of third parties

For compliance management to be effective, it must not be restricted to the boundaries of our own company. While our supplier management processes focus on vendor compliance with our standards, our global Third Party Risk Management process governs interactions with sales parties, such as commercial agents, distributors, dealers, and high-risk vendors. We expect our third parties worldwide to adhere to our compliance principles. We collaborate only with parties who pledge to comply with relevant laws, reject all forms of bribery, and adhere to environmental, health and safety guidelines.

We apply a risk-based approach to select the third parties with whom we do business. The greater the estimated risk regarding a particular country, region, or type of service, the more in-depth we examine the third party before entering into a business relationship. We also explore background information from various databases and information reported by third parties.

If we encounter compliance concerns, we further analyze and verify the relevant information. Based on the outcome, we decide whether to reject the potential third party, impose conditions to mitigate identified risks or terminate the existing relationship.

Compliance training

We provide regular compliance training (both classroom and online) on our Code of Conduct and critical compliance topics such as anti-corruption, conflict of interest, antitrust, data privacy, anti-money laundering and healthcare compliance standards. We require employees to take these courses based on their exposure to risk. Some courses also apply to independent contractors and supervised workers, such as temporary employees. In 2023, we launched a new Anti-Corruption, Anti-Bribery and Anti-Money Laundering e-learning course based on the updated Global Anti-Corruption and Anti-Money Laundering standards introduced in 2022.

Anti-money laundering

We have implemented a global anti-money laundering (AML) program consisting of a global Anti-Money Laundering Group Standard, training and a dedicated process to report and investigate red flags and any high-risk transactions. Suspicious transactions are reported to the German Financial Intelligence Unit or other authorities as required. We continuously work to improve our AML program. Following in-depth AML risk assessments of jurisdictions with stricter regulatory frameworks than our AML program, we implemented additional local AML programs where required.

Reporting potential compliance violations

We encourage all employees worldwide to report potential compliance violations. Depending on the type of misconduct and the reporting person's preference, they can choose from various reporting channels. We recommend using one of our central channels that are directly received and reviewed by a dedicated, independent and qualified team within Group Compliance. Depending on the nature, content and type of report, Compliance may investigate a submission directly or assign it to another responsible function for further investigation. One central reporting channel is our global whistleblowing compliance hotline, which can be used free of charge and anonymously to report violations. It is available in several languages by telephone or as a web-based application. The compliance hotline is also available to external stakeholders. The relevant information can be found in the "contact us" and the Compliance and Ethics section of our **website**.

Compliance-relevant cases with a particular risk profile are presented to the Compliance Case Committee, comprising senior members of our Compliance, Legal, Data Privacy, Internal Auditing, and Human Resources departments. The Committee's duties include assessing and classifying specific compliance issues and addressing identified issues using appropriate measures.

In all Compliance-relevant cases, based on the investigation outcome and recommendations from Compliance or the Compliance Case Committee, we aim to take appropriate remediation measures. These can include disciplinary actions against employees who have committed a compliance violation. If the investigation identifies a root cause that could lead to the risk of further compliance violations, we take additional preventive and corrective actions.

Both the number of new Compliance-relevant cases and the number of cases with confirmed compliance violations increased compared with the previous year. In 2023, 106 Compliance-relevant new cases with reports via the compliance hotline and other channels were created. In 32 concluded cases, it was confirmed that the principles of the Code of Conduct or other internal or external guidelines had been violated.

Reported compliance violations

	2020	2021	2022	2023 Group	2023 thereof: Merck KGaA, Darmstadt, Germany
Total number of reported compliance violations					
Number of reported compliance incidents	81	79	79	106	9
Number of confirmed cases	41	42	28	32	1
Confirmed cases by category					
Bribery and corruption	6	1	2	1	0
Violation of cartel laws and fair competition rules	0	0	1	0	0
Fraudulent actions against the Group	11	6	11	3	0
Other violations of the Group Compliance Principles for the relations with business partners	0	0	2	3	0
Other violations of Group values, internal guidelines or legal requirements	24	35	12	25	1

Compliance audits

Compliance is ensured by Group Compliance and Group Internal Auditing as the second and third lines of defense. As part of the audits, Group Internal Auditing regularly reviews functions, processes and legal entities worldwide. These reviews include an assessment of the effectiveness of the respective compliance guidelines, processes and structures in place. The units also check for violations of our Code of Conduct, Anti-Corruption Standard, Anti-Money Laundering Group Standard, and Antitrust and Competition Law Policy.

Our audit planning aims to provide comprehensive risk assurance through the best possible audit coverage of our processes, countries and projects. We take a risk-based approach to our annual audit planning process, considering factors such as sales, employee headcount, systematic stakeholder feedback and the Corruption Perceptions Index (CPI) published by the non-governmental organization Transparency International. If an internal audit gives rise to recommendations, Group Internal Auditing performs a systematic follow-up and monitors the implementation of the recommended corrective actions. In 2023, Group Internal Auditing conducted 80 internal audits involving bribery and corruption-related risks (2022: 79), including 52 operational and 27 IT audits and 1 special audit which may be conducted to meet legal requirements.

Interactions with health systems

We support health systems by collaborating with our healthcare stakeholders, such as professional medical associations, patient and carer organizations, university clinics and other institutions that provide healthcare. We follow clearly defined internal approval requirements and procedures for each type of interaction, in line with applicable laws and codes. In countries with statutory or industry obligations on the disclosure of transfers of value to healthcare stakeholders, we aim to comply with these obligations.

In some countries we inform consumers directly. For example, in the United States direct-to-consumer (DTC) advertising for prescription medicines is permitted. In line with applicable local laws, we use DTC advertising in these countries to help increase people’s awareness of certain diseases and the available therapies.

Roles and responsibilities

For all interactions with healthcare stakeholders, we have established internal policies and review processes and tools, such as record-keeping systems. Thereby, we want to ensure adherence to statutory requirements and transparency obligations.

Our Global Regulatory Affairs unit has established a dedicated standard and corresponding process document on the review and approval of our promotional materials for our Healthcare business sector. At the operational level, the relevant business and all employees involved in our sales and marketing activities must adhere to our internal policies, standards and procedures. To ensure that all promotional materials meet our standards as well as local regulations end-to-end, we apply a harmonized Group-wide review and approval system.

Our commitment: Group-wide guidelines and industry standards

In addition to applicable laws and our own internal standards, we also strive to comply with the codes of conduct of various international industry organizations, such as the **Code of Practice** published by the International Federation of Pharmaceutical Manufacturers & Associations (**IFPMA**) and the Code of Practice of the European Federation of Pharmaceutical Industries and Associations (**EFPIA**) or the regulations of the U.S. Pharmaceutical Research and Manufacturers of America **(PhRMA)**.

Moreover, we apply various specific internal rules and regulations:

- Pharma Code for Conducting Pharmaceutical Business and Pharmaceutical Operations (Pharma Code)
- Healthcare Ethical Guiding Principles
- Standard on Medical Activities

For the collaboration with patient organizations:

- Policy on Interactions with Patients, Patient Opinion Leaders, and Patient Organizations
- Guideline Good Practice and Process Guidance: Engagement with Patients, Patient Opinion Leaders, and Patient Organizations

Transparent reporting

We publish the financial and non-financial contributions we make to healthcare stakeholders in the healthcare industry, such as healthcare professionals and healthcare organizations, as appropriate and in accordance with local laws and codes. The published information includes the names of individual recipients, their addresses, the purpose, and the contributed amount or value as required by the applicable laws and codes. In addition, before publishing, we secure all necessary informed consent forms, as required by the applicable data privacy regulations.

Regular employee training

In 2023, we continued our Code of Conduct training curriculum on managing dilemmas in sector-specific situations. Moreover, employees who are responsible for the promotion of our pharmaceutical products receive regular training on current guidelines. Depending on their roles and responsibilities, new employees participate in onboarding training dealing with the review and approval of promotional materials. Based on their roles and responsibilities and in order to remain up-to-date, employees participate in mandatory e-learning courses and classroom training on our policies and guidelines as well as important changes to the reporting requirements for transfers of value.

Other Topics

Sustainable innovation and technology

The sustainable innovation that we envision and drive forward must align with and support the three goals of our sustainability strategy. We define sustainable innovation as new or improved products, services, technologies, or processes that generate economic benefits and have positive environmental and social impacts. Therefore, we develop long-term solutions for our innovation and research activities that consider the entire value chain and evaluate each product's impact over its lifecycle.

Today, our products are already having positive impact on human progress and global health, namely our medicines and our biological and chemical innovations that utilize the latest technologies. We want to continuously improve the way we measure our progress by adapting to upcoming regulations and integrating quantitative sustainability criteria into our product development processes across all business sectors.

In 2023, we continued our partnership with the patent information platform LexisNexis® PatentSight® and evaluated the sustainability impact of our intellectual property. In the reporting year, 29% (2022: 40%) of our patent families published had a positive sustainability impact. However, this key indicator is not comparable with the previous year's figure as LexisNexis® PatentSight® updated the underlying **evaluation methodology**.

Roles and responsibilities

The organizational set-up of our R&D activities reflects the overall structure of our company. All three of our business sectors operate in independent R&D units that pursue their own innovation strategies. Group Corporate Sustainability supports our business sectors and Group functions to advance sustainability within the R&D and innovation processes. This includes the coordination and alignment of common core sustainability criteria in line with our shared goals as well as quality and quantification requirements. In 2022, we created a Group-wide dashboard, showing the potential contribution of our R&D portfolio to sustainable solutions. In 2023, we integrated a procedure describing the global sustainability evaluation in our R&D process.

Our Group Science & Technology Office leads the implementation of our combined strategy for innovation as well as data and digital, enabling innovation across our business sectors while harnessing the power of advanced data and digital capacities. It aims to identify and integrate transformative and strategically relevant technology trends into our business sectors while maintaining a Group-wide overview of our technology roadmap and innovation portfolio. Fostering data and digital capacities is key to accelerating sustainable innovation and enabling rapid action and personalized offerings. Innovation projects are incubated either through our corporate innovation teams or in the business sectors.

Our venture capital fund, M Ventures, prioritizes sustainable innovations through equity investments. The fund's mandate is to invest in innovative technologies and products that have the potential to significantly impact our core business areas. In addition, the fund focuses on investments in two areas of high strategic relevance to our company: digital technology and sustainability.

M Ventures' sustainability investment strategy follows two fundamental approaches. First, it invests in sustainable solutions relevant to our three business sectors, such as novel solutions for reducing emissions and waste, green life science technologies and green electronics technologies. These solutions may be more energy- or resource-efficient or may create products designed for circularity or with a lower carbon footprint. As many of these technologies are still in their early stages, M Ventures is partnering with **SEMI.org** along with the leading corporate venture capital funds to help accelerate the innovation and adoption of potential sustainable semiconductor solutions. The second approach involves making investments that leverage our core competencies to drive sustainability in other markets. These may include start-ups addressing sustainable foods, bio-manufacturing or carbon capture and utilization.

Our commitment: Aiming for circularity

Within our R&D processes, we are committed to continuously improving and integrating sustainability and circular economy criteria to assess the sustainability performance of our products and portfolio, enabling us to create more sustainable products for our customers and society. We have integrated and tailored Design for Sustainability (DfS) across all business sectors and use our overarching dashboard to monitor progress on key sustainability criteria. In 2023, we assessed almost all relevant R&D projects and thus enhanced transparency around the sustainability performance of our global R&D portfolio. We integrated a sustainability in R&D key indicator to track progress and continued advancing the use of evaluation tools such as **DOZN™** and GreenSpeed. We aim to combine the insights from the R&D dashboard with those gained from our commercial portfolio evaluation to steer our future R&D activities.

We have dedicated corporate resources for our circular economy strategy and we are driving several circular economy pilots and initiatives throughout the organization. In addition, we held a global circular economy summit to provide a platform for best practice sharing with internal and external participants.

Reporting in accordance with the EU Taxonomy Regulation

Fundamentals

The EU taxonomy for sustainable activities (hereinafter "EU Taxonomy") is a classification system that translates the climate and environmental objectives of the European Union (EU) into criteria for sustainable economic activities. For this purpose, the EU Taxonomy defines various key performance indicators and qualitative information that the Group must disclose. The introduction of the disclosure obligation under Article 8 of Regulation (EU) 2020/852 of the European Parliament and of the European Council dated June 18, 2020 on establishing a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088 (hereinafter "EU Taxonomy Regulation") and the Delegated Acts adopted in this regard is being carried out in multiple phases:

- For the 2021 reporting period, key performance indicators were stated only for so-called taxonomy-eligible economic activities and were limited to those that make a substantial contribution to climate change mitigation or climate change adaptation as defined by the EU Taxonomy Regulation. An economic activity qualifies as taxonomy-eligible if it is within the scope of the EU Taxonomy.
- For the 2022 reporting period, apart from the degree of taxonomy-eligible economic activities making a substantial contribution to climate change mitigation or climate change adaptation within the meaning of the EU Taxonomy Regulation, it is also necessary to report the taxonomy-aligned share of the identified economic activities. According to the EU Taxonomy, an economic activity qualifies as taxonomy-aligned if it is taxonomy-eligible and makes a substantial contribution to one or more of the environmental objectives without doing significant harm to the other objectives or failing to fulfill minimum social standards.
- As well as the aforementioned information, the degree of taxonomy-eligible economic activities making a substantial contribution to the following four additional environmental objectives of the EU will be included in the disclosure obligation from the 2023 reporting period: 1) sustainable use and protection of water and marine resources, 2) transition to a circular economy, 3) pollution prevention and control, and 4) protection and restoration of biodiversity and ecosystems. Furthermore, new economic activities for the environmental objectives of climate change mitigation and climate change adaptation have been added for which the degree of taxonomy eligibility will be required to be disclosed in the 2023 reporting year. Reporting on the degree of taxonomy alignment for the newly added environmental objectives is not planned for the time being.
- From the 2024 reporting year, the degree of taxonomy eligibility and the degree of taxonomy alignment will have to be reported for all six environmental objectives.

Approach

To ensure the legally compliant fulfillment of its disclosure obligations, the Group has established an interdisciplinary project team that is continuously analyzing the existence of taxonomy-eligible and taxonomy-aligned activities in close coordination with the representatives of the business sectors and various Group functions.

Identification of taxonomy-eligible economic activities

In the course of implementing the EU Taxonomy requirements, the Group business model underwent a comprehensive analysis. Taxonomy-eligible economic activities were identified in line with a top-down approach using structured inquiries submitted to the relevant specialist departments. For the environmental objectives of climate change mitigation and climate change adaptation, the results of this analysis were supplemented by big data-supported analyses as part of a bottom-up approach. Among other things, information was used that can also be found in connection with the requirements of the REACH regulation as well as in the context of customs declarations. The economic activities for the other four environmental objectives were also identified by reference to existing reporting structures and hierarchies.

As a result of this process, taxonomy-eligible activities generating net sales were identified only in conjunction with the following economic activities:

- Manufacture of energy-efficient building equipment in the Electronics business sector (environmental objective “climate change mitigation”),
- Manufacture of active pharmaceutical ingredients in the Healthcare and Life Science business sectors (environmental objective “pollution prevention and control”),
- Manufacture of medical products in the Healthcare business sector (environmental objective “pollution prevention and control”), and
- Manufacture of electrical and electronic equipment in the Life Science business sector (environmental objective “transition to a circular economy”).

With respect to capital expenditure, the EU Taxonomy Regulation differentiates between three categories of capital expenditure:

- Capital expenditure that relates to assets or processes associated with taxonomy-aligned economic activities (category A),
- Capital expenditure that is part of a plan to expand taxonomy-aligned economic activities or to transform taxonomy-eligible economic activities into taxonomy-aligned economic activities (category B), and
- Capital expenditure related to the acquisition of products from taxonomy-eligible economic activities and individual measures that carry out the target activities in a low-carbon manner or reduce greenhouse gas emissions (category C).

Owing to its business model, the Group only engages in taxonomy-eligible economic activities in conjunction with the manufacture of active pharmaceutical ingredients, manufacture of medical products, the manufacture of electrical and electronic equipment and, to a small extent, the manufacture of energy-efficient building equipment, it has only limited taxonomy-eligible capital expenditure in category A. There is no capital expenditure in category B to date as the Group does not prepare any capital spending plans to transform taxonomy-eligible economic activities into taxonomy-aligned economic activities. Furthermore, the Group has capital expenditure resulting from the acquisition of products classified as taxonomy-eligible economic activities or attributable to qualifying individual measures (category C). In order to be taxonomy-eligible, this capital expenditure must correspond to one of the economic activities named in the Delegated Acts and be implemented and operational within 18 months.

In the Group, such capital expenditure exists especially in connection with the environmental objective of climate change mitigation in the following areas:

- Electricity generation using solar photovoltaic technology (activity 4.1 of the Delegated Act on the “climate change mitigation” environmental objective),
- Transport by motorbikes, passenger cars and light commercial vehicles (activity 6.5 of the Delegated Act on the “climate change mitigation” environmental objective), and
- Renovation of existing buildings (activity 7.2 of the Delegated Act on the “climate change mitigation” environmental objective and activity 3.2 of the Delegated Act on the “circular economy” environmental objective).

Determination of taxonomy alignment

Technical screening criteria

In order to check the taxonomy alignment of the taxonomy-eligible economic activities, the relevant regulations for the technical screening criteria under which certain economic activities qualify as contributing substantially to the environmental objective as well as for determining whether the activity causes no significant harm to any of the other environmental objectives were systematically analyzed. The basis for this was the Delegated Acts on the EU Taxonomy, which were used for the identification of taxonomy-eligible economic activities. In these, corresponding requirements are defined for the respective economic activities, which must be fulfilled for a classification as taxonomy-aligned. For this purpose, interviews were conducted with business and project managers and the physical climate risks at the sites were analyzed. Furthermore, operating permits, product data sheets, environmental product declarations, energy performance certificates and internal training documents were inspected, among other things.

Net sales, capital expenditure and operating expenditure in connection with the “climate change mitigation” environmental objective were identified as taxonomy-aligned economic activities to a very small extent only. No additional taxonomy-eligible and taxonomy-aligned net sales, capital expenditure or operating expenditure were identified for the “climate change adaptation” environmental objective. From 2024, the degree of taxonomy alignment will have to be reported for the other four environmental objectives in addition to the degree of taxonomy eligibility. Based on the information currently available, the degree of taxonomy alignment for the other four environmental objectives will also be very low. A more accurate statement is not yet possible owing to the uncertain questions regarding the interpretation of the regulations and the current progress of the project.

Minimum safeguards

The minimum safeguard frameworks include the OECD Guidelines for Multinational Enterprises, the United Nations Guiding Principles on Business and Human Rights, the fundamental conventions of the International Labour Organization, and the International Bill of Human Rights. The requirements profile of the frameworks was systematized and compared with internal documents. This included an analysis of the Code of Conduct, work instructions, guidelines and training documents. Compliance with the due diligence process required by the framework in the area of human rights is ensured with respect to the individual business activities. Risk analyses are carried out with regard to the minimum safeguard requirements and appropriate measures are derived from these.

Determination of the taxonomy KPIs

The three key performance indicators (KPIs), namely net sales, capital expenditure and operating expenditure, were mainly derived from existing financial reporting systems; for capital expenditure inquiries were made to the Investment Controlling unit in some instances. The principle of materiality was applied.

Accounting and measurement policies

The EU Taxonomy Regulation and the corresponding Delegated Acts contain wording and requirements which, even taking into account the supplementary publications of the EU Commission and the "EU Platform on Sustainable Finance", are subject to interpretation and/or for which clarifications have not yet been published in every case. The most significant interpretive issues and Our approach are presented below.

Taxonomy eligibility

Ancillary activities that are operationally necessary for our core business do not qualify as independent taxonomy-eligible economic activities. This applies, for example, to the transport of our products to our customers, research and development activities, and the acquisition or construction of production buildings in areas that cannot be allocated to a taxonomy-eligible target activity.

To check the taxonomy eligibility of an economic activity, the Group applies an end-product oriented approach for manufacturing-related activities. This means that the end product must result from one of the economic activities specified in the Delegated Act in order to qualify as being taxonomy-eligible. In the case of organic basic chemicals, the corresponding economic activities qualify as taxonomy-eligible in the interpretation of the Group only if the manufacturing activities of the named chemical products involve a significant transformation process. In our interpretation, products that are merely passed on for sale, repackaged or mixed do not qualify as taxonomy-eligible within the meaning of the EU Taxonomy Regulation.

The purchase or performance of contract manufacturing services for active pharmaceutical ingredients or medical products in the Healthcare and Life Science business sectors typically does not give rise to a taxonomy-eligible economic activity, as the Group does not control the circumstances under which the contract manufacturing is performed in many cases.

In the area of fossil gas, the Group operates a gas turbine and a co-generation facility to generate electricity and heat from fossil gaseous fuels. The facilities serve to generate our own power and heat. These activities in the area of electricity generation from fossil gaseous fuels as well as the operation of co-generation units with fossil gaseous fuels have been classified as not material. Additional activities in the field of nuclear energy and fossil gas are not performed or are performed to an insignificant extent only.

Net sales

The net sales KPI represents the ratio of net sales from taxonomy-eligible or taxonomy-aligned economic activities in a fiscal year to the total net sales of the same fiscal year. The definition of relevant net sales for the purposes of the EU Taxonomy Regulation corresponds to the definition of net sales in the consolidated financial statements (see Note (9) "**Net sales**" in the Notes to the Consolidated Financial Statements).

Capital expenditure

The share of capital expenditure on assets or processes associated with economic activities classified as taxonomy-eligible or taxonomy-aligned is determined as follows: Share of total capital expenditure that is taxonomy-eligible or taxonomy-aligned divided by total capital expenditure according to the EU Taxonomy Regulation. In the Group and within the meaning of the EU Taxonomy Regulation, capital expenditure in the reporting period comprises additions to property, plant and equipment (IAS 16), rights of use from leases (IFRS 16), and intangible assets (IAS 38) with the exception of goodwill. Apart from the additions, advance payments for the named assets are also included. The denominator also includes additions to property, plant and equipment and intangible assets resulting from business combinations. The additions can be seen in the changes in property, plant and equipment and intangible assets disclosed in the consolidated financial statements (see Note (20) "**Property, Plant and Equipment**" and Note (19) "**Other Intangible Assets**" in the Notes to the Consolidated Financial Statements).

In order to exclude double counting, capital expenditure on products from taxonomy-aligned economic activities and individual measures that have already been checked under category A (i.e. capital expenditure that relates to assets or processes associated with taxonomy-aligned economic activities) are included under this category only. Against this background, capital expenditure for production buildings, for example, is subject to a taxonomy-eligibility check under category A only, while capital expenditure for administrative buildings is included under category C.

Operating expenditure

The share of operating expenditure for assets or processes associated with economic activities classified as taxonomy-eligible or taxonomy-aligned is determined as follows: Share of total operating expenditure that is taxonomy-eligible or taxonomy-aligned divided by total operating expenditure according to the EU Taxonomy Regulation. Operating expenditure relevant within the scope of reporting under the EU Taxonomy Regulation includes direct, non-capitalized research and development costs, low-value leases, building renovations, maintenance and repair, and all other direct internal and external expenses related to the day-to-day maintenance of property, plant and equipment that are necessary to ensure the continuous and effective functioning of these assets. During the clinical and preclinical development phases in the Healthcare business sector, it is unclear as to whether the activities will ever lead to regulatory approval and hence to marketable products. Accordingly, the corresponding research and development activities have not been included as taxonomy-eligible operating expenditure in the numerator for the economic activities of pharmaceutical ingredients and medical products.

Taxonomy KPIs

The following tables present the share of sales, capital expenditure and operating expenditure attributable to taxonomy-eligible and taxonomy-aligned economic activities in respect of the environmental objective "climate change mitigation". The tables also contain information on the share of taxonomy-eligible economic activities for the four additional environmental objectives:

Economic activities	Code	Turnover 2023	Proportion of Turnover 2023	Criteria for a substantial contribution: Climate change mitigation	Climate change adaptation	Water	Pollution	Circular Economy	Biodiversity	DNSH criteria ("Do no significant harm"): Climate change mitigation	Climate change adaptation	Water	Pollution	Circular Economy	Biodiversity	Minimum safeguards	Proportion of Taxonomy-aligned or eligible turnover 2022	Category enabling activity	Category transitional activity
	([a])	€ million	%	Y; N; N/EL ([b])	Y; N; N/EL ([b])	Y; N; N/EL ([b])	Y; N; N/EL ([b])	Y; N; N/EL ([b])	Y; N; N/EL ([b])	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	%	E	T
A. TAXONOMY-ELIGIBLE ACTIVITIES																			
A.1. Environmentally sustainable activities (taxonomy-aligned)																			
Manufacture of energy efficiency equipment for buildings (A1)	CCM 3.5	7	0.03	Y	N/EL	N/EL	N/EL	N/EL	N/EL		Y	Y	Y	Y	Y	Y	0.03	E	
Turnover of environmentally sustainable activities (taxonomy-aligned) (A.1)																			
Of which enabling		7	0.03	0.03	-	-	-	-	-								0.03	E	
Of which transitional		-	-	-													-		T
A.2 Taxonomy-eligible, but not environmentally sustainable activities (not taxonomy-aligned activities)				EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL										
Manufacture of active pharmaceutical ingredients (API) or active substances	PPC 1.1	99	0.47	N/EL	N/EL	N/EL	EL	N/EL	N/EL								0.00		
Manufacture of medicinal products	PPC 1.2	5,778	27.52	N/EL	N/EL	N/EL	EL	N/EL	N/EL								0.00		
Manufacture of electrical and electronic equipment	CE 1.2	98	0.47	N/EL	N/EL	N/EL	N/EL	EL	N/EL								0.00		
Turnover of taxonomy-eligible but not environmentally sustainable activities (not taxonomy-aligned activities) (A.2)		**5,975**	**28.46**	**-**	**-**	**-**	**27.99**	**0.47**	**-**								0.00		
A. Turnover of taxonomy eligible activities (A.1 + A.2)		**5,982**	**28.49**	**0.03**	**-**	**-**	**27.99**	**0.47**	**-**										
B. TAXONOMY-NON-ELIGIBLE ACTIVITIES																			
Turnover of taxonomy-non-eligible activities (B)		**15,011**	**71.51**																
Total (A + B)		**20,993**	**100.00**																

Economic activities	Code	CapEx 2023	Proportion of CapEx 2023	Criteria for a substantial contribution						DNSH criteria ("Do no significant harm")							Proportion of taxonomy aligned or eligible CapEx 2022	Category enabling activity	Category transition-al activity
				Climate change mitigation	Climate change adaptation	Water	Pollution	Circular Economy	Biodiversity	Climate change mitigation	Climate change adaptation	Water	Pollution	Circular economy	Biodiversity	Minimum safeguards			
		€ million	%	Y; N; N/EL [b]	Y; N; N/EL [b]	Y; N; N/EL [b]	Y; N; N/EL [b]	Y; N; N/EL [b]	Y; N; N/EL [b]	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	%	E	T
A. TAXONOMY-ELIGIBLE ACTIVITIES																			
A.1 Environemtally sustainable activities (taxonomy-aligned)																			
Manufacture of energy efficiency equipment for buildings	CCM 3.5	1	0.06	Y	N/EL	N/EL	N/EL	N/EL	N/EL		Y	Y	Y	Y	Y	Y	0.06	E	
Electricity generation using solar photovoltaic technology	CCM 4.1	4	0.17	Y	N/EL	N/EL	N/EL	N/EL	N/EL		Y	Y	Y	Y	Y	Y	0.00	E	
Renovation of existing buildings	CCM 7.2	10	0.43	Y	N/EL	N/EL	N/EL	N	N/EL		Y	Y	Y	Y	Y	Y	0.51		T
CapEx of environmentally sustainable activities (taxonomy aligned) (A.1)		**16**	**0.66**	**0.66**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**								**0.58**		
Of which enabling		5	0.23	0.23	0.00	0.00	0.00	0.00	0.00									E	
Of which transitional		10	0.43	0.43															T
A.2 Taxonomy-eligible, but not environmentally sustainable activities (not taxonomy-aligned activities)				EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL										
Transport by motorbikes, passenger cars and light commercial vehicles (A.2)	CCM 6.5	32	1.35	EL	N/EL	N/EL	N/EL	N/EL	N/EL								1,26		
Manufacture of active pharmaceutical ingredients (API) or active substances	PPC 1.1	1	0.04	N/EL	N/EL	N/EL	EL	N/EL	N/EL								0.00		
Manufacture of medicinal products	PPC 1.2	101	4.27	N/EL	N/EL	N/EL	EL	N/EL	N/EL								0.00		
CapEx of taxonomy-eligible but not environmentally sustainable activities (not taxonomy-aligned activities) (A.2)		**135**	**5.67**	**1.35**	**0.00**	**0.00**	**4.31**	**0.00**	**0.00**								1,26		
A. CapEx of taxonomy eligible activities (A.1 + A.2)		**150**	**6.33**	2.02	0.00	0.00	4.31	0.00	0.00										
B. TAXONOMY-NON-ELIGIBLE ACTIVITIES																			
CapEx of taxonomy-non-eligible activities (B)		**2,226**	**93.67**																
Total (A + B)		**2,377**	**100.00**																

Economic activities	Code	OpEx 2023	Proportion of OpEx 2023	Criteria for a substantial contribution						DNSH criteria ("Do no significant harm")							Proportion of taxonomy aligned or eligible OpEx 2022	Category enabling activity	Category transition-al activity
				Climate change mitigation	Climate change adaptation	Water	Pollution	Circular Economy	Biodiversity	Climate change mitigation	Climate change adaptation	Water	Pollution	Circular economy	Biodiversity	Minimum safeguards			
	(a)	€ million	%	Y; N; N/EL (b)	Y; N; N/EL (b)	Y; N; N/EL (b)	Y; N; N/EL (b)	Y; N; N/EL (b)	Y; N; N/EL (b)	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	%	E	T
A. TAXONOMY-ELIGIBLE ACTIVITIES																			
A.1 Environemtally sustainable activities (taxonomy-aligned)																			
Manufacture of energy efficiency equipment for buildings	CCM 3.5	1	0.02	Y	N/EL	N/EL	N/EL	N/EL	N/EL		Y	Y	Y	Y	Y	Y	0.00	E	
Renovation of existing buildings	CCM 7.2	0	0.00	Y	N/EL	N/EL	N/EL	N	N/EL		Y	Y	Y	Y	Y	Y	0.00		T
OpEx of environmentally sustainable activities (taxonomy aligned) (A.1)		**1**	**0.02**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**								**0.00**		
Of which enabling		1	0.02	0.02	-	-	-	-	-								0.00	E	
Of which transitional		0	0.00	0.00	-	-	-	-	-								0.00		T
A.2 Taxonomy-eligible, but not environmentally sustainable activities (not taxonomy-aligned activities)				EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL	EL; N/EL										
Manufacture of active pharmaceutical ingredients (API) or active substances	PPC 1.1	3	0.11	N/EL	N/EL	N/EL	EL	N/EL	N/EL								0.00		
Manufacture of medicinal products	PPC 1.2	49	1.73	N/EL	N/EL	N/EL	EL	N/EL	N/EL								0.00		
Manufacture of electrical and electronic equipment	CE 1.2	4	0.16	N/EL	N/EL	N/EL	N/EL	EL	N/EL								0.00		
OpEx of taxonomy-eligible but not environmentally sustainable activities (not taxonomy-aligned activities) (A.2)		**56**	**1.99**	**0.00**	**0.00**	**0.00**	**1.83**	**0.16**	**0.00**								0.00		
A. OpEx of taxonomy eligible activities (A.1 + A.2)		**57**	**2.02**	0.02	0.00	0.00	1.83	0.16	0.00										
B. TAXONOMY-NON-ELIGIBLE ACTIVITIES																			
OpEx of taxonomy-non-eligible activities (B)		**2,761**	**97.98**																
Total (A + B)		**2,817**	**100.00**																

(a) The Code constitutes the abbreviation of the relevant objective to which the economic activity is eligible to make a substantial contribution, as well as the section number of the activity in the relevant Annex covering the objective, i.e.:
Climate Change Mitigation: CCM
Climate Change Adaptation: CCA
Water and Marine Resources: WTR
Circular Economy: CE
Pollution Prevention and Control: PPC
Biodiversity and ecosystems: BIO

(b) Y – Yes, Taxonomy-eligible and Taxonomy-aligned activity with the relevant environmental objective
N – No, Taxonomy-eligible but not Taxonomy-aligned activity with the relevant environmental objective
N/EL – not eligible, Taxonomy-non-eligible activity for the relevant environmental objective.

Research and development expenses accounted for 2,445 Mio. € (2022:2,521 Mio. €) of the reported operating expenditure, with 1,657 Mio. € (2022: 1,694 Mio. €) of this being attributable to the Healthcare business sector.

Additional information in accordance with the German commercial code (HGB)

The Management Report of Merck KGaA, Darmstadt, Germany, has been combined with the Group Management Report. The Annual Financial Statements and the Combined Management Report of the Group and Merck KGaA, Darmstadt, Germany, for fiscal 2023 are filed with the electronic German company register and are available on its website.

Merck KGaA, headquartered in Darmstadt, Germany, is the parent company of the Group.

Following the transfer of the Life Science, Healthcare and Electronics business sectors into separate legal entities, Merck KGaA, Darmstadt, Germany, primarily performs a holding company function for the Group. As part of the strategic management of the Group, this function makes strategically important decisions and ensures that compliance provisions are observed by the central enabling Group Functions on a Group-wide basis. It also performs Group-wide services for Group companies in the areas of information technology, strategic management and site management, especially at the Darmstadt site. Merck KGaA, Darmstadt, Germany, employs around 4,000 of the more than 11,000 employees at the Darmstadt site.

The financial statements of Merck KGaA, Darmstadt, Germany, have been prepared in accordance with the provisions of the German Commercial Code (HGB), the German Stock Corporation Act (AktG), and the supplementary requirements of the Articles of Association. The full version of the Annual Financial Statements of Merck KGaA, Darmstadt, Germany, together with the unqualified auditor's opinion has been submitted to the electronic company register and published there.

Effects of material company agreements on the net assets, financial position, and results of operations

Hive-down of the operating activities of the business sectors

As part of the strategic further development of Merck KGaA, Darmstadt, Germany, the existing operating activities of the Life Science, Healthcare, and Electronics business sectors within Merck KGaA, Darmstadt, Germany, together with the relevant assets and liabilities (hereinafter: "operating units"), were hived down at their carrying amounts into three separate legal entities (hereinafter: "OpCo" or plural "OpCos") with the legal form of a GmbH or German limited liability corporation and with economic effect from January 1, 2018 (operating hive-down).

Since the technical system requirements for the rollout of the business sector-specific enterprise resource planning systems (hereinafter "ERP") were not in place at the OpCos at the time of the hive-down, the business activities hived down to the OpCos have been temporarily leased back by the relevant OpCos to Merck KGaA, Darmstadt, Germany. Under the terms of a business lease agreement, Merck KGaA, Darmstadt, Germany, leased the entire operations from each of the three OpCos with economic effect from January 1, 2018. In this context, it also leased all fixed assets and acquired the current assets as well as certain liabilities and provisions at their carrying amounts under German commercial law.

The business lease agreement under which the Healthcare business sector was leased back to Merck KGaA, Darmstadt, Germany, was terminated with economic effect from March 31, 2019. Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany (formerly the Healthcare OpCo) assumed the power of operational management for the Healthcare business sector from Merck KGaA, Darmstadt, Germany, with effect from April 1, 2019. As a result of the termination of the business lease agreement, the leased objects allocated to the Healthcare business sector at the end of the lease were transferred to Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

The business lease agreement for the Electronics business sector (EL business lease agreement) was terminated with economic effect from December 31, 2019 for the part of the distribution and sales function belonging to the Electronics business sector. Accordingly, these functions were transferred from Merck KGaA, Darmstadt, Germany, to the EL OpCo (then Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany) with economic effect from January 1, 2020. The contractual, process, procedural, and working relationships and leased objects allocated to the function were transferred to the EL OpCo as a result. The EL business lease agreement for the other functions of the Electronics business sector remained in place until December 31, 2022.

To facilitate the implementation and operation of the new ERP systems for the LS OpCo (then Merck Life Science Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany) and the EL OpCo, the EL OpCo transferred the Darmstadt-based “Organics” and “OLED” production operations, including the production-related Electronics shared functions (EL Production, hereinafter: “ELP”), to the LS OpCo by way of a chain transformation in multiple steps on August 31, 2022. The function that was spun off from the EL business lease agreement via EL Production (the ELP business lease agreement) had been in place between Merck KGaA, Darmstadt, Germany, as the lessee and the LS OpCo as the lessor since this date.

By way of entries in the commercial register on November 1, 2022 (LS OpCo) and December 29, 2022 (EL OpCo), the LS OpCo and the EL OpCo changed their legal form to that of a German corporation with general partners (Kommanditgesellschaft auf Aktien) and have since been operating under the names Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Electronics KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

As a result of the aforementioned hive-down and restructuring measures and the existing EL and ELP business lease agreements, Merck KGaA, Darmstadt, Germany, continued to manage the operating business of the Electronics business sector with the exception of part of the distribution and sales function until December 31, 2022. Furthermore, as a result of the Life Science business lease agreement, Merck KGaA, Darmstadt, Germany, also ran the operating business of the Life Science business sector.

Termination of the temporary business lease of the Life Science and Electronics business sectors

Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, went live on January 1, 2023. It assumed the power of operational management for the Life Science operating business and ELP from Merck KGaA, Darmstadt, Germany, at this date. Merck KGaA, Darmstadt, Germany, therefore terminated the LS and ELP business lease agreements with effect from January 1, 2023.

Merck KGaA, Darmstadt, Germany, also terminated the EL business lease agreement with effect from January 1, 2023. The power of operational management for the Electronics business sector, with the exception of EL Production, was therefore transferred from Merck KGaA, Darmstadt, Germany, to Merck Electronics KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, at this date. As a result of the termination of the business lease agreements, the leased objects allocated to the Life Science and Electronics business sectors and EL Production – comprising current and non-current assets as well as certain liabilities and provisions – were transferred to Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Electronics KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, respectively. In exchange, Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Electronics KGaA, Darmstadt, Germany, a subsidiary of Merck

KGaA, Darmstadt, Germany, paid compensation in the amount of the balance of the transferred carrying amounts under German commercial law. In addition, around 3,400 employees were transferred from Merck KGaA, Darmstadt, Germany, to Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and around 1,000 employees were transferred to Merck Electronics KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. The remaining around 4,000 employees in Group functions remained with Merck KGaA, Darmstadt, Germany.

Additional transfers involving the Life Science business sector

By way of a contribution agreement dated December 2, 2022, Merck KGaA, Darmstadt, Germany, also transferred the assets and liabilities allocated to the Life Science business sector that were not previously included in the operating hive-down of the Life Science business sector or the LS business lease agreement to Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, with effect from January 1, 2023. This related to the "Packaging & Container" functional unit and the assets and liabilities of the Hohenbrunn site. The assets and liabilities mainly included property, plant, and equipment, cash and cash equivalents, pension provisions and other provisions and were contributed at their carrying amounts under German commercial law in exchange for the grant of new shares in Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

Due to the hive-downs and transfers described above in connection with the termination of the business lease agreements (collectively referred to hereinafter as the "transfer of operating activities"), some balance sheet items for 2023 are only comparable with the prior-year figures to a limited extent. To improve comparability, additional information on the impact of the transfer of operating activities to Merck Life Science KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Electronics KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, on individual balance sheet items of Merck KGaA, Darmstadt, Germany, is provided. The following table shows the balance sheet of Merck KGaA, Darmstadt, Germany, before (December 31, 2022) and after (January 1, 2023) the transfer of operating activities. In terms of the income statement of Merck KGaA, Darmstadt, Germany, for fiscal 2023, the transfer of operating activities resulted in lower net sales, material costs, personnel expenses and other operating expenses in particular (for details see the disclosures on the income statement in the "**Business development and results of operations**" section.

€ million	**Merck KGaA, Darmstadt, Germany 01.01.2023**	Merck KGaA, Darmstadt, Germany 31.12.2022	Change € million	Change %
Assets				
A. Fixed assets				
Intangible assets	192	192	–	0.0%
Tangible assets	961	969	-8	-0.8%
Financial assets	22,809	22,804	5	0.0%
	23,962	**23,965**	**-3**	**0.0%**
B. Current assets				
Inventories	25	546	-521	-95.4%
Trade accounts receivable	76	126	-50	-39.8%
Other receivables and other assets	1,347	968	379	39.2%
Cash and cash equivalents	0	0	–	0.0%
	1,448	**1,641**	**-192**	**-11.7%**
C. Prepaid expenses	74	74	–	0.0%
Total assets	**25,485**	**25,680**	**-195**	**-0.8%**
Equity and liabilities				
A. Net equity				
Subscribed capital	168	168	–	0.0%
General partner's equity	397	397	–	0.0%
Capital reserves	3,814	3,814	–	0.0%
Retained earnings	702	702	–	0.0%
Profit carried forward E. Merck KG, Darmstadt, Germany	80	80	–	0.0%
Net retained profit: shareholders	318	318	–	0.0%
	5,479	**5,479**	**–**	**0.0%**
B. Provisions				
Provisions for pensions and other post-employment benefits	1,487	1,509	-22	-1.5%
Other provisions	688	774	-86	-11.1%
	2,175	**2,283**	**-108**	**-4.7%**
C. Liabilities				
Financial liabilities	2,751	2,751	–	0.0%
Trade accounts payable	222	308	-86	-28.0%
Other liabilities	14,847	14,848	-1	0.0%
	17,819	**17,907**	**-87**	**-0.5%**
D. Deferred income	11	11	–	-1.7%
Total equity and liabilities	**25,485**	**25,680**	**-195**	**-0.8%**

Business development and results of operations

Net sales of Merck KGaA, Darmstadt, Germany, decreased to € 1,628 million in fiscal 2023. The € 1,552 million reduction was mainly due to the transfer of operating activities of the Life Science and Electronics business sectors into separate legal entities with effect from January 1, 2023 (see "**Effects of material company agreements on the net assets, financial position, and results of operations**"). Following the transfer, Merck KGaA, Darmstadt, Germany, no longer generates any income from operating product and service business (2022: € 1,813 million).

In the past fiscal year, net sales of Merck KGaA, Darmstadt, Germany, exclusively comprised income from the intragroup on-charging of services. This primarily related to site management services, IT services, strategic management costs and license fees for the Group umbrella brand. All in all, the intragroup on-charging of services was higher than in the previous year due to the increase in on-charged site and administrative services in particular.

Results of operations

			Change	
€ million	**2023**	2022	€ million	%
Net sales	1,628	3,180	-1,552	-48.8
Other income	105	184	-79	-43.0
Cost of materials	-721	-1,269	548	-43.2
Personnel expenses	-581	-1,256	675	-53.7
Depreciation, amortization, and write-downs	-132	-142	11	-7.5
Other operating expenses	-821	-1,150	329	-28.6
Investment result	2,203	2,015	188	9.3
Other financial result	-685	-414	-272	65.7
Profit before profit transfers and taxes	**996**	**1,148**	**-152**	**-13.2**
Profit transfers	-696	-677	-18	2.7
Taxes	-16	-228	213	-93.1
Profit after profit transfers and taxes	**285**	**242**	**43**	**17.7**

The year-on-year change in individual items of the income statement of Merck KGaA, Darmstadt, Germany, was substantially impacted by the transfer of operating activities. These effects are discussed below and above in the "**Effects of material company agreements on the net assets, financial position, and results of operations**" section. As a result, the income statement for fiscal 2023 mainly saw a decline in expense and income items relating to operating activities, such as net sales, material costs, personnel expenses and other operating expenses.

In addition to the effects of the transfer of operating activities, higher profit transfers from subsidiaries and lower tax expense in particular more than offset the higher level of other financial expenses, resulting in an increase in total profit after taxes and profit transfers.

The reduction in **other income** primarily resulted from the fact that the prior-year figure included changes relating to certain inventory items that were transferred as of January 1, 2023, as well as from the lower level of insurance compensation payments.

The transfer of operating activities meant the total **cost of materials** decreased in line with net sales. By contrast, the cost of materials in relation to sales increased to 44.3% (2022: 39.9%), as net sales in the past fiscal year resulted solely from the intragroup oncharging of services whose performance involves a proportionally higher level of material costs (see "**Effects of material company agreements on the net assets, financial position, and results of operations**").

The lower level of **personnel expenses** was due in particular to the transfer of around 4,400 employees to different legal entities as the result of the transfer of operating activities (see "**Effects of material company agreements on the net assets, financial position, and results of operations**"). The level of additions to pension provisions was also lower. This was offset by salary increases for employees covered by and exempt from collective agreements, as well as the collectively agreed inflation allowance.

Depreciation, amortization, and adjustments remained essentially unchanged as against the previous year. The transfer of operating activities did not have a material impact on the amount of fixed assets (see "**Effects of material company agreements on the net assets, financial position, and results of operations**").

The reduction in other **operating expenses** was due to the transfer of operating activities (see "**Effects of material company agreements on the net assets, financial position, and results of operations**") and mainly resulted from the lower level of external services for sales and advertising as well as other external services and procurements.

Following the transfer of operating activities, the relevance of **investment income** as the largest income item is increasing. It increased by € 188 million to € 2,203 million (2022: € 2,015 million) on the back of higher income from profit and loss transfer agreements with subsidiaries in the Healthcare business sector. The general rise in interest rates also led to an increase in the profit transfer from the Group financing company, Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. This was offset by lower dividends from other subsidiaries and higher expenses from profit and loss transfer agreements.

The increased interest expense in the **other financial result** was primarily due to higher interest expenses in respect of the Group financing company, Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, as a result of rising interest rates; this was offset by positive adjustments to the fair value of the plan assets in connection with pension provisions.

Additions to provisions for uncertain tax obligations in particular led to a higher **tax** expense in the previous year, whereas these did not occur to the same extent in 2023.

Net assets and financial position

Assets

			Change	
€ million	**Dec. 31, 2023**	Dec. 31, 2022	€ million	%
Fixed assets	**24,065**	**23,965**	**99**	**0.4**
Intangible assets	181	192	-11	-5.6
Tangible assets	1,076	969	107	11.0
Financial assets	22,808	22,804	3	0.0
Current assets	**1,708**	**1,641**	**68**	**4.1**
Inventories	29	546	-517	-94.7
Trade accounts receivable	62	126	-64	-50.9
Other receivables and other assets	1,617	968	649	67.1
Cash and cash equivalents	0	0	–	–
Prepaid expenses	**78**	**74**	**4**	**5.5**
	25,851	**25,680**	**171**	**0.7**

Equity and liabilities

			Change	
€ million	**Dec. 31, 2023**	Dec. 31, 2022	€ million	%
Net equity	**5,481**	**5,479**	**2**	**0.0**
Provisions	**2,198**	**2,283**	**-85**	**-3.7**
Provisions for pensions and other post-employment benefits	1,415	1,509	-94	-6.2
Other provisions	783	774	9	1.2
Liabilities	**18,162**	**17,907**	**256**	**1.4**
Financial liabilities	2,476	2,751	-275	-10.0
Trade accounts payable	152	308	-156	-50.5
Other liabilities	15,534	14,848	686	4.6
Deferred income	**10**	**11**	**-1**	**-12.1**
	25,851	**25,680**	**171**	**0.7**

The year-on-year change in individual items of the balance sheet of Merck KGaA, Darmstadt, Germany, was substantially impacted by the transfer of operating activities. These effects are discussed below and above in the "**Effects of material company agreements on the net assets, financial position, and results of operations**" section. In terms of the balance sheet for fiscal 2023, this primarily resulted in a reduction in inventories and trade accounts receivable on the asset side of the balance sheet and in trade payables on the equity and liabilities side, while other receivables increased.

Largely irrespective of the transfer of operating assets, one notable increase on the asset side of the balance sheet related to fixed assets (€ +99 million). This was mainly due to the investments in property, plant and equipment at the Darmstadt site.

The higher level of income from profit and loss transfers meant that other receivables and other assets also increased (€ +649 million). On the equity and liabilities side, the biggest increase related to other liabilities (€ +686 million), whereas financial liabilities decreased (€ -275 million). All in all, net assets rose slightly by 0.7%.

Inventories declined as a result of the transfer of operating activities (see "**Effects of material company agreements on the net assets, financial position, and results of operations**"). At the balance sheet date, they comprised the consumables and supplies required for site operations.

Merck KGaA, Darmstadt, Germany, was financed by equity in the amount of € 5,481 million (2022: € 5,479 million). This corresponds to an equity ratio of 21.2% (2022: 21.3%). Equity increased in particular as a result of the net income generated in fiscal 2023, which offset the dividend payments made during the year.

Merck KGaA, Darmstadt, Germany, is also financed via the Group financing company, Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, which provides Merck KGaA, Darmstadt, Germany, with sufficient financial resources and hence ensures liquidity. Other liabilities rose by € 686 million and primarily relate to current loans and clearing account liabilities in respect of Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, in the amount of € 14,476 million (2022: € 13,963 million). Financial liabilities of € 2,476 million relate to bonds issued in previous years to finance the acquisitions of Sigma-Aldrich and Versum Materials, Inc., United States, in particular. The € -275 million reduction in financial liabilities was attributable to the repayment of bonds, which resulted in an increase in other liabilities from intragroup financing. Additional information on the financing conditions and maturity structure of the bonds can be found in Note (21) "**Financial liabilities**" of the Notes to the Financial Statements in accordance with HGB.

The reduction in provisions was due in particular to the lower level of pension provisions, which primarily resulted from pension payments and employees being transferred to other legal entities within the Group.

Research and development

Research and development (R&D) expenditure declined to € 69 million in fiscal 2023 (2022: € 289 million), largely as a result of the transfer of operating activities (see "**Effects of material company agreements on the net assets, financial position, and results of operations**"). Merck KGaA, Darmstadt, Germany, continues to recognize expenses for global R&D services.

Dividend

For fiscal 2023, we are proposing to the Annual General Meeting the payment of a dividend of € 2.20 per share.

Personnel

Merck KGaA, Darmstadt, Germany, had 3,924 employees as of December 31, 2023 (2022: 8,485). The year-on-year decline of 4,561 employees was largely attributable to the transfer of operating activities (see "**Effects of material company agreements on the net assets, financial position, and results of operations**").

The average number of employees by functional area:

Personnel

Average number of employees during the year	**2023**	2022
Administration	2,615	3,085
Production and site operations	869	2,940
Research	341	1,091
Logistics	66	614
Marketing and sales	43	523
Other	74	122
Total	**4,008**	**8,375**

Risks and opportunities

As the parent of the Group, Merck KGaA, Darmstadt, Germany, is largely subject to the same opportunities and risks as the Group. Merck KGaA, Darmstadt, Germany, participates in these risks and opportunities via its equity investments and subsidiaries. This can have consequences for its investment income or the valuation of shares in subsidiaries. More information can be found in the Group "**Report on Risks and Opportunities**".

Forecast for Merck KGaA, Darmstadt, Germany

Deviations of actual business development in fiscal 2022 from the previously reported guidance

The Combined Management Report for 2022 initially forecast a downturn in net sales in fiscal 2023 due to the transfer of operating activities and the fact that the product-related sales of the transferred business sectors are no longer recognized. The remaining business sector was expected to see a similar level of sales to 2022. Net income was forecast to be slightly higher than in 2022.

Net sales declined from € 3,180 million in the previous year to € 1,628 million, largely as a result of the € 1,813 million in sales from operating product and service business that were no longer recognized as anticipated following the transfer of operating activities. Sales in the reporting year relate solely to the intragroup on-charging of services. The increase in on-charged site and administrative services in particular meant that these were higher than the prior-year forecast of € 1,366 million.

Net income was above the forecast level due to higher investment income and lower taxes in particular. Taken together, these more than offset the higher level of other financial expenses.

Forecast for 2024

Following the transfer of operating activities, net sales are becoming less relevant for Merck KGaA, Darmstadt, Germany, while the relevance of investment income as the largest income item is increasing. With this in mind, investment income is replacing net sales as a key financial performance indicator starting from fiscal 2023, and a forecast for the next fiscal year is provided below.

In line with the Group’s development, we expect investment income to see moderate growth compared with the figure recorded in fiscal 2023. Accordingly, net income is forecast to be slightly higher than in 2023 overall.

Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, will provide the company with sufficient financial resources as needed and thus ensure liquidity.

No risks that could jeopardize the continued existence of the company have been identified.