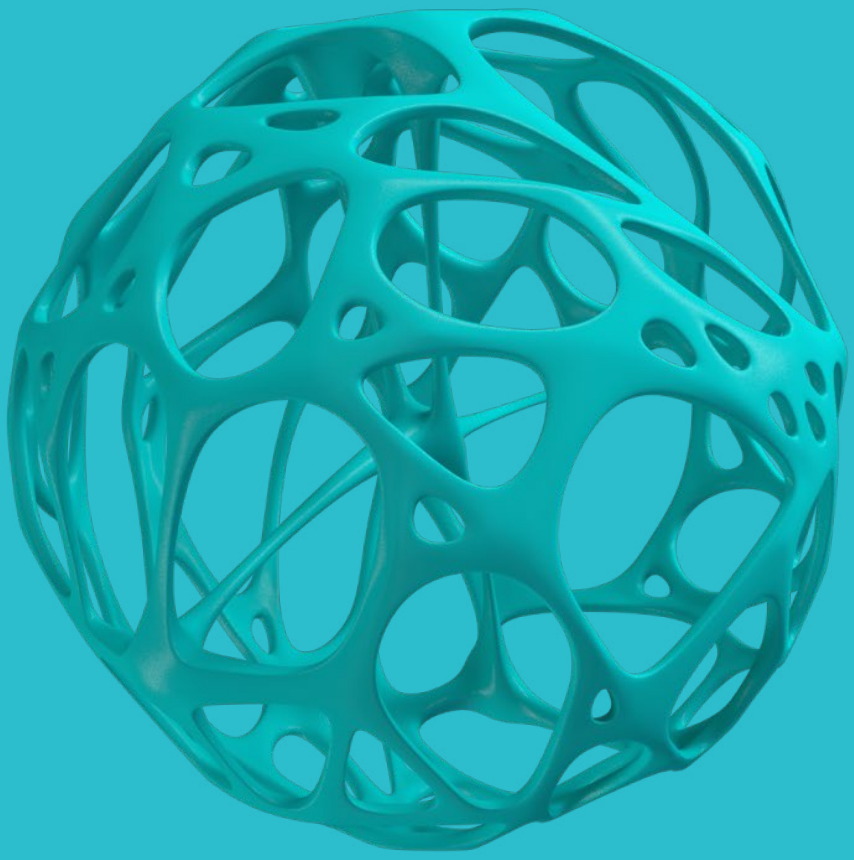
Merck KGaA
Darmstadt, Germany



Annual Report 2021

AT A GLANCE

A strong team

60,348
employees

142
nationalities

36%
women in leadership positions

Life Science
Together, we impact life and health with science.

Share of net sales **46%**

Share of EBITDA pre **50%**

Healthcare
We are helping to create, improve and prolong lives.

Share of net sales **36%**

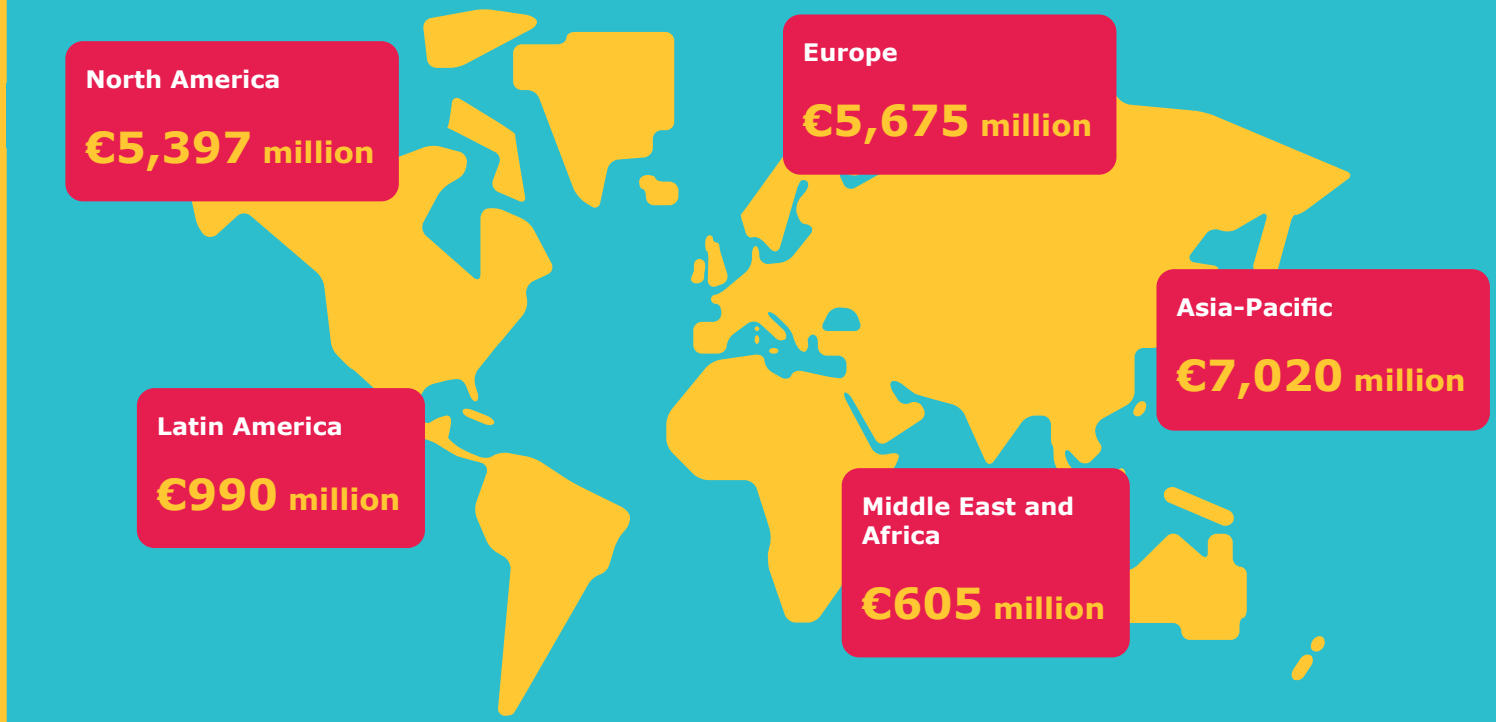
Share of EBITDA pre **33%**

Electronics
We are advancing digital living.

Share of net sales **18%**

Share of EBITDA pre **17%**

Net sales per region



KEY FIGURES 2021

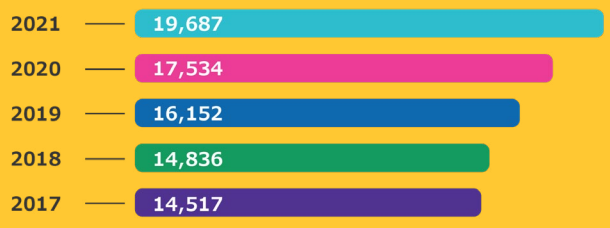
Group

€ million	2021	2020	Change € million	Change %
Net sales	19,687	17,534	2,152	12.3%
Operating result (EBIT)[1]	4,179	2,985	1,194	40.0%
Margin (% of net sales)[1]	21.2%	17.0%		
EBITDA[2]	5,946	4,923	1,023	20.8%
Margin (% of net sales)[1]	30.2%	28.1%		
EBITDA pre[1]	6,103	5,201	901	17.3%
Margin (% of net sales)[1]	31.0%	29.7%		
Profit after tax	3,065	1,994	1,071	53.7%
Earnings per share (in €)	7.03	4.57	2.46	53.8%
Earnings per share pre (€)[1]	8.72	6.70	2.02	30.1%
Operating cash flow	4,616	3,477	1,138	32.7%

[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.

Group

Net sales
€ million



Group

EBITDA pre[1]
€ million

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

Table of Contents

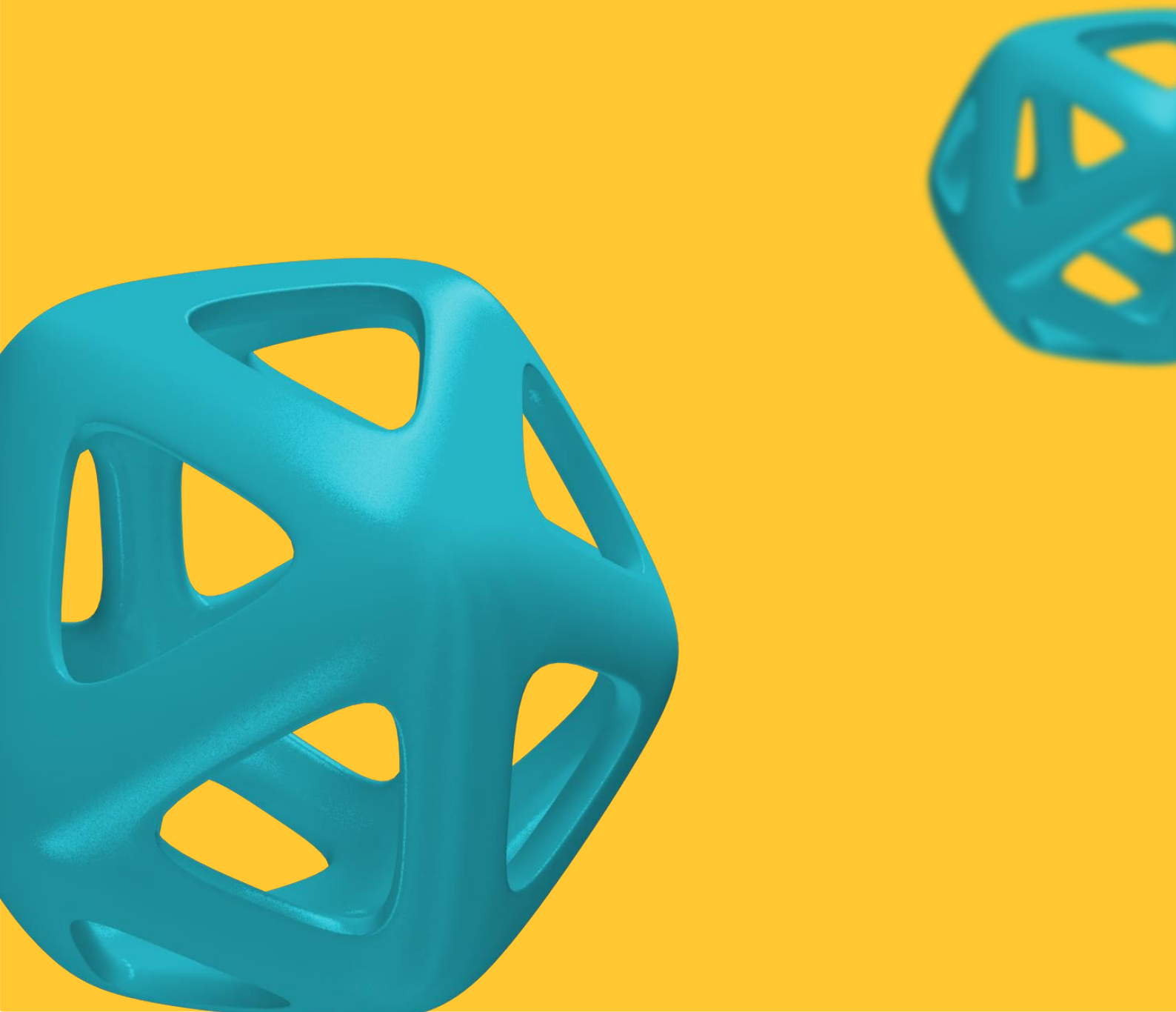
To Our Shareholders

Combined Management Report

Corporate Governance

Consolidated Financial Statements

To our shareholders



Dear shareholders, dear friends,

I am honored to address this letter to you for the first time as Chair of the Executive Board and CEO of our company. It fills me with tremendous pride to pursue our purpose – advancing human progress – together with our team of more than 60,000 curious minds worldwide. As we strive to write the next successful chapter in our company's 354-year history, we are working tirelessly to make our ambition of becoming the global 21st century science and technology pioneer a reality.

In 2021, we made a promising start on this important journey. We delivered excellent results across all three business sectors. Our company's 'Big 3'[1] growth drivers – Process Solutions in Life Science, new medicines in Healthcare, and Semiconductor Solutions in Electronics – led the way. At the same time, the safety of our global workforce continued to be our top priority in the face of the challenging environment created by the Covid-19 pandemic. And we succeeded yet again in avoiding significant disruptions to our supply chains and operations.

In Life Science, we empowered our 1.6 million customers to excel in fields such as scientific research and biotechnological manufacturing worldwide. Our strategic partnership with BioNTech is one example. In February 2021, we announced plans to accelerate the supply of urgently needed lipids, which are vital in the production of the Pfizer-BioNTech vaccine for Covid-19. We are one of a few companies in the world that are currently able to produce custom lipids in significant quantities. During the Covid-19 pandemic, we supported a total of more than 80 different vaccine developers to date along with numerous customers requiring solutions for research tools, diagnostics, and therapeutic products. By acquiring AmpTec, a leading mRNA contract manufacturing and developing organization based in Hamburg, Germany, we have further strengthened our capabilities to develop and manufacture mRNA for use in vaccines, treatments, and diagnostics. At the end of 2021, we also signed a definitive agreement to acquire Exelead, a biopharmaceutical contract development and manufacturing organization (CDMO). With the acquisition, we aim to provide our customers a unique and truly integrated offering across the mRNA manufacturing process.

[1] As of April 1, 2022, the Big 3 include the following businesses: Process Solutions & Life Science Services in Life Science, new Healthcare products and Semiconductor Solutions in Electronics.

Looking forward, our priorities are clear: We want to unlock our full potential to take us to the next level by creating superior value for our patients, customers, colleagues, and society.

Belén Garijo

Our global team also worked hard to meet increasing demand from Life Science customers in other areas. For example, we significantly expanded the capacity of our sites in France and the United States for highly durable plastic bioreactors known as single-use assemblies. We also enhanced capacity for monoclonal antibodies (mAbs) required for various medicines and vaccines.

Our Healthcare business has remained at the forefront of enabling innovative specialized medicines that can make a meaningful difference to patients worldwide. In 2021, the U.S. Food and Drug Administration (FDA) approved Tepmetko® as the first and only once-daily oral MET inhibitor for the treatment of adult patients with an aggressive form of lung cancer. This approval in the United States marked an important milestone in light of an increasing need for targeted treatments that have the potential to generate durable anti-tumor activity. In Neurology and Immunology, we generated significant growth thanks largely to Mavenclad®, which is now approved in more than 80 countries. Within Immuno-Oncology, sales of our oncology medicine Bavencio® more than doubled due to approvals as a first-in-line maintenance treatment for patients with advanced urothelial cancer.

Doing research also means accepting setbacks. Together with GlaxoSmithKline, we made a mutual decision in September 2021 to terminate our agreement on the investigational drug bintrafusp alfa. Mid-stage clinical trial data did not replicate the encouraging data observed in earlier studies. At the same time, our Healthcare pipeline remains very promising, focused on areas where we already have a strong position and knowledge base. We were pleased with important clinical advances made in 2021 for pipeline medicines to treat multiple sclerosis, head and neck cancer, as well as small-cell lung cancer.

Our Electronics business helped to serve the strong customer demand, especially from the semiconductor industry. This development is being driven by the rising adoption of digital technologies and highly impactful technology trends such as artificial intelligence, the Internet of Things, and 5G, resulting in exponential data growth. In light of our strong business performance, we announced the successful conclusion of our five-year Bright Future transformation program last September – two years ahead of schedule. At the same time, our teams in Electronics launched a new growth program called Level Up. Our goal is to capture the growth opportunities offered by significantly accelerating global demand for innovative semiconductor and display materials. Investments are an important building block for our ambitions. This is why we will invest significantly more than € 3 billion in innovation and capacities of our Electronics business sector by the end of 2025.

In addition to considerable ongoing investments in R&D, we have continued to significantly enhance our global electronics footprint. Plans for new or expanded sites for R&D and manufacturing were announced in all our relevant geographies, including China, Korea, Taiwan, Japan, the United States, and Germany, and in close proximity to our customers.

These are just a few examples of the numerous accomplishments we made in 2021. As our financial results show, we recorded an increase in organic sales of 13.8% over 2020, rising to a total of € 19.7 billion. EBITDA pre, the key financial indicator we use to steer our operating business, grew by 17.3% to € 6.1 billion. Our net financial debt fell from € 10.8 billion to € 8.8 billion. In 2021, our share price at year-end rose to € 227.00 after closing 2020 at € 140.35 – a fantastic development, from which you, our shareholders, will benefit once again. For 2021, we will propose to the Annual General Meeting a dividend of € 1.85, an increase of 32% compared with the previous year.

All this was only possible thanks to the efforts of our teams at our company worldwide. Their dedication and curiosity are a critical factor behind our successes. I would like to extend my sincere thanks to them on behalf of the entire Executive Board.

Looking forward, our priorities are clear: We want to unlock our full potential to take the company to the next level by creating superior value for our patients, customers, colleagues, and society. Acting from a position of strength, we aim to expand our science and technology leadership and mobilize the entire organization for accelerated, long-term efficient growth, also through focused and disciplined capital allocation.

Our new medium-term growth target can be summarized as ’25 by 25’: In short, we are aiming for around € 25 billion in Group sales by 2025. This will see us add more than € 1 billion in organic sales growth every year on average. Our ‘Big 3’ will continue to be the main growth engines, with approximately 80% of projected growth to be generated from these three businesses. To succeed, we are ready to invest over € 30 billion in targeted research and development, capital expenditure, and acquisitions from 2021 until 2025. These planned investments represent an increase of more than 50% compared with the prior five-year period.

In Life Science, we will continue to strengthen our core business while expanding further into high-growth segments. These include contract development and manufacturing activities for mRNA technologies, viral vectors and high potency active pharmaceutical ingredients. Our key strategic priorities will be complemented by an increased focus on business enablers, namely innovation, digital technology, resource allocation, and targeted investment.

Serving patients and focusing on unmet medical needs in everything we do will continue to drive our Healthcare business. We aspire to become a global specialty innovator to maximize the value that we bring to patients. We will continue to drive the profitable growth of our core business while delivering on the strong potential of our new products Mavenclad®, Bavencio® and Tepmetko®. We look forward to important clinical programs, for example for evobrutinib, xevinapant, M1231 or enpatoran, which are expected to help fuel our next wave of growth.

The transformation of our Electronics business has created one of the most relevant suppliers of materials and solutions for the semiconductor and display industries – and we are on track to further expand our position. This is why we will gear towards further enhancing our leading position in the electronic materials industry, driven by our investment plan and our Level Up growth initiatives. Much of this surge in investment is being done in close collaboration with leading global customers to support their own growth plans.

Overall, the continued long-term orientation that is anchored in our company’s roots is and will remain part of our corporate DNA. This holds true not only for our business ambitions, but also for the positive impact we aspire to make on society through our products, technologies, and services. We will emphasize sustainability throughout our value chains and have formulated ambitious goals for this. To step up our sustainability efforts, we introduced concrete targets for reducing greenhouse gas emissions, water consumption, and waste in 2021. These targets complement our ambitious sustainability strategy, which we presented at the end of 2020. It is also integrated into the compensation of the Executive Board, with well-defined sustainability targets included in the non-financial performance criteria.

We aim to empower everyone at our company to thrive and be their best in serving our customers and patients and in creating value for our owners and investors. This is why we are working hard to cultivate a workplace environment where integrity, inclusion, and equity are ingrained behaviors. To us, diversity is not an add-on, but a business priority. For example, the proportion of women in leadership roles increased to 36% at the end of 2021. We are now aiming for gender parity by 2030.

As you read this Annual Report, you will find a wealth of examples which underscore that we have what it takes to deliver on our ambitions! Together with my Executive Board colleagues, I am convinced that this company is taking the right steps to shape a successful future. Thank you for being a part of our journey. And most importantly, thank you for supporting us as shareholders.

Sincerely,

Belén Garijo
Chair of the Executive Board and CEO

The Executive Board

Kai Beckmann	**Peter Guenter**	**Belén Garijo**	**Matthias Heinzel**	**Marcus Kuhnert**
Member of the Executive Board	Member of the Executive Board	Chair of the Executive Board	Member of the Executive Board	Member of the Executive Board
CEO Electronics	CEO Healthcare	CEO	CEO Life Science	Chief Financial Officer

Short biographies

More information can be found at
www.emdgroup.com -> Company -> Who we are -> Management

Our Shares

At a glance

On the whole, the performance of our shares in 2021 was characterized by a strong increase in value. Our shares developed broadly in line with the relevant pharmaceutical industry index in the first half of the year. Starting from the end of June, our shares significantly outperformed the MSCI European Pharma Index as well as the DAX® and the relevant reference index for the chemical industry.

Following a correction in September that affected the S&P 500 Life Sciences Tools & Services Index to a similar extent, the shares again performed substantially better than all the relevant reference indices in October, November, and December.

With its share price rising by around 62% across the year as a whole, we clearly outperformed the DAX®, which closed on December 31 approximately 16% higher than at the start of the year. Our shares also closed 2021 up on the other relevant reference indices, which saw differing development over the course of the year.

The shares significantly outperformed the relevant reference index for the chemical industry, which saw full-year growth of around 23%. The pharmaceutical industry index rose by around 20% in 2021, meaning it was outperformed by our shares by 42 percentage points in the same period. Although the S&P 500 Life Sciences Tools & Services Index saw strong growth of around 39%, it was still bettered by the performance of our shares at around 62%.

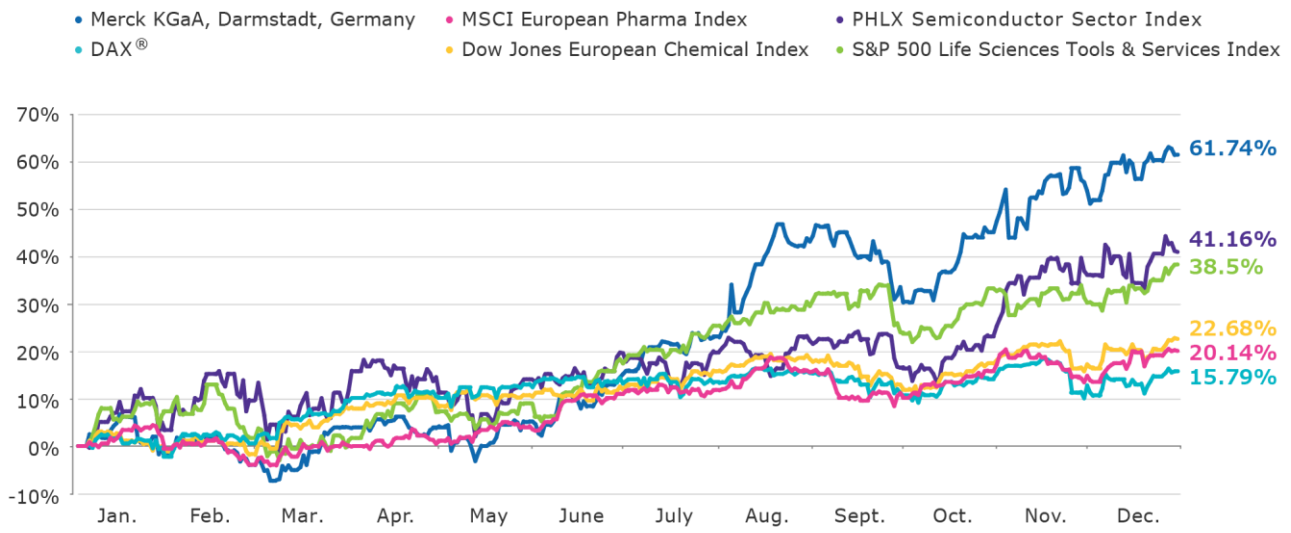
The extremely strong share price development compared with the indices was attributable to the considerable boost provided by products and services in connection with the Covid-19 pandemic, particularly in Life Science, as well as the excellent underlying financial performance in fiscal 2021.

Despite the restrictions that remained in place in 2021, our Executive Board and the Investor Relations team gave in-depth briefings in largely virtual form to more than 1,000 investors at investor conferences, as well as during roadshows and conference calls.

At approximately 346,000 shares per day, the average daily trading volume of our shares was down around 39% on the previous year, a development that should be viewed in light of the sharp rise in the share price. Europe accounted for the largest proportion of the free float in 2021, with its share remaining essentially unchanged at 48%. By investor type, growth investors and value investors dominated, as in the previous year. In 2021, the proportion of growth investors at the company increased slightly year-on-year to around 36% of the free float. The top five investors held around 22% of the free float at the end of 2021, down around two percentage points on the previous year.

Our shares

Share price development from January 1, 2021, to December 31, 2021, in %



Our shares

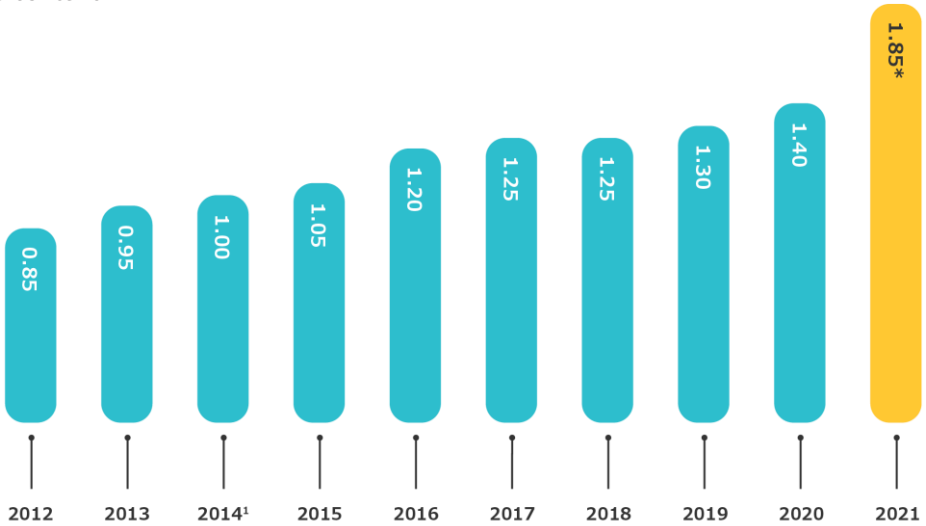
Key share price data[1]

		2021	2020
Dividend[2]	€	1.85	1.40
Share price high	€	229.40	140.35
Share price low	€	130.10	81.26
Year-end share price	€	227.00	140.35
Daily average number of our shares traded[3]	Number	346,230	566,911
Market capitalization[4] (at year-end)	€ million	98,695	61,021
Market value of authorized shares[5] (at year-end)	€ million	29,338	18,139

[1] Share price-relevant figures relate to the closing price in Xetra® trading on the Frankfurt Stock Exchange.
[2] 2021 dividend subject to approval by the Annual General Meeting.
[3] Based on the floor trading systems of all German exchanges and the regulated market on Xetra® .
[4] Based on the theoretical number of shares (434.8 million).
[5] Based on the number of shares in free float (129.2 million). Source: Bloomberg, Thomson Reuters.

Our shares

Dividend development since 2021



[1] Adjusted to the new number of shares after the share split (June 30, 2014)
* 2021 dividend subject to approval by the Annual General Meeting.

Identified investors by region as of November 2021

Source: Nasdaq Shareholder Identification; Total Shares Outstanding: 129.2 million

Identified investors by type as of November 2021

Source: Nasdaq Shareholder Identification

Combined Management Report*

* The management report of Merck KGaA, Darmstadt, Germany, has been combined with the Group management report and published in the 2021 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 2021 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 2021, 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 company 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 15d HGB in conjunction with section 289f (1) sentence 2 HGB is available at **https://www.emdgroup.com/en/investors/corporate-governance/reports.html**.
For reasons of better readability, we do not use gender-specific formulations in this annual report. The chosen male form represents all genders.

[1] German Commercial Code

Fundamental Information about the Group

The Group

We are a vibrant science and technology company. Science is at the heart of everything we do. It drives the discoveries we make and the technologies we create. We make a positive difference in the lives of millions of people every day.

The digital platform and the products and services in our Life Science business sector make precision research simpler and help speed up scientific breakthroughs. They enable quicker access to healthcare and ensure that analyses are accurate and medications are trustworthy. In the Healthcare business sector, we accompany people in every phase of their life and help them to shape, improve, and prolong it. We enable personalized treatments for serious illnesses and help many couples to realize their wish to have children. In our Electronics business sector, we are the company behind the companies, advancing digital living and changing the way we process information and make it available. Our innovations release the potential of data and open up possibilities for positively influencing the way we live.

Everything we do is fueled by a belief in science and technology as a force for good. It is a belief that has driven our work since 1668, and will continue to inspire us to find more joyful and sustainable ways to live, because we are curious minds dedicated to human progress.

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 EMD Serono in the healthcare business, as MilliporeSigma in the life science 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, and the Middle East and Africa. As of December 31, 2021, we had 60,348 employees worldwide[1]. The figure as of December 31, 2020 was 58,127 employees.

Important developments at Group level

Peter Guenter was appointed to our Executive Board effective January 1, 2021. He is responsible for the Healthcare business sector.

The Performance Materials business sector was renamed Electronics effective March 4, 2021. The new name is the visible result of the strategic realignment conducted over the past several years and underscores the current role of the business sector as one of the leading solutions providers on the electronics market.

Matthias Heinzel was appointed to our Executive Board effective April 1, 2021. He is responsible for the Life Science business sector.

Belén Garijo took over from Stefan Oschmann as Chair of the Executive Board effective May 1, 2021.

[1] The Group also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

Our response to Covid-19*

As a science and technology company, we are convinced that we can help combat the global challenges resulting from Covid-19. Our top priority is ensuring the health and safety of our employees and their families and continuing our business activities for the benefit of the many patients, scientists, and customers who depend on us.

We continued to engage in combating Covid-19 in 2021, including accelerating the supply of urgently needed lipids as part of our strategic partnership with BioNTech and comprehensively expanding our production capacities for technologies and solutions that are required for the manufacture of Covid-19 vaccines and treatments.

To date, our products and services have supported more than 80 vaccine developers, more than 35 solutions for testing, and more than 50 monoclonal antibodies, plasma products, and antiviral drugs.

For more information on how we are contributing to address the global challenges posed by Covid-19, see the following sections on our Life Science and Healthcare business sectors. We have also compiled a detailed overview on our website: **https://www.emdgroup.com/en/company/press/press-kits/corona-pandemic.html**.

Life Science

We are a leading, global supplier of tools, research-grade chemicals, and equipment for academic labs, biotech and biopharmaceutical manufacturers, and the industrial sector. Together with our customers, our purpose is to positively impact life and health with science. With a strong focus on innovation, we are committed to delivering the products, services, and digital platforms to create a sustainable future for generations to come.

Across our Research Solutions, Process Solutions, and Applied Solutions business units, we collaborate with the global scientific community to deliver breakthrough innovations along with a broad and deep portfolio of more than 300,000 products.

Research Solutions provides customer solutions to scientists in academic institutions, government labs, research hospitals, pharmaceutical, R&D, and biotech organizations, empowering their efforts to accelerate science.

Process Solutions provides biopharmaceutical manufacturers with process development expertise and technologies, supporting them to develop and manufacture drugs safely, effectively, and cost efficiently. Our biopharmaceutical customers look for expertise and products to improve every step of their manufacturing process, while biotech startups look for holistic support to build and scale up their manufacturing. With approximately 25,000 products and services – including single-use manufacturing, filtration, chromatography and purification, virus reduction, pharma and biopharma raw materials, drug delivery compounds, and engineering and validation services.

In Applied Solutions, we aim to improve health across many areas of daily life with diagnostic solutions to ensure the safety of vaccines and other life-saving therapies as well as provide testing services to identify contaminants in food, air and water. We supply products and workflow solutions that streamline processes, lower costs and deliver consistent, reliable results for diagnostic, testing and industrial customers, with 62,000-plus products and services that include lab water instruments for water purification, consumables and services, microbiology and bio-monitoring, test assays, analytical reagents, and flow cytometry kits and instruments.

In 2021, Life Science generated 46 percent of Group sales as well as 50 percent of EBITDA pre (excluding Corporate and Other).

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

Our Response to Covid-19*

We are helping to respond to the Covid-19 pandemic with products and solutions that empower scientists to detect and characterize viruses and to develop and manufacture vaccines and therapies. We are committed to providing the necessary research tools and reagents, manufacturing processes and production products to aid the global scientific fight against this novel virus. We continue to support many of our customers working on Covid-19 projects through our products and services, providing for more than 35 testing solutions across RT-PCR, antigen, and antibody diagnostics for both high-throughput centralized and distributed point-of-care settings; more than 80 different vaccine programs, consisting of several platforms that include DNA, Inactivated, Live Attenuated Virus, Viral Vector, Protein Subunit and mRNA; and more than 50 monoclonal antibodies, plasma-derived products and antiviral treatments. Additionally, through our eCommerce platform, **www.sigmaaldrich.com**, we provide a one-stop shop of more than 200 of the most commonly-used products and corresponding information for academic labs and biopharmaceutical companies working on Covid-19 diagnostic tests, vaccines and treatments.

We have also tapped into existing collaborations to support projects that target Covid-19 vaccine and therapy development. We have extended our partnership with BioNTech, for which we supplied key materials for their manufacturing platforms with a focus on therapies for cancer; today, we supply lipids for the drug delivery of BioNTech's mRNA-based Covid-19 vaccine, which is now approved for use in many countries.

As the pandemic continues, a global task force actively evaluates the overall supply chain of both products and key raw materials suppliers to mitigate any potential disruption. Leveraging business continuity plans, we remain dedicated to serving our customers in all markets. Protocols and guidelines have been set to minimize the impact to supply. Our 52 manufacturing sites and more than 100 distribution centers around the world remain operational to ensure that customers have the products and services they need to support the health of a global population.

Throughout all of this, we follow guidance outlined by the WHO, CDC and governments of impacted countries, and our global sites have relevant and approved preparedness plans and are empowered to act per their local scenarios, as necessary.

Research Solutions*

In 2021, we continued to collaborate with customers around the world to advance scientific progress.

Mid-year, we launched our new e-commerce platform with a simplified learning and buying journey on **www.sigmaaldrich.com**. The site was built to support an optimized experience for more flexible digital access. We introduced customers to an updated look and feel, enhanced mobile capabilities, faster and more reliable website performance, as well as features like self-serve order status and product ratings and reviews. In alignment with our long-term e-commerce strategy to leverage **www.sigmaaldrich.com** as a scalable growth driver and the destination for our life science community, we are leveraging our new website architecture so that we may continue to improve the customer experience more rapidly and flexibly in the future. In 2021, we supported more than 26 million global users in over 77 million sessions, with total e-commerce sales growing 22.4% over the previous year, totaling more than € 1.45 billion.

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Process Solutions*

A key goal for our Life Science business sector is to support our customers that manufacture drugs, from small to large innovator companies, bring safe and effective life-enhancing therapies and vaccines to millions of patients around the world. To that end, we continued to leverage strategic opportunities to enhance our capabilities and expand our products and services offering.

In January, we announced the acquisition of AmpTec GmbH, a leading Hamburg, Germany-based, mRNA contract development and manufacturing organization, to strengthen our capabilities to develop and manufacture mRNA for customer use in vaccines, treatments and diagnostics applicable in Covid-19 and many other diseases.

In February, we announced the further expansion of our strategic partnership with BioNTech SE, Mainz, to accelerate supply of urgently-need lipids used for the production of the Pfizer-BioNTech vaccine (BNT162b2).

Also, in February, we also announced an agreement with Alteogen, Inc., of South Korea, to provide late-stage Contract Development and Manufacturing organization (CDMO) services through our BioReliance® End-to-End Solutions to develop and produce recombinant biologics used in the development and clinical evaluation of next-generation therapeutics from monoclonal antibody drugs.

In May, we launched a new, high-purity synthetic cholesterol product to meet the high demand for lipids, a key component of mRNA-based vaccines and therapeutics. Under the SAFC® brand of products, this launch occurred nine months ahead of schedule and increases capacity by the factor 50. We are one of a few companies that produces lipids in quantities needed to meet demand for mRNA therapeutics, including the Pfizer-BioNTech Covid-19 vaccine.

In October, we launched two new technologies to advance antibody-dug conjugates (ADC) therapies. These initiatives underscore our continued investment in novel modalities and support our efforts to double our ADC and high-potent active pharmaceutical ingredient (HPAPI) capacity in the near future. With the launch of the ChetoSensar™ technology, we are working to address the hydrophobicity of ADCs. The new Dolcore™ platform significantly reduces the development and time required to manufacture ADCs, increasing speed-to-market for a novel Dolostatin-based ADC payload by up to a year.

Applied Solutions*

In January, we launched the new Milli-Q® EQ 7000 Type 1 water purification system to expand our benchtop ultrapure water system portfolio. The new Milli-Q® EQ 7000 system produces consistent ultrapure water quality that is easily customized to experimental requirements, strengthening our Milli-Q® ultrapure water offering.

In December, the U.S. government awarded a € 121 million contract for the construction of a lateral flow membrane production facility, over a three-year period, at our site in Sheboygan, Wisconsin, United States. The contract, received from the U.S. Department of Defense, on behalf of the U.S. Department of Health and Human Services, is part of an effort to ensure secure local supply and production capacity for critical products for pandemic preparedness.

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

Investments to expand capabilities and production*

In March, we announced the acceleration of our European expansion plans by adding a single-use assembly production unit at our site in Molsheim, France. With the € 25 million investment, we are responding to the unprecedented global demand of this key technology, which is used for the production of Covid-19 vaccines and other lifesaving therapies.

In June, we announced an investment to strengthen our development and production of monoclonal antibodies and other life-saving medicines and vaccines. This includes € 50 million to strengthen bioproduction activities at our site in Martillac, France, involving the creation of 150 jobs until 2024. Combined with our investment in Molsheim, France, these expansion plans are part of an ambitious multi-year program aimed at expanding the industrial capacities of our business sector to meet growing global demand for life-saving drugs and make a significant contribution to global public health.

In October, we announced the opening of our second Carlsbad, California, United States-based facility, significantly expanding our global Contract Development Manufacturing Organization (CDMO) footprint. This new € 100 million, 13,000 square meter facility will more than double our existing capacity to support large-scale commercial and industrial manufacturing for viral gene therapy, in a market expected to grow to € 9 billion by 2026.

Healthcare

Healthcare discovers, develops, manufactures, and markets innovative pharmaceutical and biological prescription drugs to treat cancer, Multiple Sclerosis (MS), infertility, growth disorders, and certain cardiovascular and metabolic diseases. Healthcare operates across four therapeutic areas: Neurology and Immunology, Oncology, Fertility, and Cardiology Metabolism & Endocrinology with a clear ambition to become a global specialty innovator. Our R&D pipeline positions us with a clear focus on strengthening our leadership positions in oncology, neurology, and immunology.

Since the start of the Covid-19 pandemic, we have been continuously making every effort to proactively handle the situation and minimize the impact of the pandemic on the supply of our medicines locally and globally through three main levers: the thorough implementation of our business continuity plans across our network, the active management of our stocks, and the assessment of alternative transportation routes to reach our customers and patients.

In 2021, Healthcare generated 36% of Group sales and 33% of EBITDA pre (excluding Corporate and Other). Europe and North America generated 55% of Healthcare’s net sales in 2021. In recent years, we have steadily expanded our presence in growth markets. In 2021, Asia-Pacific and Latin America accounted for 38% of sales.

Neurology & Immunology*

We have a long-standing legacy in neurology and immunology including more than two decades of experience in Multiple Sclerosis (MS), and are committed to people living with neuroinflammatory and immune-mediated diseases by focusing on finding solutions addressing unmet medical needs. Our current MS portfolio includes two approved products for the treatment of relapsing MS (RMS) – Rebif® (interferon beta-1a) and Mavenclad® (cladribine tablets). In addition, we have our investigational MS treatment evobrutinib, which is the first Bruton´s tyrosine kinase (BTK) inhibitor to complete Phase III trial enrollment.

In March of this year, French Health Authorities approved Mavenclad® and made it available and reimbursed for people living with MS in France. With this, Mavenclad® is now approved in more than 80 countries worldwide, including those of the European Union, Switzerland, Australia, Canada and the United States. We view

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Mavenclad® as a complementary oral treatment option in our MS product portfolio. Rebif®, a disease-modifying drug used to treat RMS, is and remains a well-established therapy. Rebif® has been a standard treatment in RMS for more than 20 years and has more than 1.6 million patient-years of therapy since approval.

Generating data around our MS treatments and the risk of respiratory viral infections has remained important also this year, helping to support clinicians as they make treatment decisions for their patients living with MS. In February, we presented new data from the MAGNIFY-MS study at the Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS) Forum 2021 (for further details see "**Research & Development**").

Further data relevant for treatment during Covid-19 were presented at the 2021 American Academy of Neurology (AAN) Annual Meeting in April (for further details see "**Research & Development**").

In May, we announced the completion of an out-licensing agreement with MoonLake Immunotherapeutics AG for sonelokimab (M1095) (for further details see "**Research & Development**").

We presented a total of 39 abstracts at the 37th Congress of the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) in October (for further details see "**Research & Development**").

New evobrutinib data were also presented at ECTRIMS, showing that evobrutinib was effective reducing the volume of slowly expanding lesions (SEL), an imaging biomarker of chronic active inflammation and axonal loss within the central nervous system (CNS), making it the first BTK inhibitor to show a significant effect on this biomarker (for further details see "**Research & Development**").

In December we announced a strategically focused expansion of our neuroinflammatory pipeline with the acquisition of the rights to develop cladribine for the treatment of generalized myasthenia gravis (gMG) and neuromyelitis optica spectrum disorder (NMOSD).

Oncology*

Erbitux® (cetuximab) is the best-selling drug in terms of revenue in the portfolio of our Biopharma business and is our flagship product in oncology. Treating more than 1 million patients since authorization, the product is a standard of care for patients with epidermal growth factor receptor (EGFR)-expressing, RAS wildtype metastatic colorectal cancer (mCRC), as well as both recurrent and/or metastatic and locally advanced squamous cell carcinoma of the head and neck (SCCHN).

Together with Pfizer Inc., we have made progress in sharing new data, obtaining additional regulatory approvals and reimbursement decisions with our anti-PD-L1 antibody Bavencio® (avelumab) (for further details see "**Research & Development**").

On January 25, the European Commission approved Bavencio® monotherapy for the first-line maintenance treatment of adult patients with locally advanced or metastatic urothelial carcinoma (UC) who are progression-free following platinum-based chemotherapy. This follows the approval of Bavencio® for this indication by the US Food and Drug Administration (FDA) in June 2020. Bavencio® is now approved as a first-line maintenance treatment for advanced UC in 39 countries and 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 setting.

Other highlights from our development pipeline included the advancement of several potential first-in-class/best-in-class compounds. The development program for tepotinib, our oral MET inhibitor designed to inhibit the oncogenic MET receptor signaling caused by *MET* (gene) alterations, has continued to achieve several milestones in 2021. Discovered in-house at our company, tepotinib underscores our strategic focus on delivering innovative precision medicines to patients with cancer.

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On February 3, tepotinib was approved by the US Food and Drug Administration (FDA) with the brand name Tepmetko® (tepotinib) following Priority Review for the treatment of adult patients with metastatic non-small cell lung cancer (NSCLC) harboring mesenchymal-epithelial transition (MET) exon 14 skipping alterations. Tepmetko® is the first and only FDA approved MET inhibitor that offers once-daily oral dosing and is administered as two 225 mg tablets (450 mg). This indication was approved under accelerated approval based on overall response rate and duration of response. Continued approval for this indication may be contingent upon verification and description of clinical benefit in confirmatory trials. In December 2021, Tepmetko became the first and only oral MET inhibitor to receive the Committee for Medicinal Products for Human Use (CHMP) positive opinion in Europe for adult patients with advanced NSCLC harboring alterations leading to METex14 skipping. Tepotinib is available in a number of other countries, and under review by various other regulatory authorities globally.

On September 30, we announced a mutual decision to end the global strategic alliance with GSK to develop bintrafusp alfa, the investigational bifunctional fusion protein designed to simultaneously block TGF-β and PD-L1. This decision was based on the clinical trial data generated to date, including three randomized clinical trials that did not demonstrate a benefit to patients. Based on these findings, several remaining studies in the program were also discontinued, including those in non-small cell lung cancer, triple negative breast cancer, biliary tract cancer, and bladder cancer. Based on the data generated during the agreement, no milestone payments were made by GSK and no future milestone obligations remain (for further details see "**Research & Development**").

Our broad portfolio of small-molecule DNA Damage Response (DDR) inhibitors represents multiple development paths as monotherapies or in combination with immunotherapy, chemotherapy or radiotherapy On April 12, we announced initiation of a Phase II trial with registrational intent for berzosertib, the leading asset in our DNA damage response (DDR) inhibitor development program, to further assess berzosertib in combination with topotecan for the treatment of relapsed, platinum-resistant small cell lung cancer (SCLC) (DDRiver SCLC 250). The berzosertib clinical development program is one of the most advanced Ataxia telangiectasia and rad3-related (ATR) inhibitor development programs industry-wide (for further details see "**Research & Development**"). Berzosertib, formerly known as VX-970, was licensed from Vertex Pharmaceuticals in 2017.

To augment the in-house innovations in our oncology portfolio with potential new solutions for patients with cancer, we entered a worldwide in-licensing agreement with Debiopharm, Lausanne, Switzerland, for the worldwide development and commercialization of xevinapant (Debio 1143), announced in March 2021. Xevinapant, a potent oral antagonist of Inhibitor of Apoptosis Proteins (IAP), is the only medicine in its class in late-stage clinical development and has the potential to be first in class. Xevinapant is currently being investigated in the **Phase III TrilynX study** for previously untreated high-risk locally advanced squamous cell carcinoma of the head and neck (LA SCCHN), in combination with platinum-based chemotherapy and standard fractionation intensity-modulated radiotherapy. A second global Phase III study will be initiated in the first half of 2022 to evaluate xevinapant in patients with cisplatin-ineligible LA SCCHN.

Fertility*

As the global market leader in fertility drugs and treatments, our fertility franchise is an important growth driver for our Biopharma business. To date, over 4 million babies have been born with the help of GONAL-*f*®[2], a leading therapeutic within our fertility portfolio.

Infertility continues to represent an increasing challenge globally due to demographic changes and ongoing lifestyle adjustments like delayed childbearing. Despite the challenges we and our customers faced as a result of the Covid-19 pandemic, there was positive progress across our fertility portfolio in 2021 from launches to congress presentations and data studies. Overall, our fertility business has bounced back, making an exceptional contribution to the overall performance of our Healthcare business in 2021.

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[1] Chua, SJ, et al. Reprod Biol Endocrinol. 2021;19(1):1-13

During the Covid-19 pandemic, we further supported patients with advancing their treatment at home with the release of our Gonal-f® (follitropin alfa) 150 IU pen. In 2021, it was launched in Portugal, Finland and Poland, and we expect the first regulatory approvals in the APAC (Asia Pacific) region soon. A series of studies conducted with fertility patients and nurses highlighted both the ease of use and the patient-friendliness of our Gonal-f® pen.

Our Pergoveris® pen is the first product with a combination of recombinant follicle-stimulating hormone (r-hFSH) and recombinant luteinizing hormone (r-hLH) in a ready-to-use liquid version, eliminating the need for mixing. This makes it a suitable treatment option for women with severe FSH and LH deficiency. In Q3 2021, the Pergoveris® Pen was successfully launched in India, Mexico and Ecuador and is now available in 44 countries. Launches around the globe will continue in order to provide patients with access to this therapeutic.

Cardiology Metabolism & Endocrinology (CM&E)*

Every day, more than 90 million patients around the world use our trusted Cardiology Metabolism & Endocrinology (CM&E) medications. Concor®, Euthyrox®, Glucophage®, and Saizen® are highly valued brands and market leaders in many key markets worldwide. As a result, CM&E is the largest business franchise of the Healthcare business sector in terms of sales, with strong growth in all major therapeutic areas of focus, contributing significantly to our overall profitability. Although no longer patent-protected, the brand equity of our products, built up over decades, makes them cornerstones for the treatment of chronic cardiovascular, metabolic, and endocrine diseases.

Concor®/Concor Cor®, containing bisoprolol, is the leading beta-blocker worldwide in volume shares for treating hypertension and cardiovascular diseases such as coronary heart diseases and chronic heart failure. In addition to the plain preparations, the Concor® family offers fixed-dose combinations such as Concor Plus®/Lodoz® (bisoprolol with hydrochlorothiazide) and Concor AM® (bisoprolol with amlodipine).

Euthyrox®, with the active ingredient levothyroxine, is the worldwide market leader 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 the drug of choice for first-line treatment of type 2 diabetes available in more than 100 countries. During 2021, multiple health authorities worldwide continued to approve Glucophage® in prediabetes when intensive lifestyle changes have failed. This indication for Glucophage® is now registered in 89 countries. Overall, considering the high prevalence of prediabetes and diabetes, we continue seeing great potential for Glucophage®.

Saizen®, with its active ingredient somatropin, is our main endocrinology product and is indicated for the treatment of growth hormone deficiency 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 Easypod® Connect, making it easier for healthcare practitioners and patients to manage adherence and helping to reach their treatment goals. Aluetta® (the new Saizen® pen) is now available in 28 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 differentiate ourselves from competitors through leadership in the eHealth space, both by building evidence and by leveraging the meaningful use of technology to provide new solutions for patient engagement, partnership with healthcare practitioners and better payer value proposition.

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Electronics

We are the company behind the companies, advancing digital living. Our primary focus is on the electronics market with our materials and solutions changing the way we generate, access, store, process, and display information. In addition, our highly specialized, application-driven Surface Solutions business makes life more colorful. The business sector consists of three business units: Semiconductor Solutions, Display Solutions, and Surface Solutions. Comparing Electronics with a smartphone, Display Solutions represents the user interface, Semiconductor Solutions the intelligence, and Surface Solutions the aesthetics. We offer innovative solutions especially for the electronics industry – for microchips and displays – and for surfaces of every kind.

As part of our transformation program Bright Future, we repositioned ourselves and developed into a leading player in the global electronic materials market. At our Capital Markets Day on September 9, we announced the successful conclusion of our five-year Bright Future transformation, originally scheduled to take five years, two years ahead of schedule and introduced our new growth program Level Up. We seek to capture the growth opportunities that come with the significantly accelerating global demand for innovative semiconductor and display materials. This demand is driven by exponential data growth and highly impactful technology trends such as the Internet of Things and 5G. As a result, we upgraded our top-line guidance for the second consecutive time since the launch of Bright Future. As we shift from transformation into an execution and growth phase, we are aiming for an organic compound annual growth rate of 3% to 6% between 2021 and 2025.

On September 20, we announced our plans to invest significantly more than € 3 billion in innovation and capacities until the end of 2025. These investments are an essential part of the new Level Up growth program. Within the scope of the program, we are addressing four mutually reinforcing key priorities: Scale, Technology, Portfolio, and Capabilities. We are investing in digital business models and data analysis competencies, as well as expanding our production and innovation capacities and footprints in close proximity to our customers. In addition, we will continue to evaluate external growth options, made possible by potential targeted bolt-on acquisitions. We will also invest further in our people and the capabilities required to enable the future growth trajectory.

Electronics accounted for 18% of Group sales in 2021, and its share of EBITDA pre (excluding Corporate and Other) was 17%. The EBITDA pre margin was 31.3% of net sales.

Semiconductor Solutions*

Semiconductor Solutions is at the heart of Electronics and is enabling the digital transformation in communications, mobility, and healthcare. As almost every electronic device uses one of our products, we are advancing virtually every aspect of digital living. We are developing solutions for smaller, faster, and more powerful devices. Semiconductor Solutions is the largest business unit in terms of sales within Electronics and offers materials, delivery systems, and services for the semiconductor industry. The overall semiconductor market is seeing strong growth with the rising adoption of digital technologies driven by recovering automotive markets and increasing smartphone demand amid wider availability of 5G networks.

The Semiconductor Materials business supplies products for every major production step in wafer processing, including doping, patterning, deposition, planarization, etching, and cleaning. Specialty cleans, photoresists, and conductive pastes for semiconductor packaging round off the portfolio. Our business fields are Thin-Film Solutions, Specialty Gases, Planarization, and Patterning Solutions. Intermolecular is our center for complex material solutions in Electronics, located in San Jose, California, USA. There, we explore, test, and develop combinations of advanced materials for next-generation electronics. Compared to conventional methods, our

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approach provides significant time savings in the material development process, faster learning cycles, and detailed findings on new material combinations to provide a unique service for customers.

The Delivery Systems & Services business develops and deploys reliable delivery equipment to ensure the safe and responsible handling of gases and liquid materials with the highest quality and safety standards for electronic manufacturers.

Display Solutions*

Our Display Solutions business unit includes the businesses Liquid Crystals (LC), Organic Light-Emitting Diodes (OLED), Photoresists, Smart Antenna and Liquid Crystal Glazing. We support our display customers in developing novel display technologies and product concepts for applications, while also addressing new requirements that have emerged from the Covid-19 pandemic. With the proliferation of multiple applications and display trends, the display industry's technological requirements are significantly expanding. We are in a leading position to develop required new display materials and technology concepts to contribute to the diverse display landscape. We are active in the development of a broad range of display materials, including LCs, OLED, Quantum Dots Pixel Color Converters, and Display Patterning Materials (DPM).

In Liquid Crystals, we continue to see very dynamic market developments. Covid-19 has accelerated the market shift towards China and increased competition. We maintained our position as the technology leader 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. Our low-temperature processable positive tone photoresists are widely used to pattern on-cell touch sensors. These sensors enable a thinner display structure, which is crucial for foldable devices. Our Liquid Crystal Glazing business is receiving an increasing number of commercial orders for eyrise® i350 invisible privacy glazing. The transparent dynamic liquid crystal glass partitions can be switched on demand to create private spaces in public and commercial venues. In October, AVUS (automobile traffic and training road) in Berlin, Germany, celebrated the reopening of its main building which now displays a full eyrise® s350 Solar Shading facade. In September, we presented our Smart Antenna technology together with our development partners ALCAN Systems and NexTenna at SATELLITE 2021, the largest tradeshow in the satellite industry. Our LC-based technology licriOn™ enables extensive connectivity access, even in remote areas where fast internet connections are unavailable or unaffordable today.

Surface Solutions*

The core markets for Surface Solutions are automotive coatings, cosmetics, and, to a smaller extent, industrial applications. We are serving these markets with functional and decorative solutions. Our main focus is on proactive solution development in close cooperation with our customers as well as expanding our portfolio through innovation in all areas. We provide our customers with solutions that help them to create innovative surfaces of all kinds. Our materials enable more beautiful, more resistant, and more effective product designs. Our pearlescent pigments allow striking automotive coatings, fascinating cosmetics, extraordinary packaging, and innovative product design. With a broad portfolio of active ingredients, we enable cosmetics manufacturers to enrich their skin care products with moisturizing, protecting, and anti-aging effects. Moreover, with our functional solutions we serve a large number of innovative applications, from dirt-repellent and easy-care surfaces to laser markings of plastic parts and cables.

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Strategy*

Strategy fundamentals

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. As a company, we have a strong foundation. These fundamentals have been defined by the Merck family. We always take them into consideration when discussing and deciding on our Enterprise strategy.

- We follow a risk diversification strategy with three distinct business sectors, and we avoid overexposure to any single customer, industry, or geography. We ensure resilience against business disruption and deep crises.
- With our science and technology focus, we want to be leaders in our fields of expertise and markets, always pushing the boundaries to find new solutions and drive innovation. We aim to create value for our business and for society.
- We continue to operate under our current ownership with the Merck family as the majority owner.
- We deliver sustainable value, and we want to maintain an attractive financial profile (for example, a strong credit rating) while assessing and considering the ESG (environmental, social, governance) impact of our growth ambition.
- Mergers and acquisitions (M&A) are an important driver of our long-term value creation strategy with a focus on innovation-driven technology.

Enterprise strategy

Our ambition

Our ambition is to become the global 21st century science and technology pioneer, and we have four key priorities to deliver on this ambition.

- Mobilizing for Efficient Growth
- Leveraging Innovation in the "Big 3"[1]
- Driving Culture & Leadership
- Focusing on Sustainability

In all three business sectors – Life Science, Healthcare and Electronics – the course has been set for sustainable, profitable growth.

For the Life Science business sector, we expect in the medium-term growth forecast average organic sales growth of 7% to 10%[2] per year. The main driver will be Process Solutions, contributing around 80% to the planned growth.

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[1] As of April 1, 2022, the Big 3 include the following businesses: Process Solutions & Life Science Services in Life Science, new Healthcare products and Semiconductor Solutions in Electronics.

[2] Including an expected decline in pandemic-related demand

In the Healthcare business sector, we expect medium-term average annual organic sales growth in the mid-single-digit percentage range. New products should contribute around 75% to growth in the coming years up to 2025.

The Electronics business sector is now aiming to grow organically by 3% to 6% per year on average between 2021 and 2025. The Semiconductor Solutions business is to contribute around 80% to the planned growth of Electronics in the coming years.

We will continue to consistently and purposefully invest in areas that make us strong and thus aim to increase our Group sales to approximately € 25 billion by 2025. We expect Group sales to grow organically by more than 6% annually on average up to 2025. Around 80% of the planned sales growth is to come from the "Big 3" businesses – the Process Solutions business within the Life Science business sector, new products from the Healthcare business sector, as well as the Semiconductor Solutions business within the Electronics business sector.

Thanks to the rapid reduction of net financial debt, our financial flexibility is increasing significantly. For this reason, we are planning to increase total investments between 2021 and 2025 by more than 50% compared with the period from 2016 to 2020. More than 70% of this is to be invested in the "Big 3."

We will look into novel transformative technologies beyond our core products and markets while keeping in strategic proximity to our business sectors to leverage our existing assets and capabilities. Our new Group Science & Technology Office is leading the implementation of our combined strategy for innovation and "data & digital," enabling innovation across our business sectors while harnessing the power of cutting-edge data and digital capacities. It aims to identify and integrate transformative technology trends into our business sectors while maintaining a company-wide view of our tech roadmap and innovation portfolio.

We are paying particular attention to the ability of our organization to best support future growth by further developing our operating model to enable new ways of working and even quicker decision making. Moreover, our focus is on the areas of talent development and leadership culture as well as diversity and inclusion. Our voluntary aim is to achieve gender parity in leadership positions by 2030. We are also constantly working to increase efficiency regarding processes and systems as well as continuing to emphasize a culture of cost consciousness.

We have made clear progress on our sustainability strategy, incorporating sustainability even more strongly as an essential component of our corporate strategy and all company processes. For example, we have set ourselves the goal of becoming climate neutral by 2040. The Executive Board has now decided that the company will join the Science Based Targets initiative. With this step, we have committed ourselves to helping achieve the Paris Agreement goals through concrete actions.

Business strategies

Life Science

Our Life Science business sector continues to be a global leader in the ~€ 190 billion life sciences industry, consistently delivering profitable growth through a broad, differentiated portfolio, close customer relationships, solid foundational capabilities, and a well-established global footprint. These attributes, and our response to Covid-19, have strengthened our position as a trusted name and market player.

We also recognize that the life sciences are continuously evolving, with intensifying competition and key growth trends gaining momentum. To sustain our position and deliver profitable growth in the range of 7% to 10%, we have sharpened our strategic focus with a robust, multi-layered plan to achieve significant growth and profitability over the next decade.

Our plan is ambitious, with deep and far-reaching impact. Each business and function within our organization will play a critical role in executing this strategy with a rigid focus. Our newly formed Transformation Office will ensure a consistent, integrated, and milestone-driven approach. We will enhance our performance, further elevate our position as a life sciences leader and, together with our customers, impact life and health with science.

To ensure we remain differentiated as our customers' needs and expectations evolve, we will build our strong positions in consumables, capitalize on large-volume opportunities, and strengthen our go-to-market approach in academia and the Contract Research Organization area. We will augment our Lab Water business through innovation and expand our pharma QC testing offerings to biologics and novel modalities. We will continue to support products for traditional modalities, such as mAbs and high-potency-APIs as we move toward regionally-balanced manufacturing for high-growth areas like single-use and filtration.

To achieve this, we will add physical capacity and expand our manufacturing network in certain regions to grow key portfolios, leverage customer proximity and reduce business manufacturing risk. This is critical to meet the massive demand surge for our Covid-19 response while ensuring the same emphasis on the many other life-saving therapies we support. We will continue to expand in high-growth segments by building scale in attractive areas currently under-penetrated. This means investing ahead of the curve and setting the standard in new segments as they mature. For example, we will significantly scale up contract development and manufacturing organization (CDMO) activities for antibody-drug conjugates (mAbs), viral vectors, and high-potency APIs. We will also expand further into mRNA.

As we do this, we will develop new business models in areas like services and work toward creating a truly end-to-end holistic offering for our customers.

We will put more emphasis on emerging regions, especially China and other Asian markets, expanding our presence to better address local market needs, establishing our company as a key partner in regional life science ecosystems.

The successful execution of our strategy will be underpinned by key enablers – innovation, digital, and resource allocation.

Accelerating innovation and focusing on science and technology leadership is essential to our future. We have embarked on a digital journey to address customer expectations and evolve our internal capabilities to drive business value, by using data science and AI tools to facilitate and automate decisions. We will continue to invest in our e-commerce platform to enable new growth models. We will target our resources toward high-growth and high-return opportunities, including bolt-on acquisitions to augment organic efforts.

The foundation of our business is critical to all we do. Maintaining the highest quality and regulatory standards and advancing sustainability is essential to our success, and along with our people, is our greatest asset. Attracting, retaining, and developing a diverse workforce is critical to our future growth.

Healthcare

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 Covid-19 pandemic has accelerated many anticipated industry trends within the healthcare sector such as changes in market dynamics, ongoing healthcare reform, and increased digitalization. To meet these demands and respond appropriately to the dynamics of our markets, we have significantly transformed our Healthcare business sector in recent years with the objective of delivering focused leadership and sustaining above-market growth through a diversified portfolio that is resilient to long-term volatility.

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, Neurology and Immunology, and Fertility – areas where significant unmet medical needs exist and where we can bring meaningful value to patients. We build this ambition on top of a strong foundation and will continue to grow Cardiovascular, Metabolism & Endocrinology (CM&E) sustainably and profitably. 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 our global footprint, bringing the innovation of our pipeline to patients and growing our presence – in the United States and in China, for example. The emerging markets and China are expected to be the largest growth drivers 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. Numerous examples in our existing business offer significant opportunities to bring value to patients and considering their growth potential, maximizing their business potential will remain important.

The second pillar of our strategy is the focus on specialty medicine franchises. Here, we expect the oncology, neurology, immunology, and fertility 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, augmented by external talent sourcing and strategic partnering. In order to optimize the 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 and to build a portfolio in each of our franchises. 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 increase our chances of success in discovering and developing new therapies, we focus our expertise on specific franchises and are exploiting synergies in disease mechanisms and biological pathways. We are investing in digital technologies and novel modalities such as antibody drug conjugates to drive pipeline growth.

Electronics

With the successful execution of the Bright Future program, our business sector has been transformed to an innovation leader within the electronics industry. In 2021, the business sector was renamed from Performance Materials to Electronics and now targets the strongly growing materials segments of the electronics industry. Our diversified portfolio delivers profitable growth and stable attractive cash flows driven by businesses like Semiconductor Solutions, Organic Light Emitting Diode (OLED) materials and future display applications. Today, our business sector is positioned as a highly appreciated innovation partner for material solutions in the semiconductor and display industries. We partner with key thought leaders around the world to enable the next generation of electronic devices.

The acceleration of digitization, and its visualization, is fueled by an exponential growth of data and a lasting need for electronics, especially semiconductor chips across all industrial sectors. Highly impactful technology trends like artificial intelligence (AI), 5G networks, big data, and Internet of Things (IoT) require more powerful chips and advanced OLED display platforms. This growth is expected to continue through the next decade, as semiconductors have become a critical component in many industries. Unprecedented investments, in the hundreds of billions of euros, are being announced for new chip manufacturing capacity across the world to overcome current chip shortages. To produce ever more powerful and energy-efficient chips, innovation in novel materials is essential.

To benefit from the strong electronics industry growth, our plan is to expand our capacities and our capabilities. We have announced investments of significantly more than € 3 billion into innovation and capacities over the next five years aligned to the businesses and regions we serve. The investment is an essential part of our sector's new Level Up growth program to capture these opportunities.

Level Up focuses on four, mutually reinforcing key priorities: Scale, Technology, Portfolio, as well as Capabilities. The priorities Scale and Technology support the massive capacity expansion that is happening globally in our focus industries, investing in our footprint in close proximity to our customers while boosting R&D and innovation. Under the priority area Portfolio, Electronics seeks to exploit attractive, external growth opportunities via selected bolt-on acquisitions. Furthermore, Level Up will initiate or accelerate important internal initiatives under the Capabilities priority. Among other things, it will further leverage our data analytics capabilities and invest even further into the safety realm. We believe these initiatives will also strengthen our attractiveness as an employer and help further develop our talent pool.

We have a clear strategy that not only addresses semiconductor and display opportunities, but also improves resilience against market cyclicality and geopolitical impacts. Supporting this, our Surface Solutions business is again aiming for growth, after its successful restructuring. Our overall strategy for Electronics will deliver attractive financial returns, shifting towards an execution and growth phase.

Sustainability strategy

Implementing our strategy globally

Our ambition is to leverage science and technology to achieve progress for mankind. For us, 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, our 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 and investors, as well as society. For more than 350 years, our company has been shaped and guided by strong values. Our success is built on values that underpin our understanding of sustainable entrepreneurship.

The rapidly growing challenges facing society and the environment require a clear objective for the coming years. That is why we have integrated sustainability into our enterprise strategy as an essential component and 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 integrate sustainability into all our value chains. By 2040, we will be climate neutral and reduce our resource consumption.

In order to firmly achieve our sustainability goals, we have defined seven focus areas: sustainable innovations and technologies for our customers, impact of our technologies and products on health and well-being, sustainability culture and values, sustainability and transparency in the supply chain, securing our social license to operate in all regions, climate change and emissions, and water and resource intensity. Within these focus areas we are currently implementing numerous initiatives and projects and are measuring our progress. These efforts ensure that sustainability will become a key indicator of our success across all our business sectors. The goals we have set ourselves to 2030 and beyond will contribute to the attainment of the United Nations SDGs.

Our business activities contribute to the following five SDGs in particular: SDG 3 (Good Health and Well-Being), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 17 (Partnerships for the Goals).

More information on sustainability topics can be found in the non-financial statement, which for fiscal 2021 has been published in the management report for the first time.

Measuring progress made with the sustainability strategy

In 2021, we defined various key indicators in order to record and measure progress made through our three sustainability goals.

As of fiscal year 2022, we will be adding a sustainability factor to our Long-Term Incentive Plan (LTIP). The 2021 Annual General Meeting approved a revised compensation system for the members of the Executive Board. For the sustainability factor, the company uses the three key indicators marked in the table. Details on how this sustainability factor is calculated can be found in the Compensation Report.

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 technology	• Percentage of newly published patent families with positive sustainability impact	Sustainable innovation & technologies
Health and wellbeing impact	• People treated with our Healthcare products[1]	Will be published in the SASB index as of April 12, 2022

[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 integrate sustainability into all our value chains.

Focus area	Sustainability key indicator	Further details
Sustainability culture and values	• Percentage of women in leadership positions	Diversity & inclusion
	• Percentage of employees trained on sustainability	Reporting as of 2022
Sustainable and transparent supply chain	• Percentage of relevant suppliers (in terms of number and purchase volume) that are covered by a valid sustainability assessment[1]	Responsbile supply chain
Securing our social license to operate in all regions	• Environment, Health and Safety (EHS) Incident Rate	Process, plant & transport safety
	• Violations of Global Social and Labor Standards Policy	Human rights
	• Lost Time Injury Rate (LTIR)	Health & safety

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

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	Will be published in the Sustainability Report 2021 as of April 12,2022
	• Water Intensity Score	Will be published in the Sustainability Report 2021 as of April 12,2022
Water and resource intensity	• Wastewater quality	Reporting as of 2022

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

Strategic finance and dividend policy

We pursue a conservative financial policy characterized by the following:

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 businesses form the basis for our strong and sustainable cash flow generation capacity. Moreover, we have several funding resources in place. A € 2 billion syndicated loan facility is in place until 2025 to cover any unexpected cash needs.

This credit line is a backup facility that should only be used in exceptional situations. In addition, we have a commercial paper program with a volume of € 2 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.

Additionally, as a general rule, the bond market represents a key element. The most recent bond issues took place in January 2020 (€ 1.5 billion euro bonds) and September 2020 (€ 1.0 billion hybrid bond). 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 mainly work 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 capital markets at attractive financial conditions. On October 21, 2021, we received a rating upgrade by Moody’s from Baa1 to A3 (stable outlook). In October 2021, Scope Ratings also changed the outlook of our A-rating from stable to positive. The Standard & Poor’s (S&P) rating is A with a stable outlook.

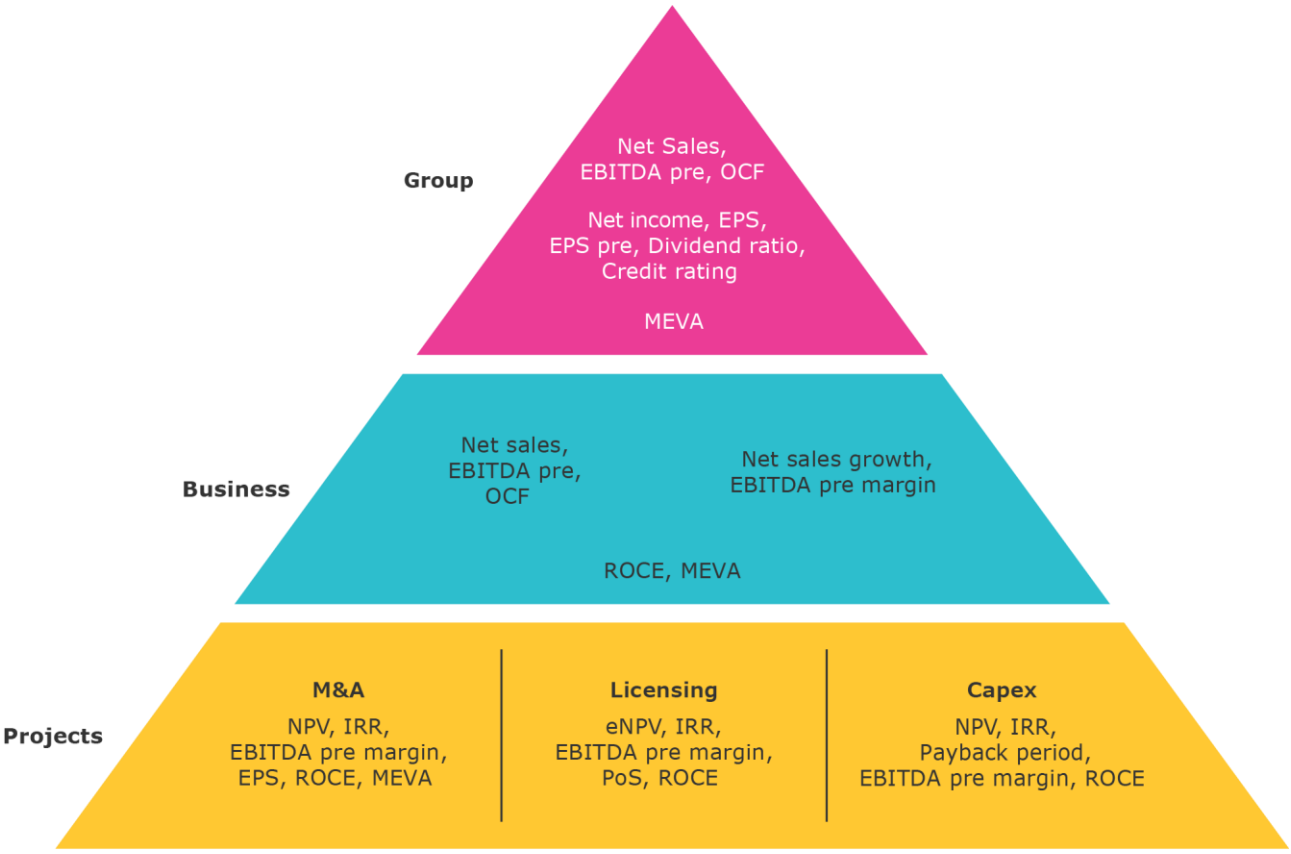
Sustainable dividend policy

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 = Earnings before interest, income tax, depreciation and amortization as well as adjustments.
EPS = Earnings per share.
MEVA[1] = Value added of 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[1] = Mergers & 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 factors for assessing operational performance. Therefore, 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 operating plan 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	**2021**	2020	€ million	%
Net sales	**19,687**	**17,534**	**2,152**	**12.3%**

EBITDA pre

EBITDA pre is the main performance indicator measuring ongoing operational profitability and is used internally and externally. To provide an alternative understanding of the underlying operational performance, it excludes from the operating result 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 selected 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 underlies strict governance at the Group level. Within the scope of internal performance management, EBITDA pre allows for necessary changes or restructuring without penalizing the performance of the operating business. The following table shows the composition of EBITDA pre in the 2021 fiscal year compared to 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]

	2021			2020[2]			Change
€ million	IFRS	Elimination of adjustments	pre[1]	IFRS	Elimination of adjustments	pre[1]	pre[1]
Net sales	**19,687**	**–**	**19,687**	**17,534**	**–**	**17,534**	**12.3%**
Cost of sales	-7,351	25	-7,326	-6,835	53	-6,782	8.0%
Gross profit	**12,335**	**25**	**12,361**	**10,699**	**53**	**10,752**	**15.0%**
Marketing and selling expenses	-4,304	17	-4,287	-4,207	60	-4,147	3.4%
Administration expenses	-1,241	83	-1,158	-1,188	98	-1,090	6.3%
Research and development costs	-2,408	8	-2,400	-2,288	27	-2,262	6.1%
Impairment losses and reversal of impairment losses on financial assets (net)	1	–	1	-6	-0	-6	>100.0%
Other operating income and expenses	-206	76	-129	-25	169	144	>100.0%
Operating result (EBIT)[1]	**4,179**			**2,985**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	1,767	-53	1,715	1,938	-128	1,810	-5.3%
EBITDA[2]	**5,946**			**4,923**			
Restructuring expenses	79	-79	–	162	-162	–	
Integration expenses/IT expenses	81	-81	–	108	-108	–	
Gains (-)/losses (+) on the divestment of businesses	-3	3	–	10	-10	–	
Acquisition-related adjustments	-18	18	–	-10	10	–	
Other adjustments	19	-19	–	9	-9	–	
EBITDA pre[1]	**6,103**	**–**	**6,103**	**5,201**	**–**	**5,201**	**17.3%**
thereof: organic growth[1]							18.1%
thereof: exchange rate effects							-0.6%
thereof: acquisitions/divestments							-0.1%

[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)

As announced in the annual report 2020, the Operating Cash Flow has been introduced as leading steering KPI for us since the beginning of 2021. The Operating Cash Flow results from our running business and describes the cash generated by operations. It is mainly influenced by the EBITDA pre, income tax, financial result and changes in net working capital.

Group

Operating cash flow

			Change	
€ million	**2021**	2020	€ million	%
EBITDA pre[1]	**6,103**	**5,201**	**901**	**17.3%**
Adjustments[1]	-157	-279	122	-43.7%
Finance result[2]	-255	-354	100	-28.1%
Income tax[2]	-859	-637	-222	34.9%
Changes in other financial assets recognized in profit or loss	-6	0	-6	>100.0%
Changes in working capital[1]	-349	-162	-186	>100.0%
thereof: Changes in inventories[3]	-472	-85	-387	>100.0%
thereof: Changes in trade accounts receivable[3]	-310	-84	-226	>100.0%
thereof: Changes in trade accounts payable/refund liabilities[3]	433	7	426	>100.0%
Changes in provisions[3]	196	-110	305	>100.0%
Changes in other assets and liabilities[3]	-121	-123	2	-2.0%
Neutralization of gains/losses on disposal of fixed assets and other disposals[3]	-24	-98	74	-75.7%
Other non-cash income and expenses[3]	86	39	48	>100.0%
Operating cash flow	**4,616**	**3,477**	**1,138**	**32.7%**

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

[2] According to Consolidated Income Statement.

[3] According to the Consolidated Cash Flow Statement.

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 the prioritization of investment opportunities and portfolio decisions.

Net present value (NPV)

The main criterion for the prioritization of investment opportunities is the 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 projection period 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. Depending on the type and location of a project, different markups are applied to the WACC.

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, when looking at individual accounting periods, return on capital employed is an important metric for the assessment of investment projects. It is calculated as the adjusted operating result (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 to prioritize 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 Group (MEVA)

Value added of Group gives information about the financial value created in a period. 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. To provide an alternative view, we also report earnings per share pre, in which the effects of integration expenses, IT expenses for selected projects, restructuring expenses, gains/losses on the divestment of businesses, acquisition expenses, and other adjustments are eliminated. Moreover, amortization of acquired intangible assets as well as impairment losses on property, plant & equipment, and intangible assets are eliminated. 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 company'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	**2021**	2020	€ million	in %
Net income	**3,055**	**1,987**	**1,067**	**53.7%**
Non-controlling interest	10	7	4	58.5%
Income tax	859	637	222	34.9%
Amortization of acquired intangible assets	803	857	-54	-6.3%
Adjustments[1]	210	407	-197	-48.5%
Income tax on the basis of the underlying tax rate[1]	-1,135	-974	-162	16.6%
Non-controlling interests to be adjusted	-10	-7	-4	58.5%
Net income pre[1]	**3,791**	**2,914**	**876**	**30.1%**
Earnings per share pre[1] in €	**8.72**	**6.70**	**2.02**	**30.1%**

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

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, Standard & Poor's, and Scope. 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.

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.

Other 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. From a Group perspective, innovations in the businesses as well as the promotion of a diverse workforce, especially at the leadership level, and sustained planning for the filling of company-critical positions, are of particular importance.

Innovation

Innovations are the foundation of our business and will also be prerequisites for future success in changing markets. We are continuously working to develop new products and service innovations for patients and customers. Indicators for the degree of innovation are defined based on the specifics of the respective businesses.

Sustained employee development

We believe that a diverse workforce strengthens our ability to innovate. We actively promote diversity among our leaders in order to create an integrative culture that reflects our values and enables every employee to fulfill their potential. We ensure that our ambitious corporate goals can be realized through strategic succession planning for company-critical positions. To gauge the success of the related measures, we have introduced diversity and succession planning as focus issues and non-financial indicators.

Research and Development

Science is at the heart of everything we do. We conduct research and development (R&D) worldwide in order to develop new products and services to improve the quality of life of patients and satisfy the needs of our customers. Further optimizing the relevance and efficiency of our research and development activities – either on our own or in cooperation with third parties – is one of our top priorities.

Around 8,300 employees worked in research and development and corresponding support functions in 2021. They dealt with innovations to address long-term health and technology trends in both established and growth markets (2020: approximately 7,900).

Expenditures for R&D amounted to € 2.4 billion in 2021 (2020: € 2.3 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. We continue to focus on digitized and automated labware, DNA purification for downstream applications, and emerging chemical synthesis, as well as software for our BioContinuum™ Platform to accelerate Biopharma 4.0. In addition, our teams remain dedicated to delivering advancements in our core portfolios, such as filtration, pure lab water, and diagnostic solutions. With our Healthcare business sector's R&D pipeline, we aspire to make a positive difference for patients – always with the goal to help create, improve, and prolong lives. Our main research areas include oncology, immuno-oncology, and immunology including multiple sclerosis. The main focus of our Electronics business sector's research is on the development of innovative materials and technologies required for the manufacturing of ever smaller, faster and more powerful processors and memory chips. In addition, 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.

Research and Development Costs

			Change	
€ million	**2021**	2020	€ million	%
Life Science	351	313	38	12.1%
Healthcare	1,712	1,640	72	4.4%
Electronics	278	274	4	1.6%
Corporate and Other	67	62	5	8.4%
Total	**2,408**	**2,288**	**119**	**5.2%**

The ratio of research expenditure to Group sales was 12.2% (2020: 13.0%). The decline is due to the positive sales development.

Life Science*

Across our three business units of Research Solutions, Process Solutions and Applied Solutions, our R&D teams, composed of approximately 2,000 employees, continue to bring expertise and a diversified and relevant portfolio of products and services to our customers around the world. In 2021, our Life Science business sector focused on delivering breakthrough innovations for our academic, biopharmaceutical and industrial customers.

As such, we launched more than 15,000 products in 2021, including those launched through our "faucet program" for antibodies, reference materials, chemicals and nanomaterials. These included key innovations from all our business units, such as our GenElute™-E Single Spin purification kits; ProCellics™ Raman Analyzer with Bio4C™ PAT Raman Software, and a new Milli-Q® EQ 7000 Type 1 water purification system.

Research Solutions

In May, we introduced a new solution improving productivity in the lab through a more flexible and streamlined nucleic acid purification process. GenElute™-E kits reduce traditional silica-based workflow hands-on time from about 45 minutes to only three minutes. The technology workflow also reduces plastic waste on average by 55%, compared with traditional methods, and eliminates overnight processing requirements.

In September, the Millicell® DCI Digital Cell Imager was introduced for fast, accurate, and objective cell monitoring. Besides assessing common cell culture parameters and growth trends for more consistent cell cultures, it expands capabilities with off–device cloud storage and a web-based app for data analysis, sorting, and archiving. With the instrument, it's possible to collect critical insights without risking sample contamination from manual cell culture handling.

Also in September, we introduced the ColorWheel® flow cytometry antibodies and dyes, a lyophilized product for enhanced stability and ambient shipping that allows for more flexibility for scientists to pair any antibody with any dye in their flow cytometry workflows.

Process Solutions

In March, we received a patent for an improved CRISPR genome-editing method in Japan. Our proxy-CRISPR technology provides a solution to improve genome editing and advance new possibilities for research. This marks our second CRISPR patent in Japan and our 38th CRISPR patent. Our 39th and 40th CRISPR patents were also allowed in May by the European Patent Office and the Intellectual Property Office of Singapore, respectively, which are directed to our CRISPR-chrom and CRISPR vector technologies.

In September, we launched the ProCellics™ Raman Analyzer with Bio4C™ PAT Raman Software, continuing to pave the way to Bioprocessing 4.0. This new time-saving product, which won the "Best New Product/Service" award at Interphex 2021, enables greater upstream process optimization, helps reduce the risk of contamination and batch failures and provides added flexibility to operators.

In October, we launched the new technology Chetosensar™, giving new promise to antibody-drug conjugates (ADC) that were previously terminated by alleviating the solubility challenges and expanded capacity to advance ADC therapies. These initiatives underscore our continued investment in novel modalities and support our efforts to double our ADC and High-Potent Active Pharmaceutical Ingredient (HPAPI) capacity in the near future.

In October, we also signed an agreement licensing our patented CRISPR-Cas9 technology to Cellecta, Inc., a functional genomics products and services provider based in Mountain View, California, United States. Through the licensing of its innovative technology, we are paving the path for researchers and scientists to identify and accelerate next generation treatments. Cellecta provides RNAi and CRISPR technologies for the discovery and characterization of novel therapeutic targets and genetic profiling for drug and biomarker discovery and

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

validation, leading the way for developing highly effective next-generational treatments. Cellecta plans to use the foundational CRISPR patent estate for CRISPR-mediated targeted “knock-in”, a critical method that gives scientists more efficient options for complex projects in therapeutic and disease research.

In November, we signed a Memorandum of Understanding (MoU) with the Korea-based bio-venture company, GI Innovation, to further research and development of critical life-saving cancer treatments, as well as drugs for allergy-related conditions. Through the mutual agreement, we will support GI Innovation with technologies and services including CHOZN® platform, cell culture media, and overall process consulting and technical support.

In December, we announced a strategic collaboration with biotechnology companies Innovative Biotech to design the manufacturing process for the first vaccine production facility in Nigeria.

Applied Solutions

In January, we launched the new Milli-Q® EQ 7000 Type 1 water purification system to expand our benchtop ultrapure water system portfolio. The new Milli-Q® EQ 7000 system produces consistent ultrapure water quality that is easily customized to experimental requirements, strengthening our Milli-Q® ultrapure water offering.

The € 35 million expansion project to build a second lateral flow membrane manufacturing product line in Cork, Ireland, was completed this year, and commercial manufacturing commenced over the summer. The new casting line more than doubles our lateral flow membrane capacity.

Additionally, earlier this year, three of our Milli-Q® water purification systems were designated Greener Alternative Products. The Milli-Q® IQ 7000, IQ 7003, and IQ 7010 water purification systems were innovated not only to be more compact but also to use less water, plastic, and electricity.

In December, the U.S. government awarded a € 121 million contract ($136.7 USD) for the construction of a lateral flow membrane production facility, over a three-year period, at the company’s United States site in Sheboygan, Wisconsin. The contract, received from the U.S. Department of Defense, on behalf of the U.S. Department of Health and Human Services, is part of an effort to ensure secure local supply and production capacity for critical products for pandemic preparedness.

Recognized for Award-Winning Innovation

In April, we were named 2021 Charitable Supplier of the Year and 2021 Protein Supplier of the Year by the CiteAb Awards. These awards, from a leading life science data provider, celebrate the top suppliers and individuals in the research reagent sector worldwide, helping researchers and their suppliers make more informed decisions.

In June, our Madison, Wisconsin, United States, site was awarded “Best New HPAPI Facility” at the 2021 HPAPI Summit. This new 70,000-square-foot facility doubles our HPAPI kilo lab capacity and enables us to expedite the manufacture of HPAPIs, ADC linker/payloads, and complex APIs. With our new expanded facility, we will be the largest single-digit occupational exposure limit CDMO provider in the world.

In September, we signed a partnership with the Federal University of Goiás State, Brazil to create an Innovation and Technology Hub. The partnership will enable the implementation of a prototyping and a training center for rapid diagnostic tests. The new space is the first in Brazil to concentrate molecular biology techniques, electrochemical biosensors and rapid tests by lateral flow immunochromatography in one laboratory.

In November, we announced that we will support SaudiVax Ltd., based in the Kingdom of Saudi Arabia, to design a best-in-class, multi-modality manufacturing facility to localize manufacturing of biologics and vaccines for the MENA region. SaudiVax is positioned to become the first developer and manufacturer of Halal vaccines and biotherapeutics in Saudi Arabia, leveraging our integrated Contract Development Manufacturing Services (CDMO), innovative product offerings and single-use technologies.

Healthcare*

With our Healthcare research pipeline, we aspire to make a positive difference for patients – always with the purpose to help create, improve, and prolong lives. Our main research focus areas include oncology, neurology, and immunology.

Neurology & Immunology

Multiple sclerosis (MS) is one of the world's most common neurological disorders. Despite the emergence of a number of therapies in the last two decades, there are still significant unmet needs for MS patients. As a company we have more than 20 years of experience in MS research, and we remain committed to finding solutions for patients' significant unmet medical needs in this area.

New data for both our marketed MS treatments Mavenclad® (cladribine tablets) and Rebif® (interferon beta-1a), and our investigational treatments evobrutinib and enpatoran, have been presented across key congresses in 2021, including the Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS) Forum 2021 in February and the 2021 American Academy of Neurology (AAN) Annual Meeting in April. Generating data around our MS treatments and the risk of respiratory viral infections has remained important in 2021, helping to support clinicians as they make treatment decisions for their patients living with MS during the Covid-19 pandemic. At ACTRIMS, we presented new data from the MAGNIFY-MS study, indicating that Mavenclad-treated relapsing multiple sclerosis (RMS) patients mount a protective antibody response to common vaccines. The MAGNIFY-MS retrospective analysis demonstrated that patients develop protective antibody levels for at least six months following seasonal influenza and varicella zoster vaccines, irrespective of vaccine timing relative to Mavenclad-dosing.

At AAN, we announced a new analysis from the MAGNIFY-MS sub-study showing a specific immune repopulation pattern in patients with RMS treated with Mavenclad®, which may contribute to their ability to fight infections and develop protective antibodies from vaccines. In addition, an independent study conducted by Anat Achiron, MD, PhD, FAAN, and colleagues, The Multiple Sclerosis Center at Sheba Medical Centre and Sackler School of Medicine Tel Aviv University, Israel, was published in the "Therapeutic Advances in Neurological Disorders" journal in April and also presented at the AAN congress, showing that patients on Mavenclad-treatment were able to generate Covid-19 antibodies following the mRNA vaccine from Pfizer/BioNTech. Humoral response to the Covid-19 vaccine was independent of lymphocyte count.

Also presented at AAN were data from a Phase II placebo-controlled randomized trial showing that evobrutinib significantly reduced blood neurofilament light chain (NfL) levels, a key biomarker of neuronal damage and inflammation, in patients with MS. Elevated blood NfL levels have been shown to be associated with damage to neurons and may predict future brain atrophy and disease progression.

Enpatoran, a highly specific potential first-in-class immune modulator blocking the activation of Toll-like receptor (TLR)7 and TLR8, was the focus of two presentations at major lupus and infectious disease congresses, including ID WEEK 2021 in September and LUPUS & CORA 2021 in October. Enpatoran is being developed as a potential new oral therapy for systemic lupus erythematosus (SLE) and cutaneous lupus erythematosus (CLE), and aims to overcome limitations of available lupus therapies by providing selective inhibition of lupus-relevant disease drivers, which may increase efficacy while preserving immunity against infections. Initiation of Phase II studies in SLE and CLE is expected in the first half of 2022.

We presented a total of 39 abstracts at the 37th Congress of the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) in October. Among the presentations were late-breaking real-world data on Mavenclad®, showing a sustained benefit on long-term mobility and disability status. New data also highlighted improvement in measures of physical and mental health after one year of Mavenclad®-treatment,

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

plus new independent data that continued to show Mavenclad®-treated patients receiving an mRNA Covid-19 vaccine mount a similar antibody response similar to that of the general population.

New evobrutinib data were also presented at ECTRIMS, showing that evobrutinib was effective at reducing the volume of slowly expanding lesions (SEL), an imaging biomarker of chronic active inflammation and axonal loss within the central nervous system (CNS), making it the first Bruton´s tyrosine kinase (BTK) inhibitor to show a significant effect on this biomarker. Additionally, new safety data from the first and only integrated safety analysis of a BTK inhibitor that included MS patients were also presented, showing that evobrutinib was generally well tolerated. This came shortly after the announcement of evobrutinib being the first BTK inhibitor to complete Phase III trial enrollment.

We have continued to deliver on the strategic evolution of our immunology pipeline this year, allowing us to focus our efforts on priority assets and areas of expertise to deliver the greatest impact for patients. In May, we announced the completion of an out-licensing agreement with MoonLake Immunotherapeutics AG, Switzerland, for sonelokimab (M1095). Sonelokimab is an investigational anti-IL-17 A/F Nanobody®, which neutralizes both IL-17A and IL-17F, in patients with moderate to severe chronic plaque-type psoriasis. In January 2022 we out-licensed sprifermin, a recombinant form of human fibroblast growth factor 18, to HighLine Bio Inc, a company newly established by TrialSprak. Sprifermin is being investigated in osteoarthritis, and TrialSpark/HighLine Bio will assume full responsibility for the research, development and commercialization of the asset.

In December we announced a strategically focused expansion of our neuroinflammatory pipeline with the acquisition of the rights to develop cladribine for the treatment of generalized myasthenia gravis (gMG) and neuromyelitis optica spectrum disorder (NMOSD).

Oncology

Oncology is a core focus area in our R&D portfolio. With an emphasis on biology-driven research, we aim to deliver transformative treatments. Translational research is embedded into the whole R&D process, with several projects addressing unmet needs in hard-to-treat cancers through innovative treatment approaches and novel combinations. In 2021, we achieved several milestones across our oncology pipeline.

We continue to develop much-needed new treatment options for patients with hard-to-treat cancers and have made key progress in this area with Bavencio® (avelumab), an anti-PD-L1 antibody we are co-developing and co-commercializing with Pfizer Inc., United States. On January 25, the European Commission approved Bavencio® as monotherapy for the first-line maintenance treatment of adult patients with locally advanced or metastatic urothelial carcinoma (UC) who are progression-free following platinum-based chemotherapy. Bavencio® was first approved in the United States as a first-line maintenance treatment for advanced UC by the U.S. Food and Drug Administration (FDA) in June 2020 and is now approved for this indication in 50 countries. It is also approved as a monotherapy for the treatment of metastatic Merkel cell carcinoma in 55 countries and for the treatment of advanced renal cell carcinoma in combination with axitinib in 50 countries.

Other highlights from our development pipeline included the advancement of several potential first-in-class/best-in-class compounds. The development program for tepotinib, our oral MET inhibitor designed to inhibit the oncogenic MET receptor signaling caused by *MET* (gene) alterations, has continued to achieve multiple milestones in 2021. Discovered in-house at our company, tepotinib underscores our strategic focus on delivering innovative precision medicines to patients with cancer. In February 2021, the FDA granted accelerated approval to tepotinib under the brand name Tepmetko®, making it the first and only once-daily oral MET inhibitor approved for patients with metastatic non-small cell lung cancer (NSCLC) with *MET*ex14 skipping alterations. Continued approval for this indication may be contingent upon verification and description of clinical benefit in confirmatory trials. In December 2021, Tepmetko became the first and only oral MET inhibitor to receive the Committee for Medicinal Products for Human Use (CHMP) positive opinion in Europe for adult patients with advanced NSCLC harboring alterations leading to *MET*ex14 skipping. Tepotinib is now available in a number of countries, and under review by other regulatory authorities globally.

On April 12, we announced initiation of a Phase II trial with registrational intent for berzosertib, the leading asset in the Company's DNA damage response (DDR) inhibitor development program. The berzosertib clinical development program is one of the most advanced Ataxia telangiectasia and rad3-related (ATR) inhibitor development programs industry-wide. The global study will further assess berzosertib in combination with topotecan for the treatment of relapsed, platinum-resistant SCLC (DDRiver SCLC 250) and plans to include approximately 80 participants at about 41 study sites across Asia, Europe, and North America. As part of its new DDRiver™ Clinical Trials program, the Company is investigating DDR inhibitor targeting pathways across more than ten trials in various tumor types. Results from a Phase II proof-of-concept study conducted by the US National Cancer Institute (NCI) (NCT02487095) were also published in the April 12, 2021 edition of Cancer Cell showing that berzosertib in combination with the chemotherapy topotecan resulted in an objective response rate (ORR) of 36% among patients with relapsed small cell lung cancer (SCLC), including durable responses among a majority of responding patients with platinum-resistant disease. Berzosertib, formerly known as VX-970, was licensed from Vertex Pharmaceuticals in 2017.

At the 2021 American Society of Clinical Oncology (ASCO) Annual Virtual Meeting held June 4-8, we had a significant presence with 40 abstracts including seven oral presentations and seven poster discussions at the Virtual Scientific Program. Potential first-in-class/best-in-class early- and late-stage pipeline compounds, and investigational uses of our approved medicines were featured at the meeting.

For Bavencio®, data provided further evidence of continued patient benefit across three approved indications and included:

- New analyses from the Phase III JAVELIN Bladder 100 study demonstrating consistent survival benefit of Bavencio® as first-line maintenance treatment across key subgroups further reinforcing the role of Bavencio® for patients with advanced UC that have not progressed on 1L platinum-containing chemotherapy (abstracts: #4520; #4525; #4527).

- In advanced renal cell carcinoma (aRCC), data confirmed the efficacy benefits of the combination of Bavencio® plux axitinib across International Metastatic RCC Data Consortium (IMDC) risk groups including in the favorable risk group from the extended follow-up of the Phase III JAVELIN Renal 101 study (abstracts: #4514; #4574)

- More than five years of follow-up in Part A of the Phase II JAVELIN Merkel 200 study in metastatic Merkel cell carcinoma (mMCC) (#9517) showed meaningful long-term overall survival in previously treated patients with metastatic MCC (mMCC) who were treated with Bavencio®, supporting its role as a standard of care for these patients.

For tepotinib, new data from the Phase II VISION study was presented including:

- An oral presentation on *MET*ex14 NSCLC biomarker response detected in liquid biopsy (#9012); this investigation provides evidence that liquid biopsy may provide a reliable means for monitoring.

- *MET*ex14 skipping NSCLC with brain metastases (abstract #9084) where data demonstrated efficacy in patients with *MET*ex14 skipping NSCLC with brain metastases consistent with the overall treatment population, brain metastases are reported in 20% to 40% of patients with *MET*ex14 skipping NSCLC and are associated with poor prognosis.

- NSCLC with *MET* amplification (*MET*amp) (abstract #9021) in VISION Cohort B, the first study of a MET inhibitor in people with NSCLC with *MET*amp prospectively detected by liquid biopsy, showed the potential of tepotinib to target *MET*amp-driven disease. *MET* amplification is a genetic alteration occurring in approximately 1% to 5% of patients with NSCLC and has no approved targeted therapies.

For our first biology-driven leader, Erbitux® (cetuximab), a number of Investigator Sponsored Studies (ISS) continue to demonstrate its steady role across the continuum of care in mCRC, and as a backbone of treatment in squamous cell carcinoma of the head and neck. We licensed the right to market Erbitux®, a registered trademark of ImClone LLC, outside the United States and Canada from ImClone LLC, a wholly owned subsidiary of Eli Lilly and Company, in 1998.

At the IASLC 2021 World Conference on Lung Cancer (WCLC) and the European Society of Medical Oncology (ESMO) Annual Virtual Meetings in September 2021, we presented 27 abstracts on research from Company-sponsored, investigator-sponsored, and collaborative studies — including two oral and two mini-oral presentations.

For Bavencio®, real-world evidence was presented supporting the continued need for first-line treatments for advanced urothelial carcinoma (abstracts: #701P; #706P; #707P). Data from an investigator-sponsored study of avelumab in combination with neoadjuvant chemotherapy to treat muscle-invasive bladder cancer was also presented for the first time (presentation #659MO).

Data for tepotinib at the WCLC (abstracts: #P45.03; #P51.01) and ESMO (abstracts: #1254P; #1255P; #1366TIP) included the VISION trial — the largest study of patients with *MET*ex14 skipping NSCLC prospectively enrolled based on liquid and/or tissue biopsy (n=275) and, a trial-in-progress update from the ongoing INSIGHT 2 study in EGFR-mutant NSCLC with *MET* amplification.

Erbitux® (cetuximab) data at ESMO continue to demonstrate, in a number of studies, its significant role as the backbone of treatment in mCRC (abstract #415P; presentation #387MO).

For our investigational ATR inhibitor berzosertib (M6620), a first-time look at the ongoing Phase II study of berzosertib in patients with relapsed platinum-resistant small cell lung cancer (SCLC) was presented (abstract #1666TIP).

On September 30, we announced a mutual decision to end the global strategic alliance with GlaxoSmithKline plc, United Kingdom, (GSK) to develop bintrafusp alfa, the investigational bifunctional fusion protein designed to simultaneously block TGF-β and PD-L1. This decision was based on the clinical trial data generated to date, including three randomized clinical trials that did not demonstrate a benefit to patients.

In January, we made the decision to discontinue the INTR@PID Lung 037 clinical trial in the first-line treatment of patients with stage IV NSCLC that have high expression of PD-L1, based on the recommendation of the Independent Data Monitoring Committee, as the study was unlikely to meet the co-primary endpoint, specifically progression-free survival.

Top-line data announced in March from the Phase II INTR@PID BTC 047 study evaluating bintrafusp alfa as a monotherapy in the second-line treatment of patients with locally advanced or metastatic biliary tract cancer (BTC) who have failed or are intolerant of first-line platinum-based chemotherapy showed single-agent activity, though the study did not meet the predefined threshold that would have enabled regulatory filing for BTC in the second-line setting.

In August, based on a review of data conducted by the Independent Data Monitoring Committee, we decided to discontinue the Phase II INTR@PID BTC 055 study evaluating bintrafusp alfa with gemcitabine plus cisplatin in the first-line treatment of patients with locally advanced or metastatic biliary tract cancer (BTC), as the study was unlikely to achieve the primary objective of overall survival.

Based on these findings, several remaining studies in the program were discontinued, including those in non-small cell lung cancer, triple negative breast cancer, biliary tract cancer, and bladder cancer.

To augment the in-house innovations in our oncology portfolio with potential new solutions for patients with cancer, we announced in March 2021 that we entered into a worldwide in-licensing agreement with Debiopharm, Switzerland, for the worldwide development and commercialization of xevinapant (Debio 1143). Xevinapant, a potent oral antagonist of Inhibitor of Apoptosis Proteins (IAP), is the only medicine in its class in late-stage clinical development and has the potential to be first in class. Xevinapant is currently being investigated in the Phase III TrilynX study for previously untreated high-risk locally advanced squamous cell carcinoma of the head and neck (LA SCCHN), in combination with platinum-based chemotherapy and standard fractionation intensity-modulated radiotherapy.

Fertility

In a step forward for women with severe follicle-stimulating hormone (FSH) and luteinizing hormone (LH) deficiency and their treating physicians, in October 2021 the Committee for Medicinal Products for Human Use (CHMP) recommended an update to the Summary of Product Characteristics (SmPC) for Pergoveris®. Current scientific and clinical knowledge regarding the nature and attributes of FSH LH and LH deficiency show that severe FSH and LH deficiency cannot be defined using specific cut-off levels of FSH and LH clinical indicators. The SmPC update ensures better clarity for healthcare professionals (HCPs) on when to dispense Pergoveris®.

The 2021 meeting of the European Society of Human Reproduction and Embryology (ESHRE) that was taking place in June, saw three abstracts presented, including one oral presentation that highlighted comparative real-world effectiveness data of assisted reproduction technology collected in the National Health database in France, for women stimulated by different gonadotropins, including Gonal-f®, which showed positive clinical outcomes like cumulative live birth rate. Additionally, seven high-priority fertility manuscripts have been published in top-quartile journals so far.

A meta-analysis published in April 2021[1] suggested positive outcomes for the reference product Gonal-f® compared to treatment with biosimilar preparations of follitropin alfa regarding probability of live birth, as well as clinical and ongoing pregnancy. In addition, safety data showed for biosimilars and reference product a similar risk of ovarian hyperstimulation syndrome (OHSS), ectopic pregnancy, and multiple pregnancy[1]. The evidence base for Gonal-f® was further strengthened by a real-world study published in June 2021[2], which showed that treatment with Gonal-f® resulted in higher rates of cumulative live birth, cumulative ongoing, and cumulative clinical pregnancy versus highly purified human menotropin (HP-hMG).

We continue to support efforts to save the northern white rhinoceros from extinction. We are a partner of the BioRescue Project of the Leibniz Institute for Zoo and Wildlife Research (Leibniz-IZW) in the Forschungsverbund Berlin e.V., donating technology and financial support, as well as sharing expertise and experience in fertility to their work.

Cardiovascular Metabolism & Endocrinology (CM&E)

The new formulation of Euthyrox® (levothyroxine) for the treatment of hypothyroidism obtained further regulatory approvals in 2021, resulting in a total of 80 countries where this incremental innovation is registered, allowing for more precise dosing.

Glucophage®, containing the active ingredient metformin, is the drug of choice for first-line treatment of type 2 diabetes available in more than 100 countries. It is also approved in 89 countries for prediabetes when lifestyle intervention is not enough to control the condition. With the successful submission and launch of Glucophage® XR 850, a new dose strength has been developed for the Glucophage® family specifically dedicated to prediabetes.

[1] Chua, SJ, et al. Reprod Biol Endocrinol. 2021;19(1):1-13.

[2] Bühler et al. Reproductive Biology and Endocrinology 2021.

Concor® AM, our fixed dose combination drug of bisoprolol with amlodipine to treat hypertension, is now registered in 65 countries. In Q3 2021, we saw the launch in China where bisoprolol/amlodipine is the only long-acting single-pill combination (SPC) of a β-blocker combined with a calcium channel blocker. This is expected to fill the gap in B+C long-acting SPC treatment for patients in the country.

In 2021, the number of new patients using the Easypod® electromechanical injection device for treatment with Saizen® (somatropin) continued to grow, bringing the total number of patients enrolled on Easypod® Connect to around 25,000. Saizen® is our main endocrinology product and is indicated for the treatment of growth hormone deficiency in children and adults, while Easypod® Connect is a unique web-based platform that allows HCPs to monitor their patients' adherence to treatment with real-time injection data collected and transmitted from their Easypod® devices.

We continued the rollout of Aluetta®, our new pen for the injection of Saizen®, which complements our device portfolio and supports the growth of Saizen®, taking the total number of countries where it is currently available to 28.

Building for the future

On July 6, we celebrated the topping out of the Biotech Development Center currently under construction in Corsier-sur-Vevey, Switzerland. This investment of € 250 million, previously announced in January 2020, will help to sustainably secure capacity and high agility to deliver clinical trial material, contribute to accelerated development timelines of new biological entities, and address the increasing manufacturing complexity of the next generations of biotech compounds in a cost-effective way.

On July 19, we announced plans to invest € 200 million at our global headquarters in Darmstadt by building a new Translational Science Center for the Healthcare business sector. As of 2025, the new Translational Science Center will offer room for more than 500 scientists, who will conduct research in a wide variety of fields ranging from the identification of disease biomarkers to the development of targeted therapies. This € 200 million investment will give rise to an integrated, flexible-use laboratory building covering more than 30,000 m², that includes a lecture hall, in vitro laboratories including a cell bank, as well as a modern and flexible knowledge environment.

The Biotech Development Center and the Translational Science Center add to recent investments aiming to strengthen our capacities in the research, development, and manufacturing of medicines, notably at our R&D facility of Billerica, Massachusetts, United States, as well as at our biotech manufacturing site in Aubonne, Switzerland.

Biopharma Pipeline

As of: December 31, 2021

Therapeutic area **Compound**	**Indication**	**Status**
Neurology		
Evobrutinib (BTK inhibitor)	Relapsing multiple sclerosis	Phase III
Oncology		
Tepotinib (MET kinase inhibitor)	Non-small cell lung cancer, *MET*ex14 skipping[1]	Registration
Xevinapant (IAP inhibitor)	Locally advanced squamous cell carcinoma of the head and neck[2,3]	Phase III
Berzosertib (ATR inhibitor)	Small-Cell Lung Cancer[4]	Phase II
Tepotinib (MET kinase inhibitor)	Non-small cell lung cancer, *EGFR* mutant, *MET*amplified[5]	Phase II
M1231 (Bispecific MUC1xEGFR ADC)	Solid tumors	Phase I
M1774 (ATR inhibitor)	Solid tumors[6]	Phase I
M4076 (ATM inhibitor)	Solid tumors	Phase I
Peposertib (DNA-PK inhibitor)	Solid tumors[7]	Phase I
Immuno-Oncology		
Avelumab (anti-PD-L1 mAb)	Non-small cell lung cancer, 1st line	Phase III
Bintrafusp alfa (TGFbeta trap / anti-PD-L1)	Cervical cancer 2nd line	Phase II
M6223 (anti-TIGIT mAb)	Solid tumors[8]	Phase I
Immunology		
Enpatoran (TLR7 / 8 antagonist)	Systemic lupus erythematosus / Cutaneous lupus erythematosus	Phase I
Global Health		
Arpraziquantel (anthelmintic)	Pediatric schistosomiasis	Phase III
M5717 (PeEF2 inhibitor)	Malaria	Phase I

Additional information: Several combination studies (phase II) of avelumab with talazoparib, axitinib, ALK inhibitors or chemotherapy ongoing under sponsorship of Pfizer.

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] As announced on December 17, 2021, the Committee for Medicinal Products for Human Use of the European Medicines Agency (EMA) adopted a positive opinion, recommending approval of tepotinib as monotherapy for the treatment of adult patients with advanced non-small cell lung cancer.

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

[3] On March 01, 2021, we announced a worldwide in-licensing agreement with Debiopharm, Switzerland, for the development and commercialization of xevinapant (Debio 1143).

[4] Includes studies (phase I/II) in collaboration with/ sponsored by external partners, e.g. US National Cancer Institute (NCI).

[5] In combination with osimertinib.

[6] Study as monotherapy and in combination with niraparib.

[7] Study in combination with avelumab.

[8] Includes study in combination with bintrafusp alfa.

1L: first-line treatment
2L: second-line treatment
ADC: Antibody Drug Conjugate
ATM: ATM serine/threonine kinase
ATR: Ataxia telangiectasia and Rad3-related protein
BTK: Bruton's tyrosine kinase
EGFR: Epidermal growth factor receptor
IAP: Inhibitor of Apoptosis Proteins
mAb: Monoclonal antibody
METex14: MET exon 14
MET: MET proto-oncogene, receptor tyrosine kinase
MUC1: Mucin 1, cell surface associated
PD-L1: Programmed cell death ligand 1
PeEF2: Plasmodium eukaryotic elongation factor 2
PK: Protein kinase
TGFbeta: Transforming growth factor beta

Electronics*

Within our Electronics business sector, we are a technology leader and one of the leading players in most of our markets. As a science and technology company, we offer leading-edge products, services, and solutions that, in many cases, set us apart from the competition. Our business units are developing advanced materials for next-generation electronics. 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. We have also created a Technology Leadership Board to review and optimize our technology investment across the business sector.

In September, we announced our plans to invest significantly more than € 3 billion in innovation and capacity until the end of 2025. These investments are an essential part of the new Level Up growth program. With this investment, we are also scaling up our research and development capabilities for next-generation semiconductor and display materials to further expand our position as a leading supplier to the electronics industry.

Semiconductor Solutions

We are addressing our customers' critical material needs through every step of the wafer manufacturing process. The outstanding capabilities and competencies of the businesses are diverse and will enable us to bring game-changing innovations for our customers into the market faster.

In Semiconductor Materials, our Thin Film Solutions business achieved significant progress in advancing critical PORs (Process of Record) for new organosilanes for conformal high-performance atomic layer deposition (ALD) and progressed our plasma-enhanced chemical vapor deposition (PECVD) for low dielectric constant applications. We continue to make progress in developing high-purity metal-containing precursor offerings enabled by new engineered container delivery systems. We also focus on developing new spin-on dielectric formulations for processes with improved dielectric characteristics for faster and better logic and memory devices.

With our Specialty Gases, we continue to make progress with our new etch gas technology program, which is focused on advancing the development of new chemistries to enable more than 100-layer single-stack etching for advanced memory devices such as V-NAND. We continue to see significant performance in new POR wins across our existing portfolio and new product introductions.

Our Patterning Solutions business continues to heavily invest in pattern transfer technologies for advanced nodes. The proliferation of extreme ultraviolet (EUV) lithography is gaining momentum in the industry, and our R&D programs for pattern collapse, underlayer, and image rectification are showing excellent progress at key customers. We are uniquely positioned to drive the implementation of organometallic compounds into the photolithography segment. We are seeing strong interactions in hard mask and resist development leading to improved performance. Additionally, advanced packaging technologies are driving innovation in conventional lithography materials. We are collaborating with the leading companies to support this innovation.

Our Silicon Valley-based material innovation accelerator Intermolecular saw an increase in the amount of work done in its labs for quantum computing and neuromorphic computing companies. These companies benefit from the flexible device processing infrastructure and deep materials knowledge to quickly achieve tangible products in these emerging technology areas. For more than 15 years, Intermolecular has been exploring, testing, and developing advanced materials that are revolutionizing the next generation of electronics.

Delivery Systems & Services (DS&S) develops, deploys, and operates the equipment that enables safe and reliable delivery of hazardous materials in semiconductor manufacturing. We are increasing the global

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manufacturing capacity of our state-of-the-art specialty gas, liquid chemical, and slurry delivery equipment to meet the growing demand in memory and foundry.

We released our CHEMGUARD® 600 model for bulk Tetrakis(dimethylamino)titanium (TDMAT) delivery, extending our TDMAT technology to remote, bulk supply to support our customers' ever-increasing flow rate and uptime requirements of advanced nodes. It also eliminates the need to use solvents to purge heat-sensitive, high-K precursors with low vapor pressures. The first container changes were completed and executed much faster than anticipated. It significantly reduces the container change time and provides a greener solution, surpassing our customer's performance expectations.

In addition, we have extended our GASGUARD® Active Control development to low vapor pressure compressed gases. Initially, it was developed to maintain, repeat, and stabilize pressure for high vapor pressure gases under varying manufacturing conditions and with zero pressure drift. GASGUARD Active Control now allows semiconductor fabs to achieve much greater precision in controlling the pressure of low vapor pressure compressed gases, such as Tungsten hexafluoride (WF_6) and others.

Most of the hazardous chemicals in liquid form are delivered by helium gas pressure to a wafer processing tool. We introduced CHEMKEEPER® GenX to reduce helium consumption by more than 50% of conventional systems.

At many customer sites, these technologies and other DS&S equipment are operated and maintained by our MEGASYS® Total Gas and Chemical Services team. As part of a global operations infrastructure, we are a premier supplier of semiconductor fab and sub-fab services to the worldwide electronics industry.

Display Solutions

Our display materials are enabling the fast-growing market of innovative displays for current and future applications such as foldable smartphones, rollable TVs, or AR/VR (Augmented Reality/Virtual Reality) devices. We further strengthened our ability to drive innovations in the attractive field of OLED displays by acquiring OLED patents from Konica Minolta in 2020. With liviFlex™-H, we are addressing challenges in the manufacturing of free-form OLED displays. Furthermore, we are active in the development of innovative material solutions for next generation displays, for example in the field of QD-PCC (Quantum Dot Pixel Color Converter), micro-LEDs, and AR/VR displays in close cooperation with customers and partners.

Our liquid crystal technology ultra-brightness fringe-field switching (UB-FFS) continues its successful growth, thanks to new product qualifications and rising demand in the liquid crystal displays (LCD) sector for mobile devices, especially mobile phones and tablet PCs. The development of high-resolution 4K and 8K TV sets continues to pose a challenge, as the LCD backlight transmission and efficiency will be reduced due to higher pixel density. We are therefore actively working to expand our ultra-bright (UB) technology offering with our UBplus liquid crystal materials for the TV market. With such technologies, we increase the light transmission efficiency of applications for large-format TV sets and display panels by 10% to 15%. This contributes hugely to the reduction of power consumption and helps our customers and consumers to meet sustainability targets.

Surface Solutions

In our Surface Solutions business, we focus on the empowerment of our customers to create surfaces that do what they need them to do – and look exactly the way they expect them to look. Thus, together with our customers we not only develop product innovations but more and more focus on new application technologies and process excellence to provide customized solutions for the individual challenges of our clients.

In our automotive pigments business, our pipeline consists of three pillars: product development, application engineering and effect visualization. We are actively working on the extension of our portfolio of Colorstream® multicolor effect pigments with outstanding saturation in the bluish red color space as an ideal complementation of the existing Colorstream® Lava Red. We will also add a fine light silver Iriodin® pigment to our metallic stylings offering a unique brightness and opacity.

With the development of a high viscous Durazane® polymer, we will extend the application field of anti-scratch and easy-to-clean coatings towards thicker films.

In addition, we push the boundaries of science and technology to lead our customers on the path to digitization of color evaluation processes. That is why we are implementing a digital setup that allows us to produce highly reliable color data as additional service for our customers.

In our Cosmetics business, we continue to put sustainability at the center of our efforts by more and more focusing on natural materials in our portfolio. Therefore, we will introduce additional cosmetic active materials from botanical sources with unique efficacy addressing anti-aging and anti-inflammatory claims. We also considered sustainability in the development of the first range of metal-free metal-look pigments for unique cosmetic effects based on proprietary and novel technology of pigment particle coating.

By broadening our portfolio of inorganic UV filters with two new products based on zinc peroxide (ZnO_2), we will strengthen our position as one of the leading UV experts for light protection and tanning.

With the market introduction of additional specific specialties products for high-security applications, we will also extend our Securalic® portfolio offering our customers more reliable and highly discreet counterfeit detection.

Report on Economic Position

Macroeconomic and Sector-Specific Environment

Following the recovery of the global economy in 2021, the International Monetary Fund (IMF) stated in its World Economic Outlook published on January 25, 2022, that this momentum is expected to slow down. This became visible in the second half of 2021. With the spread of the highly transmissible Omicron variant the Covid-19 pandemic resurges and mobility restrictions in some countries were reimposed, threating the recovery path. Higher infection rates put additional pressure on labor supply. A worldwide access to vaccines, tests, and treatments also in low-income countries as well as the efficacy against newly emerging variants is key to curbing the spread of the pandemic. Furthermore, inflation continued to rise in the second half of 2021 and is expected to remain elevated longer than initially anticipated, particularly in the United States. Main drivers are the ongoing supply shortage and rising energy prices. Further challenges to the global economy are, among others, China's recovery of private consumption and investments in its real estate sector, climate change as well as geopolitical tensions including eastern Europe and east Asia threatening energy supply, international trade, and policy cooperation.

According to the latest forecasts by the IMF[1], global gross domestic product (GDP) rose by 5.9% in 2021 (2020: -3.1%). The economic activity has shown strong post-recession recovery from the Covid-19 pandemic. However, the economic rebound is uneven across countries. Advanced economies registered a growth of 5.0% (2020: -4.5%) while the emerging markets and developing economies saw growth of 6.5% (2020: -2.0%). The GDP of the United States grew by 5.6% (2020: -3.4%). The Euro Area recorded a slightly weaker GDP growth of 5.2% in 2021 (2020: -6.4%). The emerging economies of Asia registered a growth of 7.2% (2020: -0.9%). The strongest drivers were China with 8.1% (2020: 2.3%) and India at 9.0% which recovered strongly from the impacts of the pandemic (2020: -7.3%). As part of the advanced economies, the GDP of Japan grew by 1.6% (2020: -4.5%).

Our organic sales growth was significantly above the IMF's global growth expectations in 2021 at 13.8%. It was supported by all regions. North America accounted for the highest share of Group-wide growth with 34.6%, followed by Europe with 29.9%, Asia-Pacific with 29.4%, Latin America with 4.9% and the Middle East and Africa at 1.2%.

The overall growth was predominantly driven by the Life Science business sector, which was supported by Covid-19 tailwinds in 2021. Healthcare and Electronics also contributed positively to the organic sales growth. Growth in North America, Europe, and Latin America were principally the result of operations in the Life Science and Healthcare business sectors. In the Asia-Pacific region, growth was supported by all business sectors.

[1] World Economic Outlook, as of January 2022

Development in 2021 and 2020

	Change 2021[1]	Change 2020
Life Science		
Market for laboratory products[2]	10.4%	6.8%
Share of biopharmaceuticals in the global pharmaceutical market[3]	33.2%	32.0%
Monoclonal antibody (mAb) pipeline[4]	11.8%	10.8%
Healthcare		
Global pharmaceutical market	6.3%	3.4%
Market for multiple sclerosis therapies[5]	-2.7%	0.9%
Market for type 2 diabetes therapies[5]	10.6%	12.6%
Market for fertility treatment[5]	27.0%	-2.0%
Market for the treatment of colorectal cancer[6]	-16.2%	-3.3%
Electronics		
Growth of wafer area for semiconductor chips	13.9%	5.3%
Growth of liquid crystal display surface area[7]	4.0%	5.7%
Global sales of cosmetics and care products	6.6%	-1.3%
Global number of produced light vehicles	2.2%	-15.9%

[1] Predicted development. Final development rates for 2021 were not available for all industries when this report was prepared.

[2] The Global Market for laboratory products, December 2021, Frost & Sullivan. Acceleration attributed to Covid-19-related life science products for Covid-19 testing, research, and treatment as well as strong life science R&D funding environment.

[3] Market volume based on market data in local currency, translated at a constant euro exchange rate. IQVIA market data based on the past 12 months as of the third quarter of 2021.

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

[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 2021. 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 the Group.

[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, which is counteracted by a negative price momentum.

Life Science

Our Life Science business sector is a leading global supplier of products, tools, and services for research laboratories, pharma and biotech production, and industrial and testing laboratories. While Covid-19 continues to have a pronounced impact on many sectors and the global economy as a whole, the life science market has proven itself to be robust. The rapid development and launch of Covid-19 tests, vaccines, and antiviral treatments presents a sizeable but likely short-lived upside, while the base market (excluding Covid-19-specific applications) continues on a strong growth trajectory.

According to the market research firm Frost & Sullivan, the market for laboratory products, which is relevant to our Research Solutions and Applied Solutions business units, grew 10.4% in 2021 (2020: 6.8%). Demand for products related to Covid-19 testing, research, and vaccination remained strong while demand for core consumables and instruments (non-Covid-19 related) returned to pre-pandemic levels after being impacted by regional lockdowns imposed in 2020 for pandemic control. Given strong base demand but anticipated declining Covid-19 contribution and difficult comparables, the market is expected to grow in the mid-single digits.

In the pharma and biotech production market, in which our Process Solutions business unit is active, demand is driven by the development and manufacture of therapeutics and vaccines. According to IQVIA, the end market for biopharmaceuticals grew by 11.9% in 2021 (2020: 10.0%) to € 355 billion (or 33.2% of the global pharmaceutical market). Monoclonal antibodies, currently the leading area of biopharmaceuticals, continued on their growth path in 2021 with positive development of 11.8% (2020: 10.8%). The rapid development and scale up for global administration of Covid-19 vaccines provided additional demand for key bioprocess consumables on top of the base market. Continued strong base market growth is expected to persist with some volatility until the pandemic abates, as routine healthcare and clinical trials resume.

Healthcare

In its latest study from September, the pharmaceutical market research firm IQVIA forecasts growth in the global pharmaceutical market of 6.3% in 2021 (2020: 3.4%). Recovering from the Covid-19 pandemic, the pharmaceutical market is expected to see higher growth in the reporting year than last year. While the pandemic is still ongoing, the pharmaceutical industry returned overall to growth and has been resilient to supply challenges as seen in other industries. Further benefits from positive developments in intellectual property regulations as well as increasing healthcare budgets have influenced the year 2021.

The developments at a regional level are extremely heterogeneous. Latin America reported significant growth of 15.9% (2020: 10.8%). The EMEA (Europe, Middle East and Africa) region also enjoyed continued solid year-on-year growth of 5.0% (2020: 4.8%). In North America, growth also increased compared to the previous year, amounting to 6.5% (2020: 4.5%). In absolute terms, the pharmaceutical market in the United States remains the biggest and most important market by some distance. Market growth in the Asia-Pacific region (excluding China and Japan) accelerated to 6.6% (2020: 2.2%). China grew by 7.2% (2020: -1.8%), which was due to the recovery from the Covid-19 pandemic as well as the continued development of the local healthcare system and the shift from spending on generic products as a result of price regulation (e.g. volume-based procurement) in favor of innovative treatments.

Not only the growth of the pharmaceutical sector as a whole, but also the development of the biopharmaceutical market, is relevant to our business. According to IQVIA, the market volume for biological pharmaceuticals totaled approximately € 355 billion in 2021 (2020: approximately € 318 billion), thus continuing the recent trend of a continuous increase in market share. These products accounted for 33.2% of the global pharmaceutical market in 2021 (2020: 32.0%). The most important market for biological pharmaceuticals remains the United States, with a 59.9% share of the global market value.

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 positive trend of previous years, achieving growth of 10.6% in 2021 (2020: 12.6%). The therapeutic area of infertility saw a significant upturn of 27.0% in the reporting year (2020: -2.0%) recovering from the severe impacts from the pandemic in the previous year caused for example by the closure of clinics. Following the decline in last year, the market for colorectal cancer further declined by -16.2% in 2021 (2020: -3.3%) due to biosimilar penetration. The growth trend in the market for multiple sclerosis patients stalled compared to the previous year’s level with -2.7% (2020: 0.9%) impacted by generic competition.

Electronics

The semiconductor industry is the most important market for our business with materials for the production of integrated circuits (Semiconductor Solutions). In particular, the growth in demand for semiconductor materials depends 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. According to the global industry association SEMI.org, the area of delivered silicon wafers was strongly increased by approximately 13.9% in 2021 (2020: 5.3%). This growth is fueled by the ongoing acceleration of digitization through Covid-19 and the resulting boosted demand for digital end-applications (notebooks, PCs, gaming) and digital infrastructure (network, servers, 5G). The high demand and the importance of semiconductors is clearly visible in the currently ongoing global chip shortage. Semiconductors are a key ingredient in many industries including communications, consumer electronics, automotive, transportation, clean energy, aerospace, and defense. To cope with this surge in demand, all major chip manufacturers increased and accelerated their investment plans into new fabs and additional capacity. Combined with ongoing innovation needs, these investments will lead to a huge demand for innovative materials. Driven by the mentioned acceleration of digitization and the according exponential growth of data, there is a lasting need for semiconductors across all device end-markets. Our targeted semiconductor materials market is expected to grow strongly, with only minor cyclicality.

With our Liquid Crystals business, we are the leading producer of liquid crystal mixtures for the display industry. According to surveys by market researchers at Omdia (forecast Q3 2021), the display surface area is growing at 4.0% in 2021 (2020: 5.7%). Driver of this growth is the strong demand for TV and IT equipment, caused by the ongoing “stay at home booming” after Covid-19, especially in the US market since the second half of the year 2020. Liquid crystals will continue to play a key role in the display industry in the future. OLED technology, for which we are also one of the leading material suppliers, 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 LMC, a leading global provider of automotive forecasts, global automobile production grew by 2.2% in 2021, after a steep decline of -15.9% in the previous year due to Covid-19 (factory closures, supply chain interruptions, and a slump in consumer demand). China continues to be one of the most important markets. In 2021, also other key markets in Asia (ex. China), Europe, and North America returned to growth. Despite the already mentioned chip shortage, the outlook for 2022 is positive with expected further improvement in market growth. The market for cosmetics and care products showed a good recovery with an overall growth of 6.6% in 2021 (2020: -1.3%). After the negative effects of Covid-19 regarding lockdowns and social distancing and the increased trade conflicts between the United States and China last year, Euromonitor expects the market recovery to be sustainable, also beyond 2021.

Review of Forecast against Actual Business Developments

The forecast of the Group for fiscal 2021 published in the Annual Report for fiscal 2020 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 strong organic net sales growth for the Group in 2021. Over the course of the year, the Group reported more dynamic organic sales growth on the back of the sustained strong organic growth of the Life Science business sector in particular. This meant we exceeded our original forecast with double-digit overall organic net sales growth of 13.8% in fiscal 2021. At the start of the year, we still anticipated negative exchange rate effects of between -2% and -5% on our net sales. However, several currencies saw more favorable development than expected as the year progressed, particularly the Chinese yuan. The negative exchange rate effect in 2021 as a whole was -1.4%, thus falling within our most recent update in the third quarter, which provided for a range of -1% to -2%. The slightly negative portfolio effect was negligible at -0.1%.

Life Science

Our Life Science business sector significantly exceeded our original forecast, generating organic sales growth of 21.3% in 2021. Thanks to consistently strong demand in our core business and the extreme relevance of our product and service range in the context of the pandemic, we updated our forecast in the third quarter to provide for a range of between +20% and +22%. As expected, Process Solutions was again the most dynamic business unit, delivering the largest contribution to organic sales growth within Life Science. Applied Solutions and Research Solutions also contributed positively to the organic sales performance, as anticipated, albeit to a considerably lesser extent than Process Solutions.

Healthcare

We originally forecast strong organic sales growth for our Healthcare business sector compared with the previous year. Although the Covid-19 pandemic continued to have some impact, the business sector met this forecast with strong organic growth of 8.5% in 2021 as a whole. This also fell within the range of +8% to +9% that we forecast in our most recent update in the third quarter. This development was driven in particular by the significant growth contribution from fertility business compared with the muted performance in the previous year due to the pandemic, as well as the substantial growth in our most recently approved products, especially Bavencio®.

Electronics

Since we anticipated positive development in semiconductor business, we forecast solid organic growth for our Electronics business sector at the start of the year. The business sector slightly outperformed the original forecast with organic sales growth of 7.7%. Our main assumptions concerning strong growth momentum in Semiconductor Solutions, a recovery in Surface Solutions, and strong organic growth in OLED business proved to be accurate. Thanks to an especially strong fourth quarter for Semiconductor Solutions in particular, the business sector ultimately closed the year at the upper end of the most recent forecast range of between 7% and 8%.

EBITDA pre

For 2021, we originally forecast high single-digit to low double-digit organic growth in EBITDA pre for the Group compared with the previous year. This assumption was based on the expectation of low double-digit organic growth in Life Science, accompanied by strong organic growth in Healthcare and solid to strong growth in Electronics. Because of the expected unfavorable foreign exchange environment, we expected moderate negative exchange rate effects to impact EBITDA pre by between -2% and -5% compared with the prior year. EBITDA pre amounted to € 6,103 million in fiscal 2021. This represented an overall increase of 26.2% compared with the prior-year figure adjusted for the reversal of a provision for a patent dispute in the amount of € 365 million. The organic growth of 27.0% included in this figure fell within the forecast range of 26% to 29% we issued in the third quarter of 2021. Without adjusting the prior-year figure for the reversal of the provision, organic growth was also within the most recent forecast range of 17% to 20%, coming in at 18.1%. Exchange rate effects had a less negative impact than anticipated at the start of the year, which is why we narrowed our forecast range to between -1% and -2% in our reporting over the course of the year, ultimately closing 2020 at -0.6%.

Life Science

For the Life Science business sector, we originally forecast low double-digit organic growth in EBITDA pre on the back of the expected organic sales growth. However, the impact of the sustained high level of additional demand in the context of the Covid-19 pandemic, particularly in the Process Solutions business unit, became increasingly evident as the year progressed. We responded by upwardly revising our forecast for organic growth in EBITDA pre on several occasions, most recently to between 36% and 39%. With EBITDA pre of € 3,286 million in fiscal 2021 (2020: € 2,405 million) and year-on-year organic growth of 37.7%, the business sector's performance was consistent with the forecast range that was raised significantly in the report on the third quarter. Foreign exchange development impacted EBITDA pre in the Life Science business sector by -0.9%, which was marginally more favorable than our latest forecast range of -1% to -2%.

Healthcare

For our Healthcare business sector, we forecast strong organic growth in EBITDA pre compared with the previous year due to substantial expected earnings contributions from our new products, particularly Mavenclad® and Bavencio®. Healthcare generated EBITDA pre of € 2,153 million in 2021 (2020: € 1,902 million after adjustment for the reversal of a provision for a patent dispute in the amount of € 365 million; € 2,267 million excluding this adjustment). This represents an increase of 13.2% compared with the adjusted prior-year figure, while the organic growth of 17.1% fell within the forecast range at the end of the year. Without adjusting the prior-year figure for the reversal of the provision, organic growth was also within the most recent forecast range of +1% to -2%, coming in at -1.7%. By contrast, the foreign exchange effect on EBITDA pre in 2021 as a whole was substantially less negative than expected at the start of the year at -3.2%, meaning it also fell outside the most recently adjusted range of between -5% and -6%.

Electronics

Due to the anticipated growth in Semiconductor Solutions and active cost management in connection with the Bright Future transformation program, we originally forecast solid to strong organic growth in EBITDA pre in the Electronics business sector. With semiconductors in particular developing positively as expected, the forecast for organic earnings growth was raised slightly in the first quarter and remained constant over the course of the year. Electronics recorded EBITDA pre of € 1,128 million in 2021 as a whole (2020: € 1,024 million). This represented strong year-on-year organic growth of 9.7%, which was at the upper end of our forecast at the start of the year and also fell within the most recent forecast range of 9% to 12%. The slightly positive foreign exchange effect of 0.5% was slightly above our forecast of 0% to -2% in the third quarter.

Corporate and Other

The expenses for Corporate and Other in EBITDA pre amounted to € -465 million in fiscal 2021. This was consistent with the forecast issued at the start of the year as well as the most recent update, which provided for a forecast range of between € -440 million and € -470 million. Compared with the prior-year figure of € -495 million, this corresponded to a reduction in costs of -6.2%.

Operating cash flow

We originally expected the operating cash flow of the Group to increase slightly year-on-year in 2021. With an operating cash flow of € 4,616 million, up 32.7% on the previous year (2020: € 3,477 million), this forecast was exceeded by some distance. This was due in particular to the higher level of EBITDA pre in the Life Science business sector.

Group

	Net sales	EBITDA pre[1]	Operating Cash Flow	EPS pre
Actual results 2020 in € million	17,534	5,201	3,477	€ 6.70
Forecast for 2021 in the 2020 Annual Report	- Solid organic growth - Negative foreign exchange effect of -2% to -5%	- Organic growth in the high single-digit to low teens percentage range - Negative foreign exchange effect of -2% to -5%	Slight increase over the previous year	
Main comments	- Organic growth driven by all three business sectors - Negative foreign exchange effects from the U.S. dollar in particular and individual growth markets	- Life Science with growth in the low teens range - Strong growth in Healthcare - Solid to strong growth in Electronics - Realization of synergies totaling approximately € 83 million as planned from the integration of Versum Materials into Electronics - Negative foreign exchange effects from the U.S. dollar in particular and individual growth markets	- Rise in EBITDA pre - Increase in net working capital and adverse impact from negative foreign exchange effects - Higher fluctuation corridors than for net sales and EBITDA pre are to be expected - Payments in connection with the transformation and growth program THRIVE commenced by Healthcare in 2020	

[1] EBITDA pre of fiscal 2020 included income from the release of a provision for patent litigation amounting to € 365 million. Including this amount in the previous year, we expected slight to moderate organic growth.

Forecast for 2021 in the interim report:				
Q1/2021	~18,500 to 19,500 - Organic increase of +10% to +12% - Exchange rate effect -2% to -4%	~5,400 to 5,800[1] - Organic increase of +16% to +20% - Exchange rate effect -2% to -4%	~3,600 to 4,200	€ 7.50 to € 8.20
Q2/2021	~18,800 bis 19,700 - Organic increase of +12% to +14% - Exchange rate effect –2% to –4%	~5,600 bis 6,000[2] - Organic increase of +21% to +25% - Exchange rate effect –2% to –4%	~3,800 bis 4,400	€ 7.80 to € 8.50
Q3/2021	~19,300 to 19,850 - Organic increase of +13% to +15% - Foreign exchange effect –1% to –2%	~6,000 to 6,300[3] - Organic increase of +26% to +29% - Foreign exchange effect –1% to –2%	~4,200 to 4,700	€ 8.50 to € 9.00
Results 2021 in € million	19,687 (+12.3%: +13.8% organic, -0.1% portfolio, -1.4% currency)	6,103 (+17.3%: +18.1% organic, -0.1% portfolio, -0.6% currency)	4,616 +32.7%	€ 8.72 +30.1%

EBITDA pre of fiscal 2020 included income from the reversal of a provision for patent litigation amounting to € 365 million. Including this amount in 2020, we expected:

[1] organic growth of between 9% and 12% for the Group
[2] organic growth of between 12% and 17% for the Group
[3] organic growth of 17% to 20% for the Group

Life Science

	Net sales	EBITDA pre	Operating Cash Flow
Actual results 2020 in € million	7,515	2,405	n/a
Forecast for 2021 in the 2020 Annual Report	- Organic growth in the low teens percentage range - Slight to moderately negative foreign exchange effect	- Organic earnings growth in the low teens percentage range - Slightly negative foreign exchange effects	n/a
Main comments	- All businesses contribute to growth - Process Solutions remains the main driver of growth, followed by Applied Solutions - Negative foreign exchange effect on account of the U.S. dollar in particular	- Organic earnings growth owing to the expected sales growth and positive Covid-19 effects amid a slight margin improvement - Negative foreign exchange effects primarily owing to the development of individual growth market currencies	n/a
Forecast for 2021 in the interim report:			
Q1/2021	~8,200 to 8,700 - Organic increase of +15% to +18% - Exchange rate effect –2% to –5%	~2,850 to 3,000 - Organic increase of +22% to +26% - Exchange rate effect –1% to –3%	n/a
Q2/2021	~8,500 bis 8,950 - Organic increase of +18% to +21% - Exchange rate effect –2% to –4%	~3,050 bis 3,200 - Organic increase of +30% to +34% - Exchange rate effect –1% to –3%	na/
Q3/2021	~8,800 to 9,050 - Organic increase of +20% to +22% - Foreign exchange effect –2% to –3%	~3,200 to 3,350 - Organic increase of +36% to +39% - Foreign exchange effect –1% to –2%	n/a
Results 2021 in € million	8,890 (+19.6%: +21.3% organic, 0.0% portfolio, -1.6% currency)	3,286 (+36.6%: +37.7% organic, -0.2% portfolio, -0.9% currency)	n/a

Healthcare

	Net sales	EBITDA pre [1]	Operating Cash Flow
Actual results 2020 in € million	6,639	2,267	n/a
Forecast for 2021 in the 2020 Annual Report	- Strong organic growth - Slight to moderately negative foreign exchange effect	- Strong organic growth - Strongly negative foreign exchange effect	n/a
Main comments	- Roughly stable organic development of the core business - Substantial contribution to growth by Mavenclad® and Bavencio® - Negative foreign exchange effects, in particular the U.S. dollar and individual growth market currencies	- Expected substantial earnings contribution especially from Mavenclad® can more than offset the effect from the expected decline in sales of Rebif® - Marketing and selling expenses as well as research and development costs with decrease in percentage of sales due to systematic cost management and strict pipeline prioritization - Negative foreign exchange effects, in particular the U.S. dollar and individual growth market currencies	n/a

[1] EBITDA pre of fiscal 2020 included income from the release of a provision for patent litigation amounting to € 365 million. Including this amount in the previous year, we expected a strong organic decline.

Forecast for 2021 in the interim report:			
Q1/2021	~6,850 to 7,200 - Organic increase of +7% to +10% - Exchange rate effect –2% to –4%	~2,000 to 2,100[1] - Organic increase of +12% to +15% - Exchange rate effect –5% to –7%	n/a
Q2/2021	~6,850 bis 7,200 - Organic increase of +7% to +10% - Exchange rate effect –2% to –4%	~2,050 bis 2,150[2] - Organic increase of +15% to +18% - Exchange rate effect –5% to –7%	n/a
Q3/2021	~6,950 to 7,150 - Organic increase of +8% to +9% - Foreign exchange effect –1% to –2%	~2,110 to 2,200[3] - Organic increase of +17% to +20% - Foreign exchange effect –5% to –6%	n/a
Results 2021 in € million	**7,089 (+6.8%: +8.5% organic, -0.3% portfolio, -1.4% currency)**	**2,153 (-5.0%: -1.7% organic, -0.1% portfolio, -3.2% currency)**	**n/a**

EBITDA pre of fiscal 2020 included income from the reversal of a provision for patent litigation amounting to € 365 million. Including this amount in 2020, we expected:

[1] an organic decline of –4% to –6% for Healthcare.
[2] an organic decline of –1% to –4% for Healthcare.
[3] an organic development of 1% to –2% for Healthcare.

Electronics

	Net sales	EBITDA pre	Operating Cash Flow
Actual results 2020 in € million	3,380	1,024	n/a
Forecast for 2021 in the 2020 Annual Report	- Solid organic growth - Slight to moderately negative foreign exchange effect	- Solid to strong organic growth - Significant to strongly negative foreign exchange effect	n/a
Main comments	- Strong growth momentum in Semiconductor Solutions - Positive organic growth in Surface Solutions - High organic growth in OLED materials - Negative foreign exchange effects from key Asian currencies and the U.S. Dollar	- Growth in Semiconductor Solutions can more than offset price decline in Liquid Crystals supported by active cost management - Planned realization of synergies totaling around € 83 million from the integration of Versum Materials - Negative foreign exchange effects from key Asian currencies and the U.S. dollar	n/a
Forecast for 2021 in the interim report:			
Q1/2021	~3,400 to 3,550 - Organic increase of +5% to +7% - Exchange rate effect –1% to –4%	~1,050 to 1,130 - Organic increase of +9% to +12% - Exchange rate effect –3% to –5%	n/a
Q2/2021	~3,450 bis 3,600 - Organic increase of +6% to +8% - Exchange rate effect –1% to –3%	~1,070 bis 1,130 - Organic increase of +9% to +12% - Exchange rate effect –2% to –4%	n/a
Q3/2021	~3,500 to 3,650 - Organic increase of +7% to +8% - Foreign exchange effect –1% to –2%	~1,080 to 1,140 - Organic increase of +9% to +12% - Foreign exchange effect 0% to –2%	n/a
Results 2021 in € million	**3,608 (+6.7%: +7.7% organic, +0.0% portfolio, -0.9% currency)**	**1,128 (+10.2%: +9.7% organic, +0.0% portfolio, +0.5% currency)**	**n/a**

Corporate and Other

	EBITDA pre	Business Free Cash Flow
Actual results 2020 in € million	-495	n/a
Forecast for 2021 in the 2020 Annual Report	We expect that in fiscal 2021, Corporate and Other will be below the previous year's level. This is mainly due to the positive effects expected from foreign currency hedging, which will partly offset negative foreign exchange effects in the business sectors.	
Main comments		
Forecast for 2021 in the interim report:		
Q1/2021	~–440 to –490	
Q2/2021	~–450 bis –500	
Q3/2021	~–440 to –470	
Results 2021 in € million	**-465 (-6.2%: +5.7% organic, -0.1% portfolio, -11.8% currency)**	

Course of Business and Economic Position

Group

Overview of 2021

- Group net sales up € 2.2 billion or 12.3% to € 19.7 billion (2020: € 17.5 billion)
- Organic sales growth of 13.8%; negative foreign exchange effects of -1.4%
- Group EBITDA pre improves by 17.3% to € 6.1 billion (2020: € 5.2 billion); prior-year figure includes income of € 365 million from the release of a provision for potential compensation payments
- EBITDA pre margin rises to 31.0% (2020: 29.7%)
- Earnings per share pre increases by 30.1% to € 8.72 (2020: € 6.70)
- Operating cash flow of the Group amounts to € 4.6 billion (2020: € 3.5 billion)
- Reduction in net financial debt of 18.6% to € 8.8 billion (December 31, 2020: € 10.8 billion)

Group

Key figures

			Change	
€ million	**2021**	2020	€ million	%
Net sales	19,687	17,534	2,152	12.3%
Operating result (EBIT)[1]	4,179	2,985	1,194	40.0%
Margin (% of net sales)[1]	21.2%	17.0%		
EBITDA[2]	5,946	4,923	1,023	20.8%
Margin (% of net sales)[1]	30.2%	28.1%		
EBITDA pre[1]	6,103	5,201	901	17.3%
Margin (% of net sales)[1]	31.0%	29.7%		
Profit after tax	3,065	1,994	1,071	53.7%
Earnings per share (€)	7.03	4.57	2.46	53.8%
Earnings per share pre (€)[1]	8.72	6.70	2.02	30.1%
Operating cash flow	4,616	3,477	1,138	32.7%

[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.

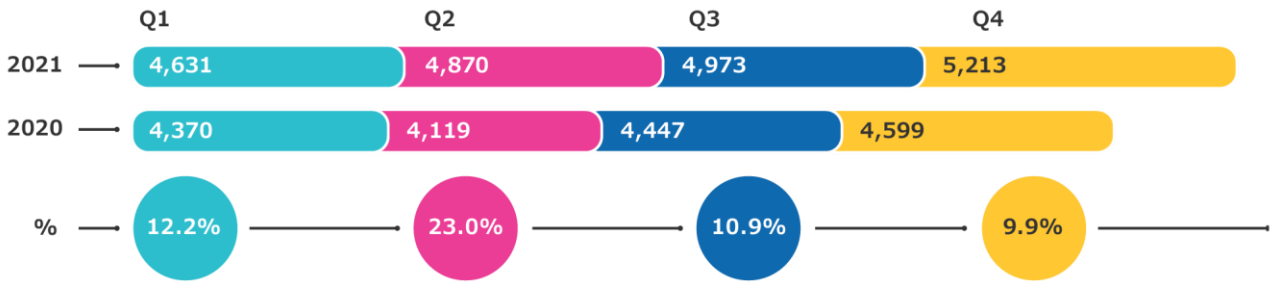
Development of sales and results of operations

In fiscal 2021, the Group generated net sales of € 19,687 million (2020: € 17,534 million), representing a year-on-year increase of € 2,152 million or 12.3%. This positive development was attributable to an organic net sales growth, which totaled € 2,421 million or 13.8% in fiscal 2021. This organic growth was driven by all of the Group's business sectors. At 21.3%, Life Science was by far the business sector with the highest organic sales growth. Exchange rate effects negatively impacted net sales in the amount of € -248 million or -1.4% in fiscal 2021. This was due in particular to the development of the U.S. dollar.

The net sales in the individual quarters as well as the respective organic growth rates in 2021 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.

The Life Science business sector recorded organic net sales growth of € 1,597 million year-on-year to € 8,990 million (2020: € 7,515 million). Including negative foreign exchange effects of -1.6%, net sales increased by 19.6% overall. Accounting for 46% of Group sales (2020: 43%), Life Science was the strongest business sector in terms of net sales. The Healthcare business sector recorded net sales growth of 6.8% to € 7,089 million in fiscal 2021 (2020: € 6,639 million). Organic sales growth of 8.5% was offset by negative foreign exchange effects amounting to -1.4%. Accordingly, the share of Group sales attributable to Healthcare fell by 2 percentage points to 36% (2020: 38%). The 6.7% increase in net sales in the Electronics business segment to € 3,608 million (2020: € 3,380 million) comprised organic growth of 7.7% and negative foreign exchange effects of -0.9%. The share of the Group's net sales attributable to Electronics declined slightly to 18% (2020: 19%).

Group

Net sales by business sector - 2021
€ million/% of net sales

Group

Net sales by business sector

€ million	2021	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2020	Share
Life Science	8,990	46%	21.3%	-1.6%	–	19.6%	7,515	43%
Healthcare	7,089	36%	8.5%	-1.4%	-0.3%	6.8%	6,639	38%
Electronics	3,608	18%	7.7%	-0.9%	–	6.7%	3,380	19%
Group	**19,687**	**100%**	**13.8%**	**-1.4%**	**-0.1%**	**12.3%**	**17,534**	**100%**

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

In fiscal 2021, the Group recorded the following regional sales performance:

Group

Net sales by region

€ million	2021	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2020	Share
Europe	5,675	29%	14.5%	-0.5%	-0.3%	13.7%	4,991	29%
North America	5,397	27%	17.7%	-3.8%	–	13.9%	4,739	27%
Asia-Pacific (APAC)	7,020	36%	11.3%	–	-0.1%	11.2%	6,313	36%
Latin America	990	5%	12.9%	-4.2%	–	8.8%	910	5%
Middle East and Africa (MEA)	605	3%	5.1%	-1.0%	–	4.1%	581	3%
Group	**19,687**	**100%**	**13.8%**	**-1.4%**	**-0.1%**	**12.3%**	**17,534**	**100%**

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

The Consolidated Income Statement of the Group is as follows:

Group

Consolidated Income Statement

					Change	
€ million	**2021**	**%**	2020	%	€ million	%
Net sales	**19,687**	**100.0%**	**17,534**	**100.0%**	**2,152**	**12.3%**
Cost of sales	-7,351	-37.3%	-6,835	-39.0%	-516	7.6%
Gross profit	**12,335**	**62.7%**	**10,699**	**61.0%**	**1,636**	**15.3%**
Marketing and selling expenses	-4,304	-21.9%	-4,207	-24.0%	-97	2.3%
Administration expenses	-1,241	-6.3%	-1,188	-6.8%	-53	4.5%
Research and development costs	-2,408	-12.2%	-2,288	-13.0%	-119	5.2%
Impairment losses and reversals of impairment losses on financial assets (net)	1	0.0%	-6	0.0%	7	>100.0%
Other operating income and expenses	-206	-1.0%	-25	-0.1%	-180	>100.0%
Operating result (EBIT)[1]	**4,179**	**21.2%**	**2,985**	**17.0%**	**1,194**	**40.0%**
Financial result	-255	-1.3%	-354	-2.0%	100	-28.1%
Profit before income tax	**3,924**	**19.9%**	**2,630**	**15.0%**	**1,293**	**49.2%**
Income tax	-859	-4.4%	-637	-3.6%	-222	34.9%
Profit after tax	**3,065**	**15.6%**	**1,994**	**11.4%**	**1,071**	**53.7%**
Non-controlling interests	-10	-0.1%	-7	0.0%	-4	58.5%
Net income	**3,055**	**15.5%**	**1,987**	**11.3%**	**1,067**	**53.7%**

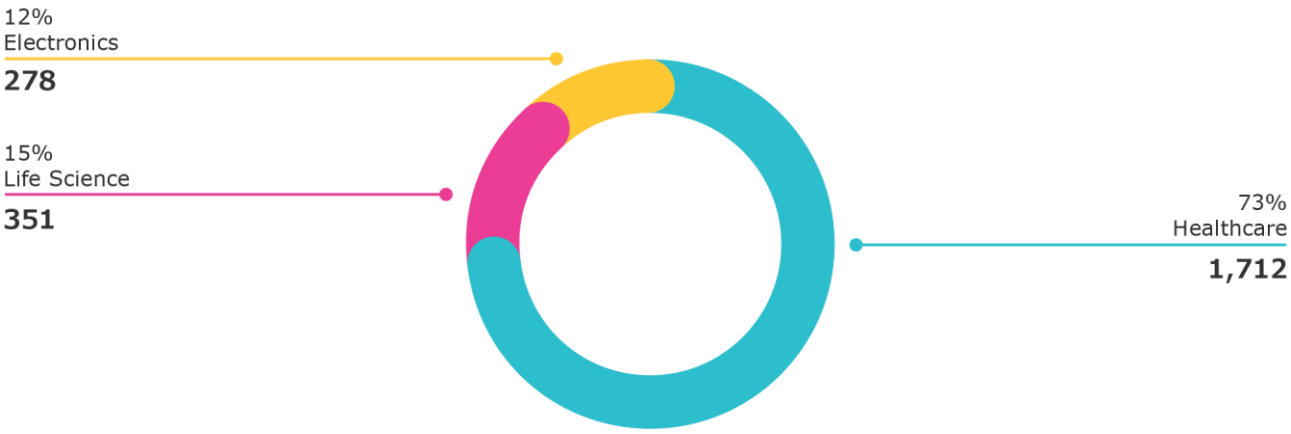
[1] Not defined by International Financial Reporting Standards (IFRS).

The positive business performance in fiscal 2021 led to an increase of 15.3% in the Group's gross profit to € 12,335 million (2020: € 10,699 million). The resulting gross margin of the Group, i.e. gross profit as a percentage of net sales, improved by 1.7 percentage points year-on-year to 62.7% (2020: 61.0%).

Group-wide research and development costs rose by 5.2% to € 2,408 million in the year under review (2020: € 2,288 million) and led to a research spending ratio (research and development costs as a percentage of net sales) of 12.2% (2020: 13.0%). Accounting for 73% (2020: 74%) of Group R&D spending, Healthcare remained the most research-intensive business sector of the Group. Further information can be found in chapter „Research and Development".

Group

Research and development costs by business sector[1] - 2021
€ million/%



[1] Not presented: research and development costs of € 67 million allocated to Corporate and Other.

The expense balance of other operating expenses and income rose to € -206 million in fiscal 2021 (2020: € -25 million). This substantial change was primarily due to the income from the release of a provision of € 365 million for potential damages in the Healthcare business sector in the previous year. Detailed information about the development and composition of other operating expenses and income can be found in Note (13) "**Other operating income**" and Note (14) "**Other operating expenses**" in the Notes to the Consolidated Financial Statements.

An increase in provisions for obligations under long-term variable compensation programs (Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany) had an adverse effect on the operating result in the year under review, with the rise in the intrinsic value of the Share Units of Merck KGaA, Darmstadt, Germany (MSUs) being reflected in the respective functional costs depending on the area of activity of the plan beneficiaries.

The financial result improved by 28.1% to € -255 million in fiscal 2021 (2020: € -354 million). This positive development was primarily due to lower interest expenses. Details about the Group's 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 € 859 million in 2021 (2020: € 637 million) and resulted in a tax rate of 21.9% (2020: 24.2%). Further information on income taxes can be found in Note (15) "**Income tax**" in the Notes to the Consolidated Financial Statements.

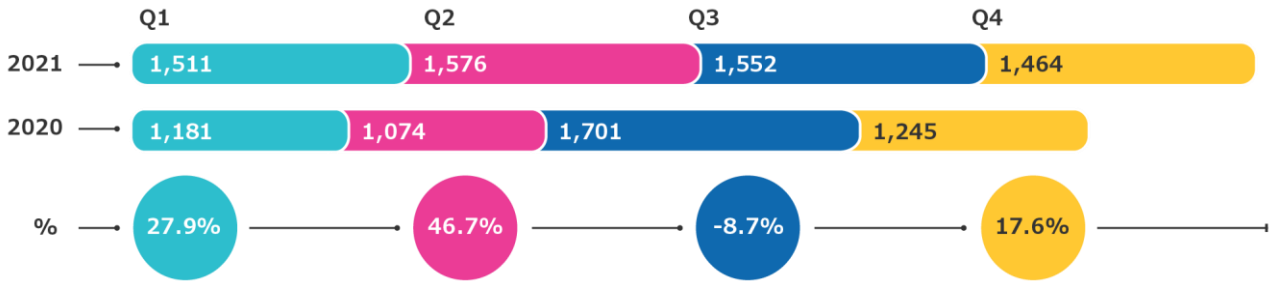
The net income attributable to Merck KGaA, Darmstadt, Germany, shareholders increased by 53.7% to € 3,055 million (2020: € 1,987 million) and resulted in an improvement in earnings per share to € 7.03 in fiscal 2021 (2020: € 4.57).

EBITDA pre, the key financial indicator used to steer operating business, rose by € 901 million or 17.3% to € 6,103 million (2020: € 5,201 million). Organic earnings growth amounted to 18.1%. It should be noted that the prior-year figure included income from the release of a provision for potential damages (€ 365 million). Foreign exchange effects (-0.6%) and portfolio effects (-0.1%) had an insignificant impact on the development of EBITDA pre in the year under review. The EBITDA pre margin of the Group (EBITDA pre as a percentage of net sales) improved to 31.0% (2020: 29.7%). The reconciliation of the operating result (EBIT) to EBITDA pre is presented in the "Internal Management System" chapter.

The development of EBITDA pre in the individual quarters in comparison with 2020 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.

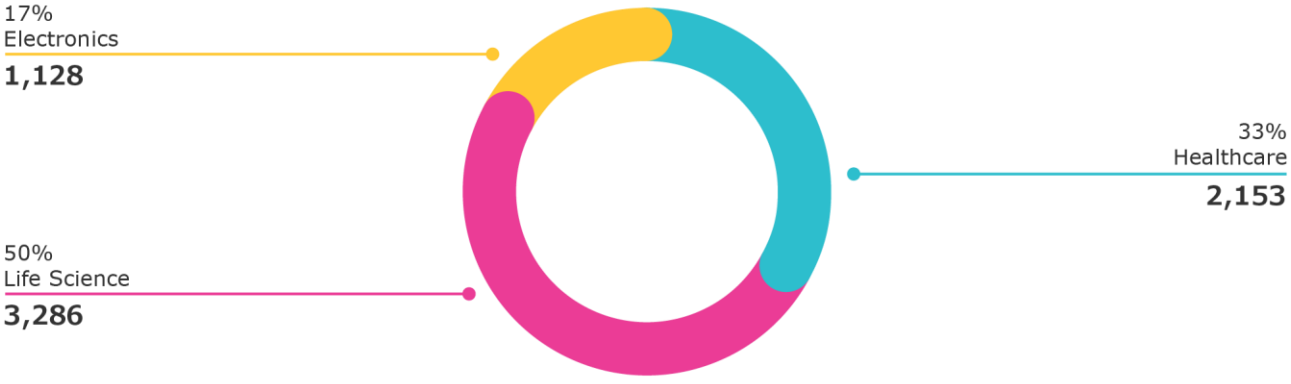
The biggest contribution to the growth in Group EBITDA pre came from the Life Science business sector, which generated EBITDA pre of € 3,286 million, up 36.6% on the previous year (2020: € 2,405 million). This meant the EBITDA pre margin in Life Science increased to 36.6% in fiscal 2021 (2020: 32.0%). The share of Group EBITDA pre attributable to the Life Science business sector (not taking into account the € -465 million reduction due to Corporate and Other) rose to 50% (2020: 42%).

EBITDA pre in the Healthcare business sector declined by -5.0% to € 2,153 million (2020: € 2,267 million). Accordingly, the EBITDA pre margin fell to 30.4% in fiscal 2021 (2020: 34.1%). It should be noted that the prior-year figure for the business sector included income from the release of a provision for potential damages (€ 365 million). The share of Group EBITDA pre attributable to the Healthcare business sector declined to 33% (2020: 40%).

The Electronics business sector increased its EBITDA pre by 10.2% to € 1,128 million in fiscal 2021 (2020: € 1,024 million). The share of Group EBITDA pre attributable to the Electronics business sector amounted to 17% in the year under review (2020: 18%). The EBITDA pre margin rose by one percentage point to 31.3% (2020: 30.3%).

Group

EBITDA pre[1] by business sector[2] - 2021
€ million/%



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Not presented: Decline in Group EBITDA pre by €-465 million due to Corporate and Other.

Net assets and financial position

Group

Balance sheet structure

	Dec. 31, 2021		Dec. 31, 2020		Change	
	€ million	**%**	€ million	%	€ million	%
Non-current assets	**34,380**	**75.8%**	**32,516**	**77.8%**	**1,864**	**5.7%**
thereof:						
Goodwill	17,004		15,959		1,046	
Other intangible assets	7,612		7,653		-41	
Property, plant and equipment	7,217		6,421		796	
Other non-current assets	2,546		2,483		63	
Current assets	**10,982**	**24.2%**	**9,280**	**22.2%**	**1,702**	**18.3%**
thereof:						
Inventories	3,900		3,294		607	
Trade and other current receivables	3,646		3,221		425	
Other current financial assets	174		125		49	
Other current assets	1,362		1,286		76	
Cash and cash equivalents	1,899		1,355		544	
Total assets	**45,362**	**100.0%**	**41,796**	**100.0%**	**3,566**	**8.5%**
Equity	**21,416**	**47.2%**	**17,017**	**40.7%**	**4,399**	**25.9%**
Non-current liabilities	**13,515**	**29.8%**	**15,548**	**37.2%**	**-2,034**	**-13.1%**
thereof:						
Non-current provisions for employee benefits	3,402		3,880		-478	
Other non-current provisions	269		281		-11	
Non-current financial debt	8,270		9,785		-1,515	
Other non-current liabilities	1,574		1,603		-29	
Current liabilities	**10,432**	**23.0%**	**9,231**	**22.1%**	**1,201**	**13.0%**
thereof:						
Current provisions	601		613		-12	
Current financial debt	2,531		2,357		174	
Trade and other current payables/ refund liabilities	3,219		2,434		785	
Other current liabilities	4,081		3,828		253	
Total equity and liabilities	**45,362**	**100.0%**	**41,796**	**100.0%**	**3,566**	**8.5%**

The total assets of the Group amounted to € 45,362 million as of December 31, 2021 (December 31, 2020: € 41,796 million), representing an increase of 8.5% or € 3,566 million in fiscal 2021. This development was due to the impact of the successful course of business as well as exchange rate changes, particularly the stronger US dollar at the reporting date.

The year-on-year increase in property, plant and equipment was attributable to additions of € 1,443 million (2020: € 1,530 million), which significantly exceeded depreciation and disposals in the reporting period. The previous year's figure includes the payment of € 208 million for the acquisition of the previously leased land and buildings of the Life Science site in Burlington, Massachusetts (USA). Of the additions to property, plant and equipment in 2021, € 198 million (2020: € 168 million) related to strategic investments in Germany, including € 151 million for the expansion of the Darmstadt site. Among other things, the Life Science business sector invested € 46 million in a new membrane production plant and € 43 million in a new filling and logistics center in Schnelldorf. Outside Germany, high levels of strategic investments were recorded in the United States (€ 203 million) and Switzerland (€ 159 million) in particular. The United States saw a Healthcare investment of € 19 million in the expansion of the research and development center in Billerica and Life Science investments of € 38 million in a new manufacturing facility for gene therapy products in Carlsbad and € 32 million in the expansion of the production facility for high-potent ingredients in Madison-Verona. In Switzerland, the Healthcare business sector invested € 86 million in a new development center to produce biotechnological products and € 31 million in a new production building for bottling these products.

In fiscal 2021, the equity of the Group rose by 25.9% to € 21,416 million (December 31, 2020: € 17,017 million). This was primarily due to the profit after tax generated (€ 3.1 billion), positive currency translation effects (€ 1.7 billion) and actuarial gains on provisions for pensions (€ 0.6 billion). The dividend payments and profit distribution in the reporting year (€ 0.8 billion) served to reduce equity (see "Consolidated Statement of Changes in Net Equity" in the Consolidated Financial Statements). The equity ratio improved by more than six percentage points to 47.2% (December 31, 2020: 40.7%).

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

Group

Net financial debt[1]

			Change	
€ million	**Dec. 31 ,2021**	Dec. 31, 2020	€ million	%
Bonds and commercial paper	9,320	9,642	-322	-3.3%
Bank loans	36	1,085	-1,050	-96.7%
Liabilities to related parties	896	817	79	9.7%
Loans from third parties and other financial debt	56	58	-2	-3.3%
Liabilities from derivatives (financial transactions)	35	102	-67	-66.0%
Lease liabilities	459	438	21	4.7%
Financial debt	**10,801**	**12,142**	**-1,340**	**-11.0%**
less:				
Cash and cash equivalents	1,899	1,355	544	40.1%
Other current financial assets[2]	149	28	120	>100.0%
Net financial debt[1]	**8,753**	**10,758**	**-2,005**	**-18.6%**

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

[2] Excluding current derivatives (operational).

Group

Reconciliation of net financial debt[1]

€ million	2021	2020
January 1	**10,758**	**12,363**
Operating Cash Flow	-4,616	-3,477
Payments for investments in intangible assets[2]	355	150
Payments from the disposal of intangible assets[2]	-39	-88
Payments for investments in property, plant and equipment[2]	1,066	1,413
Payments from the disposal of property, plant and equipment[2]	-7	-35
Acquisitions[2]	4	11
Payments for/proceeds from the disposal of assets held for sale[2]	-1	-48
Change in lease liabilities	151	65
Dividend payments/profit withdrawals[2]	757	687
Currency translation difference	203	-189
Other	122	-93
December 31	**8,753**	**10,758**

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

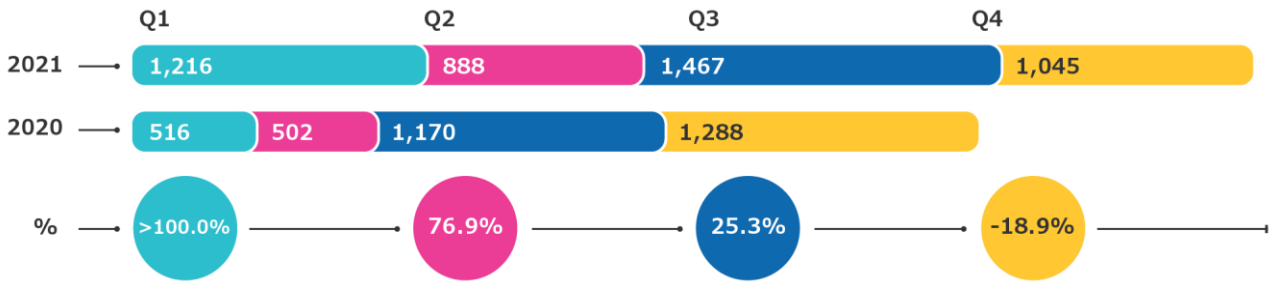
[2] As reported in the Consolidated Cash Flow Statement.

With effect from fiscal 2021, operating cash flow replaces business free cash flow as one of the three most important key performance indicators alongside net sales and EBITDA pre. The composition of operating cash flow is presented in the “Internal Management System” chapter.

In fiscal 2021, operating cash flow increased by 32.7% to € 4,616 million (2020: € 3,477 million). This strong performance was due in particular to the substantial growth in EBITDA pre. The distribution of operating cash flow across the individual quarters and the percentage changes in comparison with 2020 were as follows:

Group

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



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

The capital market uses the assessments published by rating agencies to help lenders assess the risks of a financial instrument used by our company. We are currently rated by Standard & Poor’s, Moody’s, and Scope. Standard & Poor’s has issued a long-term credit rating of A with a stable outlook, Moody’s a rating of A3 with a stable outlook, and Scope a rating of A– with a positive outlook. An overview of the development of our rating in recent years is presented in the Report on Risks and Opportunities.

The development of key balance sheet figures was as follows:

Group

Key balance sheet figures

%		Dec. 31, 2021	Dec. 31, 2020	Dec. 31, 2019	Dec. 31, 2018	Dec. 31, 2017
Equity ratio[1]	Total equity / Total assets	47.2%	40.7%	40.9%	46.7%	39.5%
Asset ratio[1]	Non-current assets / Total assets	75.8%	77.8%	79.4%	75.0%	79.1%
Asset coverage[1]	Total equity / Non-current assets	62.3%	52.3%	51.5%	62.3%	49.9%
Finance structure[1]	Current liabilities / Liabilities (total)	43.6%	37.3%	45.7%	43.3%	40.1%

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

Overall assessment of business performance and economic situation

Despite the ongoing pandemic and the resulting challenges, the Group can look back in a highly successful fiscal 2021. Needless to say, the safety of our teams around the world remained our top priority, and we averted major disruptions to our supply chains and business operations.

We reached or even exceeded the financial targets we had set ourselves for fiscal 2021. All three business sectors achieved excellent results. With particularly good performance, the "Big 3"[1] – the Process Solutions business within Life Science, new products from the Healthcare research pipeline, and the Semiconductor Solutions business within the Electronics business sector – representing the most important growth drivers of the Group. In fiscal 2021, the Group increased its net sales by 12.3% or € 2.2 billion to € 19.7 billion. Organic sales growth amounted to 13.8% or € 2.4 billion. EBITDA pre, the most important financial indicator for steering our operating business, rose by 17.3% to € 6.1 billion. Net financial debt was reduced by € 2.0 billion to € 8.8 billion thanks to the strong growth in the operating cash flow, which increased by 32.7% or € 1.1 billion to € 4.6 billion in fiscal 2021. Consequently, we will propose to the Annual General Meeting the payment of a dividend of € 1.85 per share for fiscal 2021 – an increase of 32% on the previous year.

The extremely positive business development and solid financing policies of the Group are reflected in its consistently good key balance sheet figures. The equity ratio was an impressive 47.2% as of December 31, 2021 (December 31, 2020: 40.7%). So that we can continue to achieve a rapid reduction in net financial debt, we are focusing on generating organic sales and earnings growth and on high inflows of financial resources from operating business activities.

The reduction in net financial debt also means the Group has significantly greater financial flexibility once again. This will enable us to increase our total investments for the period from 2021 to 2025 by more than 50% compared with the period from 2016 to 2020.

Based on our solid net assets and financial position, and our profitable operations, we view the economic situation of the Group as positive overall.

[1] As of April 1, 2022, the Big 3 include the following businesses: Process Solutions & Life Science Services in Life Science, new Healthcare products and Semiconductor Solutions in Electronics

Life Science

Life Science

Key figures

€ million	2021	2020	Change € million	Change %
Net sales	8,990	7,515	1,475	19.6%
Operating result (EBIT)[1]	2,479	1,599	880	55.1%
Margin (% of net sales)[1]	27.6%	21.3%		
EBITDA[2]	3,257	2,387	870	36.4%
Margin (% of net sales)[1]	36.2%	31.8%		
EBITDA pre[1]	3,286	2,405	881	36.6%
Margin (% of net sales)[1]	36.6%	32.0%		

[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.

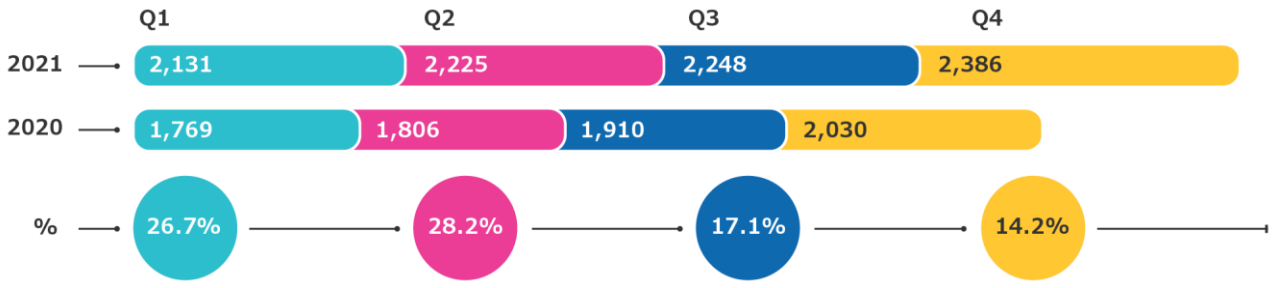
Development of sales and results of operations

In fiscal 2021, Life Science posted an organic sales growth of 21.3% with an unfavorable foreign exchange impact of -1.6%, resulting in a total growth of 19.6% compared to the previous year. All three business units contributed to the organic growth, with the by far largest contribution coming from Process Solutions and followed by Research Solutions. Overall, Life Science net sales increased to € 8,990 million (2020: € 7,515 million).

The development of sales in the individual quarters in comparison with 2020 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[1]

€ million	2021	Share	Organic growth[2]	Exchange rate effects	Acquisitions / divestments	Total change	2020	Share
Process Solutions	4,645	52%	31.0%	-1.8%	–	29.2%	3,595	48%
Research Solutions	2,512	28%	15.1%	-1.7%	–	13.4%	2,215	29%
Applied Solutions	1,833	20%	8.8%	-1.3%	–	7.5%	1,705	23%
Life Science	**8,990**	**100%**	**21.3%**	**-1.6%**	**–**	**19.6%**	**7,515**	**100%**

[1] Previous year's figures have been adjusted due to internal realignment.

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

The Process Solutions business unit, which markets products and services for the pharmaceutical production value chain, generated organic sales growth of 31.0%, which was the highest rate within the Life Science business sector. The business experienced strong demand in both core business and Covid-19- related product and service offerings. With an unfavorable foreign exchange effect of -1.8%, net sales resulted in € 4,645 million in fiscal 2021 (2020: € 3,595 million). Process Solutions thus accounted for 52% of Life Science total net sales (2020: 48%). All regions experienced double-digit organic sales growth within Process Solutions.

The Research Solutions business unit, which provides products and services to support life science research for pharmaceutical, biotechnology, and academic research laboratories, recorded an organic sales growth of 15.1% in 2021. This was mainly driven by strong demand in the core business. With an unfavorable foreign exchange effect of -1.7%, net sales totaled € 2,512 million (2020: € 2,215 million). Research Solutions thus accounted for 28% of Life Science total net sales (2020: 29%). Double-digit organic sales growth was reported for almost all regions with North America, Asia-Pacific and Europe leading the growth.

The Applied Solutions business unit with its broad range of products for researchers as well as scientific and industrial laboratories accounted for a 20% share of Life Science sales (2020: 23%). Applied Solutions recorded an organic sales growth of 8.8% in fiscal 2021. Including an unfavorable foreign exchange effect of -1.3%, sales totaled € 1,833 million (2020: € 1,705 million). From a regional perspective, the strongest growth drivers in Applied Solutions were North America and Latin America each with double-digit organic sales growth.

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

Life Science

Net sales by region

€ million	2021	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2020	Share
Europe	3,138	35%	21.1%	0.3%	0.1%	21.5%	2,583	35%
North America	3,187	36%	22.0%	-4.0%	–	18.0%	2,701	36%
Asia-Pacific (APAC)	2,286	25%	21.0%	-0.7%	–	20.3%	1,900	25%
Latin America	278	3%	20.7%	-5.3%	–	15.3%	241	3%
Middle East and Africa (MEA)	100	1%	9.5%	2.6%	–	12.1%	89	1%
Life Science	**8,990**	**100%**	**21.3%**	**-1.6%**	**–**	**19.6%**	**7,515**	**100%**

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

The following table presents the composition of EBITDA pre for 2021 in comparison with 2020. 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]

	2021			2020			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**8,990**	**–**	**8,990**	**7,515**	**–**	**7,515**	**19.6%**
Cost of sales	-3,577	4	-3,573	-3,215	5	-3,210	11.3%
Gross profit	**5,413**	**4**	**5,417**	**4,300**	**5**	**4,305**	**25.8%**
Marketing and selling expenses	-2,119	5	-2,114	-1,995	4	-1,992	6.1%
Administration expenses	-352	22	-331	-354	32	-322	2.9%
Research and development costs	-351	1	-349	-313	1	-312	11.8%
Impairment losses and reversals of impairment losses on financial assets (net)	-3	–	-3	-1	–	-1	>100.0%
Other operating income and expenses	-109	7	-102	-38	-21	-59	72.2%
Operating result (EBIT)[1]	**2,479**			**1,599**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	778	-11	767	789	-3	786	-2.4%
EBITDA[2]	**3,257**			**2,387**			
Restructuring expenses	26	-26	–	16	-16	–	
Integration expenses/IT expenses	21	-21	–	32	-32	–	
Gains (-)/losses (+) on the divestment of businesses	–	–	–	–	–	–	
Acquisition-related adjustments	-18	18	–	-30	30	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[1]	**3,286**	**–**	**3,286**	**2,405**	**–**	**2,405**	**36.6%**
of which: organic growth[1]							37.7%
of which: exchange rate effects							-0.9%
of which: acquisitions/ divestments							-0.2%

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

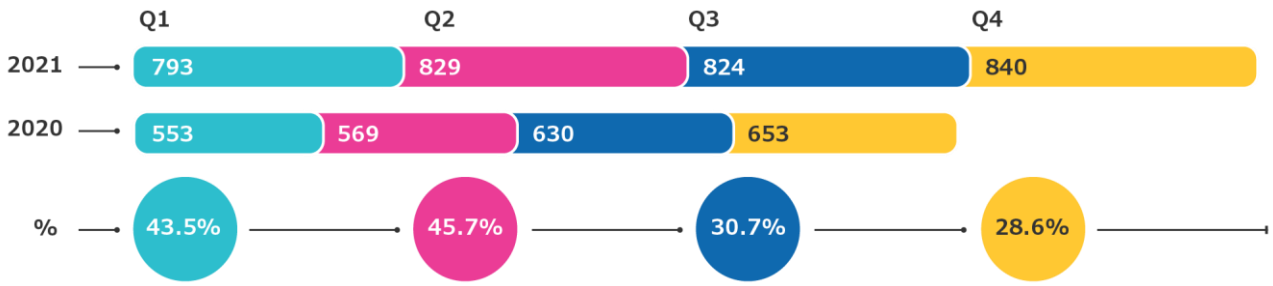
[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Adjusted gross profit increased by 25.8% to € 5,417 million (2020: € 4,305 million). The increase was mainly driven by a strong sales growth. Adjusted marketing and selling expenses increased by 6.1% to € 2,114 million (2020: € 1,992 million) due to higher logistics costs and increased personnel costs. Adjusted administration expenses increased by 2.9% to € 331 million (2020: € 322 million) and adjusted research and development costs increased by 11.8% to € 349 million (2020: € 312 million). EBITDA pre rose by 36.6% to € 3,286 million (2020: € 2,405 million) reflecting the strong performance of the Life Science business, both in the core business and from sales related to the Covid-19 pandemic. Organically, the EBITDA pre grew by 37.7% in 2021. The EBITDA pre margin, i.e. EBITDA pre as a percentage of net sales, improved to 36.6% (2020: 32.0%).

The development of EBITDA pre in the individual quarters in comparison with 2020 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	**2021**	2020	Change € million	Change %
Net sales	7,089	6,639	450	6.8%
Operating result (EBIT)[1]	1,823	1,804	19	1.0%
Margin (% of net sales)[1]	25.7%	27.2%		
EBITDA[2]	2,146	2,184	-39	-1.8%
Margin (% of net sales)[1]	30.3%	32.9%		
EBITDA pre[1]	2,153	2,267	-114	-5.0%
Margin (% of net sales)[1]	30.4%	34.1%		

[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.

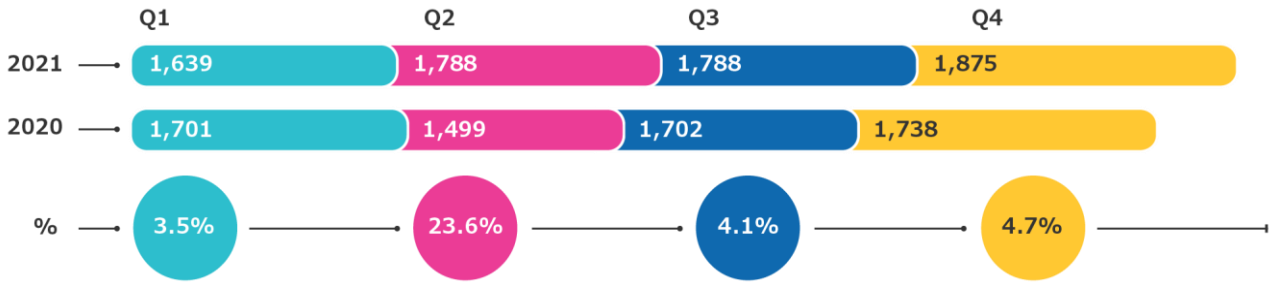
Development of sales and results of operations

The Healthcare business sector reported organic sales growth of 8.5% in fiscal 2021. Including negative foreign exchange effects of -1.4%, which were largely attributable to the development of the U.S. dollar, and the impact of the divestment of the Allergopharma allergy business in the first quarter of 2020 (-0.3%), net sales amounted to € 7,089 million (2020: € 6,639 million).

The net sales in the individual quarters as well as the respective organic growth rates in 2021 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 2021:

Healthcare

Net sales by major product lines/products

€ million	2021	Share	Organic growth[1]	Exchange rate effects	Total change	2020	Share
Oncology	**1,411**	**20%**	**28.5%**	**-1.9%**	**26.6%**	**1,116**	**17%**
thereof: Erbitux®	987	14%	12.2%	-1.3%	10.8%	891	13%
thereof: Bavencio®	373	5%	> 100.0%	-5.4%	> 100.0%	156	2%
Neurology & Immunology	**1,645**	**23%**	**1.2%**	**-2.2%**	**-1.1%**	**1,662**	**25%**
thereof: Rebif®	952	13%	-13.6%	-2.3%	-15.9%	1,131	17%
thereof: Mavenclad®	693	10%	32.6%	-2.1%	30.5%	531	8%
Fertility	**1,337**	**19%**	**25.6%**	**-1.7%**	**23.9%**	**1,079**	**16%**
thereof: Gonal-f®	767	11%	23.8%	-1.9%	21.9%	630	9%
Cardiovascular, Metabolism and Endocrinology	**2,540**	**36%**	**-1.1%**	**-0.7%**	**-1.8%**	**2,585**	**39%**
thereof: Glucophage®	864	12%	-4.4%	–	-4.4%	903	14%
thereof: Concor®	523	7%	0.1%	-1.2%	-1.1%	529	8%
thereof: Euthyrox®	470	7%	3.8%	-0.6%	3.2%	455	7%
thereof: Saizen®	248	3%	7.3%	-1.3%	6.0%	234	4%
Other	**157**	**2%**				**197**	**3%**
Healthcare	**7,089**	**100%**	**8.5%**	**-1.4%**	**6.8%**	**6,639**	**100%**

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

In fiscal 2021, the oncology drug Erbitux® (cetuximab) surpassed Rebif® to become the top-selling medicine in the Healthcare product portfolio, generating a year-on-year increase of 10.8% to € 987 million (2020: € 891 million). Organic growth amounted to 12.2%, with negative foreign exchange effects having an impact of -1.3%. In addition to the lower prior-year figures due to the pandemic and the related catch-up effects, high demand in China and Japan was the main contributor to the strong organic growth. Accordingly, net sales in the Asia-Pacific region saw organic growth of 14.2% to € 391 million (2020: € 342 million). Higher demand was also recorded in Europe, with net sales in the region increasing organically by 5.0% to € 417 million (2020: € 404 million). In North America, a temporary partnership with Eli Lilly and Company, United States, had a positive impact on growth in Erbitux® sales. The product was contract manufactured for Eli Lilly and the resulting sales were allocated to the United States. As a result of this special effect, net sales for North America increased to € 59 million (2020: € 32 million).

In the field of immuno-oncology, sales of the oncology drug Bavencio® more than doubled to € 373 million (2020: € 156 million) in spite of negative foreign exchange effects of -5.4%. All regions contributed to this very positive development. The main growth drivers were the approvals granted for the first-line maintenance treatment of patients with locally advanced or metastatic urothelial carcinoma (UC) in the United States in June 2020 and Europe and Japan in the first quarter of 2021.

Mavenclad®, for the oral short-course treatment of highly active relapsing multiple sclerosis, saw organic sales growth of 32.6% in fiscal 2021. Taking into account negative exchange rate effects of -2.1%, net sales of € 693 million were generated in 2021 (2020: € 531 million). The main drivers for the positive development of Mavenclad® were the partial recovery of the high-efficacy MS therapy segment, which was negatively impacted by the pandemic in the previous year, and increased demand in the United States and Europe in particular. Moreover, independent data were published showing that Mavenclad®-treated patients who received an mRNA Covid-19 vaccine have a similar antibody response to the general population. Mavenclad® was also approved in additional countries in fiscal 2021, meaning that it is now approved in more than 80 countries.

Healthcare

Product sales and organic growth[1] of Rebif®, Glucophage® and Erbitux® by region - 2021

		Total	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
	€ million	987	417	59	391	71	49
Erbitux®	Organic growth[1]	12.2%	5.0%	83.7%	14.2%	15.9%	4.8%
	Share	100%	42%	6%	40%	7%	5%
	€ million	952	286	571	10	32	52
Rebif®	Organic growth[1]	-13.6%	-12.2%	-16.1%	-11.0%	-1.9%	4.4%
	Share	100%	30%	60%	1%	3%	6%
	€ million	864	127	–	491	139	107
Glucophage®	Organic growth[1]	-4.4%	5.5%	–	-11.5%	15.0%	-2.3%
	Share	100%	15%	–	57%	16%	12%

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

Sales of the drug Rebif®, which is used to treat relapsing forms of multiple sclerosis, amounted to € 952 million in fiscal 2021 (2020: € 1,131 million). Although the long-term downward trend slowed temporarily in the previous year due to the pandemic, an organic decline in net sales of -13.6% was recorded in 2021 as a result of the persistently difficult competitive situation on the interferon market and the competition from oral dosage forms and high-efficacy MS therapies. Sales in North America, the biggest sales market for Rebif®, fell by -16.1% organically to € 571 million (2020: € 705 million), while sales in Europe saw an organic decline of -12.1% to € 286 million (2020: € 331 million).

Sales in the cardiovascular diseases, metabolic disorders and endocrinology segment were down slightly on the previous year. With an organic decline of -1.1% and negative foreign exchange effects of -0.7%, net sales amounted to € 2,540 million (2020: € 2,585 million). Sales of the diabetes drug Glucophage® amounted to € 864 million in fiscal 2021 (2020: € 903 million). The organic downturn of -4.4% was primarily due to the price volume regulation (volume-based procurement) that has been in effect in China since 2020. Sales of the beta-blocker Concor®, which has also been subject to this regulation in China, stagnated at the prior-year level. The products Euthyrox® and Saizen® enjoyed positive organic sales growth in fiscal 2021, thereby largely offsetting the decline in Glucophage® sales.

The Fertility product line reported very good organic sales growth of 25.6%. Taking into account negative exchange rate effects of -1.7%, global net sales increased to € 1,337 million (2020: € 1,079 million). The sales growth was largely due to Covid-19-related catch-up effects in the North America and Asia-Pacific regions and overall strong demand for our fertility products. Gonal-f®, the leading recombinant hormone used in the treatment of infertility, recorded organic growth of 23.8% and increased its net sales to € 767 million (2020: € 630 million).

Net sales of the Healthcare business sector by region in 2021 developed as follows:

Healthcare

Net sales by region

€ million	2021	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2020	Share
Europe	2,268	32%	7.4%	-1.5%	-0.8%	5.1%	2,158	32%
North America	1,673	23%	11.0%	-3.3%	–	7.7%	1,554	23%
Asia-Pacific (APAC)	1,997	28%	8.1%	1.1%	-0.2%	9.0%	1,831	28%
Latin America	682	10%	10.2%	-3.7%	–	6.5%	641	10%
Middle East and Africa (MEA)	468	7%	4.5%	-1.6%	–	2.9%	455	7%
Healthcare	**7,089**	**100%**	**8.5%**	**-1.4%**	**-0.3%**	**6.8%**	**6,639**	**100%**

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

The following table presents the composition of EBITDA pre in fiscal 2021 in comparison with 2020. The IFRS figures have been modified to reflect the elimination of adjustments included in the functional costs.

Healthcare

Reconciliation EBITDA pre[1]

	2021			2020			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**7,089**	**–**	**7,089**	**6,639**	**–**	**6,639**	**6.8%**
Cost of sales	-1,713	-3	-1,715	-1,613	7	-1,606	6.8%
Gross profit	**5,376**	**-3**	**5,374**	**5,026**	**7**	**5,033**	**6.8%**
Marketing and selling expenses	-1,600	7	-1,593	-1,664	47	-1,617	-1.5%
Administration expenses	-313	12	-302	-320	7	-313	-3.6%
Research and development costs	-1,712	5	-1,707	-1,640	24	-1,616	5.6%
Impairment losses and reversals of impairment losses on financial assets (net)	5	–	5	-4	–	-4	>100.0%
Other operating income and expenses	67	-8	59	406	-1	405	-85.4%
Operating result (EBIT)[1]	**1,823**			**1,804**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	323	-6	317	381	-2	379	-16.3%
EBITDA[2]	**2,146**			**2,184**			
Restructuring expenses	11	-11	–	95	-95	–	
Integration expenses/IT expenses	9	-9	–	4	-4	–	
Gains (-)/losses (+) on the divestment of businesses	-13	13	–	-16	16	–	
Acquisition-related adjustments	–	–	–	–	–	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[1]	**2,153**	**–**	**2,153**	**2,267**	**–**	**2,267**	**-5.0%**
of which: organic growth[1]							-1.7%
of which: exchange rate effects							-3.2%
of which: acquisitions/ divestments							-0.1%

[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 adjusted gross profit of the Healthcare business sector rose to € 5,374 million in fiscal 2021 (2020: € 5,033 million). At 75.8%, the resulting gross margin was at the same level as in the 2020 reporting period (75.8%).

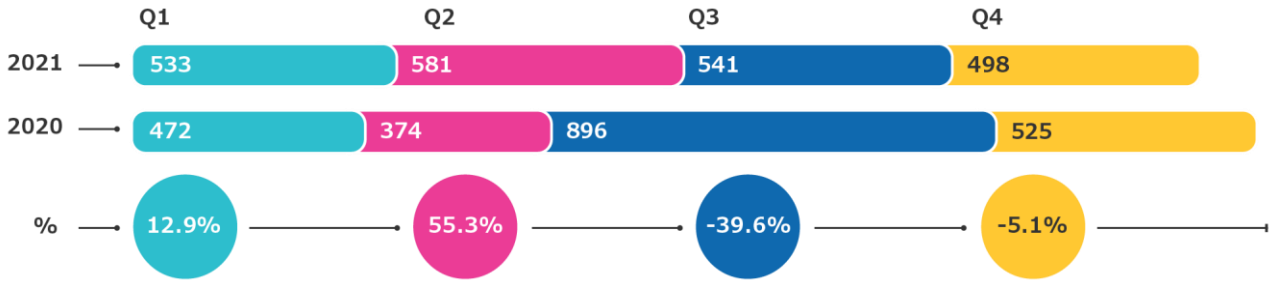
Marketing and selling expenses after adjustments declined by -1.5% year-on-year to € 1,593 million (2020: € 1,617 million). This was primarily due to positive effects from the transformation and growth program initiated in fiscal 2020 as well as the end of scheduled amortization in connection with the co-marketing agreement with Pfizer Inc., United States, for Xalkori®. The increase in research and development costs to € 1,707 million (2020: € 1,616 million) was especially attributable to two effects: the lower level of costs in the previous year, which reflected the lower spending requirements at the time, and the provisions recognized in the year under review for subsequent costs from the near-complete discontinuation of the bintrafusp alfa program due to the termination of the partnership with GlaxoSmithKline plc (GSK) by mutual consent. The reduction in the income balance of other operating expenses and income to € 59 million (2020: € 405 million) was primarily due to the income from the release of a provision of € 365 million for potential damages relating to patent litigation with Biogen Inc., United States, in the previous year. Earnings were positively affected in the amount of € 50 million as a result of the milestone payments recognized in the year under review for the approval of Bavencio® as a first-line maintenance treatment for locally advanced or metastatic urothelial carcinoma (UC) in Europe and Japan.

After eliminating adjustments, amortization, and depreciation, EBITDA pre fell by -5.0% to € 2,153 million in fiscal 2021 (2020: € 2,267 million). This was mainly due to the aforementioned income from the release of a provision for potential damages in the previous year. The organic decline amounted to -1.7%, with negative foreign exchange effects having an impact of -3.2%. This resulted in an EBITDA pre margin of 30.4% (2020: 34.1%).

The development of EBITDA pre in the individual quarters in comparison with 2020 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	2021	2020	Change € million	Change %
Net sales	3,608	3,380	227	6.7%
Operating result (EBIT)[1]	509	240	269	> 100.0%
Margin (% of net sales)[1]	14.1%	7.1%		
EBITDA[2]	1,070	925	146	15.7%
Margin (% of net sales)[1]	29.7%	27.4%		
EBITDA pre[1]	1,128	1,024	104	10.2%
Margin (% of net sales)[1]	31.3%	30.3%		

[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.

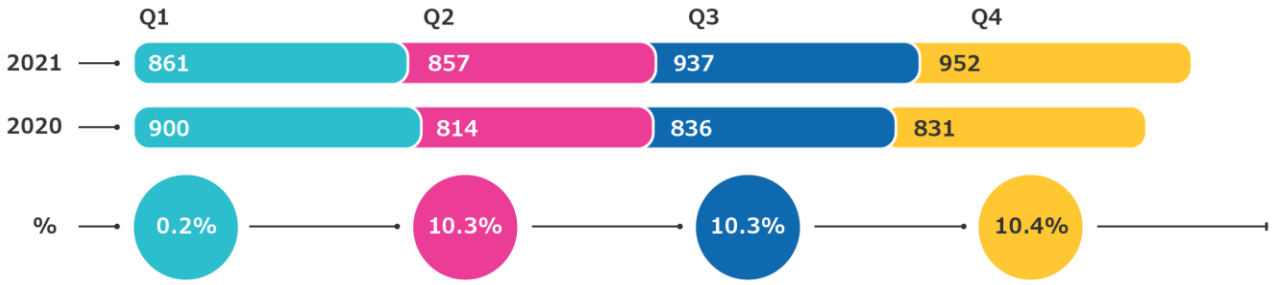
Development of net sales and results of operations

In 2021, net sales of the Electronics business sector increased 6.7% to € 3,608 million (2020: € 3,380 million). Robust growth in the Semiconductor Solutions business and a recovery in the Surface Solutions business from a Covid-19-impacted 2020 drove an organic sales increase of 7.7% in 2021. Foreign exchange rates dampened the growth by -0.9%.

The net sales in the individual quarters as well as the respective organic growth rates in 2021 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[1]

€ million	2021	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2020	Share
Semiconductor Solutions	2,151	60%	15.0%	-1.5%	–	13.6%	1,894	56%
Display Solutions	1,046	29%	-6.4%	0.2%	–	-6.2%	1,115	33%
Surface Solutions	410	11%	12.5%	-1.7%	–	10.8%	370	11%
Other	–	–	-42.8%	-0.4%	–	-43.2%	1	–
Electronics	**3,608**	**100%**	**7.7%**	**-0.9%**	**–**	**6.7%**	**3,380**	**100%**

[1] Within the scope of the integration of Versum Materials Inc., USA, two products previously allocated to the Semiconductor Solutions business unit have now been assigned to Display Solutions. The previous year's figures have been adjusted accordingly.

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

Net sales of Semiconductor Solutions increased by a total of 13.6% to € 2,151 million (2020: € 1,894 million). The Semiconductor Solutions business unit, which comprises two businesses, namely Semiconductor Materials and Delivery Systems & Services, accounted for 60% of net sales of the Electronics business sector in 2021 (2020: 56%). Semiconductor Materials focuses on the development and commercialization of material-based solutions for the semiconductor industry, while Delivery Systems & Services focuses on developing, selling and operating delivery systems for semiconductor manufacturers. Organically, net sales grew by 15.0% in 2021 as strong, broad-based demand across both Semiconductor Materials and Delivery Systems & Services overcame the challenges presented by delays in the global supply chain network. Adverse foreign exchange effects of -1.5% slightly impacted the growth.

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 by –6.2% to € 1,046 million (2020: € 1,115 million). Display Solutions saw an organic decline of -6.4% while sales growth in OLED materials partially offset the challenges faced in Liquid Crystals from continued increased competition. Foreign exchange effects were slightly favorable at 0.2%.

Net sales of the Surface Solutions business unit grew 10.8% to € 410 million (2020: € 370 million). Organically, Surface Solutions increased sales by 12.5% as the business continued its recovery from the effects of the Covid-19 crisis, which significantly impacted 2020. Foreign exchange effects were unfavorable at -1.7%.

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

Electronics

Net sales by region

€ million	2021	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2020	Share
Europe	269	7%	7.9%	-0.3%	–	7.6%	250	8%
North America	536	15%	14.9%	-4.0%	–	10.9%	484	14%
Asia-Pacific (APAC)	2,737	76%	6.4%	-0.4%	–	6.0%	2,582	76%
Latin America	30	1%	8.6%	-4.3%	–	4.3%	28	1%
Middle East and Africa (MEA)	36	1%	1.3%	-2.3%	–	-1.0%	37	1%
Electronics	**3,608**	**100%**	**7.7%**	**-0.9%**	**–**	**6.7%**	**3,380**	**100%**

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

The following table presents the composition of EBITDA pre for 2021 in comparison with 2020. The IFRS figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Electronics

Reconciliation EBITDA pre[1]

	2021			2020			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**3,608**	**–**	**3,608**	**3,380**	**–**	**3,380**	**6.7%**
Cost of sales	-2,060	23	-2,037	-2,007	40	-1,966	3.6%
Gross profit	**1,547**	**23**	**1,571**	**1,374**	**40**	**1,414**	**11.1%**
Marketing and selling expenses	-573	5	-569	-539	9	-530	7.4%
Administration expenses	-138	16	-122	-162	17	-144	-15.2%
Research and development costs	-278	1	-277	-274	2	-272	1.8%
Impairment losses and reversals of impairment losses on financial assets (net)	-1	–	-1	–	–	–	–
Other operating income and expenses	-49	46	-3	-160	154	-5	-52.9%
Operating result (EBIT)[1]	**509**			**240**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	561	-33	528	684	-123	561	-5.8%
EBITDA[2]	**1,070**			**925**			
Restructuring expenses	26	-26	–	31	-31	–	
Integration expenses/IT expenses	32	-32	–	47	-47	–	
Gains (-)/losses (+) on the divestment of businesses	–	–	–	1	-1	–	
Acquisition-related adjustments	–	–	–	21	-21	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[1]	**1,128**	**–**	**1,128**	**1,024**	**–**	**1,024**	**10.2%**
of which: organic growth[1]							9.7%
of which: exchange rate effects							0.5%
of which: acquisitions/ divestments							–

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

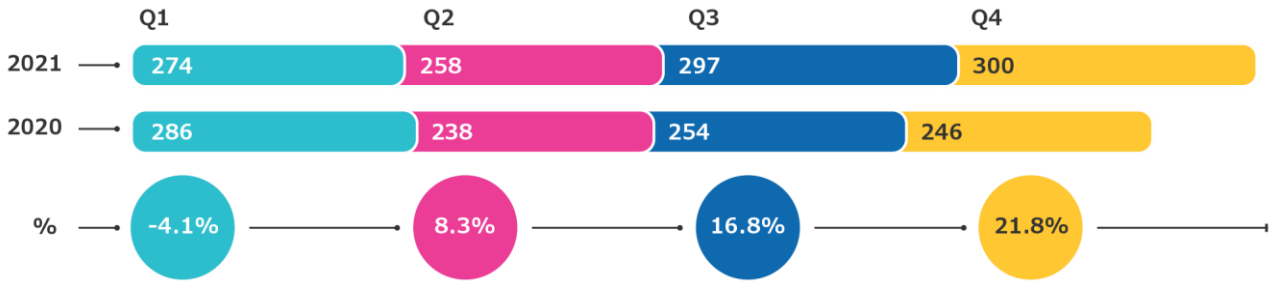
[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Adjusted gross profit of the Electronics business sector increased 11.1% to € 1,571 million (2020: € 1,414 million) largely due to the higher sales discussed above. The adjusted gross profit margin improved to 43.5% (2020: 41.8%). Adjusted marketing and selling expenses increased by 7.4% in order to support the business development as well as from rising logistics costs associated with global shipping capacity constraints and increasing fuel costs. Adjusted administration expenses declined due to synergy execution and reorganization activities associated with the Versum Materials acquisition. EBITDA pre grew organically by 9.7% driven by the sales increase discussed above as well as the positive development of gross profit and functional costs. The organic change in EBITDA pre also includes the full attainment of the Versum synergies which were promised by 2022, but delivered one year earlier. Foreign exchange effects favorably impacted EBITDA pre by 0.5%. Overall, EBITDA pre of Electronics grew by 10.2% to € 1,128 million (2020: € 1,024 million). At 31.3%, the EBITDA pre margin was above the year-earlier figure (2020: 30.3%).

The development of EBITDA pre in the individual quarters in comparison with 2020 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, such as Finance, Procurement, Legal, Communications, and Human Resources. Corporate costs additionally encompass expenses for central, non-allocated IT functions, including expenses related to the expansion and harmonization of IT systems within the Group as well as research and development costs spanning business sectors.

Corporate and other

Key figures

			Change	
€ million	**2021**	2020	€ million	%
Operating result (EBIT)[1]	-632	-658	26	-4.0%
EBITDA[2]	-527	-573	47	-8.1%
EBITDA pre[1]	-465	-495	31	-6.2%

[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.

After eliminating adjustments, administration expenses amounted to € 404 million in fiscal 2021 (2020: € 311 million). Cross-business research and development costs amounting to € 67 million (2020: € 62 million), such as expenses for the Innovation Center, were allocated to Corporate. After eliminating adjustments, other operating expenses (net) decreased to € -87 million (2020: € -197 million). The change compared with prior year was mainly attributable to the positive development of the currency result, especially thanks to foreign currency hedging. After eliminating depreciation, amortization, and adjustments, EBITDA pre amounted to € -465 million in 2021 (2020: € -495 million).

Report on Risks and Opportunities

Risks and opportunities are an integral part of our entrepreneurial activities. We have put responsibilities, processes and tools in place to identify risks at an early stage and mitigate them by taking appropriate action. Within the company, risk and opportunity management is a core component of our internal business planning.

Risk and opportunity management

We operate in a complex, global business world and is exposed to a wide range of external and internal influences. Every business decision is therefore based on the associated risks and opportunities.

In our internal risk reporting, risks are defined as potential future events or developments that could lead to a negative deviation from our (financial and non-financial) targets. In parallel, opportunities imply a positive deviation from our planned targets. Identified future events and expected developments are taken into account in internal planning, provided that it can be assumed that their occurrence is likely in the planning period. The risks and opportunities presented in the risk and opportunities section are those potential future events or developments that could respectively lead to a negative or positive deviation from existing plans.

Risk management process

The objective of our risk management activities is to identify, assess, and manage risks early and to implement appropriate measures to reduce them. The responsibilities, objectives, and processes of risk management are described in our internal risk management guidelines. The business heads, managing directors of our subsidiaries, and the heads of Group functions are specified as employees with responsibility for risks. The risk owners regularly assess their risk status and report their risk portfolio to Risk Management. We use special risk management tools to support these activities.

In this context, risk-mitigating measures are evaluated. The effectiveness of these measures and the planned implementation time frame are monitored and the residual risk is presented in the internal risk report as net risk.

Group Controlling & Risk Management forms the organizational framework for risk management and reports directly to the Group Chief Financial Officer. Within the scope of audits, Group Internal Auditing regularly reviews the performance of risk management processes within the units and, at the same time, the communication of relevant risks from the operating businesses to Group Risk Management. Furthermore, the external auditor reviews the risk early warning system in the course of its annual audit of the financial statements. Group Risk Management uses the information reported to determine the current risk portfolio for the Group, presenting this in a report to the Executive Board, the Supervisory Board, and relevant Committees with detailed explanations twice per year. This also encompasses a quantitative aggregation of risks at Group level, using a Monte Carlo simulation. Furthermore, significant changes in the assessment of the risks already known and new significant risks can be reported at any time and are communicated to the Executive Board on an ad-hoc basis.

For the internal bottom-up risk reporting process, a minimum threshold of a potential negative impact on our EBITDA pre is set at the level of € 10 million in the standard cycle and € 25 million in the ad-hoc process. The timeframe applied for internal risk reporting is five years. It can go beyond five years in special cases, e.g., for regulatory risks related to climate change. The outlined risks and their evaluation are based on respective annual values in the reporting timeframe. The assessment of the risks presented relates to December 31, 2021. There were no relevant changes after the balance sheet date that would have necessitated an amended presentation of the risk situation of the Group.

Opportunity management process

The opportunity management process is integrated into our internal controlling processes and is carried out in the operating units on the basis of the Group strategy. The businesses analyze and assess potential market opportunities as part of strategy and planning processes. In this context, investment opportunities are examined and prioritized primarily in terms of their potential value proposition, in order to ensure an effective allocation of resources. We specifically invest in growth markets to leverage the opportunities of dynamic development and customer proximity at a local level.

If the occurrence of the identified opportunities is rated as likely, they are incorporated into the business plans and the short-term forecasts. Trends going beyond this, or events that could lead to a positive development in the net assets, financial position, and results of operations, are presented in the following report as opportunities. These could have a positive effect on our medium-term prospects.

Risk and opportunity assessment

Risks

The significance of risks is calculated on the basis of their potential negative impact on the forecasted 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 than likely

Degree of impact

Degree of impact	Explanation
> € 500 million	Critical negative impact on the net asset, financial position, and results of operations
€ 100 – 500 million	Substantial negative impact on the net asset, financial position, and results of operations
€ 25 – 100 million	Moderate negative impact on the net asset, financial position, and results of operations
€ 10 – 25 million	Minor negative impact on the net asset, financial position, and results of operations
< € 10 million	Immaterial negative impact on the net asset, financial position, and results of operations

Opportunities

Opportunities are assessed in their respective specific business environment. General measures of the business functions are quantified during operational planning, usually in relation to sales, EBITDA pre, and operating cash flow. Net present value, internal rate of return, the return on capital employed (ROCE), and the payback period of the investment are primarily used to assess and prioritize investment opportunities. We use these indicators to assess the opportunities arising from the investment projects. Similarly, scenarios are frequently set up to simulate the influence of possible fluctuations and changes in the respective parameters on results. An overarching, systematic classification of the probability of occurrence and impact of opportunities is not carried out.

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 conveyance and presentation of information that is relevant for the preparation of the Consolidated Financial Statements and the Combined Management Report.

Key tools

Our internal control system for financial reporting is based on the COSO 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.

The internal 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 our subsidiaries must meet. At the same time, this function steers and monitors the scheduling and process-related requirements of the Consolidated Financial Statements. Group Accounting centrally 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 statutory financial statements of the parent company and of the subsidiaries, 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 company acquisitions or pension obligations, external experts are additionally involved where necessary.

The individual companies have a local internal control system within a global framework. Where financial processes are handled by a Shared Service Center, the internal control system of the Shared Service Center is additionally applied. Both ensure that accounting complies with IFRS (International Financial Reporting Standards) 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 separation 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 control system is regularly tested in the format of self-assessments by our legal entities, group functions, and shared services. The quality is systematically reviewed by a dedicated global financial control and governance team. Control deficiencies are properly recorded and, where necessary, adequate countermeasures are taken to remediate control deficiencies in a timely manner.

The overall effectiveness of our internal control system with regard to accounting and compliance with financial reporting on the part of the 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 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 structures and processes described related to the Group accounting procedures 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. The internal control system at Merck KGaA, Darmstadt, Germany, makes it possible to lower the risk of material misstatements in accounting to a minimum. However, no internal control system can entirely rule out a residual risk, whatever its design.

Business-related risks and opportunities

Political and regulatory risks and opportunities

As a global company, 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

In the Healthcare business sector, the known trend toward increasingly restrictive requirements in terms of drug pricing, reimbursement, and the expansion of rebate groups is continuing. 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 taken into account as far as possible in the business sector's plans. Close communication with health and regulatory authorities serves as a preventive measure to avert risks.

Remaining risks beyond the current plans resulting from restrictive regulatory requirements are likely with a potential moderate to substantial impact.

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, in particular in Asia. These regulations demand comprehensive tests for chemicals. Moreover, the use of chemicals 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 have to expect even increasing demands concerning the substitution of specific hazardous substances. We are constantly pursuing research and development in substance characterization and the possible substitution of critical substances so as to mitigate this risk. Nevertheless, it is classified as a possible risk with a potential substantial impact on the net assets, financial position, and results of operations.

Risk of negative political and macroeconomic developments

The ongoing general trend of de-globalization and reshoring critical supplies might initiate the (re-)establishment of trade barriers, sanctions, and foreign exchange policy changes. Additionally, there is an increasing threat from armed conflicts. These risks can have a negative impact on our supply chains and can lead as well to declines in sales in certain countries and regions. They are taken into account as much 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.

Potential negative macroeconomic developments can also impact our business. To minimize these impacts, corresponding measures pertaining to the sales strategy have been initiated in these countries.

The spread of the coronavirus since the beginning of 2020 is associated with risks in global macroeconomic developments, likewise with the potential for negative effects on our businesses. The opportunities in connection with combating the Covid-19 pandemic are described in the "Market risks and opportunities" section.

The rise in inflation in the course of 2021 across some of our major markets could negatively impact our business. The current inflation dynamics are driven by a combination of base effects, supply disruptions, hefty fiscal spending, and special factors. Persistently high inflation could increase our operating expenses (e.g., raw materials, utilities, and logistics) as well as capital expenditures, and lead to an increase in central bank rates, which would affect our refinancing costs.

The net risk of negative geo-political and macroeconomic developments is seen as possible and might have substantial to critical effects on the net assets, financial position, and results of operations.

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.

Opportunities in connection with combating the Covid-19 pandemic

As a science and technology company, we are contributing to the global fight against Covid-19. In Life Science, we have been working with more than 80 vaccine developers around the world and have supported more than 35 testing solutions and more than 50 projects involving monoclonal antibodies, plasma products, and antiviral drugs. We are collaborating with numerous researchers and institutions to assist them with the process development of and the production process for marketed and potential Covid-19 vaccine candidates, as well as for the mass production of SARS-CoV-2 diagnostic tests.

Opportunities from leveraging the e-commerce and distribution platform

In the Life Science business sector, our dedication to the customer experience extends from the lab to our primary e-commerce platform, sigmaaldrich.com, which connects scientists in nearly every country around the world with the products, publications, and technical expertise needed to advance their discovery, research, and development further and faster.

Our efforts include innovative approaches across the globe, bolstering sigmaaldrich.com and our e-commerce expertise. To that end, this year we launched a new website architecture and user interface providing customers with an updated look and feel, enhanced mobile capabilities, and faster and more reliable website performance, as well as features like self-serve order status and product ratings and reviews. In alignment with our long-term e-commerce strategy to leverage sigmaaldrich.com as a scalable growth driver and the destination for our life science community, we are leveraging our new website architecture so that we may continue to improve the customer experience more rapidly and flexibly in the future.

Opportunities presented by viral vectors and HPAPIs/ADCs

In the Life Science business sector, we strengthened our viral vector manufacturing capabilities with the launch of the VirusExpress™ lentiviral production platform. We are committed to accelerating the manufacture of cell and gene therapies with the goal of getting these lifesaving treatments to patients faster. This proven, scalable platform increases dose yields and reduces process development times.

We also expanded our manufacturing capabilities of high-potent active pharmaceutical ingredients (HPAPI) and antibody drug conjugates (ADC) in the United States with the creation of one of the largest single-digit, nanogram containment production facilities for HPAPIs. This will allow the continuous manufacturing of increasingly potent agents at an industrial scale for therapies with the potential to treat cancer. ADCs are an emerging class of medicines designed for the high-specificity targeting and destruction of cancer cells while preserving healthy cells. Only nine ADCs are currently approved worldwide. The ADC industry is experiencing strong growth and is expected to reach € 13 billion by 2030.

Opportunities in the semiconductor industry

We have huge growth opportunities in the semiconductor market due to the significantly accelerating global demand for innovative semiconductor materials. This demand is driven by exponential data growth and highly impactful technology trends such as the Internet of Things (IoT) and 5G. We are working on nearly all of these new technology inflection points of the semiconductor roadmap together with our customers. Our capacity investments are synchronized to our customers' expansion plans and we continue to tackle industry challenges as well as supply reliability. Our semiconductor business has a very broad and unique portfolio which is not dependent on a single product or technology. It consists of different, independent technologies: Thin Film, Patterning, Planarization, Specialty Gases and Delivery System & Services. There is a natural hedge due to our holistic capabilities. Furthermore, we supply products for all essential production steps of wafer processing: patterning, deposition, planarization, etching, cleaning, doping and packaging. For instance, this year we launched the new AZ® 910 Remover which offers an innovative, cost-effective solution to support our customers with their advanced cleaning needs integral to realizing next-generation chips.

Moreover, we are developing new dielectric platforms in cooperation with our key customers for 3D NAND applications. There has been a change in 3D NAND device architecture and some of our customers are moving from floating gate to replacement gate technology. Therefore, we are currently working with these customers on this new device architecture.

Opportunities due to new technologies in the manufacturing of displays

We see major opportunities in significant market growth of organic light-emitting diode (OLED) materials in high-quality display applications. We have been performing research and development in the area of organic light-emitting diode (OLED) technology for more than 15 years and have become one of the leading material suppliers for OLEDs. Through our semiconductor and display knowledge, we will be able to contribute to the new generation of optimized sensors. Furthermore, we see opportunities in foldable displays, which require a broad set of materials ranging from encapsulation to the OLED stack.

Opportunities in liquid crystal distribution

We are pursuing a strategy of leveraging our expertise as the global market leader in liquid crystals in order to develop new fields of application for innovative liquid crystal technologies. Beside the opportunities for displays e.g., for gaming applications, we are pressing ahead to capture the future markets for liquid crystal in windows (LCWs) and mobile antennas. With our smart antenna technology, we offer a unique technology that can be used for the data transfer to the growing number of LEO satellites, providing internet connection to remote areas worldwide. LCWs are creating new architectural possibilities for switchable solar shadings and – as introduced in 2021 - for creating private spaces in public and commercial venues.

Risks due to increased competition and customer technology changes

In the Healthcare business sector, both our biopharmaceutical products and classic pharmaceutical business are exposed to increased competition from rival products (in the form of biosimilars and generics). 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 risk is likely with a potential substantial to critical impact.

Risks and opportunities of research and development

For us, innovation is a major element of the Group strategy. Research and development projects can experience delays, expected budgets can be exceeded, or targets can remain unmet. Research and development activities are of special importance to the Healthcare business sector. In the course of portfolio management, we regularly evaluate and, if necessary, refocus research areas and all R&D pipeline projects. Alliances with external partners and the out-licensing of programs also form part of the catalog of measures for the efficient allocation of resources. The conclusion and continuation of these partnerships and externalizations plays an important role.

The strategic alliance concluded with Pfizer Inc. in 2014 enabled us to jointly develop Bavencio® (avelumab). Following approvals for patients with metastatic Merkel cell carcinoma and those with locally advanced or metastatic urothelial carcinoma (UC) in 2017, the United States Food and Drug Administration (FDA) and the European Commission issued approvals for Bavencio® plus Inlyta® (axitinib) for the first-line treatment of patients with advanced renal cell carcinoma in 2019. Last year, the FDA approved Bavencio® for the maintenance treatment of patients with locally advanced or metastatic urothelial carcinoma that has not progressed with first-line platinum-containing chemotherapy. This year the European Commission (EC) and the Japanese Ministry of Health, Labour and Welfare (MHLW) approved Bavencio® as monotherapy for the first-line maintenance treatment of adult patients with locally advanced or metastatic urothelial carcinoma who are progression-free following platinum-based chemotherapy. Additional applications for Bavencio® have been submitted to regulatory authorities worldwide.

Mavenclad® (cladribine tablets) was approved by the European Commission in 2017. It is the first short-course oral treatment approved in Europe for the treatment of relapsing multiple sclerosis (RMS) in patients with high disease activity. With the approvals in a number of additional countries in 2018 and 2019, including the United States and Switzerland, Mavenclad® is now approved in more than 80 countries. This year, independent data has shown that Mavenclad®-treated patients receiving an mRNA Covid-19 vaccine mount a similar antibody response to that of the general population which is important since new strains of Covid-19 push the pandemic onward and guidance recommends booster vaccinations. New data presented at the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) 2021 highlight improvement in measures of physical and mental health of patients with relapsing multiple sclerosis after one year of treatment with Mavenclad®. Late-breaking real-world data suggest the sustained benefit of Mavenclad® treatment on long-term mobility and disability status.

The oncology drug Tepmetko® (tepotinib) was the first oral MET inhibitor to receive regulatory approval anywhere in the world for the treatment of advanced non-small cell lung cancer (NSCLC) harboring mesenchymal-epithelial transition (MET) gene alterations, with its approval in Japan in March 2020. In February, the FDA approved Tepmetko® for the treatment of patients with metastatic non-small cell lung cancer harboring MET exon 14 skipping alterations. Tepmetko® is the first and only FDA approved MET inhibitor that offers once-daily oral dosing. This indication is approved under accelerated approval based on overall response rate and duration of response. The continued approval may be contingent upon verification and description of clinical benefit in confirmatory trials. In December 2021, the Committee for Medicinal Products for Human Use (CHMP) of the European Medicines Agency (EMA) adopted a positive opinion recommending the granting of a full marketing authorization for Tepmetko® as the first and only oral MET inhibitor for adult patients with advanced NSCLC harboring alterations leading to METex14 skipping. The CHMP positive opinion will now be reviewed by the European Commission, with a decision expected in the first quarter of 2022.

In addition to marketing already approved medicines, we are pushing ahead with research projects in other important therapeutic areas. The portfolio of projects is evaluated on a regular basis. This may also lead to in-licensing or out-licensing, or further strategic alliances.

The development of our Bruton’s tyrosine kinase (BTK) inhibitor Evobrutinib is further progressing. New data presented at the 37th Congress of the ECTRIMS show that Evobrutinib is the first BTK inhibitor to demonstrate a significant reduction in slowly expanding lesions (SEL) in patients with RMS. SELs are chronic, active,

demyelinated multiple sclerosis (MS) lesions, which are thought to be an early indicator of disease progression in MS. Additionally, the enrolment in the Phase III Evolution RMS clinical trial program has been completed. It is evaluating the efficacy and safety of investigational BTK inhibitor Evobrutinib in patients with relapsing multiple sclerosis. Evobrutinib is an oral, highly selective inhibitor BTK and a potential innovation for people living with MS, as it may offer a novel dual mechanism of action that is thought to impact myeloid cells in addition to B-cells and thus could address MS pathobiology in a fundamentally new way. The data from a Phase II placebo-controlled randomized trial showed that the BTK inhibitor Evobrutinib significantly reduced blood neurofilament light chain levels, a key biomarker of neuronal damage and inflammation, in patients with multiple sclerosis.

In March, we announced a worldwide in-licensing agreement with Debiopharm, Lausanne, Switzerland, for the development and commercialization of Xevinapant (Debio 1143). Xevinapant, a potent oral Inhibitor of Apoptosis Proteins (IAP) antagonist, is the only medicine in its class in late-stage clinical development and has the potential to be first-in-class. Xevinapant is currently being investigated in the Phase III TrilynX study for previously untreated high-risk locally advanced squamous cell carcinoma of the head and neck (LA SCCHN), in combination with platinum-based chemotherapy and standard fractionation intensity-modulated radiotherapy.

In April, we announced key clinical advancements for berzosertib (M6620), an investigational, potent and selective ataxia telangiectasia and Rad3-related (ATR) inhibitor. Berzosertib is the leading asset in our DNA damage response (DDR) inhibitor program and one of the most advanced ATR inhibitors in oncology clinical development industry-wide. We are leading more than ten clinical trials across DNA Damage Response (DDR) pathways in various tumor types.

In December, we announced the strategically focused expansion of our neurology pipeline with the acquisition of the rights to develop cladribine for the treatment of generalized myasthenia gravis (gMG) and neuromyelitis optica spectrum disorder (NMOSD). We entered into an agreement to secure the global rights by acquiring Chord Therapeutics, a Swiss-based biotech company focused on rare neuroinflammatory diseases. We expect the transaction to be closed in early 2022 after satisfactory completion of customary closing conditions.

With Enpatoran and M1231 we have two additional assets in our portfolio with first-in-class potential. M1231 is a MUC1/ EGFR bi-specific Antibody-Drug Conjugate (ADC) that has an enhanced safety profile compared to existing ADC therapies. We consider this asset as next generation ADC for patients with solid tumors aiming for effective delivery of potent chemotherapy payload with reduced on- and off-target toxicity. Enpatoran is a small molecule for targeted inhibition of the important lupus mediator TLR7/8, aiming for improved efficacy with low infection risk. For Enpatoran, we plan to initiate a Phase II study in CLE (Cutaneous lupus erythematosus) and SLE (Systemic Lupus Erythematosus) in early 2022.

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 minimizing risk. We are currently not aware of any risks beyond general development risks that could significantly affect the net assets, financial position, and results of operations.

Furthermore, there is the risk that regulatory authorities either do not grant or delay approval or grant only restricted approval. Additionally, there is the risk that undesirable side effects of a pharmaceutical product could remain undetected until after approval or registration, which could result in a restriction of approval or withdrawal from the market. Well-advanced programs in our pipeline and those of our partners result in potential new approvals; on the other hand, missing targets in this area may have substantial to critical effects on our financial position and operating result, 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 improbable to likely.

For more detailed description on our R&D activities worldwide, please refer to the section "**Research and Development**" in "**Fundamental Information about the Group**" in the annual report.

Opportunities presented by activities to boost innovative strength

Digital technologies and data are becoming increasingly important. They will enable the development of personalized solutions of the future, accelerate our R&D pipelines, and ultimately improve patient and customer outcomes. In this context, developing and adhering to rigorous ethical standards is of utmost importance for all our activities. Therefore, we created our Digital Ethics Advisory Panel to provide external guidance and expertise on complex ethical matters around data usage, algorithms, and new digital innovations, ensuring that the company develops new digital technologies responsibly. In 2021, we established the Code of Digital Ethics, which serves as a basis for ethical risk assessment in existing ventures but is also utilized to design ethics checkpoints for nascent digital solutions throughout the company. To stay ahead of the curve, we are bringing innovation and digitalization closer together.

We look into transformative technologies and innovative (digital) business models beyond our core products and markets while keeping in strategic proximity to our business sectors. Examples for transformative technologies include our innovation fields Cultured Meat and Bioelectronics. We are cooperating with start-ups and companies in our and other industries to drive innovative approaches.

Opportunities provided by CRISPR technology

As a pioneer of genome-editing innovation for nearly two decades, we are leveraging CRISPR technology as a core competency of our business. Around the world, our Life Science business sector holds 40 CRISPR-related patents in methods and composition, including the fundamental technology of CRISPR Cas9 for gene editing and integration in mammalian cells and paired Cas9 nickases. Two of the CRISPR-Cas9-assisted genome-editing patents are available in the United States, allowing us to support US scientists and researchers in their work to advance and protect gene-therapy development programs. In the reporting year, we signed an agreement licensing our CRISPR-Cas9 technology to Cellecta, Inc., a functional genomics products and services provider based in Mountain View, California, United States. Through the licensing of our innovative technology, we are paving the path for researchers and scientists to identify and accelerate next-generation treatments.

Risks and opportunities related to the quality and availability of products

Opportunities arising from capacity expansion

In Life Science, we opened our second Carlsbad, California-based facility in the United States, significantly expanding our global contract development and manufacturing organization (CDMO) footprint. The new € 100 million, 140,000-square foot facility will more than double the company's existing capacity to support large-scale commercial and industrial manufacturing for viral gene therapy, in a market expected to grow to US$ 10 billion by 2026. This is the company's second Carlsbad, California-based facility to serve cell and gene therapy customers driven by the industry's rapid adoption of viral vector-based therapies. With the acquisition of Exelead and AmpTec we will further strengthen our CDMO offering for mRNA. Exelead specializes in complex injectable formulations, including Lipid Nanoparticle-based drug delivery technology which is key in mRNA therapeutics for use in Covid-19 and many other indications. AmpTec's PCR-based technology combined with our expertise in lipides manufacturing allows us to offer customers innovative technologies, products and services to help advance life-enhancing therapeutics and vaccines for Covid-19. Additionally, our Life Science business sector has been awarded a € 121 million contract award for the construction of a lateral flow membrane production facility over a three-year period at our U.S. site in Sheboygan, Wisconsin, United States. The contract award from the U.S. Department of Defense, on behalf of the U.S. Department of Health and Human Services, is part of an effort to ensure secure local supply and production capacity for critical products for pandemic preparedness. We further broadened our manufacturing footprint with a combined € 40 million investment at our production facilities in Danvers, Massachusetts, and Jaffrey, New Hampshire, United States. These sites supply critical products to customers developing lifesaving therapies, including Covid-19 vaccines, as well as provide products and services for biopharmaceutical manufacturing. These expansions will significantly increase capacity and output at these facilities by 2022, respectively, and create nearly 700 new manufacturing positions. Furthermore, we announced the addition of a single-use assembly production unit at

our site in Molsheim, France, the first site in Europe to produce this product critical to the manufacture of Covid-19 vaccines and other life-saving therapies.

In Electronics, we plan to invest more than € 3 billion in innovation and capacities up to the end of 2025. We will continue to heavily invest in research and development (R&D) in leading-edge material solutions and plan to spend more than € 2 billion in long-term fixed assets (capital expenditures). The investment is an essential part of the business sector's Level Up growth program, as announced at our Capital Markets Day on September 9. Through Level Up, Electronics seeks to capture the growth opportunities that come along with the significantly accelerating global demand for innovative semiconductor and display materials. This demand is driven by exponential data growth and highly impactful technology trends such as the Internet of Things and 5G. Level Up will initiate or accelerate important internal initiatives under the Capabilities priority. Among other things, it will further leverage its data analytics capabilities and invest even further into the safety realm.

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 our own internal inspections, and carry out external audits. Thanks to these quality assurance processes, the occurrence of a risk with a substantial impact is improbable; however, it cannot be entirely ruled out. Depending on the product concerned and the severity of the objection, such a risk might have a negative impact on the net assets, financial position, and results of operations.

Risks of production availability

Further risks include operational failures due to fire or force majeure, for example natural disasters such as floods or earthquakes, which could lead to a substantial interruption or restriction of business activities. Insofar as it is 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 are working to continuously mitigate the risks by making regular investments, setting up alternative sourcing options, and maintaining inventory levels.

Although the occurrence of these risks is considered highly improbable, an individual event could have a critical negative effect on the net assets, financial position, and results of operations.

Risks of dependency on suppliers

In balanced markets, single-sourcing strategies may be chosen to bundle our company's demand and accelerate price reductions. This strategy might result in dependency on individual suppliers for a number of goods or services. Consequently, events like discontinued/curtailed production or supply disruptions could potentially result in unavailability of such goods or services and have a critical impact on the concerned businesses. The Covid-19 pandemic represented an additional force, driving the potential risks of the single-source strategies. With long-term strategic alliances, qualification and validation of alternative sources, and supplier development strategies, we are able to reduce the probability of occurrence of these risks and rate them as possible.

Product liability risks

Companies in the chemical and pharmaceutical industries are particularly exposed to product liability risks. Product liability risks can lead to considerable claims for damages, loss of reputation, and costs to avert damages. We have taken out the liability insurance that is standard in the industry for 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 highly improbable, individual cases could still have a critical effect on the net assets, financial position, and results of operations.

Risks due to product-related crime

As a leading global science and technology company and manufacturer of products of the highest quality, we are exposed to various security- and crime-related risks. Due to the increasing complexity of global trade, our products are particularly at risk from counterfeiting, theft, illegal diversion, and misuse. If left unaddressed, this would not only lead to financial loss, reputational damage, and business disruption but also impact patient & customer safety. Consequently, we have implemented technical, operational, and procedural measures aimed at protecting the integrity of our products and supply chains, whilst also ensuring new threats are identified and addressed. Overall, the threat resulting from product-related crime is likely with a potential moderate impact.

Risks and opportunities from the use of social media

Our company and its employees are active on numerous social media channels. The consistent and legally compliant use of the channels and their content is important in terms of increasing awareness of our brand, among other things. Our company takes precautions and implements processes to ensure awareness of the proper handling of social media, controlling publication, and actively managing communication.

Nevertheless, reputational risks could result, for instance through public dialogues in social media. We thus rate this as a moderate risk.

Financial risks and opportunities

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

Risk and opportunity management in relation to the use of financial instruments

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 by extensive guidelines. Speculation is prohibited. 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 its continued existence, a company must be able to always fulfill its commitments from operating and financial activities. 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 billion with a term until 2025, 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 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 syndicated loan facility of € 2 billion was syndicated amongst 19 banks – 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 (further information can be found in "**Credit risks**" in the note "**Management of financial risks**" in the Notes to the Consolidated Financial Statements).

Counterparty risk is classified as a possible risk with a moderate effect.

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 forecast 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 in the note "**Derivative financial instruments**" in the Notes to the Consolidated Financial Statements). Foreign exchange rate risks are rated as possible with a potential substantial effect on the net assets, financial position, and results of operations.

Variable interest and current financial liabilities are exposed to the risks and opportunities of interest rate fluctuations. These are also managed and reduced using derivatives. Interest rate risks have a potentially negative impact, are considered possible, and pose an immaterial 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 in particular 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 in the notes “**Goodwill**” and "**Other intangible assets**" in the Notes to the Consolidated Financial Statements). All relevant risks were assessed during the preparation of the Consolidated Financial Statements and were taken into account accordingly. We rate risks beyond this as improbable with a potential critical impact.

Risks and opportunities from pension obligations

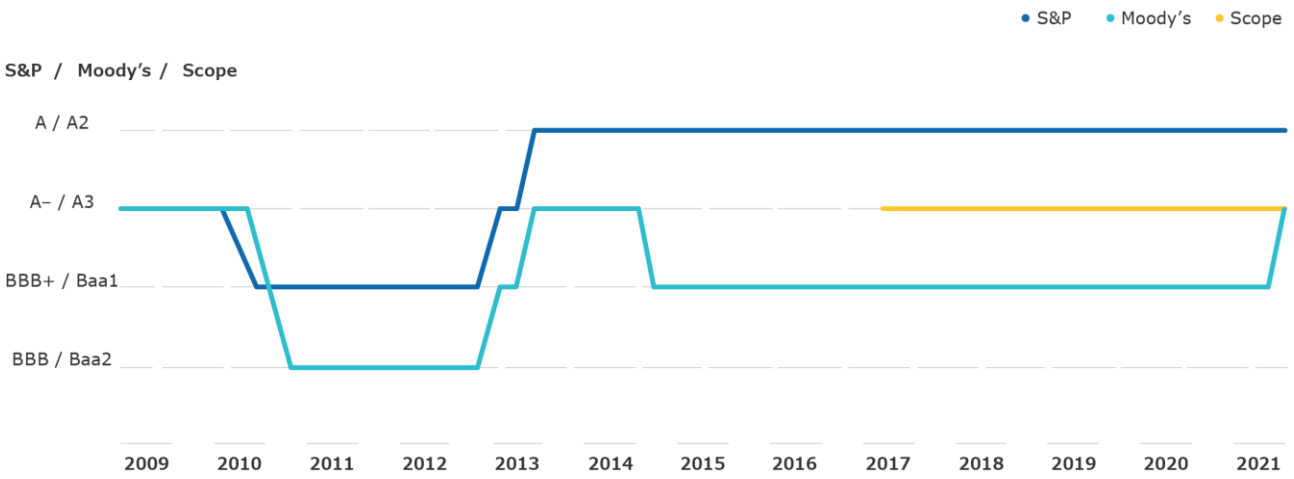
We have commitments in connection with pension obligations. The present value of defined benefit obligations can be significantly increased or reduced by changes in the relevant valuation parameters, for example the interest rate or future salary increases. Pension obligations are regularly assessed 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 in the note "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 on the net assets, financial position, and results of operations.

Assessment by independent rating agencies

The capital market uses the assessments published by rating agencies to help lenders assess the risks of a financial instrument used by our company. We are currently rated by Standard & Poor's, Moody's, and Scope. Standard & Poor's has issued a long-term credit rating of A with a stable outlook, Moody's a rating of A3 with a stable outlook, and Scope a rating of A- with a positive 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



Tax risks

Merck KGaA, Darmstadt, Germany, and its subsidiaries operate worldwide and are consequently subject to different national tax laws and regulations. National tax audits of Group entities are conducted on an ongoing basis by the tax authorities of the countries in which the Group operates. Tax risks result in particular from changes in national tax laws and regulations, case law and interpretation 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 liabilities and on deferred tax assets and liabilities.

The resulting tax risks are regularly and systematically reviewed by the tax function. Appropriate standards are in place to identify tax risks at an early stage, review and assess them and minimize them accordingly. Measures to reduce risks are coordinated by the tax department with the national companies. Risks in addition to those already considered in the balance sheet are classified as improbable to possible with potential moderate to substantial impact on the net asset, financial position, and results of operations.

For information on the accounting and measurement policies for income taxes, please refer to the section "**Income tax**" in "**Notes to the Consolidated Financial Statements**" in the annual report.

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 litigation 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., Kenilworth, NJ, United States (outside the United States and Canada: Merck Sharp & Dohme Corp. (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 can lead to expenses with a substantial 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 due to antitrust and other government proceedings

Raptiva®: In December 2011, the federal state of São Paulo, Brazil, sued us for damages because of alleged collusion between various pharmaceutical companies and an association of patients suffering from psoriasis and vitiligo. This collusion is alleged to have been intended to increase sales of the medicines from the companies involved to the detriment of patients and state coffers. Moreover, patients are also suing for damages in connection with the product Raptiva®. We have taken appropriate accounting measures for these issues, which

relate to various legal cases. Risks in excess of this with a negative effect on the net assets, financial position, and results of operations cannot be ruled out, but are considered possible with minor impact.

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

Paroxetine: In the United Kingdom, Merck KGaA, Darmstadt, Germany, was subject to antitrust investigations by the British Competition and Market Authority (CMA) in connection with the generics business that was divested in 2007. In March 2013, the authorities informed us of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd., United Kingdom and several subsidiaries of GlaxoSmithKline plc, United Kingdom, in connection with the antidepressant drug paroxetine, violated British and European competition law. They stated that our company was liable as the then-owner of Generics (UK) Ltd. And because it was involved in the negotiations for the settlement agreement. The investigations into Generics (UK) Ltd. started in 2011, without this being known to us. After the European Court of Justice confirmed in January 2020 that such settlement agreements can violate European competition law, the Competition Appeal Tribunal (CAT) set a low single-digit million euro figure fine in May 2021 that Merck KGaA, Darmstadt, Germany, paid in September of fiscal year 2021. The risk is considered to be more than likely with minor impact. A provision in a low double-digit million euro amount was recognized for the risk of additional potential claims as of December 31, 2021.

Citalopram: In connection with the generics business that was divested in 2007, Merck KGaA, Darmstadt, Germany, was accused of breaching EU antitrust law through agreements entered into by its former subsidiary Generics (UK) Ltd., relating to the antidepressant Citalopram patented by Lundbeck A/S, Denmark. The European Commission imposed a fine in June 2013. Our company filed a lawsuit against the Commission's decision with the European Court (EC) in August 2013. The lawsuit was rejected in 2016. Our company subsequently filed an appeal against this decision with the European Court of Justice (CJEU), which confirmed the first-instance ruling of the EC in March 2021. Although the fine of € 18 million was paid in 2013, additional potential claims were considered to be probable. A provision in a mid-double-digit million euro amount was recognized for these proceedings as of December 31, 2021. The risk is considered to be more than likely with minor impact.

Human resources risks

Our future growth is highly dependent on our innovative strength. Therefore, the expertise and engagement of employees in all sectors in which we operate are crucial to the success of the company. The markets relevant to the company are characterized by intensive competition for 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 and retaining specialists and talents 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.

Information technology risks

We use a variety of IT systems and processes in order 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 our company, such as the failure of central IT systems, the loss of the data integrity or the disclosure of confidential data from research and 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.

The Group operates an information protection management system based on ISO 27001, comprising security guidelines as well as organizational and technical measures to prevent and address IT security incidents. 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 mitigating measures taken and functional continuity plans, the effects of cybercrime or the failure of business-critical IT applications and their influence on the net assets, financial position, and results of operations are considered to be possible and with potentially substantial impact.

Environmental, climate-related, and safety risks and opportunities

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 people, goods, and our reputation. Those include physical risks stemming from exposure to droughts, storms, and floods. Audits, consulting, and training on environmental protection and occupational health and safety minimize these risks to people and 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 and 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 carbon management measures. We classify these as possible risks based on which a substantial impact on the financial position cannot be ruled out.

Opportunities arising from the further integration of Sustainability in the Corporate Strategy

In 2020, we integrated sustainability more strongly in the corporate strategy, setting three goals in the areas of science and technology, value chain, and climate and environment. By considering the goals of the sustainability strategy when making business decisions, we contribute to achieving the United Nations Sustainable Development Goals. In 2021, we established the new Group Function “Corporate Sustainability, Quality and Trade Compliance”. Our dedication to sustainability paired with our commitment to quality, regulatory excellence, and compliance are important focus areas for us. Combining these strategic elements will ensure an effective and efficient execution of our strategy and enable us to cater to the increasing expectations of customers, patients, employees, investors, and the general public. Furthermore, we are promoting visionary sustainability projects in areas like the circular economy and digital sustainability.

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 reaching business targets and synergy goals, as well as staying 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. The Group leverages on its 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. Given the current situation, there are no major risks.

Overall view of the risk and opportunity situation and management assessment

The most significant individual risks in the businesses have been named in the report above, with business- and market-related risks being the most significant alongside IT and legal risks. Most notably, the ongoing Covid-19 pandemic increases existing risks related to more restrictive regulatory requirements regarding drug pricing and reimbursement, the demand for our products, business interruptions at our production facilities, lack of availability of good quality materials or services, risks related to research and development, and negative macroeconomic developments.

Following the concentrated risk mitigation measures taken – such as the implementation of management action (organizational responsibility and process improvements), existing insurance coverage, and accounting precautions – we were able to take counteraction, in particular 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 highly improbable. We are convinced that we will also successfully manage the challenges described in the future, also benefiting from diversification through our different products and markets.

In our view, business-related opportunities offer the greatest potential. The activities listed hold significant opportunities for us in the medium to long term, beyond the underlying forecast period. We pursue the opportunities that arise and specify their expected effects in the forecast development of net sales, EBITDA pre, and operating cash flow. Furthermore, we will actively seek new opportunities, examine their implementation, 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 net assets, financial position, and results of operations.

Report on Expected Developments

The following report provides a forecast for fiscal 2022 for the Group and its three business sectors: Life Science, Healthcare and Electronics.

Fundamental assumptions

The acquisitions of Chord Therapeutics SA, Switzerland, a biotech company specializing in rare disorders of the nervous system, as well as Exelead Inc., USA, a biopharmaceutical contract development and manufacturing company (CDMO), are not expected to lead to a material portfolio effect at Group level in fiscal 2022 (more detailed information about these transactions can be found in Note (6) "**Acquisitions and divestments**" in the Notes to the Consolidated Financial Statements.

As regards exchange rate developments, we expect a continuing volatile environment due to political and macroeconomic developments. In contrast to the previous year, we expect a positive foreign exchange effect in 2022. This effect will be driven in particular by the development of the U.S. dollar and the Chinese renminbi. The vast majority of the remaining currencies are also expected to develop favorably. The expected positive exchange rate effects on EBITDA pre of the business sectors will be partially offset by our currency hedging transactions; however, we do not hedge all growth market currencies (see Note (42) "**Management of financial risks**" in the Notes to the Consolidated Financial Statements). This forecast for 2022 is now based on a euro-U.S. dollar exchange rate in a corridor of 1.11 to 1.16.

Forecast for the Group

€ million	**Actual results 2021**	Forecast for 2022	Key assumptions
Net sales	19,687	• Strong organic growth • Positive foreign exchange effect 1% to 4%	• Strong organic growth in Life Science • Solid organic growth in Healthcare • Solid to strong organic growth in Electronics • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi
EBITDA pre	6,103	• Strong organic growth • Positive foreign exchange effect 2% to 5%	• Strong organic growth in Life Science • Moderate to solid organic growth in Healthcare • Solid organic growth in Electronics • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi
Operating Cash Flow	4,616	• Strong increase	• Organic increase in EBITDA pre as well as positive foreign exchange effects • Rise in working capital within the scope of business performance • Payouts for ongoing transformation programs, particularly in Healthcare and Electronics • Higher fluctuation corridors than for net sales and EBITDA pre are to be expected

Net sales

For the Group in fiscal 2022, we expect strong organic net sales growth, driven by all our business sectors, particularly Life Science. In fiscal 2022, we do not expect a significant portfolio effect at Group level from the aforementioned acquisitions. We expect positive foreign exchange effects between 1% and 4%.

EBITDA pre

EBITDA pre is our key financial indicator for steering operating business. For fiscal 2022, we expect EBITDA pre to see strong organic growth. Life Science will be the main growth driver; Healthcare and Electronics will also contribute positively to the organic development. The expected foreign exchange development is forecast to have a positive effect of 2% to 5% on Group EBITDA pre compared with fiscal 2021; it is likely to be seen mainly in the Healthcare and Electronics business sectors.

Operating cash flow

Apart from EBITDA pre, operating cash flow is one of our key performance indicators at Group level. As regards the composition of operating cash flow, we refer to the section entitled “Internal Management System” as well as the Consolidated Cash Flow Statement in this report. In general, the forecast for operating cash flow is subject to a higher fluctuation corridor than the forecast for net sales and 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 largely mirror the strong operating performance. The development of working capital, which will reflect strong business performance, will dampen operating cash flow as will the expected payments within the scope of the ongoing transformation and growth programs in fiscal 2022. These programs relate mainly to the Healthcare and Electronics business sectors. Positive exchange rate effects will also be reflected in operating cash flow. Overall, we expect a strong increase in fiscal 2022.

Forecast for the Life Science business sector

Forecast for the Life Science Business Sector

€ million	**Actual results 2021**	Forecast for 2022	Key assumptions
Net Sales	8,990	• Strong organic growth • Slight to moderately positive foreign exchange effect	• All businesses contribute to organic growth • Process Solutions remains the strongest growth driver contributing Covid-19-related sales of up to € 900 million • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi
EBITDA pre	3,286	• Strong organic earnings growth • Slight to moderately positive foreign exchange effect	• Organic earnings growth owing to the expected sales growth • Positive foreign exchange effects particularity from the Chinese renminbi and the U.S. dollar

Net sales

For fiscal 2022, we forecast that the Life Science business sector will show strong organic growth of EBITDA pre compared with the previous year. The business unit will remain the strongest growth driver by far. Growth will be exclusively attributable to organic growth in the core business. We expect Process Solutions to see sales of up to € 900 million in connection with the fight against the Covid-19 pandemic. The Applied Solutions and Research Solutions business units will also contribute positively to the overall development of Life Science. The dynamic growth in our Life Science business is currently subject to higher volatility due to the varying developments across product groups and customer segments. Increased research and development activity as well as higher production volumes among pharmaceutical companies, especially in the biopharmaceutical segment, are the key drivers of growth in the core business. In connection with the Covid-19 pandemic, the production of vaccines, medicines and diagnostics, for which we manufacture the required input materials, is contributing to our sales. The expansion of our production capacities will enable us to meet a higher level of demand. We forecast a slight to moderately positive foreign exchange effect.

EBITDA pre

For fiscal 2022, we forecast that the Life Science business sector will show strong organic growth of EBITDA pre compared with the previous year. Earnings growth will continue to be driven mainly by the dynamic development of demand. In this context, the development of EBITDA pre is subject to higher uncertainty owing to the currently existing supply bottlenecks and the pressure on prices caused by rising inflation. Based on our estimates, the foreign exchange effect on earnings in fiscal 2022 should be slightly to moderately positive.

Forecast for the Healthcare business sector

Forecast for the Healthcare Business Sector

€ million	**Actual results 2021**	Forecast for 2022	Key assumptions
Net Sales	7,089	• Solid organic growth • Slight to moderately positive foreign exchange effect	• Continued significant growth contributions from Mavenclad® and Bavencio® as well as contributions from Tepmetko® • CM&E franchise returns to growth following negative impacts in the previous year due to the volume-based procurement regulations in China • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi
EBITDA pre	2,153	• Moderate to solid organic growth • Solid to strong positive foreign exchange effect	• Expected substantial earnings contribution especially from Mavenclad® can more than offset the effect from the expected decline in sales of Rebif® • Marketing and selling expenses as well as research and development costs with a decreasing share of sales due to systematic cost management and strict pipeline prioritization • Absence of one-time effects from the previous year • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi

Net sales

For fiscal 2022, we expect solid organic growth of net sales. We expect further significant increases in sales of Mavenclad® and Bavencio® to contribute substantially to this. We also expect the oncology drug Tepmetko®, our oral MET inhibitor, which was approved in the United States in fiscal 2021, to increasingly contribute to growth. For our established portfolio, we forecast a roughly stable organic development. Generally, this will be driven by organic growth in the Fertility franchise and by products in the Cardiovascular, Metabolism & Endocrinology franchise. Following the adverse impacts on sales of products from the Cardiovascular, Metabolism & Endocrinology (CM&E) franchise in fiscal 2021 caused by the volume-based procurement regulations introduced in China in 2021, the franchise will return to a growth course in fiscal 2022 as expected. The decline in sales of Rebif® due to continued competitive pressure can thus be offset. We forecast a slight to moderately positive foreign exchange effect.

EBITDA pre

For fiscal 2022, we expect EBITDA pre of the Healthcare business sector to see moderate to solid organic growth. Significant earnings contributions, especially from Mavenclad®, should more than compensate for the negative earnings effects due to the expected decline in sales of Rebif®. The expected positive development of EBITDA pre will result from continued strict cost management. Consequently, operating expenses will develop more moderately compared with the rise in sales. In addition, we will further pursue the continuous prioritization of our development pipeline. We therefore expect the share of both marketing and selling expenses as well as research and development costs to decline as a percentage of sales. The development of research and development costs will remain heavily dependent on clinical data as well as further expected study results. The absence of one-time effects from fiscal 2021 will negatively impact the development of EBITDA pre. This relates primarily to the milestone payments realized in the previous year within the scope of our strategic alliance with Pfizer to develop and commercialize Bavencio® as well as the earnings effect from the full receipt

of the previously deferred upfront cash payment as a result of the mutual decision to end the global strategic alliance with GlaxoSmithKline plc (GSK) on the co-development and co-commercialization of bintrafusp alfa. In total, these one-time effects amounted to € 173 million, which was disclosed in other operating income. In fiscal 2022, we expect income from active portfolio management at the year-earlier level. For the Healthcare business sector, we expect solid to strong positive foreign exchange effects.

Forecast for the Electronics business sector

Forecast for the Electronics Business Sector

€ million	**Actual results 2021**	Forecast for 2022	Key assumptions
Net sales	3,608	• Solid to strong organic growth • Moderate to solid positive foreign exchange effect	• Strong growth dynamic in Semiconductor Solutions and OLED materials • Positive foreign exchange effects particularly from the U.S. dollar and individual Asian currencies
EBITDA pre	1,128	• Solid organic growth • Solid to strong positive foreign exchange effect	• Growth in Semiconductor Solutions can more than offset price decline in Liquid Crystals supported by active price and cost management • Positive foreign exchange effects particularly from the U.S. dollar and individual Asian currencies

Net sales

For the Electronics business sector, we forecast solid to strong organic net sales growth in fiscal 2022. The key growth driver of the development compared with the previous year will be the Semiconductor Solutions business unit, for which we expect a strong growth dynamic that will exceed market growth in the medium term. As expected, the project business in this business unit will be subject to stronger fluctuations owing to its dependency on major individual orders. We also expect our Surface Solutions business unit to see a positive organic development in fiscal 2022. Our Display Solutions business will continue to decline organically. This will be attributable to the organic decrease in the Liquid Crystals business, which is facing persistent price erosion due to the price pressure common in this industry. This will be dampened by the continued strong business performance in OLED materials. We forecast a moderate to solid positive foreign exchange effect.

EBITDA pre

For our Electronics business sector, we expect a solid organic increase in EBITDA pre in 2022. We assume that the anticipated growth of Semiconductor Solutions as well as active price and cost management will more than offset the price erosion in Liquid Crystals. In this context, the development of EBITDA pre is subject to higher uncertainty owing to the currently existing supply bottlenecks and the related pressure on prices caused by rising inflation. We forecast solid to strong positive foreign exchange effects on EBITDA pre.

Corporate and Other

For Corporate and Other, we expect a slight increase in costs in fiscal 2022. This takes into consideration expected negative effects from foreign currency hedging, which will partially offset positive foreign exchange effects in the business sectors.

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) and the explanatory report pursuant to section 176 (1) sentence 1 of the German Stock Corporation Act (AktG).

As of the balance sheet date, 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, 2021, no shareholders owned direct or indirect investments exceeding 10% of the voting rights.

According to the Articles of Association of our company, 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 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, once or repeatedly, up to and including April 27, 2022, by up to a total of € 56,521,124.19 by issuing new no-par value bearer shares against cash and/or non-cash contributions (Authorized Capital 2017). Limited liability shareholders shall be generally granted the statutory right to subscribe to the new shares. However, the Executive Board is authorized, with the approval of the Supervisory Board, to exclude the limited liability shareholders' subscription right, in full or in part, in case of a capital increase against 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, which are issued under exclusion of the subscription right, do not exceed a proportional amount of 10% of the share capital either at the time of the Authorized Capital 2017 taking effect or at the time of the Authorized Capital 2017 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 the subscription right or sold during the term of the Authorized Capital 2017, based on an authorization to issue new shares or sell own shares by direct or analogous application of section 186 (3) sentence 4 AktG. Further, 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 the Authorized Capital 2017 under exclusion of the limited liability shareholders' subscription right by analogous application of section 186 (3) sentence 4 AktG.

It is likewise possible to exclude the subscription right of the limited liability shareholders with the approval of the Supervisory Board in the case of capital increases through 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, the 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 right of the 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, in full or in part, its equity interest into share capital.

Moreover, with the approval of the Supervisory Board, the subscription right of the 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, a subscription right 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.

Lastly, with the approval of the Supervisory Board, the subscription right of the limited liability shareholders can be excluded in order to exclude fractional amounts from the subscription right.

The sum of shares issued on the basis of the Authorized Capital 2017 under exclusion of the limited liability shareholders' subscription right must not exceed a proportional amount of 20% of the share capital, by taking into account other shares of the company which, during the term of the Authorized Capital 2017, are sold or issued under exclusion of the subscription right or are to be issued under bonds issued after April 28, 2017, under exclusion of the subscription right; 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 the subscription right is not excluded under the above provisions, it may also be granted to the limited liability shareholders by way of an indirect subscription right pursuant to section 186 (5) AktG or, in part, by way of a direct subscription right, and otherwise by way of an indirect subscription right 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 divided into 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 increase in contingent capital 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 issued against contributions 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 27, 2018, to April 26, 2023, 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, wholly or in part, of granting 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 2021 includes for the first time 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. 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.

KPMG AG 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 KPMG – excluding references to our Sustainability Report. Our Sustainability Report meets the requirements of the Global Reporting Initiative (GRI) standards – Comprehensive option. It will be available **online** as of April 12, 2022. With this, we disclose topics set forth by Sustainability Accounting Standards Board (SASB) and 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 Regulatory Affairs Governance Policy for chemical products sets out the processes and management structures for product safety.

We 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.

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.

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

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

Numerous global challenges, such as climate change, resource scarcity and unequal access to health in various countries, are also crucial to our company. In order to address them, we continuously seek solutions made possible by science and technology. At the same time, we are working to make our business models more resilient.

We describe our sustainability strategy in the "**Strategy**" section of the management report within the Annual Report for 2021 and, in more detail, in the Sustainability Report for 2021 in the chapter entitled "**Sustainability Strategy**".

Roles and responsibilities

Our Executive Board has Group-wide responsibility for our sustainability strategy. It has adopted our three strategic goals: In 2030, we will achieve human progress for more than one billion people through sustainable science and technology. By 2030, we will integrate sustainability into all our value chains. And by 2040, we will achieve climate neutrality and reduce our resource consumption (details can be found under "**Strategy**").

The Group Corporate Sustainability unit is responsible for developing and shaping the sustainability strategy and it regularly informs the Executive Board about the progress made and the need for action. It is part of the **newly created Group function** Corporate Sustainability, Quality and Trade Compliance, which reports to the Chair of the Executive Board. Consequently, overarching Executive Board responsibility for Environment, Social, Governance (ESG) also lies with the Chair of the Executive Board.

Group Corporate Sustainability is also responsible for the Corporate Sustainability Council. The committee consists of representatives from our business sectors and from key Group functions, such as Procurement, HR and Strategy. Council members from various countries provide input on regional sustainability aspects. The Corporate Sustainability Council steers and monitors the Group-wide implementation of the sustainability strategy. It aligns the strategy with the individual business strategies, defines priorities, specifies globally applicable sustainable guidelines, and recommends corresponding initiatives to the Executive Board. With their respective area of responsibility, each Executive Board member is also responsible for sustainability.

In November 2021, we established an external expert committee for sustainability issues. The Sustainability Advisory Panel of Merck KGaA, Darmstadt, Germany (**MSAP**) consists of six independent international experts

on sustainability-related topics. They advise the company on selected issues and assess their sustainability aspects as well as the company's planned activities.

Topics for the non-financial statement

Pursuant to section 289c para 3 of the German Commercial Code, 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 business activities affect non-financial aspects. And secondly, the information is necessary to understand the company's course of business, results of operations and economic position. In 2021, 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 2021. They cover fiscal 2021 and pertain to our entire Group, including its 227 companies in 66 countries. Any deviations from the reporting framework are indicated on a case-by-case basis.

Aspect	Topic
Environmental matters	• Environmental management • Climate action • Plant, process and transport safety • Chemical product safety
Employee-related matters	• Recruiting and retaining talent • Diversity and inclusion • Health and safety
Social matters	• Sustainable supply chains (including the mica supply chain) • Patient safety • Product-related crime • Prices of medicines • Clinical studies • Bioethics • Digital ethics • Data protection and security
Respect for human rights	• Human rights
Anti-corruption and anti-bribery	• Governance and compliance (including anti-corruption anti-competitive behavior) • Responsible marketing • Interactions with health systems
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. We did not identify any net risks that fulfill the materiality criteria as set forth by section 289c (3) no. 3 and 4 of the German Commercial Code. Additional risks are described in the **Report on Risks and Opportunities** in the combined management report.

Environmental matters

Environmental stewardship

Minimizing negative environmental impacts and taking meaningful climate action requires a holistic approach while also constantly monitoring practices and performance. Our goal is to avoid harmful emissions into the air, water, and soil as far as 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, taking into consideration information from publicly accessible sources such as local residents and non-governmental organizations (NGOs).

Roles and responsibilities

The Chair of the Executive Board and CEO of our company responsible for environmental stewardship, which also covers climate action, water management, waste and recycling, biodiversity, and plant and process safety. Her duties include the approval of overarching Group-wide guidelines, such as our EHS Policy.

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

Within our business sectors, the Operations Leadership Committee (OLC) makes strategic decisions on issues pertaining to emissions, energy, water and waste topics. This body consists of representatives from Life Science, Healthcare, and Electronics, as well as from 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 stewardship.

Our commitment: Standards and standard operating procedures

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 stewardship and health and safety. It is also aimed at our suppliers, calling on them to likewise adopt higher standards of environmental sustainability and safety. Our EHS policy thus complements the **Responsible Sourcing Principles** of our Group Procurement function. In addition, through our Contractor EHS Management Standard, we ensure that our contract partners also take environment, health and safety aspects into account.

Potential EHS risks posed by acquisitions, divestments or site closures are assessed within the scope of due diligence, a process defined in our EHS Due Diligence and Post Merger Transaction Standard. We prioritize new sites when performing audits.

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, 2021, our **provisions for environmental protection** totaled € 153 million, 94% of which was attributable to Merck KGaA, Darmstadt, Germany.

Assessing environmental impacts

As a matter of principle, we conduct risk-based assessments along with audits on all our production facilities every three years with the goal of analyzing and minimizing our environmental footprint. Conducted by Corporate Sustainability, Quality, and Trade Compliance (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", "satisfactory", "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 significant violations can increase the frequency. In 2021, we commissioned a total of 51 audits, which were conducted either virtually or on site (in 2020, only 10 audits were conducted because of Covid-19). All audited sites received either a "good" or "satisfactory" rating and no site was rated as "critical".

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 on an annual basis.

In the event of a major occurrence, our digital Rapid Incident Report System (RIRS) promptly notifies the Executive Board as well as SQ and Group Communications functions. 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 can report any violations of our standards to Group Compliance. As in 2020, we recorded no significant violations of environmental laws or regulations Group-wide in 2021.

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. In 2021, 90 of our sites worldwide were covered by the **ISO 14001** certificate.

Every year, we contract a third party to perform a certification audit. In 2021, a sampling of eight sites underwent an audit for our Group certificate, with all audited facilities passing. Beyond undergoing external inspections, we also conduct internal audits to ensure Group-wide compliance with our requirements.

Climate action

We want to do our part to preserve the climate and achieve the Paris Agreement on Climate Change. In 2020, we drew up new objectives: By 2030, we intend to lower our direct (Scope 1) and indirect (Scope 2) greenhouse gas emissions by 50% compared with 2020. This is to be achieved by reducing process-related emissions, implementing energy efficiency measures, and purchasing more electricity from renewable sources. We are also aiming to cover 80% of our purchased electricity with renewables by 2030.

Moreover, we plan to lower our indirect emissions along our entire value chain (Scope 3) by 1,500 metric kilotons of CO_2 equivalents (CO_2eq) by 2030. By 2040, we intend to have achieved climate-neutral operations throughout our entire value chain, a target that covers our Scope 1, 2 and 3 emissions.

In November 2021, our company decided to join the Science Based Targets initiative. In becoming part of this effort, we have committed ourselves to taking concrete steps to reach the Paris Agreement targets.

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 units worldwide implementing the necessary measures at the local level.

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”, “Emissions”, and “Emissions of Refrigerants”. We utilize an internal audit process to randomly check compliance with all EHS standards.

Emissions reduced

In 2021, we emitted approximately 1,843,000 metric tons of CO_2 equivalents (CO_2eq) (2020: 2,028,000 metric tons). Our direct emissions (Scope 1) totaled 1,522,000 metric tons of CO_2eq, with process-related emissions accounting for 1,261,000 metric tons of CO_2eq and fuel use accounting for the remainder. Indirect emissions (Scope 2) totaled roughly 321,000 metric tons calculated according to the market-based method (approximately 385,000 metric tons according to the location-based method, which does not specifically take renewable energy sources into account). Greenhouse gas emission intensity (Scope 1 and 2) amounted to 0.09 kg of CO_2eq per € of net sales in this period.

In 2020 and 2021, we focused on creating more transparency on our Scope 3 emissions. The Greenhouse Gas Protocol defines 15 categories for Scope 3 emissions from upstream and downstream activities. In 2021, our emissions totaled 5,716,000 metric tons of CO_2eq. Categories 1 and 2 (Purchased Goods and Services and Capital Goods) accounted for the lion's share, representing 68% 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	2018	2019	2020[3]	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Total CO_2eq[4] emissions	**636**	**621**	**2,028**	**1,843**	**153**
thereof:					
direct CO_2eq emissions (Scope 1)	332	341	1,706	1,522	115
indirect CO_2eq emissions[5] (Scope 2)	304	280	322	321	38
Biogenic CO_2 emissions	**13**	**13**	**13**	**15**	**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] Includes Versum Materials as of 2020.

[4] eq = equivalent

[5] The figures presented here have been calculated in accordance with the market-based method.

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]

	2018	2019	2020	**2021**
Total gross other indirect emissions (metric kilotons CO_2eq[2])	**348**	**339**	**5,030**	**5,716**
Purchased goods & services (category 1)[3]	n/a	n/a	3,040	3,572
Capital goods (Category 2)[3]	n/a	n/a	293	291
Fuel- and energy-related emissions, not included in Scope 1 or 2 (category 3)	131	127	102	143
Upstream transportation & distribution (category 4)[4]	n/a	n/a	264	264[5]
Waste generated in operations (category 5)	47	50	85	79
Business travel (category 6)[6,7]	104	87	32	26
Employee commuting (category 7)	66	75	90	94
Upstream leased assets (category 8)[8]	0	0	0	0
Downstream transportation & distribution (category 9)[4]	n/a	n/a	8	8[5]
Processing of sold products (category 10)[9]	0	0	0	0
Use of sold products (category 11)[4]	n/a	n/a	1,091	1,213
End-of-life treatment of sold products (category 12)[4]	n/a	n/a	23	23[5]
Downstream leased assets (category 13)	0	0	2	2
Franchises (category 14)[10]	0	0	0	0
Investments (category 15)	n/a	n/a	0	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] eq = equivalent

[3] 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.

[4] Compared to other Scope 3 categories, the screening of the emissions in this category contains more uncertainties. Their impact cannot be estimated more precisely at this time. We are working on improving the accuracy of these data.

[5] Due to high efforts for data preparation, we reference 2020 data for 2021.

[6] Since 2021, we have applied a new calculation approach for 2021 and 2020. The figure for 2020 was therefore adjusted retrospectively.

[7] Air travel, hotel stays, rental car travels, rail travel (German Railway)

[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] 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.
Details on the calculation (methodology, assumptions, uncertainties) of the Scope 3 categories can be found in the **Scope 3 document**.

Significant spills

	2018	2019	2020	**2021**
Total number of significant spills	0	0	0	0

Energy efficiency

In 2021, a variety of energy efficiency initiatives helped us save around 1,700 metric tons of CO_2eq at our global headquarters in Darmstadt. For instance, we updated heating, ventilation and air conditioning systems, implemented energy-saving lighting concepts.

As part of the energy and water efficiency program of our Life Science business sector, we rolled out new tools in 2021 to help us assess projects for saving energy and water. In addition, we trained 40 employees from sites outside of Germany on energy management.

Slight rise in energy consumption

We consumed 2,454 gigawatt hours of energy in 2021, versus 2,374 gigawatt hours in 2020. Our energy intensity relative to sales totaled 0.12 kWh/€ in 2021.

Energy consumption[1]

In GWh	2018	2019	2020	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Total energy consumption	**2,158**	**2,178**	**2,374**	**2,454**	**628**
Direct energy consumption	**1,261**	**1,288**	**1,266**	**1,318**	**564**
Natural gas	1,194	1,222	1,179	1,232	556
Liquid fossil fuels[2]	33	33	52	48	8
Biomass and self-generated renewable energy	34	33	35	38	0
Indirect energy consumption	**897**	**890**	**1,108**	**1,136**	**64**
Electricity	749	745	945	958	64
Steam, heat, cold	148	145	163	178	0
Total energy sold	**0.0**	**0.1**	**0.2**	**0.1**	**0.0**
Electricity	0.0	0.1	0.2	0.1	0.0
Steam, heat, cold	0.0	0.0	0.0	0.0	0.0

In TJ					
Total energy consumption	**7,770**	**7,839**	**8,546**	**8,834**	**2,261**
Direct energy consumption	**4,541**	**4,637**	**4,558**	**4,745**	**2,030**
Natural gas	4,298	4,399	4,244	4,435	2,002
Liquid fossil fuels[2]	119	119	187	173	29
Biomass and self-generated renewable energy	124	119	126	137	0
Indirect energy consumption	**3,229**	**3,202**	**3,989**	**4,090**	**230**
Electricity	2,696	2,682	3,402	3,449	230
Steam, heat, cold	533	520	587	641	0
Total energy sold	**0.0**	**0.5**	**0.7**	**0.4**	**0.0**
Electricity	0.0	0.5	0.7	0.4	0.0
Steam, heat, cold	0.0	0.0	0.0	0.0	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

At 15 sites we use photovoltaics to produce power.

We currently only record purchased secondary energy – this is primarily electricity and, to a lesser extent, heat/steam/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.

In 2021, we increased our focus on purchasing electricity from renewable sources. In this period, we sourced 30% of our purchased electricity from renewable energies (2020: 27%). Renewables represented 13% of our total energy consumption.

Plant, process and transport safety

We seek to minimize manufacturing process hazards wherever possible in order to avoid workplace accidents, production outages, and chemical spills, which is why we regularly review our approach to plant and process safety and continuously gauge it using our EHS performance 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 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 insufficient local regulations covering the transport of hazardous materials.

Assessing potential risks

Before commissioning a plant, we draft a safety concept and that is subject to continuous review throughout the entire lifetime of the facility and, when necessary, updated until the facility is decommissioned. This safety concept contains an overview of potential risks and specifies corresponding protective measures. After any alterations are made to a plant, we also reassess the hazard and risk situation.

Our Risk Management Process guides all our sites in identifying and assessing risks and is used 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 productions sites and every four years at warehouse and distribution sites. If major shortcomings are identified, we re-audit the 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 2021, we conducted 51 EHS audits in accordance with our Group-wide EHS standards. Our own warehouse locations accounted for 19 of these audits and interfaces to third-party warehouses for a further 7. Due to the Covid-19 situation, all audits were conducted remotely.

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 a year. Four indicators are particularly important to us here:

- 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 put the number of incidents and the severity of the event in proportion to the number of hours worked. The lower the EHS Incident Rate, the safer the site is. Our EHR IR in 2021 was 3.9 (2020: 3.4).
- The EHS IR also includes our Loss of Primary Containment (LoPC) indicator. In 2021, we recorded no significant incident-related spills at any of our production, research or warehouse sites Group-wide.
- A further important indicator is the EHS Leading Rate (EHS LR), which reflects the number and the results of the analyses of near misses and critical situations. Some of our individual business sectors have also defined their own annual targets for EHS IR and EHS LR.
- In 2021, we set ourselves a new goal for the Lost Time Injury Rate (LTIR) (number of accidents Group-wide resulting in at least one missed day of work per million hours worked). We aim to bring our LTIR below 1.0 Group-wide by 2025. In 2021, our LTIR was 1.2 (2020: 1.3).

Chemical product safety

Product safety is one of our top priorities. Starting at the product launch stage, we investigate the potential adverse impacts that chemical substances may have. 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 all regulatory requirements. We publish this information primarily on the relevant digital channels. Paper safety data sheets are still common in some countries and 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 taking into account respective businesses requirements and customer needs. This approach includes registering chemicals, classifying hazardous substances and highlighting risks via the use of safety data sheets, labels, and digital communications.

Our Group standards provide a framework for governing the setup of effective operational processes for product safety, hazard communication and chemicals regulatory compliance throughout our business sectors. Our Group Chemicals Regulations Council monitors relevant regulatory developments.

This approach also applies to innovative fields of development such as nanomaterials, which we use with the greatest 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 guidelines define the roles, responsibilities, and basic processes required to comply with national and international regulations. In addition, we have also endorsed general 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 allows us to streamline our internal processes and provide consistent, harmonized, and high-quality information to our customers

In 2021, there were no incidents of non-compliance with regulations, specifically concerning potential health and safety impacts and the labeling of our chemical products.

Safety analysis during product launch

Safe and sustainable by design implies that product safety starts with development. Therefore, at an early stage in our product launch process, we analyze innovations in terms of their impacts on human health and the environment. We also evaluate the intrinsic hazards of both our existing and new products to create relevant product safety information in line with all 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 all relevant information to our customers and the public, which helps raise awareness of the hazards and build a greater understanding of how to mitigate risks and use the products safely.

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

Employee-related matters

Attracting and retaining talent

We believe that curiosity can make great things happen. Therefore, we aim to provide an environment that gives our employees plenty of scope for creativity and sparks their desire to innovate. Our **employer brand** communicates this mindset to the outside world. Through our slogan “Bring Your Curiosity to Life”, we show applicants what they can expect and what they can contribute when they join our company.

Diversity, equity and inclusion are integrated in our attraction and selection activities. We train our recruiters to avoid unconscious bias during interviews and ensure that all new employer branding campaigns follow diversity criteria.

In 2021, we started using a new technology to support gender-neutral language, for example when creating job advertisements. Additionally, we included a dedicated “diversity” section in our interview guide, helping hiring managers to keep inclusivity top-of-mind.

We work across countries to understand cultural norms that allow our colleagues to bring their best selves to work. Attracting applicants with diverse backgrounds remains a top priority for us because we believe this gives us a competitive advantage as we expand our employee base.

Total number of employees[1]

As of Dec. 31	2018	2019	2020	**2021 Group**	**2021 thereof: Merck KGaA, Darmstadt, Germany**
Total number of employees	51,749	57,071	58,127	60,348	8,081
Men	29,006	32,531	33,204	34,274	5,292
Women	22,743	24,540	24,923	26,074	2,789

[1] The Group also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

Employee age by region

As of Dec. 31

Number of employees	Worldwide	North America	Europe (including Germany)	Merck KGaA, Darmstadt, Germany	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2020							
Up to 29 years old	8,570	1,906	3,193	1,161	2,800	472	199
thereof: women	4,018	825	1,525	420	1,307	260	101
30 to 49 years old	34,974	6,615	15,416	4,458	9,669	2,323	951
thereof: women	15,268	2,841	7,076	1,505	3,776	1,161	414
50 or older	14,583	4,791	7,978	2,959	1,049	592	173
thereof: women	5,637	1,861	3,142	839	342	209	83
Average age	**41.7**	**44.4**	**43.1**	**43.4**	**37.0**	**40.7**	**39.1**
Total employees	**58,127**	**13,312**	**26,587**	**8,578**	**13,518**	**3,387**	**1,323**
2021							
Up to 29 years old	9,129	2,219	3,341	1,125	2,912	482	175
thereof: women	4,359	961	1,598	415	1,437	265	98
30 to 49 years old	36,157	6,939	15,653	4,288	10,260	2,404	901
thereof: women	15,888	2,958	7,224	1,550	4,081	1,225	400
50 or older	15,062	4,912	8,223	2,668	1,113	643	171
thereof: women	5,827	1,881	3,276	824	356	231	83
Average age	**41.6**	**43.9**	**43.1**	**43.1**	**37.1**	**40.8**	**39.7**
Total employees	**60,348**	**14,070**	**27,217**	**8,081**	**14,285**	**3,529**	**1,247**

Internationality of employees

As of Dec. 31	2018[1]	2019[2]	2020	**2021 Group**	**2021 thereof: Merck KGaA, Darmstadt, Germany**
Number of nationalities	136	139	141	142	89
Number of nationalities in management positions (Role 4 or above)	70	73	75	79	39
% of non-Germans in management positions (Role 4 or above)	64	64	66	66	13

[1] In 2018, the position assessment had not yet been carried out for employees of all Sigma-Aldrich legal entities in Germany, or for employees of Allergopharma.

[2] In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma.

New employees

As of Dec. 31	2018	2019[1]	2020	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Total number of new employee hires	**7,129**	**7,924**	**6,669**	**8,960**	**504**
by age group					
up to 29 years old	2,967	3,432	2,889	3,679	263
30 to 49 years old	3,728	4,055	3,347	4,610	225
50 or older	434	437	433	671	16
by gender					
Women	3,401	3,622	3,016	4,101	215
Men	3,728	4,302	3,653	4,859	289
by region					
Europe	2,560	2,529	2,160	2,567	504
North America	1,524	1,733	1,789	2,855	not applicable
Asia-Pacific (APAC)	2,222	2,729	2,206	2,803	not applicable
Latin America	583	578	396	579	not applicable
Middle East and Africa (MEA)	240	355	118	156	not applicable
Rate of new employee hires[2] (%)	**14**	**14**	**11**	**15**	**6**
by age group[3]					
up to 29 years old	42	43	43	41	52
30 to 49 years old	52	51	50	51	45
50 or older	6	6	7	8	3
by gender[3]					
Women	48	46	45	46	43
Men	52	54	55	54	57
by region[3]					
Europe	36	32	32	29	100
North America	21	22	27	32	not applicable
Asia-Pacific (APAC)	31	34	33	31	not applicable
Latin America	8	7	6	6	not applicable
Middle East and Africa (MEA)	3	5	2	2	not applicable

[1] These figures exclude the approximately 2,400 Versum Materials and Intermolecular employees who are not classified as new hires because they joined the Group as part of the acquisitions.

[2] 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.

[3] 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]

	2018	2019	2020[3]	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Total turnover rate	**9.09**	**9.07**	**8.22**	**10.82**	**2.37**
Turnover rate by gender					
Men	9.03	8.69	8.22	10.69	2.45
Women	9.18	9.54	8.22	11.00	2.22
Turnover rate by age group					
Up to 29 years old	14.24	13.13	11.30	16.64	2.59
30 to 49 years old	8.53	8.90	7.74	10.05	1.95
50 or older	7.39	7.03	7.52	9.22	2.95
Turnover rate by region					
Europe	5.73	5.72	5.64	6.00	2.37
North America	9.90	11.02	9.79	15.44	not applicable
Asia-Pacific (APAC)	14.51	13.18	10.60	14.66	not applicable
Latin America	15.41	13.47	11.40	12.95	not applicable
Middle East and Africa (MEA)	9.77	12.14	11.80	16.57	not applicable
Total number of leavers	**4,613**	**4,863**	**4,721**	**6,354**	**201**
by gender					
Men	2,578	2,621	2,697	3,575	139
Women	2,035	2,242	2,024	2,779	62
by age group					
Up to 29 years old	1,061	1,042	974	1,451	30
30 to 49 years old	2,649	2,898	2,677	3,545	86
50 or older	903	923	1,070	1,358	85
by region					
Europe	1,457	1,500	1,490	1,601	201
North America	1,064	1,264	1,281	2,078	not applicable
Asia-Pacific (APAC)	1,468	1,484	1,394	2,015	not applicable
Latin America	522	459	398	449	not applicable
Middle East and Africa (MEA)	102	156	158	211	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 2021, the average length of service for employees Group-wide was 9.5 years (2020: 9.6 years), with 15.7 years (2020: 16.2 years) for employees of Merck KGaA, Darmstadt, Germany.

Roles and responsibilities

The Human Resources (HR) department is responsible for advising all business sectors and Group functions on matters concerning our human capital. The HR team addresses the needs of our employees, organizational topics, and company culture. Across all our sites, HR employees work together with leaders from various functions and business sectors to employ strategies to engage our people in line with Group-wide HR guidelines and requirements, including attractive compensation models and benefits. Every two to three years, we carry out internal audits to check that the guidelines are being implemented.

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, including Diversity, Equity & Inclusion (DE&I), reports directly to her. Our Business Services unit oversees the operational tasks of human resources work, such as drafting contracts and payroll accounting. The Chief Financial Officer has responsibility for this unit.

The Engagement and Inclusion unit within our HR organization is responsible for employee engagement, diversity, equity, and inclusion and also develops and manages our employee surveys.

Our commitment: Group-wide policies and guidelines

We are dedicated to upholding the appropriate and fair labor and social standards stipulated in our Group-wide **Social and Labor Standards Policy**. It complements the provisions of our **Human Rights Charter** and our **Code of Conduct** with respect to labor and social standards. These include the fundamental Conventions of the **International Labour Organization** (ILO), which cover freedom of association and collective bargaining, forced labor, child labor, anti-discrimination, equal opportunity, equal pay, working hours, occupational health and safety, and the prevention of abuse and harassment. The Social and Labor Standards Policy outlines that we do not tolerate any form of discrimination, physical or verbal harassment or intolerance in the workplace. In this way, it creates the framework for fair and respectful interaction. We conduct internal audits to ensure that our local subsidiaries comply with these principles.

Performance-based pay and social benefits

To ensure a competitive compensation structure, we regularly review our compensation policy based on data analyses and benchmarks. In doing so, we take internal factors and market requirements equally into account. Before adapting our compensation structure, we consult with key stakeholders, such as employee representatives. The pay structures within our company are based on defined criteria, such as job requirements and performance. We make no distinctions based on gender or other diversity criteria.

Diversity, equity and inclusion

At our company, diversity drives progress. It strengthens our ability to innovate and contributes to our success in science and technology. We encourage employees, patients and customers to be their individual, curious and unique selves. The more diverse our people, the better we can succeed in business while making a difference in people's lives.

In 2021, we strengthened and expanded our commitment to diversity. While we have always been a diverse organization – today spanning 66 countries, with more than 60,000 employees – we recognize that the success of our organization depends on our ability to foster an environment that promotes equity and cultivates inclusion.

Together, we are building one culture in which we care about one another and are solidifying a sense of belonging for all so that our different voices are heard to drive better business outcomes. Ultimately, we are creating opportunity and enabling advancement for employees around the globe.

To reflect our expanded DE&I commitment, we are focused on three critical priority areas:

Gender

We are aiming for gender parity in leadership positions by 2030. In 2021, we increased the share of women in leadership roles to 36% (2020: 35%) and maintained a stable 43% proportion of women in the global workforce.

Culture and ethnicity

By 2030, we plan to increase the proportion of colleagues who are members of underrepresented racial and ethnic groups in our United States leadership teams from 21% to 30%. We continue to pursue self-identification efforts to help us further understand our organizational structure in regard to culture and ethnic representation.

With 23% of our employees based in the United States, it is crucial that we become an employer of choice among racial and ethnic minorities in this market. We continually listen and learn from our colleagues in the market to ensure our workforce reflects the talent currently available in the marketplace.

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

Inclusion

For us, inclusion means creating a culture and environment where everyone can reach their full potential and is able to add value. Our leaders are key to achieving this. In 2021, we began rolling out a Group-wide program to help leaders reflect on how they can lead more inclusively. All leaders, including new ones, are required to actively participate. In the reporting period, 37% of our leaders participated in this inclusion training. We also monitor progress using our Employee Engagement Survey inclusion score. Additionally, countries and sectors can focus on further diversity dimensions such as LGBTQI+, different abilities, age diversity, or veteran/military status.

A cornerstone of our DE&I strategy is to foster an inclusive culture in partnership with over 40 employee resource groups (ERGs) across the globe. With nearly 4,500 employees involved in one or more ERGs, we are able to build awareness of matters impacting our diverse workforce through programs and open dialogue. Our ERGs range from Women in Leadership to our Black Leaders Network and our Leaders of Ethnicity Allies and Faith.

Number of employees by hierarchical level[1]

As of Dec. 31	2018[2]	2019[3]	2020	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Total employees	**51,749**	**57,071**	**58,127**	**60,348**	**8,081**
Senior management (Role 6+)	193	190	193	194	70
Middle management (Role 4 & 5)	3,095	3,352	3,637	3,831	824
Low management (Role 3)	9,019	9,499	10,286	10,880	2,077
Other employees (below Role 3)	39,442	44,030	44,011	45,443	5,110
% of women (total)	**44**	**43**	**43**	**43**	**35**
thereof: in senior management (Role 6+)	36	39	42	49	18
thereof: in middle management (Role 4 & 5)	1,025	1,146	1,284	1,413	257
thereof: in low management (Role 3)	3,795	4,029	4,352	4,669	773
thereof: other employees (below Role 3)	17,888	19,326	19,245	19,943	1,741
% of men (total)	**56**	**57**	**57**	**57**	**65**
thereof: in senior management (Role 6+)	157	151	151	145	52
thereof: in middle management (Role 4 & 5)	2,070	2,206	2,353	2,418	567
thereof: in low management (Role 3)	5,224	5,470	5,934	6,211	1,304
thereof: other employees (below Role 3)	21,554	24,704	24,766	25,500	3,369
by age group					
Up to 29 years old (%)	**15**	**15**	**15**	**15**	**14**
thereof: in senior management (Role 6+)	0	0	0	0	0
thereof: in middle management (Role 4 & 5)	5	8	6	8	2
thereof: in low management (Role 3)	211	190	199	241	65
thereof: other employees (below Role 3)	7,279	8,362	8,365	8,880	1,058
30 to 49 years old (%)	**61**	**60**	**60**	**60**	**53**
thereof: in senior management (Role 6+)	69	69	68	63	25
thereof: in middle management (Role 4 & 5)	1,829	1,933	2,032	2,172	512
thereof: in low management (Role 3)	6,206	6,516	6,926	7,298	1,336
thereof: other employees (below Role 3)	23,536	25,859	25,948	26,624	2,415
50 years or older (%)	**24**	**25**	**25**	**25**	**33**
thereof: in senior management (Role 6+)	124	121	125	131	45
thereof: in middle management (Role 4 & 5)	1,261	1,411	1,599	1,651	310
thereof: in low management (Role 3)	2,602	2,793	3,161	3,341	676
thereof: other employees (below Role 3)	8,627	9,809	9,698	9,939	1,637

[1] The Group also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

[2] In 2018, the position assessment had not yet been carried out for employees of all Sigma-Aldrich legal entities in Germany, or for employees of Allergopharma. In the facts and figures, these employees are included under “other employees (below Role 3)”.

[3] In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma. In the figures, employees whose positions have not been assessed have been allocated to “other employees (below Role 3)”.

Roles and responsibilities

Our Chief Diversity, Equity and Inclusion Officer is responsible for our global Diversity, Equity and Inclusion (DE&I) strategy and steering related activities. In this role, she reports directly to the Chair of the Executive Board, whose responsibilities include Group Human Resources.

We have a centralized Diversity Council that consists of high-ranking executives from all our business sectors and select Group functions. In addition, all business sectors and major Group functions have various working groups at management level that implement the Diversity, Equity and Inclusion strategy in their area of responsibility.

Our commitment: Industry-wide initiatives and regulations

Our **Social and Labor Standards Policy** spells out that we do 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

Meeting statutory requirements

The German Law for the Equal Participation of Women and Men in Leadership Positions in the Public and Private Sector has been in effect in Germany since 2015. Owing to our legal form as a KGaA (corporation with general partners), this law also applies in part to us.

With a 37.5% share of women (six out of 16 members), our Supervisory Board already meets the stipulations of German gender quota legislation. As a KGaA, we are not required to set targets for our Executive Board. Our Executive Board currently has a 20% share of women (1 out of 5). Detailed information can be found in the **Statement on Corporate Governance**.

Rooting out unconscious bias

We seek to raise awareness of unconscious bias among our managers and employees, also through Group-wide training courses on this topic. Since 2021, we have been using new technologies in the context of recruitment in order to support the use of gender-neutral language, for example when creating job advertisements. This is intended to reduce unconscious bias in the hiring process and ensures that our job advertisements are attractive to diverse talent.

Pay Equity Analysis

Our commitment to pay equity is an important aspect of our DE&I strategy. In order to create transparency on unexplained pay gaps and their underlying root causes, we conducted a pay equity analysis in 2021. In this first step, we analyzed our top ten countries covering roughly 80% of our employees. The focus of the analysis was on pay gaps based on gender. The detailed data analysis had not yet been completed at the end of 2021. Based on the initial findings, we continue to create a detailed action plan and work on business alignment to ensure fair pay for all our employees.

Taking action against discrimination

We do not tolerate any kind of discrimination at our company. This is stipulated with binding effect in our **Code of Conduct** and our **Social and Labor Standards Policy**. Should employees experience harassment or discrimination in the workplace, they can report the issue via various channels. Their first points of contact are either their supervisor or our Human Resources (HR) or Compliance teams. Alternatively, employees throughout the Group have the possibility to call our **Compliance Hotline** anonymously. As part of our “Group Compliance Case Committee”, HR coordinates suspected cases relating to human resources topics. In 2021, seven suspected cases of discrimination were reported via the compliance hotline and other channels. Of these reports, six incidents were confirmed.

Health and safety

We seek to promote the health and well-being of our employees and sustain their ability to perform over the long term, which necessitates a safe workplace. We are therefore constantly working to take our health and safety culture to the next level.

The lost time injury rate (LTIR) is the indicator used to gauge the success of our occupational safety efforts. This figure is a global measure of the number of accidents resulting in at least one day of missed work per

one million hours worked. We track the LTIR globally for both employees and supervised temporary staff. In 2021, we set a new workplace accident reduction target, specifically to bring our LTIR below 1.0 by 2025.

Before starting any activity worldwide, 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 chances of problems arising and their potential impacts. Such hazard assessments are the responsibility of our individual sites and are therefore conducted by them.

We have developed a performance indicator system based on data, such as the health-related responses from our annual anonymous Employee Engagement Survey. We use this survey to calculate our work-balance index and our healthiness index, which should reflect the general state of health of our workforce worldwide and their ability to manage the demands of their professional and personal lives. These indices allow us to assess the data at team level (groups of at least ten), a minimum threshold that enables us to protect people's anonymity. In 2021, we introduced an overarching health question to the survey to document and track our company's health culture and its development in the coming years.

Roles and responsibilities

Our Environment, Health and Safety (EHS) management system is the responsibility of Corporate Sustainability, Quality, and Trade Compliance, which reports to the Chair of the Executive Board. This Group function sets objectives, globally oversees the respective initiatives, and conducts internal EHS audits, while local EHS managers and their teams see to it 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 worried about their health or safety are permitted to temporarily step back from their work until the issue has been resolved. Across the Group, they are encouraged to report such concerns via our **compliance hotline**.

Our commitment: Policies and company agreements

Defining our principles and strategies for Environment, Health and Safety (EHS), our Corporate **EHS Policy** is an integral part of our EHS management system, which 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 46 sites at the end of 2021.

Our Group Health Policy details our approach to ensuring workplace safety for our employees while also promoting their health and well-being. This document sets out our Group-wide approach to health and safety management, which is aimed at preventing workplace accidents and occupational illnesses.

To complement this policy, our Contractor EHS Management standard helps us ensure that our contractors adhere to environment, health, and safety requirements throughout the entire process, from starting a job to completion.

Accident rates

Our employees are required to immediately report any relevant occupational accidents to Corporate Sustainability, Quality and Trade Compliance, where the incidents are assessed. If necessary, we then implement additional safety measures at our sites. This procedure is an integral practice across all of our production facilities around the world.

We track 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 2021, our LTIR was 1.2, an improvement over 2020 (1.3). 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. In 2021, we once more recorded no fatal accidents.
- We use our Environment, Health and Safety Incident Rate (EHS IR) to **track accidents**.
- Alongside this indicator, we also use the Occupational Illness Rate in the United States to monitor work-related illnesses and their long-term effects.

Work-related accidents[1]

	2018	2019	2020	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Lost Time Injury Rate (LTIR = workplace accidents resulting in missed days of work per one million hours worked)	**1.2**	**1.6**	**1.3**	**1.2**	**2.5**
by region					
Europe	1.8	2.6	2.4	2.1	2.5
North America	1.1	1.0	0.8[2]	1.2	not applicable
Asia-Pacific (APAC)	0.3	0.2	0.1	0.1	not applicable
Latin America	1.5	1.7	0.8[2]	0.4	not applicable
Middle East and Africa (MEA)	0.7	0.0	0.4	0.0	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

[2] Figure retroactively adjusted

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 new EHS managers must complete a three-day EHS onboarding that covers topics such as occupational health and safety as well as our BeSafe! safety culture program. Through this initiative, we raise employee awareness of workplace dangers and teach them rules for safe behavior. Despite the ongoing pandemic, in 2021 we managed to integrate four legacy Versum sites into BeSafe! and conducted the training online. In addition, we regularly provide occupational safety training at our sites covering both legal requirements as well as the specific local risks.

Social matters and respect for human rights

Responsible supply chain

One of the goals of our supplier management endeavors is compliance with fundamental environmental and social standards, in addition to high-quality, reliable delivery and competitive prices. We have introduced relevant strategies, processes and guidelines that we are continuously improving in order to prevent violations of supply chain standards and improve our sustainability performance. We ensure that all legal requirements are taken into account and that corresponding measures are initiated where necessary. For this purpose, we set up an internal working group in 2021 tasked with ensuring that we are compliant with the **German Supply Chain Due Diligence Act**.

To achieve our corporate sustainability goals, our Group Procurement team works closely with our suppliers. We aim to create transparency in all our sourcing regions and fully integrate sustainability into all our value chains.

Therefore, we have set two new key indicators that will measure our journey towards increasing this transparency by evaluating the sustainability performance of our relevant suppliers with 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. Relevant suppliers either indicate a specific country and industry risk or contribute to a major part (50% minimum) of our purchase volume. For the risk evaluation, we apply the risk data provided by **EcoVadis** for almost our complete purchase volume (98%). For the calculation of our purchase volume, we consider sourcing-relevant third parties (excluding expenses such as taxes and customs, as well as fees and memberships). We measure these key indicators using two equally weighted metrics: coverage in terms of purchase volume (2021: 65%), and the number of suppliers (2021: 21%).

Supplier Decarbonization Program

Our Supplier Decarbonization Program is a key element contributing to reduce our emissions in line with our decision to join the Science Based Targets initiative. Through the program, we aim to reduce greenhouse gas emissions associated with purchased goods and services as well as capital goods.

Risk management process

To ensure supply security, we select our suppliers based on various criteria, such as country risk, material and supplier risk, and their strategic importance to the business. This helps our sourcing managers to identify potential mitigation actions with relevant suppliers and support them in making improvements.

The approach towards our strategic suppliers, which account for approximately 53% of our total spending, includes the identification, monitoring and assessment of supply security risks. It comprises four main elements:

- Supplier Risk Assessments: to capture the overarching risks at supplier legal entity level, including multiple risk domains.
- Alert system: to notify our Procurement Organization in the event of a risk or production issue arising with any of our suppliers.
- Material Risk Assessments: to determine the risks of relevant materials used in our most significant finished products.
- Risk Response Tracker: to create and monitor risk mitigation activities.

We calculate risk factors for suppliers and raw materials by multiplying risk probability and risk impact. For the supplier evaluation, we consider 29 risk titles, including, but not limited to economic freedom, social unrest, unfair business practices, and poor labor practices. We have also included criteria for identifying supplier relationships impacted by key sustainability risks, such as mineral sourcing or animal welfare. In 2021, we further developed our supplier risk assessment, focusing on the more relevant risk titles and thus sharpening our approach.

Due diligence process for responsible sourcing of minerals

Our company sources and sells products that contain minerals commonly summarized under the term "3TG" (tin, tungsten, tantalum, and gold – collectively also known as conflict minerals). Our overall aim is to source materials in a responsible and conflict-free manner and not to contribute to adverse impacts through our sourcing activities. Therefore, we developed a comprehensive due diligence program and respective practices to address minerals originating from conflict-affected and high-risk areas (CAHRAs). Our program framework is in alignment with applicable laws and international standards.

Our **Responsible Minerals Sourcing Charter** forms the basis of our due diligence program. We are continuously working to improve our due diligence practices and ensure conflict-free sourcing of 3TG.

We are a member of the Responsible Minerals Initiative (**RMI**). RMI provides us with tools and resources to make sourcing decisions that improve regulatory compliance and support responsible sourcing of minerals from CAHRAs. RMI uses third-party auditors to audit smelters and refiners and to investigate working conditions as well as environmental, health and safety issues. In the event that sufficient RMI-based information is not obtained, we conduct further research to determine whether an appropriate level of due diligence is ensured.

Roles and responsibilities

Group Procurement is responsible for integrating sustainability requirements into the relevant stages of our sourcing and supplier management processes. Our Center of Excellence for Supply Security 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**. These are defined in our **Responsible Sourcing Principles**. We expect our suppliers to ensure that their subcontractors respect the same rules.

Our **Responsible Minerals Sourcing Charter** demonstrates our commitment to responsible sourcing of minerals from CAHRAs. It applies to all our legal entities and subsidiaries worldwide, all our employees as well as any third party acting on our behalf. The charter complements the requirements set out in our **Responsible Sourcing Principles**.

Moreover, we support the Compliance Initiative of the German Association for Supply Chain Management, Procurement and Logistics (**BME**) and have endorsed the BME Code of Conduct.

To ensure that we work based on industry standards and can rely on comparable data analytics and expert analysis, we collaborate with our peer companies in industry initiatives. We are member of both Together for Sustainability (**TfS**) and the Pharma Supply Chain Initiative (**PSCI**).

We invite our suppliers to let us or trusted partners conduct assessments or audits to increase our supply chain transparency and identify fields of activity in order 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 160 countries and 200 sectors across the four categories of Environment, Labor and Human Rights, Ethics, and Sustainable Procurement. The results are shared among TfS member companies in compliance with all restrictions stipulated by antitrust law.

Through the TfS initiative, we have access to more than 1,460 valid scorecards on the assessment of our suppliers, 882 of which completed a new assessment or re-assessment in 2021. In some cases, these were initiated by us and in other cases by other TfS members.

Our approach to responsibility in the 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 in plastics. We procure the majority of our mica from the Indian states of Jharkhand and Bihar. By procuring mica from these areas, where political instability, poverty, and child labor are widespread, we are supporting this region by safeguarding local employment and livelihoods. We source the raw material only from suppliers acting in formal working environments and monitor compliance with our standards, including the prohibition of child labor.

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 **Responsible Sourcing Principles**. 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, our company would terminate the business relationship immediately. We drive initiatives and take measures to improve the conditions of mica sourcing based on our high standards. 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 Group employees, regular inspections are conducted by third parties, who conduct comprehensive announced audits as well as frequent, unannounced verification visits.

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. Our employees in Kolkata (India) and Darmstadt (Germany) take action to address any issues identified. 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 inspections to review labor standards throughout our supply chain. During these visits, IGEP officials monitor occupational safety as well as compliance with laws preventing child labor. In 2021, its inspections focused on medical check-ups for workers as well as the implementation of health and risk assessment concepts and safety training. In addition, IGEP has revised and improved the escalation process: Biweekly review meetings are now held with Group representatives to assess suppliers. These meetings help identify any required actions, which our sourcing teams then discuss and implement with our suppliers. Our suppliers have successfully improved the working conditions on the 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 and to monitor their productivity. Based on written records of the daily extraction quantities, we review the volumes of mica reported and supplied to the processing facilities.

Our processes undergo constant review and improvement. We are also evaluating other sources for mica in accordance with our quality, social and environmental standards both in India and in other regions. In 2021, we obtained a considerable amount of our mica from Brazil, where we have also established oversight mechanisms to monitor and audit adherence to these standards. In addition, we manufacture effect pigments based on synthetic substrates as an alternative to pigments based on natural mica.

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, 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 – for example, the German Supply Chain Due Diligence Act and 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 Group Corporate Sustainability unit is responsible for coordinating all human rights due diligence activities. The persons responsible for these issues in the respective Group functions, business sectors and local units implement the specific measures, for instance by integrating human rights due diligence into existing processes.

Our commitment: Guiding principles, charters and laws

Our **Human Rights Charter** aligns with the **UN Guiding Principles on 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 business partners to comply with this charter.

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.

Furthermore, we also 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**.

We also meet our human rights due diligence obligations when deploying new technologies. In 2021, we adopted the **Code of Digital Ethics**. This defines digital ethics principles and forms the basis for the work of the Digital Ethics Advisory Panel. More information can be found under **Digital ethics**.

In the reporting period, we analyzed our activities designed to implement human rights due diligence in order to identify potential for improvement. We took both stakeholder and regulatory requirements into

consideration. The analysis showed that we need a uniform, Group-wide process in order to better evaluate the effectiveness of our human rights due diligence. Above and beyond this, we want to further strengthen the human rights working group, for instance by involving our business sectors more intensively.

Auditing our suppliers and sites

We use internal audits to check whether the workplace requirements of our Human Rights Charter are being observed at our sites. More information on internal audits can be found under **Compliance management**.

In addition, we review human rights aspects at our sites through site security risk assessments. In 2021, we formalized the assessments as security audits, which will be implemented at regular intervals in line with the audit plan in the future. The audits are one control mechanism of our security governance framework.

Increased risk transparency and centralized corrective and preventive actions tracking allows us to ensure that out sites meet security-relevant human rights aspects.

Through the Together for Sustainability (**TfS**) initiative, we determine whether our strategic suppliers comply with human rights standards.

Creating awareness among our employees

To train our Managing Directors and senior leaders reporting directly to the Executive Board, we offer an e-learning course on the requirements of our Human Rights Charter and our Social and Labor Standards Policy and the implementation thereof in their areas of responsibility. In addition, the onboarding course for all new EHS managers covers the topics of human rights and modern slavery. In addition, during the reporting period the regional Security Academy meetings elaborated on current developments in the areas of human rights and modern slavery. The Security Academy is a training platform for our local, national and regional Security functions. It addresses security-relevant topics and is coordinated by our Corporate Security Group function.

Our reporting practices

We inform the public about our approaches, measures and results of human rights due diligence. We provide information on this annually in our Sustainability Report. Additionally, legislation in Australia and the United Kingdom requires us to publish the steps we are taking to counter forced labor and human trafficking. Apart from the **UK Modern Slavery Statement** we also published our first **Australia Modern Slavery Statement** in 2021. Both have been signed by our Executive Board Chair.

Our complaint mechanism

Our compliance hotline is the most important channel for reporting complaints about potential human rights violations. Our employees as well as external stakeholders can report suspected cases in their respective national language, free of charge and anonymously to our Group-wide whistleblowing system, either by telephone or a web-based application through our compliance hotline. We thoroughly investigate all complaints that we receive and take countermeasures if necessary. In 2021, we noted no violations, either with respect to child or forced labor or with respect to the right to collective bargaining or freedom of association. More information on the compliance hotline can be found under **Compliance management**.

Human rights violations[1]

	2018[2]	2019[2]	2020	**2021**
Number of reported violations of Social and Labor Standards Policy	-	-	108	121
Number of confirmed Violations of Social and Labor Standards Policy	-	-	29	41
thereof: number of incidents of discrimination	-	-	2	6

[1] In 2020, we modified our reporting structure for human rights violations. Previously, we reported on such violations in the "Reported compliance violations" table. Since 2020, we report on violations of our Social and Labor Standards Policy, which was drafted and rolled out across the entire Group in 2019.

[2] Due to our revised reporting practices, we have decided not to report the data from previous years.

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 medical product's benefit-risk profile. If we consider the medical product's benefit-risk profile to be positive, we then submit an application for marketing authorization to the relevant regulatory authorities.

Continual monitoring

Once we launch a new medicinal product, the number of patients being treated with it 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 and manage the benefit-risk profiles after its market release. Pharmacovigilance includes the process of monitoring a medical product on an ongoing basis to detect and assess safety signals as part of signal management activities. Continuous monitoring of adverse effects allows us to proactively and transparently minimize and communicate any risks. In addition, we always provide healthcare professionals and patients with the latest information on the safety of all our marketed medicinal products. The scope of continuous safety monitoring includes the entire life cycle of a product, ranging from development, market launch, and commercialization to expiration of the marketing authorization.

Roles and responsibilities

Our Global Patient Safety unit is responsible for pharmacovigilance. 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 experts help to ensure all information on the risks and adverse effects of our medical products is 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.

In order to implement our R&D Strategy 2023, our Global Patient Safety unit is on a journey of transformation. Our vision is to embed a deep knowledge of safety into early decision-making as we evolve to practice predictive safety. In 2021 we continued to refine our approach to benefit-risk assessments. For example, we applied a scoring system based on safety aspects and used it to determine the prioritization levels of our products. We also redesigned our pharmacovigilance processes using a business process management model that ensures cross-functional alignment between our corporate functions. We expect to complete the implementation of these processes in 2022.

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

Our Medical Safety and Ethics Board

Our Medical Safety and Ethics Board (MSEB) oversees the safety and benefit-risk assessments of our medicinal products throughout their clinical development and commercialization. It endorses appropriate measures to minimize risks, such as updates to product information. This 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 reviews human-related ethical matters as appropriate.

Our commitment: Guidelines and statutory requirements

We follow international guidance and standard procedures, such as the International Council for Harmonisation (**ICH**) guidelines and the Good Pharmacovigilance Practices (GVP) established by the European Medicines Agency (**EMA**) and national health authorities. In addition, we comply with all new statutory pharmacovigilance regulations in the countries where we market our products.

Monitoring drug safety

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 2021, we had eight pharmacovigilance inspections.

Furthermore, we perform audits to ensure that all our units and subsidiaries involved in pharmacovigilance consistently meet all global requirements. In 2021, we conducted a total of 18 pharmacovigilance audits and found no significant deviations in our pharmacovigilance systems from these requirements and standards. We also audit our vendors and licensing partners involved in pharmacovigilance, which helps us improve our pharmacovigilance processes and comply with regulatory requirements.

Redefining our approach to benefit-risk assessments

We have developed an improved benefit-risk strategy to help us transform from a reactive and compliance-driven organization into a proactive and benefit-risk-focused organization. By truly understanding the benefit-risk profiles of our products, we can enable early decision-making within the organization to protect the safety of patients. Ultimately, the aim is to be able to provide the right medicine to the right patient at the right time. As part of this initiative, we have also developed the concepts and principles for conducting benefit-risk assessments at each stage of product development and post-marketing.

We have concluded the pilot phase of our new benefit-risk strategy and are now following up with incremental implementation by the end of 2022.

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 all product information documents, such as package leaflets, to ensure our medicinal products contain the latest information on safety, efficacy, and pharmaceutical formulation. In accordance with regulatory requirements, we submit all modifications to our leaflets to the respective regulatory authorities for

approval. In 2021, there were no 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 the experience and knowledge required to carry out their activities. We manage our training via a global learning platform and verify compliance with training our requirements by producing training completion reports.

All our approximately 23,000 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 products.

Product-related crime

Our company develops and manufactures pharmaceutical and chemical products of the highest quality. We take resolute action against product-related crime in order to protect our patients and customers from the harm caused by illegal products. For this purpose, we have implemented a Group-wide strategy, which focuses on identifying and responding to the availability of counterfeit medicines as well as ensuring the integrity of our products and supply chains. Moreover, we are committed to collaborating both with government authorities and with national and international organizations. Together, we want to tackle product-related crime and raise awareness of the issue among stakeholders as well as the wider public.

By the end of 2022, we will introduce a Group-wide security audit management program, which is intended to further increase transparency and the security level performance within our organization and prove our compliance with security requirements. For this purpose, we are developing key figures to support this process. These key figures will be supplemented by the existing audit management tool.

Roles and responsibilities

The Corporate Security unit coordinates our approach to tackling product-related crime on the strategic level. A cross-functional team supports the operational implementation of the strategy. The team comprises experts from various units, including Legal/Trademarks, Product Security, Export Control, Supply Chain, Patient Safety, Regulatory Affairs, and Quality Assurance. Furthermore, all our sites have product crime officers who serve as central, local points of contact and act as the interface between both local and global stakeholders, internal and external alike.

Our commitment to Group-wide policies and standards

Globally applicable regulations are a key part of our approach to effectively and efficiently tackling product-related crime. The Group-wide guideline entitled “Illicit Trade & Product Crime Prevention” describes our goals and measures for reducing product-related crime and minimizing its impact. Our Group-wide Product Crime Incident Management standard sets out mandatory requirements for effectively managing incidents of product-related crime.

Detecting counterfeit drugs and withdrawing them from circulation

A team of experts examines, evaluates, and processes every notification we receive regarding suspected counterfeit medicines. Our response always complies with both the regulatory requirements and our own wider objectives for tackling counterfeit products. We pro-actively conduct investigations both online and offline in order to identify and disrupt the availability of illicit products in legitimate and illegitimate channels. We document all incidents using a central, Group-wide reporting system. Moreover, we support the prosecution of criminals by working closely with the authorities. As a member of the Pharmaceutical Security Institute (**PSI**), we routinely share intelligence about product crime with other pharmaceutical companies.

Tracking system for chemical substances

We monitor chemicals that could be misused to produce illegal weapons, explosives, or narcotics, tracking through an internal system that flags suspicious orders or orders of sensitive products. These are released only once we have confirmed the existence of a verified end-user declaration.

In addition to fulfilling the duties defined in the statutory provisions on export control, we also report suspicious orders and inquiries to the competent authorities. Through these efforts, we are honoring a voluntary commitment of the German Chemical Industry Association (VCI) and meeting the terms of the Guideline for Operators published by the European Commission. In 2021, we reported 745 orders placed for relevant substances. In addition, we helped to resolve six inquiries from authorities regarding specific suspected cases. We evaluate the effectiveness of our measures for avoiding product misuse based on, among other things, the number of incidents suggested to us by the authorities and solved.

Raising awareness of product-related crime

We aim to continuously raise awareness of product-related crime among our business partners and employees, educating and training our people Group-wide on the subject to strengthen their competencies. All staff involved in security, such as product crime officers, participate in appropriate training programs. We are continuously evolving these programs and adapting them to new trends.

Prices of medicines

To help ensure that all patients have access to the most effective medicines for their needs, we are working to prevent cost from becoming a barrier to treatment. Therefore, we adapt our medicine prices according to people's ability to pay in different geographical or socioeconomic segments.

We are committed to fair, flexible and sustainable pricing – both within and across countries. We therefore adapt our prices based on local market considerations, such as unmet medical and treatment needs, health system capacity, infrastructure, and education standards. 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 price analyses annually to validate price thresholds and provide guidance on local pricing to our subsidiaries for the following year to ensure they meet patient access needs, taking a consistent, data-driven approach. We also make our products affordable to patients in low- and middle-income countries with an equitable value and access strategy that includes participating in government tenders, providing flexible pricing, establishing high-quality affordable brands or branded generics, and operating patient access programs.

Furthermore, we support innovative risk-sharing agreements and are working to improve data efficiency in health systems in order to achieve an optimal distribution of funds and resources.

Roles and responsibilities

Our Global Market Access and Pricing unit evaluates market launch prices in coordination with the respective franchises. The team reports directly to a member of our Healthcare Executive Committee. The GMAP unit systematically evaluates and applies our medicines portfolios for equal access initiatives. 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 **Access to Health Charter** 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 fully comply with all 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 addition, we aim to pilot outcome-based contracting models in one or two markets for our fertility product portfolio by the end of 2022.

Equitable value and access approaches to serve low- and-middle-income patients

We work in close partnership with governments and other stakeholders on innovative, differential medicine pricing schemes. We developed an equitable and value access strategy and by 2023, want to test it with pilot programs for two products of our innovative product portfolio in at least two low- and middle-income countries. In addition, we supply products at affordable prices to certain countries in Africa, Asia, Latin America, and the Middle East.

Our Biopharma tender excellence initiative offers a strategic tender framework. This includes a web-based system that helps country teams increase quality and agility in tender decisions, while improving performance tracking and collaboration.

For some of our existing high-quality products, we have created second brands at affordable prices, particularly in countries with a large percentage of patients with very low incomes.

We operate patient access programs that enable us to offer certain products at affordable prices in several countries.

Clinical studies

We conduct high-caliber clinical research that always complies with applicable laws and regulations. When performing clinical studies, we adhere to the highest ethical and scientific standards worldwide.

We only conduct clinical studies to investigate issues that are relevant to patients, healthcare professionals, or society, and only when the medicines being tested show significant therapeutic promise and have a positive benefit-risk ratio. In addition, a sound, established scientific methodology must be available to investigate these scientific or medical questions. We only enroll the specific number of participants required to answer each of these 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 subjects to undue risk or irreversible harm. Personal data privacy is also very important to us, and we maintain a strong focus on data protection and confidentiality in compliance with statutory regulations.

We assure that no subject enrolling in a clinical study is discriminated against on the basis of ethnic origin, gender or socio-economic status.

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. We are also working to further develop the way in which our research work is communicated and how it can improve the healthcare people receive. At every level of our organization, we are additionally educating staff about the value of closer, more consistent patient interaction and the requirements to protect our patients' independence and privacy.

Clinical studies in low- and middle-income countries

We conduct all our clinical studies in accordance with local laws and regulations, and we adhere to all relevant international scientific and ethical standards, irrespective of the region or country.

Roles and responsibilities

Clinical drug development, including clinical studies and the related governance process, are the responsibility of the Global Development unit. The Head of Global 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 Development Studies Committee is responsible for the studies performed by the company on medicines that are under clinical development, while the Global Medical Decision Board is responsible for our own studies with approved medicines, 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 drug 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 oversees the safety of subjects participating in our clinical studies and, as necessary, reviews the benefit-risk profiles of investigational drugs.

Our commitment: International guidelines and requirements

Our Human Subjects Research and Development Policy provides the framework for conducting clinical studies and helps ensure that we adhere to all applicable legal, ethical and scientific standards. In addition to the relevant national laws and regulations, these standards 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
- The **Belmont Report** by the **U.S. Office for Human Research Protections**
- 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**), the Japan Pharmaceutical Manufacturers Association (**JPMA**), 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 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 (for example, at vendors' sites and investigational sites). We respond immediately to observations 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.

Due to the Covid-19 pandemic, we postponed some audits from 2020 to 2021. However, for all audit types we successfully implemented a remote audit approach. As a result, we were able to largely implement the audit plan for 2021, shifting only a small number of audits to 2022.

Conducting clinical studies responsibly

Every clinical study follows defined procedures to ensure it is conducted to the highest 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. In 2021, regulatory authority inspections did not unveil significant issues which had any impact on patient rights, patient safety, or the data integrity of a study.

Disclosure of clinical studies and publication of results

We are obligated to disclose findings from our clinical studies. We do this publicly in a complete, accurate, balanced, transparent, and timely manner as laid out in our Clinical Trial Disclosure Policy. We publish results from our clinical studies in medical journals in line with applicable laws and industry codes. In this way, we adhere in particular to the current version of the Good Publication Practice (GPP3) and follow the recommendations of the International Committee of Medical Journal Editors (**ICMJE**). Our **Standard on Clinical Trial Data Transparency** underscores our strong commitment in this matter.

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 medicines. 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 medicines 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 this research in an ethical manner. We develop frameworks that guide us in making informed decisions to meet the most rigorous ethical standards. Patient benefit and well-being is always our top priority, whether in clinical studies, treatment with our medicines, or the distribution of our products to academic researchers and the biopharmaceutical industry. We carefully evaluate our position when it comes to controversial topics.

Roles and responsibilities

For around ten years, the Bioethics Advisory Panel of Merck KGaA, Darmstadt, Germany (MBAP), appointed by the Executive Board, provided guidance on bioethical questions. To tackle a broader array of topics going forward, in May 2021 we transformed this body into the Ethics Advisory Panel for Science and Technology of Merck KGaA, Darmstadt, Germany (MEAP). The new committee provides clear recommendations on science and technology topics and issues that go beyond pure bioethics. Co-chaired by two of our leading scientific experts, the MEAP provides recommendations that steer our actions and business activities. In addition to renowned international specialists from the fields of bioethics, theology, law, and science, the panel also features technology and sustainability experts.

The MEAP meets multiple times a year and can also be convened on an ad-hoc basis in response to emerging urgent ethical issues. The meeting minutes can be accessed on our intranet, along with the guidance resulting from each meeting. Our employees can submit topics for the MEAP to discuss and can furthermore report ethical concerns through our compliance hotline or by reaching out to our Bioethics team.

Our dedicated committees on genome editing and stem cell research operate under the overarching MEAP. Using our internal guidelines as a basis, they make recommendations on issues relating to specific topics. Our Stem Cell Research Oversight Committee (SCROC) verifies all internal research proposals that employ human stem cells, ensuring compliance with legal requirements as well as our ethical guidelines. This also includes joint projects with external partners.

Our commitment to policies and standards

Our **Genome Editing Principle** provides a mandatory ethical and operational framework for our employees. It is complemented by additional guidelines that shape our approach to ethically conducted research and business. Our **Stem Cell Principle** sets the ethical boundaries for the use of human stem cells in our research. Our **Fertility Principle** guides our research in fertility treatment and in-vitro-fertilization.

Use of genome-editing technologies

CRISPR/Cas9 opens up new possibilities in genetic engineering research that could bring about major advances in the treatment of serious diseases or in “green genetic engineering”, which is the use of genome editing techniques in plant cultivation. Laws in different countries allow for a varying degree of latitude in applying this technique. Bioethical views 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, the Group does not support the use of genome editing in human embryos or clinical applications of germline interventions in humans. We recognize that there may be value in responsibly conducted research in this area.”

Stem cell research

At the present time, 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 only allow the use of human embryonic stem cells if clearly defined conditions have been met. For instance, we only utilize stem cells for research purposes if our Stem Cell Research Oversight Committee (SCROC) has reviewed the respective project and given approval. 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. At its October 2021 meeting, the SCROC revised our Stem Cell Principle to align it with the new guidelines published by the International Society for Stem Cell Research (ISSCR) in 2021.

Digital ethics

Having made it our mission to develop new digital technologies responsibly, we identify any ethical issues that may arise from either using this technology or from applying algorithm-driven and data-based business models at an early stage.

Established in 2021, the new Digital Ethics Advisory Panel of Merck KGaA, Darmstadt, Germany (DEAP) focuses on complex ethical issues surrounding digital technologies. Ensuring that our digital business model follows a holistic, ethical approach, its efforts complement the work of our Ethics Advisory Panel for Science and Technology (MEAP). Launched in 2010, the MEAP provides guidance on ethical issues pertaining to our business activities and research.

Roles and responsibilities

The DEAP deals with all ethical issues arising from our digital businesses, especially digital health. It plays a pivotal role in ensuring that we develop digital innovations responsibly and address potential digital ethics questions that could result from the use of these digital technologies. Making recommendations on our actions as a company, the panel consists of external United States' and European science and industry experts from the following fields: digital ethics, law, Big Data technologies, digital health, medicine, and data governance. Furthermore, if necessary, we draw on bioethics experts as well as representatives from patient organizations. As with the MEAP, the DEAP is appointed by the Executive Board. All employees may submit topics for the panel to discuss. The minutes from DEAP meetings as well as their recommendations will be accessible on our intranet. The panel held four meetings in 2021. One DEAP session focused on our company's role and responsibility in terms of how (patient) data is collected and handled by customers who utilize our digital products and services.

What we are committed to: Policies and standards

We aim to position ourselves as the "digital ethics company", meeting rigorous ethical standards in critical areas such as health data handling.

In 2021, we worked with the DEAP and other partners from academia and science to draft our Code of Digital Ethics (**CoDE**), a document that governs our approach to the ethical management of data and algorithms. The CoDE serves as a guideline for our digital business models, a tool for analyzing ethical challenges, and a basis for practical DEAP guidance. In March 2021, the Executive Board decided to classify the CoDE as a charter; this is our company's highest category for quality control documents and one that also includes our Code of Conduct and our company values. As such, the CoDE applies to all employees, is publicly accessible, and will become part of the employee training curricula.

Data protection and privacy

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 to train our employees to handle data responsibly and with clear accountability. It safeguards our company by providing data privacy risk assurance and compliance with relevant data privacy laws globally. Group Data Privacy also contributes to creating value for the development of digital business models.

Roles and responsibilities

Group Data Privacy is part of our global Group Compliance and Data Privacy function. In addition, 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 act independently. As part of our compliance reporting, Group Data Privacy regularly prepares data privacy updates as well as a comprehensive data privacy report. This report is part of the compliance report submitted to the Executive Board and the Supervisory Board.

Our Data Privacy Management System

Our goal is to establish a global and consistent Data Privacy Management System (DPMS) by the end of 2022. It will be based on the following three pillars: Data Privacy portfolio, people, and communication. The Data Privacy portfolio consists of eight key elements, covering all parts of a functioning DPMS, in line with legal requirements and industry standards. In 2021, we rolled out the revised Data Privacy Policy and Data Breach Standard and updated the e-learning environment amongst other deliverables.

Ensuring IT security

It is vital for our businesses that we protect our information systems, their contents, and our communication channels against criminal or unwanted activities of any kind, such as e-crime and cyberattacks, including unauthorized access, information leakage, and misuse of data or systems. Our Group Security and IT Security units maintain organizational, process-related and technical information security countermeasures based on recognized international standards. We employ harmonized electronic and physical security controls (e.g. access control, security monitoring) to bolster our ability to handle sensitive data, such as trade secrets.

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 also take steps to meet local data privacy requirements, where these are stricter than our Group-wide standards.

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. We launched a content update to this training course in May 2021.

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 2021, we began implementing a new, enhanced tool, which is expected to go live in 2022.

We registered no sanctioned complaints or incidents concerning breaches of customer privacy, data leaks, theft, or loss of customer data in 2021. In three cases, minor personal data breaches were reported to the supervisory authority. These were not sanctioned.

Data Privacy

	2018	2019[1]	2020	**2021 Group**	**2021 thereof: Merck KGaA, Darmstadt, Germany**
Reported violations of Data Privacy Guidelines	1	1	3	3	1
Customer Privacy[2]					
Total number of substantiated complaints received from outside parties	0	0	0	0	0
Total number of complaints from regulatory bodies	0	1	0	0	0
Total number of identified leaks, thefts, or losses of customer data	1	1	0	0	0

[1] Since 2019, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

[2] 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 policies on the following core topics: anti-corruption and anti-bribery (including healthcare compliance, third-party due diligence, transparency reporting), anti-money laundering, antitrust, conflict of interest, and dawn raid preparedness.

To cover these compliance topics, we have Group-wide policies and procedures in place that ensure our business activities align 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 (see the “Our commitment: guidelines and standards” section for more details)
- 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; performing internal and external reporting
- Case Management: Timely response to reports of misconduct and implementation of corrective actions
- Continuous Improvement: Based on and applying to all compliance program elements

Our Group 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 Group Compliance Officer oversees approximately 94 Compliance Officers and Compliance experts around the world. The Compliance Officers implement our compliance program within their respective areas of responsibility (adapting to local legislation, if legally required) 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 contains Group-wide policies and procedures for entrepreneurial conduct. The following are mandatory for all our employees:

- **Code of Conduct of Merck KGaA, Darmstadt, Germany**
- **Human Rights Charter**
- Anti-Corruption Policy
- Money Laundering Prevention Policy
- Conflict of Interest Policy
- Antitrust and Competition Law Policy
- Compliance Reporting and Investigation Policy
- Dawn Raid Policy
- Healthcare Ethical Guiding Principles
- Pharma Code
- Standard on Local Compliance Standards

Risk assessment

Proper compliance risk management is crucial in order to identify undetected risks and keep our company protected. In 2021, we launched a global, redesigned risk identification process for all our business sectors. The new process enables objectivity and a more data-driven risk approach. We established a comprehensive risk matrix that focuses on bribery and corruption risks, which are illustrated through in-depth risk categorization and risk scenarios. The matrix consists of a questionnaire to detect the risk exposure level of the business sectors and another mitigation questionnaire that checks the implementation of the compliance program. These risk questionnaires are primarily answered by the business heads.

We are implementing the risk identification process in a staggered, top-down approach. We started the risk assessment with global functions in 2021. In a second step, we will conduct country-specific assessments in 2022.

Conflicts of interest

We take all potential conflicts of interest seriously. Employees must avoid situations where their professional judgment may come into conflict with their personal interests. They must also disclose every potential conflict of interest to their manager and document the disclosure. Such issues are typically resolved directly between the employee and the manager but can also be routed to Human Resources, Legal, Compliance, or other relevant functions.

In 2021, we further raised employees' awareness of conflicts of interest by establishing a dedicated global interactive training program and enhancing our communication. In addition, as described under "**Avoidance of conflicts of interest**", Executive Board and Supervisory Board members are exclusively committed to the interests of the company and neither pursue personal interests nor grant unjustified advantages to third parties.

Management and requirements of our business partners

Our global Third Partner Risk Management process governs interactions with sales partners, such as agents, distributors, and dealers. We expect our business partners worldwide to adhere to our compliance principles. We collaborate only with partners 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 selecting business partners. The greater the estimated risk regarding a certain country, region, or type of service, the more in-depth we examine the company before entering into a business relationship. We also explore background information from various databases and information reported by our business partners.

If we encounter compliance concerns, we further analyze and verify the relevant information. Based on the outcome, we decide whether to reject the potential business partner, impose conditions to mitigate identified risks, or terminate the existing relationship.

Until the end of 2023, we plan that all subsidiaries of our company will have a Third Partner Risk Management process and tool that follows a risk-based approach to conduct business only with legally compliant third parties. To enable stepwise implementation, we already launched this new process and tool in selected pilot countries in 2021..

Compliance training

We provide regular compliance classroom and online training courses on our Code of Conduct, anti-corruption, antitrust, data privacy, money laundering prevention, 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 2021, we launched two new versions of our antitrust e-learning training courses: a fundamental and an advanced course. Both courses are available in ten languages. 12,560 employees completed the fundamental training. In addition to the fundamental training, 6,057 employees with potentially higher risk exposure took the advanced training course. The mandatory training courses must be completed by all relevant employees.

We regularly update our training plan and adapt it to new developments to continuously educate our employees on existing and new compliance requirements, guidelines, and projects.

Anti-money laundering

We have implemented a global Anti-Money Laundering (AML) program consisting of a global policy, training, and a dedicated process to report and investigate red flags as well as any high-risk transactions and to report suspicious transactions to the German Financial Intelligence Unit.

It is our aim to continuously improve our AML program. In 2021, we conducted a worldwide risk analysis to identify jurisdictions that impose the strictest AML legal and regulatory framework applicable to our businesses, so that we can improve our AML program accordingly. Based on this analysis, we initiated in-depth AML risk assessments for high-risk jurisdictions, where we can implement a stricter AML program, if required.

Reporting potential compliance violations

We encourage all employees worldwide to report potential compliance violations to their supervisors, Legal, HR or other relevant departments. Globally, they can also use our central whistleblowing compliance hotline free of charge and anonymously to report violations in their local language by telephone or via a web-based application. Reports of potential compliance violations that we receive via our compliance hotline are reviewed by the Compliance Investigations and Case Management team. Cases with a certain risk profile are presented

to the Compliance Case Committee, which comprises senior representatives from our Compliance, Corporate Security, Data Privacy, Human Resources, Internal Auditing, and Legal departments.

The Committee's duties include assessing and classifying ethical issues, investigating their background and addressing these issues using appropriate measures. Based on the investigation outcome and recommendations from the compliance investigation team or the Compliance Case Committee, appropriate disciplinary action may be taken against employees who have committed a compliance violation. If, during the investigation, a root cause is identified that could lead to further compliance violations, we take preventive and corrective actions.

The compliance hotline is also available to external stakeholders. The relevant information can be found in the Compliance and Ethics section of our **website**.

Both the number of suspected compliance violations reported and the number of actual compliance cases were stable compared with the previous year. In 2021, we received 79 compliance-related reports via the compliance hotline and other channels that led to investigations. There were 42 confirmed cases of violations of the Code of Conduct or other internal and external rules.

Reported compliance violations

	2018	2019	2020	2021 Group	2021 thereof: Merck KGaA, Darmstadt, Germany
Total number of reported compliance violations					
Number of reported compliance incidents	72	75	81	79	6
Number of confirmed cases	19	30	41	42	3
Confirmed cases by category					
Bribery and corruption	3	9	6	1	0
Violation of cartel laws and fair competition rules	1	0	0	0	0
Fraudulent actions against the Group	5	8	11	6	0
Other violations of the Group Compliance Principles for the relations with business partners	1	4	0	0	0
Other violations of Group values, internal guidelines or legal requirements	9	9	24	35	3

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 unit also checks for violations of our Code of Conduct and our Anti-Corruption Policy. Moreover, they request and check a self-assessment of the workplace requirements set out in our Human Rights Charter.

Our audit planning aims to provide comprehensive risk assurance through the best possible audit coverage of our processes. 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 2021, Group Internal Auditing conducted 84 internal audits that

included bribery and corruption-related risks, thereof 55 operational, 28 IT and one special audits (for example, incident-specific internal investigations).

Interactions with health systems

The well-being of patients is our primary consideration when promoting pharmaceutical products. We support health systems by providing information to our healthcare stakeholders, such as professional medical associations, patient advocacy groups, university clinics, and other healthcare providing institutions. 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 comply with these obligations.

Direct-to-consumer advertising only in certain countries

Direct-to-consumer (DTC) advertising for prescription medicines is permitted in some countries, such as the United States. 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 engagements with healthcare stakeholders, we have established internal policies and review processes and tools, such as record-keeping systems, 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. 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 comply with the codes of conduct of various international and local 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
- 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

In 2021, we continued to publish financial and non-financial contributions that we made 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 and their addresses as well as the purpose and amount of the transfer, as required by the applicable laws and codes. Before publishing, we secured all necessary informed consent forms, as required by the applicable data privacy regulations.

Regular employee training

In 2021, we continued with the international roll-out of our Code of Conduct-related training curriculum on dealing with dilemmas in healthcare-specific situations. Employees who are responsible for the promotion of our pharmaceutical products receive regular training on current guidelines. 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 trainings on our policies and guidelines as well as important changes to the reporting requirements of transfers of value.

Other topics

Sustainable innovation and technology

The sustainable innovation that we envision or 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 long-term solutions that consider the entire value chain and evaluate each product's impact over its lifecycle.

Research and development (R&D) play an essential role in further improving our sustainability performance. They are critical elements that determine the sustainability impact of our products, from their initial conception to market launch. Our business sectors create tailored sustainability strategies to develop products that benefit patients and customers. We are also improving the way we measure our progress, which includes the introduction of sustainability criteria within our product development processes.

In 2021, we partnered with the well-established patent information platform LexisNexis® PatentSight® to assess the sustainability impact of our intellectual property. Building on this, we will start disclosing the share of newly published sustainability-related patent families as of the 2022 reporting year.

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 independent R&D units that pursue their own innovation strategies. Group Corporate Sustainability supports our business sectors and group functions to advance and integrate sustainability within our R&D and innovation processes in line with our shared goals.

Our new Group Science & Technology Office leads the implementation of our combined strategy for innovation and "data & digital", enabling innovation across our business sectors while harnessing the power of highly advanced data and digital capacities. It aims to identify and integrate transformative technology trends into our business sectors while maintaining a company-wide view of our tech roadmap and innovation portfolio. In addition, it ensures the strategic fit of our innovation fields. Fostering data & digital 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.

Lastly, we are also investing in sustainable solutions via **M Ventures**, our strategic corporate venture capital fund. It complements our Life Science, Healthcare and Electronics business sectors by focusing on investments in two areas of high strategic relevance to our company: digital technology and sustainability.

Our commitment: Aiming for circularity

Within our R&D processes, we continuously improve and integrate sustainability KPIs to measure the sustainability performance of our products and portfolio. For example, our Life Science business sector developed Design for Sustainability (DfS) as well as the DOZN™ tool to enable the creation of more sustainable products for our customers. In addition, several circular economy initiatives are underway throughout the organization, some of which are in collaboration with external partners.

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 figures and qualitative information that the Group must disclose. 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 two phases:

- For 2021, key figures will be stated only for so-called taxonomy-eligible economic activities and will be limited to those that make a significant contribution to climate change mitigation or climate change adaptation as defined by the EU Taxonomy Regulation. An economic activity is considered taxonomy-eligible provided that it is within the scope of the EU taxonomy.

- As of 2022, four further environmental objectives of the EU will be included in the disclosure obligation: 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. In addition to the degree of taxonomy eligibility, the share of taxonomy alignment of the identified economic activities will then also be disclosed. According to the EU taxonomy, an economic activity is considered taxonomy-aligned if it makes a significant contribution to at least one of the six environmental objectives while ensuring that such an activity does no significant harm to the remaining objectives or the social minimum safeguards.

For the environmental objective "pollution prevention and control," which is to be disclosed for the first time for the 2022 reporting period, the Group expects a higher share of taxonomy-eligible economic activities than for the objectives "climate change mitigation" and "adaptation to climate change" that are reported for the 2021 reporting period. This assessment is based on proposals for technical assessment criteria by the "Technical Working Group of the EU Platform on Sustainable Finance" dated August 3, 2021, which, with respect to the environmental objective "pollution prevention and control", list the production of chemicals, pharmaceutical and chemical products, and pharmaceutical preparations without further specification as taxonomy-relevant economic activities. These proposals will flow into the development of the delegated act through which the European Commission will define the technical evaluation criteria in 2022.

Approach

To ensure the timely and legally compliant fulfillment of its disclosure obligations, the Group established an interdisciplinary project team that is analyzing the existence of taxonomy-eligible activities in close coordination with the representatives of the business sectors and various Group functions. The identification of the taxonomy-eligible economic activities for the first two environmental objectives proceeded in line with a top-down approach using structured inquiries submitted to the relevant departments. The results of this analysis were confirmed by supplementary 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 three key figures net sales, capital expenditure and operating expenditure were mainly derived from existing financial reporting systems. Double counting is excluded by the very nature of the procedure.

Accounting principles

To review the taxonomy-eligibility of an economic activity, for manufacturing-related activities, the Group applies an end-product oriented approach. This means that the end product must result from one of the economic activities named in the delegated act. In the case of chemical products, the corresponding economic activities are only considered taxonomy-eligible if the end product is an organic basic chemical within the meaning of the delegated acts for the environmental objectives “climate change mitigation” and “climate change adaptation”. The manufacture and distribution of specialty chemicals, which represent the core activities of the Life Science and Electronics business sectors, are not covered by this definition.

Furthermore, the Group only takes into consideration the manufacturing activities named in the delegated act if these are linked to 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. In particular in the Life Science business sector, net sales from the sale of organic basic chemicals or plastic products are not taxonomy-eligible in the vast majority of cases due to the lack of a manufacturing process.

The economic activities specified in the delegated act are also considered taxonomy-eligible with respect to capital expenditure and operating expenditure if they are only performed for company-internal purposes and do not generate any sales with third parties. For example, this means that in the viewpoint of the Group, capital expenditure and operating expenditure incurred in conjunction with the renovation of buildings for own use are also within the scope of the EU Taxonomy Regulation. By contrast, the Group considers neither economic activities in the context of the construction of new buildings nor the acquisition and ownership of buildings to be taxonomy-eligible.

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). Within 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 assets 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. Operating expenditure relevant within the scope of reporting under the EU Taxonomy Regulation include 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.

Key figures and qualitative information

The following overview presents the share of net sales, capital expenditure and operating expenditure attributable to taxonomy-eligible economic activities in respect of the environmental objective “Climate change mitigation”.

Environmental Objective "Climate Change Mitigation"

Key Performance Indicator	Reference value in the reporting period 2021 (in € million)	Share of the taxonomy-eligible economic activities (in %)	Share of the not taxonomy-eligible economic activities (in %)
Net sales	19,687	< 1%	> 99%
CapEx	1,817	< 1%	> 99%
OpEx[1]	2,692	< 1%	> 99%

[1] The EU taxonomy only defines a certain portion of all operating expenses as a baseline for operating expenses.

The lower share of taxonomy-eligible net sales, capital expenditure and operating expenditure in connection with the environmental objective “climate change mitigation” is mainly due to the very limited conformity of the business activities of the Group with the economic activities stated in the EU Taxonomy Regulation. The low amount of net sales from taxonomy-eligible economic activities was generated in the manufacture of energy efficiency equipment for buildings. The share of taxonomy-eligible operating and capital expenditures was largely attributable to the renovation of existing buildings.

Research and development expenses accounted for € 2,408 million of the presented operating expenditure with € 1,712 million of this being attributable to the Healthcare business sector.

No additional taxonomy-eligible net sales, capital expenditure or operating expenditure were identified for the environmental objective “climate change adaptation”.

Compensation Report

This compensation report describes the structure and application of the compensation system for the Executive Board of Merck KGaA, Darmstadt, Germany, in the 2021 fiscal year. It provides a transparent overview of the relationship between compensation and performance, and presents the compensation awarded or due to the members of the Executive Board and the Supervisory Board in the 2021 fiscal year. The compensation report has been jointly prepared by the Supervisory Board and the Executive Board in accordance with the provisions of section 162 of the German Stock Corporation Act (AktG) and the recommendations of the German Corporate Governance Code in the version dated December 16, 2019. It has formally and materially been audited by KPMG AG Wirtschaftsprüfungsgesellschaft in line with the requirements of section 162 (3) AktG as part of the combined management report. The compensation report and the corresponding audit opinion as part of the audit opinion on the annual financial statements of Merck KGaA, Darmstadt, Germany, can be found on our website.

The legislation and regulations relating to the compensation report are geared toward the situation at a German stock corporation (“Aktiengesellschaft” or “AG”) and do not take into consideration the special characteristics of a corporation with general partners (“Kommanditgesellschaft auf Aktien” or “KGaA”), such as our company. Major differences between the two legal forms exist in terms of liability and management. In the case of an AG, only the AG is liable as a legal entity, whereas the general partners of a KGaA also have unlimited personal liability for the company’s obligations (section 278 (1) AktG). Unlike the management board members of an AG, the members of the Executive Board of our company are personally liable partners of both Merck KGaA, Darmstadt, Germany, and the general partner E. Merck KG, Darmstadt, Germany, and not merely employed members of a corporate board. Given the structural differences between an AG and a KGaA, several recommendations of the German Corporate Governance Code apply to a KGaA only in a modified form.

Review of the 2021 fiscal year

In fiscal year 2021, the Group demonstrated great strength in a challenging market environment. All three business sectors, Life Science, Healthcare and Electronics, reported organic sales growth. Despite challenging conditions due to the pandemic, we succeeded yet again in avoiding significant disruptions to our supply chains and operations while at the same time, the safety of our global workforce continued to be our top priority.

In the Life Science business sector, our products and services enabled our customers worldwide to excel in areas such as scientific research and biotechnological manufacturing. Our capacity was expanded in bioprocessing and targeted acquisitions were made to broaden the portfolio. In addition, the Life Science business saw strong demand in both its core business and in dealing with the Covid-19 pandemic.

In the Healthcare business sector, in addition to strengthening the business with established products, the focus was on research for and development of specialty medicines. The approval of Tepmetko® is particularly noteworthy in this regard. In addition, there was significant growth in the immuno-oncology area in connection with the drug Bavencio® and in the therapeutic areas of neurology and immunology mainly through Mavenclad®.

The Electronics sector benefited from strong customer demand especially in the semiconductor industry. In light of the strong business performance, the completion of the Bright Future transformation program, originally scheduled for five years, was achieved — two years earlier than planned. At the same time, the new "Level Up" growth program was launched. This is intended to exploit the growth opportunities associated with the significant increase in global demand for innovative semiconductor and display materials. In addition to considerable ongoing investment in research and development (R&D), the global presence of the Electronics business was further significantly expanded. It was decided to build or expand R&D and production facilities in all relevant regions including China, Korea, Taiwan, Japan, the United States and Germany close to our customers.

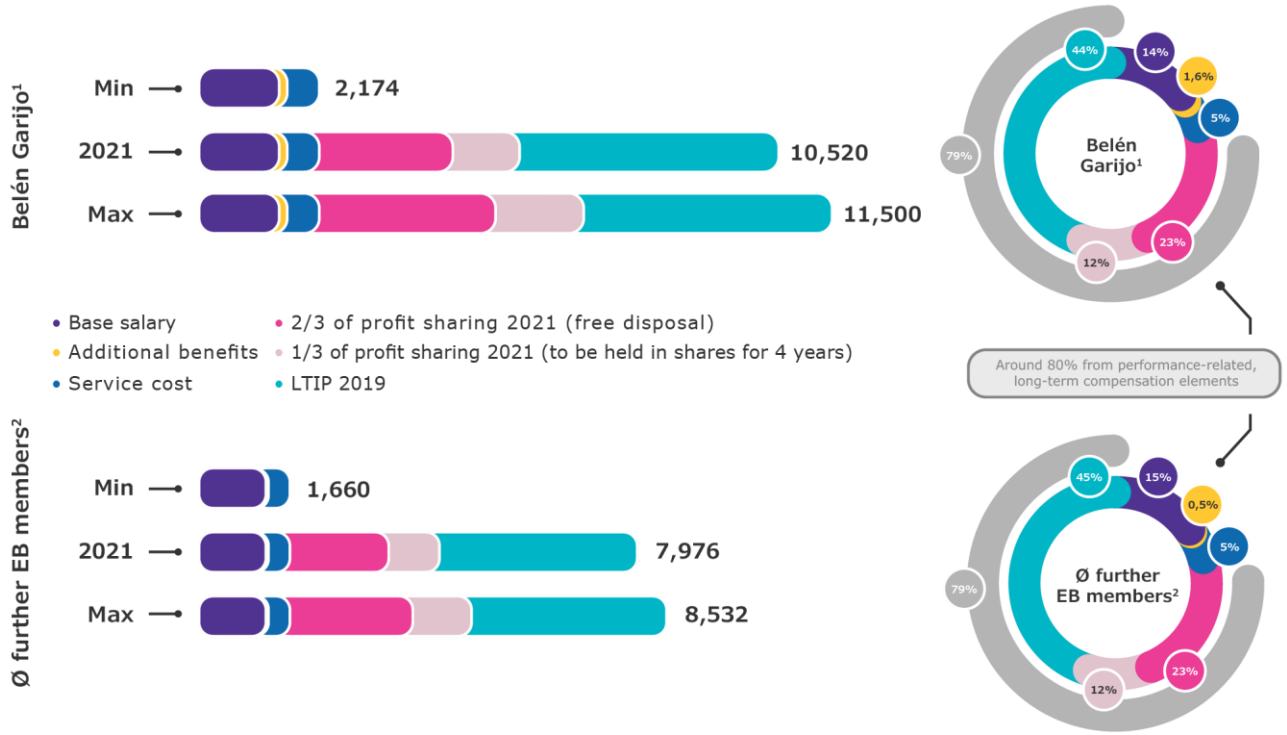
As a result, a large number of milestones were achieved across the business units in 2021. What we are doing in the area of sustainability has been intensified in all business sectors and group functions, e.g., in the R&D areas but also in the purchasing, finance and strategy units. We aim to develop products that create sustainable added value for society, for example via circular economy approaches. We also want to embed sustainability in all our value chains and have started a supplier decarbonization program in fiscal 2021. To further reduce our resource consumption, new greenhouse gas emissions and water consumption reduction targets were set in 2021, and we have applied to join the Science Based Targets Initiative. These targets underpin our ambitious sustainability strategy, which we unveiled at the end of 2020. The implementation of the sustainability strategy was further supported by the development of key performance indicators and a sustainability factor for compensation of the Executive Board.

Additionally, the year was characterized by personnel changes in the Executive Board. After a decade of successful service on the Executive Board, Stefan Oschmann left the company as planned to pursue other opportunities. Belén Garijo, a highly experienced and internationally recognized manager, took over as Chair of the Executive Board. She has been with our company since 2011 and has been a member of the Executive Board since 2015. In addition, the Executive Board was strengthened with two internationally experienced managers. Peter Guenter has assumed responsibility for the Healthcare sector while Matthias Heinzel is now in charge of the Life Science sector.

Following the entry into force of the Act Implementing the Second Shareholders' Rights Directive (ARUG II) and the reformed GCGC, the compensation system for the Executive Board was adjusted with effect from January 1, 2021. The detailed compensation system is published on our website. The adjusted compensation system was approved at the Annual General Meeting 2021 with a voting result of 87.08% . The compensation system for the Supervisory Board was also presented at the 2021 Annual General Meeting and approved with 99.64%.

Compensation for fiscal year 2021 – Summary

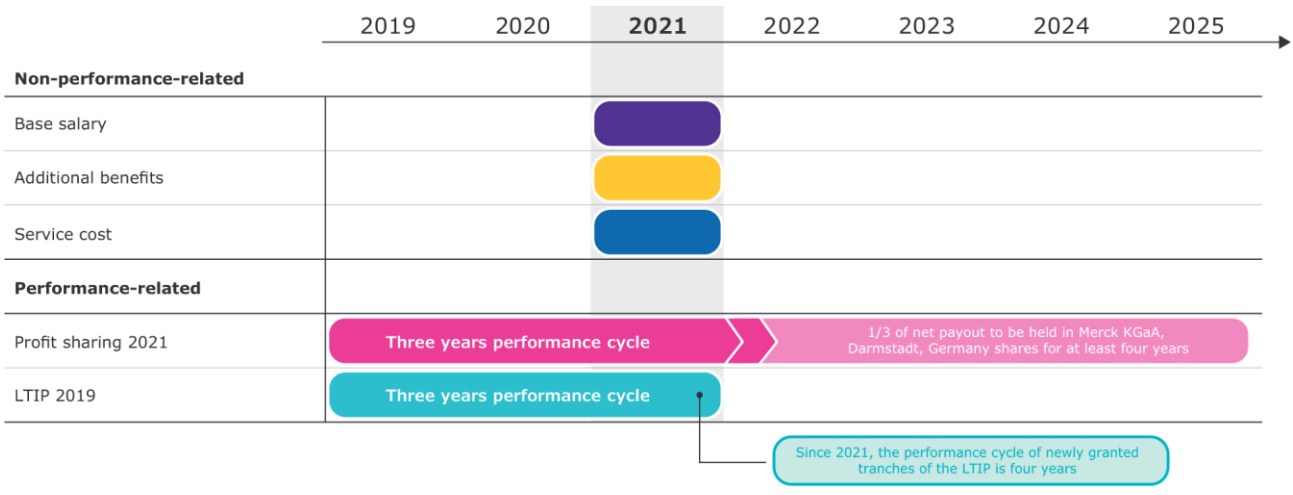
Summary of the compensation for the Executive Board members' performance up to December 31, 2021 – voluntary diclosure



[1] Belén Garijo is Chair of the Executive Board since May 1, 2021.

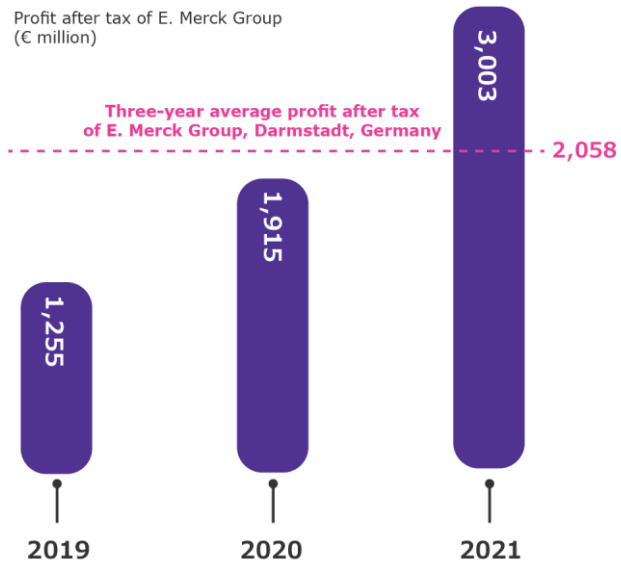
[2] In the calculation of the average compensation of the further members of the Executive Board (EB), the compensation of Kai Beckmann and Marcus Kuhnert are taken into account. Peter Guenter and Matthias Heinzel joined the Executive Board in the fiscal year 2021 and therefore did not receive any compensation from the LTIP 2019. Taking their compensation into account would therefore lead to a distorted presentation.

Compensation for fiscal year 2021 – Chronological overview

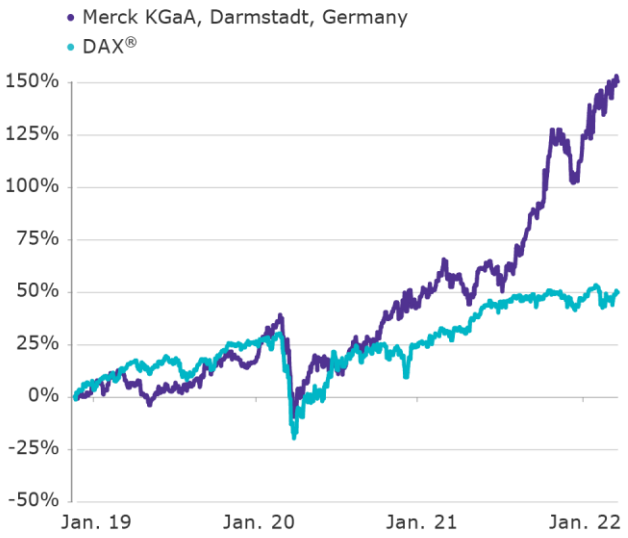


Performance-related compensation – Performance

Profit sharing 2021



Share price development (2019-2021)

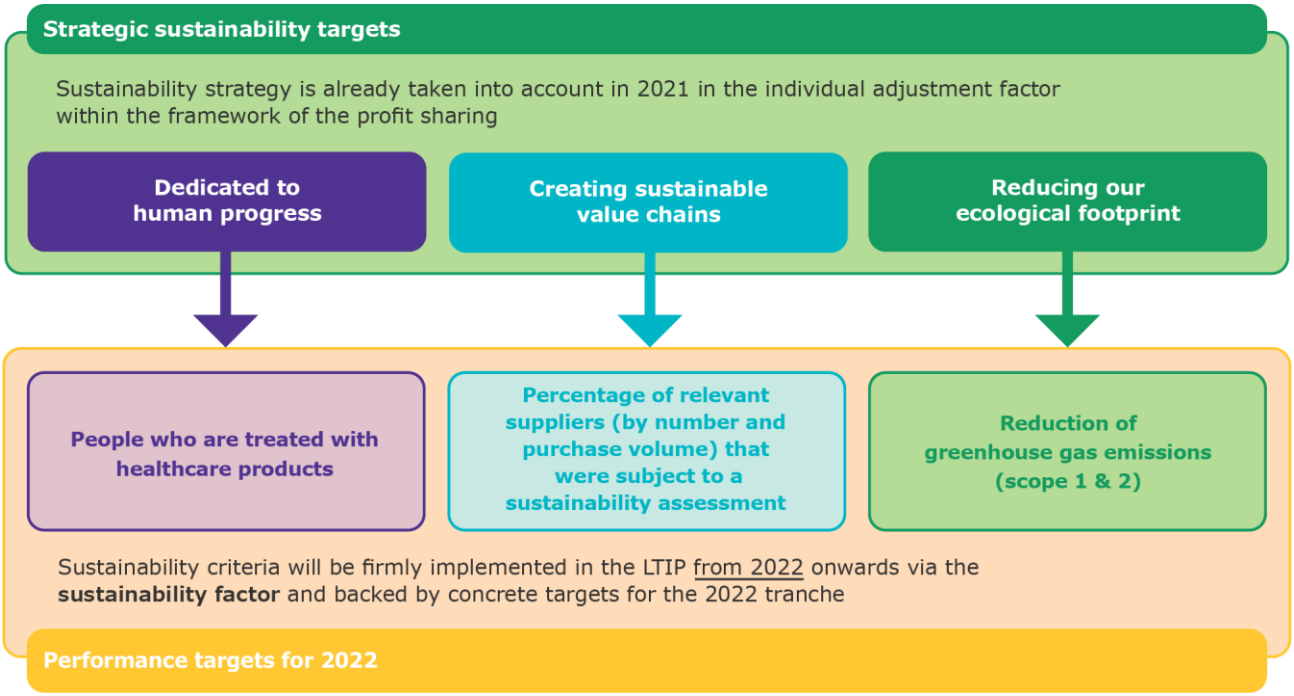


LTIP 2019 (2019 - 2021)

Performance indicator	Target corridor	Actual value	Target achievement (0% - 150%)
Share price performance relative to DAX® (Weighting: 50%)	Lower limit -20% · Target value 0% · Upper limit 50%	**87.6%**	**150.0%**
EBITDA pre margin (Weighting: 25%)	Lower limit 24.5% · Target value 27.5% · Upper limit 30.5%	**29.2%**	**128.4%**
Organic sales growth (Weighting: 25%)	Lower limit 4.3% · Target value 7.3% · Upper limit 10.3%	**8.0%**	**111.7%**
	= Actual value	**Total target achievement[1]:**	**135.0%**

[1] Cap of relative share price development was reached. Due to share price development actual payout is capped at 250%.

Sustainability targets in the compensation of the Executive Board



Determining the compensation of the Executive Board

At our company, unlike at publicly listed German stock corporations, it is not the Supervisory Board but the Board of Partners of E. Merck KG, Darmstadt, Germany, that is responsible for designing and reviewing the compensation system and deciding on the amount and composition of compensation received by the Executive Board members. The Board of Partners has assigned this task to its Personnel Committee. As a result, the Personnel Committee is responsible for the development and regular review of the compensation system, i.e., in particular for the structure and examination of the performance-independent and performance-related compensation elements. The Personnel Committee also takes into account the compensation system for managers and employees below Executive Board level in order to ensure consistency between the compensation systems, and uniform controlling. Furthermore, the Personnel Committee is responsible for defining the annual targets and thresholds of the key performance indicators for the performance-related compensation elements.

In addition to the structure of the Executive Board compensation system, the Personnel Committee is responsible for defining the specific amounts of compensation paid to the members of the Executive Board. The compensation paid to the members of the Executive Board takes into account the responsibilities and duties of the individual Executive Board members, and in particular their status as personally liable partners, their individual performance, and the economic situation, as well as the performance and future prospects of the company.

Furthermore, Executive Board compensation is oriented toward the external peer environment of our company, which comprises the DAX® companies as well as a group of selected international competitors:

The relationship between Executive Board compensation and the compensation of top management and the workforce as a whole continues to be taken into account, also in a multi-year assessment. Top management is defined as encompassing the senior levels of management below the Executive Board. The compensation of the remaining workforce as a whole is based on typical employee compensation.

The Personnel Committee reviews the amount and structure of the Executive Board compensation by reference to the peer groups described and with the assistance of an independent compensation consultant.

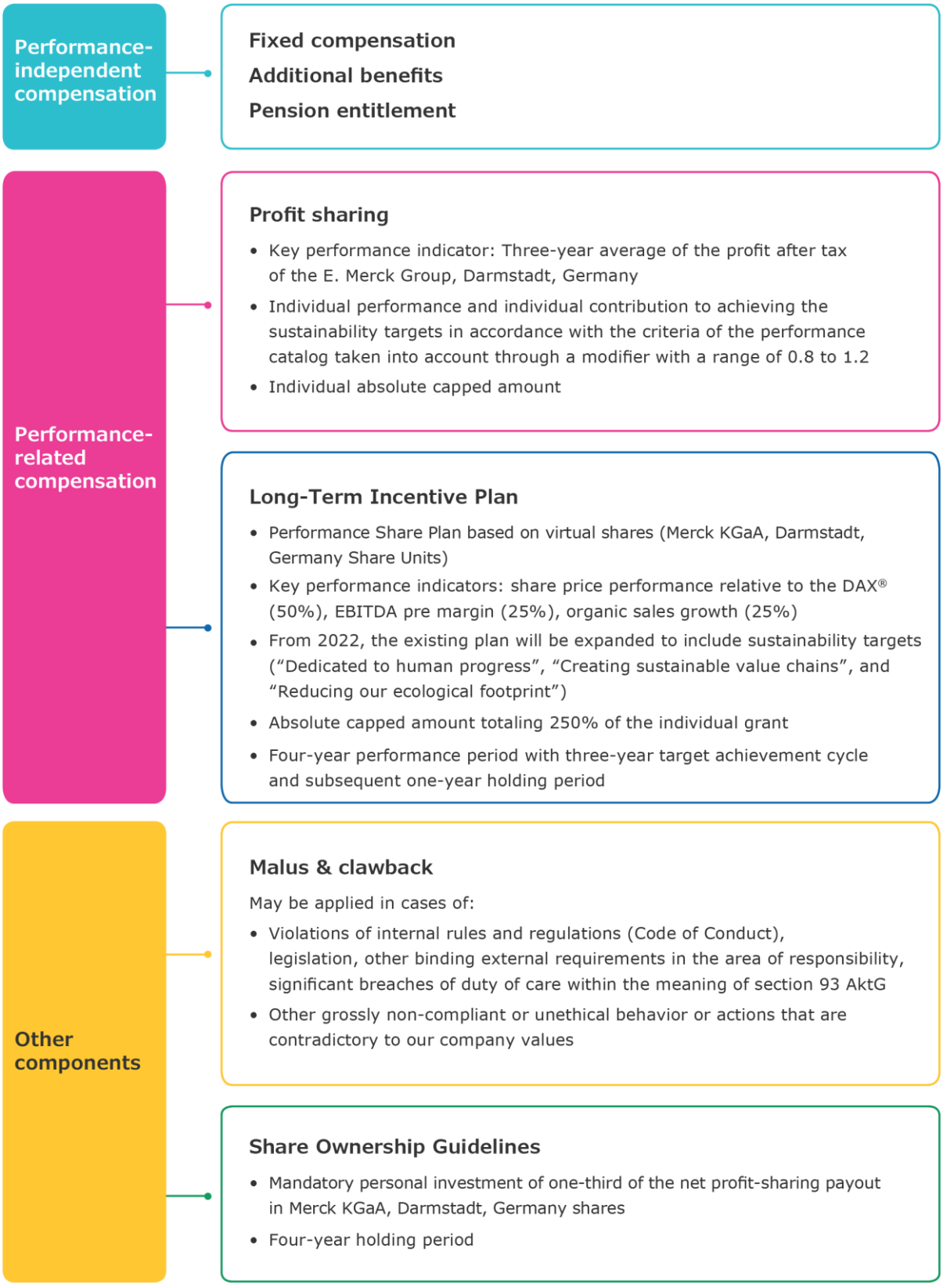
Overview of the structure of the compensation system

Compensation components

Executive Board compensation fundamentally comprises three main components: fixed compensation, profit sharing, and the Long-Term Incentive Plan. This is complemented by contributions to the company pension plan as well as additional benefits. There are also additional compensation arrangements for the members of the Executive Board, in particular malus and clawback provisions and a Share Ownership Guideline.

The performance-related compensation elements – profit sharing and the Long-Term Incentive Plan – are based on a multiyear performance period and are wholly oriented toward the company's long-term development. In addition, the two variable compensation components are designed to be tied to the company's share price to a large extent, thereby ensuring that our shareholders' interests are taken into particular account. The key performance indicators selected for variable compensation are derived from the corporate strategy and form part of our central controlling system. In this way, the variable compensation paid to the Executive Board members is used as a strong controlling tool in order to ensure a focus on our objective of long-term profitable growth accompanied by strong cost discipline.

The following diagram shows an overview of all of the elements of the compensation system for the Executive Board members:



Executive Board compensation for 2021

The performance-related and performance-independent compensation components applied in the Executive Board compensation system in the 2021 fiscal year are fully consistent with the Executive Board compensation system approved by the 2021 Annual General Meeting. Compliance with the compensation system is ensured by the Personnel Committee. The Personnel Committee decides by resolution on the concrete application (e.g., setting of targets, determination of target achievement, etc.) as well as the respective amounts to be paid out.

The following section reports on the compensation awarded or due in accordance with section 162 (1) AktG. Accordingly, the following sections contain all amounts actually received by the individual members of the Executive Board (active and former members) in the financial year (compensation awarded) or all amounts legally due but not yet received (compensation due).

In addition, compensation is disclosed on a voluntary basis for which the members of the Executive Board have provided the underlying service completely by December 31, 2021, but for which payment will be made in the following year. This relates to the profit sharing for fiscal year 2021, as well as the 2019 LTI tranche, whose performance period ended on December 31, 2021. These amounts have been provisionally determined by the Personnel Committee by way of a resolution and subsequently communicated to the members of the Executive Board. The final amount will be paid to the members of the Executive Board after the preparation of the consolidated financial statements of E. Merck KG, Darmstadt, Germany, and will be reported on in the Compensation Report for fiscal year 2022. This enables transparent information and ensures the link between performance and compensation in the fiscal year.

Performance-independent compensation

Fixed compensation

The fixed compensation received by the members of the Executive Board comprises fixed and performance-independent amounts that are paid in the form of 12 equal monthly installments.

Additional benefits

The additional benefits include company cars with private use, contributions to insurance policies and expenses for personal protection.

As compensation for the loss of entitlements to variable remuneration from his previous employment, Peter Guenter received a commitment to a cash compensation totaling € 1,500,000.00 as sign-on bonus, which will be paid in four equal installments on July 1, 2021; July 1, 2022; July 1, 2023; and July 1, 2024; provided he continues to be a member of the Executive Board. In addition, the total costs of € 62,168.00 for temporary local accommodation, relocation and relocation services in connection with his move to Darmstadt were paid as a onetime occurrence.

Pension entitlement

The members of the Executive Board are granted a defined contribution pension obligation as a direct commitment.[1] A fixed amount is paid into a benefit account every year and interest is paid at the applicable statutory maximum technical interest rate for the life insurance industry in accordance with section 2 (1) of the Regulation on the Principles Underlying the Calculation of the Premium Reserve (DeckRV). Once a member retires, the amount in the benefit account is paid out either in ten annual installments or as a one-time payment.

[1] For accounting purposes, this corresponds to a defined-benefits obligation within the meaning of IAS 19.8.

Pension obligations

		IAS 19[1]			
		Service cost		Present value of the pension obligation as of December 31	
€ thousand	Contribution level	**2021**	2020	**2021**	2020
Belén Garijo (Chair since May 1, 2021)	583	572	440	6,308	5,649
Kai Beckmann	450	441	392	5,823	5,325
Peter Guenter (since January 1, 2021)	450	452	–	451	–
Matthias Heinzel (since April 1, 2021)	450	387	–	376	–
Marcus Kuhnert	400	406	409	4,290	3,860
Total	**2,333**	**2,258**	**1,241**	**17,248**	**14,834**

[1] For accounting purposes, this corresponds to a defined-benefits obligation within the meaning of IAS 19.8.

There was a defined benefit pension obligation for Stefan Oschmann until April 30, 2021. The amount of the pension was based on a percentage of his pensionable compensation.

Pension obligation

			IAS 19			
			Service cost		Present value of the pension obligation as of December 31	
€ thousand	Pensionable compensation	Percentage entitlement	**2021**	2020	**2021**	2020
Stefan Oschmann (until April 30, 2021)	800	70	–	1,611	15,730	17,344

Performance-related compensation

Performance-related compensation comprises profit sharing as well as the Long-Term Incentive Plan. Both compensation elements are based on multi-year performance periods and are tied to the company's share price to a large extent.

Profit sharing

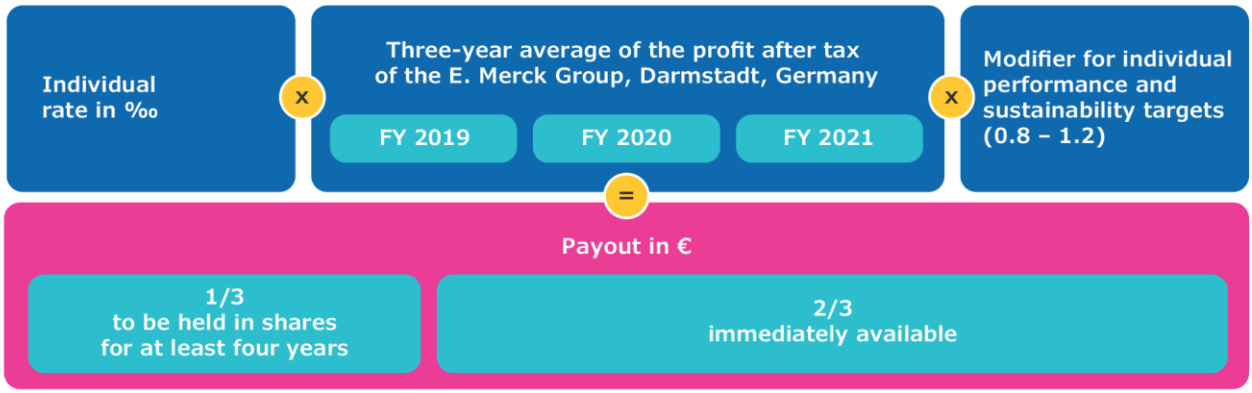
For the purposes of profit sharing, an individual profit sharing rate is defined for the members of the Executive Board as a per mille rate of the three-year average of the consolidated profit after tax of E. Merck KG, Darmstadt, Germany. The current and the two preceding fiscal years are included in the calculation.

The use of profit after tax as the key performance indicator, which also serves as the basis for dividend payments, ensures very close alignment with shareholder interests.

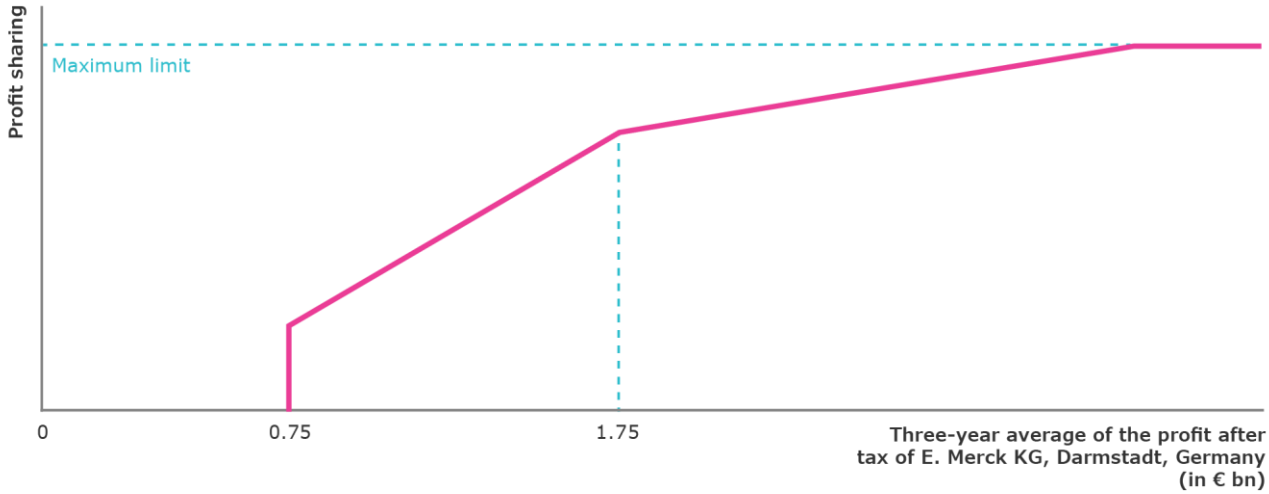
To appropriately consider the individual performance of the Executive Board members, the Personnel Committee is able to modify the payment by applying a factor ranging from 0.8 to 1.2. In determining the level of this factor, the Personnel Committee applies the criteria defined in the compensation system that also include ambitious sustainability targets. The performance factor makes it possible to recognize outstanding performance by a member of the Executive Board by multiplying profit sharing by a value greater than 1.0 up to 1.2. Similarly, multiplying by a value less than 1.0 down to 0.8 can reduce profit sharing if the circumstances call for it.

The members of the Executive Board are obligated to hold one-third of the yearly total net amount from profit sharing in shares of our company for at least four years. Further details are provided under the heading "Share Ownership Guideline".

The following illustration shows the profit sharing for the 2021 fiscal year:



An average profit of at least € 0.75 billion must be generated in order for the profit sharing payment to be made. This minimum threshold reflects the "pay-for-performance" philosophy that underpins the compensation system. Where profit is generated in excess of this threshold, the level of the individual profit sharing rates is staggered. The maximum profit sharing payment is capped individually.



The three-year average that is relevant for the 2021 fiscal year was based on the profit after tax generated by the Group of E. Merck KG, Darmstadt, Germany, in 2019, 2020 and 2021:

Profit after tax of the Group of E. Merck KG, Darmstadt, Germany

€ million	2018	2019	2020	**2021**
Profit after tax of the Group of E. Merck KG, Darmstadt, Germany	3,324	1,255	1,915	3,003
Three-year average profit after tax of the Group of E. Merck KG, Darmstadt, Germany (2018-2020)			2,165	
Three-year average profit after tax of the Group of E. Merck KG, Darmstadt, Germany (2019-2021)				2,058

For the fiscal year 2021, the Personnel Committee has set the performance factor at 1.0 for all members of the Executive Board taking into account their individual performance and contribution to the sustainability targets. This recognizes the contributions of the members of the Executive Board, which led to the conclusion of a successful fiscal year 2021.

The 2021 fiscal year was concluded with remarkable success in terms of employee safety and health, good financial results, stable business operations, and an extremely positive share price development. In addition to the successful further development of the business, the Executive Board showed ambitious commitment to rapidly achieving the goals set out in the sustainability strategy. For example, significant progress was made in systematically embedding sustainability in all the company's processes. Further information on the development of sustainability topics can be found in the non-financial statement, which will be published in the management report (Lagebericht) for the first time in fiscal year 2021.

Taking into account the relevant three-year average of the consolidated profit after tax of the Group of E. Merck KG, Darmstadt, Germany, the individual profit sharing rates and the performance factor, this results in the following profit sharing for 2021:

Profit sharing 2021 summary

	Three-year average profit after tax of the Group of E. Merck KG, Darmstadt, Germany (€ million)	Average profit-sharing rate 2021 (in per mill)	Performance factor for individual performance	Payout amount (€ thousand)	thereof mandatory personal investment (1/3) (€ thousand)[1]
Belén Garijo (Chair since May 1, 2021)	2,058	1.78	1.0	3,671	1,224
Stefan Oschmann (until April 30, 2021)		0.63	1.0	1,287	429
Kai Beckmann		1.39	1.0	2,854	951
Peter Guenter (since January 1, 2021)		1.54	1.0	3,165	1,055
Matthias Heinzel (since April 1, 2021)		1.16	1.0	2,385	795
Marcus Kuhnert		1.29	1.0	2,654	885

[1] Gross amount - investment is based on net amount.

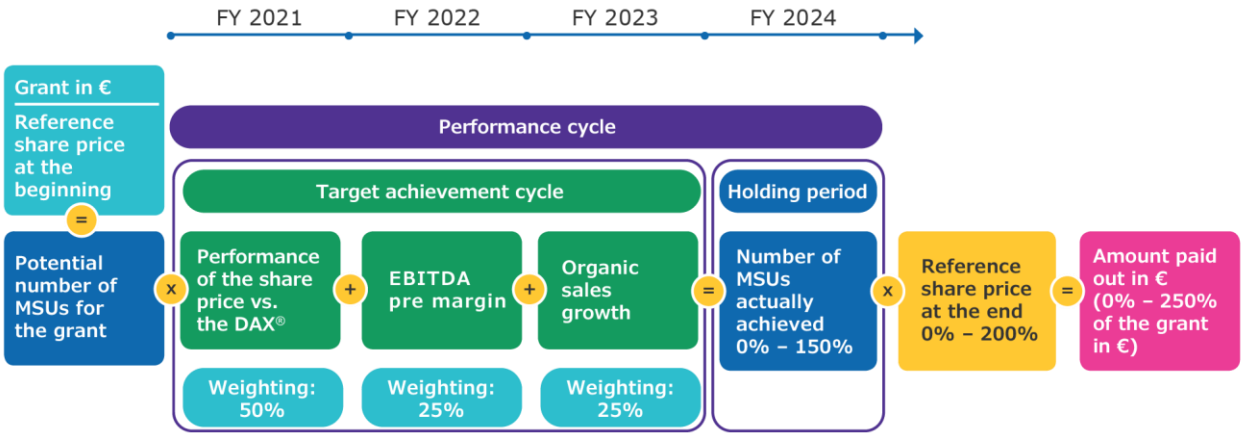
The profit-sharing payout will be made in cash in April 2022. One-third of the net payout amount must be held in shares of Merck KGaA, Darmstadt, Germany, for at least four years. Further details of the investment obligation can be found in the “Share Ownership Guideline” section.

In fiscal year 2021, the profit sharing for the fiscal year 2020 has been paid out, which is therefore to be reported as remuneration awarded or due in fiscal year 2021 in accordance with section 162 of the German Stock Corporation Act (AktG). All information on profit sharing 2020 can be found in the Compensation Report 2020.

Long-Term Incentive Plan (LTIP)

Long-Term Incentive tranche for the fiscal year 2021

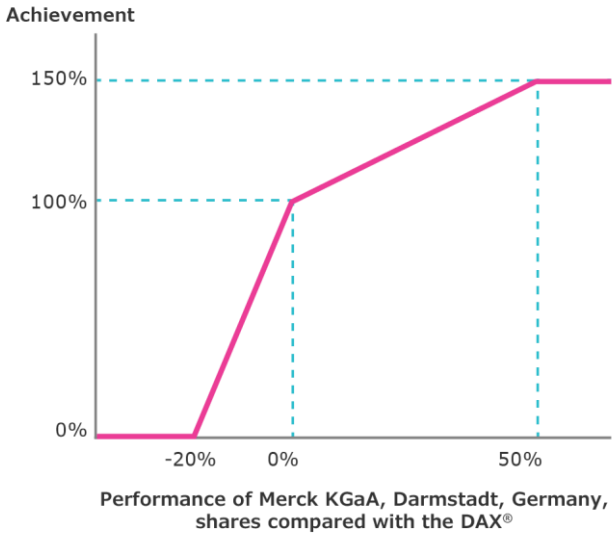
The Long-Term Incentive Plan is designed as a virtual performance share plan. It is based on a four-year future-oriented performance cycle that is composed of a three-year target achievement cycle and, since the 2021 tranche, a subsequent one-year holding period. As part of the LTIP, the members of the Executive Board are provisionally eligible to receive a certain number of virtual shares, referred to as share units of Merck KGaA, Darmstadt, Germany ("MSUs").



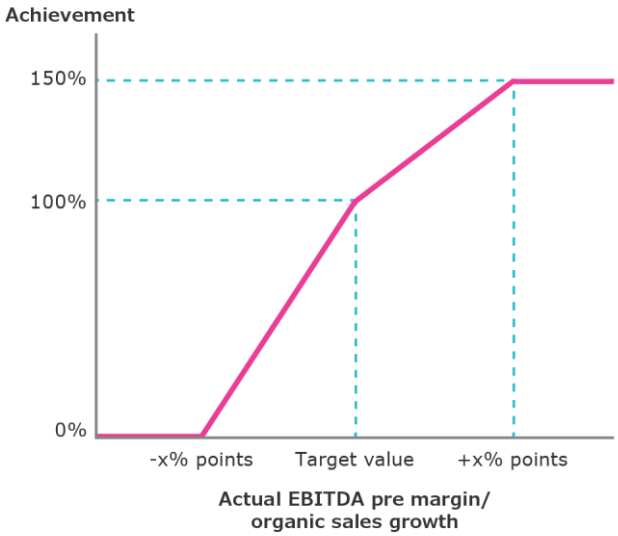
The number of MSUs is calculated as follows: An individual grant in euros is set for each Executive Board member. Every year, this grant is divided by the definitive reference share price at the beginning of the performance cycle, resulting in the number of MSUs that the respective member is provisionally entitled to receive. The number of MSUs actually allocated to the Executive Board members after the end of the target achievement cycle may be between 0% and 150% of the MSUs they are provisionally entitled to receive and depends on the development of three weighted key performance indicators over the three-year target achievement cycle. The relevant key performance indicators are:

- The performance of the Merck KGaA, Darmstadt, Germany, share price compared with the performance of the DAX® with a weighting of 50%,
- The EBITDA pre margin as a proportion of a defined target value with a weighting of 25%, and
- The organic sales growth of the Group as a proportion of a defined target value with a weighting of 25%.

The number of MSUs actually allocated after the end of the target achievement cycle is based on the following target achievement curves. The targets and thresholds for the key performance indicators of EBITDA pre margin and organic sales growth are defined by the Personnel Committee at the start of the performance period and subsequently published in the compensation report.



Performance of Merck KGaA, Darmstadt, Germany, shares compared with the DAX®



Actual EBITDA pre margin/ organic sales growth

The target achievement cycle is followed by a one-year holding period. The payout may be between 0% and a maximum of 250% of the amount originally allocated and depends on the number of MSUs actually allocated and the reference share price at the end of the performance cycle.

In the fiscal year 2021, the 2021 tranche of the LTIP was allocated on the basis of the following parameters:

LTIP Tranche 2021 allocation

	Grant amount (€ thousand)	Reference share price of Merck KGaA, Darmstadt, Germany, at the beginning (in €)	Number of potential MSUs
Belén Garijo (Chair since May 1, 2021)	2,190	132.43	16,538
Stefan Oschmann (until April 30, 2021)	752		5,676
Kai Beckmann	1,715		12,951
Peter Guenter (since January 1, 2021)	1,900		14,348
Matthias Heinzel (since April 1, 2021)	1,425		10,761
Marcus Kuhnert	1,400		10,572

LTI tranches allocated before the fiscal year 2021

The 2018, 2019 and 2020 tranches of the LTIP are structured like the 2021 tranche allocated in the fiscal year. However, the one-year holding period following the target achievement cycle has just been introduced in 2021. Accordingly, the performance period of the 2018, 2019, and 2020 tranches is three years.

The payout under the 2018 tranche of the LTIP was made in April of the 2021 fiscal year. The performance cycle for this tranche ran from January 1, 2018, to December 31, 2020. The performance cycle for the 2019 tranche of the LTIP ended in fiscal year 2021. The performance cycle for this tranche ran from January 1, 2019, to December 31, 2021. The payout will be made in April 2022.

The targets and thresholds, the actual amounts and the resulting target achievement for the 2018 and 2019 tranches can be summarized as follows:

LTIP Tranche 2018 target achievement

	Lower target corridor limit	Target	Upper target corridor limit	Actual achieved value	Target achievement
Share price performance relative to the DAX® (weighting: 50%)	-20.0%	0.0%	50.0%	45.1%	145.1%
EBITDA pre margin (weighting: 25%)	24.2%	27.2%	30.2%	27.4%	103.3%
Organic sales growth (weighting: 25%)	3.0%	6.0%	9.0%	5.4%	80.0%
Total target achievement					**118.4%**

LTIP Tranche 2019 target achievement

	Lower target corridor limit	Target	Upper target corridor limit	Actual achieved value	Target achievement[1]
Share price performance relative to the DAX® (weighting: 50%)	-20.0%	0.0%	50.0%	87.6%	150.0%
EBITDA pre margin (weighting: 25%)	24.5%	27.5%	30.5%	29.2%	128.4%
Organic sales growth (weighting: 25%)	4.3%	7.3%	10.3%	8.0%	111.7%
Total target achievement					**135.0%**

[1] Cap of relative share price development was reached.

The resulting payouts are as follows:

LTIP 2018 summary

	Grant amount (€ thousand)	Reference share price of Merck KGaA, Darmstadt, Germany, at the beginning (in €)	Number of potential MSUs	Total target achievement	Final number of MSUs	Reference share price of Merck KGaA, Darmstadt, Germany, at the end (in €)	Payout amount (€ thousand)
Stefan Oschmann (until April 30, 2021)	2,255	91.7	24,584	118%	29,101	132.43	3,854
Udit Batra (until July 13, 2020)	1,705		18,588		22,004		2,428
Kai Beckmann	1,430		15,590		18,455		2,444
Walter Galinat (until September 30, 2018)	1,320		14,391		17,035		999
Belén Garijo	1,870		20,386		24,132		3,196
Marcus Kuhnert	1,320		14,391		17,035		2,256

LTIP 2019 summary

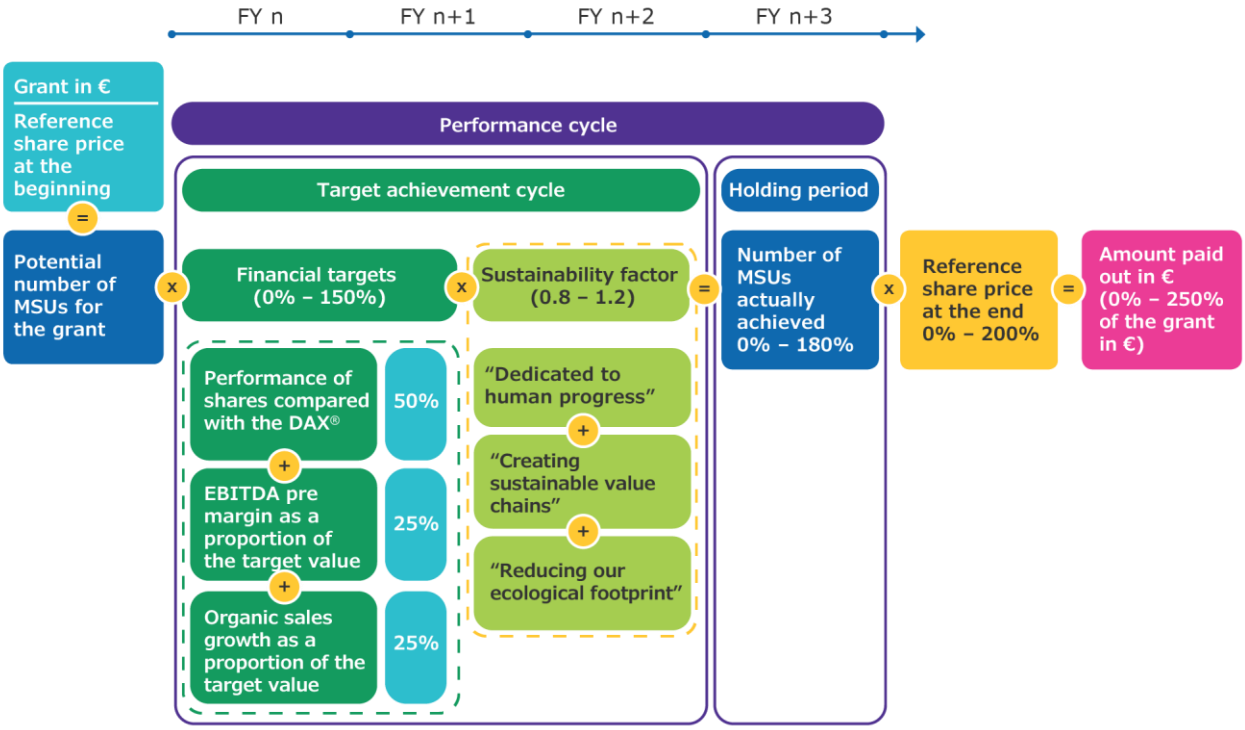
	Grant amount (€ thousand)	Reference share price of Merck KGaA, Darmstadt, Germany, at the beginning (in €)	Number of potential MSUs	Total target achievement	Final number of MSUs	Reference share price of Merck KGaA, Darmstadt, Germany, at the end (in €)	Payout amount[1] (€ thousand)
Stefan Oschmann (until April 30, 2021)	2,255	93.75	24,054	135%	32,479	212.16	4,377
Udit Batra (until July 13, 2020)	1,705		18,187		24,557		2,131
Kai Beckmann	1,530		16,320		22,036		3,825
Belén Garijo	1,870		19,947		26,933		4,675
Marcus Kuhnert	1,320		14,080		19,012		3,300

[1] Payout capped at 250% of grant amount and subject to verification of compliance with maximum compensation in fiscal year 2022.

The performance period of the LTIP tranche 2020 runs until December 31, 2022. Accordingly, detailed reporting will be provided in the 2022 compensation report.

Outlook: Long-Term Incentive Plan from 2022

Starting from fiscal year 2022, our sustainability strategy will be even more firmly enshrined in the compensation system for the members of the Executive Board following the introduction of a sustainability factor with a range of 0.8 to 1.2. The sustainability factor, which measures the performance of selected sustainability targets over the three-year target achievement cycle, can increase or reduce the target achievement resulting from the financial key performance indicators by up to 20%.



The sustainability factor encompasses three performance criteria: "Dedicated to human progress", "Creating sustainable value chains" and "Reducing our ecological footprint". From 2022 onward, the Personnel Committee will define specific measurable key performance indicators at the start of each tranche of the LTIP as well as the target and threshold levels that will be used to calculate the target achievement at the end of the target achievement cycle. The following criteria were defined for the selection of the key performance indicators:

- Relevance and influence of the performance indicators on the three overarching performance criteria of the sustainability strategy
- Internal and external influence of the performance indicators by management
- Good measurability and operationalization
- Sustained impact to support long-term solutions and not incentivize short-term actions

The amount of the sustainability factor depends on the degree of target achievement and may range between 0.8 and 1.2. Every year, the Personnel Committee also determines the weighting of the performance criteria for each tranche of the LTIP in order to emphasize priorities.

The Personnel Committee has defined the following parameters for the sustainability factor for the 2022 tranche of the LTIP:

Performance criterion	Weighting	Concrete sustainability target (Key Performance Indicator)
Dedicated to Human Progress	20%	People treated with our Healthcare products
Creating sustainable value chains	40%	Percentage of relevant suppliers (in terms of number and purchase volume) that are covered by a valid sustainability assessment
Reducing our ecological footprint	40%	Greenhouse gas emissions Scope 1+2

- We are convinced that, with the help of science and technology, we can make a contribution to solving many global challenges. We aim to be commercially successful and to create positive value for society through our business activities. In connection with the performance criterion "Dedicated to human progress", we measure the contribution of our Healthcare business sector, namely how many people worldwide have been treated with medical products from our company. We plan to continuously increase this number and thus contribute to a significant improvement in medical care and the state of health of as many people as possible. In addition, we are assessing how plausible contributions to " Dedicated to human progress" can also be implemented in the Life Science and Electronics business sectors.

- With regard to the performance criterion "Creating sustainable value chains", we want to anchor sustainability more firmly in our supply chains. This may be achieved by increasing the transparency of our supply chains and subjecting more companies with which our company maintains supply relationships to a sustainability assessment. In particular, we want to focus on suppliers where we see special sustainability risks in the supply chain. When measuring our progress, we pay attention to both the increase in the proportion of suppliers with sustainability assessment in relation to their number and their share of the purchase volume. With regard to the number of relevant suppliers, we expect a significant increase in the share over the next few years and thus coverage of a large part of the relevant purchase volume.

- With regard to the performance criterion "Reducing our ecological footprint", we aim to make a significant contribution to climate protection and the Paris Climate Agreement. That is why we have decided in 2021 that we would like to join the Science Based Targets Initiative. On our way to climate neutrality, we aim to reduce both direct (Scope 1) and indirect emissions (Scope 2) by 50% by 2030 compared to 2020. This target is to be achieved through the reduction of process-related emissions, energy efficiency measures, and the increased purchase of electricity from renewable sources. For process emissions in particular (Scope 1), we aim to achieve a significant reduction in emissions over the next few years through the use of new technologies, despite further growth in our business.

The specific targets and thresholds, the actual amounts and the resulting target achievement will be published in the corresponding compensation report after the end of the performance cycle.

Share Ownership Guideline

In 2017, we introduced with the Share Ownership Guideline (SOG) that the members of the Executive Board have to invest and hold a fixed percentage of their annual fixed compensation in shares. As of the beginning of the fiscal year 2021, we have linked this share ownership obligation to the variable compensation element of profit sharing. Under the adjusted SOG, the Executive Board members are now required to hold one third of the net profit sharing payment in shares of Merck KGaA, Darmstadt, Germany, for at least four years. The adjusted SOG will be applied for the first time related to the profit sharing payout for the fiscal year 2021. The required shares will be purchased automatically via an external provider.

The Share Ownership Guideline promotes even stronger alignment between the interests of the Executive Board members and those of our shareholders, and it additionally raises the entrepreneurial responsibility of the Executive Board members in addition to their status as personally liable general partners.

The following table provides an overview of the shareholding requirement of the members of the Executive Board as of December 31, 2021, under the SOG that applied until December 31, 2020 as well as the amount to be invested in shares under the new SOG that has applied since January 1, 2021:

Share Ownership Guideline

	Status quo as of December 31, 2021		
	Number of shares	In % of base salary[1]	Mandatory net investment from profit sharing[2]
Belén Garijo (Chair since May 1, 2021)	12,389	196%	1,224
Kai Beckmann	10,527	199%	951
Peter Guenter (since January 1, 2021)	–	–	1,055
Matthias Heinzel (since April 1, 2021)	–	–	795
Marcus Kuhnert	9,474	179%	885
Stefan Oschmann (until April 1, 2021)	–	–	429

[1]Reference share price as of December 31, 2021: 227.00€.

[2]Gross amount - investment based on net amount

[3]Due to his retirement on April 30, 2021, the shareholding obligation under the original SOG ceased to apply as of December 31, 2021

Malus and clawback provisions

Through their status as personally liable general partners of Merck KGaA, Darmstadt, Germany, and E. Merck KG, Darmstadt, Germany, the Executive Board members bear a unique entrepreneurial responsibility. This is also reflected by the penalty criteria set forth in profit sharing and by the German statutory regulations on liability for damages stipulated in section 93 AktG. In order to take even greater account of the prominent position of entrepreneurial responsibility in compensation, a clawback provision is implemented for the Long-Term Incentive Plan. Cases in which the clawback provision may be applied include violations of internal rules and regulations (Code of Conduct), legislation, other binding external requirements in the area of responsibility, significant breaches of duty of care within the meaning of section 93 AktG, and other grossly non-compliant or unethical behavior or actions that are contradictory to our company values. In these cases, amounts that have already been allocated under the Long-Term Incentive Plan may be retained. The Personnel Committee is entitled to demand the repayment of profit sharing and LTIP payouts from a member of the Executive Board if it subsequently transpires that the payout was made wrongfully, either in full or in part. For example, this is the case when targets are not actually met or are not met to the extent assumed when the payout was calculated due to incorrect information being applied. The extent of these claims for restitution is based on section 818 of the German Civil Code (BGB). The Personnel Committee may agree deadlines for the assertion of claims for restitution with the members of the Executive Board.

Neither the malus provision nor the clawback provision were exercised in the fiscal year 2021.

Compensation-related transactions

Belén Garijo was appointed as Chair of the Executive Board effective May 1, 2021, becoming the first woman to lead a DAX®-listed international corporation. In connection with the position of CEO of Merck KGaA, Darmstadt, Germany, a new five-year employment contract was concluded between Belén Garijo and E. Merck KG, Darmstadt, Germany. For the fiscal year 2021, Belén Garijo received compensation for her position as an ordinary member of the Executive Board in the period from January 1, 2021, to April 30, 2021, and compensation for her position as Chair of the Executive Board for the period from May 1, 2021, to December 31, 2021.

Contracts with the members of the Executive Board are usually concluded for a period of five years. When an employment contract begins or ends during the course of the year, the fixed compensation, profit sharing and individual LTIP tranches are paid on a pro rata basis.

Should members of the Executive Board be held liable for financial losses while executing their duties, this liability risk is covered by a D&O insurance policy under certain circumstances. The D&O insurance policy has a deductible in accordance with the legal requirements.

Post-contractual non-competition clause

Post contractual non-competition clauses have been agreed with the vast majority of Executive Board members except for Marcus Kuhnert. With him it has been agreed on to conclude an agreement about a post-contractual non-competition clause if required. The post-contractual non-competition clause involves the payment of compensation amounting to 50% of the member's average compensation within the last twelve months and is paid for a period of two years. Other earnings, pension payments and any severance payments are offset against this amount.

A post-contractual non-competition clause was agreed with Stefan Oschmann. He will be paid monthly compensation of € 343,184 in the period from May 1, 2021, to April 30, 2023. His monthly pension of € 46,667 is offset against this amount.

Obligations in connection with the cessation of Executive Board membership

The contracts of the Executive Board members do not provide for ordinary termination. The right to extraordinary termination for good cause in accordance with section 626 BGB is available to both parties without observing a notice period.

The contracts of the Executive Board members may provide for the continued payment of fixed compensation to surviving dependents for a limited period of time in the event of death. Above and beyond existing pension obligations, no further obligations are provided for in the event of the termination of the contractual relationships of the Executive Board members.

There is a cap on the amounts payable to Executive Board members in the event of the early termination of the contract without good cause justifying such termination. Pursuant to this, payments in connection with the termination of an Executive Board member's duties shall not exceed twice the annual total compensation, or constitute compensation for more than the remaining term of the employment contract (severance cap). If an Executive Board member's duties cease due to the termination of the employment contract either by the company or the Executive Board member before the four-year performance cycle of an open tranche in the Long-Term Incentive Plan expires, the obligations resulting from the plan continue to apply if there are specific grounds for the termination, e.g., if the employment contract is not renewed after it expires or if the Board of Partners determines this to be appropriate at its own discretion; otherwise, the obligations no longer apply. If the compensation in the fiscal year in which the Executive Board member's duties cease is expected to be significantly higher or lower than in the previous fiscal year, the Board of Partners may decide to adjust the amount applied as the member's total compensation at its own discretion.

The contract with Stefan Oschmann regularly ended on April 30, 2021 due to retirement as of May 1, 2021. Stefan Oschmann is receiving a pension of € 46,667 per month as a company pension since May 1, 2021. In connection with the regular termination of his position as Chief Executive Officer, he will also receive a waiting allowance of € 343,184 per month for the period from May 1, 2021 to April 30, 2023. The monthly pension will be offset against the monthly waiting allowance. Further explanations of these payments can also be found under the heading "Post-contractual non-competition clause".

Payments by affiliates of the Group

In the period from January 1, 2020, to July 13, 2020, the total compensation of Udit Batra as a member of the Executive Board also included his compensation as CEO of EMD Millipore Corp., United States. Between January 1 and July 13, 2020, Udit Batra received fixed compensation of € 413 thousand from EMD Millipore Corp., United States, as well as a bonus of € 1,008 thousand and an LTI payout of € 1,131 thousand. In the fiscal year, Udit Batra received an LTI payout of € 1,939 thousand as part of his compensation from EMD Millipore Corp., United States. These payments are included in the corresponding compensation elements paid to Udit Batra as a member of the Executive Board of E. Merck KG, Darmstadt, Germany.

Individual disclosure of the compensation of the Executive Board

Compensation awarded and due to current members of the Executive Board in the fiscal year 2021

In accordance with the revised section 162 (1) of the German Stock Corporation Act (AktG), the compensation awarded or due to each member of the Executive Board in financial year 2021 and the respective relative share of total compensation are now presented transparently in the tables below. This includes all compensation elements which were paid out or became legally due in fiscal year 2021.

Regarding Stefan Oschmann, the compensation awarded or due, which has been paid after he has left the Executive Board (waiting allowance and pension) is presented in the section "Compensation awarded or due to former members of the Executive Board in the financial year".

To ensure a transparent presentation of the relation between business performance and the resulting compensation, compensation for fiscal year 2021 is also disclosed on a voluntary basis, with the variable compensation components being allocated to the year in which the final performance was rendered, irrespective of the actual date of payment or the legal due date.

In order to provide a complete picture of the total compensation of the Executive Board members, pension expense is also reported on a voluntary basis.

The compensation of the current members of the Executive Board is shown in the following tables.

In fiscal year 2021 pursuant to section 162 AktG	**For fiscal year 2021 as voluntary disclosure**
Base salary	
Additional benefits	
Profit sharing for fiscal year 2020, payout in fiscal year 2021	Profit sharing for fiscal year 2021, payout in fiscal year 2022
LTIP tranche 2018 (Jan 1, 2018-Dec 31, 2020), payout was in fiscal year 2021	LTIP tranche 2019 (Jan 1, 2019-Dec. 31, Dec 2021), payout will be in fiscal year 20221
Other compensation	
Sign-On Bonus for Peter Guenter	
Service cost as voluntary disclosure	

[1] Subject to verification of compliance with the maximum remuneration

The figures presented in the table have been rounded in accordance with standard commercial practice. This may lead to the consequence that individual values cannot be added to the totals.

Compensation awarded or due

	Belén Garijo Chair of the Executive Board (since May 1, 2021; previously member of the Executive Board)				
	In the fiscal year (pursuant to section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2021		2020	**2021**	2020
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,433	18%	1,200	1,433	1,200
Additional benefits	169	2%	66	169	66
Profit sharing				–	3,299
Profit sharing 2019	–		3,000	–	–
Profit sharing 2020	3,299	41%	–	–	3,299
Profit sharing 2021	–		–	3,671	–
LTIP				–	3,196
LTI 2017 (2017 to 2019)	–		1,385	–	–
LTI 2018 (2018 to 2020)	3,196	39%	–	–	3,196
LTI 2019 (2019 to 2021)	–		–	4,675	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**8,097**	**100%**	**5,651**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**9,948**	**7,761**
Service cost	572	–	440	572	440
Total compensation	**8,669**	**–**	**6,091**	**10,520**	**8,201**

	Stefan Oschmann Chair of the Executive Board (until April 30, 2021)				
	In the fiscal year (pursuant to section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2021		2020	**2021**	2020
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	500	6%	1,400	500	1,400
Additional benefits	13	0%	269	13	269
Profit sharing				–	4,069
Profit sharing 2019	–		4,810	–	–
Profit sharing 2020	4,069	48%	–	–	4,069
Profit sharing 2021	–		–	1,287	–
LTIP	–		–	–	3,854
LTI 2017 (2017 to 2019)	–		1,670	–	–
LTI 2018 (2018 to 2020)	3,854	46%	–	–	3,854
LTI 2019 (2019 to 2021)	–		–	4,377	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**8,436**	**100%**	**8,149**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**6,177**	**9,592**
Service cost	–	–	1,611	–	1,611
Total compensation	**8,436**	**–**	**9,760**	**6,177**	**11,203**

	Kai Beckmann Member of the Executive Board				
	In the fiscal year (pursuant to section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2021		2020	**2021**	2020
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	19%	1,100	1,200	1,100
Additional benefits	30	0%	21	30	21
Profit sharing				–	2,640
Profit sharing 2019	–		2,400	–	–
Profit sharing 2020	2,640	42%	–	–	2,640
Profit sharing 2021	–		–	2,854	–
LTIP				–	2,444
LTI 2017 (2017 to 2019)	–		1,059	–	–
LTI 2018 (2018 to 2020)	2,444	39%	–	–	2,444
LTI 2019 (2019 to 2021)	–		–	3,825	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**6,314**	**100%**	**4,580**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**7,909**	**6,205**
Service cost	441	–	392	441	392
Total compensation	**6,755**	**–**	**4,972**	**8,350**	**6,597**

	Peter Guenter Member of the Executive Board (since January 1, 2021)				
	In the fiscal year (pursuant to section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2021		2020	**2021**	2020
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	72%	–	1,200	–
Additional benefits	95	6%	–	95	–
Profit sharing				–	–
Profit sharing 2019	–		–	–	–
Profit sharing 2020	–	–	–	–	–
Profit sharing 2021	–		–	3,165	–
LTIP				–	–
LTI 2017 (2017 to 2019)	–		–	–	–
LTI 2018 (2018 to 2020)	–	–	–	–	–
LTI 2019 (2019 to 2021)	–		–	–	–
Others	375	22%	–	375	–
Compensation awarded or due pursuant to § 162 AktG	**1,670**	**100%**	**–**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**4,835**	**–**
Service cost	452	–	–	452	–
Total compensation	**2,122**	**–**	**–**	**5,287**	**–**

	Matthias Heinzel Member of the Executive Board (since April 1, 2021)				
	In the fiscal year (pursuant to section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2021		2020	**2021**	2020
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	900	97%	–	900	–
Additional benefits	25	3%	–	25	–
Profit sharing				–	–
Profit sharing 2019	–		–	–	–
Profit sharing 2020	–	–	–	–	–
Profit sharing 2021	–		–	2,385	–
LTIP				–	–
LTI 2017 (2017 to 2019)	–		–	–	–
LTI 2018 (2018 to 2020)	–	–	–	–	–
LTI 2019 (2019 to 2021)	–		–	–	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**925**	**100%**	**–**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**3,310**	**–**
Service cost	387	–	–	387	–
Total compensation	**1,312**	**–**	**–**	**3,697**	**–**

	Marcus Kuhnert Member of the Executive Board				
	In the fiscal year (pursuant to section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2021		2020	**2021**	2020
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	20%	1,000	1,200	1,000
Additional benefits	42	1%	25	42	25
Profit sharing				–	2,640
Profit sharing 2019	–		2,284	–	–
Profit sharing 2020	2,640	43%	–	–	2,640
Profit sharing 2021	–		–	2,654	–
LTIP				–	2,256
LTI 2017 (2017 to 2019)	–		977	–	–
LTI 2018 (2018 to 2020)	2,256	37%	–	–	2,256
LTI 2019 (2019 to 2021)	–		–	3,300	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**6,138**	**100%**	**4,286**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**7,196**	**5,921**
Service cost	406	–	409	406	409
Total compensation	**6,544**	**–**	**4,695**	**7,602**	**6,330**

Compensation awarded and due to former members of the Executive Board in the fiscal year

The compensation awarded or due to former members of the Executive Board during the fiscal year is also presented below. Tranches of the LTIP already allocated before a member of the Executive Board left the company continue to run until the end of the originally contractually agreed term and are settled and paid out after the end of the performance period. In addition, some members who have already left the Executive Board receive fixed payments from pension plans.

In individual cases, there are pension commitments from previous agreements which provide for a supplementary annual variable payment. In accordance with the individual contractual agreements, such supplementary payment is based on the profit of the Group of E. Merck KG, Darmstadt, Germany, and is capped with reference to a percentage of the pension amount received.

The following tables show the compensation awarded or due to former members of the Executive Board in fiscal year 2021 in accordance with section 162 (1) of the German Stock Corporation Act (AktG) and the respective relative share of total compensation. For former members of the Executive Board who left the Executive Board in the last ten years, the information is given by nameing. All members of the Executive Board who left previously are presented anonymously in order to comply with § 162 Stock Corporation Act (AktG) para. 5 sentence 2 on the omission of personal data.

Compensation awarded or due

	Stefan Oschmann Chair of the Executive Board (until April 30, 2021)		
	2021		2020
	€ thousand	in %	€ thousand
Pension	373	12%	–
Others (waiting allowance)	2,745	88%	–
Compensation awarded or due pursuant to § 162 AKtG	**3,118**	**100%**	**–**

	Udit Batra Member of the Executive Board (until July 13, 2020)		
	2021		2020
	€ thousand	in %	€ thousand
Base salary	–	–	636
Additional benefits	–	–	4
Profit sharing	–		–
Profit sharing 2019	–	36%	2,800
Profit sharing 2020	1,364		–
Group LTIP	–		–
LTI 2017 (2017 to 2019)	–	64%	1,262
LTI 2018 (2018 to 2020)	2,428		–
Others	–	–	–
Pension	–	–	–
Compensation awarded or due pursuant to § 162 AKtG	**3,792**	**100%**	**4,702**
Service cost	–	–	147
Total compensation	**3,792**	**–**	**4,849**

	Walter Galinat Member of the Executive Board (until September 30, 2018)		
	2021		2020
	€ thousand	in %	€ thousand
Group LTIP			
LTI 2017 (2017 to 2019)	–	76%	759
LTI 2018 (2018 to 2020)	998		–
Others	–	–	–
Pension	313	24%	313
Compensation awarded or due pursuant to § 162 AKtG	**1,311**	**100%**	**1,072**

	Former Member of the Executive Board 1		
	2021		2020
	€ thousand	in %	€ thousand
Pension	542	57%	542
Complementary payment (variable)	406	43 %	400
Compensation awarded or due pursuant to § 162 AKtG	**948**	**100%**	**942**

	Former Member of the Executive Board 2		
		2021	2020
	€ thousand	in %	€ thousand
Pension	679	57%	679
Complementary payment (variable)	510	43%	502
Compensation awarded or due pursuant to § 162 AKtG	**1,189**	**100%**	**1,181**

	Former Member of the Executive Board 3		
	2021		2020
	€ thousand	in %	€ thousand
Pension	441	57%	441
Complementary payment (variable)	331	43 %	326
Compensation awarded or due pursuant to § 162 AKtG	**772**	**100%**	**767**

	Former Member of the Executive Board 4		
	2021		2020
	€ thousand	in %	€ thousand
Pension	447	57%	447
Complementary payment (variable)	335	43 %	330
Compensation awarded or due pursuant to § 162 AKtG	**782**	**100%**	**777**

	Former Member of the Executive Board 5		
	2021		2020
	€ thousand	in %	€ thousand
Pension	361	57%	361
Complementary payment (variable)	271	43 %	267
Compensation awarded or due pursuant to § 162 AKtG	**632**	**100%**	**628**

	Former Member of the Executive Board 6		
	2021		2020
	€ thousand	in %	€ thousand
Pension	128	67%	128
Complementary payment (variable)	64	33 %	63
Compensation awarded or due pursuant to § 162 AKtG	**192**	**100%**	**191**

	Former Member of the Executive Board 7		
	2021		2020
	€ thousand	in %	€ thousand
Pension	324	67%	324
Complementary payment (variable)	162	33 %	160
Compensation awarded or due pursuant to § 162 AKtG	**486**	**100%**	**484**

	Former Member of the Executive Board 8		
	2021		2020
	€ thousand	in %	€ thousand
Pension	211	58%	211
Complementary payment (variable)	151	42 %	148
Compensation awarded or due pursuant to § 162 AKtG	**362**	**100%**	**359**

	Former Member of the Executive Board 9		
	2021		2020
	€ thousand	in %	€ thousand
Pension	87	2%	520
Complementary payment (variable)	4,894	98 %	4,385
Compensation awarded or due pursuant to § 162 AKtG	4,980	100%	4,905

In addition, as a result of a Higher Regional Court ruling, a back payment of the 2008 and 2009 profit sharing and corresponding interest were to be paid to a former member of the Executive Board in fiscal year 2021.

	Former Member of the Executive Board 10		
	2021		2020
	€ thousand	in %	€ thousand
Back payment profit sharing			
Profit sharing 2008	3,185	65%	–
Profit sharing 2009	2,845		–
Others	3,303	35%	–
Compensation awarded or due pursuant to § 162 AKtG	**9,333**	**100%**	**–**

Former members of the Executive Board who only received pension payments in the 2021 fiscal year are shown in the following table. The compensation granted and owed in the 2021 fiscal year in accordance with section 162 (1) AktG consists entirely of non-performance-related compensation elements.

Pension payments

€ thousand	**2021**	2020
Karl-Ludwig Kley	630	630
Bernd Reckmann	459	430
Michael Becker	466	466
Former member of the Executive Board 11	430	418

Compliance with the defined maximum compensation

The maximum compensation limits the compensation granted in the fiscal year, i.e., the total of all non-performance-related and performance-related compensation elements granted in a fiscal year. Pension payments are not included in the maximum compensation.

The maximum compensation for the fiscal year is € 11,500,000 for the Chair of the Executive Board and € 9,500,000 each for ordinary members of the Executive Board. The total compensation awarded or due in accordance with §162 of the Stock Corporation Act (AktG) less any pension payments and plus service costs is below the defined maximum compensation in accordance with §87a AktG for all members of the Executive Board.

For Stefan Oschmann, a legacy agreement existed prior to the approval of the compensation system by the Annual General Meeting 2021, which provides for a maximum compensation of €12,700,000 in the fiscal year 2021 taking into account the retirement as of April 30, 2021. Such maximum compensation was also complied with in the fiscal year 2021.

In addition to the maximum compensation, there is a separate payment cap for each of the performance-related compensation elements. An upper limit has been set for the amount of profit sharing for all members of the Executive Board. The payout from the Long-Term Incentive Plan cannot exceed 2.5 times the individual award value, even in the case of exceptional performance. In addition, there is a cap on the amount of the total of profit sharing, LTIP and fixed compensation.

Compliance with the defined maximum compensation is ensured by the Personnel Committee setting the amounts of the variable compensation components by resolution.

The defined maximum compensation for the members of the Executive Board is shown in the following table.

Overall compensation limit

in €	Maximum compensation pursuant to section 87a AktG
Belén Garijo (Chair since May 1, 2021)	11,500,000
Kai Beckmann	9,500,000
Peter Guenter (since January 1, 2021)	9,500,000
Matthias Heinzel (since April 1, 2021)	9,500,000
Marcus Kuhnert	9,500,000

Compensation for the Supervisory Board members in fiscal year 2021

The compensation of the Supervisory Board members is defined by article 20 of the Articles of Association of Merck KGaA, Darmstadt, Germany, and corresponds to the compensation system for the Supervisory Board that was adopted by the 2021 Annual General Meeting with 99.64% of the votes cast.

Accordingly, the members of the Supervisory Board receive fixed compensation of € 47,000 per year. The Chairman receives double and the Vice Chairman receives one and a half times this amount. In addition to their fixed compensation, Supervisory Board members who are also members of the Audit Committee, which has been established in the meeting of the Supervisory Board on February 26, 2021, receive annual compensation of € 15,000. The Chair of the Audit Committee receives additional annual compensation of € 30,000. In fiscal year 2021, the compensation for membership of the Audit Committee was paid pro rata temporis.

Moreover, the members receive additional compensation of € 750 per meeting they attend.

The compensation granted and owed and the respective relative share of the total compensation for the current members of the Supervisory Board is presented in the following table. No members stepped down from the Supervisory Board in the fiscal year. There were no payments to former members of the Supervisory Board in the fiscal year.

Compensation awarded or due

	2021							2020				
	Fixed compensation		**Compensation for committee duties**		**Meeting fees**		**Total compensation**	Fixed compensation		Meeting fees		Total compensation
	€ thousand	in %	€ thousand	in %	€ thousand	in %	€ thousand	€ thousand	in %	€ thousand	in %	€ thousand
Wolfgang Büchele	94.0	86%	12.7	12%	3.0	3%	109.7	94.0	97%	3.0	3%	97.0
Sascha Held	70.5	82%	12.7	15%	3.0	3%	86.2	70.5	96%	3.0	4%	73.5
Gabriele Eismann	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Edeltraud Glänzer	47.0	75%	12.7	20%	3.0	5%	62.7	47.0	94%	3.0	6%	50.0
Jürgen Glaser	47.0	95%	–	–	2.3	5%	49.3	47.0	94%	3.0	6%	50.0
Michael Kleinemeier	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Renate Koehler	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Anne Lange	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Peter Emanuel Merck	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Dietmar Oeter	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Alexander Putz (since May 28, 2020)	47.0	94%	–	–	3.0	6%	50.0	27.9	95%	1.5	5%	29.4
Christian Raabe	47.0	75%	12.7	20%	3.0	5%	62.7	47.0	94%	3.0	6%	50.0
Helene von Roeder	47.0	62%	25.4	34%	3.0	4%	75.4	47.0	94%	3.0	6%	50.0
Helga Rübsamen-Schaeff	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0
Daniel Thelen	47.0	75%	12.7	20%	3.0	5%	62.7	47.0	94%	3.0	6%	50.0
Simon Thelen	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	3.0	6%	50.0

Supervisory Board member Wolfgang Büchele received an additional € 140,000 (2020: € 140,000) for 2021 in this function as a member of the corporate bodies of E. Merck KG, Darmstadt, Germany.

Supervisory Board member Helga Rübsamen-Schaeff received an additional € 150,000 (2020: € 150,000) for 2021 in this function as a member of the corporate bodies of E. Merck KG, Darmstadt, Germany, and an additional € 6,000 (2020: € 6,000) for 2021 as a member of the Supervisory Board of Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

Supervisory Board member Michael Kleinemeier received an additional € 140,000 (2020: € 140,000) for 2021 in this function as a member of committees of E. Merck KG, Darmstadt, Germany.

Supervisory Board member Helene von Roeder received an additional € 150,000 (2020: € 150,000) for 2021 in this function as a member of the corporate bodies of E. Merck KG, Darmstadt, Germany.

Supervisory Board member Peter Emanuel Merck received an additional € 80,000 (2020: € 80,000) for 2021 in this function as a member of the corporate bodies of E. Merck KG, Darmstadt, Germany.

Supervisory Board member Daniel Thelen received an additional € 140,000 for 2021 in this function as a member of the corporate bodies of E. Merck KG, Darmstadt, Germany (2020: € 140,000).

Supervisory Board member Simon Thelen received an additional € 140,000 (2020: € 140,000) for 2021 in this function as a member of the corporate bodies of E. Merck KG, Darmstadt, Germany, and an additional € 3,000 (2020: € 3,000) for 2021 as a member of the Supervisory Board of Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

Comparative presentation of compensation and earnings development

The comparative presentation in accordance with section 162 (1) no. 2 of the AktG shows the annual change in the compensation of the members of the Executive Board and the members of the Supervisory Board, the development of earnings of the Group as well as the development of the average remuneration of a full-time employee of the Group over the last five years.

For employee compensation, the average personnel expenses excluding company pension costs are used. This reflects the total compensation of employees worldwide.

For members of the Executive Board, the compensation awarded and due in fiscal years 2020 and 2021 is used in accordance with section 162 of the German Stock Corporation Act (AktG). For the years 2019, 2018 and 2017, the allocated compensation is used excluding the service costs according to the DCGK sample table in the compensation report of the respective fiscal year.

The increase in Supervisory Board compensation is due to the introduction of additional compensation for the Audit Committee.

Comparative presentation

€ thousand / in %	**2021**	2020	**Change 2021/2020**	Change 2020/2019	Change 2019/2018	Change 2018/2017
Member of the Executive Board						
Belén Garijo (Chair since May 1, 2021)	8,097	5,651	43.30%	-6.90%	7.20%	6.00%
Stefan Oschmann (until April 30, 2021)	8,436	8,149	3.50%	-11.40%	58.90%	-20.10%
Kai Beckmann	6,314	4,580	37.90 %	-11.00%	26.20%	-26.00%
Peter Guenter (since January 1, 2021)	1,670	–	–	–	–	–
Matthias Heinzel (since April 1, 2021)	925	–	–	–	–	–
Marcus Kuhnert	6,138	4,286	43.20%	-9.70%	27.40%	-4.20%
Former Member of the Executive Board						
Stefan Oschmann (until April 30, 2021)	3,118	–	–	–	–	–
Udit Batra (until July 13, 2020)	3,792	4,702	-19.40%	-16.30%	34.90%	-1.20%
Walter Galinat (until September 30, 2018)	1,311	1,072	22.30%	-10.10%	-59.30%	-7.60%
Karl-Ludwig Kley (until August 31, 2016)	630	630	–	67.10%	-25.50%	-82.00%
Bernd Reckmann (until 29. April 2016)	459	430	6.70%	-43.00%	184.50%	-87.20%
Michael Becker (until December 31, 2011)	466	466	–	1.50%	1.80%	1.60%
Former member of the Executive Board 1	948	942	0.60%	1.60%	2.40%	0.90%
Former member of the Executive Board 2	1,189	1,181	0.70 %	1.60%	2.50%	0.90%
Former member of the Executive Board 3	772	767	0.70%	1.60%	2.40%	1.00%
Former member of the Executive Board 4	782	777	0.60%	1.60%	2.40%	1.00%
Former member of the Executive Board 5	632	628	0.60%	1.60%	2.30%	1.00%
Former member of the Executive Board 6	192	191	0.50%	1.60%	2.20%	1.10%
Former member of the Executive Board 7	486	484	0.40%	1.50%	2.40%	1.10%
Former member of the Executive Board 8	362	359	0.80%	1.70%	2.30%	1.00%
Former member of the Executive Board 9	4,980	4,905	1.50%	-0.60%	-1.40%	9.80%
Former member of the Executive Board 10	9,333	–	–	–	–	–
Former member of the Executive Board 11	430	418	2.90%	–	-17.20%	32.20%
Member of the Supervisory Board						
Wolfgang Büchele	109.7	97.0	13.09%	–	–	–
Sascha Held	86.2	73.5	17.28%	110.00%	–	–
Gabriele Eismann	50.0	50.0	–	-1.50%	1.50%	–
Edeltraud Glänzer	62.7	50.0	25.40%	–	–	1.50%
Jürgen Glaser	49.3	50.0	-1.40%	42.10%	–	–
Michael Kleinemeier	50.0	50.0	–	45.20%	–	–
Renate Koehler	50.0	50.0	–	42.10%	–	–
Anne Lange	50.0	50.0	–	45.20%	–	–
Peter Emanuel Merck	50.0	50.0	–	42.10%	–	–
Dietmar Oeter	50.0	50.0	–	-1.50%	1.50%	–
Alexander Putz (since May 28, 2020)	50.0	29.4	69.83%	87.70%	-68.60%	1.50%
Christian Raabe	62.7	50.0	25.40%	42.10%	–	–
Helene von Roeder	75.4	50.0	50.80%	42.10%	–	–
Helga Rübsamen-Schaeff	50.0	50.0	–	–	–	1.50%
Daniel Thelen	62.7	50.0	25.40%	42.10%	–	–
Simon Thelen	50.0	50.0	–	42.10%	–	–
Personnel expenses without pension expenses	5,608,000	5,363,000	4.60%	8.90%	4.70%	3.70%
Average number of employees	58,706	57,580	2.00%	7.40%	-0.30%	3.40%
Average compensation of an employee	96	93	2.60%	1.40%	5.00%	0.20%
Earnings development						
Profit after tax of Merck KGaA, Darmstadt, Germany (IFRS)	3,065,000	1,994,000	53.70%	50.60%	-61.00%	29.90%
Profit after tax of the Group of E. Merck KG, Darmstadt, Germany (IFRS)	3,003,000	1,915,000	56.80%	52.60%	-62.20%	30.40%

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 2021 are being filed with the electronic German Federal Gazette (elektronischer Bundesanzeiger) and are available on the website of the German company register.

Merck KGaA, headquartered in Darmstadt, Germany, is the parent company of the Group. In addition to its function as a holding company, Merck KGaA, Darmstadt, Germany, generates sales in the Life Science, Healthcare, and Electronics business sectors. Merck KGaA, Darmstadt, Germany, employs the majority of the 11,000-plus workforce in Darmstadt.

The financial statements of Merck KGaA, Darmstadt, Germany, have been prepared in accordance with the provisions of the German Commercial Code (HGB), as amended by the German Accounting Directive Implementation Act (BilRUG), and the German Stock Corporation Act (AktG). 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 operator of the electronic Federal Gazette (elektronischer Bundesanzeiger), where they are published and forwarded to the company register.

Statement on Corporate Governance

For fiscal 2021, our company exercises the option to publish the corporate governance statement on the Group website in accordance with section 315d HGB in conjunction with section 289f (1) sentence 2 of the HGB. The corporate governance declaration is available on the company's website at **https://www.emdgroup.com/en/investors/corporate-governance/reports.html**.

Effects of material company agreements on the net assets, financial position, and results of operations

End of the temporary business lease of our Healthcare and Electronics business sectors

As part of the strategic development of Merck KGaA, Darmstadt, Germany, the existing operating activities of our Life Science, Healthcare, and Electronics business sectors within Merck KGaA, Darmstadt, Germany, together with the relevant assets and liabilities (hereinafter: "operating sectors"), were spun off at their carrying amounts into three separate companies (hereinafter: "OpCo" or plural "OpCos") with the legal form of a GmbH or German limited liability corporation (operating spin-off). This operating spin-off is based on the spin-off and takeover agreement concluded between Merck KGaA, Darmstadt, Germany, and the OpCos in notarized form on March 2, 2018. Following approval by the 2018 Annual General Meeting, the operating spin-off took place with economic effect as of 0:00 on January 1, 2018.

Immediately after the spin-off took effect, all shares held by Merck KGaA, Darmstadt, Germany, in the respective OpCos were transferred to holding companies via a further spin-off (holding company spin-off), as a result of which the OpCos are each indirectly held by Merck KGaA, Darmstadt, Germany, via an intermediate holding company. The acquiring legal entities within the scope of the holding company spin-off were Merck Life Science Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, for the business shares of Life Science OpCo, Merck Healthcare Holding GmbH, Darmstadt, Germany, a subsidiary of

Merck KGaA, Darmstadt, Germany, for the business shares of Healthcare OpCo, and Merck Performance Materials Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, for the business shares of Electronics OpCo (referred to individually as "HoldCo", independently of the sector, and jointly as "HoldCos"). To this end, Merck KGaA, Darmstadt, Germany, and the HoldCos signed a notarized spin-off and takeover agreement on March 2, 2018. The holding company spin-off took place with economic effect as of 0:00 on January 1, 2018.

Since the technical system requirements for the introduction of the sector-specific enterprise resource planning systems (hereinafter "ERP") as regards the OpCos were not in place at the time of the spin-off, the business activities spun off to the OpCos have been temporarily leased back by the relevant OpCos to Merck KGaA, Darmstadt, Germany, until sector-specific ERP systems have been introduced. For this purpose, also on March 2, 2018, Merck KGaA, Darmstadt, Germany, entered into a business leasing contract with each respective OpCo with economic effect as of 0:00 on January 1, 2018, to lease back all the operating business previously spun off to the OpCo. Under the terms of the respective business leasing contract, Merck KGaA, Darmstadt, Germany, leases the entire operation from the respective OpCo, as well as all fixed assets in this context; it acquires the current assets as well as certain liabilities and provisions at their carrying amounts under German commercial law. The business lease allowed the spin-off measures to be implemented for all OpCos with economic effect at a uniform time, 0:00 on January 1, 2018, while retaining the flexibility of transitioning the management of the relevant operating business in accordance with the sector-specific ERP introduction at an individual time to the OpCo in question in a targeted manner. On the basis of the business leasing contract, Merck KGaA, Darmstadt, Germany, will temporarily continue to operate the spun-off business as a leaseholder in its own name and for its own account. Once the relevant ERP systems have been introduced for the respective OpCo, the business lease with this OpCo will be terminated and the business previously leased out will pass to the OpCo.

The aforementioned spin-off and business leasing contracts form part of an overall entrepreneurial concept. They were submitted to the Annual General Meeting of Merck KGaA, Darmstadt, Germany, on April 27, 2018, (Annual General Meeting 2018) for approval as a coherent restructuring measure and were approved. In 2018, the Healthcare OpCo changed its legal form to that of a German corporation with general partners (Kommanditgesellschaft auf Aktien) and has since been trading under the name of Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

The business leasing contract under which our Healthcare business sector was leased back to Merck KGaA, Darmstadt, Germany, was terminated on January 11, 2019, with economic effect as of 24:00 on March 31, 2019. As a result of the end of the business leasing contract, the leased objects allocated to our Healthcare business sector at the end of the lease – comprising current assets as well as certain liabilities and provisions – were transferred to Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, at their carrying amounts under German commercial law.

As planned, the business leasing contract between Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, for the distribution and sales function of our Electronics business sector was terminated on November 18, 2019, with economic effect as of 24:00 on December 31, 2019. By way of an agreement dated November 18, 2019, the business leasing contract for the other functions of our Electronics business sector remains in place. Accordingly, the distribution and sales function of our Electronics business sector moved to Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, with economic effect as of 0:00 on January 1, 2020. The sector-specific ERP system for the distribution and sales function of our Electronics business sector was introduced at Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, as planned on January 1, 2020. As a result of the partial termination of the business leasing contract, the leased objects allocated to the distribution and sales function of our Electronics business sector at the end of the lease – comprising current assets as well as certain liabilities and provisions – were transferred to Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, at their carrying amounts under German commercial law. The contractual, process, procedural, and working relationships allocated to the

function were also transferred to Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

As the carrying amounts of the assets exceeded the carrying amounts of the liabilities, Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, made a settlement payment to Merck KGaA, Darmstadt, Germany. In addition, the licenses for the intangible assets and know-how of the distribution and sales function leased to Merck KGaA, Darmstadt, Germany, came to an end.

As a result of the aforementioned spin-off and restructuring measures and the business leasing contract that remains in place, Merck KGaA, Darmstadt, Germany, still continues to manage the operating business of our Electronics business sector with the exception of part of the distribution and sales function. Furthermore, as a result of the business leasing contract, Merck KGaA, Darmstadt, Germany, also runs the operating business of our Life Science business sector.

Construction of the Gernsheim Science and Technology Park (“Fluxum Gernsheim”)

As part of the strategic development of the Gernsheim site into a science and technology park, various operations at the Gernsheim site have been bundled and transferred to separate subsidiaries domiciled in Gernsheim.

Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany

Firstly, this relates to the transfer of site management functions based in Gernsheim (hereinafter referred to as “SM Gernsheim”) from Merck KGaA, Darmstadt, Germany, to Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, which will act as an infrastructure service provider at the site in the future, by way of contribution. The transfer was based on the contribution agreement concluded between Merck KGaA, Darmstadt, Germany, and Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, in notarized form on September 21/22, 2021, which took effect from the end of September 30, 2021. The agreement provided for the transfer of the assets and liabilities attributable to SM Gernsheim to Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany at their current carrying amounts. This primarily related to the balance sheet items of fixed assets, inventories, other receivables, and pension provisions, including the plan assets offset in accordance with section 246 (2) sentence 2 HGB, as well as the transfer of 96 employees together with the corresponding personnel provisions.

Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany

Secondly, this relates to the transfer of the Gernsheim-based production operations of the Surface Solutions business unit within our Electronics business sector, including the Gernsheim-specific Electronics shared functions and the Gernsheim logistics operation (hereinafter referred to collectively as “SSG Production”), by way of their separation and transfer to Merck Gernsheim Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, under transformation law and their subsequent spin-off to Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

The separation relating to SSG Production was based on the separation and transfer agreement concluded between Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Gernsheim Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, in notarized form on August 10, 2021. The separation took place with economic effect as of 0:00 on July 1, 2021. As Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, was leasing SSG Production to Merck KGaA, Darmstadt, Germany, under a business leasing contract at this time, the separation involved not only the transfer of the assets and liabilities of SSG Production held by Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of

Merck KGaA, Darmstadt, Germany, to Merck Gernsheim Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, at their current carrying amount, but also, with the approval of Merck KGaA, Darmstadt, Germany, the transfer of the rights and obligations of Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, relating to SSG Production under the aforementioned business leasing contract (the separated portion of the business leasing contract relating to SSG Production being hereinafter referred to as the "SSG business leasing contract").

Immediately after the separation took economic effect, all the assets and liabilities transferred to Merck Gernsheim Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and the rights and obligations arising from the separated SSG business leasing contract were spun off to Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. Merck Gernsheim Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, entered into a notarized spin-off and takeover agreement to this effect on August 10, 2021. The spin-off and the separation took place with economic effect as of 0:00 on July 1, 2021.

As the technical system requirements for Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, to commence operations were not yet fulfilled when the spin-off took place, the separated SSG business leasing contract between Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, continued to be implemented as previously for a brief transitional period. The SSG business leasing contract was subsequently terminated on August 31, 2021, with effect from the end of September 30, 2021. Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, commenced operations via SSG Production with effect from October 1, 2021. As a result of the termination of the SSG business leasing contract, the leased objects allocated to SSG Production within our Electronics business sector at the end of the lease – largely comprising inventories as well as certain liabilities and provisions – were transferred to Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, at their carrying amounts under German commercial law. The contractual, process, procedural, and working relationships (603 employees) allocated to SSG Production were also transferred to Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. As the carrying amounts of the assets exceeded the carrying amounts of the liabilities, Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, made a settlement payment to Merck KGaA, Darmstadt, Germany.

The following table shows the impact of the transfers to the Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and the Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, on the net assets and financial position of Merck KGaA, Darmstadt, Germany. The spin-off of the operations mainly resulted in lower sales, material, personnel and other operating expenses in fiscal year 2021.

€ million	**Carrying amounts of the carved-out assets and liabilities**
Assets	
A. Fixed assets	
Intangible assets	0.1
Tangible assets	2.1
Financial assets	–
	2.2
B. Current assets	
Inventories	66.3
Trade accounts receivable	0.1
Other receivables and other assets	18.6
Cash and cash equivalents	–
	85.0
C. Prepaid expenses	–
Total assets	**87.2**
Equity and liabilities	
A. Provisions	
Provisions for pensions and other post-employment benefits	7.8
Other provisions	9.5
	17.3
B. Liabilities	
Trade accounts payable	9.3
Other liabilities	–
	9.3
C. Deferred income	–
Total equity and liabilities	**26.6**
Net assets	**60.6**

Business development

The net sales of Merck KGaA, Darmstadt, Germany, increased moderately in 2021. The upturn of € 257 million primarily resulted from the Life Science business sector. On the other hand, net sales declined in the Electronics business sector in particular. The net sales of the Healthcare business sector relate to Group services oncharged to other companies in the Healthcare business sector.

			Change	
€ million	**2021**	**2020**	€ million	%
Life Science	1,537	1,169	368	31.5
Healthcare	531	508	23	4.5
Electronics	1,037	1,176	-138	-11.8
Other sales	327	323	4	1.2
Total	**3,433**	**3,176**	**257**	**8.1**

Other sales mainly included the intragroup oncharging of IT services, rent, and the umbrella brand, as well as other administrative services.

The share of sales with other Group companies (Group sales) amounted to 91.9% in the year under review (2020: 92.5%).

			Change	
€ million	**2021**	**2020**	€ million	%
Group internal product sales	1,944	1,890	54	2.8
Third party product sales	278	238	40	16.8
Group internal services	1,211	1,048	163	15.5
	3,433	**3,176**	**257**	**8.1**

At 72.0% (2020: 66.2%), the share of exports in 2021 was higher than in the previous year.

			Change	
€ million	**2021**	**2020**	€ million	%
Outside Germany	2,472	2,103	369	17.6
Germany	961	1,073	-112	-10.5
Total	**3,433**	**3,176**	**257**	**8.1**

Net sales in the Life Science business sector increased strongly compared with the previous year, mainly as a result of the global business development of the Process Solutions business unit (+42.4%); further information can be found under “Course of Business and Economic Position”. The Research Solutions (+3.4%) and Applied Solutions (+0.3%) business units also contributed to this development. Sales growth was recorded in all regions, with Europe, Asia-Pacific, and North America enjoying particularly pronounced upturns.

In the Electronics business sector, sales in the Display Solutions business unit including OLED sales declined by -6.3% year-on-year. The Surface Solutions business unit also recorded a double-digit downturn in sales (-39.4%) including Cosmetics sales. A mid-eight-figure amount of the downturn in the Surface Solutions business unit was attributable to the transfer of the operations at the Gernsheim site to a separate company,

Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, effective October 1, 2021. Additionally, the sale of inventories in connection with the transfer of the distribution and sales functions to Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, effective January 1, 2020 resulted in a one-off increase in net sales in the previous year. From a regional perspective, sales declined in Europe and Asia-Pacific in particular.

Results of operations

			Change	
€ million	**2021**	2020	€ million	%
Net sales	3,433	3,176	257	8.1
Other income	96	355	-259	-73.0
Cost of materials	-1,412	-1,265	-148	11.7
Personnel expenses	-1,195	-1,070	-124	11.6
Depreciation, amortization, and write-downs	-144	-131	-13	9.6
Other operating expenses	-946	-1,047	102	-9.7
Investment result	1,606	1,092	515	47.2
Financial result	-294	-345	51	-14.8
Profit before profit transfers and taxes	**1,145**	**765**	**380**	**49.7**
Profit transfers	-743	-520	-223	43.0
Taxes	-113	-64	-50	77.6
Profit after profit transfers and taxes	**289**	**181**	**108**	**59.4**

Profit after taxes and **profit transfers** increased on the back of higher net sales and investment income in particular, as well as lower other operating expenses. This was primarily offset by higher material and personnel expenses as well as the lower level of other income.

The higher **other income** in the previous year resulted mainly from the merger of AB Pensions GmbH & Co. KG, as well as higher reversals of provisions.

The **cost of materials** increased in line with net sales. The cost of materials in relation to sales remained largely unchanged at 41.1% (2020: 39.9%).

The higher level of **personnel expenses** was mainly attributable to the increase in pension provisions and provisions for bonuses, as well as salary increases for employees covered by and exempt from collective agreements. This was offset by a headcount reduction as a result of the employees transferred to Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, in connection with the construction of the Gernsheim Science & Technology Park; see section “Effects of material company agreements on the net assets, financial position, and results of operations“.

Depreciation, amortization and write-downs mainly increased as a result of the write-downs on software and property, plant and equipment in the previous year.

The decrease in **other operating expenses** was primarily due to lower expenses for other external services and procurements, fees, contributions and insurance premiums, and repairs and maintenance.

The **investment result** increased on the back of higher profit transfers and dividends from subsidiaries.

The lower level of interest expense in the **financial result** was due to lower interest expenses to the inhouse bank Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, as well as lower interest expenses in respect of third parties as a result of the repayment of bonds and external loans.

Net assets and financial position

Assets

			Change	
€ million	**Dec. 31, 2021**	Dec. 31, 2020	€ million	%
Fixed assets	**23,872**	**23,883**	**-11**	**-0.0**
Intangible assets	210	229	-18	-8.1
Tangible assets	857	862	-5	-0.5
Financial assets	22,805	22,793	12	0.1
Current assets	**1,645**	**1,447**	**198**	**13.7**
Inventories	454	470	-16	-3.4
Trade accounts receivable	122	133	-11	-8.6
Other receivables and other assets	1,069	843	226	26.8
Cash and cash equivalents	0	1	-0	-64.6
Prepaid expenses	**53**	**52**	**1**	**1.1**
	25,570	**25,382**	**188**	**0.7**

Equity and liabilities

			Change	
€ million	**Dec. 31, 2021**	Dec. 31, 2020	€ million	%
Net equity	**5,576**	**5,351**	**225**	**4.2**
Provisions	**1,831**	**1,735**	**95**	**5.5**
Provisions for pensions and other post-employment benefits	1,187	1,104	83	7.5
Other provisions	643	631	12	1.9
Liabilities	**18,150**	**18,283**	**-133**	**-0.7**
Financial liabilities	3,000	3,517	-517	-14.7
Trade accounts payable	319	263	56	21.2
Other liabilities	14,831	14,503	328	2.3
Deferred income	**13**	**13**	**0**	0.6
	25,570	**25,382**	**188**	**0.7**

Net assets increased slightly by 0.7%. The main increase on the asset side of the balance sheet related to current assets (€ 198 million), while net equity saw the biggest increase on the equity and liabilities side (€ 225 million). On the other hand, liabilities declined by € -133 million. The equity ratio increased slightly to 21.8% (2020: 21.1%).

The transfer of the Surface Solutions and Site Management operations at the Gernsheim site to separate subsidiaries resulted in the derecognition of the assets and liabilities attributable to this function (see section “Effects of material company agreements on the net assets, financial position, and results of operations”).

Other receivables and other assets increased mainly as a result of the higher level of investment income at subsidiaries.

The increase in provisions was caused by the rise in provisions for pensions and other provisions.

The decline in financial liabilities was attributable to the repayment of bonds and external loans.

Other liabilities largely rose as a result of the higher level of liabilities to affiliated companies at year-end, and in particular to the inhouse bank Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

Research and development

In fiscal 2021, research and development expenditure increased by € 24 million (10.7%) year-on-year to € 253 million (2020: € 229 million). A large portion was also incurred by companies outside the Group.

Research and development expenses

			Change	
€ million	**2021**	**2020**	€ million	%
Life Science	66	57	8	14.7
Healthcare	6	0	6	0.0
Electronics	165	159	6	4.0
Other R&D spending that cannot be allocated to individual business sectors	17	13	4	28.2
Total	**253**	**229**	**24**	**10.7**

The ratio of research and development spending to sales was 7.4% (2020: 7.2%). Overall, the average number of employees working in research and development was 1,098.

Dividend

For fiscal 2021, we are proposing to the Annual General Meeting the payment of a dividend of € 1.85 per share.

Personnel

As of December 31, 2021, Merck KGaA, Darmstadt, Germany, had 8,081 employees, representing a decrease as against the previous year (2020: 8,578). The reduction was primarily due to the employees transferred to Merck Site Management GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, in connection with the construction of the Gernsheim Science & Technology Park; 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	**2021**	2020
Production	3,109	3,222
Administration	3,102	3,119
Research	1,098	1,076
Logistics	628	633
Marketing and sales	495	470
Other	36	16
Total	**8,468**	**8,536**

Risks and opportunities

Merck KGaA, Darmstadt, Germany, is largely subject to the same opportunities and risks as the Group. More information can be found in the Report on Risks and Opportunities.

Forecast for Merck KGaA, Darmstadt, Germany

Deviations of actual business development in fiscal 2021 from the previously reported guidance

The Combined Management Report for 2020 initially stated that net sales in fiscal 2021 were expected to be at a similar level to fiscal 2020. Net income was also expected to be the same as in the previous year.

Net sales in the Life Science business sector increased strongly compared with the previous year, mainly as a result of the Process Solutions business unit (+42.4%). The Research Solutions (+3.4%) and Applied Solutions (+0.3%) business units also contributed to this development. Year-on-year sales growth was recorded in all regions, especially Europe, Asia-Pacific, and North America.

As expected, net sales in the Healthcare business sector were at the same level as in the previous year.

In the Electronics business sector, sales in the Display Solutions business unit including OLED sales declined by -6.3% year-on-year. The Surface Solutions business unit also recorded a double-digit downturn in sales (-39.4%) including Cosmetics sales. The downturn in the Surface Solutions business unit was attributable in part to the transfer of the operations at the Gernsheim site to a separate company, Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, effective October 1, 2021. Additionally, the sale of inventories in connection with the transfer of the distribution and sales functions to Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, effective January 1, 2020, resulted in a one-off increase in net sales in the previous year. From a regional perspective, sales declined in Europe and Asia-Pacific in particular.

Thanks to higher profit transfers and dividends from subsidiaries in particular, net income was above the forecast level despite lower income from the merger of AB Pensions GmbH & Co. KG and from the reversal of provisions.

Forecast 2022

Electronics is expected to see a low nine-figure downturn in sales as a result of the transfer of the Surface Solutions business unit to Merck Surface Solutions GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. The other business sectors are expected to see a similar level of sales to 2021.

As in the previous year, the financing costs of the Sigma-Aldrich acquisition and the Versum Materials acquisition will continue to adversely affect net income. Nevertheless, net income for 2022 is expected to see a similar level as in 2021 due to the positive investment income and dividends from the subsidiaries.

Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, will provide the company with sufficient financial resources and thus ensure liquidity.

No risks that could jeopardize the continued existence of the company have been identified.

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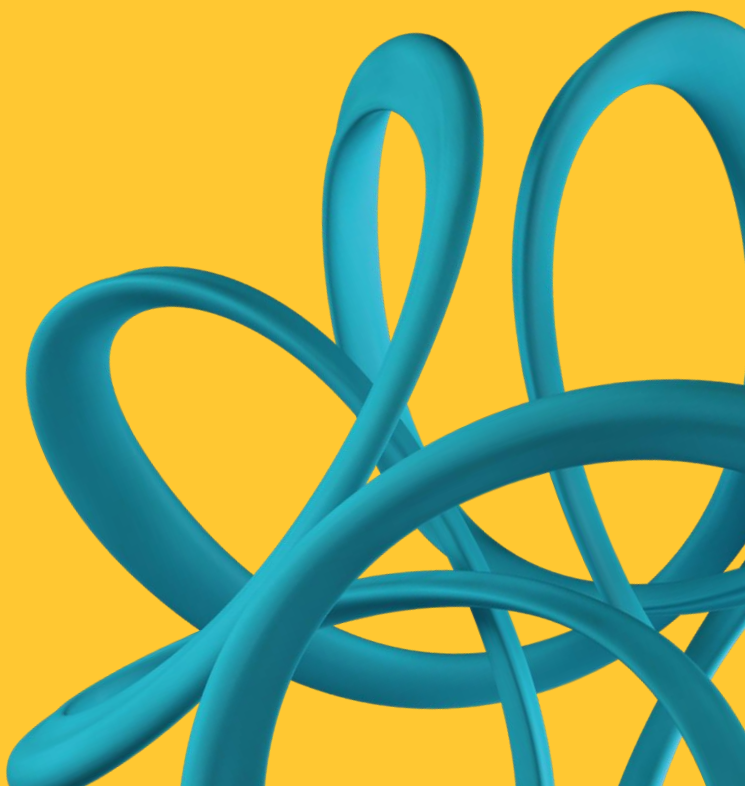
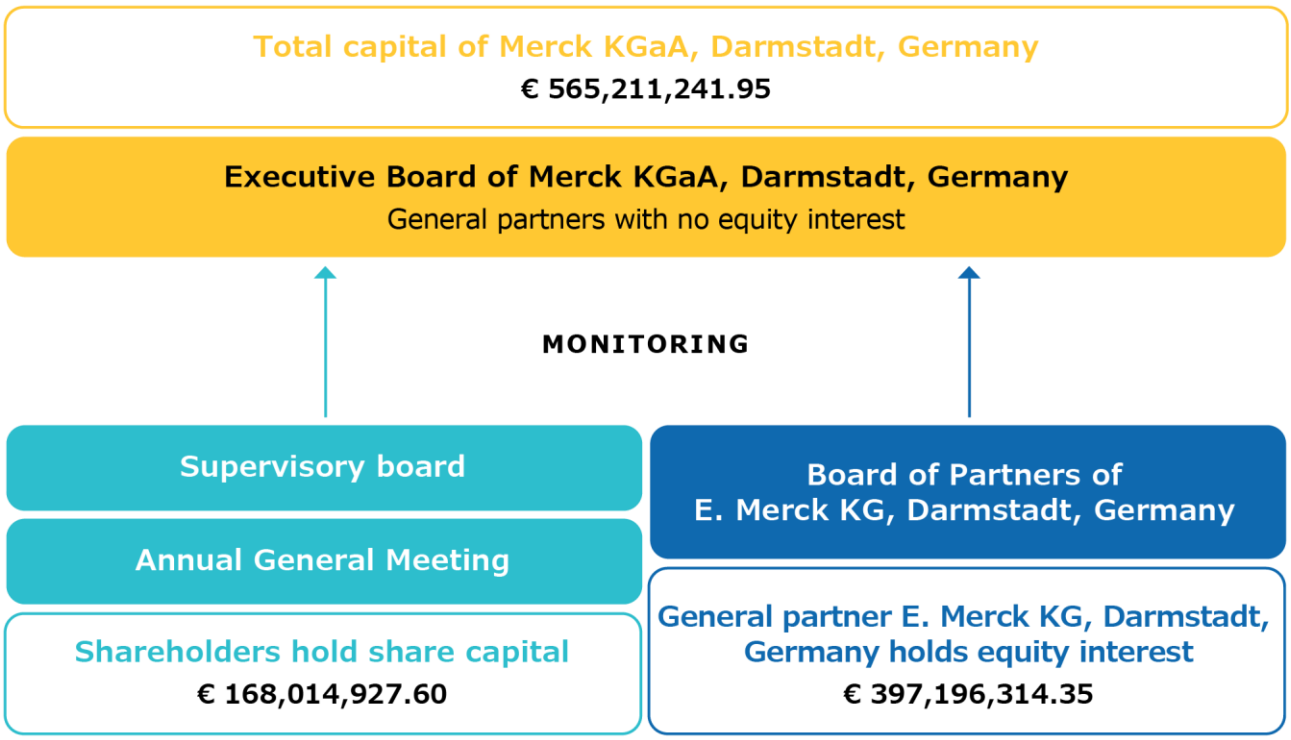
Corporate Governance



Capital Structure and Corporate Bodies of Merck KGaA, Darmstadt, Germany



Further information can be found under "**Merck KGaA, Darmstadt, Germany**" in the "**Statement on Corporate Governance**".

Statement on Corporate Governance

The Statement on Corporate Governance contains the Declaration of Conformity, relevant information on practices within the company, and a description of the procedures of the corporate bodies, as well as targets for the percentage of positions held by women and the diversity policy.

Joint report of the Executive Board and the Supervisory Board including Declaration of Conformity

The German Corporate Governance Code is geared toward the conditions found in a German stock corporation ("Aktiengesellschaft" or "AG") and does not take into consideration the special characteristics of a corporation with general partners ("Kommanditgesellschaft auf Aktien" or "KGaA") such as Merck KGaA, Darmstadt, Germany. Given the structural differences between an AG and a KGaA, several recommendations of the German Corporate Governance Code are to be applied to a KGaA only in a modified form. Major differences between the two legal forms exist in terms of liability and management. In the case of an AG, only the AG is liable as a legal entity, whereas the general partners of a KGaA also have unlimited personal liability for the company's obligations (section 278 (1) AktG). At Merck KGaA, Darmstadt, Germany, this pertains to both E. Merck KG, Darmstadt, Germany – which pursuant to article 8 (5) of the Articles of Association is excluded from management and representation – as well as to the managing general partners, who together make up the Executive Board of Merck KGaA, Darmstadt, Germany. The members of the Executive Board of Merck KGaA, Darmstadt, Germany, are therefore subject to unlimited personal liability. Unlike an AG, their executive authority is not conferred by the Supervisory Board, but rather by their status as general partners. Consequently, in addition to other responsibilities typical of the supervisory board of an AG (see description of the procedures of the Supervisory Board), the supervisory board of a KGaA does not have the authority to appoint the management board, draw up management board contracts, or specify compensation of the management board. This legal form also involves special features with regard to the General Meeting. For example, in a KGaA, many of the resolutions made require the consent of the general partners (section 285 (2) AktG), including in particular the adoption of the Annual Financial Statements (section 286 (1) AktG).

Merck KGaA, Darmstadt, Germany, applies the German Corporate Governance Code analogously where these regulations are compatible with the legal form of a KGaA. In order to enable shareholders to compare the situation at other companies more easily, to a broad extent we base corporate governance on the conduct recommendations made by the Government Commission of the German Corporate Governance Code and forgo having our own, equally permissible, code. The recommendations of the Code in the version dated December 16, 2019, the intent and meaning of which are applied, have been complied with in the period since the last Declaration of Conformity issued on February 26, 2021. We will continue to comply with the recommendations of the Code in the future.

For a clearer understanding, the following gives a general explanation of the application of German company law at Merck KGaA, Darmstadt, Germany, with additional references to the General Meeting and shareholder rights.

Merck KGaA, Darmstadt, Germany

The general partner E. Merck KG, Darmstadt, Germany, holds around 70% of the total capital of Merck KGaA, Darmstadt, Germany (equity interest); the shareholders hold the remainder, which is divided into shares (share capital). E. Merck KG, Darmstadt, Germany, is excluded from the management of business activities. The general partners with no equity interest (Executive Board) manage the business activities. Nevertheless, due to its substantial capital investment and unlimited personal liability, E. Merck KG, Darmstadt, Germany, has a

strong interest in the businesses of Merck KGaA, Darmstadt, Germany, operating efficiently in compliance with procedures. The participation of Merck KGaA, Darmstadt, Germany, in the profit/loss of E. Merck KG, Darmstadt, Germany, in accordance with articles 26 et seq. of the Articles of Association further harmonizes the interests of the shareholders and of E. Merck KG, Darmstadt, Germany. E. Merck KG, Darmstadt, Germany, appoints and dismisses the Executive Board. In addition, E. Merck KG, Darmstadt, Germany, has created bodies – complementing the expertise and activities of the Supervisory Board – to monitor and advise the Executive Board. This task applies primarily to the Board of Partners of E. Merck KG, Darmstadt, Germany.

Based on the provisions of the German Stock Corporation Act, the Articles of Association of Merck KGaA, Darmstadt, Germany, and the rules of procedure of the various committees, Merck KGaA, Darmstadt, Germany, has a set of rules for the Executive Board and its supervision that meet the requirements of the German Corporate Governance Code. The investors, who bear the entrepreneurial risk, are protected as provided for by the German Corporate Governance Code. We take suggestions from the capital market on corporate governance seriously and hold discussions with investors and shareholder representatives.

The General Meeting of Merck KGaA, Darmstadt, Germany

The 26th Annual General Meeting of Merck KGaA, Darmstadt, Germany, was held on April 23, 2021, in Darmstadt, Germany. In response to the Covid-19 pandemic, in 2021 the Executive Board again decided, with the approval of the Supervisory Board, to hold the 2021 Annual General Meeting in virtual form, i.e., without the shareholders and their proxies attending in person. In doing so, it exercised the option that the legislation again provided in 2021 in the form of the act on mitigating the consequences of the Covid-19 pandemic in civil, insolvency, and criminal procedure law (Gesetz zur Abmilderung der Folgen der Covid-19-Pandemie im Zivil-, Insolvenz- und Strafverfahrensrecht). Shareholders and shareholder representatives participated in the General Meeting virtually. The meeting was broadcast audiovisually on the Internet in full. At 70.10%, the proportion of share capital represented at the meeting (including postal votes) was slightly higher than in the previous year. In 2020, the proportion of share capital represented was 69.44%. The Annual General Meeting service provider does not forward voting instructions to our company in advance of the Annual General Meeting but keeps them in the system until the count takes place.

In particular, the Annual General Meeting passes resolutions concerning the approval of the Annual Financial Statements, the appropriation of net retained profit, the approval of the actions of the Executive Board members and the Supervisory Board members, the election of the auditor, amendments to the Articles of Association, the compensation system for the Executive Board, and the control and profit and loss transfer agreements of Merck KGaA, Darmstadt, Germany. The shareholders of Merck KGaA, Darmstadt, Germany, exercised their rights at the virtual Annual General Meeting using the Internet-based General Meeting system and via a prior question and answer process. Above and beyond the statutory requirements, this year shareholders were also given the opportunity to submit statements on the agenda to the company prior to the Annual General Meeting. These statements were published ahead of the Annual General Meeting and were available for shareholders to view until the end of the Annual General Meeting. They were able to exercise their voting rights personally, through an authorized representative, or through a proxy appointed by the company. The proxies were in attendance throughout the duration of the General Meeting. All the documents and information concerning upcoming General Meetings (including a summary explanation of shareholder rights) are also posted on our website. The introductory speech by the Chair of the Executive Board was published in advance on the Internet on April 15, 2021, in order to make it available to interested shareholders and members of the public and thus satisfy the high transparency requirements of the Group.

Declaration of Conformity

In accordance with section 161 AktG, applying the provisions of the German Corporate Governance Code correspondingly, the Executive Board and the Supervisory Board issued the following Declaration of Conformity with the recommendations of the Government Commission of the German Corporate Governance Code:

“Declaration of the Executive Board and the Supervisory Board of Merck KGaA, Darmstadt, Germany, on the recommendations of the Government Commission of the German Corporate Governance Code pursuant to section 161 of the German Stock Corporation Act (AktG). Since the last Declaration of Conformity on February 26, 2021, we have complied with the recommendations of the Government Commission of the German Corporate Governance Code in the version dated December 16, 2019, as published in the official section of the German Federal Gazette.

In view of future compliance with the current recommendations of the Government Commission of the German Corporate Governance Code, the Executive Board and the Supervisory Board declare the following: The company will comply with the recommendations of the Code in the version dated December 16, 2019.”

Darmstadt, February 2022

For the Executive Board
signed Belén Garijo

For the Supervisory Board
signed Wolfgang Büchele

Information on corporate governance practices

Reporting

It is the objective of Merck KGaA, Darmstadt, Germany, to provide the latest information to all shareholders, media, financial analysts, and interested members of the public, while creating the greatest possible transparency. For this reason, we uses a wide range of communication platforms to engage in a timely dialog with all interested parties about the company's situation and business changes. Our principles include providing factually correct, comprehensive, and fair information.

Information subject to disclosure requirements, as well as information that is not, can be accessed worldwide on the website of Merck KGaA, Darmstadt, Germany (**www.emdgroup.com**), which is the company's most important publication platform. In addition to a comprehensive financial calendar, quarterly statements and/or quarterly and half-year financial reports covering at least the past five years are available there in German and English. In line with the legal requirements, ad hoc announcements are also published on the website. These contain information on circumstances and facts that could impact the share price of Merck KGaA, Darmstadt, Germany.

Regular press conferences, investor meetings on the occasion of investor conferences, and roadshows offer another platform for dialog. The company presentations prepared for this purpose are also available on the website of Merck KGaA, Darmstadt, Germany. In addition, the Investor Relations team is available to private and institutional investors who wish to receive further information. To ensure the greatest possible transparency, all documents concerning the General Meeting are available on the company website. Additionally, at least some parts of the General Meeting are generally webcast live on the Internet. The Annual General Meeting on April 23, 2021, was again held virtually and hence was webcast live on the Internet in full.

Dealing with insider information

Dealing properly with insider information is very important to us. Our Insider Committee examines the existence of insider information, ensures compliance with legal obligations, and prepares any necessary measures. The members of the Insider Committee are appointed by the Executive Board; at least two members work in Group Legal & Compliance. The Insider Committee meets at regular intervals or when circumstances require. The Chief Financial Officer is vested with the authority to make the final decision on handling potential insider information.

In order to ensure a high level of protection for insider information, the Executive Board issued internal insider guidelines applicable throughout the Group worldwide, which were most recently updated in fiscal 2020. The guidelines inform employees about their responsibilities under insider trading laws and give clear instructions for compliant behavior. In addition, they describe the function of the Insider Committee in detail. Moreover, our Code of Conduct, which is binding for all employees, also contains an explicit, detailed reference to the ban on using insider information. Within the scope of obligatory training courses on the Code of Conduct as well as specific training courses on insider law, all employees are instructed on the key stipulations of insider trading.

Accounting and audits of financial statements

Merck KGaA, Darmstadt, Germany, prepares its Consolidated Financial Statements and Combined Management Report in accordance with International Financial Reporting Standards (IFRS), as applicable in the European Union, as well as the supplementary German statutory provisions applicable under section 315e (1) of the German Commercial Code (HGB). The Consolidated Financial Statements and the Combined Management Report are prepared by the Executive Board and examined by an auditor, taking into account the German generally accepted standards for the audit of financial statements promulgated by the Institute of Public Auditors in Germany (Institut der Wirtschaftsprüfer, IDW).

The Supervisory Board commissioned KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, to audit the Consolidated Financial Statements and the Combined Management Report for 2021. KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, is obliged to inform the Supervisory Board without delay of any grounds for disqualification or bias occurring during the audit if these cannot be immediately rectified. Additionally, the auditor shall immediately report to the Supervisory Board any findings and issues that emerge during the audit that have a direct bearing upon the tasks of the Supervisory Board. The auditor shall inform the Supervisory Board or note in the audit report any circumstances determined during the audit that would render inaccurate the Declaration of Conformity made by the Executive Board and the Supervisory Board. It has also been agreed with the auditor that in order to assess whether the Executive Board has fulfilled its obligations in accordance with section 91 (2) of the German Stock Corporation Act (AktG), the audit will also cover the company's early warning risk identification system. Moreover, the auditor is required to examine and evaluate the accounting-relevant internal control system insofar as this is necessary and appropriate for assessing the accuracy of financial reporting.

Since 1995, KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, has been the auditing firm responsible for the statutory audit of the Annual Financial Statements and Consolidated Financial Statements of Merck KGaA, Darmstadt, Germany. The auditor responsible for auditing the Consolidated Financial Statements changes regularly. Dirk Janz is currently leading the audit engagement. Mr. Janz has been the auditor in charge of the engagement since fiscal 2020. KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, has assured the company that it is independent of the group entities in accordance with the requirements of European law and German commercial and professional law, and that it has fulfilled its other German professional responsibilities in accordance with these requirements. The Supervisory Board has found no grounds to doubt the independence of KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin. Neither party identified any conflicts of interest. The Audit Committee reviews the quality of the audit, including the performance of the auditor in charge of the engagement, annually on the basis of objective indicators.

Due to the requirement to change auditors at regular intervals, Merck KGaA, Darmstadt, Germany, must appoint a new auditor (different than the current one) no later than for fiscal 2024. In fiscal 2019, the Supervisory Board of Merck KGaA, Darmstadt, Germany, therefore decided to prepare a public request for tender for the audit of the Annual Financial Statements and Consolidated Financial Statements of Merck KGaA, Darmstadt, Germany, and to voluntarily change auditors for the fiscal 2023 audit, earlier than required. The public request for tender was published in the German Federal Gazette in February 2020. Based on this request for tender, the Supervisory Board of Merck KGaA, Darmstadt, Germany, resolved at its meeting on July 30, 2021, to propose to the Annual General Meeting that Deloitte GmbH Wirtschaftsprüfungsgesellschaft, Munich, be elected as the auditor of the Annual Financial Statements and Consolidated Financial Statements of Merck KGaA, Darmstadt, Germany, for fiscal 2023. This resolution was based on a corresponding recommendation by the Audit Committee and in accordance with its preference.

Further reports

The combined management report of Merck KGaA, Darmstadt, Germany, and the Group for fiscal 2021 includes the compensation report and a combined non-financial declaration for the first time. This incorporates the non-financial declaration of the Group in accordance with section 315b HGB and the non-financial declaration of Merck KGaA, Darmstadt, Germany, in accordance with 289b HGB and section 315b (1) HGB in conjunction with section 298 (2) HGB. It is included as a separate chapter of the management report. An overview of the information contained in the combined non-financial declaration can be found at "**Topics for the non-financial statement**". In addition, our company publishes a sustainability report that meets the requirements of the Global Reporting Initiative (GRI) standards and contains reports in accordance with the standards published by the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-related Financial Disclosures (TCFD). This will be available from April 12, 2022, as an online version on the company's website at **https://www.emdgroup.com/en/sustainability-report/2021**.

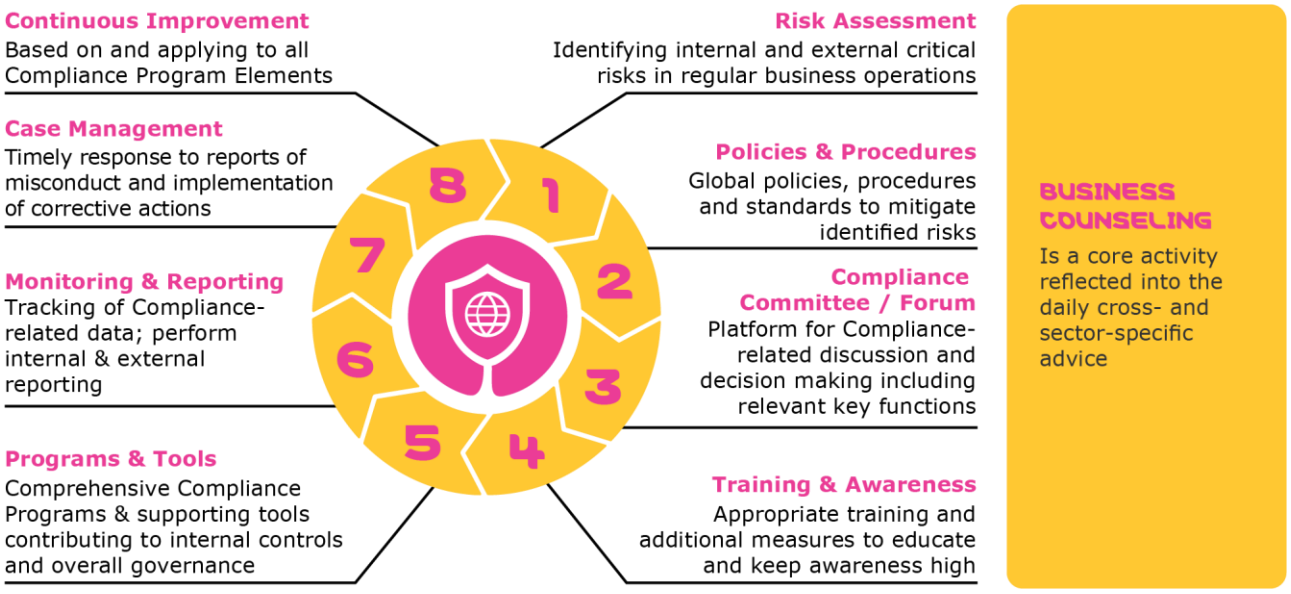
Values and compliance

First and foremost, responsible entrepreneurship means acting in accordance with the law – also known as compliance. All our activities are required to adhere to the applicable laws, regulations, and international ethical standards around the world. Compliance violations would result not only in possible legal action but also could seriously compromise our reputation as an employer and business partner.

Our "Group Compliance & Data Protection" function is responsible for the core topics of anti-corruption, anti-money laundering, business partner due diligence, data protection and transparency requirements, as well as for compliance with healthcare regulations and dawn raids. Group-wide policies, procedures, and processes are in place for these important compliance topics in order to ensure that our business activities are consistent with the relevant laws, regulations, and international ethical standards.

Our compliance management system encompasses important core elements that make up our compliance portfolio:

Elements of our compliance program



Living our values together is the underlying principle of our compliance management system. The Compliance department adopts a specific brief in this respect.

A global framework for ethical and legally compliant business processes serves to minimize risk. We achieve this by identifying specific compliance risks and requirements. Suitable policies and controls are implemented in order to reduce risk. Our goals also focus on our employees: It is up to us. This serves to strengthen employees' sense of responsibility and accountability. We achieve this by informing employees about the applicable compliance rules and ethical standards and by giving them the responsibility for complying with these requirements. As compliance is the second line of defense against risks, it is important that we consistently safeguard what really matters. This is why we regularly implement key figures that allow us to assess risks and the effectiveness of controls. Compliance not only contributes to company growth but also creates targeted value added by allowing us to advise the business sectors and help them to navigate the respective compliance requirements. The advice we provide takes account of changes in business requirements and is adapted accordingly.

Based on a corporate culture that places the fundamental company values – courage, achievement, responsibility, respect, integrity, and transparency – at the center of our entrepreneurial actions, our Code of Conduct (**http://www.emdgroup.com/company/responsibility/en/regulations-and-guidelines/code-of-conduct.pdf**) helps those involved in the business to implement the values when dealing with one another on a daily basis.

With its Code of Conduct, which was revised in mid-2017 and updated to reflect the changes in the Executive Board in 2021, we have established a set of rules and regulations that are intended to help our employees to act responsibly and to make the right decisions in their daily work.

The Code of Conduct explains the company principles for dealings with business associates, shareholders, colleagues, and employees, and within the scope of our responsibility for society. Therefore, it supports all employees in acting ethically – not only in their dealings with one another but also outside the company. Accordingly, the Code of Conduct is also the main set of rules for our Compliance Program. We have aligned the content of its Code of Conduct with our values and integrated important topics such as data privacy, healthcare compliance, and bioethics. To us, compliance means observing legal and internal regulations and the basic ethical principles anchored in the company's values. With the Code of Conduct and the various unit-specific ethical compliance rules, the values are integrated into daily work and business practice. The Code of Conduct applies to all employees, both at headquarters and in the subsidiaries. We also expect our business associates worldwide to accept these principles or to have their own comparable principles. While supplier management ensures compliant behavior of suppliers, global business partner risk management encompasses the relations with sales-related business associates such as distributors and wholesalers.

The Compliance department monitors observance of the Code of Conduct with support from corresponding monitoring and training programs throughout the Group. All employees are called upon to report potential compliance violations to their supervisor, Legal, HR, or other relevant departments or via the Compliance hotline. In cooperation with Group Internal Auditing, the Compliance Office regularly reviews the implementation of Group-wide compliance measures at the subsidiaries. The audits regularly focus on the local compliance structure, the compliance measures taken, and the existence of corresponding compliance guidelines and processes.

The Group Compliance Officer is responsible for the establishment, maintenance, and further development of our global Compliance Program. Among other things, the Group Compliance Officer and his team, consisting of a Center of Expertise and sector compliance officers, take appropriate measures to help lower the risk of serious violations of antitrust law, anti-corruption rules, and legal regulations and requirements of industry codes in the healthcare sector and support the business sectors with specific compliance input. Responsibility for money laundering prevention was added in 2018, with Compliance coordinating the necessary organizational measures, including risk analysis, policies, and training.

A further focus area of the Compliance Program is ensuring legally and ethically correct dealings with medical professionals and adhering to the transparency requirements. The Compliance organization has agreed on extensive measures with the affected areas of the company in order to establish an internal framework of rules as well as the corresponding processes for approving and documenting interactions with experts that ensure correct publication. We, of course, also ensure compliance with the respectively valid data protection regulations.

The role of the Group Compliance Officer is reflected in the subsidiaries, which ensure via country representatives that compliance measures are implemented in the countries. Since 2013, Compliance tasks in the countries and on a regional basis have largely been performed by full-time compliance officers. As a result, a higher level of compliance expertise is based locally, and the growing tasks in all business sectors are taken into account. At the same time, the management structure was streamlined and the reporting lines for the countries were consolidated regionally/globally. Since the end of 2016, the compliance officers in the countries have been reporting to the dedicated compliance officers for the respective business sectors (Life Science, Healthcare, and Electronics). A separate responsibility was also created for Group functions. Regular regional

and global compliance meetings are held to promote the exchange of information within the Compliance organization. This is supplemented by a global concept for local compliance forums and global compliance committees, at which compliance-related topics including the compliance priorities in the respective countries or at a global level are discussed with senior management. These constitute an important element of risk assessment and quality assurance.

Newcomer training seminars were introduced in 2010 for newly appointed compliance officers. These seminars serve to build up compliance expertise and strengthen cooperation within the Compliance organization. This Group-wide network is used to steer the global Compliance Program. Within the global Group Compliance function a Center of Expertise has been established with responsibility for the continuous maintenance and further development of the Compliance Program and shaping the company's internal compliance guidelines. The Compliance organization is also involved in the relevant due diligence processes for the incorporation of new business units as well as possible divestments and acquisitions, and the subsequent integration of companies. Within the scope of the global compliance program, a high degree of importance is attached to regular compliance seminars of our Compliance Training Plan, which are conducted as web-based training courses and classroom sessions. By presenting various training topics, particularly on the Code of Conduct, corruption, antitrust and competition law, as well as healthcare compliance and data protection, they serve to sensitize employees and management to the consequences of compliance violations and to show ways of avoiding them. Since we set up a central Compliance hotline, our employees and individuals outside of our company have been able to report compliance violations by telephone or via a web-based application in their respective language. The Compliance hotline is available 24 hours a day, free of charge. Case numbers enable anonymous, two-way communication. The reports received are individually reviewed. If a compliance violation exists, corresponding corrective action is taken based on concrete action plans. If necessary, disciplinary measures are taken. These can range from a simple warning up to the dismissal of the employee who violated a compliance rule. In 2010, we set up a Compliance Case Committee to guide these processes. The Compliance Case Committee consists of senior members from various Group governance functions; they are involved in reviewing compliance violations and introducing countermeasures. The joint work in the Compliance Case Committee enables processes between the various Group functions to be optimally coordinated and designed efficiently.

The Compliance Office reports regularly to the Executive Board, the Finance Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany, and the Audit Committee of the Supervisory Board, informing them of the status of compliance activities (including training status), compliance risks, and serious compliance violations.

The Executive Board informs the supervisory bodies at least once a year about the key compliance issues.

Data protection

Group data protection within the Group is integrated into the Group's Compliance organization. As required by law, this department operates independently and without being required to follow instructions. The department regularly prepares data protection updates and produces a comprehensive data protection report at regular intervals as part of our broader compliance reporting efforts. The Group Data Protection Officer has a team currently comprising around 20 employees who work around the world as local data protection officers and constitute a center of expertise for the provision of data protection structures and requirements. Other individuals around the world also perform a local data protection function alongside their primary activity for us.

Our data protection management encompasses various elements of our portfolio alongside the pillars of people and communication. The portfolio is composed as follows:

Elements of our data protection program

The data protection organization has put specific guidelines in place in order to ensure that data protection processes comply with the relevant regulations. The "Group Data Privacy Policy" defines the standards according to which data is processed, stored, used, and transmitted at our company. This enables us to provide a high level of protection when it comes to processing the data of our employees, contract partners, customers, suppliers, patients, healthcare practitioners, and participants in clinical trials. The statutory documentation requirements are realized in a central IT tool that also serves as the basis for key data protection processes: documenting processing activities, defining the local data protection officers, documenting video recordings and reports, and processing potential data protection violations. Our understanding of data protection throughout the Group is based on European legislation in particular, including the provisions of the EU's General Data Protection Regulation (EU GDPR), which has been in force since May 2018. However, we also comply with and implement local data protection regulations.

Risk and opportunity management

The Executive Board, the Supervisory Board, the Audit Committee, and the Finance Committee are regularly informed about the current risk portfolio of the Group and the individual companies. More detailed information can be found in the Report on Risks and Opportunities.

Avoidance of conflicts of interest

Within the framework of their work, all Executive Board and Supervisory Board members of Merck KGaA, Darmstadt, Germany, are exclusively committed to the interests of the company and neither pursue personal interests nor grant unjustified advantages to third parties.

Before an Executive Board member takes on honorary offices, board positions, or other sideline activities, this must be approved by the Personnel Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany. The Chair of the Executive Board, Belén Garijo, and the Chief Financial Officer, Marcus Kuhnert, are both members of the Executive Board of E. Merck KG, Darmstadt, Germany. This does not, however, create conflicts of interest.

In its report to the General Meeting, the Supervisory Board discloses any conflicts of interest involving its members and how they were dealt with. Consultancy agreements as well as other service and work contracts of a Supervisory Board member with our company require the approval of the Supervisory Board. In fiscal 2021, there were neither conflicts of interest, nor consultancy agreements or other service or work contracts with Merck KGaA, Darmstadt, Germany, including affiliates involving Supervisory Board members.

Adherence to environmental and safety standards

At our company, environmental protection is based on closed-loop thinking and the integration of precautionary measures into our process, procedural, and product development planning. The principles and strategies set out in our Environment, Health and Safety Policy implement the guidelines formulated by the national and international associations of the chemical industry in the Responsible Care guidelines. The Responsible Care Global Charter developed by the International Council of Chemical Associations (ICCA) emphasizes overall responsibility for products, supply chains, and society. We have signed this expanded version of the Responsible Care Global Charter for the entire Group. It is implemented by us at an international level. We report our ecological, economic, and social performance transparently in accordance with the internationally recognized principles of the Global Reporting Initiative (GRI).

- We have set ourselves the goal of climate-neutral business operations along the entire value chain by 2040 in terms of Scope 1 and Scope 2 as well as our Scope 3 emissions. By 2030, we intend to reduce our direct (Scope 1) and indirect (Scope 2) emissions by 50% compared with 2020. We aim to lower the indirect emissions in our value chain (Scope 3) by 1,500 metric kilotons of CO_2 equivalents by 2030.
- We also aim to source 80% of our purchased electricity from renewable sources by 2030.
- Furthermore, we intend to reduce the environmental impact of our waste by 5% between now and 2025 (based on our Waste Score), as well as reducing water consumption by 10% by 2025 and improving the quality of our waste water by 2030.

We aim to lower the lost time injury rate (LTIR) to below 1 by 2025. We are also developing a Global Health Concept for the entire Group. Many guidelines specify how the sites and employees of the Group are to observe the principles in their daily work. The Group function Corporate Sustainability, Quality and Trade Compliance steers these global activities and ensures compliance with statutory requirements, internal standards, and business needs throughout the entire Group. In this way, Group-wide risks are minimized, and continuous improvement is promoted in the areas of environment, health, safety, security, and quality. Corporate Responsibility reports are also published at regular intervals.

Procedures of the Executive Board, Supervisory Board, Board of Partners, and its Committees

Members of the Executive Board of Merck KGaA, Darmstadt, Germany

Information on memberships of statutory supervisory boards and comparable German and foreign supervisory bodies (section 285 no. 10 HGB in conjunction with section 125 (1) sentence 5 AktG).

Member	Memberships of (a) statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Belén Garijo Frankfurt am Main, Chair since May 1, 2021	(b) • Banco Bilbao Vizcaya Argentaria S. A., Bilbao, Spain (listed) • L'Oréal S. A., Clichy, France (listed)
Kai Beckmann Darmstadt, CEO Electronics	(a) • Bundesdruckerei GmbH, Berlin, Germany (not listed)
Peter Guenter (since January 1, 2021) Frankfurt am Main, CEO Healthcare	(b) • Galapagos N.V., Mecheln, Belgium (listed)
Matthias Heinzel (since April 1, 2021) Weinheim, CEO Life Science	(b) • International Flavors & Fragrances Inc. (IFF), New York, USA (listed)
Marcus Kuhnert Königstein, Chief Financial Officer	(b) • Döhler Group SE, Darmstadt, Germany (listed)
Stefan Oschmann (until April 30, 2021) Munich, Chairman until April 30, 2021	(a) • Springer Nature AG & Co. KGaA, Germany (not listed)

The general partners with no equity interest (Executive Board) manage the business activities in accordance with the laws, the Articles of Association, and the rules of procedure. They are appointed by E. Merck KG, Darmstadt, Germany, with the approval of a simple majority of the other general partners. The members of the Executive Board are jointly responsible for the entire management of the company. Certain tasks are assigned to individual Executive Board members based on a responsibility distribution plan. Each Executive Board member promptly informs the other members of any important actions or operations in his or her respective business area. Among other things, the Executive Board is responsible for preparing the Annual Financial Statements of Merck KGaA, Darmstadt, Germany, and of the Group as well as for approving the quarterly and half-year financial statements of the Group. In addition, the Executive Board ensures that all legal provisions, official regulations, and the company's internal policies are observed, and works to achieve compliance with them by all the companies of the Group. A Group-wide guideline defines in detail which transactions require prior approval by the Executive Board.

The Executive Board provides the Supervisory Board and its Audit Committee with regular, up-to-date, and comprehensive reports about all company-relevant issues concerning strategy, planning, business development, risk situation, risk management, and compliance. The rules of procedure of the Executive Board and of the Supervisory Board regulate the further details and ensure that the Supervisory Board is kept adequately informed by the Executive Board.

The Executive Board informs the Board of Partners and the Supervisory Board at least quarterly of the progress of business and the situation of the company. In addition, the Executive Board informs the aforementioned boards at least annually of the company's annual plans and strategic considerations.

The Executive Board passes its resolutions in meetings that are normally held once a month.

Supervisory Board

The Supervisory Board has 16 members. The Supervisory Board was composed as follows in fiscal 2021:

Member	Memberships of (a) other statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations	Member of the Supervisory Board since	Attendance of meeting of the Supervisory Board
Wolfgang Büchele (Chairman of the Supervisory Board) Römerberg, Chairman of Exyte GmbH, Stuttgart (Independent Shareholder Representative)	(a) • Gelita AG, Eberbach, Germany (Chairman) (not listed) (b) • E. Merck KG, Darmstadt, Germany[1] (not listed) • Wegmann Unternehmens-Holding GmbH & Co. KG, Fürstenfeldbruck, Germany (Chairman) (not listed) • Kemira Oyj, Helsinki, Finland (listed) • KNDS NV, Amsterdam, Netherlands (not listed)	Jul. 1, 2009	4/4
Sascha Held (Vice Chairman of the Supervisory Board) Riedstadt, Application Consultant (full-time member and Chairman of the Joint Works Council of Merck KGaA, Darmstadt, Germany)	No board positions	Apr. 26, 2019	4/4
Gabriele Eismann Seeheim-Jugenheim, Senior Product Manager (full-time member of the Joint Works Council of Merck KGaA, Darmstadt, Germany)	No board positions	May 09, 2014	4/4
Edeltraud Glänzer Hannover, Chair of August-Schmidt-Stiftung, Bochum until October 30, 2021	(a) • B. Braun Melsungen AG, Melsungen, Germany (not listed) until March 18, 2021	Mar. 28, 2008	4/4
Jürgen Glaser Bingen, Regional Director of the German Mining, Chemical, and Energy Industrial Union (IG BCE), Darmstadt	(a) • SIRONA Dental Systems GmbH, Wals, Austria (not listed) (b) • BKK of Merck KGaA, Darmstadt, Germany (not listed)	Apr. 26, 2019	3/4
Michael Kleinemeier Heidelberg, Managing Director of e-mobiligence GmbH, Heidelberg (Independent Shareholder Representative)	(b) • E. Merck KG, Darmstadt, Germany[1] (not listed) • Transporeon GmbH, Ulm, Germany (not listed)	Apr. 26, 2019	4/4
Renate Koehler Darmstadt, Pharmacist and Manager of Engel-Apotheke pharmacy, Darmstadt (Independent Shareholder Representative)	No board positions	Apr. 26, 2019	4/4
Anne Lange Riedstadt, Application Engineer (full-time member and Vice Chairwoman of the Joint Works Council of Merck KGaA, Darmstadt, Germany)	No board positions	Apr. 26, 2019	4/4
Peter Emanuel Merck[2] Hamburg, Managing Partner of Golf-Lounge GmbH, Hamburg (Independent Shareholder Representative)	No board positions	Apr. 26, 2019	4/4
Dietmar Oeter Seeheim-Jugenheim, Vice President Corporate Quality Assurance	No board positions	May 09, 2014	4/4
Alexander Putz Michelstadt, Chemical laboratory assistant (full-time member of the Joint Works Council of Merck KGaA, Darmstadt, Germany)	No board positions	May 28, 2020	4/4
Christian Raabe Höchst, IT Business Partner Darmstadt Site	No board positions	Apr. 26, 2019	4/4

Footnotes on next page

Member	Memberships of (a) other statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations	Member of the Supervisory Board since	Attendance of meeting of the Supervisory Board
Helene von Roeder Frankfurt am Main, Member of the Executive Board (CFO) of Vonovia SE, Bochum (Independent Shareholder Representative)	(b) • E. Merck KG, Darmstadt, Germany[1] (not listed) • Vonovia Finance B.V., Amsterdam, Netherlands (listed) • AVW Versicherungsmakler GmbH, Hamburg, Germany (not listed)	Apr. 26, 2019	4/4
Helga Rübsamen-Schaeff Düsseldorf, Consultant (Independent Shareholder Representative)	(a) • Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany[1] (Chair) (not listed) • 4SC AG, Martinsried, Germany (listed) • AiCuris Anti-Infective Cures AG, Wuppertal, Germany (listed) (b) • E. Merck KG, Darmstadt, Germany[1] (not listed)	May 09, 2014	4/4
Daniel Thelen Cologne, Program Manager Infrastructure at DB Netz AG, Frankfurt am Main (Independent Shareholder Representative)	(b) • E. Merck KG, Darmstadt, Germany[1] (not listed)	Apr. 26, 2019	4/4
Simon Thelen[2] Cologne, Head of Hand Surgery, Department of Orthopedics and Trauma Surgery, University Hospital Düsseldorf (Independent Shareholder Representative)	(a) • Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany[1] (not listed) (b) • E. Merck KG, Darmstadt, Germany[1] (not listed)	Apr. 26, 2019	4/4

[1] Internal board position.

[2] Members delegated according to article 6 (5) of the Articles of Association.

The Supervisory Board performs a monitoring function. It supervises the Executive Board's management of the company. In comparison with the supervisory board of a German stock corporation, the role of the supervisory board of a corporation with general partners (KGaA) is limited. This is due to the fact that the members of the Executive Board are personally liable partners and therefore are responsible for the management of the company. In particular, the Supervisory Board is not responsible for appointing and dismissing general partners or for regulating the terms and conditions of their contracts. This is the responsibility of E. Merck KG, Darmstadt, Germany. Nor does the Supervisory Board have the authority to issue rules of procedure for the Executive Board or a catalog of business transactions requiring approval. This authority likewise belongs to E. Merck KG, Darmstadt, Germany (article 13 (3) sentence 1 and (4) sentence 1 of the Articles of Association).

However, the fact that the Supervisory Board has no possibilities to directly influence the Executive Board restricts neither its information rights nor its audit duties. The Supervisory Board must monitor the Executive Board in terms of legality, regularity, usefulness, and economic efficiency. In particular, the Supervisory Board has the duty to examine the reports provided by the Executive Board. This includes regular reports on the intended business policy, as well as other fundamental issues pertaining to corporate planning, especially financial, investment, and HR planning, the profitability of the Group, and the course of business. The regular reports pertaining to Group Internal Auditing, risk management, the internal control system, and compliance are now received by the Audit Committee of the Supervisory Board. In addition, by means of consultation with the Executive Board, it creates the basis for supervision of the management of the company by the Supervisory Board in accordance with section 111 (1) AktG.

The Supervisory Board and the Audit Committee examine the Annual Financial Statements as well as the Consolidated Financial Statements and the Combined Management Report, taking into account the auditors report. Moreover, the Audit Committee discusses the quarterly statements and the half-year financial report, taking into account in the latter case the report of the auditor on the audit review of the abridged financial statements and the interim management report of the Group, and reports to the Supervisory Board. The adoption of the Annual Financial Statements is not the responsibility of the Supervisory Board, but of the General Meeting. The Supervisory Board and the Audit Committee normally meet four times a year. Further meetings may be convened if requested by a member of either the Supervisory Board or the Executive Board. As a rule, resolutions of the Supervisory Board are passed at meetings at the instruction of the Chairman. In exceptional cases a resolution may be passed by other means, details of which are given in the rules of procedure.

The members of the Board of Partners of E. Merck KG, Darmstadt, Germany, and of the Supervisory Board may be convened to a joint meeting if so agreed by the chairpersons of the two boards.

The Supervisory Board has adopted rules of procedure for its activities that are available on the company's website at **www.emdgroup.com/company/who-we-are/management-and-company-structure/supervisoryboard/EN/Rules-of-Procedure-Supervisory-Board-EN.pdf**.

The rules of procedure prescribe that the Supervisory Board may form committees. The Supervisory Board has formed a Nomination Committee comprising three shareholder representatives. Its members are Wolfgang Büchele (Chair), Helga Rübsamen-Schaeff, and Simon Thelen. The Nomination Committee is responsible for proposing to the Supervisory Board suitable candidates for its proposal to the Annual General Meeting. Apart from legal requirements and the recommendations of the German Corporate Governance Code, the "Objectives of the Supervisory Board with respect to its composition," "Profile of skills and expertise," and the "Diversity Policy" are to be taken into consideration as well. The Supervisory Board also established an Audit Committee in fiscal 2021 (further details can be found in the Report of the Supervisory Board). Owing to the aforementioned limited authority, and since a corresponding need has not yet arisen, the Supervisory Board in fiscal 2021 had no further committees.

The German Stock Corporation Act in the version currently applicable to the company states that the Supervisory Board and the Audit Committee of a publicly listed company must have at least one member who has professional expertise in accounting or auditing. As financial expert, Helene von Roeder has particular knowledge and experience of the application of reporting principles and internal controls, is familiar with auditing of financial statements. She is also the Chair of the Audit Committee of the company's Supervisory Board and the Finance Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany. A further provision of the German Stock Corporation Act requires that the members of the Supervisory Board be collectively familiar with the sector in which their company operates. This requirement is specifically addressed in the Supervisory Board's profile of skills and expertise, which stipulates that the Supervisory Board have at least four members who possess such knowledge of the sector. We currently meet this requirement (see also "Objectives of the Supervisory Board with Respect to Its Composition and Profile of Skills and Expertise").

Information on the independence of the shareholder representatives can be found under "Objectives of the Supervisory Board with Respect to its Composition and Profile of Skills and Expertise." The next self-assessment of the Supervisory Board is scheduled for 2022.

Board of Partners of E. Merck KG, Darmstadt, Germany

Some of the responsibilities that lie with the supervisory board of a German stock corporation are fulfilled at our company by E. Merck KG, Darmstadt, Germany. This applies primarily to the Board of Partners of E. Merck KG, Darmstadt, Germany. Therefore, the Board of Partners as well as the composition and procedures of its committees are described in the following.

The Board of Partners has nine members. The Board of Partners was composed as follows in fiscal 2021:

Member	Memberships of (a) statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Johannes Baillou (Chairman of the Board of Partners) Vienna, Austria, Vice Chairman of the Executive Board and General Partner of E. Merck KG, Darmstadt, Germany	No board positions
Simon Thelen (Vice Chairman of the Board of Partners since July 31, 2021) Cologne, Head of Hand Surgery, Department of Orthopedics and Trauma Surgery, University Hospital Düsseldorf	(a) • Merck KGaA, Darmstadt, Germany (listed) • Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany (not listed)
Wolfgang Büchele Römerberg, Chairman of Exyte GmbH, Stuttgart	(a) • Merck KGaA, Darmstadt, Germany (listed) • Gelita AG, Eberbach, Germany (Chairman) (not listed) (b) • Wegmann Unternehmens-Holding GmbH & Co. KG, Fürstenfeldbruck, Germany (Chairman) (not listed) • Kemira Oyj, Helsinki, Finland (listed) • KNDS NV, Amsterdam, Netherlands (not listed)
Michael Kleinemeier Heidelberg, Managing Director of e-mobiligence GmbH, Heidelberg	(a) • Merck KGaA, Darmstadt, Germany (listed) (b) • Transporeon GmbH, Ulm, Germany (not listed)
Katharina Kraft Mannheim, Senior Strategy Manager at BASF SE, Ludwigshafen	No board positions
Helene von Roeder Frankfurt am Main, Member of the Executive Board (CFO) of Vonovia SE, Bochum	(a) • Merck KGaA, Darmstadt, Germany (listed) (b) • Vonovia Finance B.V., Amsterdam, Netherlands (listed) • AVW Versicherungsmakler GmbH, Hamburg, Germany (not listed)
Helga Rübsamen--Schaeff Düsseldorf, Consultant	(a) • Merck KGaA, Darmstadt, Germany (listed) • Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany (Chair) (not listed) • 4SC AG, Martinsried, Germany (listed) • AiCuris Anti-Infective Cures AG, Wuppertal, Germany (listed)
Frank Stangenberg-Haverkamp Darmstadt, Chairman of the Executive Board and General Partner of E. Merck KG, Darmstadt, Germany, Vice Chairman until July 30, 2021	(a) • Fortas GmbH, Rösrath, Germany (Chairman) (not listed) • Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany (not listed) (b) • Travel Asset Group Ltd., London, United Kingdom (Chairman) (not listed)
Daniel Thelen Cologne, Program Manager Infrastructure at DB Netz AG, Frankfurt am Main	(a) • Merck KGaA, Darmstadt, Germany (listed)

The Board of Partners supervises the Executive Board in its management of the company. It informs itself about the business matters of Merck KGaA, Darmstadt, Germany, and may inspect and examine the company's accounts, other business documents, and assets for this purpose. According to article 13 (4) of the Articles of Association of Merck KGaA, Darmstadt, Germany, the Executive Board requires the approval of E. Merck KG, Darmstadt, Germany, for transactions that are beyond the scope of the Group's ordinary business activities. For such transactions, approval must first be obtained from the Board of Partners of E. Merck KG, Darmstadt, Germany. The Board of Partners convenes as and when necessary; however, it normally meets four times a year. The members of the Executive Board of Merck KGaA, Darmstadt, Germany, are invited to all meetings of the Board of Partners, unless the Board of Partners resolves otherwise in individual cases. The members of the

Board of Partners may convene a joint meeting with the Supervisory Board of Merck KGaA, Darmstadt, Germany, if so agreed by the chairpersons of the two boards.

The Board of Partners may delegate the performance of individual duties to committees. Currently, the Board of Partners has three committees in place: the Personnel Committee, the Finance Committee, and the Research and Development Committee.

Personnel Committee

The Personnel Committee has four members: Johannes Baillou (Chair), Wolfgang Büchele, Michael Kleinemeier, and Frank Stangenberg-Haverkamp. The Personnel Committee meets at least twice a year. Further meetings are convened as and when necessary. Meetings of the Personnel Committee are attended by the Chair of the Executive Board of Merck KGaA, Darmstadt, Germany, unless the Committee decides otherwise. The Personnel Committee is responsible for, among other things, the following decisions concerning members and former members of the Executive Board: contents and conclusion of employment contracts and pension contracts; granting of loans and salary advances; changes to the compensation structure and adaptation of compensation; approval for taking on honorary offices, board positions, and other sideline activities; and division of responsibilities within the Executive Board of Merck KGaA, Darmstadt, Germany. The Personnel Committee passes its resolutions by a simple majority; in matters concerning the Chair of the Executive Board, unanimity is required. The Chairman of the Committee regularly informs the Board of Partners of its activities.

Finance Committee

The Finance Committee has five members: Helene von Roeder (Chair), Johannes Baillou, Wolfgang Büchele, Daniel Thelen, and Simon Thelen. The Finance Committee holds at least four meetings a year, some of which are joint meetings with the Audit Committee of the Supervisory Board of Merck KGaA, Darmstadt, Germany. At least one meeting is a joint meeting with the auditor of Merck KGaA, Darmstadt, Germany. Further meetings are convened as and when necessary. Meetings of the Finance Committee are attended by the Chief Financial Officer of Merck KGaA, Darmstadt, Germany. Other members of the Executive Board of Merck KGaA, Darmstadt, Germany, may attend the meetings upon request of the Finance Committee. These meetings regularly include the Chair of the Executive Board. The Finance Committee is responsible for, among other things, analyzing and discussing the Annual Financial Statements, the Consolidated Financial Statements, and the respective reports of the auditor, as well as the half-year financial report and the quarterly statements. In addition, the Finance Committee addresses the Group’s net assets, financial position, results of operations, and liquidity, as well as accounting issues. Upon request of the Board of Partners, the Finance Committee examines investment projects that must be approved by the Board of Partners and provides recommendations pertaining thereto. It passes its resolutions with a simple majority. The Committee Chairperson regularly informs the Board of Partners of the activities of the Finance Committee.

Research and Development Committee

The Research and Development Committee has four members: Helga Rübsamen-Schaeff (Chair), Johannes Baillou, Katharina Kraft, and Simon Thelen. The Research and Development Committee is convened as and when necessary, but holds at least two meetings a year. Meetings of the Research and Development Committee are attended by members of the Executive Board of Merck KGaA, Darmstadt, Germany, upon request of the Committee. These meetings regularly include the Chair of the Executive Board as well as the CEO Life Science, the CEO Healthcare, and the CEO Electronics. The Research and Development Committee is responsible for, among other things, reviewing and discussing the research activities of the Life Science, Healthcare, and Electronics business sectors. It passes its resolutions with a simple majority. The Chair of the Committee reports to the Board of Partners on the insights gained from the meetings.

Stipulations to promote the percentage of management positions held by women pursuant to section 76 (4) and section 111 (5) of the German Stock Corporation Act (AktG)

Stipulations pursuant to section 76 (4) AktG (target for the percentage of positions held by women on the two upper management levels below the Executive Board)

We foster diversity within the company, which also includes ensuring a balance of genders in management. To this end, we pursue both voluntary and legally required objectives, and we work continuously and sustainably on achieving them. As a global company with correspondingly aligned global (leadership) structures, we are striving to increase the proportion of management positions held by women (managers, experts, and project managers in roles 4 and above)[1] as a voluntary goal. We want to achieve gender parity by the end of 2030.

In addition, Merck KGaA, Darmstadt, Germany, is subject to the statutory obligations under section 76 (4) AktG. Against this background, on December 15, 2016, the Executive Board of Merck KGaA, Darmstadt, Germany, defined the targets for the percentage of positions held by women in the Group as 21% for the first management level and 26% for the second management level below the Executive Board. December 31, 2021, was set as the deadline for achieving these targets.

On December 31, 2021, the actual percentage of positions held by women at the Group was 35.5% at the first management level and 31.8% at the second management level. In other words, the successful appointment and promotion of women resulted in the target for the percentage of positions held by women being comfortably exceeded at both management levels.

On December 21, 2021, the Executive Board of Merck KGaA, Darmstadt, Germany, set the new targets to be achieved by December 31, 2024, as follows:

- First management level of Merck KGaA, Darmstadt, Germany, below the Executive Board: 35.5% of positions held by women, which corresponds to full headcounts
- Second management level of Merck KGaA, Darmstadt, Germany, below the Executive Board: 31.8% of positions held by women, which also corresponds to full headcounts

The first management level comprises all managers of the Group with a direct reporting line to the Executive Board of the Group or who belong to the Global Executive Group. The second management level comprises all managers of the Group, who report to managers with a direct reporting line to the Executive Board of the Group or the Global Executive Group.

Stipulations pursuant to section 111 (5) AktG (target for the percentage of positions on the Supervisory Board held by women)

Pursuant to section 111 (5) AktG, the Supervisory Board of companies that are listed or subject to codetermination stipulates binding targets for the percentage of positions on the Supervisory Board and on the Management Board held by women. However, Merck KGaA, Darmstadt, Germany, is not required to set stipulations pursuant to section 111 (5) AktG for the following reasons: The statutory target of 30% pursuant to section 96 (2) AktG is already applied to the Supervisory Board of Merck KGaA, Darmstadt, Germany; this eliminates the obligation to stipulate a further target for the percentage of positions held by women on the Supervisory Board (see section 111 (5) sentence 5 AktG). In turn, the obligation to stipulate a target for the percentage of positions held by women on the Executive Board pursuant to section 111 (5) AktG and the minimum composition requirement for the Executive Board pursuant to section 76 (3a) AktG are not applicable

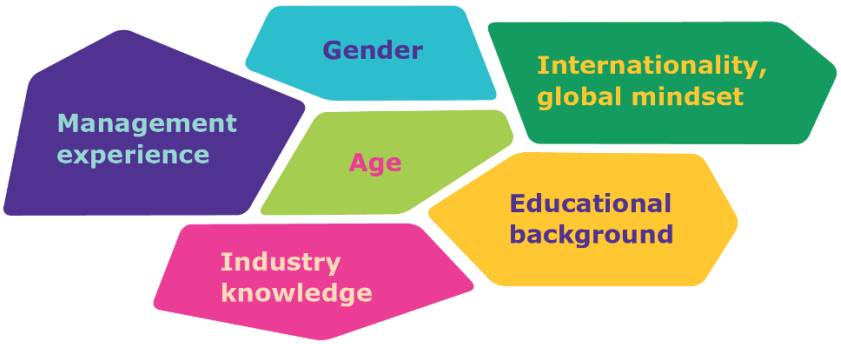
[1] The group in question accounts for around 7% of the total workforce; see the description of “Diversity and management”.

to the legal form of a corporation with general partners (Kommanditgesellschaft auf Aktien), as a corporation with general partners neither has a management board comparable to that of a stock corporation, nor does the Supervisory Board have personnel authority over the Executive Board. Rather, the Executive Board of Merck KGaA, Darmstadt, Germany, consists of personally liable general partners (see also the description of Supervisory Board procedures). In line with its diversity policy, however, we also continue to pursue representation of both genders as an objective for the Executive Board.

Diversity policy pursuant to section 289f (2) No. 6 of the German Commercial Code (HGB)

We are pursuing a Group-wide, global diversity program. At our company, diversity stands for a culture of inclusion, mutual esteem, and respect. To demonstrate this open and dynamic company culture, we promote diversity throughout the Group – and do so at all levels, including the Executive Board and Supervisory Board.

We believe that a diverse workforce boosts the innovative strength of the Group and contributes materially to our business success. That is why we are furthering a culture of diversity independent of age, gender, disability, ethnic or cultural background, religion, industry experience, and educational background. The diversity policy to strategically steer the topics of diversity and inclusion at our company thus focuses on the following key criteria:



Our Group-wide diversity policy encompasses both voluntary as well as legally defined objectives that we continuously and sustainably work to achieve. In this context, it should be noted that with respect to the Executive Board of Merck KGaA, Darmstadt, Germany, many rules can only be applied correspondingly. This is because the Executive Board comprises personally liable general partners of Merck KGaA, Darmstadt, Germany, and is not a management board with employed members of a corporate body (for details, please also see the "Joint Report of the Executive Board and the Supervisory Board").

In addition to the aspects presented in the following, reference is made to the objectives of the Supervisory Board with respect to its composition and the profile of skills and expertise of the Supervisory Board (see the information on the "Objectives of the Supervisory Board with respect to its composition and profile of skills and expertise"). The statements made there are part of the diversity policy for the Supervisory Board presented here.

Age

Our boards are to have a balanced age structure. This permits future-oriented and consistent succession planning and is a key element of sustainable company management and monitoring. Maximum age limits apply to both boards. A maximum age of 70 applies to members of the Executive Board, while the standard age limit for Supervisory Board members is 75. Our diversity policy aims for an age range of at least ten years between the youngest and the oldest member of the respective board.

With an age range of over 35 years, the current composition of the Supervisory Board satisfies this objective. The age range of the Executive Board is currently eight years.

Gender

Gender diversity also plays a crucial role since it enables us to benefit from a larger talent pool, and allows us as a company to develop a better understanding of important customer groups.

Additionally, we continue to pursue representation of both genders as an objective for the Executive Board. The Board of Partners of E. Merck KG, Darmstadt, Germany, appointed Belén Garijo, former CEO of Healthcare and Vice Chair of the Executive Board, as the new Chair of the Executive Board effective May 1, 2021, making it the first time a woman has been appointed to these positions. The statutory target of 30% pursuant to section 96 (2) AktG already applies to the Supervisory Board of Merck KGaA, Darmstadt, Germany, and is currently met.

Internationality and global mindset

As a science and technology company with global operations and major markets on five continents with around 59,000 employees[1] at locations in 66[2] countries, internationality and the associated global mindset is one of our key success factors. According to our diversity policy, the Executive Board's internationality derives from leadership experience or national origin, relative to our key sales markets or those locations that are organizationally and culturally relevant to our employee development efforts. For both criteria, Europe, North America, and Asia-Pacific are currently the key regions.

The Executive Board meets this objective with management experience in the named regions, e.g., in the following countries: Denmark, Spain, the United States, Singapore, and Malaysia. In addition, more than one-third of the Executive Board members are not German citizens.

Management experience

The key prerequisites for high-performance leadership teams are both the diversity of the individual competency profiles and a balance between a Group-internal and external management perspective. Therefore, the Executive Board as a whole must have in-depth knowledge and experience in the following key areas of importance to the company: strategy and planning, finance and accounting, sales and operations, human resources, legal and compliance, and information technology, as well as ecological and social sustainability. In addition, it is important for the composition of the Executive Board to ensure a good balance of members from within and outside the company. Our diversity policy seeks to derive inspiration and innovation from outside the company and to identify the latest trends of relevance to the core businesses of the company, while ensuring sustainability and continuity in line with our corporate culture.

The current Executive Board fulfills both of the aforementioned objectives: All required aspects of the competency profile are covered by at least one member of the Executive Board. Likewise, two members of the

[1] The Group also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

[2] Each country with at least one active employee is included as a separate country.

Executive Board possess multiple years of experience working within the Group prior to their appointment to the Executive Board.

Industry experience

To efficiently lead and manage the Group, the Executive Board must have in-depth knowledge of the key industries and business sectors that the company operates in. For each of the areas Life Science, Healthcare, and Electronics, there should be at least one member of the Executive Board with in-depth expertise in accordance with the diversity concept.

The Executive Board covers the full range of the necessary industry experience.

Educational background

In order to translate the tremendous innovative potential of a science and technology company into sustainable business success, interdisciplinary educational backgrounds are a key element of our diversity policy both for the Executive Board and for the Supervisory Board. The current composition of both boards illustrates this interdisciplinary aspect to a very high degree.

The members of the Executive Board contribute knowledge of various fields including economic sciences, medicine (pharmacology, physical education), information technology, and electrical engineering. In addition, the majority of members of the Executive Board hold a university and doctorate degree.

Moreover, the members of the Supervisory Board have a background in one or more of the following fields of specialization: chemistry, pharmaceutics, mathematics, law, human medicine, business administration and economics, physics, education, and computer sciences, among others.

Seven Supervisory Board members are university graduates and hold doctorates.

Report of the Supervisory Board

The Supervisory Board again properly executed its duties in 2021 in accordance with the law as well as the company's Articles of Association and rules of procedure. In particular, the Supervisory Board monitored the work of the Executive Board diligently and regularly.

Cooperation with the Executive Board

The cooperation with the Executive Board was characterized by intensive, trustworthy exchange. During fiscal 2021, the Executive Board provided the Supervisory Board with regular written and verbal reports on the business development of Merck KGaA, Darmstadt, Germany, and the Group. In particular, the Supervisory Board was informed about the current and potential impact of the Covid-19 pandemic, the market and sales situation of the company against the background of macroeconomic development, and the financial position of the company and its subsidiaries, along with their earnings development and corporate planning. Within the scope of quarterly reporting, the sales and operating results were presented for the Group as a whole, and broken down by business sector. Aside from the Supervisory Board meetings, the Chairman of the Supervisory Board also maintained, and continues to maintain, a regular exchange of information with the Chair of the Executive Board.

Key topics of the Supervisory Board meetings

Four Supervisory Board meetings were held in fiscal 2021. At these meetings, the Supervisory Board intensely discussed the reports of the Executive Board as well as, together with the Executive Board, company developments and strategic issues. The Chair of the Audit Committee reported comprehensively on the previous meetings of the Audit Committee at all the meetings of the Supervisory Board (starting with the first regular meeting following its establishment in May 2021).

At the meeting in February 2021, which was held as a video conference due to the ongoing Covid-19 pandemic, the Executive Board first intensively addressed the Annual Financial Statements and Consolidated Financial Statements for 2020, the Combined Management Report, the reports of the auditor, including the audit report on the non-financial declaration for fiscal 2020, and the proposal for the appropriation of net retained profit. The auditor explained the audit reports including the focus areas of the audit. The Executive Board and the Head of Group Accounting reported on the financial statements. Furthermore, the Supervisory Board resolved upon the report and the objectives of the Supervisory Board with respect to its composition and the profile of skills and expertise, the Declaration of Conformity with the German Corporate Governance Code, and the Statement on Corporate Governance. The Supervisory Board also adopted the proposals to be made to the Annual General Meeting and approved the plan to again hold the Annual General Meeting in virtual form in light of the ongoing Covid-19 pandemic. The Executive Board reported on business performance in 2020 and presented the plans for fiscal 2021 as well as the positive expectations for the Group's global business even in light of the Covid-19 pandemic, which it discussed in detail with the Supervisory Board. The Supervisory Board also took note of the written risk report. The Head of Group Internal Auditing presented the report from Group Internal Auditing for 2020. No risks that could threaten the continued existence of the company were identified. The annual data protection and compliance report for 2020 was also presented. Furthermore, the Supervisory Board resolved the establishment of an Audit Committee with immediate effect (further details can be found under "**Committees**" below). The meeting also heard a report on the status of the enterprise resource planning (ERP) project in Darmstadt. Finally, the meeting resolved the formal amendment of the Articles of Association of Merck KGaA, Darmstadt, Germany, to reflect the departure of the Chairman of the Executive Board, Stefan Oschmann, the appointment of Belén Garijo as the new Chair of the Executive Board, and the appointment of the two new Executive Board members, Peter Guenter and Matthias Heinzel.

The meeting in May 2021, which was held as a video conference due to the ongoing Covid-19 pandemic, focused on the report of the Executive Board on business performance in the first quarter and the updated forecast for fiscal 2021. The Executive Board discussed developments in the first quarter of 2021 and provided an outlook concerning the expected business performance in 2021 as a whole. The Supervisory Board extensively discussed the contributions of our individual business sectors to the positive financial performance. The report of the Research and Development Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany, for Life Science/Electronics was a further focus of the meeting. Finally, the Supervisory Board discussed the topic of sustainability and the fact that this has become a strategic priority for the company and a critical factor in its success.

At the meeting in July 2021, the Executive Board first reported on the positive business performance in the second quarter of 2021 and how this should be viewed compared with the previous year and in the context of the ongoing Covid-19 pandemic. The EU Chemicals Strategy was discussed at the meeting. The Supervisory Board also resolved to commission the auditor to conduct a limited assurance review of the non-financial declaration for fiscal 2021. Finally, the Supervisory Board resolved, on the basis of the recommendation by the Audit Committee and in accordance with its preference, to propose to the Annual General Meeting that Deloitte GmbH Wirtschaftsprüfungsgesellschaft be elected as the auditor of the Annual Financial Statements of the Group for fiscal 2023 and the auditor responsible for conducting the audit review of the abridged financial statements and interim management report included in the half-year financial report as of June 30, 2023.

At its fourth meeting in November 2021, the Supervisory Board first dealt with the report of the Executive Board on the third quarter of 2021. The Executive Board explained the very positive business performance, even compared with the strong prior-year quarter, and the raised forecast for fiscal, which had exceeded the expectations of the capital market. The background of the positive business performance was then discussed in detail by the Supervisory Board. Other topics discussed included the report by the Research and Development Committee for Healthcare and transactions of Merck KGaA, Darmstadt, Germany, and the Group with related parties within the meaning of section 111a et seq. AktG. In the previous year, a procedure was established to regularly assess whether the conditions of section 111a (2) sentence 1 AktG have been met for such transactions. There were no transactions requiring the approval of the Supervisory Board in accordance with section 111b (1) AktG. The Global Executive Conference was also discussed.

In parts of its meetings, the Supervisory Board regularly meets without the members of the Executive Board being present. Additionally, the employee representatives gather for a preparatory meeting ahead of each Supervisory Board meeting. The employee representatives also gather immediately after each Supervisory Board meeting to discuss the topics addressed at the meeting. Among other things, this includes a discussion of which topics should be placed on the agenda for the next Supervisory Board meeting.

Annual Financial Statements

The Annual Financial Statements of Merck KGaA, Darmstadt, Germany, the Consolidated Financial Statements of the Group, and the Combined Management Report for Merck KGaA, Darmstadt, Germany, and the Group, including the accounts, were audited by KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin.

The auditors issued an unqualified audit opinion on the Annual Financial Statements of Merck KGaA, Darmstadt, Germany, in accordance with German Auditing Standards.

For the Consolidated Financial Statements prepared in accordance with International Financial Reporting Standards and for the Combined Management Report, the auditors issued the unqualified auditor’s report reproduced in the Annual Report of the Group.

In addition, the auditor audited the calculation of the participation of Merck KGaA, Darmstadt, Germany, in the profit of E. Merck KG, Darmstadt, Germany, in accordance with article 27 (2) of the Articles of Association, as well as the separate combined non-financial (Group) report. The Annual Financial Statements of Merck KGaA, Darmstadt, Germany, the Consolidated Financial Statements of the Group, and the Combined Management

Report for Merck KGaA, Darmstadt, Germany, and the Group, including the non-financial declaration and the proposal of the Executive Board for the appropriation of net retained profit, were submitted firstly to the Audit Committee and then to the Supervisory Board together with the auditor's reports.

The Audit Committee examined the Annual Financial Statements of Merck KGaA, Darmstadt, Germany, the proposal for the appropriation of net retained profit, and the auditor's report. It also examined the Consolidated Financial Statements of the Group as well as the Combined Management Report for Merck KGaA, Darmstadt, Germany, and the Group, including the non-financial declaration, and took note of the auditor's reports of KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin. It focused particularly on the key audit matters of particular importance in the audit opinion, on the resulting risks for the financial statements, the approach adopted during the audit as described, and the conclusions drawn by the auditor. On completion of its examination, the Audit Committee raised no objections and thus recommended that the Supervisory Board approve the Annual Financial Statements for Merck KGaA, Darmstadt, Germany, the Consolidated Financial Statements of the Group, the Combined Management Report of Merck KGaA, Darmstadt, Germany, and the Group prepared by the Executive Board, and the report presented by the auditor in accordance with article 27 (2) of the Articles of Association.

At its meeting in February 2022 to approve the financial statements, the Supervisory Board also examined the Annual Financial Statements of Merck KGaA, Darmstadt, Germany, the proposal for the appropriation of net retained profit, the auditor's report presented in accordance with article 27 (2) of the Articles of Association, the Consolidated Financial Statements of the Group, and the Combined Management Report of Merck KGaA, Darmstadt, Germany, and the Group in accordance with article 14 (2) of the Articles of Association, and took note of the auditor's reports of KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin. The discussion of the relevant agenda item at this meeting was also attended by the auditors who sign the audit opinion on the Annual Financial Statements of Merck KGaA, Darmstadt, Germany, and the Consolidated Financial Statements of the Group. The auditors also reported on their audit at this meeting as well as in the meeting of the Audit Committee. Based on the recommendation of the Audit Committee and its own review, the Supervisory Board approved the Annual Financial Statements for Merck KGaA, Darmstadt, Germany, the Consolidated Financial Statements of the Group, the Combined Management Report of Merck KGaA, Darmstadt, Germany, and the Group prepared by the Executive Board, and the report presented by the auditor in accordance with article 27 (2) of the Articles of Association. The Supervisory Board gave its consent to the proposal of the Executive Board for the appropriation of net retained profit after conducting its own review.

Corporate governance and Declaration of Conformity

Corporate governance is a topic of high priority for the Supervisory Board. We take investor suggestions on this matter extremely seriously. In its own estimation, the Supervisory Board has an adequate number of independent members. There were no conflicts of interest, as defined by the German Corporate Governance Code, involving Supervisory Board members during the year under review. In fiscal 2021, the Chairman of the Supervisory Board was prepared to hold talks with investors on topics pertaining to the Supervisory Board as appropriate, and remains willing to do so. The Chairman of the Supervisory Board conducted an investor discussion with Schroders Investment Management on the Executive Board compensation system in fiscal 2021. No other discussions were requested by investors. Following the most recent self-assessment in fiscal 2020, the next self-assessment of the Supervisory Board is scheduled to take place in fiscal 2022.

After discussing corporate governance issues in detail, the Executive Board and the Supervisory Board adopted the updated Declaration of Conformity in accordance with section 161 AktG and issued it jointly in February 2022. The statement is permanently available on the website of Merck KGaA, Darmstadt, Germany (**www.emdgroup.com/en/investors/corporate-governance/reports.html**). More information about corporate governance at Merck KGaA, Darmstadt, Germany, including the compensation of the Executive Board and Supervisory Board, is given in the Statement on Corporate Governance of the Annual Report.

Committees

Apart from the Nomination Committee and the Audit Committee, the Supervisory Board of Merck KGaA, Darmstadt, Germany, did not have any further committees in fiscal 2021 on account of the special features that apply to the Supervisory Board of a corporation with general partners (KGaA) under German company law, and because a corresponding need for this has not emerged to date. The members of the Nomination Committee did not convene in fiscal 2021.

In February 2021, the Supervisory Board established an Audit Committee comprising three shareholder representatives and three employee representatives. The members of the Audit Committee are Helene von Roeder (Chair), Wolfgang Büchele, Edeltraud Glänzer, Sascha Held, Christian Raabe, and Daniel Thelen. The Audit Committee meets four times a year. Further meetings are convened as and when necessary. The Audit Committee is generally responsible for accounting and auditing matters. In particular, its responsibilities include examining the Annual Financial Statements and Consolidated Financial Statements and the respective reports of the auditor, the half-year financial report, and the quarterly reports. It also reviews the performance of the auditing firm, particularly the auditor in charge of the engagement. It prepares the negotiations and resolutions of the Supervisory Board on the approval of the Annual Financial Statements and Consolidated Financial Statements and the proposal to the Annual General Meeting on the election of the auditor. The adoption of the Annual Financial Statements is not the responsibility of the Audit Committee or the Supervisory Board, but of the General Meeting. The Audit Committee also ascertains the independence of the auditor, assigns the audit mandate to the auditor, and determines the focus areas of the audit and the fee agreement. Furthermore, the Audit Committee monitors the accounting process, the effectiveness of the internal control system, the risk management system, the internal auditing system, and compliance. The Chair of the Audit Committee and the auditor also engage in a regular dialog outside of the meetings of the Audit Committee.

At its first regular meeting in May 2021, the Audit Committee primarily addressed the selection process for the new auditor. The results of an intensive preliminary assessment by the company based on objective, predefined criteria for selection were discussed in detail by the Audit Committee, and the shortlisted candidates were given the opportunity to present themselves at length in person. Ahead of the meeting, all candidates had been given extensive opportunities to present themselves to the company and outline their plans in the event of being selected as the auditor. The candidates were then discussed in detail. The Chair of the Executive Board and the Chief Financial Officer subsequently presented the report on the net assets, financial position, and results of operations of the Group for the first quarter of 2021, which the Audit Committee then discussed.

The meeting in July 2021 again focused on the selection recommendation in connection with the mandatory change of auditor. The system for deciding on the auditor was addressed. This was followed by a final discussion of the results of the assessment model and the presentation of the remaining candidates. Based on this discussion, the Audit Committee resolved a recommendation that the Supervisory Board propose to the Annual General Meeting the election of either one of the two remaining candidates as the auditor of the Annual Financial Statements of the company and the Consolidated Financial Statements of the Group for fiscal 2023. The Audit Committee stated and explained to the Supervisory Board its preference that Deloitte GmbH Wirtschaftsprüfungsgesellschaft, one of the two remaining candidates, be proposed to the Annual General Meeting as the auditor of the Annual Financial Statements and Consolidated Financial Statements for fiscal 2023. The Chief Financial Officer and the Head of Group Accounting subsequently presented the report on the net assets, financial position, and results of operations of the Group for the second quarter of 2021, which the Audit Committee then discussed. The auditor presented its half-year financial report. Another focal point of the meeting was the resolution of the list of audit and non-audit services to be performed by the auditor up until the end of 2021. The system for monitoring the performance of non-audit services, which is to be introduced effective January 1, 2022, in light of the new and more stringent statutory regulations arising from the German Act to Strengthen Financial Market Integrity (FISG), was then discussed and adopted. The risk management status report was presented and discussed.

At the meeting in November 2021, the Chief Financial Officer and the Head of Group Accounting reported on the net assets, financial position, and results of operations of the Group in the extremely successful third quarter of 2021. The Audit Committee then extensively discussed the report on the third quarter. The meeting then reviewed the contractual terms for the annual audit of the financial statements and evaluated the audit of the financial statements, the audit fees, and the contractual terms following an extensive presentation by the Head of Group Accounting. Finally, the planning for the audit of the financial statements as of December 31, 2021, was discussed with the auditor. The company's internal control system was a further topic of discussion. It was reported that the internal control system had been fundamentally revised and subjected to an external audit by an auditing firm. Finally, the report on Group Internal Auditing and compliance and data protection was presented.

Personnel matters and training

With one exception, all the Supervisory Board meetings were attended by all Supervisory Board members. Jürgen Glaser excused himself from attending the meeting in July 2021. The members of the Audit Committee attended all meetings of the Audit Committee. There were no changes to the composition of the Supervisory Board in fiscal 2021.

The members of the Audit Committee participated in a two-day training session organized by the company in conjunction with the Frankfurt School of Finance & Management on the responsibilities and obligations of an audit committee and on the subject of finance. The members of the Supervisory Board participated in a one-day training session on accounting and balance sheet analysis. The cost of the training was borne by the company.

Darmstadt, February 2022

The Supervisory Board of Merck KGaA, Darmstadt, Germany

Wolfgang Büchele
Chairman

Objectives of the Supervisory Board with respect to its Composition and Profile of Skills and Expertise

Initial situation

According to recommendation C. I of the German Corporate Governance Code in the version dated December 16, 2019, the Supervisory Board shall specify concrete objectives regarding its composition as well as prepare a profile of skills and expertise for the entire board. In its composition, the Supervisory Board shall take into account the number of independent members, consider the principle of diversity, specify an age limit, and disclose the term of Supervisory Board membership.

General notes on the composition of the Supervisory Board

The Supervisory Board of Merck KGaA, Darmstadt, Germany, currently comprises 16 members, eight of whom represent the shareholders and a further eight who represent the employees. The eight employee representative members are elected by employee delegates pursuant to the provisions of the German Co-determination Act (Mitbestimmungsgesetz, MitbestG). These consist of six company employees, including a senior executive, as well as two union representatives. The Supervisory Board has no statutory proposal right with respect to electing the delegates or employee representatives. Two of the eight shareholder representatives are specified by a delegation right of E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany. The Supervisory Board likewise has no statutory proposal right with respect to exercising this delegation right. The other six shareholder representatives are elected by the General Meeting. In accordance with section 124 (3) sentence 1 AktG, the Supervisory Board shall propose Supervisory Board members to the General Meeting for election. These proposals require a majority of the votes of the shareholder representative members of the Supervisory Board. The next scheduled election to the Supervisory Board shall take place at the 2024 Annual General Meeting. The General Meeting is not required to follow the election proposals. The appointment objectives and competency requirements that the Supervisory Board sets forth below therefore do not represent requirements to be met by those eligible to elect or to delegate members. Instead, they are intended to express the objectives pursued by the Supervisory Board in office with regard to its advisory and monitoring functions.

For the Supervisory Board of Merck KGaA, Darmstadt, Germany, professional qualifications and personal expertise are the two most important prerequisites for appointments to seats on the Supervisory Board. When proposing Supervisory Board candidates for election or delegation, the Supervisory Board will always give top priority to these prerequisites, which are essential for fulfilling its legal duties. Overall, the Supervisory Board's policy is to optimally meet its monitoring and advisory duties by having diversity among its members. Diversity includes, in particular, internationality as well as different experience backgrounds and career paths. The proportion of women on the Supervisory Board is also considered to be an aspect of diversity. When preparing proposals for election or delegation to the Supervisory Board, the Supervisory Board shall consider in each case to what extent different, complementary specialist skills; professional and life experience; and an appropriate representation of both genders benefit the work of the Supervisory Board. Additionally, the Supervisory Board shall support the Executive Board in its efforts to increase diversity within the company.

Objectives of the Supervisory Board with respect to its composition

According to recommendation C. I of the German Corporate Governance Code in the version dated December 16, 2019, the Supervisory Board specified the following objectives regarding its composition, and reports below on their status of implementation.

Internationality

The Supervisory Board shall have at least three members with business experience in the main sales markets of Merck KGaA, Darmstadt, Germany and the Group. Currently, the main sales markets of Merck KGaA, Darmstadt, Germany, and the Group are Europe, America, and Asia-Pacific. The present composition of the Supervisory Board satisfies this objective. More than three Supervisory Board members have entrepreneurial experience in a wide range of European countries. More than three Supervisory Board members have experience in management positions in companies that operate globally.

Women on the Supervisory Board

Six women are currently members of the Supervisory Board of Merck KGaA, Darmstadt, Germany. Accordingly, women make up 37.5% of the Supervisory Board. When nominating candidates for election to the Supervisory Board or making proposals for delegations, the Supervisory Board shall examine whether the percentage of women can be increased by suitable candidates. The Supervisory Board considers the 37.5% share of female members to be satisfactory at the present time. This is due to the percentage of women in leadership positions at our company and in consideration of the composition of the supervisory boards of other companies of comparable size.

Independence

The Supervisory Board shall have an appropriate number of independent shareholder representatives as members. In any case, at least five of the shareholder representatives on the Supervisory Board shall be independent. According to the Articles of Association of Merck KGaA, Darmstadt, Germany, six members representing the shareholders are to be elected by the General Meeting, and two members are to be delegated. Taking this and the special ownership structure of Merck KGaA, Darmstadt, Germany, into account, the shareholder representatives consider five shareholder representatives to be an appropriate number of independent members. In the opinion of the shareholder representatives, the objectives concerning independent members are met at the present time. The shareholder representatives consider the following members to be independent: Wolfgang Büchele, Michael Kleinemeier, Renate Koehler, Peter Emanuel Merck, Helene von Roeder, Helga Rübsamen-Schaeff, Daniel Thelen, and Simon Thelen. In particular, the shareholder representatives do not believe that membership of the Board of Partners of E. Merck KG, Darmstadt, Germany, conflicts with independence. The Board of Partners exists complementary to the competencies and the activities of the Supervisory Board. It is not to be expected that this will lead to material and not merely temporary conflicts of interest. It should also be taken into account that due to its substantial capital investment and unlimited personal liability, E. Merck KG, Darmstadt, Germany, has a strong interest in the businesses of Merck KGaA, Darmstadt, Germany, operating efficiently and in compliance with procedures, counteracting from the outset conflicts of interest between E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, and thus also corresponding conflicts of interest between the members of the respective corporate boards.

No material conflicts of interest

Moreover, no one shall be proposed for election to the Supervisory Board who simultaneously serves on a board of or advises a major competitor of the company, or who, owing to another function, such as advisor to major contract partners of the company, could potentially become involved in a conflict of interest. No Supervisory Board member serves on a board of or advises a major competitor. No Supervisory Board member performs a function that could lead to a lasting conflict of interest.

Age limit

As a rule, the members of the Supervisory Board shall not exceed the age of 75. This objective is met at the present time.

Regular limit on the length of Supervisory Board membership

The objective of the Supervisory Board regarding its composition is that, as a rule, all members belong to the board for an uninterrupted period of no more than 15 years (corresponding to three regular terms of office). This objective is also met at the present time. The length of membership of the Supervisory Board members is set out in the Statement on Corporate Governance in the "Procedures of the Executive Board, Supervisory Board, Board of Partners, and its Committees" section.

Profile of skills and expertise

Additionally, in accordance with recommendation C. I of the German Corporate Governance Code in the version dated December 16, 2019, the Supervisory Board has prepared a profile of skills and expertise and reports on the status of implementation below.

In-depth knowledge of the fields relevant to the company

The Supervisory Board shall have at least four members with in-depth knowledge of and experience in fields that are important to the company, including at least one expert for the Life Science and Healthcare/Electronics business sectors respectively. This requirement is met at the present time. At present, the Supervisory Board has more than four members who have in-depth knowledge of and experience in the Life Science and Healthcare/Electronics business sectors. More than four Supervisory Board members also have executive experience in companies that also or specifically operate in the Life Science and Healthcare/Electronics business sectors.

Management experience

The Supervisory Board shall have at least three members who have experience in managing or supervising a medium- or large-sized company. The Supervisory Board has more than three members who have the corresponding experience. They include Supervisory Board members who were or still are members of the management or executive board at relevant companies, as well as Supervisory Board members who have gained experience in supervisory bodies of German or foreign companies of this size.

Knowledge of business administration

The Supervisory Board must have at least four members who have in-depth knowledge of business administration and at least one member who has professional expertise in accounting or auditing. This requirement is met at the present time.

Experience in other supervisory or control bodies

Lastly, the Supervisory Board shall have at least four members who have experience as members of other supervisory or control bodies (whereby possible membership of the Board of Partners of E. Merck KG, Darmstadt, Germany, is not taken into account). This requirement is also met at the present time.

consolidated financial statements

Consolidated Income Statement

€ million	Note	2021	2020
Net sales	9	**19,687**	**17,534**
Cost of sales	10	-7,351	-6,835
Gross profit		**12,335**	**10,699**
Marketing and selling expenses	11	-4,304	-4,207
Administration expenses		-1,241	-1,188
Research and development costs	12	-2,408	-2,288
Impairment losses and reversals of impairment losses on financial assets (net)	42	1	-6
Other operating income	13	528	838
Other operating expenses	14	-734	-863
Operating result (EBIT)[1]		**4,179**	**2,985**
Finance income	40	62	44
Finance costs	40	-317	-398
Profit before income tax		**3,924**	**2,630**
Income tax	15	-859	-637
Profit after tax		**3,065**	**1,994**
thereof: attributable to shareholders of Merck KGaA, Darmstadt, Germany (net income)		3,055	1,987
thereof: attributable to non-controlling interests	34	10	7
Earnings per share (in €)	17		
Basic		7.03	4.57
Diluted		7.03	4.57

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

Consolidated Statement of Comprehensive Income

€ million	Note	2021	2020
Profit after tax		**3,065**	**1,994**
Items of other comprehensive income that will not be reclassified to profit or loss in subsequent periods			
Net defined benefit liability	25		
Changes in remeasurement		751	-602
Tax effect		-119	130
Changes recognized in equity		632	-473
Equity instruments	34		
Fair value adjustments		-41	116
Tax effect		8	–
Changes recognized in equity		-33	116
		599	-356
Items of other comprehensive income that may be reclassified to profit or loss in subsequent periods			
Cash flow hedge reserve	37		
Fair value adjustments		-127	54
Reclassification to profit or loss		27	45
Reclassification to assets		–	–
Tax effect		5	-30
Changes recognized in equity		-95	69
Cost of cash flow hedge reserve	37		
Fair value adjustments		-13	-13
Reclassification to profit or loss		27	12
Reclassification to assets		–	–
Tax effect		-3	1
Changes recognized in equity		11	-1
Currency translation difference			
Changes taken directly to equity		1,730	-1,864
Reclassification to profit or loss		-6	4
Changes recognized in equity		1,724	-1,860
		1,640	-1,792
Other comprehensive income		**2,239**	**-2,149**
Comprehensive income		**5,304**	**-155**
thereof: attributable to shareholders of Merck KGaA, Darmstadt, Germany		5,289	-160
thereof: attributable to non-controlling interests	36	15	5

Consolidated Balance Sheet[1]

€ million	Note	Dec. 31, 2021	Dec. 31, 2020
Non-current assets			
Goodwill	18	17,004	15,959
Other intangible assets	19	7,612	7,653
Property, plant and equipment	20	7,217	6,421
Investments accounted for using the equity method		3	2
Non-current receivables	25	25	25
Other non-current financial assets	36	911	822
Other non-current non-financial assets	22	95	81
Non-current income tax receivables	15	10	10
Deferred tax assets	15	1,502	1,543
		34,380	**32,516**
Current assets			
Inventories	24	3,900	3,294
Trade and other current receivables	25	3,646	3,221
Contract assets	26	207	169
Other current financial assets	36	174	125
Other current non-financial assets	22	663	597
Current income tax receivables	15	492	520
Cash and cash equivalents	35	1,899	1,355
		10,982	**9,280**
Total assets		**45,362**	**41,796**
Total equity	34		
Equity capital		565	565
Capital reserves		3,814	3,814
Retained earnings		15,134	12,378
Gains/losses recognized in equity		1,824	189
Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany		**21,338**	**16,946**
Non-controlling interests		78	71
		21,416	**17,017**
Non-current liabilities			
Non-current provisions for employee benefits	33	3,402	3,880
Other non-current provisions	27	269	281
Non-current financial debt	37	8,270	9,785
Other non-current financial liabilities	38	106	62
Other non-current non-financial liabilities	29	15	55
Non-current income tax liabilities	15	42	45
Deferred tax liabilities	15	1,411	1,441
		13,515	**15,548**
Current liabilities			
Current provisions for employee benefits	33	224	152
Other current provisions	27	377	461
Current financial debt	37	2,531	2,357
Other current financial liabilities	38	1,192	1,008
Trade and other current payables	30	2,380	1,768
Refund liabilities	9	839	666
Current income tax liabilities	15	1,421	1,460
Other current non-financial liabilities	29	1,468	1,360
		10,432	**9,231**
Total equity and liabilities		**45,362**	**41,796**

[1] Previous year's figures have been adjusted, see Note (2) "**Reporting principles**".

Consolidated Cash Flow Statement

€ million	Note	2021	2020
Profit after tax		**3,065**	**1,994**
Depreciation/amortization/impairment losses/reversals of impairment losses		1,762	1,938
Changes in inventories		-472	-85
Changes in trade accounts receivable		-310	-84
Changes in trade accounts payable/refund liabilities		433	7
Changes in provisions		196	-110
Changes in other assets and liabilities		-121	-123
Neutralization of gains/losses on disposal of fixed assets and other disposals		-24	-98
Other non-cash income and expenses		86	39
Operating Cash Flow	16	**4,616**	**3,477**
thereof: from discontinued operations		–	–
Payments for investments in intangible assets		-355	-150
Payments from the disposal of intangible assets		39	88
Payments for investments in property, plant and equipment		-1,066	-1,413
Payments from the disposal of property, plant and equipment		7	35
Payments for investments in financial assets		-269	-278
Payments for acquisitions less acquired cash and cash equivalents (net)		-4	-11
Proceeds from the disposal of other financial assets		69	340
Payments for the acquisition of non-financial assets		–	-500
Proceeds from the disposal of non-financial assets		–	501
Payments from other divestments		1	–
Payments for the disposal of assets held for sale		–	-8
Proceeds from the disposal of assets held for sale less transferred cash and cash equivalents		–	55
Investing Cash Flow	23	**-1,578**	**-1,340**
thereof: from discontinued operations		–	-8
Dividend payments to shareholders of Merck KGaA, Darmstadt, Germany		-181	-168
Dividend payments to non-controlling interests		-8	-7
Profit withdrawal by E. Merck KG, Darmstadt, Germany		-567	-512
Proceeds from new borrowings of financial debt from E. Merck KG, Darmstadt, Germany		471	390
Repayment of financial debt to E. Merck KG, Darmstadt, Germany		-393	-382
Repayment of bonds		-317	-2,724
Proceeds from the issuance of bonds		–	2,486
Payments from new borrowings of other current and non-current financial debt		388	3,561
Repayment of other current and non-current financial debt		-1,896	-4,166
Financing Cash Flow	41	**-2,504**	**-1,522**
thereof: from discontinued operations		–	–
Changes in cash and cash equivalents		**534**	**615**
Changes in cash and cash equivalents due to currency translation		9	-40
Cash and cash equivalents as of January 1		1,355	781
Cash and cash equivalents as of December 31 (consolidated balance sheet)	35	**1,899**	**1,355**

Consolidated Statement of Changes in Net Equity

For details see Note (34) "**Equity**".

€ million	Equity capital	Capital reserves	Retained earnings	Gains/losses recognized in equity	Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany	Non-controlling interests	Total equity
Jan. 1, 2020	**565**	**3,814**	**11,483**	**1,980**	**17,841**	**73**	**17,914**
Profit after tax	–	–	1,987	–	1,987	7	1,994
Gains/losses recognized in equity	–	–	-357	-1,790	-2,147	-2	-2,149
Comprehensive income	**–**	**–**	**1,631**	**-1,790**	**-160**	**5**	**-155**
Dividend payments	–	–	-168	–	-168	-7	-175
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	–	–	-567	–	-567	–	-567
Transactions with no change of control	–	–	-1	–	-1	–	-1
Change in scope of consolidation/Other	–	–	–	–	–	–	–
Dec. 31, 2020	**565**	**3,814**	**12,378**	**189**	**16,946**	**71**	**17,017**

€ million	Equity capital	Capital reserves	Retained earnings	Gains/losses recognized in equity	**Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany**	Non-controlling interests	**Total equity**
Jan. 1, 2021	**565**	**3,814**	**12,378**	**189**	**16,946**	**71**	**17,017**
Profit after tax	–	–	3,055	–	3,055	10	3,065
Gains/losses recognized in equity	–	–	599	1,635	2,234	5	2,239
Comprehensive income	**–**	**–**	**3,653**	**1,635**	**5,289**	**15**	**5,304**
Dividend payments	–	–	-181	–	-181	-8	-189
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	–	–	-716	–	-716	–	-716
Transactions with no change of control	–	–	–	–	–	–	–
Change in scope of consolidation/Other	–	–	–	–	–	–	–
Dec. 31, 2021	**565**	**3,814**	**15,134**	**1,824**	**21,338**	**78**	**21,416**

Notes to the Consolidated Financial Statements

General Disclosures

(1) Company information

These consolidated financial statements for the year ended December 31, 2021, were prepared for MERCK Kommanditgesellschaft auf Aktien (Merck KGaA), Frankfurter Strasse 250, 64293 Darmstadt, Germany, entered in the commercial register of the Darmstadt Local Court under HRB 6164. The ultimate parent company of the Group is the parent company of Merck KGaA, Darmstadt, Germany, E. Merck Kommanditgesellschaft (E. Merck KG,), Darmstadt, Germany. The consolidated financial statements of E. Merck KG, Darmstadt, Germany, can be accessed at **www.bundesanzeiger.de**. Shares in Merck KGaA, Darmstadt, Germany, are traded on the regulated market on the Frankfurt Stock Exchange and other exchanges.

(2) Reporting principles

These consolidated financial statements have been prepared in accordance with the International Financial Reporting Standards (IFRS) effective at the end of the reporting period and adopted by the European Union and the additional provisions of section 315e of the German Commercial Code (HGB). The fiscal year is the calendar year. These consolidated financial statements have been prepared in euros, the reporting currency. The values presented in the consolidated financial statements have been rounded. This may lead to individual values not adding up to the totals presented.

The Executive Board of Merck KGaA, Darmstadt, Germany, prepared these consolidated financial statements on February 15, 2022, and approved them to be forwarded to the Supervisory Board. The Supervisory Board is responsible for examining the consolidated financial statements and declaring whether it approves them.

The German Corporate Governance Code declaration (declaration of conformity) in accordance with section 161 of the German Stock Corporation Act (Aktiengesetz) was issued and made available to the Group's shareholders. It can be viewed in the corporate governance section at **https://www.emdgroup.com/en/investors.html**.

The accounting and measurement policies used in the consolidated financial statements are presented in the following Notes and are indicated there.

Amendments to standards effective for the first time in fiscal 2021

The following regulations are binding as of fiscal 2021:

- Amendment to IAS 39 "Financial Instruments: Recognition and Measurement"
- Amendments to IFRS 4 "Insurance Contracts"
- Amendment to IFRS 7 "Financial Instruments: Disclosures"
- Amendment to IFRS 9 "Financial Instruments"
- Amendment to IFRS 16 "Leases"

The regulations listed had no material impact on the consolidated financial statements.

Standards and amendments to standards effective for the first time from fiscal 2022 and 2023

The following regulations are binding as of fiscal 2022:

- Amendment to IAS 16 “Property, Plant, and Equipment”
- Amendment to IAS 37 “Provisions, Contingent Liabilities, and Contingent Assets”
- Amendment to IFRS 3 “Business Combinations”
- Amendment to IFRS 16 “Leases”
- Annual Improvements to IFRS 2018-2020 Cycle

The following regulations are binding as of fiscal 2023:

- IFRS 17 “Insurance Contracts”
- Amendment to IFRS 17 “Insurance Contracts”

We did not opt for early application of any of these regulations.

The impact of IFRS 17 “Insurance Contracts” on Merck Re S.A., Luxembourg, a fully consolidated subsidiary of Merck KGaA, Darmstadt, Germany, is currently being investigated. Based on the information currently available, however, IFRS 17 is not expected to have a material impact on the net assets, financial position, and results of operations of the Group. Furthermore, none of the other changes are expected to have a material impact on the consolidated financial statements.

Regulations published but not yet endorsed by the European Union

As of the balance sheet date, the following regulations were published by the IASB but not yet endorsed by the European Union:

- Amendment to IAS 1 “Presentation of Financial Statements”
- Amendment to IAS 8 “Accounting Policies, Changes in Accounting Estimates, and Errors”
- Amendment to IAS 12 “Income Taxes”
- Amendment to IFRS 17 “Insurance Contracts”

From today’s perspective, the new regulations are not expected to have any material effects on the consolidated financial statements.

Change in reporting of non-current income tax receivables and income tax liabilities

To improve comparability, the Group amended the reporting of non-current income tax receivables and income tax liabilities in fiscal 2021 and restated the prior-period figures accordingly.

Non-current assets now also include “Non-current income tax receivables”. As of January 1, 2020, € 11 million was reclassified from other non-current non-financial assets in this context.

Non-current liabilities now also include “Non-current income tax liabilities”. There were no non-current income tax liabilities as of January 1, 2020, meaning that the change in reporting did not require any reclassifications as of this date.

Accounting and measurement policies

Currency translation

Functional currency

To a predominant extent, the subsidiaries of Merck KGaA, Darmstadt, Germany, conduct their business independently so that the functional currency is normally the respective local currency.

Some subsidiaries, particularly in the Electronics business sector, use the U.S. dollar as their functional currency rather than the local currency.

Transactions in non-functional currency

When the financial statements of consolidated companies are prepared, business transactions that are conducted in currencies other than the functional currency are translated using the exchange rate on the date of the transaction.

Translation of financial statements into the reporting currency (euro)

The financial statements of consolidated companies not using the euro as their functional currency are translated into the reporting currency, the euro. Assets and liabilities are measured at the closing rate while income and expenses are translated at average monthly rates. Any currency translation differences arising during consolidation of Group companies are recognized in equity.

Hyperinflation

Since 2018, Argentina's economy has been classified as hyperinflationary in accordance with IAS 29 "Financial Reporting in Hyperinflationary Economies". Accordingly, business activities in Argentina are no longer reported at historical cost but are presented adjusted for inflation. For this purpose, the Group uses a combination of the wholesale index IPIM (Índice de precios internos al por mayor) and the consumer price index IPC (Índice de precios al consumidor). The index applied stood at 7,396.8 as of the balance sheet date (December 31, 2020: 4,896.2/January 1, 2020: 3,722.0). The loss on the net monetary position is recognized under remaining other operating expenses in "Other operating expenses".

After adjusting the amounts for inflation, the balance sheet items and income and expenses are translated into the reporting currency, the euro, at the closing rate in accordance with IAS 21.42. Prior-year comparative figures are not restated.

Exchange rates of most significant currencies

The exchange rates of the most significant currencies in these consolidated financial statements were as follows:

	Average rate		Closing rate	
€ 1 =	**2021**	2020	**Dec. 31, 2021**	Dec. 31, 2020
Chinese renminbi (CNY)	7.634	7.872	7.206	8.000
Japanese yen (JPY)	129.848	121.756	130.189	126.801
Swiss franc (CHF)	1.081	1.070	1.034	1.083
South Korean won (KRW)	1,353.475	1,344.968	1,345.493	1,336.094
Taiwan dollar (TWD)	33.062	33.589	31.285	34.548
U.S. dollar (USD)	1.183	1.141	1.131	1.230

(3) Discretionary decisions and sources of estimation uncertainty

Dealing with discretionary decisions and sources of estimation uncertainty

The preparation of the consolidated financial statements requires the Group to make discretionary decisions and assumptions as well as estimates to a certain extent. The discretionary scope and estimation uncertainty are assessed in a Group-specific manner. Discretion describes the need to make assumptions concerning recognition or measurement. Estimation uncertainty is determined by the degree of availability and reliability of historical experience and external data for future developments.

Increased uncertainty due to the Covid-19 pandemic

The Group is continuously examining the impact of the Covid-19 pandemic on its business and the resulting effects for the Group's accounting. Despite a temporary downturn in net sales in 2020, the Group's diversified business model has proven to be largely robust during the pandemic to date. Most notably, the high level of demand for the products and services of the Life Science business sector – and the Process Solutions business unit in particular – resulted in significant sales and earnings growth in the reporting period. Business development in the Electronics business sector is also benefiting from the acceleration of the digitalization trend as a result of the Covid-19 pandemic and the consequent growth in demand for semiconductor materials. As in the previous year, the positive course of business and current business planning gave no grounds to suggest that the going concern assumption should not have been applied in preparing the consolidated financial statements.

Although the degree of estimation uncertainty has decreased compared with the previous year, it remains greater than usual because the pandemic situation is still developing dynamically and having a corresponding impact on global macroeconomic performance.

Increased uncertainty due to climate risks

As a globally active science and technology group, the Group is subject to transition-related and physical climate risks that could have a potentially negative impact on its net assets, financial position, and results of operations and lead to increased estimation uncertainty in its accounting. Physical climate risks describe the risks of longer-term changes in the general climatic conditions, while transition-related climate risks describe the consequences for companies as a result of the transition to a sustainable economic system.

The Group has set itself the goal of reducing its direct (Scope 1) and indirect (Scope 2) greenhouse gas emissions by 50% in the period from 2020 to 2030. This will be achieved by lowering process-related emissions, implementing energy efficiency measures, and increasingly purchasing electricity from renewable sources. The Group also plans to reduce the indirect emissions along the entire value chain (Scope 3) by 1,500 metric kilotons of CO_2 equivalents by 2030 and to achieve climate-neutral business operations along the entire value chain by 2040. In November 2021, the Group also decided to sign up to the Science Based Targets Initiative, meaning it has committed to contribute to the achievement of the Paris Agreement goals through specific actions.

The most significant transition-related climate risks to the net assets, financial position, and results of operations are in the Electronics business sector, which is responsible for well in excess of half of the Group's direct (Scope 1) and indirect (Scope 2) greenhouse gas emissions. The majority of the greenhouse gas emissions in this business sector take the form of process-related emissions resulting from the production of specialty gases for the semiconductor and electronics industries. In order to achieve the climate goals it has adopted, the Group intends to reduce the emissions in its business with these specialty gases by making technological improvements to the production process in particular. Based on the information currently available, the implementation of the Group's sustainability strategy is not expected to result in a significant decline in net sales in this business. There have been no indications of impairment of the assets concerned to date, nor has it been necessary to adjust their remaining useful lives.

Overview of significant discretionary decisions and sources of estimation uncertainty

The accounting matters with the most significant discretionary decisions as well as the most comprehensive assumptions relating to the future and sources of estimation uncertainty are described below:

Accounting matter	**Carrying amount as of Dec. 31, 2021 in € million**	IFRS	Discretionary scope/ estimation uncertainty	Sensitivity analysis	Note
Goodwill	17,004			yes	18
Determination of recoverable amount		IAS 36	high		
Other intangible assets	7,612			yes	6, 19
Identification and measurement of intangible assets within the scope of business combinations		IFRS 3	high		
In-licensing of intangible assets		IAS 38	medium		
Determination of amortization		IAS 38	medium		
Identification of impairments or reversal of impairments		IAS 36	high		
Property, plant, and equipment	7,217			no	20
Determination of depreciation		IAS 16	medium		
Identification of impairments or reversal of impairments		IAS 36	medium		
Leases	447			yes	21
Recognition and measurement of lease arrangements		IFRS 16	medium		
Inventories	3,900			no	24
Identification of impairments or reversal of impairments		IAS 2	medium		
Trade and other receivables	3,646			no	25, 42
Determination of loss allowance		IFRS 9	medium		
Other financial assets				yes	36, 43
Determination of fair values of contingent considerations	271	IFRS 13	high		
Determination of fair values of equity instruments	462	IFRS 9, IFRS 13	medium		
Provisions for employee benefits				yes	33
Determination of present value of defined-benefit obligations	5,995	IAS 19	medium		
Determination of parameters for the valuation of fair values of share-based payment programs	348	IFRS 2	medium		
Other provisions and contingent liabilities	647			no	27, 28
Recognition and measurement of other provisions and contingent liabilities		IAS 37	high		
Revenue recognition				yes	9
Measurement of sales deductions and refund liabilities	839	IFRS 15	high		
Income tax				no	15
Recognition and measurement of income tax liabilities	1,462	IAS 12	high		
Recognition and measurement of deferred taxes from temporary differences		IAS 12	medium		
Recognition of deferred tax assets from tax loss carryforwards	11	IAS 12	high		

(4) Subsequent events

The acquisition of Chord Therapeutics SA, Switzerland, was closed on January 31, 2022. See Note (6) "**Acquisitions and divestments**" for further information.

On January 19, 2022, the Group exercised an early repayment option and repaid a USD bond with a nominal value of USD 1 billion (€ 883 million) ahead of schedule. The bond was originally set to mature on March 19, 2022.

On February 7, 2022, the Group announced a change in the organizational structure of the Life Science business sector effective April 1, 2022. The existing contract development and manufacturing services and testing services, together with the respective sales and marketing, research and development, manufacturing, and supply chain functions, will be consolidated in the new Life Science Services business unit. Additionally, the existing Research Solutions and Applied Solutions business units will be combined to form the Science and Lab Solutions business unit, which will act as a third pillar alongside Process Solutions and Life Science Services.

Subsequent to the balance sheet date, no further events of special importance occurred that could have a material impact on the net assets, financial position, or results of operations.

Group Structure

(5) Changes in the scope of consolidation

Accounting and measurement policies

Scope of consolidation

Immaterial subsidiaries are not included in consolidation but are instead reported in non-current financial assets (see Note (36) "**Other financial assets**").

The scope of consolidation changed as follows in the reporting period:

Fully consolidated companies as of Dec. 31, 2020		**326**
Additions	Companies established	1
	Acquisitions	–
	Materiality	4
Retirements	Liquidations/mergers	-5
	Divestments	–
	Immateriality	-1
	Loss of control	–
Fully consolidated companies as of Dec. 31, 2021		**325**
Subsidiaries rated at-equity as of Dec. 31, 2020		1
Subsidiaries rated at-equity as of Dec. 31, 2021		2
Non-consolidated subsidiaries as of Dec. 31, 2020		33
Non-consolidated subsidiaries as of Dec. 31, 2021		36

The list of non-consolidated subsidiaries mainly comprises non-operating shelf companies as well as entities subject to liquidation procedures, which were subsequently measured at fair value through other comprehensive income. Overall, the impact of subsidiaries not consolidated due to immateriality on net sales, profit after tax, assets, and equity was less than 1% relative to the entire Group. The two companies accounted for using the equity method are Syntropy Technologies LLC, United States, and MM Domain Holdco Limited, United Kingdom. In addition, there are two joint operations (Hydrochlor, LLC, United States, and Showa Denko Versum Materials 2 Co., Ltd., Japan) as referred to by IFRS 11. The joint operations are immaterial to the presentation of the financial position and financial performance, both individually and in aggregate. The effects of the existing contractual arrangements also have no potentially significant effect in these contexts.

The list of shareholdings presents all of the companies included in the consolidated financial statements as well as all of the shareholdings of Merck KGaA, Darmstadt, Germany (see Note (48) "**List of shareholdings**").

(6) Acquisitions and divestments

Accounting and measurement policies

Business combinations

The balance sheet items goodwill, other intangible assets, and deferred taxes are significantly influenced by purchase price allocations conducted within the scope of business combinations. As observable market prices are mostly not available for the acquired other intangible assets, the Group regularly relies on the expertise of external professionals when it comes to business combinations. The following overview shows the methods typically used to measure intangible assets within the scope of purchase price allocations:

	Measurement method for determining fair value
Customer relationships	Multi period excess earnings method
Technology	Relief from royalty method
Trademark	Relief from royalty method

Results from foreign currency hedging of expected business combinations, if they meet the requirements for hedge accounting, are offset against the carrying value of the net assets acquired.

Where management considers it to be appropriate, the optional concentration test set out in IFRS 3.B7B is applied in individual transactions. This makes it easier to determine whether a transaction constitutes a business combination or the acquisition of an individual asset or a group of similar assets.

Significant discretionary decisions and sources of estimation uncertainty

Business combinations

In particular, estimation uncertainty and discretionary decisions in conjunction with purchase price allocation relate to:

- planning of future cash flows,
- the customer churn rate, which indicates how existing customer relationships will change in the future,
- the license rate for technologies, which estimates royalty savings on the basis of comparable transactions of similar technologies,
- the discount factor, which is applied for maturity- and risk-based discounting of expected cash inflows, and
- the useful life and the degree of technical obsolescence which depend, among other things, on assumptions about technological developments.

Divestments

The assessment as to when a non-current asset, disposal group, or discontinued operation meets the prerequisites of IFRS 5 for classification as “held for sale” is subject to discretionary judgment. Even in the case of an existing management decision to review a disposal, an uncertain assessment has to be made as to the probability of whether a corresponding disposal will occur during the year.

Planned acquisitions in the fiscal year

Planned acquisition of Chord Therapeutics SA, Switzerland

On December 20, 2021, the Group announced the conclusion of an agreement to acquire Chord Therapeutics SA, Switzerland, a biotech company specializing in rare neuroinflammatory diseases. It is currently being examined as to whether the acquisition constitutes a business operation when applying the optional concentration test in accordance with IFRS 3. The purchase price was agreed as an upfront cash payment in a double-digit million euro amount plus standard payments for the achievement of future development and sales milestones. The transaction closed on January 31, 2022.

Planned acquisition of Exelead Inc., United States

On December 30, 2021, the Group signed a definitive agreement for the purchase of all of the shares in Exelead Inc., United States, (Exelead), a biopharmaceutical contract development and manufacturing organization (CDMO), for around USD 780 million (approximately € 690 million) in cash. The transaction is expected to close in the first quarter of 2022 subject to regulatory clearances as well as the satisfaction of other customary closing conditions. Exelead specializes in complex injectable formulations, including the lipid nanoparticles that are key components of mRNA (messenger ribonucleic acid) therapeutics for treating Covid-19 and other indications. The aim of the planned acquisition is for Exelead's capacities and expertise to expand the Group's service range for mRNA contract development and manufacturing, allowing it to provide a fully integrated offering across the entire mRNA manufacturing process. The business will be integrated into the Process Solutions business unit in the Life Science business sector.

Acquisitions in the previous year

Acquisition of Resolution Spectra Systems S.A.S., France

On June 30, 2020, the Group completed the acquisition of all of the shares in Resolution Spectra Systems S.A.S., a leading provider of systems for real-time analysis and monitoring of bioprocesses. The acquisition strengthened the Group's bioprocessing product portfolio within the Life Science business sector. The purchase price comprised a fixed compensation of € 4 million and future sales-based milestone payments of up to € 4 million. The purchase price allocation was completed as of December 31, 2020.

Acquisition of AmpTec GmbH, Hamburg, Germany

On December 22, 2020, the Group acquired all shares in AmpTec GmbH, one of the leading contract development and manufacturing organizations for mRNA (messenger ribonucleic acid).

The deal strengthened the Group's capabilities to develop and manufacture mRNA. The acquisition added to the Group's lipid manufacturing expertise and created an integrated offering across the entire mRNA value chain. The company was integrated into the Process Solutions business unit, which is part of the Life Science business sector. The purchase price comprised a payment of € 7 million and milestone payments of up to € 18 million for the achievement of technological development targets and sales- and profit-based targets. Valuation of the contingent purchase price payments resulted in a purchase price of € 13 million in accordance with IFRS 3. Purchase price allocation was carried out and completed in the course of fiscal 2021. The prior-year figures were not restated for reasons of materiality.

Divestments in the previous year

Divestment of the Allergopharma allergy business

On February 19, 2020, the Group signed an agreement to sell its Allergopharma allergy business to Dermapharm Beteiligungs GmbH, Grünwald, Germany. Following regulatory approval and the satisfaction of other customary closing conditions, the transaction closed on March 31, 2020. Allergopharma is a leading provider of specific immunotherapies for type 1 allergies. The transaction encompassed the Allergopharma

business in Europe and Asia, including a wide range of therapeutic and diagnostic products, as well as the production site in Reinbek, Germany. The final purchase price was € 70 million. After deducting the cash transferred, the Group received € 56 million. This was reported in the cash flow statement in cash flows from investment activities in fiscal 2020. The gain on disposal in the amount of € 35 million was reported in other operating income in the consolidated income statement.

In the management's estimation, the conditions for classification as a disposal group within the meaning of IFRS 5 were met only when the agreement on the divestment of the Allergopharma business was signed.

Divestment of Litec-LLL GmbH, Greifswald, Germany

The Group sold Litec-LLL GmbH on August 31, 2020, as part of a management buyout. The company specializes in lighting materials. The selling price was € 3 million.

(7) Collaboration and licensing agreements

Accounting and measurement policies

Out-licensing agreements

The Group primarily enters into material out-licensing agreements for intellectual property in the Healthcare business sector. In the vast majority of cases, the granting of a license constitutes a distinct performance obligation that must usually be recognized at a point in time. Due to the uncertainty of development results and regulatory events, contingent consideration is typically recognized when the event in question has occurred. Sales-based and usage-based royalties are recognized when the contract partner makes the corresponding sales or uses the intellectual property. As out-licensing transactions in the Healthcare business sector do not form part of ordinary activities, the corresponding income from upfront payments, milestone payments and royalties is reported in other operating income (see Note (13) "**Other operating income**").

In-licensing agreements

The accounting and measurement policies for the in-licensing of intellectual property are presented in Note (19) "**Other intangible assets**".

Collaboration agreements

In addition to out-licensing agreements for selling intellectual property, the Group enters into collaboration agreements in the Healthcare business sector in which the Group works with partners to develop pharmaceutical drug candidates and, if regulatory approval is granted, to commercialize them. The agreements with Pfizer Inc., United States (Pfizer), in the field of immuno-oncology is the most significant collaboration. The immuno-oncology collaboration with GlaxoSmithKline plc, United Kingdom, on the drug candidate bintrafusp alfa was ended amicably, effective September 30, 2021.

As the partner companies do not have customer characteristics, these collaboration agreements do not fall directly within the scope of IFRS 15, and any income from upfront payments, milestone payments, and royalties is reported under other operating income. Reimbursements of research and development costs made between the collaboration partners are recognized on a net basis in research and development costs. The Group recognizes the consideration received in the course of collaboration agreements for bundled obligations arising from granting rights to intellectual property as well as other goods and services promised as income over the performance period in line with industry practice. Income is caught up cumulatively upon receipt of uncertain future milestone payments attributable to contractual obligations which have already been fulfilled. This refers especially to milestone payments subsequent to regulatory approval. Furthermore, collaboration agreements in the Healthcare business sector typically allocate the net sales generated in specific markets, or with specific products, to the respective collaboration partners in the event of a successful approval; in turn, defined income and expense items are carried by the collaboration partners according to fixed allocation ratios. Under these circumstances, the Group recognizes the net sales from the commercialization of products to third-party

customers, if the Group takes on the role of a principal within the meaning of IFRS 15. Expenses resulting from payments made to collaboration partners in connection with profit share agreements are reported under "Other operating expenses".

Significant discretionary decisions and sources of estimation uncertainty

Collaboration and licensing agreements

As part of the accounting treatment of collaboration and licensing agreements, significant discretionary decisions have to be made in the following areas:

- Identification of an appropriate income recognition method;
- Determination of the appropriate timing of income recognition.

Estimates are to be made especially when it comes to determining the transaction price and progress on the performance obligation.

Strategic alliance with Pfizer Inc., United States, to jointly co-develop and co-commercialize active ingredients in immuno-oncology

On November 17, 2014, the Group formed a global strategic alliance with Pfizer to co-develop and co-commercialize the anti-PD-L1 antibody avelumab. Avelumab received its first regulatory approvals in 2017 under the trade name Bavencio®. The overriding objective of the strategic alliance is to share the development risks and to expand the two companies' presence in immuno-oncology. The execution of the collaboration agreement is not being structured through a separate vehicle. Upon entry into the agreement in 2014, Pfizer made an upfront cash payment of US$ 850 million (€ 678 million) to the Group, which was recognized in the income statement until the end of 2019. Pfizer also committed to making further payments of up to US$ 2 billion to the Group subject to the achievement of defined development and commercial milestones.

According to the collaboration agreement, during the development period each company bears one half of the development expenses. In the commercialization phase, the Group recognizes the majority of net sales from the commercialization of Bavencio® while the Group and Pfizer evenly split the net amount of sales less defined expense components. Net sales generated with Bavencio® amounted to € 373 million in the year under review (2020: € 156 million). In fiscal 2021, the Group recognized a high double-digit million euro amount in research and development expenses (2020: low triple-digit million euro amount) and profit transfer expenses of € 159 million (2020: € 63 million). The Group also realized other operating income of € 50 million from the achievement of two approval milestones in fiscal 2021 (2020: no other operating income from the achievement of milestones).

End of strategic alliance with GlaxoSmithKline plc, United Kingdom, to co-develop and co-commercialize active ingredients in immuno-oncology

On February 5, 2019, the Group had entered into a global agreement in the field of immuno-oncology with a subsidiary of GSK to co-develop and co-commercialize the drug candidate bintrafusp alfa (formerly M7824). In fiscal 2019, the Group received an upfront payment of € 300 million, which was recognized as deferred income on the balance sheet and presented under other liabilities. The Group recognized the upfront payment as income over time in accordance with the fulfillment of performance obligations existing on the basis of contractual agreements. A cost-based method was used to recognize these payments. According to the collaboration agreement, each company bore one half of the development expenses in the development period.

In the third quarter of 2021, it was amicably decided with GSK to end the agreement on bintrafusp alfa effective September 30, 2021. The decision was based on the clinical study data gathered by that time, and in

particular the results of the INTR@PID Lung 037 study on the first-line treatment of patients with non-small cell lung cancer, which failed to reproduce the promising results of previous studies.

As in the previous year, the Group had recognized research and development costs in a low triple-digit million euro amount in fiscal 2021. This included a mid double-digit million euro amount in expenses for the recognition of provisions for follow-on obligations, which were recognized as a result of the termination of the collaboration in the third quarter of 2021. Furthermore, other operating income of € 123 million was recognized in fiscal 2021 from the reversal in profit or loss of the remainder of the upfront payment that was received from GSK and deferred in 2019 (2020: € 85 million).

Out-licensing of the rights to a drug candidate in the area of osteoarthritis to Novartis AG, Switzerland, in the previous year

On October 1, 2020, the Group entered into an agreement with Novartis AG, Switzerland (Novartis), on the out-licensing of M6495, a phase II-ready drug candidate for the treatment of osteoarthritis. The Group received an upfront payment of € 50 million and is entitled to potential additional payments of up to € 400 million subject to the achievement of certain sales and development milestones, as well as royalties on future net sales. Novartis will assume full responsibility for the development and commercialization of M6495. The income from the out-licensing of intellectual property in the amount of € 27 million was reported in other operating income in the previous year. There was no further effect on the net assets, financial position, and results of operations in fiscal 2021.

In-licensing agreement with Debiopharm International SA, Switzerland, on drug candidates for the treatment of head and neck cancer

On March 1, 2021, the Group announced its entry into an in-licensing agreement with Debiopharm International SA, Switzerland (Debiopharm), for the exclusive rights for the development and global commercialization of the drug candidate xevinapant (Debio 1143), and for the development of preclinical follow-on compounds. Xevinapant is currently being investigated in a phase III study for patients with untreated high-risk locally advanced squamous cell carcinoma of the head and neck in combination with platinum-based chemotherapy and standard fractionation intensity-modulated radiotherapy.

The Group made upfront payments of € 188 million in conjunction with the agreement. Moreover, Debiopharm received a right to future milestone payments of up to € 710 million in total, dependent on the achievement of certain development and sales milestones, plus royalties on future net sales. The transaction became effective in April 2021. The upfront cash payment resulted in the recognition of an intangible asset not yet available for use in the amount of € 118 million, an asset under other financial assets for claims for reimbursement in respect of Debiopharm, and a prepayment for future development activities.

Out-licensing agreement with MoonLake Immunotherapeutics AG, Switzerland, on a drug candidate for the treatment of several inflammatory diseases

On May 3, 2021, the Group announced the conclusion of an out-licensing agreement on sonelokimab (M1095) with the newly founded MoonLake Immunotherapeutics AG, Switzerland (MoonLake). Sonelokimab is an investigational anti-IL-17 A/F Nanobody® that neutralizes both IL-17A and IL-17F in patients with moderate to severe chronic plaque-type psoriasis. MoonLake will assume full responsibility for the research, development, and commercialization of sonelokimab. Under the agreement, the Group will receive an upfront cash payment in a double-digit million euro amount and an equity interest of almost 10% in MoonLake. Depending on the achievement of certain development and sales milestones, the Group is also entitled to future milestone payments up to a mid triple-digit million euro amount, as well as royalties depending on future net sales. The equity instruments received were measured at their fair value on initial recognition. The income from the out-licensing of intellectual property in a low double-digit million euro amount was reported in other operating income.

Operating Activities

(8) Segment Reporting

Accounting and measurement policies

Segment reporting

The internal organizational and reporting structure of the Group forms the basis of the segmentation of its business activity. It is founded on the business models of the business sectors, leading to largely identical risk structures within the segments. Resource allocation and the assessment of business development are performed at the level of the segments by the Executive Board of Merck KGaA, Darmstadt, Germany, as the chief operating decision-maker.

Corporate and Other includes income and expenses, assets, and liabilities, as well as cash flows that cannot be allocated to the reportable segments as they are managed at Group level in central Group functions. Moreover, the column serves the reconciliation to the Group figures. As these are managed at Group level, financial expenses and financial income, which include interest expenses and interest income, as well as income tax expenses and income are also disclosed under Corporate and Other.

Apart from net sales, the success of a segment is mainly determined by EBITDA pre (segment result). EBITDA pre is not defined by the International Financial Reporting Standards, but it is the most important performance indicator for the Group. To permit a better understanding of operational performance, EBITDA pre excludes depreciation and amortization, impairment losses and reversals of impairment losses in addition to specific adjustments presented below.

Information by business sector – 2021

€ million	Life Science	Healthcare	Electronics	Corporate and Other	Group
Net sales[1]	**8,990**	**7,089**	**3,608**	**–**	**19,687**
Intersegment sales	62	–	–	-62	–
Operating result (EBIT)[2]	**2,479**	**1,823**	**509**	**-632**	**4,179**
Depreciation	767	315	528	103	1,713
Impairment losses[3]	11	19	36	3	68
Reversals of impairment losses	–	-11	-3	–	-14
EBITDA[4]	**3,257**	**2,146**	**1,070**	**-527**	**5,946**
Adjustments[2]	29	8	58	62	157
EBITDA pre (segment result)[2]	**3,286**	**2,153**	**1,128**	**-465**	**6,103**
EBITDA pre margin (in % of net sales)[2]	36.6%	30.4%	31.3%	–	31.0%
Assets by business sector	21,917	7,809	10,306	5,329	45,362
Liabilities by business sector	-2,094	-2,807	-720	-18,326	-23,947
Investments in property, plant and equipment[5]	461	350	237	16	1,066
Investments in intangible assets[5]	45	277	19	15	355
Non-cash changes in provisions (according to consolidated cash flow statement)[6]	122	176	5	85	387

[1] Excluding intersegment sales.

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

[3] Without impairments on financial assets

[4] 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.

[5] According to the consolidated cash flow statement.

[6] Excluding provisions for pensions and other post-employment benefits.

Information by business sector – 2020

€ million	Life Science	Healthcare	Electronics	Corporate and Other	Group
Net sales[1]	**7,515**	**6,639**	**3,380**	**–**	**17,534**
Intersegment sales[2]	46	–	–	-46	–
Operating result (EBIT)[3]	**1,599**	**1,804**	**240**	**-658**	**2,985**
Depreciation	786	324	561	84	1,756
Impairment losses[4]	3	56	123	–	183
Reversals of impairment losses	–	–	–	–	–
EBITDA[5]	**2,387**	**2,184**	**925**	**-573**	**4,923**
Adjustments[3]	18	83	99	78	279
EBITDA pre (segment result)[3]	**2,405**	**2,267**	**1,024**	**-495**	**5,201**
EBITDA pre margin (in % of net sales)[3]	32.0%	34.1%	30.3%	–	29.7%
Assets by business sector	20,145	7,358	9,735	4,558	41,796
Liabilities by business sector	-1,589	-2,494	-666	-20,030	-24,780
Investments in property, plant and equipment[6]	653	480	230	49	1,413
Investments in intangible assets[6]	51	43	46	10	150
Non-cash changes in provisions (according to consolidated cash flow statement)[7]	83	-218	29	124	18

[1] Excluding intersegment sales.

[2] Values adjusted.

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

[4] Without impairments on financial assets

[5] 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.

[6] According to the consolidated cash flow statement.

[7] Excluding provisions for pensions and other post-employment benefits.

Information by country and region – 2021

€ million	**Europe**	thereof: Germany	thereof: Switzerland	**North America**	thereof: USA	**Asia-Pacific**	thereof: China	**Latin America**	**Middle East and Africa**	**Group**
Net sales by customer location[1]	5,675	1,067	385	5,397	5,145	7,020	2,887	990	605	19,687
Net sales by company location[1]	6,218	1,655	529	5,478	5,253	6,640	2,549	947	404	19,687
Goodwill and other intangible assets[2]	5,051	1,712	1,686	18,851	18,840	713	67	2	–	24,617
Property, plant and equipment	3,902	1,717	998	1,974	1,968	1,118	385	167	55	7,217
Research and development costs	-2,016	-947	-945	-304	-304	-61	-24	-15	-11	-2,408
Number of employees	27,216	13,339	2,465	14,070	13,875	14,285	4,606	3,526	1,237	60,334

[1] Excluding intersegment sales.

[2] Goodwill and other intangible assets show an allocation by currency area.

Information by country and region – 2020

€ million	**Europe**	thereof: Germany	thereof: Switzerland	**North America**	thereof: USA	**Asia-Pacific**	thereof: China	**Latin America**	**Middle East and Africa**	**Group**
Net sales by customer location[1]	4,991	979	292	4,739	4,524	6,313	2,529	910	581	17,534
Net sales by company location[1]	5,515	1,501	462	4,830	4,639	5,962	2,224	868	361	17,534
Goodwill and other intangible assets[2]	4,930	1,585	1,628	17,876	17,866	804	63	1	–	23,612
Property, plant and equipment	3,581	1,610	877	1,664	1,657	973	343	147	56	6,421
Research and development costs	-1,931	-884	-905	-269	-269	-63	-21	-14	-10	-2,288
Number of employees	26,586	13,292	2,383	13,312	13,131	13,518	4,275	3,384	1,296	58,096

[1] Excluding intersegment sales.

[2] Goodwill and other intangible assets show an allocation by currency area.

The Group divides its business activities into three business sectors: The Life Science business sector comprises products for scientific institutions and research and analytical laboratories in the pharmaceutical/biotechnology industry and applications for customers manufacturing pharmaceuticals. In line with the product portfolio, customers in this business sector primarily include companies of the pharmaceutical and biotechnology sector as well as retailers and public research organizations. The Healthcare business sector contains the business with prescription pharmaceuticals. Its customers mainly comprise wholesalers, hospitals, and pharmacies. The Electronics business sector bundles all specialty chemical business and almost exclusively serves industrial companies. The fields of activity of the individual segments are described in detail in the sections on the business sectors in the combined management report.

No single customer accounted for more than 10% of the Group's total net sales in fiscal 2021 or 2020. Transfer prices for intragroup net sales were determined on an arm's-length basis.

The following table presents the reconciliation of segment results of all operating businesses to the profit before income tax of the Group:

€ million	2021	2020
EBITDA pre of the operating businesses[1]	**6,567**	**5,696**
Corporate and Other	-465	-495
EBITDA pre of the Group[1]	**6,103**	**5,201**
Depreciation/amortization/impairment losses/reversals of impairment losses	-1,767	-1,938
Adjustments[1]	-157	-279
Operating result (EBIT)[1]	**4,179**	**2,985**
Financial result	-255	-354
Profit before income tax	**3,924**	**2,630**

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

The adjustments comprised the following:

€ million	2021	2020
Restructuring expenses	-79	-162
Integration expenses/IT expenses	-81	-108
Gains (+)/losses (-) on the divestment of businesses	3	-10
Acquisition-related adjustments	18	10
Other adjustments	-19	-9
Adjustments before impairment losses/reversals of impairment losses[1]	**-157**	**-279**
Impairment losses[2]	-56	-128
Reversals of impairment losses	3	–
Adjustments (total)[1]	**-210**	**-407**

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

[2] Without impairments on financial assets.

Expenses of € 26 million related to various restructuring measures in the Life Science business sector (2020: € 15 million). A further € 22 million in restructuring expenses in the Electronics business sector related to the Bright Future transformation program in particular (2020: € 20 million).

At € 44 million in fiscal 2021 (2020: € 50 million), integration and IT expenses related to expenses for launching new ERP systems.

As in the previous year, impairment losses related in particular to intangible assets in the Electronics business sector.

The adjustments are reported in the consolidated income statement as part of the respective functional costs and allocated to them as follows:

2021

€ million	thereof: cost of sales	thereof: marketing and selling expenses	thereof: administration expenses	thereof: research and development expenses	thereof: other operating income and expenses	**Total**
Restructuring expenses	-21	-17	-29	-8	-5	-79
Integration expenses/IT expenses	-5	-1	-53	–	-22	-81
Gains (+)/losses (–) on the divestment of businesses	–	–	-1	–	5	3
Acquisition-related adjustments	–	–	–	–	18	18
Other adjustments	–	–	–	–	-19	-19
Adjustments before impairment losses/reversals of impairment losses[1]	**-25**	**-17**	**-83**	**-8**	**-24**	**-157**
Impairment losses[2]	–	–	–	–	-56	-56
Reversals of impairment losses	–	–	–	–	3	3
Adjustments in the operating result (total)[1]	**-25**	**-17**	**-83**	**-8**	**-76**	**-210**

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

[2] Without impairments on financial assets.

2020

€ million	thereof: cost of sales	thereof: marketing and selling expenses	thereof: administration expenses	thereof: research and development expenses	thereof: other operating income and expenses	Total
Restructuring expenses	-33	-55	-28	-25	-21	-162
Integration expenses/IT expenses	-1	-5	-71	-1	-30	-108
Gains (+)/losses (–) on the divestment of businesses	–	–	–	–	-10	-10
Acquisition-related adjustments	-19	–	–	–	29	10
Other adjustments	–	–	–	–	-9	-9
Adjustments before impairment losses/reversals of impairment losses[1]	**-53**	**-60**	**-98**	**-27**	**-41**	**-279**
Impairment losses[2]	–	–	–	–	-128	-128
Reversals of impairment losses	–	–	–	–	–	–
Adjustments in the operating result (total)[1]	**-53**	**-60**	**-98**	**-27**	**-169**	**-407**

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

[2] Without impairments on financial assets.

(9) Net sales

Accounting and measurement policies

Nature and timing of revenue recognition

Net sales are recognized when (or as) the customer obtains control of the asset. For sales of goods, the customer typically obtains control as soon as delivery is made, given that the customer is generally not able to obtain any benefits from the asset before that point in time. In the case of equipment sales, the criteria for revenue recognition are only met after installation has been successfully completed – to the extent that the installation requires specialized knowledge, does not represent a clear ancillary service and the relevant equipment can only be used by the customer once successfully set up.

For service contracts and customer-specific contract manufacturing of goods and equipment, the Group recognizes revenue over time based on the progress towards complete satisfaction of the performance obligation, if there is a contractual claim for payment against the customer for the services already performed. Input- and output-oriented methods are used to appropriately determine progress on a contract-specific basis. Specifically, they are mainly calculated on the basis of the time elapsed, milestones reached, units delivered, or costs incurred as of the reporting date.

Intellectual property is out-licensed to a limited extent in the Life Science and Healthcare business sectors. Unlike in the Life Science business sector, these transactions do not usually form part of ordinary activities in the Healthcare business sector, meaning that the corresponding income is reported in other operating income (see Note (7) "**Collaboration and licensing agreements**" and Note (13) "**Other operating income**").

Net sales from contracts comprising several separate performance obligations are recognized on a pro rata basis when the respective performance obligation has been fulfilled. Multiple-element arrangements of this nature exist to a limited extent in the Applied Solutions business unit in the Life Science business sector and in the Semiconductor Solutions business unit in the Electronics business sector.

Determining the transaction price

The Group grants customers various kinds of rebates and discounts. These, as well as anticipated customer refund claims, state compulsory charges and rebates from health plans and programs, are deducted from sales. The most significant portion of these deductions from sales is attributable to the Healthcare business sector and, in particular, sales in the United States.

Sales deductions provided on the invoice as price-reducing items, which will likely be applied by customers when making the respective payments, are recognized as reduction of trade accounts receivable. Expected refunds, such as bonus payments, reimbursements for rights of return or rebates from health plans and programs, are reported in the consolidated balance sheet under refund liabilities.

The measurement of sales deductions and refund liabilities resulting from expected rebates and discounts considers the following:

- past experience;
- pricing information;
- expected sales volume growth rates.

The measurement of sales deductions and refund liabilities resulting from rights of return takes into account historical rates of return for individual product groups, information from distributors on inventory levels and publicly available information on product sales from sector-specific service providers (in the Healthcare business sector).

Contractual payment terms

Given that the Group generates the large majority of its net sales through transactions with simple structures, the company usually has an enforceable right to payment after the performance obligation has been fulfilled. The payment targets contractually agreed between the Group and its customers usually range between 30 and 60 days.

Practical expedients

The Group uses the practical expedient of IFRS 15 in which the promised amount of consideration is not adjusted for the effects of a significant financing component if the period between the fulfillment of a performance obligation and the payment by the customer only amounts to up to one year.

Significant discretionary decisions and sources of estimation uncertainty

Sales deductions

The measurement of sales deductions and the corresponding refund liabilities requires extensive estimates. Uncertainties exist in particular concerning the extent to which past experience serves as a reliable basis for estimating the future development of expected refunds, such as bonus payments, reimbursements for rights of return or rebates from health plans and programs. External information from distributors and industry services outside of the Group's control, which are also subject to uncertainty, are used to determine sales deductions.

Due to a lack of past experience, the estimation uncertainty referenced above is particularly relevant for product launches in the Healthcare business sector.

Any changes in estimates of the parameters listed above have a cumulative impact on the net sales for the respective adjustment period.

If the carrying amount of refund liabilities had been 10% higher as of the reporting date, this would have resulted in a € 84 million (2020: € 67 million) reduction in profit before tax.

The following tables present a breakdown of net sales by key product lines/products:

Life Science

€ million	**2021**		2020[1]	
Process Solutions	4,645	52%	3,595	48%
Research Solutions	2,512	28%	2,215	29%
Applied Solutions	1,833	20%	1,705	23%
Total	**8,990**	**100%**	**7,515**	**100%**

[1] Previous year's figures have been adjusted due to an internal realignment.

Healthcare

€ million	**2021**		2020	
Oncology	**1,411**	**20%**	**1,116**	**17%**
thereof: Erbitux®	987	14%	891	13%
thereof: Bavencio®	373	5%	156	2%
Neurology & Immunology	**1,645**	**23%**	**1,662**	**25%**
thereof: Rebif®	952	13%	1,131	17%
thereof: Mavenclad®	693	10%	531	8%
Fertility	**1,337**	**19%**	**1,079**	**16%**
thereof: Gonal-f®	767	11%	630	9%
Cardiovascular, Metabolism & Endocrinology	**2,540**	**36%**	**2,585**	**39%**
thereof: Glucophage®	864	12%	903	14%
thereof: Concor®	523	7%	529	8%
thereof: Euthyrox®	470	7%	455	7%
thereof: Saizen®	248	3%	234	4%
Other	**157**	**2%**	**197**	**3%**
Total	**7,089**	**100%**	**6,639**	**100%**

Electronics

€ million	2021		2020[1]	
Semiconductor Solutions	2,151	60%	1,894	56%
Display Solutions	1,046	29%	1,115	33%
Surface Solutions	410	11%	370	11%
Other	–	–	1	–
Total	**3,608**	**100%**	**3,380**	**100%**

[1] Within the scope of the integration of Versum Materials Inc., USA, two products previously allocated to the Semiconductor Solutions business unit have now been assigned to Display Solutions. The previous year's figures have been adjusted accordingly.

The following tables present a more detailed breakdown of net sales by business sector from contracts with customers.

2021

€ million

Net sales by product type	**Life Science**		**Healthcare**		**Electronics**		**Group**	
Goods	7,906	88%	7,011	99%	3,182	88%	18,099	92%
Equipment	469	5%	2	–	336	9%	807	4%
Services	603	7%	26	–	88	3%	718	4%
License income	12	–	–	–	1	–	14	–
Commission income	–	–	18	–	–	–	18	–
Income from co-commercialization agreements	–	–	31	1%	–	–	31	–
Total	**8,990**	**100%**	**7,089**	**100%**	**3,608**	**100%**	**19,687**	**100%**
Net sales by region (customer location)								
Europe	3,138	35%	2,268	32%	269	7%	5,675	29%
North America	3,187	36%	1,673	23%	536	15%	5,397	27%
Asia-Pacific	2,286	25%	1,997	28%	2,737	76%	7,020	36%
Latin America	278	3%	682	10%	30	1%	990	5%
Middle East and Africa	100	1%	468	7%	36	1%	605	3%
Total	**8,990**	**100%**	**7,089**	**100%**	**3,608**	**100%**	**19,687**	**100%**

2020

€ million

Net sales by product type	Life Science		Healthcare		Electronics		Group	
Goods	6,585	88%	6,496	98%	3,029	90%	16,111	92%
Equipment	386	5%	5	–	254	7%	645	4%
Services	535	7%	56	1%	96	3%	686	4%
License income	9	–	–	–	1	–	10	–
Commission income	–	–	18	–	–	–	18	–
Income from co-commercialization agreements	–	–	65	1%	–	–	65	–
Total	**7,515**	**100%**	**6,639**	**100%**	**3,380**	**100%**	**17,534**	**100%**
Net sales by region (customer location)								
Europe	2,583	35%	2,158	32%	250	8%	4,991	29%
North America	2,701	36%	1,554	23%	484	14%	4,739	27%
Asia-Pacific	1,900	25%	1,831	28%	2,582	76%	6,313	36%
Latin America	241	3%	641	10%	28	1%	910	5%
Middle East and Africa	89	1%	455	7%	37	1%	581	3%
Total	**7,515**	**100%**	**6,639**	**100%**	**3,380**	**100%**	**17,534**	**100%**

Group net sales amounted to € 19,687 million in fiscal 2021 (2020: € 17,534 million). As in the previous year, around 4% of this figure was recognized over time (2021: € 726 million; 2020: € 697 million). This mainly related to net sales from services and from customer-specific equipment in the Applied Solutions and Process Solutions business units in the Life Science business sector and net sales from the project business of the Semiconductor Solutions business unit in the Electronics business sector.

The table below shows future net sales from orders already received:

	Year of expected revenue recognition		
€ million	2022	2023 or later fiscal years	**Total**
As of Dec. 31, 2021	5,729	364	6,093

	Year of expected revenue recognition		
€ million	2021	2022 or later fiscal years	Total
As of Dec. 31, 2020	3,892	376	4,268

The significant increase as against the previous year resulted, in particular, from the positive performance of the Process Solutions business unit in the Life Science business sector.

The following table shows the change in refund liabilities:

2020

	Rebates/Bonus payments		Rights of return		
€ million	Total	thereof: United States	Total	thereof: United States	Total
Jan. 1, 2020	**522**	**315**	**43**	**29**	**565**
Additions due to business combinations	–	–	–	–	**–**
Other additions	1,713	1,234	41	20	**1,754**
Disposals due to divestments/Reclassification to assets held for sale	-8	–	–	–	**-8**
Utilizations	-1,501	-1,081	-33	-17	**-1,534**
Cumulative increase (-)/decrease (+) in net sales	-66	-67	-3	-4	**-69**
thereof: attributable to performance obligations satisfied in prior periods	-48	-48	-3	-3	**-51**
Currency translation	-39	-35	-4	-3	**-42**
Other	1	–	–	–	**1**
Dec. 31, 2020	**622**	**368**	**44**	**26**	**666**

2021

	Rebates/Bonus payments		Rights of return		
€ million	Total	thereof: United States	Total	thereof: United States	**Total**
Jan. 1, 2021	**622**	**368**	**44**	**26**	**666**
Additions due to business combinations	–	–	–	–	**–**
Other additions	2,216	1,528	58	34	**2,273**
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	**–**
Utilizations	-1,995	-1,392	-48	-27	**-2,044**
Cumulative increase (-)/decrease (+) in net sales	-102	-94	-2	-1	**-105**
thereof: attributable to performance obligations satisfied in prior periods	-86	-82	2	2	**-83**
Currency translation	43	35	3	3	**47**
Other	1	–	–	–	**1**
Dec. 31, 2021	**784**	**445**	**55**	**35**	**839**

The development in contract assets and contract liabilities is shown in Note (26) "**Contract assets**" and in Note (29) "**Other non-financial liabilities**".

(10) Cost of sales

Accounting and measurement policies

Cost of sales

The cost of sales primarily includes the cost of manufactured products sold and the merchandise sold.

Cost comprises the following items: directly attributable costs, such as cost of materials, personnel and energy costs, depreciation and amortization, overheads attributable to the production process, inventory impairment losses and their reversals.

Cost of sales included amortization of intangible assets (excluding amortization of internally generated or separately acquired software) in the amount of € 201 million (2020: € 210 million). Material costs amounted to € 3,535 million in fiscal 2021 (2020: € 3,074 million) and were largely reported under cost of sales.

Impairment losses on inventories amounted to € 221 million (2020: € 312 million) in the reporting period; reversals of impairment losses came to € 171 million (2020: € 97 million).

(11) Marketing and selling expenses

Accounting and measurement policies

Marketing and selling expenses

Marketing and selling expenses within logistics costs also include expenses for transportation services performed on behalf of customers. The corresponding income from these services is reported under net sales.

Amortization of the intangible assets under marketing and selling expenses is mainly attributable to customer relationships, marketing authorizations, licenses and similar rights, brands, and trademarks, which can be functionally allocated to Marketing and selling.

Marketing and selling expenses comprised the following items:

€ million	2021	2020
Sales force	-891	-910
Internal sales services	-886	-862
Sales promotion	-461	-413
Logistics	-985	-899
Amortization of intangible assets[1]	-589	-636
Royalty and license expenses	-166	-164
Other marketing and selling expenses	-325	-324
Marketing and selling expenses	**-4,304**	**-4,207**

[1] Excluding amortization of internally generated or separately acquired software.

The increase in expenses for sales promotion is due to increased advertising activity following the relaxation of measures to combat the Covid-19 pandemic. In addition to the higher sales volume, the increase in logistics expenses was due to price rises resulting from capacity bottlenecks in international goods transportation.

The decrease in amortization of intangible assets was related to the regional expiration of distribution rights for Xalkori® in the business sector Healthcare. The downturn in the Life Science business sector was due to assets reaching the end of their scheduled useful lives.

Of the royalty and license expenses, € 48 million (2020: € 41 million) related to the commercialization of Erbitux®, while € 44 million (2020: € 51 million) related to license expenses in connection with the commercialization of Glucophage® in China.

(12) Research and development costs

Accounting and measurement policies

Research and development costs

The item comprises the costs of the Group's own research and development departments, the expenses incurred as a result of research and development collaborations as well as the costs of clinical trials in the Healthcare business sector (both before and after approval is granted).

For information on the capitalization of development costs, see Note (19) "**Other intangible assets**".

Cost reimbursements for research and development are offset against research and development costs.

The net income from repayments of subsidies received and reimbursements recognized within research and development costs amounted to € 100 million in fiscal 2021 (2020: € 127 million). This decline was essentially due to lower reimbursements of development costs from the strategic alliance with GlaxoSmithKline plc, United Kingdom, in the field of immuno-oncology (see Note (7) "**Collaboration and licensing agreements**").

(13) Other operating income

Accounting and measurement policies

Other operating income

Other operating income comprises all income that cannot be allocated to net sales or finance income on account of its character.

Income from upfront payments, milestone payments, and royalties

Income from upfront payments, milestone payments and royalties, comprises consideration received by the Group from contract partners that are not customers. This relates in particular to collaboration and out-licensing agreements in the Healthcare business sector (see Note (7) "**Collaboration and licensing agreements**").

Income from the revaluation of contingent considerations

The accounting treatment of contingent consideration agreed at the sale of a business as defined in IFRS 3 is shown in Note (36) "**Other financial assets**".

Other operating income was broken down as follows:

€ million	2021	2020
Income from upfront payments, milestone payments and royalties	304	229
Income from disposal of businesses and assets	67	97
Income from the reversal of provisions for litigation	27	424
Reversal of impairment losses on non-financial asset	14	–
Income from the revaluation of contingent considerations	7	1
Income from miscellaneous services	5	5
Income from fair value measurement of assets	3	–
Remaining other operating income	101	81
Other operating income	**528**	**838**

The income from upfront payments, milestone payments, and royalties included € 123 million (2020: € 85 million) from the collaboration agreement with GlaxoSmithKline plc, United Kingdom, and milestone payments of € 50 million received from Pfizer Inc., United States, for Bavencio®. For further explanations see Note (7) "**Collaboration and licensing agreements**". License income primarily resulted from interferon beta products (Biogen Inc., United States) in the amount of € 60 million (2020: € 74 million) and a license for the antidepressant Viibryd® (AbbVie Inc., United States) in the amount of € 50 million (2020: € 38 million).

Further information on income from disposals of businesses and assets can be found in Note (6) "**Acquisitions and divestments**".

Income from the reversal of provisions for litigation mostly related to the reversal of a provision for EU antitrust proceedings in connection with the acquisition of Sigma-Aldrich Corporation, United States, that was not fully utilized. In the previous year they essentially related to the end of the legal dispute with Biogen Inc., United States. Further information can be found in Note (27) "**Other provisions**".

(14) Other operating expenses

Accounting and measurement policies

Other operating expenses

Other operating expenses comprise all expenses that cannot be reasonably allocated to a functional cost type or finance costs.

The breakdown of other operating expenses was as follows:

€ million	2021	2020
Profit share agreements	-178	-80
Impairment losses on non-financial assets	-68	-183
Project expenses (including integration and IT projects)	-60	-93
Non-income related taxes	-58	-56
Premiums, fees and contributions	-42	-36
Expenses on revaluation of contingent considerations	-28	-17
Expenses from Litigation	-19	-52
Expenses for miscellaneous services	-12	-15
Expenses from fair value measurement of assets	-8	-2
Restructuring expenses	-7	-29
Expenses from disposal of businesses and assets	-4	-3
Currency effects from operating activities	-1	-57
Remaining other operating expenses	-248	-240
Other operating expenses	**-734**	**-863**

Expenses from profit share agreements primarily related to the strategic alliance with Pfizer Inc., United States, in the field of immuno-oncology (see Note (7) "**Collaboration and licensing agreements**").

Impairments of non-financial assets were attributable to intangible assets (see Note (19) "**Other intangible assets**") in the amount of € 47 million (2020: € 160 million) and to property, plant, and equipment (see Note (20) "**Property, plant, and equipment**") in the amount of € 22 million (2020: € 23 million).

The remaining other operating expenses included, among other things, personnel expenses where a reliable allocation to the functional areas was not possible.

(15) Income tax

Accounting and measurement policies

Current income taxes

Current income taxes for the reporting period and, where applicable, for prior periods are calculated in the amounts that the tax authorities are expected to demand or reimburse. The calculation is based on the company-specific tax rate applicable in the relevant tax year.

Uncertain income tax assets and liabilities

Factual assessments are made to calculate uncertain income tax assets and liabilities. Uncertain income tax matters are recognized depending on the likelihood that the responsible tax authorities will accept the respective income tax treatment. If recognition by the tax authorities is considered unlikely, the respective uncertain tax asset or uncertain tax liability is measured at the most likely amount. Uncertain income tax liabilities are reported within income tax liabilities. Expected income tax-related penalties and interest that do not fall within the scope of IAS 12 are treated as provisions in line with IAS 37.

Deferred taxes

Deferred tax assets resulting from deductible temporary differences that exceed deferred tax liabilities relating to the same taxation authority and the same taxable entity are recognized if it is considered probable that taxable profit will be available against which they can be utilized. This corresponds to the procedure for recognizing deferred tax assets on unused tax credits and tax loss and interest carryforwards.

The recognition of deferred tax assets requires an estimate of the probability of future use. The influencing factors considered as part of this assessment include the following:

- temporary differences relating to the same taxation authority and the same taxable entity that will be subject to taxation in the future,
- results history,
- results planning, and
- existing tax planning of the respective Group company.

Deferred tax liabilities are recognized for planned dividend payments of subsidiaries within the next 12 months.

Significant discretionary decisions and sources of estimation uncertainty

Income taxes

The calculation of the reported assets and liabilities from current and deferred income taxes requires extensive discretionary judgments, assumptions and estimates.

When assessing income tax assets and liabilities, the interpretation of tax provisions may be subject to particular uncertainty. The possibility that the relevant tax authorities will take a differing view concerning the application and interpretation of tax standards cannot be ruled out. Changes to the assumptions underlying the interpretation of tax standards, for example as a result of changes in legislation, are recognized in the balance sheet when the change comes into force.

Regarding deferred tax items, there is uncertainty as to when an asset will be realized or a liability settled. This applies in particular to deferred taxes recognized in the course of company acquisitions. Assessing the

recoverability, particularly of tax credits and tax loss and interest carryforwards, requires assumptions and estimates concerning the future taxable income of the respective Group company. Furthermore, the extent to which a subsidiary's planned dividend distribution is probable within the next twelve months is discretionary.

Income taxes in the consolidated income statement were broken down as follows:

€ million	**2021**	2020
Current income taxes in the period	-1,078	-959
Income taxes for previous periods	45	-11
Deferred taxes in the period	174	333
thereof: from temporary differences	206	334
thereof: from changes in tax rates	-23	6
thereof: from tax loss carryforwards	-9	-7
Income taxes	**-859**	**-637**

Tax reconciliation

The following table presents the reconciliation from the theoretical income tax expense to the income tax expense according to the consolidated income statement. The theoretical income tax expense is determined by applying the statutory tax rate of a corporation headquartered in Darmstadt of 31.7% (2020: 31.7%).

€ million	**2021**	2020
Profit before income tax	3,924	2,630
Tax rate	31.7%	31.7%
Theoretical income tax expense	-1,245	-834
Tax rate differences	424	307
Tax effect of companies with a negative contribution to consolidated profit	-33	-31
Income tax for previous periods	45	-11
Tax credits	-30	-32
Tax effect on tax loss carryforwards	29	5
Tax effect of non-deductible expenses/Tax-free income/Other tax effects	-49	-41
Income tax expense according to consolidated income statement	**-859**	**-637**
Tax ratio according to consolidated income statement	**21.9%**	**24.2%**

Income taxes consisted of corporation and trade taxes for the German companies and comparable income taxes for non-German companies. Income taxes relating to previous periods recognized in fiscal 2021 resulted mainly from completed tax audits and mutual agreement procedures as well as from additions to liabilities for risks from tax audits.

Deferred taxes (consolidated income statement)

The reconciliation between deferred taxes on the consolidated balance sheet and deferred taxes on the consolidated income statement is presented in the following table:

€ million	**2021**	2020
Change in deferred tax assets (consolidated balance sheet)	-40	121
Change in deferred tax liabilities (consolidated balance sheet)	30	384
Deferred taxes credited/debited to equity	119	-116
Changes in scope of consolidation/Currency translation/other changes	66	-58
Deferred taxes (consolidated income statement)	**174**	**333**

As in the previous year, the item “Changes in consolidated group/currency translation/other changes” mainly comprised exchange rate effects for items translated from U.S. dollars to the reporting currency (euro).

Changes in tax loss carryforwards

Tax loss carryforwards were structured as follows:

	Dec. 31, 2021			Dec. 31, 2020		
€ million	**Germany**	**Outside Germany**	**Total**	Germany	Outside Germany	Total
Tax loss carryforwards	**136**	**1,023**	**1,159**	**94**	**1,110**	**1,204**
Tax loss carryforwards for which a deferred tax asset is recognized	2	60	62	4	161	165
Tax loss carryforwards for which no deferred tax asset is recognized	134	963	1,097	90	949	1,039
Potential deferred tax assets for tax loss carryforwards	**41**	**251**	**292**	**27**	**257**	**284**
Recognized deferred tax assets on tax loss carryforwards	–	11	11	–	20	20
Not recognized deferred tax assets on tax loss carryforwards	41	240	281	27	237	264

The majority of the tax loss carryforwards either has no expiry date or can be utilized for up to 20 years.

Deferred taxes (consolidated balance sheet)

Deferred tax assets and liabilities related to the following balance sheet items:

	Dec. 31, 2021		Dec. 31, 2020	
€ million	**Assets**	**Liabilities**	Assets	Liabilities
Intangible assets	99	1,527	114	1,600
Property, plant and equipment	35	103	27	101
Current and non-current financial assets	1	7	–	26
Inventories	757	20	679	13
Current and non-current receivables/Other assets	90	9	19	6
Current and non-current provisions	859	57	948	35
Current and non-current liabilities	85	68	94	22
Tax loss carryforwards	11	–	20	–
Tax refund claims/Other	42	99	51	48
Deferred taxes (before offsetting)	**1,980**	**1,889**	**1,951**	**1,849**
Offset deferred tax assets and liabilities	-478	-478	-408	-408
Deferred taxes (consolidated balance sheet)	**1,502**	**1,411**	**1,543**	**1,441**

In fiscal 2021, net deferred tax assets increased by € 174 million as a result of items recognized in profit or loss, which primarily related to the reduction in deferred taxes recognized for temporary differences on intangible assets. This development was more than offset by items not recognized in profit or loss, which related to deferred tax effects resulting from items recognized through other comprehensive income such as the remeasurement of the net defined benefit obligation, changes in the fair value of financial assets and derivatives held for hedging purposes and currency translation effects. In both fiscal 2021 and 2020, the latter were attributable in particular to deferred tax liabilities recognized for temporary differences on intangible assets.

Given the positive earnings forecasts, it was assumed that it will be possible to realize recognized deferred tax assets of € 82 million (December 31, 2020: € 72 million), which exceeded deferred tax liabilities relating to the same taxation authority and the same taxable entity, even though there was a loss in the current or previous period.

For deductible temporary differences in the amount of € 57 million (December 31, 2020: € 0 million) no deferred tax assets were recognized in the balance sheet.

Deferred tax liabilities from outside basis differences for planned dividend payouts were recognized in the amount of € 93 million (December 31, 2020: € 46 million). Retained earnings of subsidiaries for which no deferred taxes are recognized amounted to € 8,553 million as of December 31, 2021 (December 31, 2020: € 12,609 million). The resulting temporary differences that will be taxable in future periods in the event of dividend payments amounted to € 476 million as of December 31, 2021 (December 31, 2020: € 672 million).

Income tax receivables and income tax liabilities

Income tax receivables amounted to € 502 million as of December 31, 2021 (December 31, 2020: € 530 million) and mainly resulted from tax prepayments that exceeded the actual amount of tax payable for the past fiscal year and earlier fiscal years, from refund claims for previous years, and from withholding tax claims. As of December 31, 2021, income tax liabilities including liabilities for uncertain tax obligations totaled € 1,462 million (December 31, 2020: € 1,505 million).

(16) Operating cash flow

Accounting and measurement policies

Operating cash flow

The operating cash flow is calculated and presented based on the following principles:

- The operating cash flow is presented using the indirect method based on profit after taxes.
- The option to recognize interest received and interest payments made is exercised to the extent that such transactions are recognized in cash flow from operating activities.
- Tax payments are reported in operating cash flow. Only significant transactions where the associated tax payments can be practically calculated are recognized in the relevant item of the consolidated cash flow statement.

Tax payments made totaled € 1,135 million in fiscal 2021 (2020: € 1,006 million). Tax refunds received amounted to € 90 million (2020: € 140 million).

Interest paid totaled € 216 million (2020: € 340 million).

The changes in provisions in the previous year were primarily influenced by the reversal of the provision for the patent dispute with Biogen Inc., United States (see Note (27) "**Other provisions**").

(17) Earnings per share

Accounting and measurement policies

Earnings per share

Basic earnings per share is calculated by dividing the profit after taxes attributable to the shareholders of Merck KGaA, Darmstadt, Germany (net income) by the weighted average number of theoretical shares outstanding. The calculation of the theoretical number of shares is based on the fact that the general partner's equity is not represented by shares. Corresponding to the division of the subscribed capital of € 168 million into 129,242,252 shares (see Note (34) "**Equity**"), the general partner's equity of € 397 million equates to 305,535,626 theoretical shares. Overall, equity capital thus amounted to € 565 million or 434,777,878 theoretical shares outstanding.

As in the previous year, equity capital remained unchanged in fiscal 2021. The weighted average (basic) number of shares was 434,777,878 and thus corresponded to the number of theoretical shares outstanding. In fiscal 2021 and 2020, there were no shares with a potential diluting effect; as a result, the diluted earnings per share were equivalent to basic earnings per share.

Operating Assets, Liabilities, and Contingent Liabilities

(18) Goodwill

Accounting and measurement policies

Goodwill

In the course of business combinations, goodwill is recognized on the acquisition date. The option to measure non-controlling interests at fair value on the date of their acquisition (full goodwill method) is not utilized.

Method for impairment testing

Impairment testing for goodwill takes place at the level of the Life Science, Healthcare, and Electronics business sectors. These groups of cash-generating units (CGUs) are the lowest level at which goodwill within the Group is monitored for internal management purposes.

Impairment testing is performed annually and on an ad hoc basis where there are indications of impairment. The existence of indications of impairment may be analyzed using various factors, particularly changes in short-term and medium-term planning, sector studies, analyst forecasts, validation multiples based on peer group information, the Group's average market capitalization compared to its balance sheet equity, and the development of its order books.

For both value in use and fair value less cost of disposal the recoverable amount is calculated in accordance with the discounted cash flow method (Level 3 in the IFRS 13 fair value hierarchy). The determination of the recoverable amount for the Life Science CGU and Healthcare CGU was based on the value in use in fiscal 2021 as well as in the previous year. In fiscal 2021, the recoverable amount for the impairment test of the Electronics CGU was based on the value in use (2020: fair value less costs of disposal). The last medium-term plan approved by the Executive Board, with a detailed planning period of four years, served as the basis for planning. The value of the net cash flows was determined on the basis of the following principles:

	Value in use	Fair value less costs of disposal
Sales growth in the detailed planning period	Based on plans approved by the Executive Board, taking into account internal past experience and largely non-observable input factors in the market, for example regarding future market shares, selling prices and volumes, and excluding new products from the development pipeline and other expansion investments	Based on plans approved by the Executive Board, taking into account internal past experience and largely non-observable input factors in the market, for example regarding future market shares, selling prices and volumes, and including new products from the development pipeline and other expansion investments
Profit margins in the detailed planning period	Based on past experiences, adjusted for expected profitability developments	

The discount factor after taxes is derived on the basis of the following input parameters:

Risk-free interest rate	Derived from the returns of long-term government bonds
Beta factor	Derived from the respective peer group
Market risk premium	Based on a combination of different estimating methods; e.g. historical and implied stock yields
Cost of debt and capital structure	Derived from the market data of the respective peer group companies

The long-term growth rate after the detailed planning period is determined taking into account expected long term growth and long-term inflation expectations.

Significant measurement assumptions

The planning used in conjunction with impairment testing in fiscal 2021 was based, in contrast to the previous year, only on one baseline scenario.

The expected average sales growth used to determine the value in use in the Life Science CGU in the detailed planning period was a high single-digit percentage (2020: high single-digit percentage). Taking into account Group costs allocated on a pro rata basis, the EBITDA pre margin applied in the detailed planning period was around 32% in fiscal 2021 (2020: around 30%).

The expected average sales growth in the Healthcare CGU amounted to a low single-digit percentage in the detailed planning period (2020 low single-digit percentage in the baseline scenario). In line with the value-in-use concept, this did not include net sales from the launch of new products.

The calculation of the value in use of the Electronics CGU included expected average sales growth in the detailed planning period at a mid-single-digit percentage rate (2020: mid-single-digit percentage rate in the baseline scenario). Taking into account Group costs allocated on a pro rata basis, the EBITDA pre margin applied in the detailed planning period in fiscal 2021 was unchanged as against the previous year at around 30%.

Owing to the greater planning uncertainty on account of the Covid-19 pandemic, two planning scenarios had been used for impairment testing in the previous year. The baseline scenario (“V” scenario) applied in the previous year assumes that global economic growth will recover at a comparable pace after a sharp slump, and that growth rates will then return to those seen before the outbreak of the pandemic. An additional negative scenario (extended “U” scenario) was included in the previous year with a probability of occurrence of just under 20%. In the previous year, this scenario assumed a slower recovery from the impact of the Covid-19 pandemic and a prolonged reduction in average global GDP growth across the entire detailed planning period. The negative scenario in the previous year assumed a reduction in annual net sales of between 2% and 3% compared with the base scenario for the Life Science CGU (Healthcare CGU: between 1% and 7%; Electronics CGU: between 6% and 7%). With regard to annual EBITDA pre, the negative scenario assumed an annual reduction of between 2% and 3% in the Life Science CGU (Healthcare CGU: between 1% and 10%; Electronics CGU: between 10% and 13%).

The additional significant value-relevant assumptions for underlying the goodwill impairment tests are quantified below.

	Long-term growth rate		Discount factor					
			Weighted cost of capital after tax			Weighted cost of capital before tax		
in %	**2021**	Q2/Q3 2020	**2021**	Q2 2020	Q3 2020	**2021**	Q2 2020	Q3 2020
Life Science	1.75%	1.75%	5.5%		6.0%	6.7%		7.4%
Healthcare[1]	0.00%	0.00%	5.5%	5.6%	5.5%	7.4%	7.5%	7.5%
Electronics[1, 2]	1.00%	1.00%	5.4%	5.8%	5.7%	6.7%	7.2%	7.1%

[1] The figures for impairment testing in Q2 2020 relate to the ad hoc tests performed in response to the Covid-19 pandemic.

[2] In the prior year, the pre-tax weighted average cost of capital was determined based on the fair value less costs of disposal concept.

Net cash flows were discounted using cost of capital after tax. The aforementioned cost of capital before tax was subsequently derived iteratively.

Significant discretionary decisions and sources of estimation uncertainty

Goodwill

The determination of the recoverable amount is subject to discretion and significant estimation uncertainty. Assumptions regarding the amount of net cash flows, long-term growth rates and discount factors are considered a material source of estimation uncertainty due to their inherent uncertainty.

In all the impairment tests performed, the recoverable amount in both fiscal 2021 and the previous year was more than 15% higher than the carrying amount of the respective CGU. Regardless of this, the planning data used was checked for plausibility against external analyst assessments and the recoverable amounts determined were validated using validation multiples based on peer group information.

In addition, sensitivity analyses of the key assumptions were performed as part of the impairment tests. As a result, no change of a significant assumption deemed possible by management would have resulted in an impairment. Even the sole application of the negative scenario presented above (extended "U" scenario) would not have resulted in the need to recognize impairment losses for any of the CGUs in the previous year. The following table presents the minimum amount by which key assumptions could have changed before the impairment test triggered the recognition of an impairment loss. The figures for fiscal 2020 apply to both the ad hoc and scheduled impairment tests:

	Decrease in net cash flows		**Decrease in long-term growth rate**		**Increase in cost of capital after tax**	
	%		percentage points		percentage points	
	2021	2020	**2021**	2020	**2021**	2020
Life Science	>10	>10	>2	>2	>2	>2
Healthcare	>10	>10	>2	>2	>2	>2
Electronics	>10	>10	>2	>2	>2	>1.5

Goodwill shown below was incurred mainly in the course of the acquisitions of the Versum Materials Inc., United States, the Sigma-Aldrich Corporation, United States, the AZ Electronic Materials S.A., Luxembourg, the Millipore Corporation, United States, and the Serono SA, Switzerland.

	Goodwill			
€ million	Life Science	Healthcare	Electronics	**Total**
Cost as at Jan. 1, 2020	**11,130**	**1,534**	**4,449**	**17,114**
Other additions	18	–	–	18
Disposals due to divestments/Reclassification to assets held for sale	–	-9	–	-9
Transfers	–	–	–	–
Impairment losses	–	–	–	–
Currency translation difference	-862	–	-303	-1,165
Dec. 31, 2020	**10,287**	**1,525**	**4,146**	**15,959**
Cost as of Jan. 1, 2021	**10,287**	**1,525**	**4,146**	**15,959**
Additions	–	–	–	–
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–
Transfers	-4	–	–	-4
Impairment losses	–	–	–	–
Currency translation difference	776	–	273	1,050
Dec. 31, 2021	**11,059**	**1,525**	**4,420**	**17,004**

The changes in goodwill caused by foreign exchange rates resulted almost exclusively from translating the goodwill from the acquisitions of Versum Materials, Inc., United States, the Sigma-Aldrich Corporation, United States, AZ Electronic Materials S.A., Luxembourg, and the Millipore Corporation, United States, which were mostly denominated in U.S. dollars.

Goodwill impairment testing did not give rise to the need to recognize any impairment losses in either fiscal 2020 or fiscal 2021.

(19) Other intangible assets

Accounting and measurement policies

Recognition and initial measurement of purchased intangible assets

In in-licensing, the portion of the consideration paid by the Group to acquire intellectual property is recognized as an intangible asset. If research and development services to be performed by the seller are also agreed in conjunction with the transaction, the related share of consideration is separated and recognized in research and development expenses in line with the service performance.

Contingent consideration linked to milestone payments in connection with the purchase of intangible assets arising outside a business combination is recognized as an intangible asset and as a financial liability once the milestone is reached.

Intangible assets acquired in business combinations are recognized at fair value on the acquisition date.

Recognition and initial measurement of internally generated intangible assets

Owing to the high level of uncertainty until pharmaceutical products are approved, the criteria for the capitalization of development costs in accordance with IAS 38 are not met in the Healthcare business sector for the development of drug candidates. Costs incurred after regulatory approval are insignificant and are therefore not recognized as intangible assets. In the Life Science and Electronics business sectors, development expenses are capitalized as soon as all the recognition criteria are met and can be verified accordingly. This also includes expenses that were required for REACH registration. Furthermore, development expenses for internal software

projects and the enhancement of purchased ERP programs are capitalized providing that the relevant criteria have been fulfilled.

Subsequent measurement

Subsequent measurement is at amortized cost.

Purchased and internally generated intangible assets with finite useful lives are amortized using the straight-line method over their useful lives. The useful lives of customer relationships, brand names and trademarks as well as marketing authorizations, acquired patents, licenses and similar rights, and software are usually between three and 24 years. In determining these useful lives, the Group considers factors including the typical product life cycles for each asset and publicly available information about the estimated useful lives of similar assets.

An impairment test is performed if there are indications of impairment. These are determined once a year and on an ad hoc basis with the involvement of the responsible departments, and taking external and internal information sources into consideration. The Group examines the existence of indications of impairment using various factors, particularly deviations from sales and earnings forecasts and the analysis of changes in medium-term planning. In the event of impairment, an impairment loss is recognized under other operating expenses. Impairment losses are reversed up to amortized cost and reported in other operating income if the original reasons for impairment no longer apply.

Intangible assets with indefinite useful lives and purchased as well as internally generated intangible assets not yet available for use are not amortized, but rather tested for impairment when a triggering event arises or at least once a year.

Significant discretionary decisions and sources of estimation uncertainty

Purchased intangible assets

The identification and measurement of intangible assets acquired in the course of business combinations are subject to significant discretion and estimation uncertainty.

In connection with in-licensing agreements in the Healthcare business sector, a discretionary estimate is made of the extent to which upfront payments and milestone payments are remuneration for development services yet to be performed or whether such payments are acquisition costs of an intangible asset to be capitalized.

Determination of useful life

Significant assumptions and estimates are required to determine the appropriate amount of amortization of other intangible assets. This relates in particular to the determination of the underlying useful life.

If the amortization of intangible assets from customer relationships, brands, trademarks, marketing authorizations, patents, licenses and similar rights, and other had been 10% higher, for example due to shortened useful lives, profit before income tax would have been € 80 million lower in fiscal 2021 (previous year: € 86 million).

Identification of a need to recognize impairment loss and reverse impairment loss

Discretionary decisions are required in assessing substantial evidence of impairment as well as in identifying the need to reverse the impairment of other intangible assets. Significant valuation-related assumptions and estimates are also required to calculate the appropriate write-down amount in impairment testing.

€ million	Customer relationships, brands and trademarks	Marketing authorizations, patents, licenses, similar rights, and other items		Software and software in development	Advance payments	Total
		Finite useful life	Not yet available for use			
Cost as of Jan. 1, 2020	**9,893**	**11,141**	**1,101**	**906**	**–**	**23,040**
Additions due to business combinations	–	4	–	–	–	4
Other additions	–	26	33	97	–	157
Disposals due to divestments/ Reclassification to assets held for sale	-4	-2	–	-6	–	-12
Other disposals	–	-11	-27	-25	–	-63
Transfers	–	5	-5	–	–	–
Currency translation difference	-741	-147	-16	-28	–	-933
Dec. 31, 2020	**9,148**	**11,015**	**1,086**	**944**	**–**	**22,193**
Accumulated amortization and impairment losses as of Jan. 1, 2020	**-2,829**	**-9,853**	**-634**	**-503**	**–**	**-13,820**
Depreciation, amortization, and write-downs	-577	-281	–	-82	–	-940
Impairment losses	-26	-68	-62	-4	–	-160
Reversals of impairment losses	–	–	–	–	–	–
Disposals due to divestments/ Reclassification to assets held for sale	4	2	–	1	–	7
Other disposals	–	5	–	24	–	29
Transfers	–	–	–	–	–	–
Currency translation difference	217	104	1	21	–	343
Dec. 31, 2020	**-3,211**	**-10,091**	**-695**	**-543**	**–**	**-14,540**
Net carrying amounts as of Dec. 31, 2020	**5,937**	**924**	**391**	**401**	**–**	**7,653**
Cost as of Jan. 1, 2021	**9,148**	**11,015**	**1,086**	**944**	**–**	**22,193**
Additions due to business combinations	–	–	–	–	–	–
Other additions	–	103	186	85	1	375
Disposals due to divestments/ Reclassification to assets held for sale	–	–	–	–	–	–
Other disposals	-6	-26	-12	-2	–	-45
Transfers	3	58	-39	-1	–	21
Currency translation difference	678	154	13	32	–	878
Dec. 31, 2021	**9,825**	**11,305**	**1,235**	**1,058**	**–**	**23,423**
Accumulated depreciation and impairment losses as of Jan. 1, 2021	**-3,211**	**-10,091**	**-695**	**-543**	**–**	**-14,540**
Depreciation, amortization, and write-downs	-551	-252	–	-90	–	-893
Impairment losses	–	–	-38	-9	–	-47
Reversals of impairment losses	–	–	14	–	–	14
Disposals due to divestments/ Reclassification to assets held for sale	–	–	–	–	–	–
Other disposals	6	21	1	1	–	28
Transfers	-3	-13	–	-1	–	-17
Currency translation difference	-229	-108	-2	-17	–	-356
Dec. 31, 2021	**-3,989**	**-10,443**	**-720**	**-659**	**–**	**-15,810**
Net carrying amounts as of Dec. 31, 2021	**5,836**	**862**	**515**	**400**	**–**	**7,612**

Additions to market authorizations, patents, licenses, similar rights, and other items with a finite useful life amounted to € 103 million in fiscal 2021 (2020: € 26 million). Of this figure, a high double-digit million euro amount related to the acquisition of a right to fast-track U.S. FDA approval in the Healthcare business sector.

A further € 186 million (2020: € 33 million) related to additions for assets not yet ready for use that were mainly attributable to the Healthcare business sector. This essentially concerned the recognition of an intangible asset in connection with the in-licensing agreement with Debiopharm International SA, Switzerland, for the exclusive rights for the development and global commercialization of the drug candidate Xevinapant (Debio 1143).

The gross carrying amounts and accumulated amortization for the capitalized software primarily relates to purchased software as well as internally generated applications and enhancements of purchased ERP programs that are already available for use. Software additions of € 85 million (2020: € 97 million) primarily related to the internal development of software solutions.

Reclassifications of marketing authorizations, patents, licenses, similar rights, and other items primarily related to the successful completion and attainment of availability for use of development projects in the Electronics business sector

The currency translation effects essentially resulted from the translation of other intangible assets denominated in U.S. dollars.

Overview of material other intangible assets

The carrying amounts of customer relationships, brands, and trademarks as well as marketing authorizations, patents, licenses, similar rights, and other items were attributable to the business sectors as follows:

€ million	Remaining useful life in years	Life Science	Healthcare	Electronics	**Total Dec. 31, 2021**	Total Dec. 31, 2020
Customer relationships, brands and trademarks		**3,778**	**–**	**2,058**	**5,836**	**5,937**
Customer relationships	4.5–16.8	3,294	–	2,027	5,321	5,329
thereof from the following acquisitions:						
Sigma-Aldrich Corporation	14.9–15.9	2,946	–	132	3,078	3,023
Versum Materials, Inc.	4.8–16.8	–	–	1,895	1,895	1,921
Millipore Corporation	4.5–5.5	298	–	–	298	362
Brands and trademarks	1.5–5.9	485	–	30	515	608
thereof from the following acquisition:						
Sigma-Aldrich Corporation	5.9	416	–	–	416	450
Marketing authorizations, patents, licenses and similar rights and other						
Finite useful life		**208**	**123**	**531**	**862**	**924**
Marketing authorizations	–	–	1	–	1	17
Patents, licenses and similar rights	0.3–11.3	206	–	516	722	840
thereof from the following acquisitions:						
AZ Electronic Materials S.A.	0.3–11.3	–	–	257	257	333
Versum Materials, Inc.	2.8–4.8	–	–	201	201	206
Others		1	123	15	138	67
Not yet available for use		**12**	**370**	**134**	**515**	**391**
thereof from the following acquisition:						
Versum Materials, Inc.	–	–	–	118	118	151

(20) Property, plant, and equipment

Accounting and measurement policies

Recognition and initial measurement

In the course of determining cost, government grants received within the scope of IAS 20 are deducted. Grants receivable for financial support that are no longer linked to future costs are recognized in profit or loss.

Subsequent measurement

Subsequent measurement is based on amortized cost. Property, plant, and equipment is depreciated using the straight-line method over the useful life of the asset concerned and the corresponding expenses are allocated to the respective functional costs. Depreciation of property, plant, and equipment is based on the following useful lives:

	Useful life
Production buildings	No more than 33 years
Administration buildings	No more than 40 years
Plant and machinery	6 to 25 years
Operating and office equipment, other facilities	3 to 10 years

The useful lives of the assets are reviewed regularly and adjusted if necessary.

An impairment test is performed if there are indications of impairment. External and internal information is used in this context. In the event of impairment, an impairment loss is recognized under other operating expenses. Impairment losses are reversed up to amortized cost and reported in other operating income if the original reasons for impairment no longer apply.

Significant discretionary decisions and sources of estimation uncertainty

Determination of the useful life and residual value

Assumptions and estimates are required in determining the appropriate useful life and the expected residual value in order to calculate the amount of depreciation on property, plant, and equipment. This applies in particular to the determination of the underlying remaining useful life. In making these estimates, the Group considers the useful lives of the property, plant, and equipment derived from past experience.

Identification of a need to recognize impairment loss and reverse impairment loss

Discretionary decisions are required in the identification of objective evidence of impairment as well as in identifying the need to reverse impairment of property, plant and equipment.

€ million	Land, land rights and buildings	Plant and machinery	Other facilities, operating and office equipment	Construction in progress and advance payments to vendors and contractors	Total
Cost at January 1, 2020	**4,816**	**4,910**	**1,532**	**1,278**	**12,537**
Additions due to business combinations	1	1	–	–	2
Other Additions	363	49	87	1,031	1,530
Disposals due to divestments/Reclassification to assets held for sale	-66	-44	-7	-1	-117
Other Disposals	-217	-62	-53	-4	-336
Transfers	249	510	142	-901	–
Currency translation difference	-177	-119	-52	-39	-386
Dec. 31, 2020	**4,969**	**5,245**	**1,649**	**1,365**	**13,229**
Accumulated depreciation and impairment losses as of Jan. 1, 2020	**-1,854**	**-3,390**	**-1,097**	**-4**	**-6,345**
Depreciation	-297	-346	-175	–	-818
Impairment losses	-5	-5	–	-13	-23
Reversals of impairment losses	–	–	–	–	–
Disposals due to divestments/Reclassification to assets held for sale	17	27	7	–	51
Disposals	85	44	43	1	174
Transfers	1	–	–	-1	–
Currency translation difference	56	65	32	–	153
Dec. 31, 2020	**-1,997**	**-3,605**	**-1,189**	**-17**	**-6,808**
Net carrying amounts as of Dec. 31, 2020	**2,972**	**1,640**	**460**	**1,348**	**6,421**
Cost as of Jan. 1, 2021	**4,969**	**5,245**	**1,649**	**1,365**	**13,229**
Changes in the scope of consolidation	–	–	–	–	–
Additions	130	35	73	1,205	1,443
Reclassification to assets held for sale	–	–	–	–	–
Disposals	-72	-74	-99	-3	-247
Transfers	254	348	101	-702	1
Currency translation difference	182	132	30	39	383
Dec. 31, 2021	**5,464**	**5,687**	**1,754**	**1,905**	**14,810**
Accumulated depreciation and impairment losses January 1, 2021	**-1,997**	**-3,605**	**-1,189**	**-17**	**-6,808**
Depreciation	-293	-359	-168	–	-819
Impairment losses	-3	-14	–	-4	-22
Reversals of impairment losses	–	–	–	–	–
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	–
Disposals	46	66	92	1	206
Transfers	–	-4	–	5	–
Currency translation difference	-56	-71	-21	–	-149
Dec. 31, 2021	**-2,304**	**-3,987**	**-1,287**	**-15**	**-7,593**
Net carrying amounts as of Dec. 31, 2021	**3,160**	**1,700**	**467**	**1,890**	**7,217**

Disposals due to divestments essentially included the sale of the Allergopharma allergy business in fiscal 2020.

The individual additions to construction in progress in fiscal 2021 with an investment volume of more than € 30 million are presented below:

Business sector	Investment project	Country
Life Science	Production plant	Germany
Life Science	Filling and logistics center	Germany
Life Science	Production plant	United States
Life Science	Production plant	United States
Healthcare	Biotech development system	Switzerland
Healthcare	Filling and packaging center	Switzerland

(21) Leasing

Accounting and measurement policies

Leasing

IFRS 16 scope

The Group exercises the option provided by IFRS 16 to not recognize leases of intangible and low-value assets as leases. Right-of-use assets under leases are reported in the balance sheet item "Property, plant, and equipment" (see Note (20) "**Property, plant, and equipment**").

Where the provision of company cars to employees qualifies as an employee benefit within the meaning of IAS 19, IFRS 16 is not applied. In this case, its balance-sheet treatment is governed solely by IAS 19.

Separation of lease and non-lease components

Leases for land, land rights and buildings are separated into lease and non-lease components. The Group otherwise elects to exercise the option not to separate non-lease components from lease components.

Depreciation of the right-of-use assets arising from leases

Basically, right-of-use assets are depreciated over the lease term. If it is considered sufficiently probable that an existing purchase option will be exercised or ownership will be automatically transferred at the end of the lease term, however, depreciation takes place over the period that applies for corresponding assets under property, plant, and equipment (see Note (20) "**Property, plant, and equipment**").

Determining the incremental borrowing rate

If the interest rate for the lease cannot be reliably determined, the incremental borrowing rate is applied in measuring the lease liability. Within the Group, the incremental borrowing rate is determined on the basis of the risk-free interest rate of the respective Group company over a similar term and in the same currency. This interest rate is adjusted using a risk surcharge specific to the Group. The Group applies the repayment model to determine the current portion of the lease. The current portion of the lease corresponds to the repayment share of the next twelve months.

Determining the lease term

Where renewal or termination options are available, their exercise is assessed on a case-by-case basis, considering factors such as location strategies, leasehold improvements and the degree of specificity.

Significant discretionary decisions and sources of estimation uncertainty

Leasing

Identification of a lease

Discretionary decisions can arise during the identification of leases in answering the question of whether a lessor's right of substitution is substantive. The Group classifies rights of substitution as not substantive if the facts and circumstances of the case do not support a different assessment.

Measurement of lease and non-lease components

In the case of leases for land, land rights, and buildings, separating the lease into lease and non-lease components is subject to discretion and estimation uncertainty if observable prices are not available from the contract partner or other potential lessors.

Determining the lease term

When determining the lease term, existing renewal and termination options must be evaluated to determine the probability that such options will be exercised.

The assessment of the probability of exercise may be discretionary even though it relies on existing and material information on the general economic context, such as location strategies, leasehold improvements, or the degree of specificity. If the available information does not allow a reliable assessment, the Group uses historical experience for comparable situations.

The largest 30 of more than 5,500 leases accounted for around 50% of total lease liabilities in fiscal 2021 and 2020. They are essentially for right-of-use assets for office, warehouse, and laboratory buildings. If options to renew these leases were exercised in future, which is not yet considered likely, this would result in additional potential undiscounted cash outflows of up to € 145 million (2020: € 200 million).

Where individual contracts include termination options, it was considered unlikely that these would be exercised so that additional lease payments were already considered in the corresponding lease liability.

Determining the incremental borrowing rate

Determining the risk-free interest rate and determining the risk surcharge are both discretionary.

Initial measurement of the lease liability and the right-of-use asset

In measuring the lease liability, there is discretionary scope and significant estimation uncertainty regarding:

- measuring any payments in the course of promised residual value guarantees and
- assessing the probability that existing purchase and termination options and renewal options will be exercised.

In measuring right-of-use assets under leases, the Group is subject to estimation uncertainty regarding any demolition obligations and their resulting payments.

The reconciliation of net carrying amounts of right-of-use assets from leases was as follows:

	Right-of-use assets			
€ million	Land, land rights and buildings	Plant and machinery	Other facilities, operating and office equipment	Total
Net carrying amounts as of Jan. 1, 2020	**487**	**13**	**58**	**557**
Changes in the scope of consolidation	-1	–	–	-2
Additions	130	2	55	187
Disposals	-119	-1	-9	-129
Depreciation	-107	-5	-42	-153
Impairment losses	–	–	–	–
Reversal of impairment losses	–	–	–	–
Other	-30	2	-3	-32
Net carrying amounts as of Dec. 31, 2020	**360**	**11**	**58**	**429**

	Right-of-use assets			
€ million	Land, land rights and buildings	Plant and machinery	Other facilities, operating and office equipment	**Total**
Net carrying amounts as of Jan. 1, 2021	**360**	**11**	**58**	**429**
Changes in the scope of consolidation	–	–	–	–
Additions	118	1	40	159
Disposals	-19	–	-4	-22
Depreciation	-96	-5	-39	-140
Impairment losses	–	–	–	–
Reversal of impairment losses	–	–	–	–
Other	19	2	2	22
Net carrying amounts as of Dec. 31, 2021	**382**	**9**	**56**	**447**

The net carrying amounts of other facilities, operating and office equipment mainly include the right-of-use assets for vehicles.

The additions to land, land rights, and buildings primarily related to the extension of existing rental agreements and the conclusion of new rental agreements for office, laboratory, and warehouse space. The disposals under land, land rights, and buildings in previous year primarily resulted from the acquisition of the previously leased land and buildings of the Life Science Campus in Burlington, United States.

The expenses and income and the payments under the leases in accordance with IFRS 16 were reported in the consolidated income statement and the consolidated statement of cash flows as follows:

€ million	**2021**	2020
Right-of-use assets		
Depreciation	-140	-153
Impairment losses	–	–
Reversals of impairment losses	–	–
Expenses for leasing low-value assets	-18	-18
Expenses for leases with variable lease payments	–	–
Income from subleasing right-of-use assets	–	–
Income from sale-and-lease-back transactions	–	–
Interest expenses for lease liabilities	-10	-15
Total	**-168**	**-186**

€ million	**2021**	2020
Operating Cash flow	-28	-34
Financing Cash Flow	-141	-144
Total	**-169**	**-178**

The future lease payments are distributed over the following periods:

December 31, 2021

€ million	Within 1 year	1-5 years	After more than 5 years	**Total**
Future lease payments	122	282	81	485
Interest portion of future payments	-7	-15	-6	-28
Present value of future lease payments	**116**	**267**	**75**	**457**

December 31, 2020

€ million	Within 1 year	1-5 years	After more than 5 years	Total
Future lease payments	118	262	88	468
Interest portion of future payments	-8	-16	-7	-31
Present value of future lease payments	**110**	**246**	**81**	**436**

(22) Other non-financial assets

Accounting and measurement policies

Other non-financial assets

Other non-financial assets are carried at amortized cost. Impairments are recognized for any credit risks.

Other non-financial assets are broken down as follows:

	Dec. 31, 2021			Dec. 31, 2020		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Receivables from non-income related taxes	428	7	434	368	4	372
Prepaid expenses	142	15	157	151	14	164
Assets from defined benefit plans	5	–	5	2	–	2
Remaining other assets	89	73	162	76	63	139
Other non-financial assets	**663**	**95**	**758**	**597**	**81**	**677**

(23) Cash flow from investing activities

In particular, the payments for investments in intangible assets primarily included payments to Debiopharm International SA, Switzerland, for the acquisition of the exclusive rights to the development and commercialization of the drug candidate xevinapant (see Note (7) "**Collaboration and licensing agreements**") and payments for the acquisition of a right to fast-track U.S. FDA approval in the Healthcare business sector.

Net cash outflows for investments in financial assets amounting to € 269 million (2020: € 278 million) mainly resulted from short-term investments in securities that did not meet the requirements for classification as cash and cash equivalents.

Net cash inflows from the disposal of other financial assets amounted to € 340 million in the previous year and essentially related to the sale of short-term investments in securities.

The payments made and received from the acquisition and the disposal of other non-financial assets resulted from the short-term investment of available funds in the previous year.

The proceeds from the disposal of assets held for sale less transferred cash and cash equivalents reported in the previous year essentially resulted from the sale of the Allergopharma allergy business (see Note (6) "**Acquisitions and divestments**").

(24) Inventories

Accounting and measurement policies

Inventories

In addition to directly attributable unit costs, the cost of sales also includes overheads attributable to the production process, which are determined on the basis of normal capacity utilization of the production facilities. Goods for resale are recognized at cost. When determining amortized cost, the "first-in, first-out" (FIFO) and weighted average cost formulas are used.

Inventories are tested for impairment using a business sector-specific method. Under this method, cost is compared to the net realizable values. If the net realizable value is lower than the amortized cost, the asset is written down by a corresponding amount, which is recognized as an expense in the cost of sales.

In addition to the impairment derived from the sales market, impairment losses may also be necessary for quality reasons or due to a lack of usability of the items or their remaining shelf life. If the reason for impairment no longer applies, the carrying amount is adjusted to the lower of cost or the new net realizable value.

Since inventories are, for the most part, not manufactured within the scope of long-term production processes, borrowing costs are not included.

Inventory prepayments are reported under other non-financial assets.

Significant discretionary decisions and sources of estimation uncertainty

Identification of impairments or reversal of impairments

Discretionary decisions are required in the identification of impairment as well as in identifying the need to reverse impairment of inventories. There are estimation uncertainties with respect to the calculation of the net realizable value. In particular, changes in selling prices and expected costs of completion are considered in calculating this value.

Inventories consisted of the following:

€ million	Dec. 31, 2021	Dec. 31, 2020
Raw materials and supplies	814	633
Work in progress	990	905
Finished goods/goods for resale	2,096	1,756
Inventories	**3,900**	**3,294**

The increase in inventories in fiscal 2021 was driven by all three business sectors. Whereas the upturn in the Healthcare business sector was minor, the Life Science and Electronics business sectors saw significant growth in inventories as stocks of raw materials were built up in order to secure production, as well as due to delays in logistics processes.

Impairment losses on inventories amounted to € 592 million in the reporting period (2020: € 545 million). Impairment losses that are included in the cost of sales are shown in Note (10) "**Cost of sales**".

(25) Trade and other receivables

Accounting and measurement policies

Trade and other receivables

Trade accounts receivable without significant financing components that are not the subject of a factoring agreement are measured at the amount of the unconditional claim for consideration on initial recognition. For additions to trade accounts receivable, loss allowances are recognized to allow for expected credit losses.

At initial recognition, other receivables are measured at fair value plus the direct transaction costs incurred upon acquisition of the asset.

Trade accounts receivable that are potentially designated to be sold on account of a factoring agreement are measured at fair value through other comprehensive income.

The measurement policies applied in determining loss allowances for trade and other receivables are shown in Note (42) "**Management of financial risks**" in the "**Credit risks**" section.

Loss allowances and reversals of loss allowances are reported under "Impairment losses and reversals of impairment losses on financial assets (net)" in the consolidated income statement if the asset can be

caracterized as operational. If the asset can be characterized as financial, it is recognized in financial income or financial expenses.

Further information on the accounting and measurement policies governing financial assets can be found in Note (36) "**Other financial assets**".

Significant discretion and sources of estimation uncertainty

Trade and other receivables

Information on the significant discretion and estimation uncertainty concerning trade and other receivables can be found in Note (42) "**Management of financial risks**".

Trade and other receivables were measured as follows:

	Dec. 31, 2021			Dec. 31, 2020		
€ million	Subsequently measured at amortized cost	Subsequently measured at fair value through other comprehensive income	**Total**	Subsequently measured at amortized cost	Subsequently measured at fair value through other comprehensive income	Total
Gross trade accounts receivable	3,556	20	3,576	3,106	19	3,125
Gross other receivables	156	–	156	196	–	196
Gross trade and other receivables	**3,712**	**20**	**3,732**	**3,302**	**19**	**3,321**
Loss allowances on trade accounts receivable	-58	–	-59	-73	–	-73
Loss allowances on other receivables	-2	–	-2	-2	–	-2
Net trade and other receivables	**3,652**	**20**	**3,672**	**3,227**	**19**	**3,246**
thereof: current	3,626	20	3,646	3,202	19	3,221
thereof: non-current	25	–	25	25	–	25

The increase in trade accounts receivable was driven by all business sectors, particularly Life Science.

(26) Contract assets

Accounting and measurement policies

Contract assets

Contract assets represent contractual claims to receive payment from customers for whom the contractual performance obligation has already been fulfilled, although an unconditional claim to payment has yet to arise.

The following table shows the change in contract assets:

€ million	2021	2020
Jan. 1	**169**	**156**
Additions due to business combinations	–	–
Other additions	553	420
thereof: attributable to performance obligations satisfied in prior periods	2	15
Disposals due to divestments/Reclassification to assets held for sale	–	–
Reclassification to trade accounts receivable	-522	-402
Currency effects	7	-5
Other	–	–
Dec. 31	**207**	**169**

Contract assets resulted in particular from rendering services and manufacturing of products in the Life Science and Electronics business sectors.

(27) Other provisions

Other provisions developed as follows:

€ million	Litigation	Restructuring	Environmental protection	Acceptance and follow-on obligations	Interest and penalties related to income taxes	Other	Total
Jan. 1, 2021	**155**	**168**	**148**	**47**	**78**	**146**	**741**
Additions	102	53	15	72	44	78	364
Utilizations	-30	-66	-4	-16	-7	-40	-164
Release	-132	-29	–	-26	-26	-83	-297
Interest effect	–	–	-6	–	–	–	-6
Currency translation	2	1	–	–	1	4	8
Changes in scope of consolidation/other	1	–	–	–	4	-5	–
Reclassification to assets held for sale	–	–	–	–	–	–	–
Dec. 31, 2021	**97**	**126**	**153**	**77**	**94**	**100**	**647**
thereof: current	80	65	14	61	94	63	377
thereof: non-current	17	61	139	16	–	37	269

Accounting and measurement policies

Provisions for litigation

To assess a recognition obligation in relation to provisions for litigation and to quantify future outflows of resources, the Group draws on the knowledge of the legal department as well as outside counsel.

Assessing the need for recognizing provisions for litigation is based on the likelihood of possible outcomes for proceedings. In particular, the factors influencing this likelihood are:

- the validity of the arguments brought forward by the opposing party, and
- the legal situation and current court rulings in comparable proceedings in the jurisdiction in question.

The following factors are also relevant in measuring provisions for litigation:

- the duration of proceedings in pending legal disputes,
- the applicable license rate plus an expected infringement surcharge,
- the usual damages and fines for comparable legal disputes, and
- the discount factor to be used.

Provisions for restructuring

The Group uses formal restructuring plans to assess recognition obligation for provisions for restructuring projects and the amount of the expected outflow of resources.

Provisions for environmental protection

To assess a recognition obligation in relation to provisions for environmental protection and to quantify future outflows of resources, the Group draws on appraisals by independent external experts and the knowledge of in-house specialists.

The following are key parameters in calculating the present value of the future settlement amount of provisions for environmental protection:

- the future settlement date,
- the extent of environmental damage,
- the applicable remediation methods,
- the associated future costs, and
- the discount factor.

Provisions for acceptance and follow-on obligations

The assessment of the recognition obligation for provisions for acceptance and follow-on obligations and the quantification of future outflows of resources is based on internal project plans as well as on the assessment of the respective matters by in-house and external specialists.

The main parameters in determining the amount of the provision are:

- the ability to use or potential for modification of secured manufacturing capacities at third-party providers, particularly for pharmaceutical compounds,
- the number of affected patients and the expected duration of their continued treatment in clinical development programs,
- the expected date or period of the outflow of resources, and
- the expectations concerning future events influencing the obligations.

Provisions for interest and penalties related to income taxes

Objective assessments are performed to determine the need to recognize provisions for interest and penalties related to income taxes not covered by IAS 12. These assessments rely on internal and external expertise.

Significant discretion and sources of estimation uncertainty

Provisions for litigation

Like the measurement of provisions, the assessment of a recognition obligation for provisions for litigation is to a particular extent subject to a degree of estimation uncertainty. The uncertainties relate, in particular, to the assessment of the likelihood and the amount of the outflow of resources.

Provisions for restructuring

Estimation uncertainty about the provisions for restructuring primarily relate to determining the amount of the expected outflow of resources. This is largely influenced by the assumptions made concerning the change in or termination of the employment relationships of the affected employees and the planned implementation date of the restructuring plan.

Provisions for environmental protection

The assessment of a recognition obligation and the measurement of the provisions for environmental protection are subject to discretionary decisions and estimation uncertainties to a particular degree.

The estimation uncertainties relate in particular to the assessment of the timing and likelihood of a future outflow of resources and assessment of the extent of necessary remediation measures and the related calculation of the amount of the liability.

Provisions for acceptance and follow-on obligations

Estimation uncertainty regarding the provisions for acceptance and follow-on obligations primarily relates to determining the amount of the expected outflow of resources.

Provisions for interest and penalties related to income taxes

Estimation uncertainty concerning the provisions for interest and penalties related to income taxes mainly relate to the interpretation of tax codes and the effects of amended case law.

The most important legal matters in the reporting period are detailed below.

Product-related and patent disputes

PS-VA liquid crystals mixtures: In the Electronics business sector, the Group was involved in a legal dispute with JNC Corporation, Japan (JNC). JNC claimed that, by manufacturing and marketing certain liquid crystal mixtures, the Group had infringed JNC patents in China, Taiwan, and Korea. The Group maintained that these patents are invalid owing to relevant prior art. Patent infringement proceedings brought by JNC and the Group's patent nullity proceedings in Korea – that were, until recently, still pending – were resolved as a result of the two parties reaching an agreement in March 2021. On the basis of the agreement, the Group was not required to make any further payments to JNC. The provision, a low double-digit million euro amount, was reversed in the first quarter of fiscal 2021.

Rebif®: The Group was involved in a patent dispute with Biogen Inc., United States (Biogen), in the United States. Biogen claimed that the sale of Rebif® in the United States infringed on a Biogen patent. The disputed patent was granted to Biogen in the United States in 2009. Subsequently, Biogen sued the Group and other pharmaceutical companies for damages due to the infringement of this patent. The Group defended itself against all allegations and brought a countersuit against Biogen claiming that the patent was invalid and not infringed by the Group's actions. In the first instance (district court), a jury found the patent to be invalid. This jury verdict was overturned by the judge in the same instance in September 2018. The patent was thus deemed to be legally valid for the time being. The Group filed a complaint with the United States Court of Appeals for the Federal Circuit (second instance) against the first-instance ruling in October 2018. On September 28, 2020, this court overturned the verdict of the judge in the first instance, declared Biogen's

patent to be invalid and instructed the District Court to reinstate the original jury verdict. A complaint filed by Biogen against the ruling was definitively rejected in fiscal 2021, meaning that the proceedings have been concluded and can no longer be contested. The provision of € 365 million that had been recognized for the case was reversed in fiscal 2020 and the resulting income was reported in other operating income.

Bone cement: On July 19, 2021, the Group was served an extended suit for damages by Heraeus Medical GmbH, Wehrheim, Germany (Heraeus). Heraeus has been involved proceedings against Biomet Deutschland GmbH, Freiburg im Breisgau, Germany (Biomet), Zimmer Nederland B.V., Netherlands (Zimmer), and Biomet, Inc., United States, since 2017 with the aim of being awarded damages for the unauthorized exploitation of business secrets. It extended its suit to include the Group in July 2021. Based on the accusation, the Group believes it is exposed to the possibility of having to pay damages for having enabled the unlawful imitation of bone cement products by the original defendants, Biomet and Zimmer, owing to a breach of contractual obligations of good faith. The suit has been extended based on the declaratory judgment obtained by Heraeus against the Group in 2013. This judgment found that, in 2004, in dissolving the joint venture that existed with Biomet from 1997 to 2004, the Group breached its duties to Heraeus under a distribution arrangement with Heraeus that existed until 2001. In the second quarter of fiscal 2021 a provision in a mid-double-digit million euro amount had been recognized for this matter. Further developments gave new insights that led to the estimation that a payment of damages by the Group is unlikely. The previously recognized provision was released.

Antitrust and other proceedings

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. The Group filed a lawsuit against the Commission’s decision with the European Court in August 2013. The lawsuit was rejected in 2016. The Group subsequently filed an appeal against this decision with the European Court of Justice, which confirmed the first instance ruling in March 2021. Although the fine of € 18 million was paid in 2013, additional potential claims were considered to be probable. A provision in a mid-double-digit million euro amount was recognized for these proceedings as of December 31, 2021. A cash outflow within the next 12 months is considered possible.

Paroxetine: In the United Kingdom, the Group was subject to antitrust investigations by the British Competition and Market Authority in connection with the generics business that was divested in 2007. In March 2013, the authorities informed the Group of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd., United Kingdom, and several subsidiaries of GlaxoSmithKline plc, United Kingdom, in connection with the antidepressant drug paroxetine, violated British and European competition law. They stated that the Group was liable as the then owner of Generics (UK) Ltd. and because it was involved in the negotiations for the settlement agreement. The investigations into Generics (UK) Ltd. started in 2011, without this being known to the Group. After the European Court of Justice confirmed in January 2020 that such settlement agreements can violate European competition law, the Competition Appeal Tribunal set a low single-digit million euro fine in May 2021 that the Group paid in the September of fiscal 2021. A provision in a low double-digit million euro amount was recognized for the risk of additional potential claims as of December 31, 2021. A cash outflow within the next 12 months is considered possible.

Antitrust review of the acquisition of Sigma-Aldrich Corporation, United States (Sigma-Aldrich): In May 2021, the European Commission fined Sigma-Aldrich € 8 million as it held that key information on an innovation project had been withheld in conjunction with its approval of the Group’s acquisition of Sigma-Aldrich. The European Commission had approved the registration of the merger in 2015, subject to the condition that the Group and Sigma-Aldrich divest parts of the European solvents and inorganic chemicals businesses of Sigma-Aldrich in order to resolve antitrust concerns. In July 2017, it reported that its antitrust review of the acquisition had come to the preliminary conclusion that the Group and Sigma-Aldrich had provided incorrect or misleading information. This allegation against the Group was dropped in 2020. The proceedings were concluded with the imposition of the fine, its payment in June 2021 and the decision to take no further legal action. As no further

outflows of resources are expected, the remainder of the provision was reversed in the second quarter of fiscal 2021. This resulted in income of a low double-digit million euro amount that was reported in other operating income.

Restructuring

The restructuring provisions recognized as of December 31, 2021, primarily relate to obligations for workforce reduction measures in connection with communicated restructuring projects in all segments. In particular, this resulted from a program for the reorganization of the global sales organization and research and development activities in the Healthcare business sector.

Outflows of resources under the restructuring provisions are expected within the next five years.

Environmental protection

Provisions for environmental protection resulted in particular from obligations for soil remediation and groundwater protection in connection with the crop protection business in Germany and Latin America that was discontinued in 1987.

Acceptance and follow-on obligations

Provisions for acceptance and follow-on obligations primarily related to costs in connection with discontinued development projects in the Healthcare business sector as well as obligation surpluses from onerous contracts. The additions were mainly due to the discontinuation of development projects under the strategic alliance with GlaxoSmithKline, United Kingdom (see Note (7) "**Collaboration and licensing agreements**"), and relate to the winding up of clinical trials.

Interest and penalties related to income taxes

Provisions for interest and penalties related to income taxes mainly comprised interest payables associated with or resulting from tax payables.

Miscellaneous other provisions

Miscellaneous other provisions included provisions for asset retirement obligations, for other tax risks not constituting income tax in accordance with IAS 12, for warranty obligations, and for remaining risks in connection with the disposal of the Consumer Health business.

(28) Contingent liabilities

Accounting and measurement policies

Contingent liabilities

To identify contingent liabilities from litigation and tax matters, the Group draws on the knowledge of the legal department and the tax department as well as the opinions of external consultants and attorneys.

The key factors in the identification of contingent liabilities are:

- the validity of the arguments brought forward by the opposing party or the tax authority and
- the legal situation and current court rulings in comparable proceedings in the jurisdiction in question.

The amount of the contingent liability is based on the best possible estimate which in turn is based on likelihood of possible outcomes of proceedings and on the applicable license rate in patent disputes.

Significant discretionary decisions and sources of estimation uncertainty

Contingent liabilities

The identification and the measurement of contingent liabilities are both subject to considerable uncertainty.

This applies with regard to assessing the likelihood of an outflow of resources as well as determining its amount.

Contingent liabilities were composed as follows:

€ million	Dec. 31, 2021	Dec. 31, 2020
Contingent liabilities from litigation and tax matters	109	87
Other contingent liabilities	–	–

Contingent liabilities from litigation mainly related to obligations under labor law and tort law. Contingent liabilities from tax matters primarily related to the determination of earnings under tax law, customs regulations, and excise tax matters.

In addition, there are contingent liabilities from various legal disputes with Merck & Co., Inc., Kenilworth, NJ, United States (outside the United States and Canada: MSD), among other things due to breach of the coexistence agreement entered into between the two companies and/or trademark/name right infringement regarding the use of the designation “Merck”. In this context, the Group has sued MSD in various countries and has been sued by MSD in the United States. An outflow of resources – except costs for legal defense – was not deemed sufficiently probable as of the balance sheet date to justify the recognition of a provision. Since the contingent liability from these legal disputes could not be reliably quantified as of the balance sheet date, this matter was not considered in the table presented above.

(29) Other non-financial liabilities

Accounting and measurement policies

Other non-financial liabilities

Accruals for personnel expenses included in other non-financial liabilities comprise, in particular, liabilities resulting from vacation entitlements, bonuses and social security contributions.

Contract liabilities include payments received by the Group prior to completion of contractual performance. In addition to consideration received within the scope of collaboration agreements, this applies particularly to service agreements.

Other non-financial liabilities comprise the following:

	Dec. 31, 2021			Dec. 31, 2020		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current[1]	Total
Accruals for personnel expenses	980	–	980	823	–	823
Liabilities from non-income related taxes	226	1	228	157	1	158
Contract liabilities	198	3	202	304	47	351
Other accruals	64	10	74	76	7	82
Other non-financial liabilities	**1,468**	**15**	**1,483**	**1,360**	**55**	**1,415**

[1] Previous year's figures have been adjusted, see Note (2) "**Reporting principles**".

The increase in accruals for personnel expenses is attributable in particular to higher bonus liabilities due to the positive course of business.

The decline in contract liabilities is essentially due to the end of the strategic alliance with GlaxoSmithKline plc, United Kingdom, in the field of immuno-oncology (see Note (7) "**Collaboration and licensing agreements**").

The following table shows the development of contract liabilities in the period under review:

	2021			2020		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Jan. 1	**304**	**47**	**351**	**291**	**87**	**379**
Additions due to business combinations	**–**	**–**	–	1	**–**	1
Other additions	1,283	2	1,284	849	1	850
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	–	–
Recognition of income/reversal	-1,435	-1	-1,437	-888	–	-888
Cumulative catch-up adjustments to revenue	-9	–	-9	21	-2	19
Reclassification from non-current to current	44	-44	–	39	-39	–
Currency translation	12	–	12	-9	–	-9
Other	–	–	–	–	–	–
Dec. 31	**198**	**3**	**202**	**304**	**47**	**351**

As of January 1, 2021, contract liabilities amounted to € 351 million (January 1, 2020: € 379 million), of which a total of € 308 million (2020: € 232 million) was recognized through profit or loss in fiscal 2021.

(30) Trade and other payables

Accounting and measurement policies

Trade and other payables

Trade and other payables are subsequently measured at amortized cost.

Trade and other payables included accrued amounts of € 838 million (December 31, 2020: € 673 million) from outstanding invoices.

Employees

(31) Number of employees

As of December 31, 2021, the number of employees within the Group was 60,334 (December 31, 2020: 58,096 employees).

The following table shows the average number of employees broken down by function.

	2021	2020
Production	19,782	17,624
Administration	11,820	11,338
Research and development	7,167	7,503
Supply chain	4,557	4,298
Marketing and sales	14,298	14,101
Other	1,082	2,716
Average number of employees	**58,706**	**57,580**

(32) Personnel expenses

Personnel expenses comprised the following:

€ million	**2021**	2020
Wages and salaries	4,824	4,669
Compulsory social security contributions and other costs	748	694
Pension expenses	461	408
Personnel expenses	**6,033**	**5,771**

Personnel expenses comprised expenses of € 170 million (2020: € 162 million) for defined contribution plans which are funded exclusively using external funds and therefore do not represent any obligation for the Group other than making contribution payments. In addition, employer contributions amounting to € 87 million (2020: € 85 million) were transferred to the German statutory pension insurance system and € 88 million (2020: € 77 million) to statutory pension insurance systems abroad.

(33) Provisions for employee benefits

Provisions for employee benefits are composed as follows:

€ million	Dec. 31, 2021	Dec. 31, 2020
Provisions for pensions and other post-employment benefits	3,001	3,594
Non-current other employee benefit provisions	401	286
Non-current provisions for employee benefits	**3,402**	**3,880**
Current provisions for employee benefits	**224**	**152**
Provisions for employee benefits	**3,625**	**4,032**

Provisions for other employee benefits include provisions for share-based payments, which are discussed in greater detail in the section on share-based payments in this note.

Provisions for pensions and other post-employment benefits

Accounting and measurement policies

Provisions for pensions and other post-employment benefits

In addition to retirement benefit obligations, provisions for pensions and other post-employment benefits include obligations for other post-employment benefits, such as medical care.

The present value of the defined benefit obligation is determined by expert third parties according to the actuarial projected unit credit method. The discount rates are generally determined on the basis of the yields of high-quality corporate bonds with similar maturities and currencies.

The discount factors for defined benefit pension plans are typically determined by reference to discount rates for similar maturities calculated by an external, globally active actuary. This was based on bonds with ratings of at least “AA” or a comparable rating from at least one of the leading rating agencies as of the reporting date.

The other actuarial assumptions used as the basis for calculating the defined benefit obligation, such as rates of salary increases and pension trends, were determined on a country-by-country basis in line with the economic conditions prevailing in each country. The latest country-specific mortality tables are also applied (Germany: Heubeck 2018G, Switzerland: BVG 2020G, United Kingdom: S3PA and S2PA). The potential effects of the Covid-19 pandemic are not shown in these tables and hence were not taken into account.

Apart from the net balance of interest expense for the defined benefit obligations and interest income from the plan assets, which is reported in financial income and financial expenses, the expenses for defined benefit plans are allocated to the individual functional areas in the consolidated income statement.

The calculation of the defined benefit obligations was based on the following actuarial parameters and durations:

	Germany		Switzerland		United Kingdom		Other countries	
	2021	2020	**2021**	2020	**2021**	2020	**2021**	2020
Discount rate	1.28%	0.70%	0.30%	0.06%	1.79%	1.43%	2.22%	1.75%
Future salary increases	2.51%	2.51%	1.89%	1.57%	–	–	3.14%	2.92%
Future pension increases	1.74%	1.75%	–	–	3.11%	2.77%	1.52%	1.48%
Duration	22	24	17	19	20	20	13	14

These were average values weighted by the present value of the respective defined benefit obligation.

Significant discretionary decisions and sources of estimation uncertainty

Provisions for pensions and other post-employment benefits

The determination of the present value of the obligation from defined benefit pension plans primarily requires discretionary judgment as regards the selection of methods to determine the discount rate and to select suitable mortality tables, as well as estimates of future salary and pension increases.

The following overview shows how the present value of all defined benefit obligations would have been impacted by changes to relevant actuarial assumptions:

December 31, 2021

€ million	**Germany**	**Switzerland**	**United Kingdom**	**Other countries**	**Total**
Increase (+)/decrease (–) in present value of all defined benefit obligations if					
the discount rate were 50 basis points higher	-414	-81	-55	-24	-574
the discount rate were 50 basis points lower	487	93	64	25	669
the expected rate of future salary increase were 50 basis points higher	148	6	–	11	165
the expected rate of future salary increase were 50 basis points lower	-133	-6	–	-10	-149
the expected rate of future pension increase were 50 basis points higher	235	47	22	8	312
the expected rate of future pension increase were 50 basis points lower	-212	–	-21	-7	-240

December 31, 2020

€ million	Germany	Switzerland	United Kingdom	Other countries	**Total**
Increase (+)/decrease (–) in present value of all defined benefit obligations if					
the discount rate were 50 basis points higher	-480	-88	-54	-25	-647
the discount rate were 50 basis points lower	569	102	62	30	763
the expected rate of future salary increase were 50 basis points higher	180	7	–	14	201
the expected rate of future salary increase were 50 basis points lower	-163	-6	–	-12	-181
the expected rate of future pension increase were 50 basis points higher	272	50	21	7	350
the expected rate of future pension increase were 50 basis points lower	-245	–	-20	-7	-272

Sensitivities are determined on the basis of the respective parameters in question, with all other measurement assumptions remaining unchanged.

Both the benefit obligations as well as the plan assets are subject to fluctuations over time. The reasons for such fluctuations could include changes in market interest rates and thus the discount rate, as well as adjustments to other actuarial assumptions (such as life expectancy or expected future increases in pension). This could lead to – or cause an increase in – underfunding. Depending on statutory regulations, it may become necessary in some countries to reduce underfunding through additions of liquid assets.

In order to minimize fluctuations of the net defined benefit liability, in managing its plan assets, the Group also pays attention to potential fluctuations in liabilities. The portfolio is structured in such a way that, in the ideal scenario, plan assets and defined benefit obligations develop in opposing directions when exposed to exogenous factors. This applies in particular to interest rate fluctuations.

Depending on the legal, economic and fiscal circumstances prevailing in each country, different retirement benefit systems are provided for the employees. Generally, these systems are based on the years of service and salaries of the employees. Pension obligations comprise both obligations from current pensions and accrued benefits for pensions payable in the future.

In order to limit the risks of changing capital market conditions and other developments, for the past number of years newly hired employees have been offered plans that are not based on final salary.

The value recognized in the consolidated balance sheet for pensions and other post-employment benefits was derived as follows:

€ million	**Dec. 31, 2021**	Dec. 31, 2020
Present value of all defined benefit obligations	**5,995**	**6,352**
Fair value of the plan assets	-2,999	-2,760
Funded status	**2,996**	**3,592**
Effects of the asset ceilings	–	–
Net defined benefit liability	**2,996**	**3,592**
Assets from defined benefit plans	5	2
Provisions for pensions and other post-employment benefits	**3,001**	**3,594**

The defined benefit obligations were based on the following types of benefits provided by the respective plan:

	Dec. 31, 2021				
€ million	Germany	Switzerland	United Kingdom	Other countries	**Total**
Benefit based on final salary					
Annuity	3,016	–	593	96	3,705
Lump sum	–	–	–	138	138
Installments	2	–	–	–	2
Benefit not based on final salary					
Annuity	981	999	–	83	2,063
Lump sum	1	–	6	38	45
Installments	6	–	–	–	6
Other	–	–	–	8	8
Medical plan	–	–	–	28	28
Present value of defined benefit obligations	**4,006**	**999**	**599**	**391**	**5,995**
Fair value of the plan assets	**1,308**	**946**	**570**	**176**	**2,999**

	Dec. 31, 2020				
€ million	Germany	Switzerland	United Kingdom	Other countries	Total
Benefit based on final salary					
Annuity	3,313	1	571	108	3,993
Lump sum	–	–	–	141	141
Installments	1	–	–	–	1
Benefit not based on final salary					
Annuity	1,054	1,002	–	83	2,139
Lump sum	–	–	6	33	39
Installments	7	–	–	–	7
Other	–	–	–	5	5
Medical plan	–	–	–	27	27
Present value of defined benefit obligations	**4,375**	**1,003**	**577**	**397**	**6,352**
Fair value of the plan assets	**1,250**	**820**	**516**	**174**	**2,760**

The vast majority of defined benefit obligations of German entities were attributable to plans that encompass old-age, disability, and surviving dependent pensions. These obligations were based on benefit rules comprising benefit commitments dependent on years of service and final salary, as well as two different direct commitments for employees newly hired since January 1, 2005, that is not based on the final salary. The benefit entitlement for new members from January 1, 2005, to December 31, 2020, resulted from the cumulative total of annually determined pension components calculated on the basis of a defined benefit expense and an age-based annuity table. The benefit entitlement for new members from January 1, 2021, resulted from the performance of salary-based employer contributions and voluntary employee contributions, topped up by the employer, to an external fund. A minimum return on contributions has been guaranteed. Statutory minimum funding obligations did not exist.

Pension obligations in Switzerland mainly comprised retirement, disability and surviving dependent benefits regulated by law. The employer and the employees made contributions to the plans. Statutory minimum funding obligations existed.

Pension obligations in the United Kingdom resulted primarily from benefit plans which are based on years of service and final salary and were closed to newly hired employees from 2006 onward. The agreed benefits

comprised retirement, disability and surviving dependent benefits. The employer and the employees made contributions to the plans. Statutory minimum funding obligations existed.

The development of the net defined benefit liability was as follows:

2020

€ million	Present value of the defined benefit obligations	Fair value of the plan assets	Effects of the asset ceilings	Net defined benefit liability
January 1, 2020	**-5,644**	**2,692**	**-1**	**-2,953**
Current service cost	-197	–	–	-197
Interest expense	-69		–	-69
Interest income	–	30	–	30
Plan administration costs recognized in income	–	-3	–	-3
Past service cost	-1	–	–	-1
Gains (+) or losses (-) on settlement	-1	–	–	-1
Currency effects recognized in income	-1	–	–	-1
Other effects recognized in income	–	–	–	–
Items recognized in income	**-269**	**27**	**–**	**-242**
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (-) arising from changes in demographic assumptions	-4	–	–	-4
Actuarial gains (+)/losses (-) arising from changes in financial assumptions	-678	–	–	-678
Actuarial gains (+)/losses (-) arising from experience adjustments	–	–	–	–
Remeasurements of plan assets				
Actuarial gains (+)/losses (-) arising from experience adjustments	–	78	–	78
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (-)	–	–	1	1
Actuarial gains (+)/losses (-)	**-682**	**78**	**1**	**-602**
Pension payments	134	-53	–	81
Employer contributions	–	38	–	38
Employee contributions	-16	16	–	–
Payment transactions	**118**	**1**	**–**	**119**
Changes in the scope of consolidation	72	–	–	72
Currency translation recognized in equity	49	-34	–	15
Other changes	4	-4	–	–
Other	**125**	**-38**	**–**	**87**
December 31, 2020	**-6,352**	**2,760**	**–**	**-3,592**

2021

€ million	Present value of the defined benefit obligations	Fair value of the plan assets	Effects of the asset ceilings	**Net defined benefit liability**
January 1, 2021	**-6,352**	**2,760**	**–**	**-3,592**
Current service cost	-228	–	–	-228
Interest expense	-46	–	–	-46
Interest income	–	19	–	19
Plan administration costs recognized in income	–	-3	–	-3
Past service cost	3	–	–	3
Gains (+) or losses (-) on settlement	–	–	–	–
Currency effects recognized in income	-29	27	–	-2
Other effects recognized in income	1	–	–	1
Items recognized in income	**-299**	**43**	**–**	**-256**
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (-) arising from changes in demographic assumptions	60	–	–	60
Actuarial gains (+)/losses (-) arising from changes in financial assumptions	626	–	–	626
Actuarial gains (+)/losses (-) arising from experience adjustments	-80	–	–	-80
Remeasurements of plan assets				
Actuarial gains (+)/losses (-) arising from experience adjustments	–	145	–	145
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (-)	–	–	–	–
Actuarial gains (+)/losses (-)	**606**	**145**	**–**	**751**
Pension payments	135	-52	–	83
Employer contributions	–	35	–	35
Employee contributions	-18	17	–	-1
Payment transactions	**117**	**–**	**–**	**117**
Changes in the scope of consolidation	–	–	–	–
Currency translation recognized in equity	-76	60	–	-16
Other changes	9	-9	–	–
Other	**-67**	**51**	**–**	**-16**
December 31, 2021	**-5,995**	**2,999**	**–**	**-2,996**

The actual income from plan assets amounted to € 164 million in the year under review (2020: € 108 million).

Covering the benefit obligations with financial assets represents a means of providing for future cash outflows, which are required in some countries (for example Switzerland and the United Kingdom) on the basis of legal requirements and in other countries (for example Germany) on a voluntary basis.

The fair value of the plan assets was allocated to the following categories:

	Dec. 31, 2021			Dec. 31, 2020		
€ million	Quoted market price in an active market	No quoted market price in an active market	**Total**	Quoted market price in an active market	No quoted market price in an active market	**Total**
Cash and cash equivalents	85	–	85	80	–	80
Equity instruments	769	–	769	645	–	645
Debt instruments	1,281	–	1,281	1,317	–	1,317
Direct investments in real estate	–	146	146	–	125	125
Investment funds	246	266	512	285	208	493
Insurance contracts	–	71	71	–	72	72
Other	129	6	135	23	5	28
Fair value of the plan assets	**2,510**	**489**	**2,999**	**2,350**	**410**	**2,760**

Plan assets did not directly include financial instruments issued by Group companies or real estate used by Group companies.

Employer contributions to plan assets and direct payments to plan beneficiaries for the next year are expected to amount to € 37 million (2020: € 32 million) and € 84 million (2020: € 81 million) respectively.

The expected payments of undiscounted benefits were as follows:

December 31, 2021

	Expected payments of undiscounted benefits				
€ million	**Germany**	**Switzerland**	**United Kingdom**	**Other countries**	**Total**
2022	75	21	22	37	156
2023	81	21	22	25	149
2024	83	21	23	22	149
2025	88	21	23	26	158
2026	91	21	24	24	160
2027-2031	515	101	134	139	888

December 31, 2020

	Expected payments of undiscounted benefits				
€ million	Germany	Switzerland	United Kingdom	Other countries	**Total**
2021	72	19	18	23	132
2022	78	19	18	27	142
2023	79	19	18	19	135
2024	82	20	19	19	140
2025	86	19	19	25	149
2026-2030	485	95	106	121	807

The weighted duration of defined benefit obligations amounted to 21 years (2020: 22 years).

Other employee benefit provisions

Accounting and measurement policies

Other employee benefit provisions

Other employee benefit provisions include obligations from share-based compensation programs. More information on these compensation programs can be found below.

Obligations for partial retirement programs and other severance payments not recognized in connection with restructuring programs as well as obligations in connection with long-term working hour accounts and anniversary bonuses are also included in other employee benefit provisions.

Other employee benefit provisions developed as follows:

€ million	Non-current other employee benefit provisions	Current other employee benefit provisions	Total
Jan. 1, 2021	**286**	**152**	**438**
Additions	253	160	413
Utilizations	-27	-139	-165
Release	-38	-48	-86
Interest effect	1	–	1
Currency translation	16	8	23
Reclass non-curr to curr	-90	90	–
Changes in scope of consolidation/other	–	–	–
Dec. 31, 2021	**401**	**224**	**624**

Share-based payments

Accounting and measurement policies

Share-based payments

Provisions are recognized for the share-based compensation program with cash settlement within the Group (“Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany”) and reported in other employee benefit provisions.

The fair value of the obligations is calculated by an external expert using a Monte Carlo simulation on each balance sheet date. The main parameters in the measurement of the share-based compensation programs with cash-settlement are long-term indicators of company performance and the price movement of the shares of Merck KGaA, Darmstadt, Germany, in relation to the DAX®. The effects of the expansion of the DAX®-30 to create the DAX®-40 in fiscal 2021 were reflected in the measurement of the compensation program as part of the net expenses.

The expected volatilities are based on the implicit volatility of the shares of Merck KGaA, Darmstadt, Germany, and the DAX® in accordance with the remaining term of the respective tranche. The dividend payments incorporated into the valuation model are based on medium-term dividend expectations.

Changes to the intrinsic value of share-based compensation programs are allocated to the respective functional costs according to the causation principle. Time value changes are recognized in financial income or finance costs.

Significant discretionary decisions and sources of estimation uncertainty

Share-based payments

The measurement of long-term share-based compensation programs implies extensive estimation uncertainty. The following overview shows the amounts by which the non-current provisions from share-based compensation programs (carrying amount as of December 31, 2021: € 184 million/carrying amount as of December 31, 2020: € 99 million) would have been impacted by changes in the DAX® or the closing price of the share of Merck KGaA, Darmstadt, Germany, on the balance sheet date. The amounts stated would have led to a corresponding reduction or increase in profit before income tax.

		Increase (+)/decrease (–) of the provision	
€ million		**Dec. 31, 2021**	Dec. 31, 2020
Variation of the share price of Merck KGaA, Darmstadt, Germany	10%	5	17
	-10%	-9	-16
Change in the DAX®	10%	-2	-6
	-10%	–	6

Sensitivities were determined on the basis of the respective parameters in question, with all other measurement assumptions remaining unchanged. The 2019 tranche reported under current provisions will not be subject to any value fluctuations between December 31, 2021, and the payout date and was therefore excluded from the sensitivity analysis (December 31, 2020: exclusion of 2018 tranche).

These share-based compensation programs with cash settlement in place within the Group are aligned with target achievement based on key performance indicators as well as the long-term performance of the shares of Merck KGaA, Darmstadt, Germany. Certain employees are eligible to receive a certain number of virtual shares – Share Units of Merck KGaA, Darmstadt, Germany (MSUs) – at the end of a three-year performance cycle. The number of MSUs that could be received depends on the individual grant defined for the respective person and the average closing price of the shares of Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 of the respective performance cycle (reference price). When the three-year performance cycle ends, the number of MSUs to then be granted is determined based on the development of defined key performance indicators (KPIs).

The calculation is based on the performance of the share price of Merck KGaA, Darmstadt, Germany, compared to the performance of the DAX® with a weighting of 50%, the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 25%, and the development of organic sales growth as a proportion of a defined target value, also with a weighting of 25%.

Depending on the development of the KPIs, at the end of the respective performance cycle the eligible participants are granted between 0% and 150% of the MSUs they could be eligible to receive. A cash payment is made based on the MSUs granted after the three-year performance cycle has ended. The value of a granted MSU, which is relevant for payment, corresponds to the average closing price of the shares of Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to the end of the performance cycle. The payout amounts of the respective tranches are limited to two and a half times the individual grant.

The following table presents the key parameters as well as the development of the potential number of Share Units of Merck KGaA, Darmstadt, Germany (MSUs) for the individual tranches:

	2019 tranche	2020 tranche	2021 tranche
Performance cycle	Jan. 1, 2019 - Dec. 31, 2021	Jan. 1, 2020 - Dec. 31, 2022	Jan. 1, 2021 - Dec. 31, 2023
Term	3 Years	3 Years	3 Years
Reference price of the shares of Merck KGaA, Darmstadt, Germany, in € (60-day average of the share price of Merck KGaA, Darmstadt, Germany, prior to the start of the performance cycle)	93.75	105.52	132.43
DAX® value (60-day average of the DAX® prior to the start of the performance cycle)	11,304.33	12,971.22	12,995.23
Potential number of MSU			
Potential number offered for the first time in 2019	876,061	–	–
Forfeited	37,122	–	–
Dec. 31, 2019	838,939	–	–
Potential number offered for the first time in 2020	–	871,700	–
Forfeited	47,622	33,825	–
Paid out	1,417	217	–
Dec. 31, 2020	789,900	837,658	–
Potential number offered for the first time in 2021	–	–	685,700
Forfeited	67,867	74,364	41,813
Paid out	4,038	2,006	–
Dec. 31, 2021	**717,995**	**761,288**	**643,887**

The value of the provisions as of December 31, 2021, was € 348 million (December 31, 2020: € 213 million). Net expenses of € 249 million were incurred in fiscal 2021 (2020: net expenses of € 149 million). The three-year tranche issued in fiscal 2018 ended at the end of 2020; an amount of € 110 million was paid out in fiscal 2021. The three-year tranche issued in fiscal 2019 ended at the end of 2021; a payout of € 163 million is expected for fiscal 2022. At the reporting date, the average closing prices of the shares of Merck KGaA, Darmstadt, Germany, in Xetra® trading over the last 60 trading days was € 207.24.

Capital Structure, Investments, and Financing Activities

(34) Equity

Accounting and measurement policies

Accounting treatment of the general partner's equity

As a partnership limited by shares, Merck KGaA, Darmstadt, Germany, has two different shareholder groups who have contributed to the company: the general partner E. Merck KG, Darmstadt, Germany, as the personally liable partner, and the shareholders.

From an accounting perspective, the contributions of both shareholder groups are treated as equity, regardless of the general partner's option to terminate its capital share. This treatment is based on the provision in the Articles of Association of Merck KGaA, Darmstadt, Germany, stating that the limited liability shareholders may decide on the conversion of the company into a stock corporation and thus limit the general partner's settlement claim to fulfillment in equity instruments.

Equity capital/capital reserves

The equity capital of the company consisted of the subscribed capital composed of shares and the equity interest held by the general partner E. Merck KG, Darmstadt, Germany (general partner's equity). As of the balance sheet date, the company's subscribed capital amounting to € 168 million was divided into 129,242,251 no-par value bearer shares plus one registered share. Each share therefore corresponded to € 1.30 of the subscribed capital. The amount resulting from the issue of shares by Merck KGaA, Darmstadt, Germany, exceeding the nominal amount was recognized in the capital reserves. The equity interest held by the general partner amounted to € 397 million. As in the previous year, there were no changes in subscribed capital in the fiscal year.

Retained earnings

Retained earnings developed as follows:

€ million	Retained earnings/net retained profit	Remeasurement of defined benefit plans	Fair value reserve for equity instruments	**Retained earnings**
Jan. 1, 2020	**13,134**	**-1,729**	**79**	**11,483**
Profit after tax	1,987	–	–	1,987
Gains/losses recognized in equity	–	-473	116	-357
Comprehensive income	**1,987**	**-473**	**116**	**1,631**
Dividend payments	-168	–	–	-168
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	-567	–	–	-567
Transactions with no change of control	-1	–	–	-1
Change in scope of consolidation/Other	68	23	-91	–
Dec. 31, 2020	**14,453**	**-2,179**	**105**	**12,378**
Jan. 1, 2021	**14,453**	**-2,179**	**105**	**12,378**
Profit after tax	3,055	–	–	3,055
Gains/losses recognized in equity	–	632	-33	599
Comprehensive income	**3,055**	**632**	**-33**	**3,653**
Dividend payments	-181	–	–	-181
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	-716	–	–	-716
Transactions with no change of control	–	–	–	–
Change in scope of consolidation/Other	–	8	-8	–
Dec. 31, 2021	**16,610**	**-1,539**	**63**	**15,134**

Gains/losses recognized in equity

Gains/losses recognized in equity developed as follows (see also Note (39) "**Derivative financial instruments**"):

€ million	Fair value reserve for debt instruments	Cash flow hedge reserve	Cost of cash flow hedge reserve	Currency translation difference	**Gains/losses recognized in equity**
Jan. 1, 2020	**-1**	**-118**	**-33**	**2,131**	**1,980**
Profit after tax	–	–	–	–	–
Gains/losses recognized in equity	**–**	**69**	**-1**	**-1,859**	**-1,790**
Fair value adjustment	–	54	-13	-1,862	-1,821
Reclassification to profit or loss	–	45	12	4	61
Reclassification to assets	–	–	–	–	–
Tax effect	–	-30	1	–	-29
Comprehensive income	**–**	**69**	**-1**	**-1,859**	**-1,790**
Dec. 31, 2020	**–**	**-49**	**-34**	**273**	**189**
Jan. 1, 2021	**–**	**-49**	**-34**	**273**	**189**
Profit after tax	–	–	–	–	–
Gains/losses recognized in equity	**–**	**-95**	**11**	**1,719**	**1,635**
Fair value adjustment	–	-127	-13	1,725	1,584
Reclassification to profit or loss	–	27	27	-6	49
Reclassification to assets	–	–	–	–	–
Tax effect	–	5	-3	–	2
Comprehensive income	**–**	**-95**	**11**	**1,719**	**1,635**
Dec. 31, 2021	**–**	**-145**	**-23**	**1,992**	**1,824**

The share of net profit of E. Merck KG, Darmstadt, Germany

E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, engage in reciprocal net profit transfers. This makes it possible for E. Merck KG, Darmstadt, Germany, the general partner of Merck KGaA, Darmstadt, Germany, and the shareholders to participate in the net profit/loss of Merck KGaA, Darmstadt, Germany, in accordance with the ratio of the general partner's equity interest and the subscribed capital (70.274% or 29.726% of the equity capital).

The allocation of net profit/loss is based on the net income of both E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, determined in accordance with the provisions of the German Commercial Code. These figures are adjusted for trade tax and/or corporation tax and create the basis for the allocation of net profit/loss. The adjustment for corporation tax is made to compensate for the difference in the tax treatment between the general partner and the limited liability shareholders. Corporation tax is only calculated on the income received by the limited liability shareholders. Its equivalent is the income tax applicable to the partners of E. Merck KG, Darmstadt, Germany, which must be paid by them directly. The adjustment thus ensures that the share in net profit corresponds to the respective interests held by the two shareholder groups.

Appropriation of profits

The profit distribution to be resolved upon by shareholders also defines the amount of that portion of net profit/loss freely available to E. Merck KG, Darmstadt, Germany. If the shareholders resolve to carry forward or to allocate to retained earnings a portion of the net retained profit of Merck KGaA, Darmstadt, Germany, to which they are entitled, E. Merck KG, Darmstadt, Germany, shall be obliged to allocate to the profit brought forward/retained earnings of Merck KGaA, Darmstadt, Germany, a comparable sum determined according to the ratio of subscribed capital to general partner's equity. This ensures that the retained earnings and the profit carried forward of Merck KGaA, Darmstadt, Germany, correspond to the ownership ratios of the shareholders

on the one hand and E. Merck KG, Darmstadt, Germany, on the other hand. Consequently, for distributions to E. Merck KG, Darmstadt, Germany, the available amount is the amount that results from netting the profit transfer of Merck KGaA, Darmstadt, Germany, with the amount either allocated or withdrawn by E. Merck KG, Darmstadt, Germany, from retained earnings/profit carried forward. This amount corresponds to the sum paid as a dividend to the shareholders and reflects their pro rata shareholding in the company.

The reciprocal net profit/loss transfer between E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, as stipulated by the Articles of Association was as follows:

		2021		2020	
€ million		**E. Merck KG, Darmstadt, Germany**	**Merck KGaA, Darmstadt, Germany**	E. Merck KG, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany
Result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer, adjusted for trade tax		19	–	-44	–
Net income of Merck KGaA, Darmstadt, Germany, before reciprocal profit transfer		–	1,031	–	701
Corporation tax		–	33	–	20
Basis for appropriation of profits	**(100%)**	**19**	**1,065**	**-44**	**721**
Profit transfer to E. Merck KG, Darmstadt, Germany (ratio of general partner's equity to equity capital)	(70.274%)	748	-748	506	-506
Profit/loss transfer to Merck KGaA, Darmstadt, Germany (ratio of subscribed capital to equity capital)	(29.726%)	-6	6	13	-13
Corporation tax		–	-33	–	-20
Net income		**761**	**289**	**475**	**181**

The result of E. Merck KG, Darmstadt, Germany, on which the appropriation of profits adjusted for trade tax is based, amounted to € 19 million (2020: € -44 million). This resulted in a profit/loss transfer to Merck KGaA, Darmstadt, Germany, of € 6 million (2020: € -13 million). The net income of Merck KGaA, Darmstadt, Germany, adjusted for corporation tax, on which the appropriation of its profit is based, amounted to € 1,065 million (2020: € 721 million). Merck KGaA, Darmstadt, Germany, transferred a profit in the amount of € 748 million to E. Merck KG, Darmstadt, Germany (2020: € 506 million). In addition, an expense from corporation tax charges was reported in the amount of € 33 million (2020: expense of € 20 million).

	2021		2020	
€ million	**E. Merck KG, Darmstadt, Germany**	**Merck KGaA, Darmstadt, Germany**	E. Merck KG, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany
Net income	761	289	475	181
Profit carried forward previous year	63	27	63	26
Withdrawal from revenue reserves	–	–	–	–
Transfer to revenue reserves	–	–	–	–
Retained earnings Merck KGaA, Darmstadt, Germany		**315**		**208**
Withdrawal by E. Merck KG, Darmstadt, Germany	-644		-474	
Dividend proposal		-239		-181
Profit carried forward	**180**	**76**	**63**	**27**

A dividend of € 1.40 per share was distributed for fiscal 2020. The dividend proposal for fiscal 2021 will be € 1.85 per share. The proposed dividend payment to shareholders amounts to € 239 million (2020: € 181 million). On this basis, the amount E. Merck KG, Darmstadt, Germany, is entitled to withdraw is € 644 million (2020: € 474 million).

Appropriation of profits and changes in reserves

	2021			2020		
€ million	**Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany**	**Merck KGaA, Darmstadt, Germany**	**Total**	Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany	Total
Profit transfer to E. Merck KG, Darmstadt, Germany	-90	-748	-838	-48	-506	-555
Profit/loss transfer from E. Merck KG, Darmstadt, Germany	–	6	6	–	-13	-13
Transfer to revenue reserves/change in profit carried forward	–	117	117	–	–	–
Profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves	**-90**	**-626**	**-716**	**-48**	**-519**	**-567**
Result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer adjusted for trade tax		19			-44	
Profit transfer to E. Merck KG, Darmstadt, Germany/withdrawal by E. Merck KG, Darmstadt, Germany	**-90**	**-644**		**-48**	**-474**	

Based on the assumed appropriation of profits, the profit/loss transfer to E. Merck KG, Darmstadt, Germany, for fiscal 2021, including changes in reserves, amounted to € -716 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ -748 million), the profit/loss transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany (€ 6 million), the change in profit carried forward by E. Merck KG, Darmstadt, Germany (€ 117 million) and the profit transfer from Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany (€ -90 million). In the previous year, the profit/loss transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves amounted to € -567 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ -506 million), the profit/loss transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany (€ -13 million) and the profit transfer from Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany (€ -48 million) and was paid to E. Merck KG, Darmstadt, Germany, in fiscal 2021. Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, is a partnership under Swiss law that is controlled by Merck KGaA, Darmstadt, Germany, but distributes its operating result directly to E. Merck KG, Darmstadt, Germany. This distribution is a payment to shareholders and is therefore also presented under changes in equity.

Non-controlling interests

The calculation of non-controlling interests was based on the reported equity of the subsidiaries concerned.

The non-controlling interests in consolidated equity and profit or loss essentially related to the non-controlling interests in Versum Materials Taiwan Co., Ltd., Taiwan, and Merck Ltd., Thailand, a subsidiary of Merck KGaA, Darmstadt, Germany, and in the listed company PT Merck Tbk., Indonesia, a subsidiary of Merck KGaA, Darmstadt, Germany.

(35) Cash and cash equivalents

Accounting and measurement policies

Cash and cash equivalents

Cash and cash equivalents include short-term investments with a maximum maturity of up to three months, which can be readily converted to a determined amount of cash.

Cash and cash equivalents comprised the following items:

€ million	Dec. 31, 2021	Dec. 31, 2020
Cash, bank balances and cheques	1,072	910
Short-term cash investments (up to 3 months)	827	446
Cash and cash equivalents	**1,899**	**1,355**

Changes in cash and cash equivalents as defined by IAS 7 are presented in the consolidated cash flow statement.

Cash and cash equivalents included restricted cash amounting to € 388 million (December 31, 2020: € 246 million). This mainly related to cash and cash equivalents at subsidiaries that are subject to capital controls.

The maximum default risk was equivalent to the carrying amount of cash and cash equivalents.

(36) Other financial assets

Accounting and measurement policies

Other financial assets

This section does not cover the accounting and measurement policies for derivative financial instruments. They are presented in Note (39) "**Derivative financial instruments**".

Recognition and initial measurement

Financial assets are initially measured at fair value and recognized as of the settlement date. For financial assets not subsequently measured at fair value through profit or loss in subsequent periods, initial measurement also includes directly attributable transaction costs.

Detailed information on the measurement methods for financial assets measured at fair value are presented in Note (43) "**Information on fair value measurement**".

Classification and subsequent measurement

On initial recognition, financial assets are assigned to one of the following measurement categories which also correspond to the financial instrument classes as defined in IFRS 9:

- subsequent measurement at amortized cost,
- subsequent measurement at fair value through other comprehensive income, or
- subsequent measurement at fair value through profit or loss.

This classification is based on the business model and the structure of contractual payment flows. Financial assets subsequently measured at amortized cost are accounted for using the effective interest method and considering any impairment losses. The procedure for calculating impairment losses is described in Note (42) "**Management of financial risks**". Financial assets of this class are held in order to collect their contractual cash flows, which are exclusively principal repayments and interest payments on the outstanding capital amount.

Except for derivative financial instruments with positive market value, the Group only applies subsequent measurement at fair value through profit or loss for debt instruments with contractual properties resulting in cash flows that do not exclusively represent principal repayments and interest payments on the outstanding capital amount. In particular, this includes contingent consideration that was contractually agreed with the acquirer within the context of the disposal of businesses within the meaning of IFRS 3 (see Note (43) "**Information on fair value measurement**"). The Group does not utilize the option of the subsequent measurement of debt instruments at fair value through profit or loss.

Equity instruments not subject to mandatory subsequent measurement at fair value through profit or loss are measured at fair value through other comprehensive income in subsequent periods if they are intended to be held for the longer term. Further details on the measurement of equity instruments at fair value are presented in Note (43) "**Information on fair value measurement**".

Financial assets would only be reclassified in the rare event of the Group changing its business model with regard to the management of financial assets.

Derecognition

Financial assets are derecognized if the claim for the compensation is fulfilled by the other counterparty, if there is no longer a reasonable expectation that the counterparty will fulfill its contractual obligations, or if the Group transfers the contractual rights including all material risks and rewards of the financial asset to another counterparty.

Recognition

The following table provides details on the measurement effects of debt instruments on the consolidated balance sheet and the consolidated income statement:

Category	Asset type	Impairment losses/reversals of impairment losses	Net gain and net loss on disposal/value adjustments	Foreign currency gains or losses	Interest income or expenses
Subsequent measurement at amortized cost	Operational	Impairment losses, and reversals of impairment losses of financial assets (net)	Other operating income or other operating expenses	Other operating income or other operating expenses	Financial income and expenses (applying the effective interest method)
	Financial	Financial income and expenses	Financial income and expenses	Financial income and expenses	
Subsequent measurement at fair value through other comprehensive income	Operational	Impairment losses, and reversals of impairment losses of financial assets (net)	Group equity (upon derecognition: reclassification to other operating income or other operating expenses)	Other operating income or other operating expenses	Financial income and expenses
	Financial	Financial income and expenses	Group equity (upon derecognition: reclassification to financial income and expenses)	Financial income and expenses	
Subsequent measurement at fair value through profit or loss	Operational		Other operating income or other operating expenses	Other operating income or other operating expenses	Financial income and expenses
	Financial		Financial income and expenses	Financial income and expenses	

The following table provides details on the measurement effects of equity instruments on the consolidated balance sheet and the consolidated income statement:

Category	Asset type	Value adjustments	Foreign currency gains or losses	Dividend income
Subsequent measurement at fair value through other comprehensive income	Operational	Results recognized directly in equity (value adjustments)	Foreign currency gains and losses recognized directly in equity	Other operating income
		Reclass of the cumulative results previously recognized directly in equity in the retained earnings when asset is disposed		
	Financial	Results recognized directly in equity (value adjustments)	Foreign currency gains and losses recognized directly in equity	Financial income
		Reclass of the cumulative results previously recognized directly in equity in the retained earnings when asset is disposed		
Subsequent measurement at fair value through profit or loss	Operational	Other operating income or other operating expenses	Other operating income or other operating expenses	Other operating income
	Financial	Financial income and expenses	Financial income and expenses	Financial income

Other financial assets were composed as follows:

	Dec. 31, 2021			Dec. 31, 2019		
€ million	current	non-current	Total	current	non-current	Total
Subsequent measurement at amortized cost	**57**	**4**	**61**	**1**	**7**	**7**
Loans against third parties	–	4	5	–	7	7
Other	56	–	56	–	–	–
Subsequent measurement at fair value through other comprehensive income	**43**	**463**	**506**	**5**	**504**	**509**
Equity instruments	–	462	462	–	499	499
Debt instruments	43	1	44	5	4	9
Subsequent measurement at fair value through profit and loss	**49**	**444**	**493**	**23**	**312**	**335**
Contingent consideration	–	271	271	–	260	260
Other debt instruments	12	149	161	7	34	41
Derivatives without a hedging relationship (financial transactions)	37	–	37	16	10	26
Derivatives without a hedging relationship (operational)	–	24	24	–	8	8
Derivatives with a hedging relationship (operational)	**25**	**–**	**25**	**96**	**–**	**96**
Financial assets	**174**	**911**	**1,085**	**125**	**822**	**947**

The increase in other debt instruments with subsequent measurement at fair value through profit or loss is primarily due to the acquisition of units of an index fund.

As in the previous year, contingent consideration included claims arising from the divestments of the biosimilars business to Fresenius SE & Co. KGaA, Bad Homburg vor der Höhe, in 2017 and the Kuvan® business to BioMarin Pharmaceuticals Inc., United States, in 2015.

Equity interests with subsequent measurement at fair value through other comprehensive income primarily related to shares in M Ventures portfolio companies as well as Precigen Inc., United States. Please refer to Note (48) "**List of shareholdings**" for a detailed list of all investments made in equity instruments with subsequent measurement at fair value through other comprehensive income.

(37) Financial debt/Capital management

Accounting and measurement policies

Financial debt/capital management

Except for lease liabilities and derivatives with negative market values, financial debt is initially recognized at fair value and subsequently measured at amortized cost using the effective interest method.

The accounting and measurement policies for lease liabilities and derivatives are presented in Notes (21) "**Leasing**" and (39) "**Derivative financial instruments**".

The composition of financial debt as well as a reconciliation to net financial debt are presented in the following table:

					Nominal value	
	Dec. 31, 2021 € million	Dec. 31, 2020 € million	Maturity	Interest rate %	€ million	Currency
Hybrid bond 2014/2074	–	315	Dec. 2074[1]	2.625	317	€
USD bond 2015/2022	884	–	March 2022	2.950	1,000	USD
Eurobond 2015/2022	550	–	Sept. 2022	1.375	550	€
Bonds (current)	**1,434**	**315**				
Commercial paper	–	200				
Bank loans	36	835				
Liabilities to related parties	896	817				
Loans from third parties and other financial debt	13	15				
Liabilities from derivatives (financial transactions)	35	62				
Lease liabilities (IFRS 16)	117	112				
Current financial debt	**2,531**	**2,357**				
USD bond 2015/2022	–	812	March 2022	2.950	1,000	USD
Eurobond 2015/2022	–	549	Sept. 2022	1.375	550	€
Eurobond 2019/2023	600	600	Dec. 2023	0.005	600	€
USD bond 2015/2025	1,410	1,295	March 2025	3.250	1,600	USD
Eurobond 2020/2025	746	745	July 2025	0.125	750	€
Eurobond 2019/2027	597	597	July 2027	0.375	600	€
Eurobond 2020/2028	747	746	July 2028	0.500	750	€
Eurobond 2019/2031	797	796	July 2031	0.875	800	€
Hybrid bond 2014/2074	499	499	Dec. 2074[2]	3.375	500	€
Hybrid bond 2019/2079	497	496	June 2079[3]	1.625	500	€
Hybrid bond 2019/2079	996	996	June 2079[4]	2.875	1,000	€
Hybrid bond 2020/2080	997	996	Sept. 2080[5]	1.625	1,000	€
Bonds (non-current)	**7,886**	**9,126**				
Bank loans	–	250				
Loans from third parties and other financial debt	42	42				
Liabilities from derivatives (financial transactions)	–	40				
Lease liabilities (IFRS 16)	342	327				
Non-current financial debt	**8,270**	**9,785**				
Financial debt	**10,801**	**12,142**				
less:						
Cash and cash equivalents	1,899	1,355				
Current financial assets[6]	149	28				
Net financial debt[7]	**8,753**	**10,758**				

[1] The Group exercised the right to prematurely repay this tranche of the hybrid bond issued in December 2014 in June 2021.

[2] The Group has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in December 2024.

[3] The Group has the right to prematurely repay this tranche of the hybrid bond issued in June 2019 for the first time in December 2024.

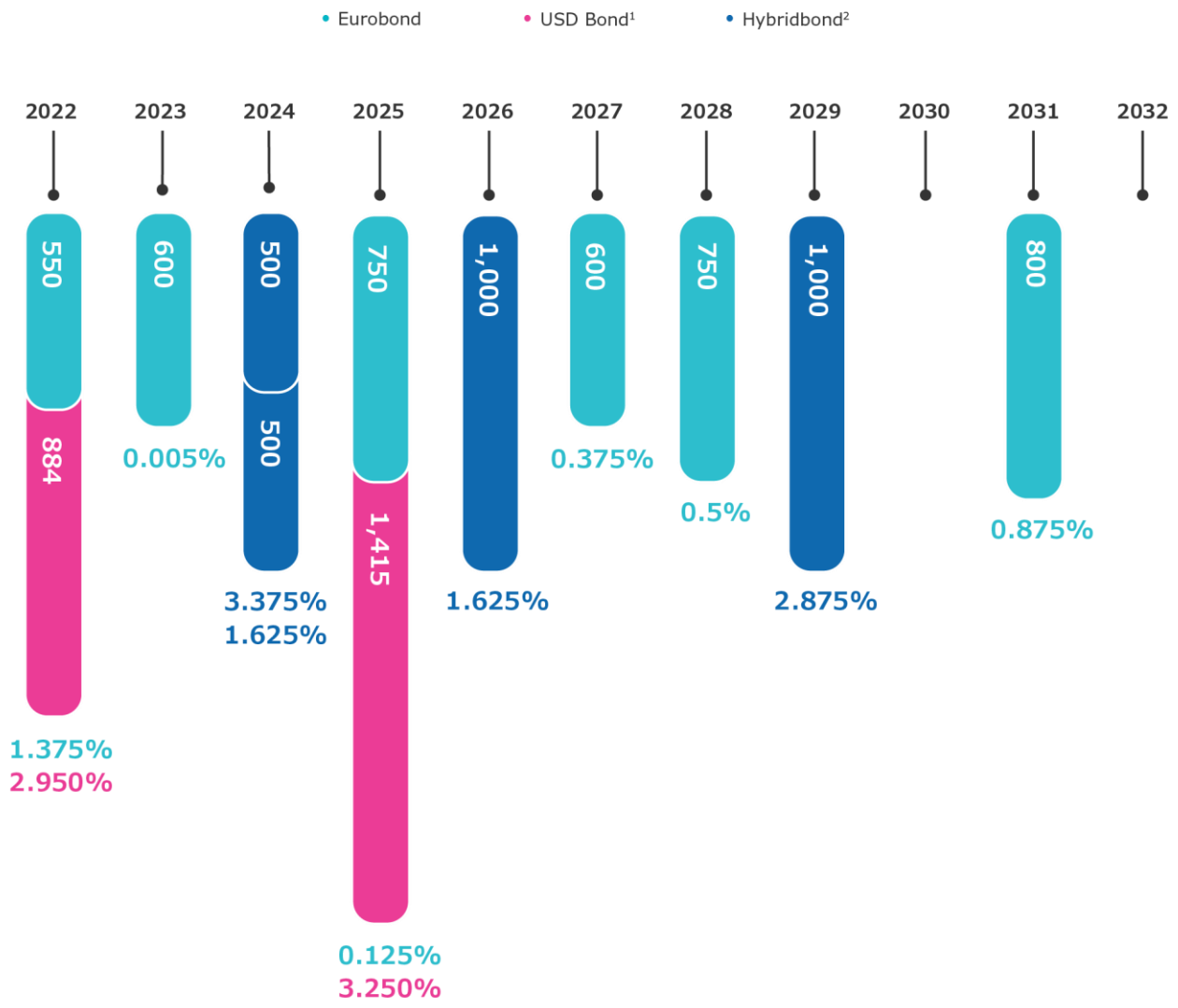
[4] The Group has the right to prematurely repay this tranche of the hybrid bond issued in June 2019 for the first time in December 2029.

[5] The Group has the right to prematurely repay this hybrid bond issued in September 2020 for the first time in September 2026.

[6] Excluding current derivatives with a hedging relationship (operational).

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

The repayment profile of the 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, 2021.
[2] For the hybrid bonds repayment is assumed at the earliest possible date.

The hybrid bonds issued by Merck KGaA, Darmstadt, Germany, and/or some of its affiliates are bonds for which the leading rating agencies have given equity credit treatment to half of the issuances, thus making the issuances more favorable to the Group's credit rating than traditional bond issues. The bonds are recognized in full as financial liabilities in the balance sheet.

Exercising a right of termination that applied every time there was a change in the interest rate, the KfW loan in the amount of € 250 million that was reported in non-current liabilities to banks in the previous year was repaid ahead of schedule on September 29, 2021.

The financial debt was not secured by liens or similar forms of collateral. The loan agreements do not contain any financial covenants. The average borrowing cost on December 31, 2021, was 1.7% (December 31, 2020: 1.6%).

Information on liabilities to related parties can be found in Note (45) "**Related party disclosures**".

Capital management

The objective of capital management is to ensure the necessary financial flexibility in order to maintain long-term business operations and realize strategic options. Maintaining a stable investment grade rating, ensuring liquidity, limiting financial risks, as well as optimizing the cost of capital are the objectives of our financial policy and set important framework conditions for capital management. In this context, net financial debt is one of the leading capital management indicators within the Group.

Traditionally, the capital market represents a major source of financing for the Group, for instance via bond issues. As of December 31, 2021, there were liabilities of € 4.05 billion from a debt issuance program most recently renewed in 2020 (December 31, 2020: € 4.05 billion). In addition, the Group had access to a commercial paper program to meet short-term capital requirements with a volume of € 2 billion, none of which were utilized as of December 31, 2021 (December 31, 2020: € 200 million).

Loan agreements represent a further source of financing for the Group. At the balance sheet date, the bank financing commitments vis-à-vis the Group were as follows:

	Dec. 31, 2021		Dec. 31, 2020			
€ million	**Financing commitments from banks**	**Utilization**	Financing commitments from banks	Utilization	Interest	Maturity of financing commitments
Syndicated loan	2,000	–	2,000	–	variable	2025
Loan agreement with banking syndicate for acquisition financing	–	–	569	569	variable	2022
Bilateral credit agreement with banks	–	–	250	250	variable	2022
Various bank credit lines	36	36	1,266	266	variable	< 1 year
	2,036	**36**	**4,085**	**1,085**		

In fiscal 2020, the Group concluded extensive lines of credit with a term of one year in connection with the Covid-19 pandemic. These were not renewed in fiscal 2021.

There were no indications that the availability of extended credit lines was restricted.

(38) Other financial liabilities

Accounting and measurement policies

Other financial liabilities

With the exception of liabilities from derivatives and contingent considerations, which are recognized in the context of business combinations according to IFRS 3, other financial liabilities are initially measured at fair value and in subsequent periods at amortized cost, applying the effective interest method. The accounting and measurement policies of derivatives are presented in Note (39) "**Derivative financial instruments**".

Other financial liabilities comprised the following:

	Dec. 31, 2021			Dec. 31, 2020		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Miscellaneous other financial liabilities	1,110	96	1,206	963	60	1,023
thereof: liabilities to related parties	708	–	708	558	–	558
thereof: interest accruals	51	–	51	55	–	55
Liabilities from derivatives (operational)	82	10	92	45	2	47
Other financial liabilities	**1,192**	**106**	**1,297**	**1,008**	**62**	**1,070**

The liabilities to related parties primarily consist of liabilities to E. Merck KG, Darmstadt, Germany.

(39) Derivative financial instruments

Accounting and measurement policies

Derivative financial instruments

The IFRS 9 provisions are applied for hedge accounting. Hedging transactions are entered into for highly probable forecast transactions in foreign currencies and for hedging fair values of assets on the balance sheet. Cash flow hedge accounting for forecast transactions in foreign currency mean the hedged item is recognized at a fixed exchange rate on a net basis instead of being recognized at the spot exchange rate at the transaction date. As a result of hedging fair values of assets on the balance sheet, the compensating changes in value of the corresponding hedged item and hedging instrument offset each other.

The Group only uses derivatives as hedging instruments. The Group uses the dollar offset method as well as regression analyses to measure hedge effectiveness.

Hedging ineffectiveness may occur in the timing of forecasted cash flows or if hedged items are dissolved. Derivatives that do not or no longer meet the documentation or effectiveness requirements for hedge accounting, whose hedged item no longer exists or for which hedge accounting rules are not applied are classified as “financial assets or liabilities at fair value through profit or loss” depending on their balance.

In the case of hedging relationships where the Group uses options as hedging instruments, only the intrinsic value of options is designated as the hedging instrument. Changes in the fair value of the time value component of options that are used for hedge accounting are recognized in other comprehensive income and in the cost of cash flow hedge reserve within equity. The subsequent accounting of these amounts depends on the type of hedged transaction.

In the case of hedging relationships where the Group uses forward contracts as hedging instruments, only the spot element is designated as the hedging instrument. Changes in the fair value of the forward element in forward contracts are recognized in other comprehensive income in the cost of cash flow hedge reserve within equity. The subsequent accounting of these amounts depends on the type of hedged transaction.

Derivative financial instruments are recognized in the consolidated balance sheet, the consolidated income statement and the consolidated statement of comprehensive income – with the exception of the balance sheet

treatment of amounts included directly from the reserve in the initial cost or in the other carrying amount of a non-financial asset or liability – as follows:

					Changes in fair value in the consolidated income statement and the consolidated statement of comprehensive income	
Hedging relationship	**Type of collateral**	**Type of hedged item**	**Market value**	**Presentation on the balance sheet**	**during the term**	**at maturity**
Derivatives with a cash flow hedging relationship	Interest rate	Financial transactions	Positive market values	Other financial assets	Fair value adjustments (in equity)	Financial income and expenses
			Negative market values	Financial debt	Fair value adjustments (in equity)	
	Currency	Transactions in operating business	Positive market values	Other financial assets	Fair value adjustments (in equity)	Other operating income
			Negative market values	Other financial liabilities	Fair value adjustments (in equity)	Other operating income
Derivatives without a hedging relationship	Interest rate	Financial transactions	Positive market values	Other financial assets	Financial income and expenses	
			Negative market values	Financial debt		
	Currency	Financial transactions	Positive market values	Other financial assets	Financial income and expenses	
			Negative market values	Financial debt		
	Virtual power purchase agreement	Transactions in operating business	Positive market values	Other financial assets	Other operating income	
			Negative market values	Other financial liabilities	Other operating expenses	

The nominal amounts of the Group's derivative exposures were as follows:

	Dec. 31, 2021		Dec. 31, 2020	
€ million	**current**	**non-current**	current	non-current
Cash flow hedge	5,061	–	5,285	–
Interest rate	–	–	569	–
Currency	5,061	–	4,716	–
No hedge accounting	7,459	–	4,451	1,100
Interest rate	1,100	–	–	1,100
Currency	6,359	–	4,451	–
Virtual power purchase agreement				
	12,519	**–**	**9,736**	**1,100**

The fair values of the derivatives were as follows:

December 31, 2021

	Positive market values				Negative market values			
	Financial transactions		Transactions in operating business		Financial transactions		Transactions in operating business	
€ million	**current**	**non-current**	**current**	**non-current**	**current**	**non-current**	**current**	**non-current**
Cash flow hedge	**–**	**–**	**25**	**–**	**–**	**–**	**82**	**–**
Interest	–	–	–	–	–	–	–	–
Currency	–	–	25	–	–	–	82	–
No hedge accounting	**37**	**–**	**–**	**24**	**35**	**–**	**–**	**10**
Interest	5	–	–	–	19	–	–	–
Currency	32	–	–	–	15	–	–	–
Virtual power purchase agreement	–	–	–	24	–	–	–	10
	37	**–**	**25**	**24**	**35**	**–**	**82**	**10**

December 31, 2020

	Positive market values				Negative market values			
	Financial transactions		Transactions in operating business		Financial transactions		Transactions in operating business	
€ million	current	non-current	current	non-current	current	non-current	current	non-current
Cash flow hedge	**–**	**–**	**96**	**–**	**–**	**–**	**45**	**–**
Interest	–	–	–	–	–	–	–	–
Currency	–	–	96	–	–	–	45	–
No hedge accounting	**16**	**10**	**–**	**8**	**62**	**40**	**–**	**2**
Interest	–	10	–	–	–	40	–	–
Currency	16	–	–	–	62	–	–	–
Virtual power purchase agreement	–	–	–	8	–	–	–	2
	16	**10**	**96**	**8**	**62**	**40**	**45**	**2**

As in the previous year, all hedging relationships were transaction related. Netting of derivatives from an economic perspective was possible due to the existing framework agreements on derivatives trading that the Group had entered into with commercial banks. Actual netting only takes place in the case of insolvency of the contract partner. Derivatives were not offset on the face of the balance sheet.

The following table presents the potential netting volume of the reported derivative assets and liabilities:

December 31, 2021

€ million	Gross presentation	Netting	Net presentation	Potential netting volume		Potential net amount
				due to master netting agreements	due to financial collateral	
Derivative assets	86	–	86	61	–	25
Derivative liabilities	-126	–	-126	-61	–	-65

December 31, 2020

€ million	Gross presentation	Netting	Net presentation	Potential netting volume		Potential net amount
				due to master netting agreements	due to financial collateral	
Derivative assets	130	–	130	74	–	56
Derivative liabilities	-149	–	-149	-74	–	-75

The reserves for cash flow hedges and the cost of cash flow hedging of the Group related to the following hedging instruments (see also Note (34) "**Equity**"):

€ million	Cost of hedging cash flows			Cash flow hedging			
	Time value of options	Forward component of currency forwards	Total	Intrinsic value of options	Spot component of currency forwards	Interest rate swaps	Total
Jan. 1, 2020	**-8**	**-25**	**-33**	**-13**	**-70**	**-36**	**-118**
Fair value adjustment (directly recognized in equity)	-2	-11	-13	31	23	–	54
Reclassification to profit or loss	–	12	12	-5	34	15	45
Reclassification to assets	–	–	–	–	–	–	–
Tax effect	1	–	1	-9	-18	-3	-30
Dec. 31, 2020	**-9**	**-25**	**-34**	**5**	**-31**	**-23**	**-49**
Jan. 1, 2021	**-9**	**-25**	**-34**	**5**	**-31**	**-23**	**-49**
Fair value adjustment (directly recognized in equity)	-2	-11	-13	-49	-78	–	-127
Reclassification to profit or loss	–	27	27	-1	12	16	27
Reclassification to assets	–	–	–	–	–	–	–
Tax effect	–	-3	-3	5	3	-3	5
Dec. 31, 2021	**-11**	**-12**	**-23**	**-40**	**-93**	**-11**	**-145**

(40) Finance income and expenses/Net gains and losses from financial instruments

Finance income and expenses were as follows:

€ million	**2021**	2020
Interest income and similar income	46	39
Capital gain from disposal of debt instruments with subsequent measurement at amortized cost	1	–
Income from fair value changes from debt instruments with subsequent measurement at fair value through profit or loss	16	4
Finance income	**62**	**43**
Interest expense and similar expenses	-272	-387
Expenses from fair value changes from debt instruments with subsequent measurement at fair value through profit or loss	-3	-3
Expenses from fair value changes of share-based compensation programs	-3	-5
Currency differences from financing activities	-39	-3
Finance costs	**-317**	**-395**
Financial result	**-255**	**-354**

Interest income and expenses arose as follows:

	2021		2020	
€ million	**Interest income**	**Interest expenses**	Interest income	Interest expenses
Financial instruments	19	-176	26	-246
Leases	–	-10	–	-15
Pension provisions	–	-27	–	-39
Other non-current provisions	–	-1	–	-20
Other interest income/expenses and similar income and expenses	27	-69	13	-75
Capitalized borrowing costs for		11		8
Property, plant and equipment		7		4
Other intangible assets		4		4
Interest income/expenses and similar income and expenses	**46**	**-272**	**39**	**-387**

The year-on-year decline in interest expenses for financial instruments is essentially due to lower interest payments for bonds.

The following table shows the development of net gains and losses, interest income and expenses, and currency differences, as well as dividend income from financial instruments (excluding items recognized in other comprehensive income) by measurement category in the period under review:

2021

			Interest result		Net gains and losses			
€ million	**Currency differences**	**Dividends**	**Interest income**	**Interest expenses**	**Impairment losses**	**Reversals of impairment losses**	**Fair value adjustments**	**Disposal gains/losses**
Financial assets								
Subsequent measurement at amortized cost	7		–		-67	68		1
Subsequent measurement at fair value through other comprehensive income								
Equity Instruments		–						
Subsequent measurement at fair value through profit or loss	1	–	19	–			665	
Financial debt								
Subsequent measurement at amortized cost	-13			-174				–
Subsequent measurement at fair value through profit or loss	–		–	-2			-697	
Total	**-5**	**–**	**19**	**-176**	**-67**	**68**	**-32**	**1**

2020

			Interest result		Net gains and losses			
€ million	Currency differences	Dividends	Interest income	Interest expenses	Impairment losses	Reversals of impairment losses	Fair value adjustments	Disposal gains/losses
Financial assets								
Subsequent measurement at amortized cost	-10		5		-81	75		–
Subsequent measurement at fair value through other comprehensive income								
Equity Instruments		1						
Debt Instruments	–		–		–	–		–
Subsequent measurement at fair value through profit or loss	-1	–	21	–			822	
Financial debt								
Subsequent measurement at amortized cost	1			-244				–
Subsequent measurement at fair value through profit or loss	–		–	-2			-884	
Total	**-10**	**1**	**26**	**-246**	**-81**	**75**	**-62**	**–**

In the table above, interest income or expenses related to derivatives without a hedging relationship are reported as a component of fair value adjustments. The currency result from equity instruments with subsequent measurement at fair value through other comprehensive income was recognized in other comprehensive income.

(41) Net cash flows from financing activities

Accounting and measurement policies

Net cash flows from financing activities

The option to recognize dividend payments and profit withdrawals in the cash flows from financing activities is exercised in determining the cash flows from financing activities.

Furthermore, the net reporting option has been exercised to report cash receipts and payments for items in which the turnover is quick, the amounts large and the maturities short. This primarily relates to rolling financing by way of commercial papers and short-term bank loans reported under “Payments from new borrowings of other current and non-current financial debt” and “Repayment of other current and non-current financial debt”.

The change in financial debt was as follows:

2021

		Cash			Non-cash					
€ million	**Jan. 1, 2021**	Cash inflows	Repay-ments	Lease interests	Change in lease liabilities	Ex-change rate effects	Fair value adjust-ment	Other	Changes in scope of consoli-dation	**Dec. 31, 2021**
Bonds	9,442	–	-317	–	–	185	–	10	–	9,320
Liabilities to E. Merck KG, Darmstadt, Germany	816	471	-393	–	–	–	–	–	–	894
Other current and non-current financial liabilities	1,885	388	-2,303	-10	151	-41	517	–	–	586
Financial debt	**12,142**	**859**	**-3,013**	**-10**	**151**	**144**	**517**	**10**	**–**	**10,801**
Derivative assets (current and non-current)	-26	407	–	–	–	–	-418	–	–	**-37**

2020

		Cash			Non-cash					
€ million	**Jan. 1, 2020**	Cash inflows	Repay-ments	Lease interests	Change in lease liabilities	Ex-change rate effects	Fair value adjust-ment	Other	Changes in scope of consoli-dation	**Dec. 31, 2020**
Bonds	9,854	2,486	-2,724	–	–	-184	–	9	–	9,442
Financial liabilities to E. Merck KG, Darmstadt, Germany	808	390	-382	–	–	–	–	–	–	816
Other current and non-current financial liabilities	2,531	3,561	-4,687	-15	65	33	398	–	-1	1,885
Financial debt	**13,194**	**6,436**	**-7,793**	**-15**	**65**	**-151**	**398**	**9**	**-1**	**12,142**
Derivative assets (current and non-current)	-33	521	–	–	–	–	-514	–	–	-26

Interest payments for leases were recognized in operating cash flow but served as a reconciliation item in the above table as they were a component of financial liabilities. Changes in lease liabilities included additions and retirements of right-of-use from leases and the effects from unwinding of the discount on lease liabilities. Other non-cash changes resulted from the application of the effective interest method.

Fair value adjustments of other current and non-current financial liabilities were attributable to liabilities from derivatives. In the consolidated cash flow statement, cash changes of assets from derivatives were reported together with repayments of other current and non-current financial liabilities. In the above reconciliation, changes of assets from derivatives were reported separately as they did not form part of financial liabilities.

The amount of unused credit lines that could be employed for future operating activities and to meet obligations and information on changes in financial debt can be found in Note (37) “**Financial debt/Capital management**”.

(42) Management of financial risks

Market fluctuations with respect to foreign exchange and interest rates represent significant profit and cash flow risks for the Group. The Group aggregates these Group-wide risks and steers them centrally, partly by using derivative financial instruments. To estimate existing risks of foreign exchange and interest rate fluctuations, the Group uses scenario analyses. The Group is not subject to any material risk concentration from financial transactions.

The Group uses marketable forward exchange contracts, options and interest swaps as hedging instruments. The strategy to hedge interest rate and foreign exchange rate fluctuations arising from forecast transactions and transactions already recognized in the balance sheet is set by a risk committee, which meets on a regular basis. The use of derivatives is regulated by extensive guidelines and subject to ongoing risk controls by Group Treasury. Speculation is prohibited. The strict separation of functions between trading, settlement and control functions is ensured. Derivatives are only entered into with banks that have a good credit rating. Related default risks are continuously monitored.

The **Report on Risks and Opportunities** included in the combined management report provides further information on the management of financial risks.

Foreign exchange risks

Owing to the international nature of its business, the Group is exposed to transactional foreign exchange risks within the scope of both its business activities and financing activities. Foreign exchange risks are continuously analyzed and different hedging strategies used to limit or eliminate these risks.

The entire foreign exchange exposure is divided into several defined subsets with different risk profiles and systematically hedged using suitable hedging instruments. Hedging is performed based on a regularly reviewed basket of currencies. The maximum time horizon for hedging is 12 months.

Foreign exchange risks from the following transactions are economically hedged through the use of foreign exchange contracts and currency options:

- intragroup financing in non-functional currency;
- receivables from and liabilities to third parties in non-functional currency.

Foreign exchange risks from the following transactions are hedged using foreign exchange contracts and currency options applying hedge accounting:

- forecast transactions in non-functional currency, the expected probability of which is very high for the next 12 months;
- firm purchase commitments over the next 12 months in non-functional currency.

The following table shows the net exposure and the effects of transactional exchange rate movements of the key currencies against the euro in relation to the net income and equity of the Group on the balance sheet date:

December 31, 2021

€ million		CHF	CNY	JPY	KRW	TWD	USD
Net exposure		**-665**	**1,086**	**108**	**208**	126	1,116
Exchange rate -10% (appreciation vs. €)	Consolidated income statement	-67	109	108	21	13	112
	Equity (other comprehensive income)	–	-15	-9	-10	-14	-120
Exchange rate +10% (depreciation vs. €)	Consolidated income statement	67	-109	-108	-21	-13	-112
	Equity (other comprehensive income)	–	41	7	9	11	116

December 31, 2020

€ million		CHF	CNY	JPY	KRW	TWD	USD
Net exposure		**-280**	**407**	**98**	**73**	65	457
Exchange rate -10% (appreciation vs. €)	Consolidated income statement	-28	41	10	7	7	46
	Equity (other comprehensive income)	40	-62	-9	-21	-18	-119
Exchange rate +10% (depreciation vs. €)	Consolidated income statement	28	-41	-10	-7	-7	-46
	Equity (other comprehensive income)	-33	64	8	17	17	115

In this presentation, effects of cash flow hedges are taken into consideration in the equity of the Group. The rise in net exposure as against the previous year resulted from lower hedge ratios. The net exposure of each of the above currencies consisted of the following components:

- planned cash flows in the next 12 months in the respective currency, less
- the nominal values of hedging instruments of these planned cash flows.

The planned cash flows in the next 12 months are analyzed and divided into subsets in accordance with the risk management strategy. In the first subset, 25% of a regularly reviewed basket of currencies is hedged. The second subset hedges a more flexible basket of currencies selected on the basis of hedging costs and correlation with the euro. The hedging strategy achieves an economic hedge ratio of at least 40% across all hedging subsets. Depending on scenario analyses, this can be increased to up to 90% using a rule-based approach. As in the previous year, balance sheet items in the above currencies were economically hedged by derivatives in full if they did not correspond to the functional currency of the respective Group company. Accordingly, they do not affect the net exposure presented above.

The impact of cash flow hedge accounting for forecast transactions in foreign currency was as follows for the major currencies:

December 31, 2021

€ million	CHF	CNY	JPY	KRW	TWD	USD
Notional amount	–	1,445	126	114	180	2,975
thereof: current	–	1,445	126	114	180	2,975
thereof: non-current	–	–	–	–	–	–
Fair Value of the hedging instrument	–	-18	–	-1	-5	-32
thereof: positive market values	–	13	–	–	–	10
thereof: negative market values	–	-31	–	-1	-5	-42
Maturity profile	–	January 2022 – December 2022	January 2022 – December 2022	January 2022 – December 2022	January 2022 – December 2022	January 2022 – December 2022
Hedge ratio[1]	–	1:1	1:1	1:1	1:1	1:1
Change in value of outstanding hedging instruments since January 1, 2021	–	-18	–	-1	-5	-32
Change in value of hedged item used to determine hedge effectiveness since January 1, 2021	–	18	–	1	5	32
Weighted average hedging rate	–	7.79	130.30	1,367.00	32.27	1.16

[1] The hedging instruments and the corresponding hedged items were denominated in the same currency, therefore the hedge ratio was 1:1.

December 31, 2020

€ million	CHF	CNY	JPY	KRW	TWD	USD
Notional amount	358	1,071	97	295	257	1,802
thereof: current	358	1,071	97	295	257	1,802
thereof: non-current	–	–	–	–	–	–
Fair value of the hedging instrument	-2	-9	2	-5	3	65
thereof: positive market values	–	6	2	3	3	71
thereof: negative market values	-2	-15	–	-8	–	-7
Maturity profile	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021
Hedge ratio[1]	1:1	1:1	1:1	1:1	1:1	1:1
Change in value of outstanding hedging instruments since January 1, 2020	-2	-9	2	-5	3	65
Change in value of hedged item used to determine hedge effectiveness since January 1, 2020	2	9	-2	5	-3	-65
Weighted average hedging rate	1.08	8.25	124.20	1,379.00	33.55	1.17

[1] The hedging instruments and the corresponding hedged items were denominated in the same currency, therefore the hedge ratio was 1:1.

In addition to the transactional foreign exchange risks described previously, the Group was exposed to currency translation risks since many of the Group's subsidiaries are located outside the euro area and have functional currencies other than the reporting currency. Exchange differences resulting from translation of the assets and liabilities of these companies into euro, the reporting currency, are recognized in equity.

Interest rate risks

The Group's net exposure to interest rate changes comprised the following:

€ million	**Dec. 31, 2021**	Dec. 31, 2020
Short-term or variable interest rate monetary deposits	2,011	1,368
Short-term or variable interest rate monetary borrowings	-2,531	-2,607
Net interest rate exposure	**-521**	**-1,240**

The effects of a parallel shift in the yield curve by +100 or -100 basis points on the consolidated income statement as well as on equity relative to all short-term or variable monetary deposits and monetary borrowings within the scope of IAS 32, except contingent considerations, are presented in the following table. In the event of a downward shift, the interest rate for instruments subject to a contractual interest rate floor of zero percent was limited accordingly:

€ million	**2021**		2020	
Change in market interest rate	**+ 100 basis points**	**– 100 basis points**	**+ 100 basis points**	**– 100 basis points**
Effects on consolidated income statement	11	-20	-21	11
Effects on equity (other comprehensive income)	–	–	–	–

The Group does not expect the IBOR reform to have a significant impact on its interest rate risk or its net assets, financial position and results of operations.

Share price risks

The shares in publicly listed companies amounting to € 117 million (December 31, 2020: € 244 million) are generally exposed to a risk of fluctuations in fair value.

Electricity price risks

The Group has entered into a virtual power purchase agreement with a term of 12 years with a wind energy project developer in the United States for an installed capacity attributable to the Group of 68 megawatts. In fiscal 2021, the contract partners agreed to increase the capacity attributable to the Group from 50 megawatts to 68 megawatts. The wind farm is scheduled to be commissioned in 2022. The Group will receive renewable energy certificates for the quantities of electricity produced. As the agreement is designed as a contract for difference, it fulfills the definition of a derivative financial instrument and is measured at fair value through profit or loss in accordance with IFRS 9. Adjustments to fair value are recognized in other operating income and expenses (see Note (13) "**Other operating income**" and (14) "**Other operating expenses**"). The carrying amount of the agreement was € 24 million as of the end of the reporting period (2020: € 8 million).

The electricity price of around 40% of the expected production volume under the virtual power purchase agreement is hedged by a separate hedging instrument.

Liquidity risks

The risk that the Group cannot meet its payment obligations resulting from financial liabilities, is limited by establishing the required financial flexibility and by Group-wide cash management. Information on issued bonds and other sources of financing can be found in Note (37) "**Financial debt/capital management**".

Liquidity risks are monitored and reported to management on a regular basis.

The following liquidity risk analysis presents the contractual cash flows such as repayments and interest on financial liabilities and the net cash flows of derivatives with a negative fair value:

December 31, 2021

		Cash flows < 1 year		Cash flows 1 – 5 years		Cash flows > 5 years	
€ million	**Carrying amount**	**Interest**	**Repayment**	**Interest**	**Repayment**	**Interest**	**Repayment**
Subsequent measurement at amortized cost							
Bonds and commercial paper	9,320	-146	-1,434	-400	-4,765	-131	-3,150
Bank loans	36	-1	-36	–	–	–	–
Trade accounts payable	2,380	–	-2,380	–	–	–	–
Liabilities to related parties	1,604	–	-1,604	–	–	–	–
Other financial liabilities	458	–	-402	–	-56	–	–
Loans from third parties and other financial debt	56	-4	-12	-9	-42	–	–
Subsequent measurement at fair value through profit or loss							
Contingent considerations	39	–	–	–	-39	–	–
Derivatives without a hedging relationship	45	-15	-32	–	–	–	–
Derivatives with a hedging relationship	**82**	**–**	**-82**	**–**	**–**	**–**	**–**
Refund liabilities	**839**	**–**	**-839**	**–**	**–**	**–**	**–**
Lease liabilities	**459**	**-7**	**-116**	**-15**	**-267**	**-6**	**-75**
	15,318	**-173**	**-6,937**	**-424**	**-5,169**	**-137**	**-3,225**

December 31, 2020

		Cash flows <1 year		Cash flows 1 – 5 years		Cash flows >5 years	
€ million	Carrying amount	Interest	Repayment	Interest	Repayment	Interest	Repayment
Subsequent measurement at amortized cost							
Bonds and commercial paper	9,642	-167	-517	-478	-5,014	-189	-4,150
Bank loans	1,085	-5	-835	-1	-250	–	–
Trade accounts payable	1,768	–	-1,768	–	–	–	–
Liabilities to related parties	1,375	–	-1,375	–	–	–	–
Other financial liabilities	439	–	-405	–	-34	–	–
Loans from third parties and other financial debt	58	-4	-15	-16	-42	–	–
Subsequent measurement at fair value through profit or loss							
Contingent considerations	26	–	–	–	-26	–	–
Derivatives without a hedging relationship	104	-15	-62	-15	–	–	–
Derivatives with a hedging relationship	**45**	**–**	**-46**	**–**	**–**	**–**	**–**
Refund liabilities	**666**	**–**	**-666**	**–**	**–**	**–**	**–**
Finance lease liabilities	**438**	**-8**	**-110**	**-16**	**-246**	**-7**	**-81**
	15,646	**-199**	**-5,799**	**-526**	**-5,612**	**-196**	**-4,231**

Credit risks

Credit risk for the Group means the risk of a financial loss if a customer or other contract partner is not able to meet its contractual payment obligations. The Group is exposed to credit risks mainly due to existing trade accounts receivable, other receivables, other debt instruments, derivatives and contract assets.

Credit risks are monitored on an ongoing basis. The risks arising from extending credit to customers or suppliers and in the course of other business relationships are also managed.

The Group analyzes all financial assets that are more than 90 days past due and examines whether the credit risk has risen significantly and, as a result, there is objective evidence of impairment requiring the recognition of additional loss allowances.

Accounting and measurement policies

Credit risks

Impairment of trade accounts receivable and contract assets

The Group uses the simplified impairment model for trade accounts receivable and contract assets, pursuant to which any credit losses expected to occur over the entire lifetime of an asset are taken into account. In order to measure expected credit losses, the assets are grouped based on the existing credit risk structure and the respective maturity structure.

The customer groups with comparable default risks to be considered are determined according to the specific business sector and the place of business of the respective customers.

The expected credit loss rates used in the simplified impairment model are derived on the basis of past default rates and current macroeconomic expectations. In doing so, country-specific ratings are taken into consideration since many of the Group's customers depend directly or indirectly on the economic trends in the country where their place of business is located (public and private healthcare systems, universities, and research companies from within the pharmaceutical industry, as well as industries subsidized under development plans, particularly in Asia). These country ratings are aggregated into three separate rating groups. Under the impairment model, past default rates and country ratings are used as an approximation of the defaults to be expected in the future.

When a country's rating changes, the historical default rates of the rating group to which the respective country has been reallocated have to be applied accordingly, rather than the historical default rates of the previous rating group.

If there is objective evidence that certain trade accounts receivable or contract assets are fully or partially impaired, additional loss allowances are recognized to account for expected credit losses.

A default generally exists when the debtor cannot fully meet its liabilities.

A debtor's creditworthiness is assumed to be impaired if there are objective indications that the debtor is in financial difficulties, such as the disappearance of an active market for its products or impending insolvency. On initial recognition, the lifetime expected credit losses are deducted from the nominal amount of trade accounts receivable considered as originated credit-impaired financial assets.

Impairment of other receivables

The general three-stage impairment model and the simplified approach are used to recognize loss allowances of financial instruments included in other receivables. The individual credit rating of the contract partner is used to determine the impairment loss of other receivables.

Individual cases are also analyzed to ascertain whether objective findings suggest that the value of other receivables is impaired. Such suggestions may include, for example, economic difficulties of the debtor, contractual breaches, or the renegotiation of contractual payment obligations. If the analysis concludes there is a substantially increased risk of default, the expected credit loss is calculated over the entire lifetime.

Impairment of other financial assets

Investments in debt instruments subsequently measured either at amortized cost or at fair value through other comprehensive income are primarily considered to be investments with low risk, meaning that the expected credit loss in the upcoming 12 months is used to determine the impairment loss.

For financial assets with only a minimal default risk, the rules concerning the mandatory recognition of a risk provision for the lifetime expected credit loss are not applied at initial recognition or during subsequent measurement. Therefore, no assessment of whether there has been a significant increase in the credit risk is carried out for such assets. The Group does not presume an increased credit risk as of the balance sheet date if the contract partner has an investment grade rating.

If there are indications that the debtor's creditworthiness had worsened but that this was not yet reflected in its existing credit rating, the credit risk assessment is adjusted and the impairment allowances recognized for expected credit losses are increased. In all other cases, there are no new risk assessments as of the balance sheet date and the risk profile initially assumed is maintained.

Wherever a considerable increase in the default risk is assumed, the lifetime expected credit loss of the financial asset is considered.

On the balance sheet date, the theoretical maximum default risk for all items referenced above corresponds to the net carrying amounts less any compensation from credit insurance.

Significant discretionary decisions and sources of estimation uncertainty

Credit risks

Impairment of trade accounts receivable and contract assets

In terms of the impairment of trade accounts receivable and of contract assets, there is significant discretion and estimation uncertainty regarding:

- the identification of customer groups with identical default risks,
- the identification of a substantial increase in the credit risk, and
- the calculation of the expected credit losses.

Impairment of other financial assets

Discretionary judgment is applied in determining individual impairment allowances.

The following table shows impairments for financial assets from operative transactions and contract assets as well as gains from their reversals recognized in the consolidated income statement:

€ million	2021	2020
Impairment losses	**-67**	**-81**
of trade accounts receivable	-67	-78
of contract assets	–	–
of debt instruments subsequently measured at amortized cost	–	-3
of debt instruments subsequently measured at fair value through other comprehensive income	–	–
Reversals of impairment losses	**68**	**75**
of trade accounts receivable	68	71
of contract assets	–	–
of other debt instruments subsequently measured at amortized cost	–	4
of other debt instruments subsequently measured at fair value through other comprehensive income	–	–
Net impairment on financial assets	**1**	**-6**

The loss allowances and reversals recognized for trade accounts receivable as shown above applied entirely to receivables resulting from contracts with customers.

Credit risks from trade accounts receivable

The credit risk from trade accounts receivable is largely impacted by the specific circumstances of individual customers. The Group also considers additional factors such as the general default risk in the respective industry and country in which the customer operates.

The credit risk of customers is assessed using established credit management processes that take individual customer risks into account. This is done in particular by analyzing the aging structure of trade accounts receivable.

The Group continuously reviews and monitors the open positions of all its customers in the corresponding countries and takes steps to mitigate credit risks if necessary.

The tables below contain an overview of the credit risk by business sector and country rating as established by leading rating agencies:

December 31, 2021

€ million	Life Science	Healthcare	Electronics	Other	**Group**
External rating of at least AA- or comparable	1,164	882	598	6	2,651
External rating of at least BBB- or comparable	150	285	17	–	452
External rating lower than BBB- or comparable	45	427	2	–	473
Trade accounts receivable before loss allowances	**1,359**	**1,594**	**617**	**6**	**3,576**

December 31, 2020

€ million	Life Science	Healthcare	Electronics	Other	Group
External rating of at least AA- or comparable	996	781	481	–	2,257
External rating of at least BBB- or comparable	136	260	13	–	410
External rating lower than BBB- or comparable	31	425	2	–	458
Trade accounts receivable before loss allowances	**1,163**	**1,466**	**496**	**–**	**3,125**

Goods were generally sold under retention of title so that a reimbursement claim existed in the event of default. Other guarantees generally were not demanded. The scope of credit-insured receivables was immaterial for the Group.

Loss allowances based on expected credit losses for trade accounts receivable as of December 31, 2021, were as follows:

December 31, 2021

€ million	Not yet due	Up to 90 days past due	Up to 180 days past due	Up to 360 days past due	More than 360 days past due	Total
Expected loss rate	0.3%	1.1%	4.4%	11.3%	55.6%	
Trade accounts receivable before loss allowances	3,076	309	67	58	66	3,576
thereof: credit impaired	6	2	3	3	32	45
Loss allowances	**-9**	**-3**	**-3**	**-7**	**-37**	**-59**
thereof: credit impaired	-2	-1	-1	-2	-30	-36

Loss allowances based on expected credit losses for trade accounts receivable as of December 31, 2020, were as follows:

December 31, 2020

€ million	Not yet due	Up to 90 days past due	Up to 180 days past due	Up to 360 days past due	More than 360 days past due	Total
Expected loss rate	0.4%	2.2%	3.7%	17.7%	62.9%	
Trade accounts receivable before loss allowances	2,633	312	56	57	68	3,125
thereof: credit impaired	7	6	–	5	42	59
Loss allowances	**-11**	**-7**	**-2**	**-10**	**-43**	**-73**
thereof: credit impaired	-3	-3	–	-3	-39	-49

Credit risks from other receivables

Gross other receivables amounted to € 156 million as of December 31, 2021 (December 31, 2020: € 196 million). Other receivables in the amount of € 154 million were allocated to Level 1 of the three-level impairment model (December 31, 2020: € 194 million), meaning that the credit loss expected in the next 12 months was used to determine the amount of impairment when examining the individual credit risk of the respective contract partner. The next table shows the impairment losses recognized for other receivables.

Credit risks from other financial assets

The Group limits credit risks from other financial assets by entering into contracts almost exclusively with contract partners whose creditworthiness is good. The credit risk from financial contracts is monitored daily on the basis of market information on credit default swap rates and regularly on the basis of rating information.

Impairment losses on financial assets developed as follows:

2021

€ million	Jan. 1	Additions	Derecog-nition	Utilizations	Reclassifica-tion within levels	Effects of currency translation	Changes in scope of consolidation	Dec. 31
Subsequent measurement at amortized cost	**-76**	**-67**	**68**	**15**	**–**	**-2**	**–**	**-61**
Trade and other receivables (including current leasing receivables)	-73	-67	68	15	–	-2	–	-59
thereof: Level 1/2	-24	-56	57	–	–	-1	–	-23
thereof: Level 3	-48	-10	11	15	–	-1	–	-33
thereof: POCI[1]	-1	-1	–	–	–	–	–	-2
Contract Assets	-1	–	–	–	–	–	–	–
thereof: Level 1/2	-1	–	–	–	–	–	–	–
thereof: Level 3	–	–	–	–	–	–	–	–
Other Receivables (including non-current leasing receivables)	-2	–	–	–	–	–	–	-2
thereof: Level 1	-1	–	–	–	–	–	–	–
thereof: Level 2	–	–	–	–	–	–	–	–
thereof: Level 3	-2	–	–	–	–	–	–	-1
Loss allowances for financial assets	**-76**	**-67**	**68**	**15**	**–**	**-2**	**–**	**-61**

[1] Purchased or originated credit-impaired receivables.

2020

€ million	Jan. 1	Additions	Derecog-nition	Utilizations	Reclassifica-tion within levels	Effects of currency translation	Changes in scope of consolidation	Dec. 31
Subsequent measurement at amortized cost	**-81**	**-81**	**75**	**7**	**–**	**5**	**–**	**-76**
Trade and other receivables (including current leasing receivables)	-77	-78	71	6	–	5	–	-73
thereof: Level 1/2	-30	-64	66	–	2	2	–	-24
thereof: Level 3	-47	-13	5	6	-2	3	–	-48
thereof: POCI[1]	–	-1	–	–	–	–	–	-1
Contract Assets	–	–	–	–	–	–	–	-1
thereof: Level 1/2	–	–	–	–	–	–	–	-1
thereof: Level 3	–	–	–	–	–	–	–	–
Other Receivables (including non-current leasing receivables)	-4	-3	4	–	–	–	–	-2
thereof: Level 1	-3	-2	4	–	–	–	–	-1
thereof: Level 2	–	–	–	–	–	–	–	–
thereof: Level 3	-1	-1	–	–	–	–	–	-2
Loss allowances for financial assets	**-81**	**-81**	**75**	**7**	**–**	**5**	**–**	**-76**

[1] Purchased or originated credit-impaired receivables.

Changes in the expected credit loss rates used in the simplified impairment model did not result in any significant changes in the additions to and reversals of loss allowances in Level 1/2.

(43) Information on fair value measurement

Accounting and Measurement Policies

Information on fair value measurement

The measurement techniques and main input factors used to determine the fair value of financial instruments are as follows:

Fair value determined by official prices and quoted market values (Level 1)

	Financial instruments concerned	Description of the measurement technique	Main input factors used to determine fair values
Financial assets			
Subsequent measurement at fair value through other comprehensive income			
Equity instruments	Shares	Derived from active market	Quoted prices in an active market
Other debt instruments	Bonds		
	other short-term cash investments		
Subsequent measurement at fair value through profit or loss			
Other debt instruments	Publicly-traded funds	Derived from active market	Quoted prices in an active market
	other short-term cash investments		
Financial liabilities			
Subsequent measurement at amortized cost			
Financial debt	Bonds	Derived from active market	Quoted prices in an active market

Fair value determined using input factors observable in the market (Level 2)

	Financial instruments concerned	Description of the measurement technique	Main input factors used to determine fair values
Financial assets			
Subsequent measurement at fair value through other comprehensive income			
Equity instruments	Shares	Derived from active market including a liquidity discount	Quoted prices in an active market and volatilities observable on the market
Subsequent measurement at fair value through profit or loss			
Derivatives (without a hedging relationship)	Forward exchange contracts and currency options	Use of recognized actuarial methods	Spot and forward rates observable on the market as well as exchange rate volatilities
	Interest rate swaps		Interest rate curves available on the market
Derivatives (with a hedging relationship)	Forward exchange contracts and currency options	Use of recognized actuarial methods	Spot and forward rates observable on the market as well as exchange rate volatilities
Financial liabilities			
Subsequent measurement at fair value through profit or loss			
Derivatives (without a hedging relationship)	Forward exchange contracts and currency options	Use of recognized actuarial methods	Spot and forward rates observable on the market as well as exchange rate volatilities
	Interest rate swaps		Interest rate curves available on the market
Derivatives (with a hedging relationship)	Forward exchange contracts and currency options	Use of recognized actuarial methods	Spot and forward rates observable on the market as well as exchange rate volatilities
Subsequent measurement at amortized cost			
Financial liabilities	Liabilities to banks and other loan liabilities	Discounting of future cash flows	Interest rates observable on the market

Fair value determined using input factors unobservable in the market (Level 3)

	Financial instruments concerned	Description of the measurement technique	Main input factors used to determine fair values
Financial assets			
Subsequent measurement at fair value through other comprehensive income			
Equity instruments	Equity investments in unlisted companies	Discounting of expected future cash flows	Expected cash flows from recent business planning, average cost of capital, expected long-term growth rate
		Derived from observable prices within the scope of equity refinancing sufficiently close to the balance sheet date, considered risk allowances	Observable prices derived from equity refinancing
		Cost-based determination	Acquisition cost
Trade and other receivables	Trade accounts receivable that are intended for sale due to a factoring agreement	Nominal value less factoring fees	Nominal value of potentially sold trade accounts receivable, average fees for sales of trade accounts receivable
Subsequent measurement at fair value through profit or loss			
Derivatives (without a hedging relationship)	Virtual power purchase agreement	Discounting of expected future cash flows	Electricity future price curves, expected electricity production volumes, discount factors
Contingent consideration	Contingent considerations from the sale of businesses or shares in corporations	Discounting of probability-weighted future milestone payments and license fees	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates
Other debt instruments	Interests in unlisted funds	Consideration of the fair value of companies in which the funds are invested	Net asset values of the fund interests
	Bonds with embedded settlement option for equity in an unlisted company	Use of recognized actuarial methods	Interest rates observable on the market
Financial liabilities			
Subsequent measurement at fair value through profit or loss			
Derivatives (without a hedging relationship)	Hedging instrument for the virtual power purchase agreement	Use of recognized actuarial methods	Electricity future price curves, expected electricity production volumes, discount factors
Contingent consideration	Contingent considerations from the purchase of businesses	Discounting of probability-weighted future milestone payments and license fees	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates

Counterparty credit risk was taken into consideration for measurements of financial instruments at fair value. In the case of non-derivative financial instruments, such as other liabilities or interest-bearing securities, this was reflected using risk premiums on the discount rate, while discounts on market value (credit valuation adjustments and debit valuation adjustments) were used for derivatives.

Equity investments in unlisted companies (Level 3)

The planning periods used to determine the fair value of equity investments in unlisted companies ranged from three to eight years (December 31, 2020: three to nine years). Cash flows for periods in excess of this are included in the terminal value calculation using long-term growth rates of between 1.0% and 9.0% (December 31, 2020: 1.0% and 2.0%). The applied average cost of capital (after tax) was 7.0% on December 31, 2021 (December 31, 2020: 7.0%).

Assets from contingent considerations (Level 3)

The fair values of assets from contingent considerations are calculated by weighting the expected future milestone payments and royalties using their probability of occurrence and discounting them. The main parameters when determining contingent considerations are:

- the estimated probability of reaching the individual milestone events,
- the underlying sales planning used to derive royalties, and
- the discount factor used.

When determining the probability of occurrence of the individual milestones events in connection with the development of drug candidates, the focus is on empirically available probabilities of success of development programs in comparable phases of clinical development in the relevant therapeutic areas. To determine the sales planning, internal sales plans and sales plans of external industry services are used. The discount rate (after tax) of between 5.4% and 6.5% as of December 31, 2021 (December 31, 2020: 5.4% to 6.5%) was calculated using the weighted average cost of capital.

Significant discretionary decisions and sources of estimation uncertainty

Equity investments in unlisted companies

Determining the parameters that are to be included in discounted cash-flow-methods and deriving the fair value from observable prices within the scope of equity refinancing are both subject to discretionary decisions and estimation uncertainty.

Assets from contingent consideration

The calculation of the fair value of assets from contingent considerations is subject to significant discretionary judgment.

The most significant contingent consideration was the future purchase price claim from the disposal of the biosimilars business to a subsidiary of Fresenius SE & Co. KGaA, Bad Homburg vor der Höhe, Germany, on August 31, 2017. It was calculated by an external valuation expert on initial recognition in 2017 and continued on this basis. As of December 31, 2021, the carrying amount was € 206 million (December 31, 2020: € 208 million).

If, in the context of determining the fair value of this contingent consideration at the date of transaction, the probability of approval as well as the discount factor of the three major development programs had been estimated to be lower or higher, this would have led to the following changes in the measurement and the corresponding effects on the profit before income tax:

December 31, 2021

		Change in probability of regulatory approval		
€ million		-10%	unchanged	10%
Change of discount rate	4.9%	-21	4	30
	5.4% (unchanged)	-25	–	25
	5.9%	-29	-4	20

December 31, 2020

		Change in probability of regulatory approval		
€ million		-10%	unchanged	10%
Change of discount rate	5.0%	-22	6	33
	5.5% (unchanged)	-27	–	27
	6.0%	-32	-5	21

The following table presents the carrying amounts and the fair values of the individual financial assets and liabilities as of December 31, 2021, for each individual financial instrument class pursuant to IFRS 9:

December 31, 2021

		Carrying amount			Fair value[1]			
€ million	Consolidated notes	Current	Non-current	Total	Fair value determined by official prices and quoted market values (Level 1)	Fair value determined using input factors observable in the market (Level 2)	Fair value determined using input factors not observable in the market (Level 3)	Total
Financial assets								
Subsequent measurement at amortized cost								
Cash and cash equivalents	35	1,899	–	1,899				
Trade and other receivables (excluding leasing receivables)	25	3,622	24	3,646				
Other debt instruments	36	57	4	61				
Subsequent measurement at fair value through other comprehensive income								
Equity instruments	36	–	462	462	117	–	345	462
Trade and other receivables	25	20	–	20	–	–	20	20
Other debt instruments	36	43	1	44	44	–	–	44
Subsequent measurement at fair value through profit or loss								–
Contingent considerations	36	–	271	271	–	–	271	271
Other debt instruments	36	12	149	161	83	–	78	161
Derivatives without a hedging relationship	36, 39	37	24	61	–	37	24	61
Derivatives with a hedging relationship	36, 39	25	–	25	–	25	–	25
Lease receivables (measured in accordance with IFRS 16)[2]	25	4	1	6				
Total		**5,719**	**937**	**6,656**	**244**	**62**	**738**	**1,044**
Financial debt								
Subsequent measurement at amortized cost								
Trade payables and other liabilities	30	2,380	–	2,380				
Financial debt	37	2,379	7,928	10,307	9,655	1,213	–	10,868
Other financial liabilities	38	1,110	56	1,166				
Subsequent measurement at fair value through profit or loss								–
Contingent considerations	38	–	39	39	–	–	39	39
Derivatives without a hedging relationship	37, 38, 39	35	10	45	–	35	10	45
Derivatives with a hedging relationship	38, 39	82	–	82	–	82	–	82
Refund liabilities	9	839	–	839				
Lease liabilities (measured in accordance with IFRS 16)[2]	37	117	342	459				
Total		**6,942**	**8,375**	**15,318**	**9,655**	**1,330**	**49**	**11,034**

[1] The simplification option under IFRS 7.29(a) was used for disclosures of certain fair values.

[2] Measurements within the scope of IFRS 16 are exempted from the requirements of IFRS 13 (IFRS 13.6(b)).

The reduction in Level 2 equity instruments measured at fair value through other comprehensive income resulted from the reclassification of the shares in Precigen Inc., United States, to Level 1.

The following table presents the carrying amounts and the fair values of the individual financial assets and liabilities as of December 31, 2020, for each individual financial instrument class pursuant to IFRS 9:

December 31, 2020

		Carrying amount			Fair value[1]			
€ million	Consolidated notes	Current	Non-current	**Total**	Fair value determined by official prices and quoted market values (Level 1)	Fair value determined using input factors observable in the market (Level 2)	Fair value determined using input factors not observable in the market (Level 3)	**Total**
Financial assets								
Subsequent measurement at amortized cost								
Cash and cash equivalents	35	1,355	–	1,355				
Trade and other receivables (excluding leasing receivables)	25	3,199	24	3,223				
Other debt instruments	36	1	7	7				
Subsequent measurement at fair value through other comprehensive income								
Equity instruments	36	–	499	499	18	226	255	499
Trade and other receivables	25	19	–	19	–	–	19	19
Other debt instruments	36	5	4	9	9	–	–	9
Subsequent measurement at fair value through profit or loss								
Contingent considerations	36	–	260	260	–	–	260	260
Other debt instruments	36	7	34	41	8	–	33	41
Derivatives without a hedging relationship	36, 39	16	18	34	–	26	8	34
Derivatives with a hedging relationship	36, 39	96	–	96	–	96	–	96
Lease receivables (measured in accordance with IFRS 16)[2]	25	3	1	4				
Total		**4,701**	**848**	**5,548**	**36**	**348**	**575**	**958**
Financial debt								
Subsequent measurement at amortized cost								
Trade payables and other liabilities	30	1,768	–	1,768				
Financial debt	37	2,183	9,419	11,602	9,970	2,180	–	12,150
Other financial liabilities	38	963	34	997				
Subsequent measurement at fair value through profit or loss								
Contingent considerations	38	–	26	26	–	–	26	26
Derivatives without a hedging relationship	37, 38, 39	62	42	104	–	102	2	104
Derivatives with a hedging relationship	38, 39	45	–	45	–	45	–	45
Refund liabilities	9	666	–	666				
Lease liabilities (measured in accordance with IFRS 16)[2]	37	112	327	438				
Total		**5,799**	**9,847**	**15,646**	**9,970**	**2,327**	**28**	**12,325**

[1] The simplification option under IFRS 7.29(a) was used for disclosures of certain fair values.

[2] Measurements within the scope of IFRS 16 are exempted from the requirements of IFRS 13 (IFRS 13.6(b)).

The changes in financial assets and liabilities for each of the individual classes of financial instruments allocated to Level 3 and measured at fair value were as follows in the previous year:

2020

	Financial assets					Financial liabilities		
	Subsequent measurement at fair value through profit or loss			Subsequent measurement at fair value through other comprehensive income		Subsequent measurement at fair value through profit or loss		
€ million	Other debt instruments	Contingent consideration	Derivatives without a hedging relationship	Equity instruments	Trade and other receivables	Contingent consideration	Derivatives without a hedging relationship	**Total**
Net carrying amounts, Jan. 1, 2020	**26**	**258**	**–**	**190**	**24**	**-16**	**–**	**483**
Additions	19	–	8	51	25	-9	–	94
Transfers into Level 3 from Level 1/Level 2	–	–	–	–	–	–	–	–
Fair value changes								
Gains (+)/losses (–) recognized in the consolidated income statement	–	2	–		–	-1	-2	-1
thereof: other operating result	-1	-18	–		–	1	-2	-20
thereof: attributable to assets/liabilities held as of the balance sheet date	-1	-18	–		–	1	-2	-20
thereof: financial income and expenses	2	20	–		–	-2	–	19
thereof: attributable to assets/liabilities held as of the balance sheet date	2	20	–		–	-2	–	19
Gains (+)/losses (–) recognized in other comprehensive income				22	–			22
Currency translation difference	-2	–	–	–	–	–	–	-1
Disposals	-3	–	–	–	-31	–	–	-33
Transfers out of Level 3 into Level 1/Level 2	–	–	–	-16	–	–	–	-16
Other	-9	–	–	9	–	–	–	–
Net carrying amounts as of Dec. 31, 2020	**33**	**260**	**8**	**255**	**19**	**-26**	**-2**	**547**

The changes in financial assets and liabilities for each of the individual classes of financial instruments allocated to Level 3 and measured at fair value were as follows in fiscal 2021:

2021

	Financial assets					Financial liabilities		
	Subsequent measurement at fair value through profit or loss			Subsequent measurement at fair value through other comprehensive income		Subsequent measurement at fair value through profit or loss		
€ million	Other debt instruments	Contingent consideration	Derivatives without a hedging relationship	Equity instruments	Trade and other receivables	Contingent consideration	Derivatives without a hedging relationship	**Total**
Net carrying amounts, Jan. 1, 2021	**33**	**260**	**8**	**255**	**19**	**-26**	**-2**	**547**
Additions	46	5	4	48	38	–	–	141
Transfers into Level 3 from Level 1/Level 2	–	–	–	–	–	–	–	–
Fair value changes								
Gains (+)/losses (–) recognized in the consolidated income statement	7	6	12		–	-12	-7	5
thereof: other operating result	-8	-12	10		–	-10	-7	-27
thereof: attributable to assets/liabilities held as of the balance sheet date	-8	-12	10		–	-10	-7	-27
thereof: financial income and expenses	15	18	1		–	-2	–	32
thereof: attributable to assets/liabilities held as of the balance sheet date	15	18	1		–	-2	–	32
Gains (+)/losses (–) recognized in other comprehensive income				91	–			91
Currency translation difference	2	–	1	–	–	-2	–	1
Disposals	-1	–	–	-13	-37	–	–	-50
Transfers out of Level 3 into Level 1/Level 2	–	–	–	-45	–	–	–	-45
Other	-8	–	–	8	–	–	–	–
Net carrying amounts as of Dec. 31, 2021	**78**	**271**	**24**	**345**	**20**	**-39**	**-10**	**689**

In particular, the additions in the reporting period included acquisitions of equity investments, acquisitions of other debt instruments, and trade receivables essentially intended for sale on the basis of a factoring agreement. Disposals during the reporting period related in particular to advance payments received in connection with trade accounts receivable under factoring agreements. The transfers from Level 3 to Level 1 related to Vera Therapeutics, Inc., United States, which has since been listed. The gains and losses from Level 3 assets recognized in other comprehensive income were reported in the consolidated statement of comprehensive income under the item “Fair value adjustments”.

The following equity instruments measured at fair value through other comprehensive income were disposed of in 2021 and 2020:

€ million	Reasons for the disposal	Fair value on the date of derecognition	The cumulative gain (+) or loss (−) on disposal recognized in other comprehensive income	Transfer of the cumulative gains (+) or losses (−) within group equity to retained earnings
2021[1]				
M Ventures portfolio companies	Portfolio adjustment/restructuring and full acquisition by third parties	16	7	7
Precigen, Inc., USA	Portfolio adjustment/restructuring	36	–	–
2020[1]				
M Ventures portfolio companies	Portfolio adjustment/restructuring and full acquisition by third parties	100	91	91

[1] Disposals due to liquidations are not included.

M Ventures portfolio companies mainly include minority interests in listed and unlisted companies. The mandate of M Ventures is to invest in innovative technologies and products that are related to the Group's three business sectors.

The M Ventures portfolio companies disposed of in fiscal 2021 were Forendo Pharma OY, Finland, Progyny, Inc., United States, and shares in F-star Therapeutics, Inc., United States (2020: ObsEva SA, Switzerland and shares in Progyny, Inc., United States).

(44) Other financial obligations

Other financial obligations comprised the following:

€ million	**Dec. 31, 2021**	Dec. 31, 2020
Acquisition of intangible assets	1,039	850
Acquisition of property, plant, and equipment	247	135
Other financial obligations	**1,286**	**985**

Obligations to acquire intangible assets existed in particular owing to contingent considerations within the scope of in-licensing and research and development collaborations. In these agreements, the Group has entered into an obligation to make milestone payments once specific targets have been reached. In the unlikely event that all of the milestones are achieved, the Group would be obligated to pay up to € 1,039 million (December 31, 2020: € 850 million) for the acquisition of intangible assets. The increase as against the previous year is essentially due to new in-licensing agreements in the Healthcare business sector portfolio (see Note (7) "**Collaboration and licensing agreements**"). The table above does not contain any other financial obligations from possible future sales-based license fees and milestone payments.

The expected maturities of the obligations to acquire intangible assets were as follows:

€ million	**Dec. 31, 2021**	Dec. 31, 2020
Within 1 year	51	33
In 1-5 years	323	152
After more than 5 years	665	665
Obligations to acquire intangible assets	**1,039**	**850**

Other financial obligations were recognized at nominal value.

Other Disclosures

(45) Related party disclosures

Accounting and measurement policies

Related party disclosures

Related parties in respect of the Group are E. Merck KG, Darmstadt, Germany, Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany, and E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany. Furthermore, direct or indirect subsidiaries of Merck KGaA, Darmstadt, Germany, associates of the Group, joint ventures of the Group, as well as pension funds that are classified as defined benefit plans in accordance with IAS 19 are also related parties within the meaning of IAS 24. Members of the Executive Board and the Supervisory Board of Merck KGaA, Darmstadt, Germany, the Executive Board and the Board of Partners of E. Merck KG, Darmstadt, Germany, as well as close members of their families are also related parties, as are companies controlled or jointly controlled by this group of persons.

Transactions were conducted with related parties as follows:

	Income		Expenses		Receivables		Liabilities	
€ million	**2021**	2020	**2021**	2020	**Dec. 31, 2021**	Dec. 31, 2020	**Dec. 31, 2021**	Dec. 31, 2020
E. Merck KG, Darmstadt, Germany	1.6	1.3	0.5	0.5	0.3	0.1	1,602.3	1,373.7
E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	0.4	0.1	0.0	0.0	0.5	0.0	0.0	0.0
Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Engel-Apotheke, Darmstadt[1]	0.1	0.0	1.0	0.7	0.0	0.0	0.0	0.0
Joint ventures	1.5	0.2	0.0	0.0	1.1	0.1	0.6	0.0
Majority interest in non-controlled companies	0.2	0.0	0.0	0.0	0.0	0.1	1.2	1.2
Non-consolidated subsidiaries	6.7	0.1	0.5	0.5	3.2	3.4	5.0	4.1

[1] The owner of Engel-Apotheke, Darmstadt, is a member of the Supervisory Board of Merck KGaA, Darmstadt, Germany.

As in the previous year, the liabilities of Group companies in respect of E. Merck KG, Darmstadt, Germany, primarily resulted from mutual profit transfers between Merck KGaA, Darmstadt, Germany, and E. Merck KG, Darmstadt, Germany, as well as the profit transfer by Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany. They included financial liabilities of € 894.1 million (December 31, 2020: € 815.9 million), subject to standard market interest rates. There was no collateral or guarantees; neither in favor of nor at the expense of the Group.

Information on pension funds that are classified as defined benefit plans in accordance with IAS 19 can be found in Note (33) "**Provisions for employee benefits**".

Information on Executive Board and Supervisory Board compensation can be found in Note (46) "**Executive Board and Supervisory Board compensation**". Activities above and beyond those described therein, such as the provision of services or the granting of loans, between companies of the Group and members of the Executive Board or the Supervisory Board of Merck KGaA, Darmstadt, Germany, the Executive Board or the Board of Partners of E. Merck KG, Darmstadt, Germany, or members of their immediate families did not take place in either fiscal 2021 or the previous year.

(46) Executive Board and Supervisory Board compensation

As a matter of principle, the compensation of the Executive Board of Merck KGaA, Darmstadt, Germany, is recognized by the general partner, E. Merck KG, Darmstadt, Germany, which is not included in these consolidated financial statements. In fiscal 2021, the companies included in these consolidated financial statements did not recognize any expenses for services rendered by members of the Executive Board of Merck KGaA, Darmstadt, Germany, at these companies (2020: expenses of € 2.6 million).

Compensation of € 32.0 million was recognized for members of the Executive Board of Merck KGaA, Darmstadt, Germany, by E. Merck KG, Darmstadt, Germany, and companies included in these consolidated financial statements in fiscal 2021 (2020: € 27.4 million). This amount included fixed compensation of € 6.4 million (2020: € 5.3 million), variable compensation of € 16.0 million (2020: € 14.0 million), other compensation of € 0.4 million (2020: € 0.0 million), and additional benefits of € 0.4 million (2020: € 0.4 million). In conjunction with the standalone long-term incentive plan for the Executive Board, the structure of which is in essentially as described in Note (33) "**Provisions for employee benefits**", 70,846 virtual shares, also referred to as Share Units of Merck KGaA, Darmstadt, Germany (MSUs), will potentially be available subject to the achievement of targets (December 31, 2020: 83,210 MSU). The fair value of these MSU at the grant date was € 8.8 million (December 31, 2020: € 7.7 million). The grant value was € 9.4 million (December 31, 2020: € 8.8 million). For the members of the Executive Board, expenses of € 24.0 million (2020: € 17.5 million) were recognized by the general partner E. Merck KG, Darmstadt, Germany, in fiscal 2021 in the additions to the provisions for the long-term incentive plan and a current service cost of € 2.3 million (2020: € 3.0 million) was recognized in the additions to the provisions for defined benefit pension commitments.

Payments to former members of the Executive Board and their surviving dependents are made as pension payments, as continued payment of fixed remuneration for a limited period in the event of death, as profit sharing, under the long-term incentive plan and waiting allowance for a post-contractual non-competition clause. These payments amounted to € 30.7 million in fiscal 2021 (2020: € 13.8 million). Provisions for defined benefit pension commitments amounted to € 155.1 million as of December 31, 2021 (December 31, 2020: € 177.0 million).

The compensation of the Supervisory Board in fiscal 2021 amounting to € 958.7 thousand (2020: € 870.5 thousand) consisted of a fixed portion of € 822.5 thousand (2020: € 822.5 thousand), meeting attendance fees of € 47.3 thousand (2020: € 48.0 thousand), and committee membership compensation of € 88.9 thousand (2020: € 0.0 thousand).

As in the previous year, no compensation was paid to former members of the Supervisory Board in fiscal 2021.

As in the previous year, the members of the Executive Board and the Supervisory Board did not receive any advances or loans in fiscal 2021. As in the previous year, no contingent liabilities were entered into for the benefit of these persons in fiscal 2021.

Further individualized information and disclosures, as well as a presentation of the compensation system for the members of the Executive Board and the Supervisory Board, can be found in the compensation report in the voluntary section of the combined management report.

(47) Auditor's fees

The costs for the auditors (KPMG) of the financial statements of the Group consisted of the following:

	2021		2020	
€ million	**Group**	**thereof: KPMG AG Wirtschafts-prüfungs-gesellschaft, Germany**	Group	thereof: KPMG AG Wirtschafts-prüfungs-gesellschaft, Germany
Audits of financial statements	9.7	2.4	9.3	2.6
Other audit-related services	0.6	0.4	0.5	0.4
Tax consultancy services	0.2	–	0.3	–
Other services	0.4	0.1	0.3	0.1
Total	**10.9**	**2.9**	**10.4**	**3.1**

Other audit-related services pertained to various statutory or contractually agreed audits. Tax consultancy services encompassed services in connection with the preparation of tax returns for employees delegated abroad. Other services included other consultancy services in regulatory and business matters.

Scope of Consolidation

(48) List of shareholdings

The shareholdings of Merck KGaA, Darmstadt, Germany, as of December 31, 2021, are presented below, along with a list of the fair values for equity instruments subsequently measured at fair value through other comprehensive income:

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
I. Fully consolidated companies				
Germany				
Germany	Merck KGaA, Darmstadt, Germany	Darmstadt	Parent company	
Germany	AmpTec GmbH A)	Hamburg	100.00	
Germany	AZ Electronic Materials GmbH A)	Darmstadt	100.00	
Germany	Biochrom GmbH A)	Berlin	100.00	
Germany	Chemitra GmbH A)	Darmstadt	100.00	100.00
Germany	Emedia Export Company mbH	Gernsheim	100.00	
Germany	Merck 12. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck 13. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 15. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 16. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck 20. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck 21. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 24. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Accounting Solutions & Services Europe GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Weiterstadt	100.00	100.00
Germany	Merck Chemicals GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Consumer Health Holding Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Export GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Financial Services GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Financial Trading GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	
Germany	Merck Gernsheim Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Healthcare Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Healthcare KGaA, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	100.00
Germany	Merck International GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Germany	Merck Internationale Beteiligungen GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Life Science Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Life Science Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck LS RTU GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Patent GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Performance Materials Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Performance Materials GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Wiesbaden	100.00	
Germany	Merck Performance Materials Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Real Estate GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Schuchardt OHG, a subsidiary of Merck KGaA, Darmstadt, Germany	Hohenbrunn	100.00	100.00
Germany	Merck Serono GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Site Management GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Gernsheim	100.00	100.00
Germany	Merck Surface Solutions GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Gernsheim	100.00	
Germany	Merck Vierte Allgemeine Beteiligungsgesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	
Germany	Merck Wohnungs- und Grundstücksverwaltungsgesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	OneZeroMed GmbH A)	Darmstadt	100.00	100.00
Germany	Sigma-Aldrich Biochemie GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Chemie GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Chemie Holding GmbH	Taufkirchen	100.00	
Germany	Sigma-Aldrich Grundstücks GmbH & Co. KG	Steinheim	100.00	
Germany	Sigma-Aldrich Logistik GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Verwaltungs GmbH	Steinheim	100.00	100.00
Germany	Versum Materials Germany GmbH	Darmstadt	100.00	
Other European countries				
Austria	Merck Chemicals and Life Science GesmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Vienna	100.00	
Austria	Merck Gesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Vienna	100.00	
Austria	Sigma-Aldrich Handels GmbH	Vienna	100.00	
Belgium	Merck Chemicals NV/SA, a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Belgium	Merck Life Science BV, a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Belgium	Merck NV/SA, a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Bulgaria	Merck Bulgaria EAD, a subsidiary of Merck KGaA, Darmstadt, Germany	Sofia	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Croatia	Merck d.o.o. , a subsidiary of Merck KGaA, Darmstadt, Germany	Zagreb	100.00	
Czech Republic	Merck Life Science spol s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Prague	100.00	
Czech Republic	Merck spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Prague	100.00	
Denmark	Merck A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Soborg	100.00	
Denmark	Merck Life Science A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Soborg	100.00	
Denmark	Survac ApS	Frederiksberg	100.00	100.00
Estonia	Merck Serono OÜ, a subsidiary of Merck KGaA, Darmstadt, Germany	Tallinn	100.00	
Finland	Merck Life Science OY, a subsidiary of Merck KGaA, Darmstadt, Germany	Espoo	100.00	
Finland	Merck OY, a subsidiary of Merck KGaA, Darmstadt, Germany	Espoo	100.00	
France	Gonnon S.A.S.	Lyon	100.00	
France	Merck Biodevelopment S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Merck Chimie S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Fontenay s/Bois	100.00	
France	Merck Performance Materials S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Trosly Breuil	100.00	
France	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	99.86	
France	Merck Santé S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Merck Serono S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Millipore S.A.S.	Molsheim	100.00	
France	Sigma-Aldrich Chimie S.a.r.l.	Saint Quentin Fallavier	100.00	
France	Sigma-Aldrich Chimie SNC	Saint Quentin Fallavier	100.00	
France	Sigma-Aldrich Holding S.a.r.l.	Saint Quentin Fallavier	100.00	
Greece	Merck Commercial Industrial Pharmaceutical Chemical Single Member S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Maroussi, Athens	100.00	
Hungary	Merck Kft., a subsidiary of Merck KGaA, Darmstadt, Germany	Budapest	100.00	
Hungary	Merck Life Science Kft., a subsidiary of Merck KGaA, Darmstadt, Germany	Budapest	100.00	
Ireland	Merck Finance Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Carrigtwohill	100.00	
Ireland	Merck Life Science Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Arklow	100.00	
Ireland	Merck Millipore Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Carrigtwohill	100.00	
Ireland	Merck Serono (Ireland) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Dublin	100.00	
Ireland	Millipore Cork Unlimited Company	Carrigtwohill	100.00	
Ireland	Shrawdine Limited	Arklow	100.00	
Ireland	Sigma-Aldrich Ireland Ltd.	Arklow	100.00	
Ireland	Versum Materials Ireland Limited	Dublin	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Italy	Allergopharma S.r.l. in Liquidazione	Rome	100.00	
Italy	Istituto di Ricerche Biomediche Antoine Marxer RBM S.p.A.	Colleretto Giacosa	100.00	
Italy	Merck Life Science S.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Milan	100.00	
Italy	Merck S.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Milan	100.00	
Italy	Merck Serono S.p.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Rome	99.74	
Italy	Versum Materials Italia S.r.l.	Milan	100.00	
Latvia	Merck Serono SIA, a subsidiary of Merck KGaA, Darmstadt, Germany	Riga	100.00	
Lithuania	Merck Serono, UAB, a subsidiary of Merck KGaA, Darmstadt, Germany	Vilnius	100.00	
Luxembourg	Mats Finance S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Chemicals Holding S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Finance S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Finanz S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Holding S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Invest SCS, a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Re S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	100.00
Luxembourg	Millipore International Holdings, S.a.r.l.	Luxembourg	100.00	
Luxembourg	Sigma-Aldrich Global S.a.r.l.	Luxembourg	100.00	
Luxembourg	Sigma-Aldrich S.a.r.l.	Luxembourg	100.00	
Malta	Merck Capital Holding Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	50.29
Malta	Merck Capital Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	
Netherlands	eyrise B.V.	Veldhoven	100.00	100.00
Netherlands	Merck B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Schiphol-Rijk	100.00	
Netherlands	Merck Chemicals B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00	
Netherlands	Merck Europe B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00	
Netherlands	Merck Holding Netherlands B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Schiphol-Rijk	100.00	
Netherlands	Merck Life Science N.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00	
Netherlands	Merck Ventures B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00	
Netherlands	Serono Tri Holdings B.V.	Schiphol-Rijk	100.00	
Netherlands	Sigma-Aldrich B.V.	Zwijndrecht	100.00	
Netherlands	Versum Materials Asia B.V.	Amsterdam	100.00	
Netherlands	Versum Materials Holdings Nederland B.V.	Amsterdam	100.00	
Netherlands	Versum Materials International B.V.	Amsterdam	100.00	
Netherlands	Versum Materials Netherlands B.V.	Amsterdam	100.00	
Netherlands	Versum Materials Netherlands International B.V.	Amsterdam	100.00	
Netherlands	Versum Materials Pacific B.V.	Amsterdam	100.00	
Norway	Merck Life Science AS, a subsidiary of Merck KGaA, Darmstadt, Germany	Oslo	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Poland	Merck Business Solutions Europe Sp. z o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Wroclaw	100.00	
Poland	Merck Life Science Sp. z o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Poznan	100.00	
Poland	Merck Sp. z o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Warsaw	100.00	
Portugal	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Algés	100.00	
Romania	Merck Romania S.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Bucharest	100.00	
Russia	Merck Life Science LLC, a subsidiary of Merck KGaA, Darmstadt, Germany	Moscow	100.00	
Russia	Merck LLC, a subsidiary of Merck KGaA, Darmstadt, Germany	Moscow	100.00	
Serbia	Merck d.o.o. Beograd, a subsidiary of Merck KGaA, Darmstadt, Germany	Belgrade	100.00	
Slovakia	Merck Life Science spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Bratislava	100.00	
Slovakia	Merck spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Bratislava	100.00	
Slovenia	Merck d.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Ljubljana	100.00	
Spain	Merck Chemicals and Life Science S.A.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Spain	Merck Life Science S.L.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Spain	Merck, S.L.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Sweden	Merck AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Sweden	Merck Chemicals and Life Science AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Sweden	Sigma-Aldrich Sweden AB	Stockholm	100.00	
Switzerland	Ares Trading SA	Aubonne	100.00	
Switzerland	Merck & Cie, a subsidiary of Merck KGaA, Darmstadt, Germany	Altdorf	51.63	51.63
Switzerland	Merck (Schweiz) AG, a subsidiary of Merck KGaA, Darmstadt, Germany	Zug	100.00	
Switzerland	Merck Performance Materials (Schweiz) AG, a subsidiary of Merck KGaA, Darmstadt, Germany	Schaffhausen	100.00	
Switzerland	Merck Serono SA, a subsidiary of Merck KGaA, Darmstadt, Germany	Aubonne	100.00	
Switzerland	SeroMer Holding SA	Eysins	100.00	
Switzerland	Sigma-Aldrich (Switzerland) Holding AG	Buchs	100.00	
Switzerland	Sigma-Aldrich Chemie GmbH	Buchs	100.00	
Switzerland	Sigma-Aldrich International GmbH	Buchs	100.00	
Switzerland	Sigma-Aldrich Production GmbH	Buchs	100.00	
Turkey	Merck Ilac Ecza ve Kimya Ticaret AS, a subsidiary of Merck KGaA, Darmstadt, Germany	Istanbul	100.00	
United Kingdom	BioReliance Limited	Aberdeen	100.00	
United Kingdom	BioReliance U.K. Acquisition Limited	Gillingham	100.00	
United Kingdom	Epichem Group Limited	Gillingham	100.00	
United Kingdom	Merck Holding Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Investments Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Life Science UK Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Gillingham	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
United Kingdom	Merck Performance Materials Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Serono Europe Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Serono Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Millipore (U.K.) Limited	Feltham	100.00	
United Kingdom	Millipore UK Holdings LLP	Feltham	100.00	
United Kingdom	SAFC Biosciences Limited	Gillingham	100.00	
United Kingdom	SAFC Hitech Limited	Gillingham	100.00	
United Kingdom	Sigma-Aldrich Company Limited	Gillingham	100.00	
United Kingdom	Versum Materials UK Limited	London	100.00	
North America				
Canada	EMD Chemicals Canada Inc.	Oakville	100.00	
Canada	EMD Crop BioScience Canada Inc.	Toronto	100.00	
Canada	EMD Inc.	Mississauga	100.00	
Canada	Millipore (Canada) Ltd.	Oakville	100.00	
Canada	Natrix Separations, Inc.	Burlington	100.00	
Canada	Sigma-Aldrich Canada Co.	Oakville	100.00	
United States	Aldrich Chemical Co. LLC	Milwaukee	100.00	
United States	Aldrich Chemical Foreign Holding LLC	St. Louis	100.00	
United States	Aldrich-APL, LLC	Urbana	100.00	
United States	BioControl Systems, Inc.	Wilmington	100.00	
United States	BioReliance Corporation	Rockville	100.00	
United States	Cell Marque Corporation	Rocklin	100.00	
United States	Cerilliant Corporation	Round Rock	100.00	
United States	Electron Transfer Technologies, Inc.	West Trenton	100.00	
United States	EMD Accounting Solutions & Services America, Inc.	Rockland	100.00	
United States	EMD Digital Inc.	Burlington	100.00	
United States	EMD Finance LLC	Wilmington	100.00	
United States	EMD Group Holding, Inc.	Wilmington	100.00	
United States	EMD Holding Corp.	Rockland	100.00	
United States	EMD Millipore Corporation	Burlington	100.00	
United States	EMD Performance Materials Corp.	Philadelphia	100.00	
United States	EMD Serono Holding, Inc.	Rockland	100.00	
United States	EMD Serono Research & Development Institute, Inc.	Billerica	100.00	
United States	EMD Serono, Inc.	Rockland	100.00	
United States	FloDesign Sonics, Inc.	Wilmington	100.00	
United States	Grzybowski Scientific Inventions Ltd.	Evanston	100.00	
United States	Intermolecular, Inc.	Wilmington	100.00	
United States	J.C. Schumacher Company	Los Angeles	100.00	
United States	Millipore Asia Ltd.	Wilmington	100.00	
United States	Millipore UK Holdings I, LLC	Wilmington	100.00	
United States	Millipore UK Holdings II, LLC	Wilmington	100.00	
United States	Ormet Circuits, Inc.	San Diego	100.00	
United States	Research Organics, LLC	Cleveland	100.00	
United States	SAFC Biosciences, Inc.	Lenexa	100.00	
United States	SAFC Carlsbad, Inc.	Carlsbad	100.00	
United States	SAFC, Inc.	Madison	100.00	
United States	Serono Laboratories, Inc.	Rockland	100.00	
United States	Sigma Chemical Foreign Holding LLC	St. Louis	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
United States	Sigma Redevelopment Corporation	St. Louis	100.00	
United States	Sigma-Aldrich Co. LLC	St. Louis	100.00	
United States	Sigma-Aldrich Corporation	St. Louis	100.00	
United States	Sigma-Aldrich Foreign Holding Co.	St. Louis	100.00	
United States	Sigma-Aldrich Manufacturing LLC	St. Louis	100.00	
United States	Sigma-Aldrich Missouri Insurance Company	St. Louis	100.00	
United States	Sigma-Aldrich Research Biochemicals, Inc.	Wilmington	100.00	
United States	Sigma-Aldrich RTC, Inc.	Laramie	100.00	
United States	Sigma-Aldrich, Inc.	Madison	100.00	
United States	Sigma-Genosys of Texas LLC	The Woodlands	100.00	
United States	Supelco, Inc.	Bellefonte	100.00	
United States	Versum Materials Formulations and Technology, LLC	Wilmington	100.00	
United States	Versum Materials Manufacturing Company, LLC	Wilmington	100.00	
United States	Versum Materials Technology LLC	Wilmington	100.00	
United States	Versum Materials US International, Inc.	Wilmington	100.00	
United States	Versum Materials US LLC	Wilmington	100.00	
United States	Versum Materials, Inc.	Wilmington	100.00	
Asia-Pacific (APAC)				
Australia	Merck Healthcare Pty. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Macquarie Park	100.00	
Australia	Merck Pty. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Bayswater	100.00	
Australia	Sigma-Aldrich Oceania Pty. Ltd.	Macquarie Park	100.00	
Australia	Sigma-Aldrich Pty. Ltd.	Macquarie Park	100.00	
China	Beijing Skywing Technology Co., Ltd.	Beijing	100.00	
China	Merck Chemicals (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Display Materials (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Electronic Materials (Suzhou) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Suzhou	100.00	
China	Merck Holding (China) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Innovation Hub (Guangdong) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Guangzhou	100.00	
China	Merck Life Science Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Life Science Technologies (Nantong) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Management Consulting (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Performance Materials Hong Kong Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Pharmaceutical (HK) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Pharmaceutical Distribution (Jiangsu) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Pharmaceutical Manufacturing (Jiangsu) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Serono (Beijing) Pharmaceutical Distribution Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Beijing	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
China	Merck Serono (Beijing) Pharmaceutical R&D Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Beijing	100.00	
China	Merck Serono Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Beijing	100.00	
China	SAFC Hitech (Shanghai) Co., Ltd.	Shanghai	100.00	
China	Sigma-Aldrich (Shanghai) Trading Co., Ltd.	Shanghai	100.00	
China	Sigma-Aldrich (Wuxi) Life Science & Technology Co., Ltd.	Wuxi	100.00	
China	Versum Materials (Dalian) Co., Ltd.	Dalian	100.00	
China	Versum Materials (Shanghai) Co., Ltd.	Shanghai	100.00	
India	Merck Life Science Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Merck Performance Materials Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Merck Specialities Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Sigma-Aldrich Chemicals Private Limited	Bangalore	100.00	
Indonesia	P.T. Merck Chemicals and Life Sciences, a subsidiary of Merck KGaA, Darmstadt, Germany	Jakarta	100.00	
Indonesia	P.T. Merck Tbk., a subsidiary of Merck KGaA, Darmstadt, Germany	Jakarta	86.65	
Japan	BioReliance K.K.	Tokyo	100.00	
Japan	Merck Biopharma Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Electronics Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Holdings G.K., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Performance Materials G.K., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Sigma-Aldrich Japan G.K.	Tokyo	100.00	
Japan	Versum Materials Japan Inc.	Tokyo	100.00	
Malaysia	Merck Sdn Bhd, a subsidiary of Merck KGaA, Darmstadt, Germany	Petaling Jaya	100.00	
Malaysia	Sigma-Aldrich (M) Sdn Bhd	Petaling Jaya	100.00	
Malaysia	Versum Materials Malaysia Sdn Bhd	Kuala Lumpur	100.00	
New Zealand	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Auckland	100.00	
New Zealand	Sigma-Aldrich New Zealand Co.	Auckland	100.00	
Philippines	Merck Business Solutions Asia Inc., a subsidiary of Merck KGaA, Darmstadt, Germany	Bonifacio Global City	99.99	
Philippines	Merck Inc., a subsidiary of Merck KGaA, Darmstadt, Germany	Bonifacio Global City	100.00	
Singapore	Merck Performance Materials Pte. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Singapore	100.00	
Singapore	Merck Pte. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Singapore	100.00	
Singapore	Sigma-Aldrich Pte. Ltd.	Singapore	100.00	
Singapore	Versum Materials Singapore International Pte. Ltd.	Singapore	100.00	
Singapore	Versum Materials Singapore Pte. Ltd.	Singapore	100.00	
South Korea	Merck Electronic Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Seoul	100.00	
South Korea	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Seoul	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
South Korea	Merck Performance Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pyeongtaek-shi	100.00	
South Korea	Sigma-Aldrich Korea Ltd.	Seoul	100.00	
South Korea	Versum Materials ADM Korea Inc.	Ansan-si	100.00	
South Korea	Versum Materials HYT Inc.	Ansan-si	100.00	
South Korea	Versum Materials Korea Inc.	Siheung-si	100.00	
South Korea	Versum Materials PM Korea Inc.	Ulsan	100.00	
South Korea	Versum Materials SPC Korea Ltd.	Pyeongtaek-shi	100.00	
Taiwan	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Taipei	100.00	
Taiwan	Merck Performance Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Taipei	100.00	
Taiwan	SAFC Hitech Taiwan Co., Ltd.	Kaohsiung	100.00	
Taiwan	Versum Materials Taiwan Co., Ltd.	Taipei	74.00	
Thailand	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Bangkok	45.11	
Vietnam	Merck Healthcare Vietnam Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Ho Chi Minh City	100.00	
Vietnam	Merck Vietnam Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Ho Chi Minh City	100.00	
Latin America				
Argentina	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Buenos Aires	100.00	
Argentina	Sigma-Aldrich de Argentina S.R.L.	Buenos Aires	100.00	
Brazil	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Rio de Janeiro	100.00	
Brazil	Sigma-Aldrich Brasil Ltda.	Barueri	100.00	
Chile	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Santiago de Chile	100.00	
Chile	Sigma-Aldrich Quimica Ltda.	Santiago de Chile	100.00	
Colombia	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Bogota	100.00	
Ecuador	Merck C.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Quito	100.00	
Guatemala	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Guatemala City	100.00	
Mexico	Merck Biopharma Distribution S.A. de C.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Mexico City	100.00	
Mexico	Merck, S.A. de C.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Mexico City	100.00	
Mexico	Sigma-Aldrich Quimica, S. de R.L. de C.V.	Toluca	100.00	
Panama	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Panama City	100.00	
Panama	Mesofarma Corporation	Panama City	100.00	
Peru	Merck Peruana S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Lima	100.00	
Uruguay	Ares Trading Uruguay S.A.	Montevideo	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Middle East and Africa (MEA)				
Egypt	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Cairo	100.00	
Israel	Inter-Lab Ltd.	Yavne	100.00	
Israel	InterPharm Laboratories Ltd.	Yavne	100.00	
Israel	Merck Serono Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Herzliya Pituach	100.00	
Israel	PMatX Ltd.	Yavne	90.00	
Israel	QLight Nanotech Ltd.	Jerusalem	100.00	
Israel	Sigma-Aldrich Israel Ltd.	Rehovot	100.00	
Israel	Versum Materials Israel Ltd.	Tel Aviv	100.00	
Kenya	Merck Healthcare and Life Science Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Nairobi	100.00	
South Africa	Merck (Pty) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Halfway House	100.00	
South Africa	Merck Life Science (Pty) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Halfway House	100.00	
Tunisia	Merck Promotion SARL, a subsidiary of Merck KGaA, Darmstadt, Germany	Tunis	100.00	
Tunisia	Merck SARL, a subsidiary of Merck KGaA, Darmstadt, Germany	Tunis	100.00	
United Arab Emirates	Merck Serono Middle East FZ-Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Dubai	100.00	
II. Companies accounted for using the equity method				
Other European countries				
United Kingdom	MM Domain Holdco Limited	London	50.00	50.00
North America				
United States	Syntropy Technologies LLC	Wilmington	50.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31, 2021 (€ million)	Fair value as of Dec. 31, 2020 (€ million)
III. Subsidiaries not consolidated for reasons of materiality						
Germany						
Germany	Merck 25. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 26. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 27. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 28. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 36. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 37. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 38. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 39. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 40. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 41. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 42. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 43. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 44. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 45. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 46. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 47. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 48. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck 49. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	-
Germany	Merck Display Trading GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00		<0.5	-

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31, 2021 (€ million)	Fair value as of Dec. 31, 2020 (€ million)
Other European countries						
Greece	Sigma-Aldrich (OM) Ltd.	Maroussi (Athens)	100.00		<0.5	<0.5
Ireland	SAFC Arklow Ltd.	Arklow	100.00		<0.5	<0.5
Russia	Chemical Trade Limited LLC	Moscow	100.00		<0.5	<0.5
United Kingdom	BioControl Systems Limited	London	100.00		<0.5	<0.5
United Kingdom	Merck Cross Border Trustees Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00		<0.5	<0.5
United Kingdom	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00		<0.5	<0.5
United Kingdom	Merck Pension Trustees Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00		<0.5	<0.5
United Kingdom	Sigma Chemical Co. Ltd.	Gillingham	100.00		<0.5	<0.5
North America						
United States	EMD Digital Holdings LLC	Wilmington	100.00		<0.5	<0.5
United States	Fluka Chemical Corp.	St. Louis	100.00		<0.5	<0.5
Asia-Pacific (APAC)						
Australia	SAFC Biosciences Pty. Ltd.	Macquarie Park	100.00		<0.5	-
China	Merck Electronics (Zhangjiagang) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Suzhou	100.00		<0.5	-
Latin America						
Dominican Republic	Merck Dominicana, S.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Santo Domingo	100.00		<0.5	<0.5
Middle East and Africa (MEA)						
Nigeria	Merck Pharmaceutical and Life Sciences Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Lagos	100.00		<0.5	<0.5
IV. Majority interest in non-controlled companies						
Germany						
Germany	Merck Foundation gGmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Latin America						
Venezuela	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Caracas	100.00		<0.5	<0.5
Venezuela	Representaciones MEPRO S.A.	Caracas	100.00		<0.5	<0.5

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31, 2021 (€ million)	Fair value as of Dec. 31, 2020 (€ million)
V. Associated companies not accounted for using the equity method for reasons of materiality						
Other European countries						
Netherlands	Calypso Biotech B.V.	Amsterdam	38.81		B)	B)
Netherlands	iOnctura B.V.	Amsterdam	29.44		B)	B)
Switzerland	Asceneuron SA	Lausanne	25.35		B)	B)
Switzerland	CAMAG Chemie-Erzeugnisse und Adsorptionstechnik AG	Muttenz	39.11		1	2
Switzerland	Vaximm AG	Basel	22.06		B)	B)
North America						
United States	Actithera Inc.	Wilmington	36.00		B)	-
United States	Prolog Healthy Living Fund II, L.P.	St. Louis	50.58		C)	C)
United States	Prolog Healthy Living Fund, L.P.	St. Louis	38.32		C)	C)
Middle East and Africa (MEA)						
Algeria	MDCA Pharma Promotion SARL	Hydra	49.00		<0.5	<0.5
VI. Other equity positions						
Germany						
Germany	Alcan Systems GmbH	Darmstadt	<20.00		B)	B)
Germany	Azelis Deutschland Kosmetik GmbH	Sankt Augustin	<20.00		<0.5	<0.5
Germany	BEEoled GmbH	Dresden	<20.00		<0.5	-
Germany	Ferroelectric Memory GmbH	Dresden	<20.00		B)	B)
Germany	Formo Bio GmbH	Berlin	<20.00		B)	B)
Germany	InfraServ GmbH & Co. Wiesbaden KG	Wiesbaden	<20.00		16	12
Germany	Inuru GmbH	Berlin	<20.00		<0.5	<0.5
Germany	IOmx Therapeutics AG	Martinsried	<20.00		B)	B)
Germany	micropsi industries GmbH	Berlin	<20.00		B)	B)
Germany	pharma mall Gesellschaft für Electronic Commerce mbH	Sankt Augustin	<20.00		1	1
Germany	PharmLog Pharma Logistik GmbH	Boenen	<20.00		2	2
Germany	PrintCity GmbH & Co. KG	Neuried	<20.00	<20.00	<0.5	<0.5
Other European countries						
Belgium	ReWind Therapeutics N.V.	Leuven-Heverlee	<20.00		B)	B)
Finland	Abacus Diagnostica OY	Turku	<20.00		<0.5	<0.5
France	Aveni SACS	Massy	<20.00		B)	B)
France	DNA Script S.A.S.	Paris	<20.00		B)	B)
France	Scipio Bioscience S.A.S.	Montrouge	<20.00		B)	B)
Netherlands	Anavo Therapeutics B.V.	Leiden	<20.00		B)	B)
Netherlands	Mosa Meat B.V.	Maastricht	<20.00		B)	B)
Netherlands	SynAffix B.V.	Nijmegen	<20.00		B)	-
Switzerland	FoRx Therapeutics AG	Basel	<20.00		B)	-
Switzerland	Inthera Bioscience AG	Schlieren	23.28		B)	B)
Switzerland	MoonLake Immunotherapeutics AG	Zug	<20.00		B)	B)
United Kingdom	Artios Pharma Limited	Cambridge	<20.00		B)	-
United Kingdom	Macrophage Pharma Limited	Cambridge	22.21		B)	B)
United Kingdom	NanoSyrinx Ltd.	Coventry	<20.00		B)	B)

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31, 2021 (€ million)	Fair value as of Dec. 31, 2020 (€ million)
United Kingdom	Outrun Therapeutics Limited	Dundee	22.00		B)	B)
United Kingdom	Peratech HoldCo Limited	Catterick Garrison	<20.00		B)	B)
United Kingdom	Storm Therapeutics Limited	London	<20.00		B)	B)
United Kingdom	Theolytics Ltd.	Headington, Oxford	<20.00		4	-
North America						
Canada	Future Fertility Inc.	Toronto	<20.00		B)	-
United States	Akili Interactive Labs, Inc.	Boston	<20.00		B)	B)
United States	Allozyne, Inc.	Seattle	<20.00		<0.5	<0.5
United States	Altoida, Inc.	Suwanee	<20.00		B)	B)
United States	ApoGen Biotechnologies, Inc.	Seattle	<20.00		B)	B)
United States	Biolinq Inc.	San Diego	<20.00		B)	B)
United States	Celestial AI Inc.	Wilmington	<20.00		B)	B)
United States	ElectronInks Inc.	Austin	<20.00		B)	B)
United States	F-star Therapeutics, Inc.	Wilmington	<20.00		B)	B)
United States	Galecto, Inc.	Wilmington	<20.00		B)	B)
United States	Hydrochlor, LLC	Wilmington	50.00		D)	D)
United States	Immunitas Therapeutics, Inc.	Wilmington	<20.00		B)	B)
United States	Indi Molecular, Inc.	Culver City	<20.00		B)	B)
United States	Kraig Biocraft Laboratories, Inc.	Ann Arbor	<20.00		<0.5	<0.5
United States	Lumiode, Inc.	New York	<20.00		B)	B)
United States	MemryX Inc.	Ann Arbor	<20.00		B)	B)
United States	Metalenz, Inc.	Boston	<20.00		B)	B)
United States	Neurable Inc.	Boston	<20.00		B)	B)
United States	Pacific Light & Hologram, Inc.	Wilmington	<20.00		B)	B)
United States	Pictor Labs, Inc.	Los Angeles	<20.00		B)	B)
United States	Plexium Inc.	Wilmington	<20.00		B)	B)
United States	Precigen, Inc.	Germantown	<20.00		68	226
United States	Raze Therapeutics, Inc.	Cambridge	<20.00		B)	B)
United States	Ribometrix Inc.	Durham	<20.00		B)	B)
United States	Riffyn, Inc.	Oakland	<20.00		B)	B)
United States	Robert W. Baird & Co.	Chicago	<20.00		C)	C)
United States	SeeQC, Inc.	Elmsford	<20.00		B)	B)
United States	Sonde Health, Inc.	Boston	<20.00		B)	B)
United States	Soteria Biotherapeutics Inc.	San Francisco	<20.00		B)	-
United States	Telios Pharma, Inc.	Wilmington	<20.00		9	9
United States	Tioga Pharmaceuticals, Inc.	San Diego	<20.00	<20.00	<0.5	<0.5
United States	Vera Therapeutics, Inc.	Wilmington	<20.00		45	11
United States	Xilio Therapeutics, Inc.	Waltham	<20.00		B)	B)
Asia-Pacific (APAC)						
China	IKAS Industry Co., Ltd.	Shenzhen	<20.00		B)	-
China	Multitude Therapeutics Inc.	Shanghai	<20.00		B)	B)
China	Nanjing Xinchen Neuromorphic Technology Co., Ltd.	Nanjing	<20.00		B)	B)
Japan	Showa Denko Versum Materials 2 Co., Ltd.	Tokyo	35.00		D)	D)
South Korea	Construction Guarantee Cooperative	Seoul	<20.00		<0.5	<0.5
Latin America						
Cayman Islands	CLEARInk Displays, Ltd.	Grand Cayman	<20.00		B)	B)

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31, 2021 (€ million)	Fair value as of Dec. 31, 2020 (€ million)
Middle East and Africa (MEA)						
Algeria	Novapharm Production SARL	Wilaya de Tipiza	20.00		2	<0.5
Israel	ARTSaVIT Ltd.	Yavne	<20.00		B)	B)
Israel	I-Heal Israel Health Entrepreneurs AI Lab Ltd.	Rehovot	<20.00		<0.5	-
Israel	Immunorizon Ltd.	Yavne	20.00		B)	B)
Israel	MediSafe Project Ltd.	Haifa	<20.00		B)	B)
Israel	Metabomed Ltd.	Yavne	<20.00		B)	B)
Israel	Neologic Ltd.	Tel Mond	<20.00		B)	-
Israel	Pantheon Biosciences Ltd.	Yavne	<20.00		B)	B)
Israel	Pilltracker 2015 Ltd.	Tel Aviv	<20.00		B)	B)
Israel	PxE Computational Imaging Ltd.	Lachish Darom	<20.00		B)	B)
Israel	Sentaur Bio Ltd.	Yavne	22.5		B)	B)
Israel	Wiliot Ltd.	Caesarea	<20.00		B)	B)

A) Companies opting for exemption as provided for by section 264 (3) and section 264b of the German Commercial Code.

B) Companies which are affiliates from the portfolio of Merck Ventures B.V., a subsidiary of Merck KGaA, Darmstadt, Germany. As of December 31, 2021, the fair value of the M Ventures portfolio amounted to € 308 million (December 31, 2020: € 234 million).

C) Closed-end funds classified as debt instruments in accordance with IFRS 9.

D) This is an affiliate within the meaning of IFRS 11 (joint activity).

Darmstadt, February 15, 2022

Belén Garijo

Kai Beckmann

Peter Guenter

Matthias Heinzel

Marcus Kuhnert

Responsibility Statement

To the best of our knowledge, and in accordance with the applicable reporting principles, the consolidated financial statements of the Group give a true and fair view of the assets, liabilities, financial position, and profit or loss of the Group. The combined management report includes a fair review of the development and performance of the business and the position of the Group, together with a description of the material opportunities and risks associated with the expected development of the Group.

Darmstadt, February 15, 2022

Belén Garijo

Kai Beckmann

Peter Guenter

Matthias Heinzel

Marcus Kuhnert

Reproduction of the Independent Auditor's Report

Based on the results of our audit, we have issued the following unqualified auditor’s report:

Independent Auditor’s Report

To MERCK Kommanditgesellschaft auf Aktien, Darmstadt

Report on the Audit of the Consolidated Financial Statements and of the Combined Management Report

Opinions

We have audited the consolidated financial statements of MERCK Kommanditgesellschaft auf Aktien and its subsidiaries (the Group), which comprise the consolidated balance sheet as of December 31, 2021, the consolidated income statement, the consolidated statement of comprehensive income, consolidated statement of changes in net equity and consolidated cash flow statement for the financial year from January 1, 2021, to December 31, 2021, and notes to the consolidated financial statements, including a summary of significant accounting policies. In addition, we have audited the combined management report of MERCK Kommandit-gesellschaft auf Aktien inclusive of the remuneration report contained in a separate section in the combined management report, including the related disclosures for the financial year from January 1, 2021, to December 31, 2021. In accordance with German legal requirements, we have not audited the components of the combined management report specified in the "Other Information" section of our auditor's report.

In our opinion, on the basis of the knowledge obtained in the audit,

- the accompanying consolidated financial statements comply, in all material respects, with the IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Section 315e (1) HGB [Handelsgesetzbuch: German Commercial Code] and, in compliance with these requirements, give a true and fair view of the assets, liabilities, and financial position of the Group as of December 31, 2021, and of its financial performance for the financial year from January 1, 2021, to December 31, 2021, and

- the accompanying combined management report as a whole provides an appropriate view of the Group's position. In all material respects, this combined management report is consistent with the consolidated financial statements, complies with German legal requirements and appropriately presents the opportunities and risks of future development. Our opinion on the combined management report does not cover the content of those components of the combined management report specified in the "Other Information" section of the auditor's report.

Pursuant to Section 322 (3) sentence 1 HGB, we declare that our audit has not led to any reservations relating to the legal compliance of the consolidated financial statements and of the combined management report.

Basis for the Opinions

We conducted our audit of the consolidated financial statements and of the combined management report in accordance with Section 317 HGB and the EU Audit Regulation No 537/2014 (referred to subsequently as "EU Audit Regulation") and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Our responsibilities under those requirements and principles are further described in the "Auditor's Responsibilities for the Audit of the Consolidated Financial Statements and of the Combined Management Report" section of our auditor's report. We are independent of the group entities in accordance with the requirements of European law and German commercial and professional law, and we have fulfilled our other German professional responsibilities in accordance with these requirements. In addition, in accordance with Article 10 (2)(f) of the EU Audit Regulation, we declare that we have not provided non-audit services prohibited under Article 5 (1) of the EU Audit Regulation. We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our opinions on the consolidated financial statements and on the combined management report.

Key Audit Matters in the Audit of the Consolidated Financial Statements

Key audit matters are those matters that, in our professional judgement, were of most significance in our audit of the consolidated financial statements for the financial year from January 1, 2021, to December 31, 2021. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, we do not provide a separate opinion on these matters.

Impairment testing of goodwill of the operating segment Electronics

Explanatory notes on the impairment tests can be found in the notes to the consolidated financial statements under note 18.

The financial statement risk

The goodwill in the consolidated financial statements as of December 31, 2021 amounts to EUR 17,004 million (37.5% of the Group's total assets), with EUR 4,420 million of this attributable to Electronics. Due to the acquisition of Versum Materials, Inc., USA, in October 2019 the goodwill of Electronics has increased significantly.

Goodwill on the level of the operating segments is to be tested for impairment once a year and may need be tested ad hoc if necessary. For the goodwill impairment test, the carrying amount is compared with the recoverable amount of the respective operating segment. The impairment test was carried out as at 31 August 2021. In performing the goodwill impairment test, the Group primarily determines the recoverable amount by means of the discounted cash flow method. The valuation model used to determine the recoverable amount is complex and the result of this valuation are highly dependent on the projection of future net cash flows (taking into account future revenue growth, profit margins and long-term growth rates) and the discount factor used, and therefore is subject to significant estimation uncertainty. Based on the impairment test conducted, the Group did not identify any need to recognize an impairment loss.

There is a risk for the financial statements that an existing goodwill impairment loss was not recognized. In addition, there is a risk that the related disclosures in the notes to the consolidated financial statements are not complete and appropriate.

Our audit approach

Using our own sensitivity analyses, we assessed with the involvement of our own specialists in valuation the extent to which the goodwill of the cash-generating unit Electronics would still be sufficiently covered by the recoverable amount if assumptions and parameters underlying the calculations were to change in a manner that is deemed possible.

We reconciled the expected net cash flows underlying the recoverable amount calculation with the current medium-term plan approved by management. To assess the assumptions used in preparing the medium-term plan, we obtained an understanding of the planning process through discussions with company representatives, including corporate management and representatives from the corporate divisions, we assessed the plausibility and consistency of the explanations received with the projections, and we compared the assumptions used with the expectations of external analysts and sources.

As part of our audit of the discount factor, we analyzed the peer group used. With regard to other assumptions and parameters (e.g. risk-free interest rate, beta factor, market risk premium), we compared those assumptions and parameters with our own assumptions and publicly available data to assess whether these were appropriate and whether they were within the range of external recommendations, to the extent available. In addition, we verified the calculation model used to determine the discount factor and qualified the method by using our own calculation model. We also examined the accuracy of the Company's previous forecasts by comparing the budgets of previous financial years with actual earnings and by analyzing deviations.

We assessed the appropriateness of the valuation model used. In order to assess the methodologically and mathematically appropriate implementation of the valuation method, we have traced the valuation carried out by the company on the basis of our own calculations and analyzed deviations. To verify arithmetical accuracy, we used a risk-based audit approach to recalculate the Company’s calculations based on samples contained in the valuation model.

In addition, we assessed whether the Company's disclosures regarding the goodwill impairment test in the notes to the consolidated financial statements are complete and appropriate.

Our observations

The calculation method used for the goodwill impairment test is appropriate and in line with the applicable valuation principles. Overall, the assumptions and parameters used by management lead to an appropriate assessment of the recoverability of the goodwill. The disclosures in the notes to the consolidated financial statements are complete and properly depict the judgment associated with the subsequent measurement of goodwill.

Completeness and measurement of income tax liabilities

Explanatory notes on the completeness and measurement of income tax liabilities can be found in the notes to the consolidated financial statements under note 15.

The financial statement risk

As of December 31, 2021, income tax liabilities including liabilities for uncertain tax obligations amount to EUR 1,462 million.

The Group operates in different jurisdictions with different legal systems. The application of local regulations on income tax, tax incentives and transfer pricing rules is complex. The recognition and measurement of income tax liabilities require the Group to exercise judgment in assessing tax matters and to make estimates regarding uncertain tax positions.

The measurement of income tax liabilities is subject to judgment and estimation uncertainty. The Group engages event driven external experts to support its own risk assessment with expert opinions from tax specialists.

There is a risk for the financial statements that income tax liabilities are not fully recognized or not appropriately measured.

Our audit approach

We involved our own specialists in national and international tax law into the audit team in order to evaluate the Group's assessment of tax risks and as far as obtained the related opinions of external experts engaged by the Group.

We obtained an understanding of existing tax risks through inquiry of employees of the tax department. We assessed the competence, capabilities and objectivity of the external experts and evaluated their expert opinions.

In addition, we analyzed correspondence with the relevant tax authorities and assessed the assumptions underlying the determination of income tax liabilities based on our knowledge and experience of how the relevant legal requirements are currently applied by the tax authorities and courts. We used a risk-based audit approach to audit the accuracy of the calculation of the income tax liabilities.

Our observations

The valuation model and assumptions underlying the completeness and measurement of income tax liabilities are reasonable.

Other Information

Management and the Supervisory Board are responsible for the other information. The other information comprises the following components of the combined management report, whose content was not audited:

- the components of the combined non-financial statement included in a separate section in in the combined management report,
- the corporate governance statement referred to in the combined management report,
- information extraneous to combined management reports and marked as unaudited and
- the remaining parts of the annual report.

The other information does not comprise the consolidated financial statements, the audited parts of the combined management report and our auditor's report.

Our opinions on the consolidated financial statements and on the combined management report do not cover the other information, and consequently we do not express an opinion or any other form of assurance conclusion thereon.

In connection with our audit, our responsibility is to read the other information and, in so doing, to consider whether the other information

- is materially inconsistent with the consolidated financial statements, with the information in the combined management report audited for content or our knowledge obtained in the audit, or
- otherwise appears to be materially misstated.

In accordance with our engagement, we performed a separate review of the combined non-financial statement. For the type, scope and results of this review, please refer to our audit report dated, February 17, 2021.

Responsibilities of Management and the Supervisory Board for the Consolidated Financial Statements and the Combined Management Report

Management is responsible for the preparation of consolidated financial statements that comply, in all material respects, with IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Section 315e (1) HGB and that the consolidated financial statements, in compliance with these requirements, give a true and fair view of the assets, liabilities, financial position, and financial performance of the Group. In addition, management is responsible for such internal control as they have determined necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern. They also have the responsibility for disclosing, as applicable, matters related to going concern. In addition, they are responsible for financial reporting based on the going concern basis of accounting unless there is an intention to liquidate the Group or to cease operations, or there is no realistic alternative but to do so.

Furthermore, management is responsible for the preparation of the combined management report that, as a whole, provides an appropriate view of the Group's position and is, in all material respects, consistent with the consolidated financial statements, complies with German legal requirements, and appropriately presents the opportunities and risks of future development. In addition, management is responsible for such arrangements and measures (systems) as they have considered necessary to enable the preparation of a combined management report that is in accordance with the applicable German legal requirements, and to be able to provide sufficient appropriate evidence for the assertions in the combined management report.

The supervisory board is responsible for overseeing the Group's financial reporting process for the preparation of the consolidated financial statements and of the combined management report.

Furthermore, the management and the Supervisory Board are responsible for the preparation of the remuneration report contained in a separate section of the combined management report, including the related disclosures, in accordance with the requirements of Section 162 AktG. They are also responsible for such internal control as they have determined necessary to enable the preparation of the remuneration report that is free from material misstatement, whether due to fraud or error.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements and of the Combined Management Report

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and whether the combined management report as a whole provides an appropriate view of the Group's position and, in all material respects, is consistent with the consolidated financial statements and the knowledge obtained in the audit, complies with the German legal requirements and appropriately presents the opportunities and risks of future development, as well as to issue an auditor’s report that includes our opinions on the consolidated financial statements and on the combined management report.

Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Section 317 HGB and the EU Audit Regulation and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer (IDW) will always detect a material misstatement. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements and this combined management report.

We exercise professional judgement and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements and of the combined management report, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinions. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal controls.

- Obtain an understanding of internal control relevant to the audit of the consolidated financial statements and of arrangements and measures (systems) relevant to the audit of the combined management report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of these systems.

- Evaluate the appropriateness of accounting policies used by management and the reasonableness of estimates made by management and related disclosures.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in the auditor’s report to the related disclosures in the consolidated financial statements and in the combined management report or, if such disclosures are inadequate, to modify our respective opinions. Our conclusions are based on the audit evidence obtained up to the date of our auditor’s report. However, future events or conditions may cause the Group to cease to be able to continue as a going concern.

- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements present the underlying transactions and events in a manner that the consolidated financial statements give a true and fair view of the assets, liabilities, financial position and financial performance of the Group in compliance with IFRSs as adopted by the EU and the additional requirements of German commercial law pursuant to Section 315e (1) HGB.

- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express opinions on the consolidated financial statements and on the combined management report. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our opinions.

- Evaluate the consistency of the combined management report with the consolidated financial statements, its conformity with [German] law, and the view of the Group’s position it provides.

- Perform audit procedures on the prospective information presented by management in the combined management report. On the basis of sufficient appropriate audit evidence we evaluate, in particular, the significant assumptions used by management as a basis for the prospective information, and evaluate the proper derivation of the prospective information from these assumptions. We do not express a separate opinion on the prospective information and on the assumptions used as a basis. There is a substantial unavoidable risk that future events will differ materially from the prospective information.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with the relevant independence requirements, and communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, the related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter.

Other Legal and Regulatory Requirements

Report on the Assurance on the Electronic Rendering of the Consolidated Financial Statements and the Combined Management Report Prepared for Publication Purposes in Accordance with Section 317 (3a) HGB

We have performed assurance work in accordance with Section 317 (3a) HGB to obtain reasonable assurance about whether the rendering of the consolidated financial statements and the combined management report (hereinafter the "ESEF documents") contained in the electronic file "merckkgaa-2021-12-31-de.zip" (SHA256-Hashwert: d438c78fd1d4165965b91d5c4aa776e5dbefe8f00e18575da76e5a3ca3fd7bce) made available and prepared for publication purposes complies in all material respects with the requirements of Section 328 (1) HGB for the electronic reporting format ("ESEF format"). In accordance with German legal requirements, this assurance work extends only to the conversion of the information contained in the consolidated financial statements and the combined management report into the ESEF format and therefore relates neither to the information contained in these renderings nor to any other information contained in the file identified above.

In our opinion, the rendering of the consolidated financial statements and the combined management report contained in the electronic file made available, identified above and prepared for publication purposes complies in all material respects with the requirements of Section 328 (1) HGB for the electronic reporting format. Beyond this assurance opinion and our audit opinion on the accompanying consolidated financial statements and the accompanying combined management report for the financial year from January 1, 2021, to December 31, 2021 contained in the "Report on the Audit of the Consolidated Financial Statements and the Combined Management Report" above, we do not express any assurance opinion on the information contained within these renderings or on the other information contained in the file identified above.

We conducted our assurance work on the rendering of the consolidated financial statements and the combined management report contained in the file made available and identified above in accordance with Section 317 (3a) HGB and the IDW Assurance Standard: Assurance Work on the Electronic Rendering of Financial Statements and Management Reports Prepared for Publication Purposes in Accordance with Section 317 (3a) HGB (IDW AsS 410 (10.2021)) and the International Standard on Assurance Engagements 3000 (Revised). Our responsibility in accordance therewith is further described below. Our audit firm applies the IDW Standard on Quality Management 1: Requirements for Quality Management in Audit Firms (IDW QS 1).

The Company's management is responsible for the preparation of the ESEF documents including the electronic rendering of the consolidated financial statements and the combined management report in accordance with Section 328 (1) sentence 4 item 1 HGB and for the tagging of the consolidated financial statements in accordance with Section 328 (1) sentence 4 item 2 HGB.

In addition, the company's management is responsible for such internal control that they have considered necessary to enable the preparation of ESEF documents that are free from material intentional or unintentional non-compliance with the requirements of Section 328 (1) HGB for the electronic reporting format.

The supervisory board is responsible for overseeing the process of preparing the ESEF documents as part of the financial reporting process.

Our objective is to obtain reasonable assurance about whether the ESEF documents are free from material intentional or unintentional non-compliance with the requirements of Section 328 (1) HGB. We exercise professional judgement and maintain professional scepticism throughout the assurance work. We also:

- Identify and assess the risks of material intentional or unintentional non-compliance with the requirements of Section 328 (1) HGB, design and perform assurance procedures responsive to those risks, and obtain assurance evidence that is sufficient and appropriate to provide a basis for our assurance opinion.
- Obtain an understanding of internal control relevant to the assurance on the ESEF documents in order to design assurance procedures that are appropriate in the circumstances, but not for the purpose of expressing an assurance opinion on the effectiveness of these controls.
- Evaluate the technical validity of the ESEF documents, i.e. whether the file made available containing the ESEF documents meets the requirements of the Delegated Regulation (EU) 2019/815, as amended as at the reporting date, on the technical specification for this electronic file.
- Evaluate whether the ESEF documents provide an XHTML rendering with content equivalent to the audited consolidated financial statements and the audited combined management report.
- Evaluate whether the tagging of the ESEF documents with Inline XBRL technology (iXBRL) in accordance with the requirements of Articles 4 and 6 of the Delegated Regulation (EU) 2019/815, as amended as at the reporting date, enables an appropriate and complete machine-readable XBRL copy of the XHTML rendering.

Further Information pursuant to Article 10 of the EU Audit Regulation

We were elected as group auditor at the annual general meeting on April 23, 2021. We were engaged by the Supervisory Board on July 5, 2021. We have been the group auditor of MERCK Kommanditgesellschaft auf Aktien without interruption since the financial year 1995.

We declare that the opinions expressed in this auditor's report are consistent with the additional report to the Supervisory Board pursuant to Article 11 of the EU Audit Regulation (long-form audit report).

Other matter – Use of the Auditor’s Report

Our auditor´s report must always be read together with the audited consolidated financial statements and the audited combined management report as well as the examined ESEF documents. The consolidated financial statements and combined management report converted to the ESEF format – including the versions to be published in the German Federal Gazette [Bundesanzeiger] – are merely electronic renderings of the audited consolidated financial statements and the audited group management report and do not take their place. In particular, the ESEF report and our assurance opinion contained therein are to be used solely together with the examined ESEF documents made available in electronic form.

German Public Auditor Responsible for the Engagement

The German Public Auditor responsible for the engagement is Dirk Janz.

Frankfurt am Main, February 17, 2022

KPMG AG

Wirtschaftsprüfungsgesellschaft

[Original German version signed by:]

[signature] Janz

Wirtschaftsprüfer

[German Public Auditor]

[signature] Jung

Wirtschaftsprüfer

[German Public Auditor]

Limited Assurance Report of the Independent Auditor regarding the combined non-financial statement[1]

To the Supervisory Board of Merck KGaA, Darmstadt, Germany

We have performed an independent limited assurance engagement on the combined non- financial statement (further "combined non-financial statement") of Merck KGaA, Darmstadt, Germany (further also "Company" or "the Group") for the period from January 1 to December 31, 2021.

As described in the combined non-financial statement, the Group engaged external providers to perform assessments and audits. The evaluation of the adequacy and accuracy of the conclusions from these external assessments was not part of our limited assurance engagement.

Management's Responsibility

The legal representatives of Merck KGaA, Darmstadt, Germany, are responsible for the preparation of the combined non- financial statement in accordance with §§ 315b, 315c in conjunction with 289b to 289e HGB and with Article 8 of REGULATION (EU) 2020/852 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (further „EU Taxonomy Regulation ") and the supplementing Delegated Acts as well as the interpretation of the wordings and terms contained in the EU Taxonomy Regulation and in the supplementing Delegated Acts by the Company as disclosed in Section "**Reporting in accordance with the EU Taxonomy Regulation**" of the combined non-financial statement.

This responsibility of the legal representatives includes the selection and application of appropriate methods to prepare the combined non-financial statement and the use of assumptions and estimates for individual disclosures which are reasonable under the given circumstances. Furthermore, the legal representatives are responsible for the internal controls they deem necessary for the preparation of the combined non-financial statement that is free of – intended or unintended – material misstatements.

The EU Taxonomy Regulation and the supplementing Delegated Acts contain wordings and terms that are still subject to substantial uncertainties regarding their interpretation and for which not all clarifications have been published yet. Therefore, the legal representatives have included a description of their interpretation in Section "**Reporting in accordance with the EU Taxonomy Regulation**" of the combined non-financial statement. They are responsible for its tenability. Due to the innate risk of diverging interpretations of vague legal concepts, the legal conformity of these interpretations is subject to uncertainty.

Practitioner's Responsibility

It is our responsibility to express a conclusion on the combined non-financial statement based on our work performed within a limited assurance engagement.

We conducted our work in the form of a limited assurance engagement in accordance with the International Standard on Assurance Engagements (ISAE) 3000 (Revised): "Assurance Engagements other than Audits or Reviews of Historical Financial Information", published by IAASB. Accordingly, we have to plan and perform the assurance engagement in such a way that we obtain limited assurance as to whether any matters have come to our attention that cause us to believe that the combined non-financial statement of the Company for the period from January 1 to December 31, 2021, has not been prepared, in all material respects in accordance with

[1] Our engagement applied to the German version of the combined non-financial statement 2021. This text is a translation of the Independent Assurance Report issued in German, whereas the German text is authoritative.

§§ 315b and 315c in conjunction with 289b to 289e HGB and with the EU Taxonomy Regulation and the supplementing Delegated Acts as well as the interpretation of the wordings and terms contained in the EU Taxonomy Regulation and in the supplementing Delegated Acts by the legal representatives as disclosed in Section "**Reporting in accordance with the EU Taxonomy Regulation**" of the combined non-financial statement. We do not, however, issue a separate conclusion for each disclosure. As the assurance procedures performed in a limited assurance engagement are less comprehensive than in a reasonable assurance engagement, the level of assurance obtained is substantially lower. The choice of assurance procedures is subject to the auditor's own judgement.

Within the scope of our engagement, we performed, amongst others, the following procedures:

- Inquiries of group-level personnel who are responsible for the materiality analysis in order to understand of the processes for determining material topics and respective reporting boundaries for the Group
- A risk analysis, including media research, to identify relevant information on the Group's sustainability performance in the reporting period
- Evaluation of the design and the implementation of systems and processes for the collection, processing and monitoring of disclosures, including data consolidation, on environmental, employee and social matters, respect for human rights, and combating corruption and bribery matters
- Inquiries of group-level personnel who are responsible for determining disclosures on concepts, due diligence processes, results and risks, performing internal control functions and consolidating disclosures
- Inspection of selected internal and external documents
- Analytical evaluation of data and of the trends of quantitative disclosures as reported at group level by all sites
- Evaluation of local data collection, validation and reporting processes as well as of the reliability of reported data based on a sample of the sites in Ulsan in South Korea, in Meyzieu in France and in Darmstadt in Germany in the form of virtual meetings
- Assessment of the overall presentation of the disclosures
- Evaluation of the process for the identification of taxonomy-eligible economic activities and the corresponding disclosures in the combined non-financial statement

The legal representatives have to interpret vague legal concepts in order to be able to compile the relevant disclosures according to Article 8 of the EU Taxonomy Regulation. Due to the innate risk of diverging interpretations of vague legal concepts, the legal conformity of these interpretations and, correspondingly, our assurance thereof are subject to uncertainty.

In our opinion, we obtained sufficient and appropriate evidence for reaching a conclusion for the assurance engagement.

Independence and Quality Assurance on the Part of the Auditing Firm

In performing this engagement, we applied the legal provisions and professional pronouncements regarding independence and quality assurance, in particular the Professional Code for German Public Auditors and Chartered Accountants (in Germany) and the quality assurance standard of the German Institute of Public Auditors (Institut der Wirtschaftsprüfer, IDW) regarding quality assurance requirements in audit practice (IDW QS 1).

Conclusion

Based on the procedures performed and the evidence obtained, nothing has come to our attention that causes us to believe that the combined non-financial statement of Merck KGaA, Darmstadt, Germany, for the period from January 1 to December 31, 2021 has not been prepared, in all material respects, in accordance with §§ 315b and 315c in conjunction with 289b to 289e HGB and with the EU Taxonomy Regulation and the supplementing Delegated Acts as well as the interpretation disclosed in Section "**Reporting in accordance with the EU Taxonomy Regulation**" of the combined non-financial statement.

Restriction of Use/General Engagement Terms

This assurance report is issued for purposes of the Supervisory Board of Merck KGaA, Darmstadt, Germany, only. We assume no responsibility with regard to any third parties.

Our assignment for the Supervisory Board of Merck KGaA, Darmstadt, Germany, and professional liability as described above was governed by the General Engagement Terms for Wirtschaftsprüfer and Wirtschaftsprüfungsgesellschaften (Allgemeine Auftragsbedingungen für Wirtschaftsprüfer und Wirtschaftsprüfungsgesellschaften) in the version dated January 1, 2017 (**https://www.kpmg.de/bescheinigungen/lib/aab_english.pdf**). By reading and using the information contained in this assurance report, each recipient confirms notice of the provisions contained therein including the limitation of our liability as stipulated in No. 9 and accepts the validity of the General Engagement Terms with respect to us.

Frankfurt am Main, February 17, 2022

KPMG AG

Wirtschaftsprüfungsgesellschaft

[Original German version signed by:]

gez. Glöckner

Wirtschaftsprüfer

[German Public Auditor]

ppa. Meldau

Business Development 2017 – 2021

This overview may include historically adjusted values in order to ensure comparability with the reporting period.

€ million	2017	2018	2019	2020	2021	Change in %
Results of operations						
Net sales	14,517	14,836	16,152	17,534	19,687	12.3%
Operating result (EBIT)[1]	2,423	1,727	2,120	2,985	4,179	40.1%
Margin (% of net sales)[1]	16.7%	11.6%	13.1%	17.0%	21.2%	
EBITDA[2]	4,164	3,528	4,066	4,923	5,946	20.8%
Margin (% of net sales)[1]	28.7%	23.8%	25.2%	28.1%	30.2%	
Adjustments[1]	82	272	318	279	157	-43.8%
EBITDA pre[1]	4,246	3,800	4,385	5,201	6,103	17.3%
Margin (% of net sales)[1]	29.3%	25.6%	27.1%	29.7%	31.0%	
Profit before income tax	2,129	1,461	1,735	2,630	3,924	49.1%
Profit after tax	2,615	3,396	1,324	1,994	3,065	53.7%
Earnings per share (in €)	5.99	7.76	3.04	4.57	7.03	53.8%
Assets and liabilities						
Total assets	35,621	36,888	43,808	41,796	45,362	8.5%
Non-current assets	28,166	27,652	34,805	32,516	34,380	5.7%
thereof:						
Goodwill	13,582	13,764	17,114	15,959	17,004	6.6%
Other intangible assets	8,317	7,237	9,221	7,653	7,612	-0.5%
Property, plant, and equipment	4,512	4,811	6,192	6,421	7,217	12.4%
Current assets	7,455	9,236	9,003	9,280	10,982	18.3%
thereof:						
Inventories	2,632	2,764	3,342	3,294	3,900	18.4%
Trade receivables and other current receivables	3,170	3,226	3,488	3,221	3,646	13.2%
Cash and cash equivalents	589	2,170	781	1,355	1,899	40.2%
Equity	14,066	17,233	17,914	17,017	21,416	25.8%
Financial liabilities	10,823	8,896	13,194	12,142	10,801	-11.0%
Non-current	8,033	6,681	8,644	9,785	8,270	-15.5%
Current	2,790	2,215	4,550	2,357	2,531	7.4%
Liquidity						
Payments for investments in intangible assets[3]	392	106	208	150	355	>100.0%
Payments for investments in property, plant, and equipment[3]	919	910	813	1,413	1,066	-24.6%
Business free cash flow[3]	2,696	2,219	2,856	3,477	4,616	32.7%
Net financial debt[1]	10,144	6,701	12,363	10,758	8,753	-18.6%
Other key data						
Equity ratio (in %)[1]	39.5%	46.7%	40.9%	40.7%	47.2%	
Research and development costs	2,108	2,227	2,268	2,288	2,408	5.2%
Dividend per share (in €)	1.25	1.25	1.30	1.40	1,85[4]	32.5%
Employees (number as of December 31)	52,880	51,713	57,036	58,096	60,334	3.9%

[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.

[3] According to the consolidated cash flow statement.

[4] Proposal on the appropriation of profits for 2021.

FINANCIAL CALENDAR

March
3
2022
Annual Report 2021

April
22
2022
Annual General Meeting

May
12
2022
Quarterly Statement Q1

August
4
2022
Half-yearly
Financial Report

November
10
2022
Quarterly Statement Q3

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