Notes to the Consolidated Financial Statements

General Disclosures

(1) Company information

These consolidated financial statements for the year ended December 31, 2022, were prepared for MERCK Kommanditgesellschaft auf Aktien, Frankfurter Strasse 250, 64293 Darmstadt, Germany (Merck KGaA, 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, Darmstadt, Germany (E. Merck KG, Darmstadt, Germany). The consolidated financial statements of E. Merck KG, Darmstadt, Germany, can be accessed at **www.bundesanzeiger.de** and **www.unternehmensregister.de**. Shares in Merck KGaA, Darmstadt, Germany, are traded on the regulated market of the Frankfurt Stock Exchange and on 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 14, 2023, 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 can be viewed at **https://www.emdgroup.com/en/investors/corporate-governance/reports.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 2022

Standard/Interpretation	Title	Date of publication	Date of endorsement by EU law	Impact on the consolidated financial statements
Amendments to IAS 16	Property, Plant and Equipment — Proceeds before Intended Use	May 14, 2020	June 28, 2021	No material impact
Amendments to IAS 37	Onerous Contracts — Cost of Fulfilling a Contract	May 14, 2020	June 28, 2021	No material impact
Amendments to IFRS 3	Reference to the Conceptual Framework	May 14, 2020	June 28, 2021	No material impact
Amendments to IFRS 16	Covid-19-Related Rent Concessions beyond 30 June 2021	March 31, 2021	August 30, 2021	No material impact
Annual Improvements to IFRS	Annual Improvements to IFRS Standards 2018–2020	May 14, 2020	June 28, 2021	No material impact

Standards and amendments to standards effective for the first time from fiscal 2023

Standard/Interpretation	Title	Date of publication	Date of endorsement by EU law	Required date of first-time application[1]	Expected impact on the consolidated financial statements
Amendments to IAS 1	Disclosure of Accounting Policies	February 12, 2021	March 2, 2022	January 1, 2023	No material impact
Amendments to IAS 8	Definition of Accounting Estimates	February 12, 2021	March 2, 2022	January 1, 2023	No material impact
Amendments to IAS 12	Deferred Tax related to Assets and Liabilities arising from a Single Transaction	May 7, 2021	August 11, 2022	January 1, 2023	No material impact
IFRS 17; Amendments to IFRS 17	IFRS 17 Insurance Contracts; Amendments to IFRS 17; Initial Application of IFRS 17 and IFRS 9 — Comparative Information	May 18, 2017 June 25, 2020 December 9, 2021	November 19, 2021 November 19, 2021 September 8, 2022	January 1, 2023	No material impact

[1] None of the regulations was applied early.

Regulations published but not yet endorsed by the European Union

Standard/Interpretation	Title	Date of publication	Expected date of first-time application	Expected impact on the consolidated financial statements
Amendments to IAS 1	Classification of Liabilities as Current or Non-current; Classification of Liabilities as Current or Non-Current — Deferral of Effective Date	January 23, 2020 July 15, 2020	January 1, 2024	No material impact
Amendments to IAS 1	Non-current Liabilities with Covenants	October 31, 2022	January 1, 2024	No material impact
Amendments to IFRS 16	Lease Liability in a Sale and Leaseback	September 22, 2022	January 1, 2024	No material impact

Impact of the introduction of a global minimum tax rate by the OECD (Pillar Two)

On December 22, 2022, the European Commission published a directive on the implementation of the internationally agreed minimum tax rate in the member states. The directive has yet to be translated into local law in the countries in which the Group is active. The Group is continuously analyzing the latest legislative developments and their impact on the countries affected. As the details of the implementation have yet to be finalized, it is not possible to reliably quantify the financial impact at present.

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.

However, 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

Argentina (since 2018) and Turkey (since April 2022) are classified as hyperinflationary economies 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. In Argentina, 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 14,227.3 as of the balance sheet date (December 31, 2021: 7,396.8/January 1, 2021: 4,896.2). In Turkey, the Consumer Price Index (CPI) published by the Turkish Statistical Institute is applied retrospectively with effect from January 1, 2022. The index applied stood at 1,128.5 as of the balance sheet date (December 31, 2021: 687.0). In accordance with the requirements of IAS 21 “The Effects of Changes in Foreign Exchange Rates” for financial statements in non-hyperinflationary reporting currencies, the prior-year amounts have not been restated.

The respective loss on the net monetary position is reported under remaining other operating expenses in other operating expenses; see Note (14) “**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 =	**2022**	2021	**Dec. 31, 2022**	Dec. 31, 2021
Chinese renminbi (CNY)	7.088	7.634	7.420	7.206
Japanese yen (JPY)	137.989	129.848	140.716	130.189
Swiss franc (CHF)	1.005	1.081	0.985	1.034
South Korean won (KRW)	1,357.642	1,353.475	1,342.189	1,345.493
Taiwan dollar (TWD)	31.336	33.062	32.728	31.285
U.S. dollar (USD)	1.054	1.183	1.065	1.131

(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 on the applicable accounting and measurement policies 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 when applying accounting policies. Sources of estimation uncertainty relate to the selection of the valuation techniques to be applied and the input factors used therein. The degree of estimation uncertainty may vary considerably depending on the availability and reliability of the input factors.

Increased uncertainty due to the macroeconomic situation

The dynamic development of the macroeconomic environment means that the degree of uncertainty in the preparation of the consolidated financial statements is considerably higher than was typically the case in the past. In particular, uncertainties include the development of inflation, the development of interest rates, geopolitical challenges, trade restrictions and sanctions. This applies in particular to the recoverability of non-financial assets. Based on the information currently available, there is no evidence of significant impairment losses to date. Furthermore, as in previous years, there are no grounds to suggest that the going concern assumption should not have been applied in preparing the consolidated financial statements.

Impact of inflation

Inflation has led to an increase in procurement costs, especially for logistics services, materials and energy (see Note (10) "**Cost of sales**" and (11) "**Marketing and selling expenses**"). As in the previous year, the cost of purchasing natural gas and electricity came to a low triple-digit million euro amount for the Group in fiscal 2022. The higher level of procurement costs resulted in an increase in the carrying amount of raw materials and supplies as well as work in progress reported in inventories. The Group raised its prices in order to offset these increased procurement costs. It is typically easier to pass on price increases in the Life Science and Electronics business sectors than in the price-regulated environment of the Healthcare business sector. Furthermore, the assumptions concerning the long-term salary and pension trends applied in calculating pension obligations were reviewed and adjusted to reflect the development of inflation. This resulted in an increase in the defined benefit obligation in connection with the measurement of defined benefit pension plans (see Note (33) **"Provisions for employee benefits**").

Impact of higher interest rates

The increase in interest rates had an impact on the measurement of provisions for defined benefit pension plans (see Note (33) "**Provisions for employee benefits**") and other non-current provisions (see Note (27) **"Other provisions**") in particular, leading to substantial reductions in the amount of the respective obligations.

The higher interest rates also resulted in a rise in the discount rates applied in performing impairment testing and determining the fair values of financial and non-financial assets (see Note (18) "**Goodwill**" and Note (43) "**Information on fair value measurement**" in particular).

Direct impact of the war in Ukraine

To date, the war in Ukraine has not had any material effects on the Group's net assets, financial position or results of operations owing to its limited business volume in Russia, Ukraine, Belarus, and the Republic of Moldova. In fiscal 2022 and 2021 alike, the total share of Group net sales generated in the aforementioned countries amounted to less than 1.5%. These sales were attributable almost exclusively to the Healthcare business sector as well as the Life Science business sector in connection with the provision of medical care. With the exception of Russia, the Group does not have any subsidiaries of its own in this region. Trade receivables from customers in Russia, Ukraine, Belarus and the Republic of Moldova are partly covered by credit insurance. The payment behavior of customers in the affected region is being monitored very closely. There were no notable loss allowances as of December 31, 2022. To date, local payments to customers and employees in Russia as well as international payments with Russia have been ensured without restriction.

Impact of trade restrictions, sanctions and supply chain bottlenecks

Some inventories were increased in order to limit the risks in connection with supply chain disruption. Accordingly, there is a heightened risk of subsequent write-downs if it is not possible to process or sell these inventories. Furthermore, the impact of the trade restrictions concerning semiconductors that were imposed between the United States of America and China in the fourth quarter of 2022 was examined with a view to the recoverability of assets that could be affected. No impairment losses have been recognized to date. However, there is considerable uncertainty with regard to future developments.

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 that could result from longer-term changes in the general climatic conditions. To determine the physical climate risk exposure, significant Group locations are subject to a structured climate risk analysis as part of a project aimed at implementing the recommendations of the "Task Force on Climate-Related Financial Disclosures" (TCFD). This involves simulating the long-term impact of various warming scenarios on the locations analyzed. The potential financial consequences of climate-related natural events, such as flooding, torrential rainfall and hurricanes, are covered by insurance policies to an appropriate extent. Based on the information currently available, physical climate risks are not currently expected to have any direct accounting impact.

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 (see the disclosures in Note (42) "**Management of financial risks**" on a virtual power purchase agreement with a wind energy project developer in the United States). The Group also plans to reduce the indirect emissions along the entire value chain (Scope 3) in terms of metric kilotons of CO_2 equivalents per euro of gross profit by 52% by 2030 and to achieve climate-neutral business operations along the entire value chain (Scope 1-3) by 2040. In April 2022, the Science Based Targets Initiative confirmed that the targets for 2030 and the necessary measures support the ambitions of the Science Based Targets Initiative and the Paris Agreement to limit global warming to 1.5 °C.

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, 2022 in € million	IFRS	Discretionary scope/ estimation uncertainty	Sensitivity analysis	Note
Goodwill	18,415			yes	18
Determination of recoverable amount		IAS 36	high		
Other intangible assets	7,302			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	8,203			no	20
Determination of depreciation		IAS 16	medium		
Identification of impairments or reversal of impairments		IAS 36	medium		
Leases	481			yes	21
Recognition and measurement of lease arrangements		IFRS 16	medium		
Inventories	4,632			no	24
Identification of impairments or reversal of impairments		IAS 2	medium		
Trade and other receivables	4,141			no	25, 42
Determination of loss allowance		IFRS 9	medium		
Other financial assets				yes	36, 43
Determination of fair values of contingent considerations	250	IFRS 13	high		
Determination of fair values of equity instruments	516	IFRS 9, IFRS 13	medium		
Provisions for employee benefits				yes	33
Determination of present value of defined-benefit obligations	4,287	IAS 19	medium		
Determination of parameters for the valuation of fair values of share-based payment programs	254	IFRS 2	medium		
Other provisions and contingent liabilities	672			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	912	IFRS 15	high		
Income tax				no	15
Recognition and measurement of income tax liabilities	1,522	IAS 12	high		
Recognition and measurement of deferred taxes from temporary differences		IAS 12	medium		
Recognition of deferred tax assets from tax loss carryforwards	30	IAS 12	high		

(4) Subsequent events

The Group is currently coordinating with the employee representatives a program to continuously improve processes and align the Group functions more closely with the businesses. The implementation of this efficiency program is to start in fiscal 2023 and is likely to adversely impact profit before tax in a low three-digit million euro amount.

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

Changes in the scope of consolidation

Subsidiaries that are immaterial to the assessment of the net assets, financial position, and results of operations of the Group 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, 2021		**325**
Additions	Companies established	1
	Acquisitions	4
	Materiality	2
Retirements	Liquidations/mergers	-11
	Divestments	–
	Immateriality	-1
	Loss of control	–
Fully consolidated companies as of Dec. 31, 2022		**320**
Companies rated at-equity as of Dec. 31, 2021		2
Companies rated at-equity as of Dec. 31, 2022		2
Non-consolidated subsidiaries as of Dec. 31, 2021		36
Non-consolidated subsidiaries as of Dec. 31, 2022		31

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) within the meaning of 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 in order to determine the presentation of the transaction in the consolidated financial statements.

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.

Acquisitions

Acquisition of Exelead Inc., United States

On December 30, 2021, the Group signed a definitive agreement to acquire Exelead Inc., United States (Exelead), a biopharmaceutical contract development and manufacturing organization (CDMO). The transaction closed on February 22, 2022, after regulatory clearances and the satisfaction of other customary closing conditions. The purchase price amounted to US$ 793 million (€ 702 million) in cash. In the consolidated cash flow statement, € 694 million has been disclosed as net cash outflows from acquisitions less acquired cash and cash equivalents.

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 acquisition is to use Exelead’s capacities and expertise to expand the service range for mRNA contract development and manufacturing and to provide a fully integrated offering across the entire mRNA manufacturing process. The business is being integrated into the Life Science Services business unit, which is part of the Life Science business sector.

Material contingent liabilities were not identified as part of the purchase price allocation.

The positive difference between the purchase price and the net assets acquired of € 462 million was recognized as goodwill. This includes expected earnings synergies resulting from the integration of Exelead into the Group, expected revenues from technical innovations and developments that go beyond the current product, development, and customer portfolios, and unrecognized intangible assets such as the expertise of the workforce. The goodwill was allocated in full to the Life Science business sector. As expected, the goodwill is non-tax deductible. As a result of foreign exchange developments, goodwill carried in U.S. dollars increased from € 462 million on first-time recognition to € 490 million as of December 31, 2022.

For the period between the acquisition and December 31, 2022, the legacy Exelead business contributed € 75 million to Group net sales as well as € -37 million to net income after taxes. This result also includes higher cost of sales due to the step-up of the acquired inventories to fair values as well as the amortization of assets identified and remeasured during purchase price allocation.

Assuming the first-time consolidation of Exelead as of January 1, 2022, sales of the Group for the period would have been € 22,241 million (compared with reported net sales of € 22,232 million), and net income after taxes would have been € 3,337 million (compared with reported net income after taxes of € 3,339 million). When calculating these figures, it was assumed that the adjustments to carrying amounts resulting from purchase price allocation had been identical and would have been taken into account in accordance with their useful life in terms of their effects on the consolidated income statement.

Acquisition of the chemicals business of Mecaro Co. Ltd., Korea

On December 30, 2022, the Group successfully completed the acquisition of the chemicals business of Mecaro Co. Ltd., Korea (Mecaro), trading as M Chemicals Inc., Korea (M Chemicals), after obtaining the necessary regulatory clearances; the acquisition had been announced on August 17, 2022. Mecaro is a Korea-based, publicly listed manufacturer of heater blocks and chemical precursors for semiconductors.

The acquisition forms part of the Level Up growth program of the Electronics business sector. M Chemicals has around 100 employees and primarily develops and produces precursors used in thin film deposition. The total purchase price involves payments totaling € 90 million, of which € 80 million were due and had been paid as of the reporting date. In the consolidated cash flow statement, € 77 million was recognized in net cash outflows from acquisitions less acquired cash and cash equivalents. The contractually agreed contingent milestone payments have not led to an increase of the transaction price.

No preliminary purchase price allocation had taken place by the time the Consolidated Financial Statements were prepared. The total difference between the purchase price and the net assets acquired, amounting to € 46 million, was therefore recognized as goodwill on a preliminary basis. The goodwill was allocated in full to the Electronics business sector. As expected, it is non-tax deductible. The goodwill was recognized in South Korean won.

Acquisition of Erbi Biosystems Inc., United States

The Group acquired all the shares in Erbi Biosystems Inc., United States (Erbi), on December 1, 2022. The purchase price amounted to € 78 million in cash. In the consolidated cash flow statement, € 73 million was recognized in net cash outflows from acquisitions less acquired cash and cash equivalents and other adjustments.

Erbi is the developer of Breez™, one of the few micro-scale, fully automated, functionally closed and continuous perfusion cell culture platform technologies on the market. By integrating Breez™ into its existing Mobius® portfolio, the Group can offer a full range of bioreactors, cell retention systems and devices as well as cell culture media. The business is allocated to the Process Solutions business unit in the Life Science business sector.

No preliminary purchase price allocation had taken place by the time the Consolidated Financial Statements were prepared. The total difference between the purchase price and the net assets acquired was therefore recognized as goodwill. The goodwill was recognized in full in the Life Science business sector. As expected, it is non-tax deductible. As a result of foreign exchange developments, goodwill carried in U.S. dollars decreased from € 74 million on first-time recognition to € 72 million as of December 31, 2022.

Fair value of the acquisitions

The determination of the fair values for Exelead was performed by an external valuation expert and completed by December 31, 2022. In the case of the Erbi and M Chemicals acquisitions, the carrying amounts as of the acquisition date have been recognized as preliminary fair values because the completion date was shortly before the reporting date. The fair values for the acquisitions were as follows:

	Fair value at the acquisition date	
€ million	Exelead	Other aquisitions[1]
Non-current assets		
Intangible assets (excluding goodwill)	160	1
Property, plant and equipment	49	31
Other non-current assets	3	–
	213	**32**
Current assets		
Inventories	47	10
Trade and other current receivables	12	2
Cash and cash equivalents	8	5
Other current assets	27	–
	94	**18**
Total assets	**307**	**50**
Non-current liabilities		
Other non-current provisions and liabilities	4	1
Deferred tax liabilities	41	–
	45	**1**
Current liabilities		
Trade payables and other liabilities	13	–
Other current liabilities and provisions	9	2
	22	**2**
Total liabilities	**67**	**3**
Net assets acquired	**240**	**47**
Purchase price for the acquisition of shares in accordance with IFRS 3	**702**	**167**
Positive difference (goodwill)	**462**	**120**

[1] Preliminary fair values.

(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 and the licensees do not constitute customers within the meaning of IFRS 15, 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 represent 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 € 611 million in the year under review (2021: € 373 million). The Group recognized a high double-digit million euro amount in research and development expenses in fiscal 2022, as in the previous year, as well as profit transfer expenses of € 255 million (2021: € 159 million). The Group also realized other operating income of € 50 million in the previous year. This resulted from the achievement of two approval 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 the third quarter of 2021, it was amicably decided with GSK that the agreement on bintrafusp alfa would end 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.

The Group recognized research and development costs in a low triple-digit million euro amount in the previous year. 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 the previous year from the reversal in profit or loss of the remainder of an upfront payment that was received from GSK and deferred in 2019.

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 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 low 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 in the previous year.

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 as the reconciliation to the Group figures. As these are managed at the 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 a key figure that is not defined by International Financial Reporting Standards. However, it represents the most important variable used to steer 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 – 2022

€ million	Life Science	Healthcare	Electronics	Total of reportable operating segments	Corporate and Other	Group
Net sales[1]	**10,380**	**7,839**	**4,013**	**22,232**	**–**	**22,232**
Intersegment sales	61	–	–	61	-61	–
Operating result (EBIT)[2]	**2,808**	**1,895**	**572**	**5,275**	**-801**	**4,474**
Depreciation	845	303	545	1,693	105	1,798
Impairment losses[3]	24	187	20	232	–	232
Reversals of impairment losses	–	–	–	–	–	–
EBITDA[4]	**3,678**	**2,385**	**1,138**	**7,200**	**-696**	**6,504**
Adjustments[2]	82	92	55	228	117	345
EBITDA pre (segment result)[2]	**3,760**	**2,477**	**1,192**	**7,428**	**-579**	**6,849**
EBITDA pre margin (in % of net sales)[2]	36.2%	31.6%	29.7%	–	–	30.8%
Assets by business sector	24,196	8,135	10,855	43,185	5,341	48,526
Liabilities by business sector	-2,094	-3,111	-744	-5,949	-16,571	-22,521
Investments in property, plant and equipment[5]	694	344	397	1,435	97	1,531
Investments in intangible assets[5]	107	136	13	256	20	275
Non-cash changes in provisions(according to consolidated cash flow statement)[6]	72	174	28	274	3	277

[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 – 2021

€ million	Life Science[1]	Healthcare	Electronics[1]	Total of reportable operating segments	Corporate and Other	Group
Net sales[2]	**8,992**	**7,089**	**3,606**	**19,687**	**–**	**19,687**
Intersegment sales	62	–	–	62	-62	–
Operating result (EBIT)[3]	**2,480**	**1,823**	**508**	**4,811**	**-632**	**4,179**
Depreciation	767	315	528	1,610	103	1,713
Impairment losses[4]	11	19	36	66	3	68
Reversals of impairment losses	–	-11	-3	-14	–	-14
EBITDA[5]	**3,258**	**2,146**	**1,070**	**6,473**	**-527**	**5,946**
Adjustments[3]	29	8	58	95	62	157
EBITDA pre (segment result)[3]	**3,287**	**2,153**	**1,128**	**6,567**	**-465**	**6,103**
EBITDA pre margin (in % of net sales)[3]	36.6%	30.4%	31.3%	–	–	31.0%
Assets by business sector	21,917	7,809	10,306	40,033	5,329	45,362
Liabilities by business sector	-2,094	-2,807	-720	-5,621	-18,326	-23,947
Investments in property, plant and equipment[6]	461	350	237	1,049	16	1,066
Investments in intangible assets[6]	45	277	19	340	15	355
Non-cash changes in provisions(according to consolidated cash flow statement)[7]	122	176	5	303	85	387

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.
[2] Excluding intersegment sales.
[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 – 2022

€ 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]	6,248	1,108	469	6,361	6,025	7,697	3,157	1,231	695	22,232
Net sales by company location[1]	6,648	1,532	592	6,596	6,302	7,297	2,818	1,175	516	22,232
Goodwill and other intangible assets[2]	4,930	1,568	1,768	20,156	20,145	628	57	2	–	25,716
Property, plant and equipment	4,302	1,911	1,059	2,368	2,363	1,265	423	211	57	8,203
Research and development costs	-2,051	-1,081	-835	-372	-371	-69	-26	-17	-12	-2,521
Number of employees	28,243	13,620	2,574	15,847	15,634	15,412	4,904	3,487	1,243	64,232

[1] Excluding intersegment sales.

[2] Goodwill and other intangible assets are allocated by currency area.

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[3]	-2,038	-969	-945	-300	-300	-61	-24	-15	-11	-2,426
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 are allocated by currency area.

[3] Adjustment of prior-year figures due to restructuring within Corporate and Other.

The Group divides its business activities into three business sectors: The Life Science business sector comprises products for scientific institutions, research and analytical laboratories in the pharmaceutical and biotechnology industry and applications for customers manufacturing pharmaceuticals. In line with the product portfolio, customers in this business sector primarily include companies in the pharmaceutical and biotechnology sectors as well as retailers and public research organizations. The Healthcare business sector includes business involving 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 2022 or 2021. 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	2022	2021
EBITDA pre of the operating businesses[1]	**7,428**	**6,567**
Corporate and Other	-579	-465
EBITDA pre of the Group[1]	**6,849**	**6,103**
Depreciation/amortization/impairment losses/reversals of impairment losses	-2,030	-1,767
Adjustments[1]	-345	-157
Operating result (EBIT)[1]	**4,474**	**4,179**
Financial result	-187	-255
Profit before income tax	**4,287**	**3,924**

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

The adjustments comprised the following:

€ million	2022	2021
Restructuring expenses	-198	-79
Integration expenses/IT expenses	-88	-81
Gains (+)/losses (-) on the divestment of businesses	38	3
Acquisition-related adjustments	-29	18
Other adjustments	-68	-19
Adjustments before impairment losses/reversals of impairment losses[1]	**-345**	**-157**
Impairment losses[2]	-232	-56
Reversals of impairment losses	–	3
Adjustments (total)[1]	**-577**	**-210**

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

[2] Without impairments on financial assets

Restructuring expenses of € 91 million (2021: € 11 million) were recognized in the Healthcare business sector, a large part of which related to a transformation project in the research and development departments. Furthermore, expenses of € 41 million were incurred for various restructuring measures in the Life Science business sector (2021: € 26 million). Restructuring expenses of € 31 million (2021: € 26 million) were incurred in the Electronics business sector, mainly for the Bright Future transformation program. A further € 36 million was spent on restructuring measures in the Group functions (2021: € 16 million).

At € 77 million in fiscal 2022 (2021: € 44 million), integration and IT expenses related to expenses for launching new ERP systems.

Other adjustments include the losses on the net position of monetary assets and liabilities resulting from hyperinflationary accounting in Argentina and Turkey, which are reported in other operating expenses (see Note (2) “**Reporting principles**”).

Impairment losses were attributable in particular to intangible assets in the Healthcare business sector (see Note (19) “**Other intangible assets**”).

The adjustments are reported in the consolidated income statement as part of the respective functional costs and allocated to them as follows:

2022

€ 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	-27	-32	-38	-74	-28	-198
Integration expenses/IT expenses	2	–	-77	-1	-12	-88
Gains (+)/losses (–) on the divestment of businesses	–	–	–	–	38	38
Acquisition-related adjustments	-7	–	–	–	-22	-29
Other adjustments	–	–	–	–	-68	-68
Adjustments before impairment losses/reversals of impairment losses[1]	**-32**	**-32**	**-115**	**-75**	**-91**	**-345**
Impairment losses[2]	–	–	–	–	-232	-232
Reversals of impairment losses	–	–	–	–	–	–
Adjustments in the operating result (total)[1]	**-32**	**-32**	**-115**	**-75**	**-323**	**-577**

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

[2] Without impairments on financial assets

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

(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 and there is no alternative use. Input- and output-oriented methods are used to appropriately determine progress on a contract-specific basis. Although progress is ideally measured using input-oriented methods, output-oriented methods are always applied when the input cannot be reliably determined, for example. Specifically, the appropriate degree of progress is mainly calculated on the basis of milestones reached, time elapsed, units delivered, or costs incurred in proportion to the anticipated total costs.

Licenses for intellectual property are granted 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 Life Science 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; and
- 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 € 91 million (2021: € 84 million) reduction in profit before tax.

The following tables present a breakdown of net sales by key product lines/products:

Life Science[1]

€ million	2022		2021	
Science & Lab Solutions	4,898	47%	4,367	48%
Process Solutions	4,526	44%	3,853	43%
Life Science Services	956	9%	772	9%
Total	**10,380**	**100%**	**8,992**	**100%**

[1] Prior-year figures have been adjusted owing to the reorganization of the Life Science business sector completed on April 1 2022, as well as to product reallocations between the Life Science and Electronics business sectors.

Healthcare

€ million	2022		2021	
Oncology	**1,683**	**22%**	**1,411**	**20%**
thereof: Erbitux®	1,023	13%	987	14%
thereof: Bavencio®	611	8%	373	5%
Neurology & Immunology	**1,743**	**22%**	**1,645**	**23%**
thereof: Rebif®	887	11%	952	13%
thereof: Mavenclad®	856	11%	693	10%
Fertility	**1,446**	**18%**	**1,337**	**19%**
thereof: Gonal-f®	825	11%	767	11%
Cardiovascular, Metabolism & Endocrinology	**2,806**	**36%**	**2,540**	**36%**
thereof: Glucophage®	930	12%	864	12%
thereof: Concor®	590	8%	523	7%
thereof: Euthyrox®	553	7%	470	7%
thereof: Saizen®	266	3%	248	3%
Other	**161**	**2%**	**157**	**2%**
Total	**7,839**	**100%**	**7,089**	**100%**

Electronics[1]

€ million	2022		2021	
Semiconductor Solutions	2,674	67%	2,150	60%
Display Solutions	900	22%	1,046	29%
Surface Solutions	439	11%	410	11%
Total	**4,013**	**100%**	**3,606**	**100%**

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors and adjustments within the Electronics business sector.

The following tables present a more detailed breakdown of net sales by business sector from contracts with customers.

2022

€ million

Net sales by nature of the products	**Life Science**		**Healthcare**		**Electronics**		**Group**	
Goods	9,097	88%	7,804	100%	3,481	87%	20,382	92%
Equipment	463	4%	1	–	417	10%	881	4%
Services	804	8%	16	–	110	3%	930	4%
License income	16	–	–	–	4	–	20	–
Commission income	1	–	17	–	–	–	18	–
Income from co-commercialization agreements	–	–	1	–	–	–	1	–
Total	**10,380**	**100%**	**7,839**	**100%**	**4,013**	**100%**	**22,232**	**100%**

Net sales by region (customer location)								
Europe	3,445	33%	2,433	31%	371	9%	6,248	28%
North America	3,931	38%	1,781	23%	649	16%	6,361	29%
Asia-Pacific	2,536	25%	2,261	29%	2,901	72%	7,697	35%
Latin America	353	3%	838	10%	40	1%	1,231	5%
Middle East and Africa	116	1%	527	7%	53	2%	695	3%
Total	**10,380**	**100%**	**7,839**	**100%**	**4,013**	**100%**	**22,232**	**100%**

2021

€ million

Net sales by nature of the products	Life Science[1]		Healthcare		Electronics[1]		Group	
Goods	7,908	88%	7,011	99%	3,180	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	**8,992**	**100%**	**7,089**	**100%**	**3,606**	**100%**	**19,687**	**100%**

Net sales by region (customer location)								
Europe	3,139	35%	2,268	32%	269	7%	5,675	29%
North America	3,189	36%	1,673	23%	535	15%	5,397	27%
Asia-Pacific	2,286	25%	1,997	28%	2,736	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	**8,992**	**100%**	**7,089**	**100%**	**3,606**	**100%**	**19,687**	**100%**

[1] Figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

Group net sales amounted to € 22,232 million in fiscal 2022 (2021: € 19,687 million). As in the previous year, around 4% of this figure was recognized over time (2022: € 933 million; 2021: € 726 million). This mainly related to net sales from services in the Life Science business sector and net sales from the project business of the Semiconductor Solutions business unit in the Electronics business sector.

Orders already received by the reporting date that will result in net sales in future periods amounted to around € 6 billion as of December 31, 2022 (December 31, 2021: around € 6 billion), of which around € 4 billion related to the Life Science business sector (December 31, 2021: around € 5 billion). Around 10% is expected to result in net sales in fiscal 2024 or in following years (December 31, 2021: around 6% in fiscal 2023 or later).

The following table shows the change in refund liabilities:

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**

2022

	Rebates/Bonus payments		Rights of return		
€ million	Total	thereof: United States	Total	thereof: United States	**Total**
Jan. 1, 2022	**784**	**445**	**55**	**35**	**839**
Additions due to business combinations	–	–	–	–	**–**
Other additions	2,470	1,902	56	40	**2,526**
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	**–**
Utilizations	-2,270	-1,739	-43	-29	**-2,313**
Cumulative increase (-)/decrease (+) in net sales	-159	-147	-9	-6	**-168**
thereof: attributable to performance obligations satisfied in prior periods	-118	-115	–	–	**-118**
Currency translation	29	31	2	2	**31**
Other	-3	–	–	–	**-3**
Dec. 31, 2022	**850**	**492**	**62**	**43**	**912**

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.

The cost of sales included amortization of intangible assets (excluding amortization of internally generated or separately acquired software) in the amount of € 207 million (2021: € 201 million). Material costs amounted to € 3,996 million in fiscal 2022 (2021: € 3,535 million) and were largely reported under cost of sales.

Impairment losses on inventories amounted to € 279 million (2021: € 221 million) in the reporting period, while reversals of impairment losses amounted to € 197 million (2021: € 171 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, licenses and similar rights, brands, and trademarks.

Marketing and selling expenses comprised the following items:

€ million	**2022**	2021
Sales force	-971	-891
Internal sales services	-972	-886
Sales promotion	-476	-461
Logistics	-1,193	-985
Amortization of intangible assets[1]	-616	-589
Royalty and license expenses	-137	-166
Other marketing and selling expenses	-348	-325
Marketing and selling expenses	**-4,714**	**-4,304**

[1] Excluding amortization of internally generated or separately acquired software.

In line with business development, the increase in expenses for the internal and external sales force was due to higher personnel and travel costs. In addition to the higher sales volume, the increase in logistics expenses was due to price rises caused by capacity bottlenecks in international goods transportation.

Of the royalty and license expenses, € 53 million (2021: € 48 million) related to the commercialization of Erbitux®.

(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 € 23 million in fiscal 2022 (2021: € 100 million). This decline was essentially due to the mutual decision to end the strategic alliance with GlaxoSmithKline plc, United Kingdom, in the field of immuno-oncology with effect from September 30, 2021 (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	**2022**	2021
Income from upfront payments, milestone payments and royalties	105	304
Realized gains from currency translation	71	6
Income from the disposal of businesses and assets	63	67
Income from the revaluation of contingent considerations	45	7
Income from fair value measurement of assets	38	3
Income from the reversal of provisions for litigation	24	27
Income from miscellaneous services	7	5
Reversal of impairment losses on non-financial assets	–	14
Remaining other operating income	132	96
Other operating income	**486**	**528**

License income primarily resulted from interferon beta products (Biogen Inc., United States) in the amount of € 55 million (2021: € 60 million) and the antidepressant Viibryd® (AbbVie Inc., United States) in the amount of € 27 million (2021: € 50 million). The year-on-year decrease in upfront payments, milestone payments, and royalties was due to the termination of the collaboration agreement with GlaxoSmithKline plc, United Kingdom (2021: € 123 million). The prior-year figure also included milestone payments of € 50 million from Pfizer Inc., United States, for approvals of Bavencio®. For further explanations see Note (7) "**Collaboration and licensing agreements**".

For information on income from the reversal of provisions for litigation, see 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	**2022**	2021[1]
Profit share agreements	-275	-178
Impairment losses on non-financial assets	-232	-68
Currency effects from operating activities	-154	-1
Non-income related taxes	-68	-58
Project expenses (including integration and IT projects)	-67	-56
Loss from hyperinflation accounting	-67	-18
Premiums, fees and contributions	-45	-42
Expenses from Litigation	-30	-19
Restructuring expenses	-12	-7
Expenses for miscellaneous services	-11	-12
Expenses from disposal of businesses and assets	-9	-4
Expenses from fair value measurement of assets	-8	-8
Expenses on revaluation of contingent considerations	-1	-28
Remaining other operating expenses	-191	-230
Other operating expenses	**-1,170**	**-730**

[1] Adjustment of prior-year figures due to a change in functional allocation within Corporate and Other.

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 € 211 million (2021: € 47 million) and to property, plant, and equipment (see Note (20) "**Property, plant, and equipment**") in the amount of € 21 million (2021: € 22 million).

Currency effects from operating activities primarily resulted from cash flow hedges in U.S. dollars.

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 for planned dividend payments within the next twelve months of profits already generated are recognized.

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.

With regard to 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	**2022**	2021
Current income taxes in the period	-1,344	-1,078
Income taxes for previous periods	28	45
Deferred taxes in the period	369	174
thereof: from temporary differences	338	206
thereof: from changes in tax rates	12	-23
thereof: from tax loss carryforwards	19	-9
Income taxes	**-948**	**-859**

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% (2021: 31.7%).

€ million	**2022**	2021
Profit before income tax	4,287	3,924
Tax rate	31.7%	31.7%
Theoretical income tax expense	-1,360	-1,245
Tax rate differences	568	424
Tax effect of companies with a negative contribution to consolidated profit	-71	-33
Income tax for previous periods	28	45
Tax credits	-79	-30
Tax effect on tax loss carryforwards	14	29
Tax effect of non-deductible expenses/Tax-free income/Other tax effects	-48	-49
Income tax expense according to consolidated income statement	**-948**	**-859**
Tax ratio according to consolidated income statement	**22.1%**	**21.9%**

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 2022 resulted in particular from completed tax audits, changes in income tax liabilities for risks from tax audits, and tax assessments for previous years.

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	**2022**	2021
Change in deferred tax assets (consolidated balance sheet)	-193	-40
Change in deferred tax liabilities (consolidated balance sheet)	133	30
Deferred taxes credited/debited to equity	305	119
Changes in scope of consolidation/Currency translation/other changes	124	66
Deferred taxes (consolidated income statement)	**369**	**174**

As in the previous year, the item "Changes in scope of consolidation/currency translation/other changes" mainly comprised exchange rate effects for items translated from U.S. dollars to the reporting currency (euro). Additionally, deferred taxes resulted from the acquisition of Exelead Inc., United States, in fiscal 2022.

Changes in tax loss carryforwards

Tax loss carryforwards were structured as follows:

	Dec. 31, 2022			Dec. 31, 2021[1]		
€ million	**Germany**	**Outside Germany**	**Total**	Germany	Outside Germany	Total
Tax loss carryforwards	**321**	**677**	**998**	**136**	**683**	**819**
Tax loss carryforwards for which a deferred tax asset is recognized	–	136	136	2	60	62
Tax loss carryforwards for which no deferred tax asset is recognized	321	541	862	134	623	757
Potential deferred tax assets for tax loss carryforwards	**98**	**165**	**263**	**41**	**166**	**207**
Recognized deferred tax assets on tax loss carryforwards	–	30	30	–	11	11
Not recognized deferred tax assets on tax loss carryforwards	98	135	233	41	155	196

[1] Prior year's figures for outside Germany were adjusted.

The majority of the tax loss carryforwards either had no expiry date or can be utilized for up to 20 years.

Deferred tax assets resulting from tax loss carryforwards that exceed deferred tax liabilities relating to the same taxation authority and the same taxable entity are not recognized if it is not considered probable that taxable profit will be available against which they can be utilized.

Deferred taxes (consolidated balance sheet)

Deferred tax assets and liabilities related to the following balance sheet items:

	Dec. 31, 2022		Dec. 31, 2021	
€ million	**Assets**	**Liabilities**	Assets	Liabilities
Intangible assets	112	1,365	99	1,527
Property, plant and equipment	39	168	35	103
Current and non-current financial assets	–	32	1	7
Inventories	846	23	757	20
Current and non-current receivables/Other assets	66	15	90	9
Current and non-current provisions	526	51	859	57
Current and non-current liabilities	170	49	85	68
Tax loss carryforwards	30	–	11	–
Tax refund claims/Other	41	96	42	99
Deferred taxes (before offsetting)	**1,829**	**1,798**	**1,980**	**1,889**
Offset deferred tax assets and liabilities	-520	-520	-478	-478
Deferred taxes (consolidated balance sheet)	**1,310**	**1,279**	**1,502**	**1,411**

The decrease in deferred taxes according to the consolidated balance sheet was due in particular to lower deductible temporary differences resulting from the remeasurement of the net defined benefit obligation through other comprehensive income. This effect was partially offset by the higher level of temporary differences on the elimination of intragroup profits.

Given the positive earnings forecasts, it was assumed that it will be possible to realize recognized deferred tax assets of € 191 million (December 31, 2021: € 82 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 € 71 million (December 31, 2021: € 57 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 € 79 million (December 31, 2021: € 93 million). Retained earnings of subsidiaries for which no deferred taxes are recognized amounted to € 10,249 million as of December 31, 2022 (December 31, 2021: € 8,553 million). The resulting temporary differences that will be taxable in future periods in the event of dividend payments would amount to € 582 million as of December 31, 2022 (December 31, 2021: € 476 million).

Income tax receivables and income tax liabilities

Income tax receivables amounted to € 456 million as of December 31, 2022 (December 31, 2021: € 502 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, 2022, income tax liabilities including liabilities for uncertain tax obligations totaled € 1,522 million (December 31, 2021: € 1,462 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 € 1,344 million in fiscal 2022 (2021: € 1,135 million). Tax refunds received amounted to € 145 million (2021: € 90 million).

Interest paid totaled € 185 million (2021: € 216 million).

(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 2022. The weighted average (basic) number of shares was 434,777,878 and thus corresponded to the number of theoretical shares outstanding. In fiscal 2022 and 2021, 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 in the Group is monitored for internal management purposes.

Impairment testing is performed on a scheduled basis in the third quarter of every year and on an ad hoc basis where there are indications of impairment. The existence of indications of impairment may be monitored using various factors such as changes in short-term and medium-term planning, sector studies, analyst forecasts, validation multiples, and the Group's average market capitalization compared to its balance sheet equity.

In the 2022 reporting year, the recoverable amount for the Life Science and Electronics CGUs was primarily determined on the basis of the fair value less costs of disposal (2021: on the basis of the value in use). As in the previous year, the determination of the recoverable amount for the Healthcare CGU in fiscal 2022 was based on the value in use.

For both fair value less cost of disposal and value in use, the recoverable amount is calculated in accordance with the discounted cash flow method (Level 3 in the IFRS 13 fair value hierarchy).

In calculating the fair value, the expected post-tax cash flows are derived from the medium-term plans prepared by the business sectors. Due to extensive investments in the Life Science and Electronics CGUs, the fourth planning year after the detailed planning period for both of these CGUs is extrapolated for an additional four years in line with business-specific assumptions before being converted to the terminal value by applying a long-term growth rate (2021: transition to the terminal value after four years starting from the following year). In the Healthcare CGU, the transition to the terminal value takes place after four years starting from the following year. Sales planning is based on internal past experience and largely non-observable input factors in the market, such as future market shares, selling prices and volumes, and new products from the development pipeline and expansion investments. Profit margins are based on past experience adjusted for expected profitability developments.

In calculating the value in use, the most recent medium-term plan approved by the Executive Board, with a detailed planning period of four years starting from the following year, serves as the basis for planning. Sales planning is based on past experience and assumptions regarding future market shares, selling prices and volumes. Expected cash inflows and outflows from new products from the Healthcare development pipeline and expansion investments are not included in the calculation of value in use. Profit margins are based on past experience 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 sector specific 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

In the Life Science CGU, the expected average sales growth in the period until the transition to the terminal value was a higher single-digit percentage (2021: higher single-digit percentage in the detailed planning period). The sales expectation for ZMGE Life Science is supported primarily by the anticipated long-term positive development in the Process Solutions and Life Science Services business units, based on ongoing high market growth and the continuing expansion of the portfolio and production capacities. Taking into account Group costs allocated on a pro rata basis, the EBITDA pre margin applied was around 34% (2021: around 32%).

The expected average sales growth in the Healthcare CGU amounted to a mid single-digit percentage rate in the detailed planning period (2021: lower single-digit percentage rate). In line with the value-in-use concept, this did not include net sales from the launch of new products.

The calculation of the recoverable amount of the Electronics CGU included the expected average sales growth in the period until the transition to the terminal value at a higher single-digit percentage (2021: mid single-digit percentage in the detailed planning period). The sales expectation for ZMGE Electronics results primarily from the long-term growth trend in the market for semiconductor materials and positive sales contributions from the Level Up growth program with an investment volume exceeding € 3 billion by the end of 2025. Taking into account Group costs allocated on a pro rata basis, the EBITDA pre margin applied in impairment testing was around 30% in both fiscal 2022 and 2021.

The additional significant value-relevant assumptions underlying the goodwill impairment tests are quantified below.

	Long-term growth rate		Weighted cost of capital after tax	
in %	**2022**	2021	**2022**	**2021**
Life Science[1]	2.00%	1.75%	7.5%	5.5%
Healthcare[2]	0.00%	0.00%	5.6%	5.5%
Electronics[3]	2.00%	1.00%	7.1%	5.4%

[1] The previous-year weighted cost of capital before taxes to determine the value in use of the CGU Life Science was 6.7%.

[2] The weighted cost of capital before taxes to determine the value in use of the CGU Healthcare for fiscal 2022 was 7.3% (previous-year 7.4%).

[3] The previous-year weighted cost of capital before taxes to determine the value in use of the CGU Electronics was 6.7%.

The increase in the long-term growth rate was due in particular to higher expectations with regard to long-term inflation expectations. Net cash flows were discounted using the cost of capital after taxes. For the calculation of the value in use, the cost of capital before taxes as shown below the table was 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. Although the Group assumes that the assumptions applied in calculating the recoverable amount are appropriate, changes to these assumptions could result in goodwill impairment with an adverse impact on the net assets, financial position, and results of operations. In the Electronics CGU in particular, there is a high degree of dependence on the assumptions concerning the long-term growth trend in the market for semiconductor materials.

As in the previous year, the recoverable amount in impairment testing in fiscal 2022 was more than 15% higher than the carrying amount of the respective CGU for both fair value less cost of disposal and value in use. Regardless of this, the planning data and recoverable amounts applied were checked for plausibility against externally available analyst assessments and “sum of the parts” calculations and validated using multiples based on peer group information.

In addition, sensitivity analyses of the key assumptions were performed as part of the scheduled impairment tests. The following table presents the minimum amount by which individual key assumptions could have changed when viewed in isolation before the impairment test triggered the recognition of an impairment loss.

	Decrease in net cash flows		**Decrease in long-term growth rate**		**Increase in cost of capital after tax**	
	%		percentage points		percentage points	
	2022	2021	**2022**	2021	**2022**	2021
Life Science	>10	>10	>2	>2	>2	>2
Healthcare	>10	>10	>2	>2	>2	>2
Electronics	>10	>10	>2	>2	>2	>2

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**
Net carrying amounts, Jan. 1, 2021	**10,287**	**1,525**	**4,146**	**15,959**
Other additions	–	–	–	–
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–
Transfers	-4	–	–	-4
Impairment losses	–	–	–	–
Currency translation difference	776	–	273	1,050
Net carrying amounts as of Dec. 31, 2021	**11,059**	**1,525**	**4,420**	**17,004**
Net carrying amounts, Jan. 1, 2022	**11,059**	**1,525**	**4,420**	**17,004**
Additions	536	–	46	582
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–
Transfers	–	–	–	–
Impairment losses	–	–	–	–
Currency translation difference	619	–	209	828
Net carrying amounts as of Dec. 31, 2022	**12,214**	**1,525**	**4,675**	**18,414**

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 2021 or fiscal 2022.

The additions in fiscal 2022 resulted in particular from the acquisition of Exelead Inc., United States (see Note (6) "**Acquisitions and divestments**").

(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.

The identification of indications of impairment takes place once a year or on an ad hoc basis if warranted with the involvement of the responsible departments, 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. An impairment test is performed if there are indications of impairment. 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 € 83 million lower in fiscal 2022 (previous year: € 80 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	Total
		Finite useful life	Not yet available for use		
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	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	678	154	13	32	878
Dec. 31, 2021	**9,825**	**11,305**	**1,235**	**1,058**	**23,423**
Accumulated amortization 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	-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**
Cost as of Jan. 1, 2022	**9,825**	**11,305**	**1,235**	**1,058**	**23,423**
Additions due to business combinations	97	63	–	–	160
Other additions	–	55	166	93	314
Disposals due to divestments/ Reclassification to assets held for sale	–	–	–	–	–
Other disposals	-17	-236	-11	-83	-347
Transfers	–	23	-23	4	2
Currency translation	487	59	13	24	582
Dec. 31, 2022	**10,391**	**11,268**	**1,379**	**1,096**	**24,135**
Accumulated depreciation and impairment losses as of Jan. 1, 2022	**-3,989**	**-10,443**	**-720**	**-659**	**-15,810**
Depreciation, amortization, and write-downs	-602	-229	–	-102	-932
Impairment losses	-9	-18	-180	-3	-211
Reversals of impairment losses	–	–	–	–	–
Disposals due to divestments/ Reclassification to assets held for sale	–	–	–	–	–
Other disposals	17	231	–	83	331
Transfers	–	-14	15	-1	–
Currency translation	-160	-36	-1	-13	-211
Dec. 31, 2022	**-4,743**	**-10,509**	**-887**	**-695**	**-16,833**
Net carrying amounts as of Dec. 31, 2022	**5,648**	**759**	**493**	**401**	**7,302**

Additions and disposals

Additions due to business combinations amounted to € 160 million in fiscal 2022 (2021: € 0 million) and were mainly attributable to the acquisition of Exelead Inc., United States, which was completed on February 22, 2022. See Note (6) “**Acquisitions and divestments**” for further information.

Additions for intangible assets not yet available for use amounted to € 166 million (2021: € 186 million). These were mainly attributable to the Healthcare business sector, and in particular to an upfront payment in a mid-double-digit million euro amount in connection with the acquisition of Chord Therapeutics SA, Switzerland.

A further € 55 million (2021: € 103 million) related to additions for market authorizations, patents, licenses, similar rights, and other items with a finite useful life, especially in the Life Science business sector.

Software additions of € 93 million (2021: € 85 million) primarily related to the internal development of IT applications. The gross carrying amounts and accumulated amortization for the capitalized software primarily related to purchased software as well as internally generated applications and enhancements of purchased ERP programs that were already available for use.

Disposals of marketing authorizations, patents, licenses, similar rights, other items, and software primarily related to the derecognition of right-of-use assets and software applications that have already been written down and that are no longer active.

Loss allowances

Impairment losses amounting to € 211 million (2021: € 47 million) were recognized on an ad hoc basis for other intangible assets in fiscal 2022. Of this figure, € 180 million (2021: € 38 million) related to intangible assets not yet available for use, mainly in the Healthcare business sector. A high double-digit million euro amount was recognized on the intangible asset attributable to the rights to the drug candidate berzosertib. Following an interim analysis of a global Phase II study of the ATR inhibitor berzosertib in combination with topotecan in patients with a certain form of lung cancer, it was decided to discontinue the trial owing to the low probability of achieving the predefined study target. Accordingly, the intangible asset was written off in full in the second quarter of 2022.

Other significant information

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, 2022**	Total Dec. 31, 2021
Customer relationships, brands and trademarks		**3,698**	**–**	**1,950**	**5,648**	**5,836**
Customer relationships	3.5–15.8	3,287	–	1,930	5,216	5,321
thereof from the following acquisitions:						
Sigma-Aldrich Corporation	13.8–14.8	2,916	–	131	3,048	3,078
Versum Materials, Inc.	3.8–15.8	–	–	1,798	1,798	1,895
Millipore Corporation	3.5–4.5	239	–	–	239	298
Brands and trademarks	1.5–4.9	411	–	21	432	515
thereof from the following acquisition:						
Sigma-Aldrich Corporation	4.9	366	–	–	366	416
Marketing authorizations, patents, licenses and similar rights and other						
Finite useful life	**–**	**244**	**124**	**391**	**759**	**862**
Marketing authorizations	–	–	–	–	–	1
Patents, licenses and similar rights	0.3–10.3	243	–	380	623	722
thereof from the following acquisitions:						
AZ Electronic Materials S.A.	0.3–10.3	–	–	170	170	257
Versum Materials, Inc.	1.8–3.8	–	–	164	164	201
Others	–	1	124	11	135	138
Not yet available for use	**–**	**18**	**341**	**134**	**493**	**515**
thereof from the following acquisition:						
Versum Materials, Inc.	–	–	–	115	115	118

(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 as of Jan. 1, 2021	**4,969**	**5,245**	**1,649**	**1,365**	**13,229**
Additions due to business combinations	–	–	–	–	–
Other Additions	130	35	73	1,205	1,443
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	–
Other 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 as of Jan. 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**
Cost as of Jan. 1, 2022	**5,464**	**5,687**	**1,754**	**1,905**	**14,810**
Changes in the scope of consolidation	47	18	4	11	81
Additions	182	42	77	1,429	1,730
Reclassification to assets held for sale	–	–	–	–	–
Disposals	-88	-94	-95	-6	-282
Transfers	290	512	127	-930	-1
Currency translation difference	80	63	12	20	175
Dec. 31, 2022	**5,975**	**6,228**	**1,879**	**2,429**	**16,511**
Accumulated depreciation and impairment losses as of Jan. 1, 2022	**-2,304**	**-3,987**	**-1,287**	**-15**	**-7,593**
Depreciation	-319	-374	-173	–	-866
Impairment losses	–	-19	–	-3	-21
Reversals of impairment losses	–	–	–	–	–
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	–
Disposals	67	84	91	1	244
Transfers	-6	11	-1	-5	-1
Currency translation difference	-26	-35	-10	–	-70
Dec. 31, 2022	**-2,588**	**-4,319**	**-1,380**	**-21**	**-8,308**
Net carrying amounts as of Dec. 31, 2022	**3,387**	**1,909**	**499**	**2,408**	**8,203**

The individual additions to construction in progress in fiscal 2022 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	Filtration plant	Ireland
Healthcare	Biotech development system	Switzerland

(21) Leasing

Accounting and measurement policies

Leasing

Scope of IFRS 16

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 12 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 leases accounted for around 50% of total lease liabilities in fiscal 2022 and 2021. 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 € 219 million (2021: € 145 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, termination 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, 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**

	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, 2022	**382**	**9**	**56**	**447**
Changes in the scope of consolidation	7	–	–	7
Additions	160	–	43	203
Disposals	-16	-1	-3	-19
Depreciation	-112	-3	-37	-152
Impairment losses	–	–	–	–
Reversal of impairment losses	–	–	–	–
Other	-6	2	-1	-5
Net carrying amounts as of Dec. 31, 2022	**415**	**8**	**58**	**481**

The net carrying amounts of other facilities, operating and office equipment mainly included the right-of-use assets for vehicles.

The additions to land, land rights, and buildings primarily related to newly agreed right-of-use assets for land and warehouses as well as agreed lease renewals.

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	**2022**	2021
Right-of-use assets		
Depreciation	-152	-140
Impairment losses	–	–
Reversals of impairment losses	–	–
Expenses for leasing low-value assets	-14	-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	-13	-10
Total	**-179**	**-168**

€ million	**2022**	2021
Operating Cash flow	-26	-28
Financing Cash Flow	-150	-141
Total	**-176**	**-169**

At the reporting date, the future lease payments were distributed over the following periods:

December 31, 2022

€ million	Within 1 year	1-5 years	After more than 5 years	**Total**
Future lease payments	132	281	111	524
Interest portion of future payments	-9	-17	-9	-35
Present value of future lease payments	**123**	**264**	**101**	**488**

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**

(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, 2022			Dec. 31, 2021		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Receivables from non-income related taxes	346	3	349	428	7	434
Prepaid expenses	210	29	239	142	15	157
Assets from defined benefit plans	46	–	46	5	–	5
Remaining other assets	103	67	170	89	73	162
Other non-financial assets	**705**	**99**	**804**	**663**	**95**	**758**

(23) Cash flow from investing activities

Payments for investments in intangible assets included an upfront payment for the acquisition of rights to the strategic expansion of the neurology pipeline (see Note (19) "**Other intangible assets**").

In particular, payments for investments in intangible assets in the previous year 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.

Payments for acquisitions less acquired cash and cash equivalents were primarily attributable to the acquisition of Exelead Inc., United States, M Chemicals Inc., Korea, and Erbi Biosystems Inc., United States (see Note (6) "**Acquisitions and divestments**").

Net cash outflows for investments in financial assets amounting to € 364 million (2021: € 269 million) mainly resulted from short-term investments in securities and fixed-term deposits that did not meet the requirements for classification as cash and cash equivalents as well as investments in M Ventures portfolio companies.

Net cash inflows from the disposal of other financial assets amounted to € 219 million (2021: € 69 million) and essentially related to the sale of short-term investments in securities and the termination of fixed-term deposits.

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.

(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, 2022**	Dec. 31, 2021[1]
Raw materials and supplies	1,076	803
Work in progress	1,418	798
Finished goods/goods for resale	2,139	2,299
Inventories	**4,632**	**3,900**

[1] The previous year's figures have been adjusted to improve comparability, as the further standardization of the ERP systems in the Life Science business sector resulted in a different allocation to the individual items in the financial year.

The increase in inventories in fiscal 2022 was driven by all three business sectors. Whereas the upturn in the Healthcare business sector was only minor, the Life Science and Electronics business sectors saw significant growth in inventories. This development was driven in particular by the Process Solutions business unit in the Life Science business sector and the Semiconductor Solutions business unit in the Electronics business sector. The reasons were a need to build up stocks of raw materials and work in progress in order to secure production and supply, as well as delays in global logistics processes.

Impairment losses 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 has an operative nature. 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, 2022			Dec. 31, 2021		
€ 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	4,046	22	4,069	3,556	20	3,576
Gross other receivables	136	–	136	156	–	156
Gross trade and other receivables	**4,182**	**22**	**4,204**	**3,712**	**20**	**3,732**
Loss allowances on trade accounts receivable	-63	–	-63	-58	–	-59
Loss allowances on other receivables	-1	–	-1	-2	–	-2
Net trade and other receivables	**4,119**	**22**	**4,141**	**3,652**	**20**	**3,672**
thereof: current	4,091	22	4,114	3,626	20	3,646
thereof: non-current	27	–	27	25	–	25

The increase in trade accounts receivable is mainly attributable to the positive sales performance in the Life Science and Healthcare business sectors. Currency translation also resulted in higher trade accounts receivable.

Trade accounts receivable in Italy with a nominal value of € 68 million (2021: € 37 million) were sold for € 68 million (2021: € 37 million). These receivables did not involve any further rights of recourse against the Group.

(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	2022	2021
Jan. 1	**207**	**169**
Additions due to business combinations	10	–
Other additions	360	553
thereof: attributable to performance obligations satisfied in prior periods	2	2
Disposals due to divestments/Reclassification to assets held for sale	–	–
Reclassification to trade accounts receivable	-451	-522
Currency effects	1	7
Other	1	–
Dec. 31	**128**	**207**

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, 2022	**97**	**126**	**153**	**77**	**94**	**100**	**647**
Additions	20	79	26	105	28	48	306
Utilizations	-8	-59	-5	-31	-1	-29	-132
Release	-27	-12	-2	-23	-34	-30	-127
Interest effect	–	–	-25	–	–	–	-25
Currency translation	1	1	–	–	1	–	3
Changes in scope of consolidation/other	1	–	–	–	–	1	1
Dec. 31, 2022	**85**	**134**	**148**	**127**	**88**	**91**	**672**
thereof: current	65	43	16	109	88	51	372
thereof: non-current	19	91	132	18	–	39	299

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.

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.

Antitrust and other proceedings

The most important legal matters in the reporting period are detailed below.

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 (EC) 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, 2022. A cash outflow within the next twelve 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 and set a fine. 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 confirmed in May 2021 the low single-digit million euro fine that the Group paid in September 2021. British National Health Services subsequently asserted claims for damages on account of the anti-competitive settlement agreements in 2002. The Group and the National Health Service for England and Wales agreed on a settlement payment in December 2022. The payment was made in January 2023. The previous provision in a low double-digit million euro amount was reversed almost in full.

Restructuring

The restructuring provisions recognized as of December 31, 2022, primarily relate to obligations for workforce reduction measures in connection with communicated restructuring plans in all business sectors. In particular, this resulted from programs for the reorganization of global research and development activities as well as the sales structures 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 and utilizations 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 in the amount of € 86 million (December 31, 2021: € 109 million) related almost exclusively to litigation and tax matters.

Contingent liabilities from litigation mainly related to obligations under labor law and tort law. The contingent liabilities from tax matters primarily related to the determination of earnings under tax law, customs regulations, and excise tax matters.

In addition, there were contingent liabilities from various legal disputes with Merck & Co. Inc., Kenilworth, NJ, United States (outside the United States and Canada: Merck Sharp & Dohme Corp. (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, Merck KGaA, Darmstadt, Germany, 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 included in the total figure for contingent liabilities.

(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.

Other non-financial liabilities comprise the following:

	Dec. 31, 2022			Dec. 31, 2021		
€ million	Current	Non-current	Total	Current	Non-current	Total
Accruals for personnel expenses	998	–	998	980	–	980
Liabilities from non-income related taxes	200	1	202	226	1	228
Contract liabilities	282	3	285	198	3	202
Other accruals	26	10	36	64	10	74
Other non-financial liabilities	**1,507**	**14**	**1,521**	**1,468**	**15**	**1,483**

The increase in current contract liabilities was mainly attributable to the project business of the Semiconductor Solutions business unit in the Electronics business sector.

The following table shows the development of contract liabilities in the period under review:

	2022			2021		
€ million	Current	Non-current	Total	Current	Non-current	Total
Jan. 1	**198**	**3**	**202**	**304**	**47**	**351**
Additions due to business combinations	1	–	1	–	–	–
Other additions	1,276	1	1,277	1,283	2	1,284
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	–	–
Recognition of income/reversal	-1,194	–	-1,195	-1,435	-1	-1,437
Cumulative catch-up adjustments to revenue	–	–	–	-9	–	-9
Reclassification from non-current to current	1	-1	–	44	-44	–
Currency translation	–	–	–	12	–	12
Other	–	–	–	–	–	–
Dec. 31	**282**	**3**	**285**	**198**	**3**	**202**

As of January 1, 2022, contract liabilities amounted to € 202 million (January 1, 2021: € 351 million), of which a total of € 181 million (2021: € 308 million) was recognized through profit or loss in fiscal 2022.

(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 € 903 million (December 31, 2021: € 838 million) from outstanding invoices.

Employees

(31) Number of employees

The number of employees was 64,232 as of December 31, 2022 (December 31, 2021: 60,334 employees).

The following table shows the average number of employees broken down by function.

	2022	2021
Production	22,086	19,782
Administration	11,886	11,820
Research and development	7,334	7,167
Supply chain	4,850	4,557
Marketing and sales	15,087	14,298
Other	1,309	1,082
Average number of employees	**62,552**	**58,706**

(32) Personnel expenses

Personnel expenses comprised the following:

€ million	**2022**	2021
Wages and salaries	5,340	4,824
Compulsory social security contributions and other costs	844	748
Pension expenses	460	461
Personnel expenses	**6,644**	**6,033**

Personnel expenses comprised expenses of € 200 million (2021: € 170 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 € 92 million (2021: € 87 million) were transferred to the German statutory pension insurance system and € 105 million (2021: € 88 million) to statutory pension insurance systems abroad.

(33) Provisions for employee benefits

Provisions for employee benefits are composed as follows:

€ million	**Dec. 31, 2022**	Dec. 31, 2021
Provisions for pensions and other post-employment benefits	1,731	3,001
Non-current other employee benefit provisions	299	401
Non-current provisions for employee benefits	**2,030**	**3,402**
Current provisions for employee benefits	**239**	**224**
Provisions for employee benefits	**2,269**	**3,625**

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).

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	
	2022	2021	**2022**	2021	**2022**	2021	**2022**	2021
Discount rate	3.74%	1.28%	2.15%	0.30%	4.95%	1.79%	4.49%	2.22%
Future salary increases	2.76%	2.51%	2.70%	1.89%	–	–	3.76%	3.14%
Future pension increases	2.14%	1.74%	0.03%	–	2.89%	3.11%	2.20%	1.52%
Duration	17	22	15	17	15	20	11	13

The increased discount rate level resulted in a decrease in the present value of the defined benefit obligations as well as a decreased duration of the obligations.

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, 2022

€ 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	-224	-61	-24	-17	-325
the discount rate were 50 basis points lower	256	69	26	18	370
the expected rate of future salary increase were 50 basis points higher	74	5	–	10	89
the expected rate of future salary increase were 50 basis points lower	-66	-5	–	-9	-80
the expected rate of future pension increase were 50 basis points higher	140	35	16	5	197
the expected rate of future pension increase were 50 basis points lower	-128	-2	-12	-5	-148
the life expectancy were 1 year higher	95	21	9		
the life expectancy were 1 year lower	-96	-22	-9		

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
the life expectancy were 1 year higher	168	30	24		
the life expectancy were 1 year lower	-168	-31	-23		

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.

Newly hired employees are only 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, 2022**	Dec. 31, 2021
Present value of all defined benefit obligations	**4,287**	**5,995**
Fair value of the plan assets	-2,634	-2,999
Funded status	**1,652**	**2,996**
Effects of the asset ceilings	33	–
Net defined benefit liability	**1,685**	**2,996**
Assets from defined benefit plans	46	5
Provisions for pensions and other post-employment benefits	**1,731**	**3,001**

The reduction was mainly due to the significant rise in the discount factors.

The defined benefit obligations were based on the following types of benefits provided by the respective plan:

	Dec. 31, 2022				
€ million	Germany	Switzerland	United Kingdom	Other countries	**Total**
Benefit based on final salary					
Annuity	2,186	1	327	72	2,586
Lump sum	–	–	–	130	130
Installments	2	–	–	–	2
Benefit not based on final salary					
Annuity	555	879	–	62	1,496
Lump sum	4	–	4	33	41
Installments	5	–	–	–	5
Other	–	–	–	5	5
Medical plan	–	–	–	22	22
Present value of defined benefit obligations	**2,752**	**881**	**332**	**323**	**4,287**
Fair value of the plan assets	**1,202**	**909**	**372**	**152**	**2,634**

	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**

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 by the Group. 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:

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**

2022

€ 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, 2022	**-5,995**	**2,999**	**–**	**-2,996**
Current service cost	-203	–	–	-203
Interest expense	-73	–	–	-73
Interest income	–	34	–	34
Plan administration costs recognized in income	–	-3	–	-3
Past service cost	-1	–	–	-1
Gains (+) or losses (-) on settlement	–	–	–	–
Currency effects recognized in income	-30	30	–	–
Other effects recognized in income	1	-2	–	-1
Items recognized in income	**-306**	**59**	**–**	**-247**
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (-) arising from changes in demographic assumptions	7	–	–	7
Actuarial gains (+)/losses (-) arising from changes in financial assumptions	2,099	–	–	2,099
Actuarial gains (+)/losses (-) arising from experience adjustments	-205	–	–	-205
Remeasurements of plan assets				
Actuarial gains (+)/losses (-) arising from experience adjustments	–	-429	–	-429
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (-)	–	–	-32	-32
Actuarial gains (+)/losses (-)	**1,901**	**-429**	**-32**	**1,440**
Pension payments	140	-52	–	88
Employer contributions	–	42	–	42
Employee contributions	-20	19	–	-1
Payment transactions	**120**	**9**	**–**	**129**
Changes in the scope of consolidation	-1	1	–	–
Currency translation recognized in equity	-3	-6	-1	-10
Other changes	-2	1	–	-1
Other	**-6**	**-4**	**-1**	**-11**
December 31, 2022	**-4,287**	**2,634**	**-33**	**-1,685**

The actual loss from plan assets amounted to € 395 million in the year under review (2021: income of € 164 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, 2022			Dec. 31, 2021		
€ 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	58	–	58	85	–	85
Equity instruments	636	–	636	769	–	769
Debt instruments	968	–	968	1,281	–	1,281
Real estate	179	321	500	184	301	485
Investment funds	140	204	344	152	111	263
Insurance contracts	–	64	64	–	71	71
Other	59	5	64	39	6	45
Fair value of the plan assets	**2,040**	**594**	**2,634**	**2,510**	**489**	**2,999**

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 € 42 million (2021: € 37 million) and € 95 million (2021: € 84 million) respectively.

The expected payments of undiscounted benefits under the plans were as follows:

December 31, 2022

	Expected payments of undiscounted benefits				
€ million	**Germany**	**Switzerland**	**United Kingdom**	**Other countries**	**Total**
2023	85	23	19	38	165
2024	91	22	19	22	155
2025	95	22	20	26	163
2026	99	22	20	23	164
2027	103	22	21	22	168
2028-2032	583	112	116	130	940

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

The weighted duration of defined benefit obligations amounted to 16 years (2021: 21 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, 2022	**401**	**224**	**624**
Additions	136	164	300
Utilizations	-20	-208	-228
Release	-79	-96	-175
Interest effect	1	–	1
Currency translation	10	3	13
Reclassification from non-current to current	-151	151	–
Changes in scope of consolidation/other	2	–	2
Dec. 31, 2022	**299**	**239**	**538**

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 recognized in income in the compensation program. A sustainability factor was also included in the valuation parameters for the tranche issued in fiscal 2022.

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, 2022: € 97 million/carrying amount as of December 31, 2021: € 184 million) would have been impacted by changes in the DAX® or the closing price of the Group share 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, 2022**	Dec. 31, 2021
Variation of Group share price	10%	20	5
	-10%	-18	-9
Change in the DAX®	10%	-10	-2
	-10%	8	–

Sensitivities were determined on the basis of the respective parameters in question, with all other measurement assumptions remaining unchanged. The 2020 tranche reported under current provisions will not be subject to any value fluctuations between December 31, 2022, and the payout date and was therefore excluded from the sensitivity analysis (December 31, 2021: exclusion of 2019 tranche).

These share-based compensation programs with cash settlement in place in 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 financial key performance indicators (KPIs). In addition to the financial KPIs, a sustainability factor is included in performance measurement for the tranche issued in fiscal 2022.

The calculation is based on the performance of the Group share price 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 these financial 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.

For the tranche issued in fiscal 2022, the MSUs measured on the basis of financial targets are multiplied by a sustainability factor composed of the three sustainability criteria: “Dedicated to human progress” (20% weighting), “Creating sustainable value chains” (40% weighting), and “Reducing our ecological footprint” (40% weighting). This factor can range from 0.8 to 1.2. This means that, depending on the result of the financial KPIs (0% to -150%) and the sustainability factor, the eligible participants are granted between 0% and 180% of the MSUs they could be eligible to receive at the end of the respective performance cycle.

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:

	2020 tranche	2021 tranche	**2022 tranche**
Performance cycle	Jan. 1, 2020 - Dec. 31, 2022	Jan. 1, 2021 - Dec. 31, 2023	Jan. 1, 2022 - Dec. 31, 2024
Term	3 Years	3 Years	3 Years
Reference price of the shares of Merck KGaA, Darmstadt, Germany, in € (60-day average Group share price prior to the start of the performance cycle)	105.52	132.43	212.16
DAX® value (60-day average of the DAX® prior to the start of the performance cycle)	12,971.22	12,995.23	15,684.57
Potential number of MSU			
Potential number offered for the first time in 2020	871,700	–	–
Forfeited	33,825	–	–
Paid out	217	–	–
Dec. 31, 2020	837,658	–	–
Potential number offered for the first time in 2021	–	685,700	–
Forfeited	74,364	41,813	–
Paid out	2,006	–	–
Dec. 31, 2021	761,288	643,887	–
Potential number offered for the first time in 2022	–	–	509,033
Forfeited	47,168	40,704	20,282
Paid out	2,510	1,253	227
Dec. 31, 2022	**711,610**	**601,930**	**488,524**

The value of the provisions as of December 31, 2022, was € 254 million (December 31, 2021: € 348 million). Net expenses of € 70 million were incurred in fiscal 2022 (2021: net expenses of € 249 million). The three-year tranche issued in fiscal 2019 ended at the end of fiscal 2021; an amount of € 163 million was paid out in fiscal 2022. The three-year tranche issued in fiscal 2020 ended at the end of fiscal 2022; a payout of € 158 million is expected for fiscal 2023. 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 € 171.73

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 fiscal 2022.

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, 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**
Jan. 1, 2022	**16,610**	**-1,539**	**63**	**15,134**
Profit after tax	3,326	–	–	3,326
Gains/losses recognized in equity	–	1,140	-31	1,109
Comprehensive income	**3,326**	**1,140**	**-31**	**4,435**
Dividend payments	-239	–	–	-239
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	-868	–	–	-868
Transactions with no change of control	–	–	–	–
Change in scope of consolidation/Other	-19	-2	21	–
Dec. 31, 2022	**18,811**	**-401**	**53**	**18,463**

Gains/losses recognized in equity

Gains/losses recognized in equity developed as follows (see also Note (39) “**Derivative financial instruments**”):

€ million	Cash flow hedge reserve	Cost of cash flow hedge reserve	Currency translation difference	**Gains/losses recognized in equity**
Jan. 1, 2021	**-49**	**-34**	**273**	**189**
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
Dec. 31, 2021	**-145**	**-23**	**1,992**	**1,824**
Jan. 1, 2022	**-145**	**-23**	**1,992**	**1,824**
Gains/losses recognized in equity	**91**	**11**	**1,159**	**1,261**
Fair value adjustment	-98	-15	1,230	1,117
Reclassification to profit or loss	194	16	-71	139
Reclassification to assets	–	–	–	–
Tax effect	-5	10	–	5
Dec. 31, 2022	**-54**	**-12**	**3,151**	**3,086**

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.

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:

		2022		2021	
€ 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		23	–	19	–
Net income of Merck KGaA, Darmstadt, Germany, before reciprocal profit transfer		–	919	–	1,031
Corporation tax		–	54	–	33
Basis for appropriation of profits	**(100%)**	**23**	**974**	**19**	**1,065**
Profit transfer to E. Merck KG, Darmstadt, Germany (ratio of general partner's equity to equity capital)	(70.274%)	684	-684	748	-748
Profit/loss transfer to Merck KGaA, Darmstadt, Germany (ratio of subscribed capital to equity capital)	(29.726%)	-7	7	-6	6
Corporation tax		–	-54	–	-33
Net income		**700**	**242**	**761**	**289**

The result of E. Merck KG, Darmstadt, Germany, on which the appropriation of profits adjusted for trade tax is based, amounted to € 23 million (2021: € 19 million). This resulted in a profit transfer to Merck KGaA, Darmstadt, Germany, of € 7 million (2021: € 6 million). The net income adjusted for corporation tax of Merck KGaA, Darmstadt, Germany, on which the appropriation of its profit is based, amounted to € 974 million (2021: € 1,065 million). Merck KGaA, Darmstadt, Germany, transferred a profit of € 684 million to E. Merck KG, Darmstadt, Germany (2021: € 748 million). In addition, an expense from corporation tax charges was reported in the amount of € 54 million (2021: expense of € 33 million).

Appropriation of profits

The profit distribution to be resolved 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 carried 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 by 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.

Based on the profit transfer, the appropriation of profits by Merck KGaA, Darmstadt, Germany, was as follows:

	2022		2021	
€ million	**Portion E. Merck KG, Darmstadt, Germany**	**Portion limited liability shareholders**	Portion E. Merck KG, Darmstadt, Germany	Portion limited liability shareholders
Net income	700	242	761	289
Profit carried forward previous year	180	76	63	27
Withdrawal from revenue reserves	–	–	–	–
Transfer to revenue reserves	–	–	–	–
Retained earnings limited liability shareholders		**318**		**315**
Withdrawal by E. Merck KG, Darmstadt, Germany	-801		-644	
Profit carried forward E. Merck KG, Darmstadt, Germany	**80**		**180**	
Dividend proposal		-284		-239
Profit carried forward of limited liability shareholders (preliminary)		**34**		**76**

A dividend of € 1.85 per share was distributed for fiscal 2021. The dividend proposal for fiscal 2022 will be € 2.20 per share. With the proposed dividend payment to shareholders amounting to € 284 million (2021: € 239 million), the profit carried forward of the shareholders after the dividend payment would amount to € 34 million (2021: € 76 million). Based on the proposed dividend payment to the shareholders, E. Merck KG, Darmstadt, Germany, would be entitled to withdraw € 801 million (2021: € 644 million), meaning that E. Merck KG, Darmstadt, Germany, would be entitled to a profit brought forward of € 80 million (2021: € 180 million).

Appropriation of profits and changes in reserves

	2022			2021		
€ 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	-684	-774	-90	-748	-838
Profit transfer to Merck KGaA, Darmstadt, Germany	–	7	7	–	6	6
Change in profit carried forward of E. Merck KG, Darmstadt, Germany	–	-100	-100	–	117	117
Profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves	**-90**	**-778**	**-868**	**-90**	**-626**	**-716**
Result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer adjusted for trade tax		23			19	
Profit transfer to E. Merck KG, Darmstadt, Germany/ withdrawal by E. Merck KG, Darmstadt, Germany	**-90**	**-801**		**-90**	**-644**	

Based on the proposed appropriation of profits, the profit transfer to E. Merck KG, Darmstadt, Germany, for fiscal 2022, including changes in reserves, amounted to € -868 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ -684 million), the profit transfer from E. Merck KG, Darmstadt, Germany, to

Merck KGaA, Darmstadt, Germany (€ 7 million), the change in profit carried forward by E. Merck KG, Darmstadt, Germany (€ -100 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 transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves amounted to € -716 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ -748 million), the profit transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany (€ 6 million), the change in profit carried forward (€ 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) and was paid to E. Merck KG, Darmstadt, Germany, in fiscal 2022. 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., Bangkok, Thailand, a subsidiary of Merck KGaA, Darmstadt, Germany, and in the listed company PT Merck Tbk., Jakarta, 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, 2022	Dec. 31, 2021
Cash, bank balances and cheques	610	1,072
Short-term cash investments (up to 3 months)	1,244	827
Cash and cash equivalents	**1,854**	**1,899**

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 € 456 million (December 31, 2021: € 388 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. Any difference between the fair value of a financial instrument on initial recognition (Level 2 and 3) and the transaction price is recognized in income using the straight-line method over the duration.

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 are only 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 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) Reclassification of the cumulative results previously recognized directly in equity in the retained earnings when asset is disposed	Foreign currency gains and losses recognized directly in equity	Other operating income
	Financial	Results recognized directly in equity (value adjustments) Reclassification of the cumulative results previously recognized directly in equity in the retained earnings when asset is disposed	Foreign currency gains and losses recognized directly in equity	Financial income
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, 2022			Dec. 31, 2021		
€ million	**current**	**non-current**	**Total**	current	non-current	Total
Subsequent measurement at amortized cost	**122**	**4**	**126**	**57**	**4**	**61**
Loans against third parties	–	4	4	–	4	5
Other	122	–	122	56	–	56
Subsequent measurement at fair value through other comprehensive income	**80**	**517**	**597**	**43**	**463**	**506**
Equity instruments	–	516	516	–	462	462
Debt instruments	80	1	81	43	1	44
Subsequent measurement at fair value through profit and loss	**66**	**436**	**502**	**49**	**444**	**493**
Contingent consideration	14	235	250	–	271	271
Other debt instruments	28	154	182	12	149	161
Derivatives without a hedging relationship (financial transactions)	16	–	16	37	–	37
Derivatives without a hedging relationship (operational)	7	46	53	–	24	24
Derivatives with a hedging relationship (operational)	**53**	**–**	**53**	**25**	**–**	**25**
Financial assets	**321**	**957**	**1,278**	**174**	**911**	**1,085**

The increase in other current financial assets with subsequent measurement at amortized cost is attributable to a fixed-term deposit with a bank.

As in the previous year, contingent consideration primarily included claims arising from the divestment of the biosimilars business to Fresenius SE & Co. KGaA, Bad Homburg vor der Höhe, in 2017.

Equity interests with subsequent measurement at fair value through other comprehensive income primarily related to shares in M Ventures portfolio companies. 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:

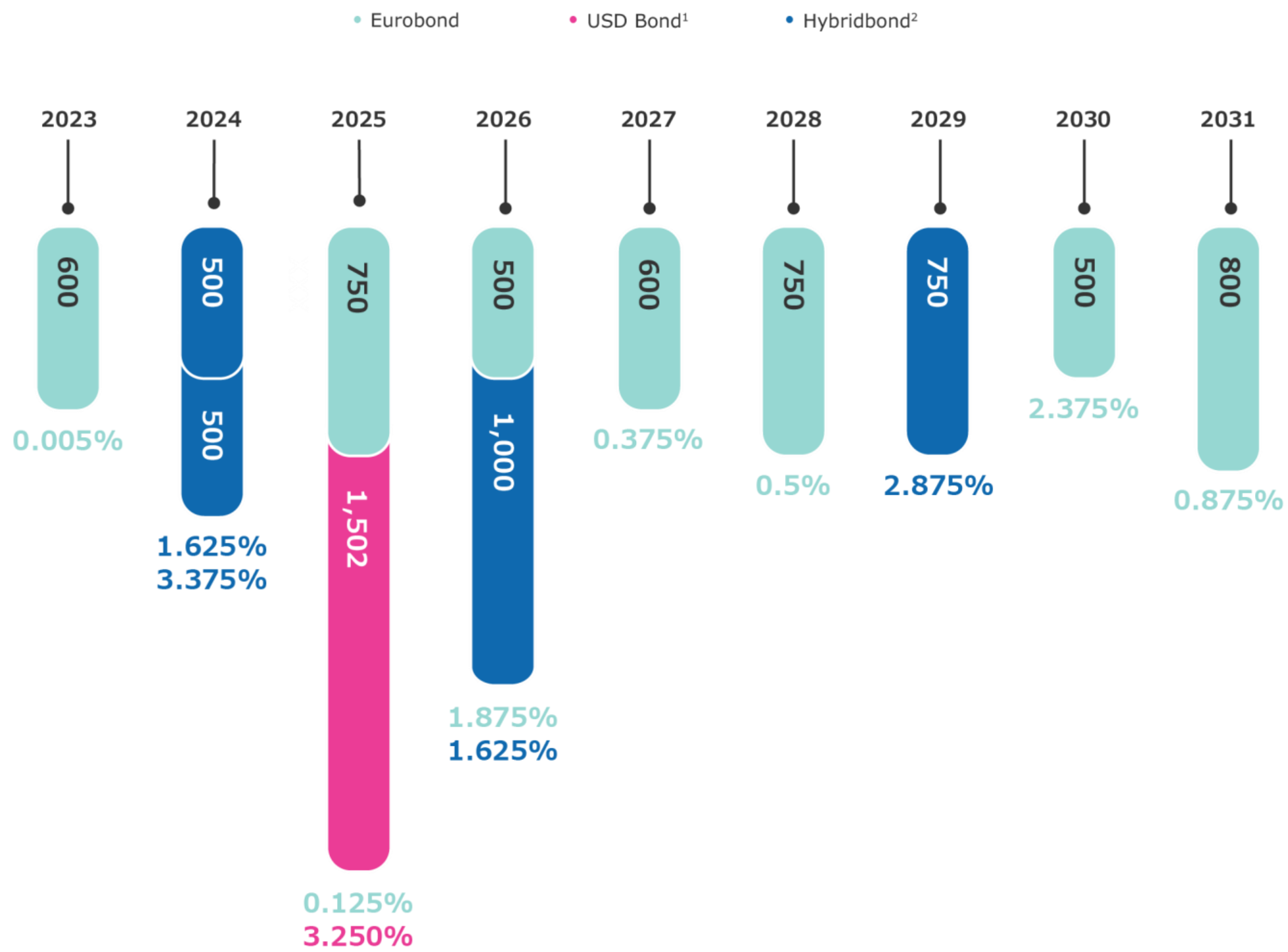
					Nominal value	
	Dec. 31, 2022 € million	Dec. 31, 2021 € million	Maturity	Interest rate %	million	Currency
USD bond 2015/2022	–	884	March 2022	2.950	1,000	USD
Eurobond 2015/2022	–	550	Sept. 2022	1.375	550	€
Eurobond 2019/2023	600	–	Dec. 2023	0.005	600	€
Bonds (current)	**600**	**1,434**				
Bank loans	203	36				
Liabilities to related parties	259	896				
Loans from third parties and other financial debt	11	13				
Liabilities from derivatives (financial transactions)	30	35				
Lease liabilities (IFRS 16)	125	117				
Current financial debt	**1,228**	**2,531**				
Eurobond 2019/2023	–	600	Dec. 2023	0.005	600	€
USD bond 2015/2025	1,498	1,410	March 2025	3.250	1,600	USD
Eurobond 2020/2025	747	746	July 2025	0.125	750	€
Eurobond 2022/2026	498	–	July 2026	1.875	500	€
Eurobond 2019/2027	598	597	July 2027	0.375	600	€
Eurobond 2020/2028	747	747	July 2028	0.500	750	€
Eurobond 2022/2030	497	–	July 2030	2.375	500	€
Eurobond 2019/2031	797	797	July 2031	0.875	800	€
Hybrid bond 2014/2074	499	499	Dec. 2074[1]	3.375	500	€
Hybrid bond 2019/2079	498	497	June 2079[2]	1.625	500	€
Hybrid bond 2019/2079	749	996	June 2079[3]	2.875	750	€
Hybrid bond 2020/2080	998	997	Sep. 2080[4]	1.625	1,000	€

Footnotes follow at the end of the table

	Dec. 31, 2022 € million	Dec. 31, 2021 € million	Maturity	Interest rate %	Nominal value million	Nominal value Currency
Bonds (non-current)	**8,126**	**7,886**				
Bank loans	–	–				
Liabilities to related parties	660	–				
Loans from third parties and other financial debt	48	42				
Liabilities from derivatives (financial transactions)	–	–				
Lease liabilities (IFRS 16)	366	342				
Non-current financial debt	**9,200**	**8,270**				
Financial debt	**10,428**	**10,801**				
less:						
Cash and cash equivalents	1,854	1,899				
Current financial assets[5]	247	149				
Net financial debt[6]	**8,328**	**8,753**				

[1] 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.
[2] 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.
[3] The Group has the right to prematurely repay this tranche of the hybrid bond issued in June 2019 for the first time in June 2029.
[4] The Group has the right to prematurely repay this hybrid bond issued in September 2020 for the first time in September 2026.
[5] Excluding current derivatives (operational) and contingent considerations, which are recognized in the context of business combinations according to IFRS 3.
[6] 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, 2022.
[2] For the hybrid bonds, repayment is assumed at the earliest possible date.

The hybrid bonds issued by Merck KGaA, Darmstadt, Germany, 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.

A partial buyback of the nominal volume of € 250 million of the hybrid bond issued in 2019 took place on September 9, 2022.

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, 2022, was 1.9% (December 31, 2021: 1.7%).

Non-current liabilities to related parties in the amount of € 660 million relate to loans from E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany.

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 an important capital management indicator 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, 2022, there were liabilities of € 4.5 billion from a debt issuance program most recently renewed in fiscal 2022 (December 31, 2021: € 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 was utilized as of December 31, 2022, or the prior-year reporting date.

Loan agreements represent a further source of financing for the Group. On the balance sheet date, the bank financing commitments in respect of the Group were as follows:

	Dec. 31, 2022		Dec. 31, 2021			
€ million	**Financing commitments from banks**	**Utilization**	Financing commitments from banks	Utilization	Interest	Maturity of financing commitments
Syndicated loan	2,500	–	2,000	–	variable	2027
Bilateral credit agreement with banks	375	–	–	–	variable	< 3 years
Various bank credit lines	203	203	36	36	variable	< 1 year
	3,078	**203**	**2,036**	**36**		

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, 2022			Dec. 31, 2021		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Miscellaneous other financial liabilities	1,240	127	1,368	1,110	96	1,206
thereof: liabilities to related parties	861	–	861	708	–	708
thereof: interest accruals	50	–	50	51	–	51
Liabilities from derivatives (operational)	34	19	53	82	10	92
Other financial liabilities	**1,275**	**147**	**1,421**	**1,192**	**106**	**1,297**

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 means 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 forecast 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	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 expenses
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 agreements	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, 2022		Dec. 31, 2021	
€ million	**current**	**non-current**	current	non-current
Cash flow hedge	4,760	–	5,061	–
Interest rate	–	–	–	–
Currency	4,760	–	5,061	–
No hedge accounting	5,255	–	7,459	–
Interest rate	–	–	1,100	–
Currency	5,255	–	6,359	–
Virtual power purchase agreements				
	10,015	**–**	**12,519**	**–**

The fair values of the derivatives were as follows:

December 31, 2022

	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	**–**	**–**	**53**	**–**	**–**	**–**	**30**	**–**
Interest	–	–	–	–	–	–	–	–
Currency	–	–	53	–	–	–	30	–
No hedge accounting	**16**	**–**	**7**	**46**	**30**	**–**	**4**	**19**
Interest	–	–	–	–	–	–	–	–
Currency	16	–	–	–	30	–	–	–
Virtual power purchase agreements	–	–	7	46	–	–	4	19
	16	**–**	**60**	**46**	**30**	**–**	**34**	**19**

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 agreements	–	–	–	24	–	–	–	10
	37	**–**	**25**	**24**	**35**	**–**	**82**	**10**

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, 2022

€ million	Gross presentation	Netting	Net presentation	Potential netting volume: due to master netting agreements	Potential netting volume: due to financial collateral	Potential net amount
Derivative assets	123	–	123	60	–	63
Derivative liabilities	-83	–	-83	-60	–	-23

December 31, 2021

€ million	Gross presentation	Netting	Net presentation	Potential netting volume: due to master netting agreements	Potential netting volume: due to financial collateral	Potential net amount
Derivative assets	86	–	86	61	–	25
Derivative liabilities	-126	–	-126	-61	–	-65

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 cash flow hedge reserve			Cash flow hedge reserve			
	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, 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**
Jan. 1, 2022	**-11**	**-12**	**-23**	**-40**	**-93**	**-11**	**-145**
Fair value adjustment (directly recognized in equity)	11	-26	-15	-73	-26	0	-98
Reclassification to profit or loss	–	16	16	106	74	13	194
Reclassification to assets	–	–	–	–	–	–	–
Tax effect	-1	11	10	2	-5	-3	-5
Dec. 31, 2022	**-1**	**-11**	**-12**	**-4**	**-50**	**–**	**-54**

(40) Finance income and expenses/Net gains and losses from financial instruments

Finance income and expenses were as follows:

€ million	2022	2021
Interest income and similar income	69	46
Capital gain from disposal of debt instruments with subsequent measurement at amortized cost	1	1
Income from fair value changes from debt instruments with subsequent measurement at fair value through profit or loss	10	16
Income from the change of the fair value of share-based compensation programs	7	–
Other interest income	2	–
Finance income	**90**	**62**
Interest expense and similar expenses	-235	-272
Capital loss from disposal of debt instruments with subsequent measurement at amortized cost	–	–
Expenses from fair value changes from debt instruments with subsequent measurement at fair value through profit or loss	-15	-3
Expenses from fair value changes of share-based compensation programs	–	-3
Currency differences from financing activities	-26	-39
Finance costs	**-277**	**-317**
Financial result	**-187**	**-255**

Interest income and expenses arose as follows:

	2022		2021	
€ million	**Interest income**	**Interest expenses**	Interest income	Interest expenses
Financial instruments	33	-161	19	-176
thereof: Financial assets				
Subsequent measurement at fair value at amortized cost	22	-3	–	–
Subsequent measurement at fair value through profit or loss	11	-2	19	–
thereof: Financial debt				
Subsequent measurement at fair value at amortized cost	–	-155	–	-174
Subsequent measurement at fair value through profit or loss	–	-1	–	-2
Leases	–	-13	–	-10
Pension provisions	–	-39	–	-27
Other non-current provisions	–	-2	–	-1
Other interest income/expenses and similar income and expenses	37	-37	27	-69
Capitalized borrowing costs for		17		11
Property, plant and equipment		10		7
Other intangible assets		6		4
Interest income/expenses and similar income and expenses	**69**	**-235**	**46**	**-272**

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, currency differences as well as dividend income from financial instruments (excluding items recognized in other comprehensive income) by measurement category:

€ million		Currency differences	Dividends	Net gains and losses: Impairment losses/reversal of impairment losses (net)	Net gains and losses: Fair value adjustments	Net gains and losses: Disposal gains/losses	Total
Financial assets							
Subsequent measurement at amortized cost	**2022**	-4		-6		1	-5
	2021	7		1		1	2
Subsequent measurement at fair value through other comprehensive income							
Equity Instruments	**2022**		–				
	2021		–				
thereof: investments derecognized	**2022**		–				
	2021		–				
thereof: investments held	**2022**		–				
	2021		–				
Debt Instruments	**2022**	–		–		2	2
	2021	–		–		–	–
Subsequent measurement at fair value through profit or loss (without derivatives)	**2022**	1	–		30		30
	2021	1	–		-5		-5
Financial debt							
Subsequent measurement at amortized cost	**2022**	–				–	–
	2021	-13				–	–
Subsequent measurement at fair value through profit or loss (without derivatives)	**2022**	–			30		30
	2021	–			-9		-9
Derivatives without a hedging relationship (net)	**2022**	–			-27		-27
	2021	–			-18		-18

In the table above, interest income or expenses related to derivatives without a hedging relationship, with the exception of the virtual power purchase agreements, 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) Financing cash flow

Accounting and measurement policies

Financing cash flow

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 paper 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:

2022

		Cash			Non-cash					
€ million	**Jan. 1, 2022**	Cash inflows	Repay-ments	Lease interest	Change in lease liabilities	Ex-change rate effects	Fair value adjust-ment	Other	Changes in scope of consoli-dation	**Dec. 31, 2022**
Bonds	9,320	995	-1,661	–	–	86	–	-13	–	8,726
Financial liabilities to E. Merck KG, Darmstadt, Germany, and E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	894	1,637	-1,613	–	–	–	–	–	–	918
Other current and non-current financial liabilities	586	1,281	-1,938	-12	187	11	663	–	7	784
Financial debt	**10,801**	**3,912**	**-5,212**	**-12**	**187**	**97**	**663**	**-13**	**7**	**10,428**
Derivative assets (current and non-current)	-37	711	–	–	–	–	-691	–	–	**-16**

2021

		Cash			Non-cash					
€ million	**Jan. 1, 2021**	Cash inflows	Repay-ments	Lease interest	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
Financial 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

The item “Financial liabilities in respect of E. Merck KG, Darmstadt, Germany” reported in the previous year was expanded in the year under review to include financial liabilities in respect of E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany, in order to recognize the loan granted by E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany, for the first time. 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.

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 of € 711 million (2021: € 407 million) were reported together with repayments of other current and non-current financial debt of € 1,938 million (2021: € 2,303 million) in the item “Repayments of other current and non-current financial debt” with a net amount of € 1,227 million (2021: € 1,896 million). 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 twelve 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; and
- 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 twelve months; and
- firm purchase commitments over the next twelve 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, 2022

€ million		CHF	CNY	JPY	KRW	TWD	USD
Net exposure		**-591**	**997**	**163**	**216**	151	867
Exchange rate -10% (appreciation vs. €)	Consolidated income statement	-59	100	16	22	15	87
	Equity (other comprehensive income)	–	-61	-9	-17	-15	-182
Exchange rate +10% (depreciation vs. €)	Consolidated income statement	59	-100	-16	-22	-15	-87
	Equity (other comprehensive income)	–	42	7	14	12	141

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	11	21	13	112
	Equity (other comprehensive income)	–	-15	-9	-10	-14	-120
Exchange rate +10% (depreciation vs. €)	Consolidated income statement	67	-109	-11	-21	-13	-112
	Equity (other comprehensive income)	–	41	7	9	11	116

In this presentation, effects of cash flow hedges are taken into consideration in the equity of the Group. The net exposure of each of the above currencies consisted of the following components:

- planned cash flows in the next twelve months in the respective currency, less
- the nominal values of hedging instruments of these planned cash flows.

The planned cash flows in the next twelve 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, 2022

€ million	CNY	JPY	KRW	TWD	USD
Notional amount	933	92	158	134	3,408
thereof: current	933	92	158	134	3,408
thereof: non-current	–	–	–	–	–
Fair Value of the hedging instrument	8	2	-3	5	10
thereof: positive market values	10	2	–	5	45
thereof: negative market values	-2	–	-3	–	-34
Maturity profile	January 2023 – December 2023	January 2023 – December 2023	January 2023 – December 2023	January 2023 – December 2023	January 2023 – December 2023
Hedge ratio[1]	1:1	1:1	1:1	1:1	1:1
Change in value of outstanding hedging instruments since January 1, 2021	8	2	-3	5	10
Change in value of hedged item used to determine hedge effectiveness since January 1, 2021	-8	-2	3	-5	-10
Weighted average hedging rate	7.32	136.00	1,373.00	31.16	1.07

[1] The hedging instruments and the corresponding hedged items were denominated in the same currency, therefore the hedge ratio was 1:1.

December 31, 2021

€ million	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, 2020	-18	–	-1	-5	-32
Change in value of hedged item used to determine hedge effectiveness since January 1, 2020	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.

In addition to the transactional foreign exchange risks described previously, currency translation risks resulted from the fact that 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, 2022	Dec. 31, 2021
Short-term or variable interest rate monetary deposits	2,083	2,011
Short-term or variable interest rate monetary borrowings	-1,228	-2,531
Net interest rate exposure	**855**	**-521**

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	2022		2021	
Change in market interest rate	**+ 100 basis points**	**– 100 basis points**	**+ 100 basis points**	**– 100 basis points**
Effects on consolidated income statement	17	-17	11	-20
Effects on equity (other comprehensive income)	–	–	–	–

The IBOR reform did not have a significant impact on the Group's interest rate risk or its net assets, financial position and results of operations.

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. The wind farm was commissioned in fiscal 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 € 50 million as of the end of the reporting period (2021: € 24 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, 2022

€ million	Carrying amount	Cash flows < 1 year		Cash flows 1–5 years		Cash flows > 5 years	
		Interest	**Repayment**	**Interest**	**Repayment**	**Interest**	**Repayment**
Subsequent measurement at amortized cost							
Bonds and commercial paper[1]	8,726	-147	-600	-363	-5,352	-111	-2,801
Bank loans	203	-5	-203	–	–	–	–
Trade accounts payable	2,498	–	-2,498	–	–	–	–
Liabilities to related parties	1,780	-25	-1,121	-81	-110	-53	-550
Other financial liabilities	503	–	-380	–	-123	–	–
Loans from third parties and other financial debt	59	-5	-10	-10	-48	–	–
Subsequent measurement at fair value through profit or loss							
Contingent considerations	4	–	–	–	-4	–	–
Derivatives without a hedging relationship	53	–	-34	–	-7	–	-12
Derivatives with a hedging relationship	**30**	**–**	**-30**	**–**	**–**	**–**	**–**
Refund liabilities	**912**	**–**	**-912**	**–**	**–**	**–**	**–**
Lease liabilities	**491**	**-9**	**-123**	**-17**	**-264**	**-9**	**-101**
	15,260	**-191**	**-5,911**	**-471**	**-5,909**	**-173**	**-3,463**

[1] For the hybrid bonds, repayment is assumed at the earliest possible date.

December 31, 2021

€ million	Carrying amount	Cash flows <1 year		Cash flows 1–5 years		Cash flows >5 years	
		Interest	Repayment	Interest	Repayment	Interest	Repayment
Subsequent measurement at amortized cost							
Bonds and commercial paper[1]	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**	**–**	**–**	**–**	**–**
Finance lease liabilities	**459**	**-7**	**-116**	**-15**	**-267**	**-6**	**-75**
	15,318	**-173**	**-6,937**	**-424**	**-5,169**	**-137**	**-3,225**

[1] For the hybrid bonds, repayment is assumed at the earliest possible date.

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 trade accounts receivable that are more than 90 days past due in order to establish whether default exists. In addition, all other financial instruments that are more than 30 days past due are examined in order to establish whether there has been a significant increase in the credit risk. Both methods are used to examine whether there is objective evidence of an 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 fundamentally considered to be investments with low risk, meaning that the expected credit loss in the upcoming twelve 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	**2022**	2021
Impairment losses	**-6**	**1**
of trade accounts receivable	-7	1
of contract assets	–	–
of debt instruments subsequently measured at amortized cost	1	–
of debt instruments subsequently measured at fair value through other comprehensive income	–	–

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, 2022

€ million	Life Science	Healthcare	Electronics	Other	**Group**
External rating of at least A- or comparable	1,363	994	648	7	3,012
External rating of at least BBB- or comparable	153	302	17	–	471
External rating lower than BBB- or comparable	60	521	4	–	585
Trade accounts receivable before loss allowances	**1,575**	**1,817**	**669**	**7**	**4,069**

December 31, 2021

€ million	Life Science	Healthcare	Electronics	Other	Group
External rating of at least A- 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**

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, 2022, were as follows:

December 31, 2022

€ 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%	0.8%	3.2%	19.6%	54.6%	
Trade accounts receivable before loss allowances	3,394	472	75	64	64	4,069
thereof: credit impaired	5	–	1	3	27	37
Loss allowances	**-9**	**-4**	**-2**	**-12**	**-35**	**-63**
thereof: credit impaired	-3	–	–	-3	-26	-32

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

Credit risks from other receivables

Gross other receivables amounted to € 136 million as of December 31, 2022 (December 31, 2021: € 156 million). Other receivables of € 128 million were allocated to Level 1 of the three-level impairment model (December 31, 2021: € 154 million), meaning that the credit loss expected in the next twelve 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:

2022

€ million	**Jan. 1**	Net Additions	Utilizations	Reclassification within levels	Effects of currency translation	Changes in scope of consolidation	**Dec. 31**
Trade and other receivables (including current leasing receivables)	-59	-7	4	–	-2	–	-63
thereof: Level 1/2	-23	-7	–	–	-1	–	-31
thereof: Level 3	-34	-1	4	–	-1	–	-31
thereof: POCI[1]	-2	1	–	–	–	–	-1
Contract Assets	–	–	–	–	–	–	–
thereof: Level 1/2	–	–	–	–	–	–	–
thereof: Level 3	–	–	–	–	–	–	–
Other Receivables (including non-current leasing receivables)	-2	1	–	–	–	–	-1
thereof: Level 1	–	–	–	–	–	–	–
thereof: Level 2	–	–	–	–	–	–	–
thereof: Level 3	-1	1	–	–	–	–	–
Loss allowances for financial assets	**-61**	**-6**	**4**	**–**	**-2**	**–**	**-64**

[1] Purchased or originated credit-impaired receivables.

2021

€ million	Jan. 1	Net Additions	Utilizations	Reclassification within levels	Effects of currency translation	Changes in scope of consolidation	Dec. 31
Trade and other receivables (including current leasing receivables)	-73	1	15	–	-2	–	-59
thereof: Level 1/2	-24	1	–	–	-1	–	-23
thereof: Level 3	-48	1	15	–	-1	–	-34
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**	**1**	**15**	**–**	**-2**	**–**	**-61**

[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			
Equity instruments	Shares	Derived from active market	Quoted prices in an active market
Other debt instruments	Publicly-traded funds		
	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 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 agreements	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 virtual power purchase agreements	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.

Transfers between the individual hierarchy levels at fair value are made at the end of the month in which the triggering event – for example an initial public offering – took place.

Equity investments in unlisted companies (Level 3)

The planning periods used to determine the fair value of equity investments in unlisted companies ranged from four to seven years (December 31, 2021: three to eight 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, 2021: 1.0% and 9.0%). The applied average cost of capital (after tax) was 7.0% on December 31, 2022 (December 31, 2021: 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 plan, internal sales plans and sales plans of external industry services are used. The discount rate (after tax) of between 6.3% and 7.3% as of December 31, 2022 (December 31, 2021: 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, 2022, the carrying amount was € 219 million (December 31, 2021: € 206 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, 2022

		Change in probability of regulatory approval		
€ million		-10%	unchanged	10%
Change of discount rate	5.8%	-18	3	24
	6.3% (unchanged)	-21	–	20
	6.8%	-24	-3	17

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

The following table presents the carrying amounts and the fair values of the individual financial assets and liabilities as of December 31, 2022, for each individual financial instrument class pursuant to IFRS 9:

December 31, 2022

		Carrying amount			Fair value[1]			
€ million	Consoli-dated 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	1,854	–	1,854				
Trade and other receivables (excluding leasing receivables)	25	4,087	25	4,112				
Other debt instruments	36	122	4	126				
Subsequent measurement at fair value through other comprehensive income				–				
Equity instruments	36	–	516	516	102	–	415	516
Trade and other receivables	25	22	–	22	–	–	22	22
Other debt instruments	36	80	1	81	81	–	–	81
Subsequent measurement at fair value through profit or loss				–				–
Equity instruments	36	–	–	–	–	–	–	–
Contingent considerations	36	14	235	250	–	–	250	250
Other debt instruments	36	28	154	182	89	–	93	182
Derivatives without a hedging relationship	36, 39	23	46	69	–	17	53	69
Derivatives with a hedging relationship	36, 39	53	–	53	–	53	–	53
Lease receivables (measured in accordance with IFRS 16)[2]	25	5	2	7				
Total		**6,289**	**984**	**7,273**	**271**	**70**	**833**	**1,174**
Financial debt								
Subsequent measurement at amortized cost								
Trade payables and other liabilities	30	2,498	–	2,498				
Financial debt	37	1,073	8,834	9,907	7,989	1,188	–	9,177
Other financial liabilities	38	1,240	123	1,364				
Subsequent measurement at fair value through profit or loss								
Contingent considerations	38	–	4	4	–	–	4	4
Derivatives without a hedging relationship	37, 38, 39	34	19	53	–	30	23	53
Derivatives with a hedging relationship	38, 39	30	–	30	–	30	–	30
Refund liabilities	9	912	–	912				
Lease liabilities (measured in accordance with IFRS 16)[2]	37	125	366	491				
Total		**5,913**	**9,347**	**15,260**	**7,989**	**1,248**	**27**	**9,265**

[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 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

€ million	Consoli-dated notes	Carrying amount: Current	Carrying amount: Non-current	Carrying amount: Total	Fair value[1]: Fair value determined by official prices and quoted market values (Level 1)	Fair value[1]: Fair value determined using input factors observable in the market (Level 2)	Fair value[1]: Fair value determined using input factors not observable in the market (Level 3)	Fair value[1]: 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 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:

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 as of 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 (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
Gains (+)/losses (–) recognized in the consolidated income statement (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**

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 2022:

2022

	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 as of Jan. 1, 2022	**78**	**271**	**24**	**345**	**20**	**-39**	**-10**	**689**
Additions	27	–	–	87	70	–	–	184
Transfers into Level 3 from Level 1/Level 2	–	–	–	–	–	–	–	–
Fair value changes								
Gains (+)/losses (−) recognized in the consolidated income statement (other operating result)	17	15	30		–	30	-13	79
thereof: attributable to assets/liabilities held as of the balance sheet date	17	7	30		–	4	-13	44
Gains (+)/losses (−) recognized in the consolidated income statement (financial income and expenses)	-4	10	1		–	-1	–	6
thereof: attributable to assets/liabilities held as of the balance sheet date	-4	9	1		–	–	–	6
Gains (+)/losses (−) recognized in other comprehensive income				-11	–			-11
Currency translation difference	2	–	2	-1	–	-3	–	–
Disposals	-21	-46	-4	-1	-68	10	–	-131
Transfers out of Level 3 into Level 1/Level 2	–	–	–	-11	–	–	–	-11
Other	-7	–	–	7	–	–	–	–
Net carrying amounts as of Dec. 31, 2022	**93**	**250**	**53**	**415**	**22**	**-4**	**-23**	**806**

Additions during the reporting period primarily comprised acquisitions of equity instruments and trade accounts receivable that are essentially designated to be sold under factoring agreements. Disposals during the reporting period related in particular to advance payments received in connection with trade accounts receivable under factoring agreements. 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 2022 and 2021:

€ 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
2022[1]				
M Ventures Portfoliogesellschaften	Portfolio adjustment/restructuring and full acquisition by third parties	4	-19	-19
2021[1]				
M Ventures Portfoliogesellschaften	Portfolio adjustment/restructuring and full acquisition by third parties	16	7	7
Precigen, Inc., USA	Portfolio adjustment/restructuring	36	–	–

[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.

(44) Other financial obligations

Other financial obligations comprised the following:

€ million	**Dec. 31, 2022**	Dec. 31, 2021
Acquisition of intangible assets	1,050	1,039
Acquisition of property, plant, and equipment	280	247
Other financial obligations	**1,330**	**1,286**

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 € 1,050 million (December 31, 2021: € 1,039 million) for the acquisition of intangible assets. 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, 2022**	Dec. 31, 2021
Within 1 year	48	51
In 1-5 years	326	323
After more than 5 years	676	665
Obligations to acquire intangible assets	**1,050**	**1,039**

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	**2022**	2021	**2022**	2021	**Dec. 31, 2022**	Dec. 31, 2021	**Dec. 31, 2022**	Dec. 31, 2021
E. Merck KG, Darmstadt, Germany	1.9	1.6	4.0	0.5	0.0	0.3	1,118.8	1,602.3
E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	0.5	0.4	0.6	0.0	0.0	0.5	660.1	0.0
Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Engel-Apotheke, Darmstadt[1]	0.1	0.1	0.2	1.0	0.0	0.0	0.0	0.0
Joint ventures	3.2	1.5	0.0	0.0	0.5	1.1	0.0	0.6
Associated companies	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Majority interest in non-controlled companies	0.4	0.2	0.0	0.0	0.0	0.0	1.2	1.2
Non-consolidated subsidiaries	0.1	6.7	0.6	0.5	1.8	3.2	0.4	5.0

[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 € 258.0 million (December 31, 2021: € 894.1 million), subject to standard market interest rates. The financial liabilities in respect of E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany, in the amount of € 660.0 million (December 31, 2021: € 0.0 million) were also 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**". Above and beyond this, no material activities 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 took place in either fiscal 2022 or the previous year.

(46) Executive Board and Supervisory Board compensation

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. It was composed as follows:

€ million	**2022**	2021
Fixed compensation	6.3	6.4
Variable compensation	17.7	16.0
Other compensation	0.4	0.4
Additional benefits	0.2	0.4
Fair value of the virtual shares held out in prospect under the long-term incentive plan at the grant date	5.8	8.8
Total compensation granted in the fiscal year	**30.4**	**32.0**

In conjunction with the standalone long-term incentive plan for the Executive Board, the structure of which is essentially as described in Note (33) "**Provisions for employee benefits**", 43,436 virtual shares, also referred to as Share Units of Merck KGaA, Darmstadt, Germany (MSU), were made potentially available in fiscal 2022 subject to the achievement of targets (2021: 70,846 MSU). The additions to provisions for the long-term incentive plan included expenses of € 6.4 million (2021: € 24.0 million).

In fiscal 2022, the general partner, E. Merck KG, Darmstadt, Germany, recognized a current service cost of € 2.4 million in the additions to the provisions for defined benefit commitments for post-employment benefits for the members of the Executive Board (2021: € 2.3 million).

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 € 21.7 million in fiscal 2022 (2021: € 30.7 million). Provisions for defined benefit pension commitments amounted to € 123.1 million as of December 31, 2022 (December 31, 2021: € 155.1 million).

The compensation of the Supervisory Board was composed as follows:

€ thousand	**2022**	2021
Fixed portion	814.9	822.5
Meeting attendance fees	48.0	47.3
Committee membership compensation	105.0	88.9
Total compensation granted in the fiscal year	**967.9**	**958.7**

As in the previous year, no compensation was paid to former members of the Supervisory Board in fiscal 2022.

As in the previous year, the members of the Executive Board and the Supervisory Board did not receive any advances or loans in fiscal 2022. As in the previous year, no contingent liabilities were entered into for the benefit of these persons in fiscal 2022.

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:

	2022		2021	
€ million	**Group**	**thereof: KPMG AG Wirtschafts-prüfungs-gesellschaft, Germany**	Group	thereof: KPMG AG Wirtschafts-prüfungs-gesellschaft, Germany
Audits of financial statements	9.7	2.3	9.7	2.4
Other audit-related services	0.4	0.4	0.6	0.4
Tax consultancy services	0.1	–	0.2	–
Other services	0.4	0.1	0.4	0.1
Total	**10.7**	**2.8**	**10.9**	**2.9**

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, 2022, 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 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 Display Trading GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Electronics KGaA, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	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 Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Weiterstadt	100.00	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

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Germany	Merck International GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Internationale Beteiligungen GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Life Science Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Life Science KGaA, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	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 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 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	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	Hoeilaart	100.00	
Belgium	Merck Life Science BV, a subsidiary of Merck KGaA, Darmstadt, Germany	Hoeilaart	100.00	
Belgium	Merck NV/SA, a subsidiary of Merck KGaA, Darmstadt, Germany	Hoeilaart	100.00	
Bulgaria	Merck Bulgaria EAD, a subsidiary of Merck KGaA, Darmstadt, Germany	Sofia	100.00	
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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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	
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	
Lativa	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	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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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 Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	50.29
Malta	Merck Capital Limited, 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.	Amsterdam	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	
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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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 Life Science AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Switzerland	Ares Trading SA	Aubonne	100.00	
Switzerland	Chord Therapeutics SA	Genf	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	
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 Ltd.	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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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 Invest LLC	Wilmington	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	Erbi Biosystems Inc.	Wilmington	100.00	
United States	Exelead Inc.	Wilmington	100.00	
United States	FloDesign Sonics, Inc.	Wilmington	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	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	
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 LLC	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 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	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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
China	Merck Electronic Materials (Suzhou) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Suzhou	100.00	
China	Merck Electronics (Zhangjiagang) Co., 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	
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	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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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	M Chemicals Inc.	Eumseong	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	
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 Company Limited, 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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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	
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	

A) Companies opting for exemption as provided for by Section 264 (3) and Section 264b of the German Commercial Code.

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31, 2022 (€ million)	Fair value as of Dec. 31, 2021 (€ 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 29. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00		<0.5	-
Germany	Merck 37. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	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	<0.5
Germany	Merck 43. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 44. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 45. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 46. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 47. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 48. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 49. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	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, 2022 (€ million)	Fair value as of Dec. 31, 2021 (€ million)
Other European countries						
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	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	MilliporeSigma Distribution LLC	Wilmington	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
Saudi Arabia	Merck Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Riyadh	100.00		<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
V. Associated companies not accounted for using the equity method for reasons of materiality and 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	21.24		B)	<0.5
Germany	DISCO Pharmaceuticals GmbH	Cologne	<20.00		B)	-
Germany	Ferroelectric Memory GmbH	Dresden	<20.00		B)	B)
Germany	Formo Bio GmbH	Berlin	<20.00		B)	B)
Germany	GreenTech Accelerator Gernsheim GmbH	Gernsheim	20.00	20.00	<0.5	-
Germany	InfraServ GmbH & Co. Wiesbaden KG	Wiesbaden	<20.00		22	16
Germany	Inuru GmbH	Berlin	<20.00		<0.5	<0.5

Footnotes follow at the end of the table

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 NV	Leuven-Heverlee	<20.00		B)	B)
Finland	Uniogen OY	Turku	<20.00		<0.5	<0.5
France	Astraveus SAS	Paris	<20.00		B)	-
France	Aveni SACS	Massy	<20.00		B)	B)
France	DIACCURATE SA	Paris	<20.00		4	-
France	DNA Script S.A.S.	Paris	<20.00		B)	B)
France	Scipio Bioscience S.A.S.	Montrouge	21.68		B)	B)
Netherlands	Anavo Therapeutics B.V.	Leiden	<20.00		B)	B)
Netherlands	Calypso Biotech B.V.	Amsterdam	38.81		B)	B)
Netherlands	iOnctura B.V.	Amsterdam	29.44		B)	B)
Netherlands	Mosa Meat B.V.	Maastricht	<20.00		B)	B)
Netherlands	SynAffix B.V.	Nijmegen	<20.00		B)	B)
Switzerland	Asceneuron SA	Lausanne	25.35		B)	B)
Switzerland	CAMAG Chemie-Erzeugnisse und Adsorptionstechnik AG	Muttenz	39.11		2	1
Switzerland	FoRx Therapeutics AG	Basel	<20.00		B)	B)
Switzerland	Inthera Bioscience AG	Schlieren	23.28		B)	B)
Switzerland	MoonLake Immunotherapeutics AG	Zug	<20.00		34	B)
Switzerland	UNISERS AG	Zurich	<20.00		B)	-
United Kingdom	Artios Pharma Limited	Cambridge	<20.00		B)	B)
United Kingdom	Lightcast Discovery Ltd.	Cambridge	<20.00		B)	-
United Kingdom	Macrophage Pharma Limited	London	22.21		B)	B)
United Kingdom	NanoSyrinx Ltd.	Coventry	<20.00		B)	B)
United Kingdom	Nucleome Therapeutics Limited	Oxford	<20.00		B)	-
United Kingdom	Outrun Therapeutics Limited	Dundee	35.39		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		B)	B)
North America						
Canada	Future Fertility Inc.	Toronto	<20.00		B)	B)
United States	Actithera Inc.	Wilmington	35.71		B)	B)
United States	Akili, Inc.	Wilmington	<20.00		<0.5	-
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	Baird Venture Partners IV Limited Partnership	Wilmington	<20.00		C)	C)
United States	Biolinq Inc.	San Diego	<20.00		B)	B)
United States	Bird Rock Bio, Inc.	La Jolla	<20.00		B)	-
United States	Celestial AI Inc.	Wilmington	<20.00		B)	B)
United States	Concerto Biosciences, Inc.	Wilmington	<20.00		B)	-
United States	ElectronInks Inc.	Austin	<20.00		B)	B)
United States	Galecto, Inc.	Wilmington	<20.00		1	3
United States	High Line Bio, Inc.	Wilmington	<20.00		2	-
United States	Hydrochlor, LLC	Wilmington	50.00		D)	D)
United States	IDRX, Inc.	Wilmington	<20.00		10	-

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, 2022 (€ million)	Fair value as of Dec. 31, 2021 (€ million)
United States	ImmuneBridge Inc.	Wilmington	21.59		B)	-
United States	Immunitas Therapeutics, Inc.	Wilmington	<20.00		B)	B)
United States	Indi Molecular, Inc.	Culver City	<20.00		B)	B)
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	PDS Biotechnology Corporation	Wilmington	<20.00		5	-
United States	Pictor Labs, Inc.	Los Angeles	<20.00		B)	B)
United States	Plexium Inc.	Wilmington	<20.00		B)	B)
United States	Polaris Electro-Optics, Inc	Wilmington	<20.00		B)	-
United States	Precigen, Inc.	Germantown	<20.00		29	68
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)
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	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)	B)
United States	Telios Pharma, Inc.	Wilmington	<20.00		10	9
United States	Tignis Inc.	Seattle	<20.00		B)	-
United States	Tioga Pharmaceuticals, Inc.	San Diego	<20.00	<20.00	<0.5	<0.5
United States	Vera Therapeutics, Inc.	Wilmington	<20.00		35	45
United States	Xilio Therapeutics, Inc.	Waltham	<20.00		2	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, 2022 (€ million)	Fair value as of Dec. 31, 2021 (€ million)
Asia-Pacific (APAC)						
China	IKAS Industry Co., Ltd.	Shenzhen	<20.00		B)	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.	Kawasaki	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)
Cayman Islands	MoonLake Immunotherapeutics Ltd.	Grand Cayman	<20.00		<0.5	-
Middle East and Africa (MEA)						
Algeria	Novapharm Production SARL	Wilaya de Tipiza	20.00		3	2
Israel	AION Labs Innovation 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)	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	22.50		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, 2022, the fair value of the M Ventures portfolio not quoted in an active market amounted to € 354 million (December 31, 2021: € 308 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 14, 2023

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