

Notes to the Consolidated Financial Statements

General Disclosures

(1) Company information

The accompanying consolidated financial statements for the year ended December 31, 2020, were prepared for MERCK Kommanditgesellschaft auf Aktien (Merck KGaA, Darmstadt, Germany), Frankfurter Strasse 250, 64293 Darmstadt, Germany, entered in the commercial register of the Darmstadt Local Court under HRB 6164. The ultimate parent company of the Group is the parent company of Merck KGaA, Darmstadt, Germany, E. Merck Kommanditgesellschaft (E. Merck KG, Darmstadt, Germany), Darmstadt, Germany. The consolidated financial statements of E. Merck KG, Darmstadt, Germany, can be accessed at www.bundesanzeiger.de.

(2) Reporting principles

These consolidated financial statements have been prepared in accordance with the International Financial Reporting Standards (IFRS and IAS) as issued by the International Accounting Standards Board (IASB) and announcements by the IFRS Interpretations Committee (IFRIC and SIC) in force on the reporting date and as adopted by the European Union, as well as the additionally applicable provisions of section 315e of the German Commercial Code (HGB). The fiscal year corresponds to the calendar year. These consolidated financial statements have been prepared in euros, the reporting currency. The figures presented in the consolidated financial statements have been rounded. This may lead to individual values not adding up to the totals presented.

The accounting and measurement policies used in the consolidated financial statements are presented in the following Notes and are marked there.

Standards, interpretations and amendments applicable for the first time in the year under review

The following regulations are binding as of fiscal 2020:

- Amendment to IAS 1 "Presentation of Financial Statements"
- Amendment to IAS 8 "Accounting Policies, Changes in Accounting Estimates and Errors"
- Amendment to IAS 39 "Financial Instruments: Recognition and Measurement"
- Amendment to IFRS 3 "Business Combinations"
- Amendment to IFRS 7 "Financial Instruments: Disclosures"
- Amendment to IFRS 9 "Financial Instruments"
- Amendment to IFRS 16 "Leases"
- Amendments to References to the Conceptual Framework in International Financial Reporting Standards

The new regulations applicable for the first time in fiscal 2020 did not have a material impact on the consolidated financial statements.

Standards, interpretations and amendments applicable for the first time in fiscal 2021

The following regulations are binding as of fiscal 2021:

- Amendment to IAS 39 “Financial Instruments: Recognition and Measurement”
- Amendments to IFRS 4 “Insurance Contracts”
- Amendment to IFRS 7 “Financial Instruments: Disclosures”
- Amendment to IFRS 9 “Financial Instruments”
- Amendment to IFRS 16 “Leases”

We did not opt for early application of any of these regulations. These regulations are not expected to have a material effect on the consolidated financial statements.

Regulations published but not yet endorsed by the European Union

As of the balance sheet date, the following regulations were published by the IASB but not yet endorsed by the European Union:

- IFRS 17 “Insurance Contracts”
- Amendment to IAS 1 “Presentation of Financial Statements”
- Amendment to IAS 16 “Property, Plant and Equipment”
- Amendment to IAS 37 “Provisions, Contingent Liabilities and Contingent Assets”
- Amendment to IFRS 3 “Business Combinations”
- Amendment to IFRS 17 “Insurance Contracts”
- Annual Improvements to IFRS 2018-2020 Cycle

From today’s perspective, the new regulations are not expected to have any material effects on the consolidated financial statements.

Adjustment to the presentation of provisions for employee benefits

To improve comparability and ensure further harmonization with the requirements of the IFRS taxonomy, the presentation of provisions and liabilities in connection with employee benefits was adjusted with effect from January 1, 2020. The balance sheet at the start of the comparative period is presented accordingly.

Provisions for employee benefits previously reported in other non-current provisions were reclassified (January 1, 2019: € 204 million/December 31, 2019: € 237 million) and reported in the item non-current provisions for employee benefits together with provisions for pensions and other post-employment benefits.

The category of current liabilities was expanded to include the item current provisions for employee benefits. This resulted in reclassifications from other current provisions (January 1, 2019: € 112 million/December 31, 2019: € 110 million).

Without the change in the disclosure of provisions for employee benefits as at December 31, 2020 the other non-current provisions would have amounted to € 566 million and the other current provisions to € 613 million.

Adjustments to the prior-year consolidated balance sheet due to completed purchase price allocations in fiscal 2020

Purchase price allocations for two company acquisitions in 2019 were completed in fiscal 2020, resulting in changes to the fair values of the assets and liabilities acquired. In accordance with IFRS 3, this required the adjustment of the consolidated balance sheet as of December 31, 2019. Further information can be found in Note (6) “Acquisitions and divestments”.

Change of the discount factor for defined benefit pension plans in the eurozone

As of December 31, 2020, the Group changed the way in which it determines the discount factor for defined benefit pension plans in the eurozone. This constitutes a change in an accounting estimate within the meaning of IAS 8. Further information can be found in Note (33) "Provisions for employee benefits".

Accounting and measurement policies

Currency translation

Functional currency

To a predominant extent, the subsidiaries of Merck KGaA, Darmstadt, Germany, conduct their business independently so that the functional currency is normally the respective local currency.

Some subsidiaries, particularly in the Performance Materials business sector, use the U.S. dollar as a functional currency in deviation from 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, and income and expenses are translated at average rates. Any currency translation differences arising during consolidation of Group companies are recognized in equity.

Hyperinflation

Since 2018, Argentina's economy has been classified as hyperinflationary in accordance with IAS 29 "Financial Reporting in Hyperinflationary Economies". Accordingly, business activities in Argentina are no longer disclosed at historical cost but are presented adjusted for inflation. For this purpose, the Group uses a combination of the wholesale index IPIM (Índice de precios internos al por mayor) and the consumer price index IPC (Índice de precios al consumidor). The index applied as of the balance sheet date stood at 4,896.2 (December 31, 2019: 3,722.0/January 1, 2019: 2,462.1). The loss on the net monetary position is reported in other operating expenses (see Note (14) "Other operating expenses").

After adjusting the figures 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:

€ 1 =	Average rate		Closing rate	
	2020	2019	Dec. 31, 2020	Dec. 31, 2019
Chinese renminbi (CNY)	7.872	7.740	8.000	7.803
Japanese yen (JPY)	121.756	122.314	126.801	121.765
Swiss franc (CHF)	1.070	1.112	1.083	1.086
South Korean won (KRW)	1,344.968	1,300.959	1,336.094	1,295.177
Taiwan dollar (TWD)	33.589	34.578	34.548	33.608
U.S. dollar (USD)	1.141	1.121	1.230	1.121

(3) Discretionary decisions and sources of estimation uncertainty

Dealing with discretionary decisions and sources of estimation uncertainty

The preparation of the consolidated financial statements requires the Group to make discretionary decisions and assumptions as well as estimates to a certain extent. The discretionary scope and estimation uncertainty are assessed in a Group-specific manner. Discretion describes the need to make assumptions concerning recognition or measurement. Estimation uncertainty denotes the degree of availability and reliability of historical experience and external data for future developments.

Increased uncertainty due to the Covid-19 pandemic

The Group is continuously examining the impact of the Covid-19 pandemic on its business and the resulting effects for the Group's accounting. To date, the Fertility franchise in the Healthcare business sector and the Surface Solutions and Display Solutions business units in the Performance Materials business sector have been most negatively affected by the Covid-19 pandemic. By contrast, the Process Solutions business unit in the Life Science business sector in particular is benefiting from increased demand, while all the other areas have seen either a slight negative impact or been largely unaffected by the pandemic. Based on the course of business and current planning, there was nothing to suggest that the going concern assumption should not have been applied in preparing these consolidated financial statements. As a preventive measure, however, the Group had increased its cash and cash equivalents in order to secure its liquidity in the meantime. There was no risk of a liquidity bottleneck at any time. Due to the high dynamics of the pandemic and the lack of historical experience, the estimates in these consolidated financial statements are subject to a greater degree of uncertainty than would usually be the case. Where making estimates involved particular challenges as a result of the Covid-19 pandemic, this is discussed in the following overview and the respective notes.

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, 2020 in € million	IFRS	Discretionary scope/estimation uncertainty	Sensitivity analysis	Increased uncertainty due to the Covid-19 pandemic	Note
Goodwill	15,959			yes	yes	18
Determination of recoverable amount		IAS 36	high			
Other intangible assets	7,653			yes	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	6,421			no	no	20
Determination of depreciation		IAS 16	medium			
Identification of impairments or reversal of impairments		IAS 36	medium			
Leases	429			yes	no	21
Recognition and measurement of lease arrangements		IFRS 16	medium			
Inventories	3,294			no	yes	24
Identification of impairments or reversal of impairments		IAS 2	medium			
Trade and other receivables	3,221			yes	yes	25, 42
Determination of loss allowance		IFRS 9	medium			
Other financial assets				yes	no	36, 43
Determination of fair values of contingent considerations	260	IFRS 13	high			
Determination of fair values of equity instruments	499	IFRS 9, IFRS 13	medium			
Provisions for pensions and other post-employment benefits				yes	yes	33
Determination of parameters for the valuation of present value of defined-benefit obligations	6,352	IAS 19	medium			
Other provisions and contingent liabilities	741			no	no	27, 28, 33
Recognition and measurement of other provisions and contingent liabilities		IAS 37	high			
Determination of parameters for the valuation of fair values of share-based payment programs		IFRS 2	medium			
Collaboration agreements				yes	no	7
Revenue recognition for upfront and milestone payments in collaboration agreements		-	medium			
Revenue recognition				yes	no	9
Measurement of sales deductions and refund liabilities	666	IFRS 15	high			
Income tax				no	no	15
Recognition and measurement of income tax liabilities	1,460	IAS 12	high			
Recognition and measurement of deferred taxes from temporary differences		IAS 12	medium			
Recognition of deferred tax assets from tax loss carryforwards	20	IAS 12	high			
Assets held for sale				no	no	6
Date on which assets and liabilities are classified as "held for sale"		IFRS 5	medium			

(4) Subsequent events

Effective January 1, 2021, Mr. Peter Guenter was appointed as a new member of the Executive Board and CEO of the Healthcare business sector.

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

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 shares in these companies are 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, 2019		335
Additions	Companies established	4
	Acquisitions	2
	Materiality	-
	Liquidations/mergers	-8
Retirements	Divestments	-5
	Immateriality	-2
	Loss of control	-
Fully consolidated companies as of Dec. 31, 2020		326
Subsidiaries rated at-equity as of Dec. 31, 2019		-
Subsidiaries rated at-equity as of Dec. 31, 2020		1
Non-consolidated subsidiaries as of Dec. 31, 2019		33
Non-consolidated subsidiaries as of Dec. 31, 2020		33

The list of non-consolidated subsidiaries mainly comprises non-operating shelf companies as well as entities subject to liquidation procedures, which are subsequently measured at fair value through other comprehensive income. The company accounted for using the equity method is Syntropy Technologies LLC, United States, which was formed in fiscal 2020. This company generated sales of € 1 million in the year under review.

The list of shareholdings presents all the companies included in the consolidated financial statements as well as all of the shareholdings of Merck KGaA, Darmstadt, Germany (see Note (50) "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 implemented within the scope of business combinations. Because prices observable on the market are mostly not available for the acquired other intangible assets, the Group relies on the expertise of external professionals for all material company acquisitions. The following overview shows the methods routinely 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.

Significant discretionary decisions and sources of estimation uncertainty

Business combinations

The recognition and measurement of assets, liabilities, and contingent liabilities at fair value within the context of purchase price allocations are associated with significant estimation uncertainty.

In particular, estimation uncertainty and discretionary decisions exist regarding:

- 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,
- the useful life and the degree of technical obsolescence which depend, among other things, on assumptions about technological trends.

Acquisitions in the fiscal year

Acquisition of Resolution Spectra Systems S.A.S., France

On June 30, 2020, the Group completed the acquisition of all of the shares in Resolution Spectra Systems S.A.S., a leading provider of systems for real-time analysis and monitoring of bioprocesses. The acquisition strengthens the Group's bioprocessing product portfolio within the Life Science business sector. The purchase price comprised a fixed compensation of € 4 million and future sales-based milestone payments of up to € 4 million. The purchase price allocation was completed as of December 31, 2020. The intangible assets identified within the scope of purchase price allocation and recognized as of the initial consolidation date were attributable to technology-related intangible assets of € 4 million. Goodwill amounted to € 5 million. The impact on the Group's net assets, financial position, and results of operations has been negligible both since actual inclusion in the consolidated financial statements and on the basis of notional consolidation from January 1, 2020.

Acquisition of AmpTec GmbH, Hamburg

On December 22, 2020, the Group acquired all of the shares in AmpTec GmbH (AmpTec), Hamburg, one of the leading contract development and manufacturing organizations for mRNA (messenger ribonucleic acid).

The deal strengthens the Group's capabilities to develop and manufacture mRNA. The acquisition adds to the Group's lipid manufacturing expertise and creates an integrated offering across the entire mRNA value chain. The company will be integrated into the Process Solutions business unit, which is part of the Life Science business sector. The preliminary purchase price comprised a payment of € 7 million and milestone payments of up to € 18 million for the achievement of technological development targets and sales- and profit-based targets. Valuation of the contingent purchase price payments resulted in a purchase price of € 13 million in accordance with IFRS 3. As the transaction took place just a few days before the reporting date, purchase price allocation had not yet been performed as of December 31, 2020. Accordingly, the difference between the purchase price and the carrying amounts of the net assets acquired is reported in full as goodwill in the amount of € 13 million. AmpTec has more than 40 employees and generated sales of € 2 million in fiscal 2020. The impact on the Group's net assets, financial position, and results of operations has been negligible both since actual inclusion in the consolidated financial statements and on the basis of notional consolidation from January 1, 2020.

Acquisitions in the previous year

Acquisition of Versum Materials, Inc., United States

On April 12, 2019, the Group announced the conclusion of a final agreement to acquire all issued and outstanding shares of Versum Materials, Inc. (Versum) for US\$ 53 per share in cash. The transaction closed on October 7, 2019. Its completion followed previous approvals issued by the relevant authorities, the approval of the shareholders of Versum and the fulfillment of other customary closing conditions.

Versum's business activities

Versum was one of the world's leading providers of process chemicals, gases, and equipment for semiconductor manufacturing. In fiscal 2018, the company generated annual sales of around € 1.2 billion in accordance with U.S. GAAP. It had around 2,300 employees and operated 14 production sites and seven research and development facilities in Asia and North America. The former Versum business was integrated into the Semiconductor Solutions business unit, which is part of the Performance Materials business sector. The objective of the transaction is to develop the Group as a leading player in the field of electronic materials for the semiconductor and display industries.

Due to the acquisition date, the Versum business acquired in fiscal 2019 contributed to the net income of the Group only from October 7, 2019.

Purchase price allocation

Determining the fair values required extensive analyses and calculations by an external professional. This process was completed in September 2020 and resulted in adjustments to intangible assets, property, plant and equipment and the associated deferred tax liabilities compared with the preliminary purchase price allocation in the 2019 financial statements. The changes in fixed assets were due in particular to the country-specific allocation of intangible assets, which in addition resulted in changes in the deferred taxes as a result of different national tax rates. There were also reclassifications within fixed assets. The final fair values at the acquisition date were as follows:

€ million	Fair value at the acquisition date
	Versum
Non-current assets	
Intangible assets (excluding goodwill)	2,889
Property, plant and equipment	512
Other non-current assets	62
	3,463
Current assets	
Inventories	224
Trade and other current receivables	155
Cash and cash equivalents	270
Other current assets	87
	737
Total assets	4,199
Non-current liabilities	
Non-current financial debt	938
Other non-current provisions and liabilities	81
Deferred tax liabilities	759
	1,778
Current liabilities	
Trade payables and other liabilities	61
Income tax liabilities	122
Other current liabilities and provisions	161
	345
Total liabilities	2,123
Net assets acquired	2,076
Purchase price for the acquisition of shares in accordance with IFRS 3	5,198
Positive difference (goodwill)	3,121

Material contingent liabilities were not identified as part of final purchase price allocation. The inventories measured at fair value were recognized in the cost of sales over a period of six months. The property, plant and equipment is depreciated over a period of up to 29 years. This resulted in depreciation of € 79 million in fiscal 2020 (2019: € 15 million).

The following overview shows the intangible assets identified within the scope of final purchase price allocation and recognized at the acquisition date:

€ million/years (preliminary)	Fair value at the acquisition date	Useful life
Customer relationships	2,356	7-19
Technology (patented and unpatented)	467	5-9/indefinite
Trademarks	44	12
Other intangible assets	22	7
Total	2,889	
Goodwill	3,121	indefinite
Total	6,010	

Amortization of the intangible assets acquired amounted to € 220 million in fiscal 2020 (2019: € 55 million).

If customer relationships were one year longer, the fair value of the customer relationships recognized in intangible assets would be € 44 million higher on the date of their acquisition. A shortening of the customer relationships by one year would reduce their fair value by € 46 million. The positive difference of € 3,121 million was recognized as goodwill. It includes expected synergies resulting from the integration of Versum 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 Performance Materials business sector. The goodwill is expected to be non-tax deductible. The change in goodwill valued in foreign currency between initial recognition and December 31, 2020 is broken down as follows:

€ million	Change in goodwill
Goodwill on December 31, 2019 ¹	3,058
Exchange rate effects	-271
Goodwill on December 31, 2020	2,787

¹ Previous year's figure have been adjusted.

Other acquisitions in the previous year

On June 17, 2019, the Group acquired the laboratory informatics provider BSSN Software GmbH, Darmstadt, (BSSN). BSSN develops and markets software for managing and integrating data, which unifies data from laboratory instruments and data systems and makes them available for analyzing, processing, and sharing. The business was integrated into the Applied Solutions business unit, which is part of the Life Science business sector. The purchase price amounted to € 16 million, including milestone payments amounting to € 6 million for reaching technological development targets. The first milestone payment of € 2 million was made in June 2020. The intangible assets identified within the scope of purchase price allocation and recognized as of the initial consolidation date were attributable to technology-related intangible assets of € 6 million.

The Group completed the acquisition of Intermolecular, Inc., United States, on September 20, 2019, for US\$ 1.20 per share in cash (the equivalent of € 56 million for 100% of shares). Intermolecular possesses application-specific materials expertise and platforms for accelerated learning and experimentation with a powerful analysis infrastructure that complements the Group's business and technology portfolio in the Semiconductor Solutions business unit, which is part of the Performance Materials business sector. In fiscal 2018, Intermolecular generated sales of US\$ 34 million and had around 90 employees. Final purchase price allocation did not result in any changes compared with the preliminary purchase price allocation presented in the previous year's annual report.

The Group completed the acquisition of FloDesign Sonics, Inc., United States, on October 10, 2019. The company developed a platform for industrial manufacturing of cell and gene therapies that allows cells to be manipulated using ultrasonic waves. It forms part of the Life Science business sector. The purchase price included fixed compensation of € 32 million. Future milestone payments of up to € 30 million for the achievement of technological development targets and an additional sales-based milestone payment were agreed as further elements of the purchase price. Taking into account the contingent purchase price payments, this resulted in a purchase price of € 46 million in accordance with IFRS 3. Final purchase price allocation did not result in any changes compared with the preliminary purchase price allocation presented in the previous year's annual report.

Adjustments to the prior-year consolidated balance sheet due to completed purchase price allocation in fiscal 2020

The preliminary purchase price allocations for Versum and BSSN were completed in fiscal 2020. The consolidated balance sheet as of December 31, 2019 was retrospectively adjusted as follows:

€ million	Dec. 31, 2019 as reported	Adjustments for Versum	Adjustments for BSSN	Dec. 31, 2019 adjusted
Non-current assets				
Goodwill	17,141	-23	-4	17,114
Other intangible assets	9,175	40	6	9,221
Property, plant and equipment	6,213	-22		6,192
Other non-current financial assets	738			738
Other non-current receivables	22			22
Other non-current non-financial assets	97			97
Deferred tax assets	1,421			1,421
	34,808	-4	1	34,805
Current Assets				
Inventories	3,342			3,342
Trade and other current receivables	3,488			3,488
Contract assets	156			156
Other current financial assets	57			57
Other current non-financial assets	591			591
Income tax receivables	589			589
Cash and cash equivalents	781			781
	9,003	-	-	9,003
Total assets	43,811	-4	1	43,808
Equity				
Equity capital	565			565
Capital reserves	3,814			3,814
Retained earnings	11,507	-24		11,483
Gains/losses recognized in equity	1,980			1,980
Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany	17,865	-24		17,841
Non-controlling interests	48	24		73
	17,914	-	-	17,914
Non-current liabilities				
Non-current provisions for employee benefits	3,194			3,194
Other non-current provisions	254			254
Non-current financial debt	8,644			8,644
Other non-current financial liabilities	43			43
Other non-current non-financial liabilities	93			93
Deferred tax liabilities	1,828	-4	1	1,825
	14,056	-4	1	14,053
Current liabilities				
Current provisions for employee benefits	110			110
Other current provisions	823			823
Current financial debt	4,550			4,550
Other current financial liabilities	1,127			1,127
Trade and other current payables	2,054			2,054
Refund liabilities	565			565
Income tax liabilities	1,402			1,402
Other current non-financial liabilities	1,211			1,211
	11,842	-	-	11,842
Total equity and liabilities	43,811	-4	1	43,808

The completion of purchase price allocation for the acquisitions made in previous year did not have any material effect on the consolidated income statement.

Divestments in the fiscal year

Significant discretionary decisions and sources of estimation uncertainty

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.

Divestment of the Allergopharma allergy business

On February 19, 2020, the Group signed an agreement to sell its Allergopharma allergy business to Dermapharm Beteiligungs GmbH, Grünwald, Germany. Following approval by the relevant regulatory authorities and other customary closing conditions, the transaction was closed effective March 31, 2020 with the exception of the immaterial business in China, which was closed separately on August 31, 2020. Allergopharma is a leading provider of specific immunotherapy for type 1 allergies. Allergopharma products were available in 18 countries. The transaction encompassed the Allergopharma business in Europe and Asia, including a wide range of therapeutic and diagnostic products, as well as the production site in Reinbek. An existing adrenaline autoinjector development project for the treatment of anaphylactic reactions did not form part of the transaction and remained with the Group. The final purchase price was € 70 million. After deducting the cash transferred, the Group received € 56 million. This was reported in the cash flow statement in cash flows from investment activities in the year under review. The gain on disposal in the amount of € 35 million was reported in other operating income in the consolidated income statement.

In the management’s estimation, the conditions for classification as a disposal group within the meaning of IFRS 5 were met only when the agreement on the divestment of the Allergopharma business was signed.

Divestment of Litec-LLL GmbH, Greifswald

The Group sold Litec-LLL GmbH on August 31, 2020 as part of a management buyout. The company specializes in lighting materials. The selling price was € 3 million; the gain on disposal and the cash received amounted to less than € 1 million.

(7) Collaboration and licensing agreements

Accounting and measurement policies

Out-licensing agreements

The Group concludes material out-licensing agreements for intellectual property in the Healthcare business sector in particular. 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, the recognition of contingent consideration usually does not take place until the result in question has materialized. In principle, sales-based and usage-based royalties are recognized only after the contract partner makes the corresponding sales or uses the intellectual property. As out-licensing transactions in the Healthcare business sector do not form part of ordinary activities, the corresponding income from upfront payments, milestone payments, and royalties is reported in other operating income (see Note (13) "Other operating income").

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. Because the partner companies do not have customer characteristics, these collaboration agreements do not fall directly within the scope of IFRS 15 and the associated income from upfront payments, milestone payments, and royalties is shown 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 two most significant collaborations are the agreements with GlaxoSmithKline plc, United Kingdom, (GSK) and Pfizer Inc., United States, (Pfizer) in the field of immuno-oncology.

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 a period of time, 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 sales generated in specific markets, or with specific products, to the respective collaboration partners in the event of a successful approval; in turn, specific income and expense items are carried by the collaboration partners according to predefined allocation ratios. Under these circumstances, the Group recognizes the 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 recognized in other operating expenses.

Joint arrangements in the Performance Materials business sector

The Group is a contract partner in two joint arrangements in the Performance Materials business sector. In both cases, the Group has joint control with the respective partner. Although they are legally separate from the partners, these joint arrangements are classified as joint operations in line with IFRS 11.B31. The Group and the contract partner ensure their contractually agreed access to the production outputs by preventing third party access. Assets, liabilities, income, and expenses from these joint arrangements allocated to the Group are accounted for in accordance with the IFRS applicable to the respective assets, liabilities, income and 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:

- Classification of joint arrangements as joint operations or joint ventures,
- Identification of an appropriate income recognition method, and
- 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 GlaxoSmithKline plc, United Kingdom, to co-develop and co-commercialize active ingredients in immuno-oncology

On February 5, 2019, the Group 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). The bifunctional fusion protein, Bintrafusp alfa, is currently an investigational candidate for several types of cancer. The overriding objective of the strategic alliance is to share the risks of development and commercialization. The execution of the collaboration agreement is not being structured through a separate vehicle.

After fulfilling the agreed conditions, the Group received an upfront payment of € 300 million in fiscal 2019, which was recognized as deferred income on the balance sheet and reported in other liabilities. In addition, the Group can receive future payments of up to € 2.5 billion (2019: up to € 2.9 billion) for achieving certain milestones related to approval and commercialization. The Group recognizes the upfront payment as income over time in accordance with the fulfillment of performance obligations existing on the basis of contractual agreements. A cost-based method is used to recognize these payments.

The Group and GSK are jointly responsible for the development and potential commercialization further down the line. According to the collaboration agreement, during the development period each company bears one half of the development expenses. While the Group would realize the net sales in the United States and GSK in all other countries in the event of regulatory approval, the partners would evenly split the net results of net sales less defined expense components.

In fiscal 2020, the Group recognized research and development costs amounting to a low three-digit million euro figure (2019: double-digit million euro figure). In addition, the Group recognized € 85 million of the upfront payment collected within other operating income (2019: € 92 million). If the percentage of completion had been 10% higher, this would have increased other operating income and profit before tax by € 30 million (while a 10% lower percentage of completion would have meant a reduction of € 30 million).

On January 20, 2021, the Group announced the discontinuation of the INTR@PID Lung 037 clinical study on the first-line treatment of patients with non-small cell lung cancer following the review of clinical data by the independent data monitoring committee. The impact of this adjusting event is included in these consolidated financial statements in a low double-digit million euro amount.

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®. This antibody is also being studied in multiple broad-based clinical trials as a potential treatment for further tumor types as a single agent as well as in combination with a wide array of approved or still investigational active ingredients. 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. 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. Based on the collaboration agreement, the Group was also granted the right to co-commercialize Xalkori® (crizotinib) with Pfizer for multiple years. Both the upfront payment and the value of the right to co-commercialize Xalkori® were recognized in the income statement until the end of fiscal 2019 and reported in other operating income. The residual book value of the intangible asset as of December 31, 2020 amounted to € 10 million (December 31, 2019: € 45 million).

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 sales from the commercialization of Bavencio® while the Group and Pfizer evenly split the net amount of sales less defined expense components. Net sales from the commercialization of Bavencio® amounted to € 156 million in the year under review (2019: € 103 million). As in the previous year, the Group recognized research and development costs in a low three-digit million euro amount in fiscal 2020, as well as profit share expenses in the amount of € 63 million (2019: € 42 million). The Group also realized other operating income of € 281 million in the previous year. This resulted from the achievement of three approval milestones as well as the recognition in the income statement of both the upfront payment and the value of the right to co-commercialize Xalkori®. For further information, please refer to Note (13) "Other operating income".

Restructuring of the collaboration with F-star Delta Ltd., United Kingdom, in the field of immuno-oncology in the previous year

In June 2017, the Group announced a strategic collaboration with F-star Delta Ltd, United Kingdom, (F-star) for the development and commercialization of bispecific immuno-oncology antibodies. In 2019, the existing licensing and collaboration agreement with F-star was restructured due to the reprioritization of resources and programs, meaning that all rights to the original drug candidate FS118 reverted to F-star. The option to acquire F-star Delta Ltd. was terminated. In the course of the realignment, the Group in-licensed an innovative bispecific antibody and, in addition, holds an option to in-license a further bispecific antibody from F-star's antibody platform. Both bispecific antibodies were handled under the previous collaboration. As a result of the aforementioned changes, impairment losses totaling € 72 million were recognized in 2019 for an intangible asset and the reverted option.

Out-licensing of the rights to a drug candidate in the area of osteoarthritis to Novartis AG, Switzerland

On October 1, 2020, the Group concluded an agreement with Novartis AG, Switzerland, (Novartis) on the out-licensing of M6495, a Phase II-ready drug candidate for the treatment of osteoarthritis. The Group received an upfront payment of € 50 million and is entitled to potential additional payments of up to € 400 million subject to the achievement of certain sales and development milestones, as well as royalties on future net sales. Novartis will assume full responsibility for the development and commercialization of M6495. The income from the out-licensing of intellectual property in the amount of € 27 million was reported in other operating income.

Out-licensing of the rights to the investigational therapy atacicept to Vera Therapeutics, Inc., United States

On November 9, 2020, the Group concluded an agreement with the biotechnology company Vera Therapeutics, Inc., United States, (Vera Therapeutics) on the out-licensing of the rights for the investigational therapy atacicept. Vera Therapeutics will initiate a Phase IIb study with atacicept in IgA nephropathy (IgAN). As part of the agreement, the Group received a 10% equity interest in Vera Therapeutics and the right to future milestone payments totaling up to € 605 million depending on the achievement of certain development and sales milestones, as well as royalties on future net sales. On initial recognition, the equity instruments received had a fair value of € 11 million. Vera Therapeutics will assume full responsibility for the development and commercialization of the atacicept program in all indications. The income from the out-licensing of intellectual property in the amount of € 27 million was reported in other operating income. This included a payment received in December 2020 for the achievement of a development milestone.

Collaboration with Artios Pharma Limited, United Kingdom, in the area of DNA repair mechanisms

On December 3, 2020, the Group and Artios Pharma Limited, United Kingdom (Artios) announced the conclusion of a global strategic cooperation in the area of DNA repair mechanisms. The aim of the collaboration is the development of therapies for the personalized treatment of cancers. Under the terms of the agreement, the partners will use Artios's platform to jointly identify multiple target molecules and lead structures. The Group has the option of acquiring control over the exclusive worldwide rights to develop and commercialize selected drug candidates resulting from the collaboration. In exchange, Artios will receive an upfront payment as well as near-term payments totaling US\$ 30 million. If the Group chooses to exercise the option, Artios will receive up to US\$ 860 million for each of the products commercialized by the Group in addition to staggered royalty payments on future net sales.

Arrangements in the Performance Materials business sector

Upon acquiring Versum Materials, Inc., United States, (Versum), the Group became an equal 50% partner in Hydrochlor, LLC, United States, (Hydrochlor) under a joint arrangement with Linde plc, Ireland. Hydrochlor was founded with the aim of supplying hydrogen chloride exclusively to the two partner companies. Also upon acquiring Versum, the Group became a partner under an agreement with Showa Denko K.K., Japan. The aim of the agreement is to manufacture a supplier product to supply to the two partner companies exclusively. Even though both agreements are legally separate from the respective partner companies, each agreement was classified as a joint operation since the respective arrangements are designed to provide output to the contract partners and each agreement is the sole source of funding for settling liabilities.

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 operations. It is founded on the business models of the business sectors, which led to homogeneous risk structures within the segments. Resource allocation and the assessment of the segments' business development are performed 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 presented. They originate mainly from the central Group functions. Moreover, the column serves the reconciliation to the Group figures. As these are managed at Group level, financial expenses and financial income, which include interest expenses and interest income, as well as income tax expenses and income are also disclosed under Corporate and Other.

Apart from sales, the success of a segment is mainly determined by EBITDA pre (segment result) and business free cash flow. EBITDA pre and business free cash flow are performance indicators not defined by International Financial Reporting Standards (IFRS). However, they represent important variables used to steer the Group. To enable operational performance to be controlled using the performance indicator EBITDA pre, this is calculated excluding depreciation and amortization, impairment losses and reversals of impairment losses, and adjustments.

Information by business sector – 2020

€ million	Healthcare	Life Science	Performance Materials	Corporate and Other	Group
Net sales¹	6,639	7,515	3,380	–	17,534
Intersegment sales	–	18	–	-18	–
Operating result (EBIT)²	1,804	1,599	240	-658	2,985
Depreciation	324	786	561	84	1,756
Impairment losses	56	3	123	–	183
Reversals of impairment losses	–	–	–	–	–
EBITDA²	2,184	2,387	925	-573	4,923
Adjustments ²	83	18	99	78	279
EBITDA pre (segment result)²	2,267	2,405	1,024	-495	5,201
EBITDA pre margin (in % of net sales) ²	34.1%	32.0%	30.3%	–	29.7%
Assets by business sector	7,358	20,145	9,735	4,558	41,796
Liabilities by business sector	-2,494	-1,589	-666	-20,030	-24,780
Investments in property, plant and equipment ³	480	653	230	49	1,413
Investments in intangible assets ³	43	51	46	10	150
Non-cash changes in provisions ⁴	-294	-13	18	75	-213

¹ Excluding intersegment sales.

² Not defined by International Financial Reporting Standard (IFRS).

³ According to the consolidated cash flow statement.

⁴ Excluding provisions for pensions and other post-employment benefits.

Information by business sector – 2019

€ million	Healthcare	Life Science	Performance Materials	Corporate and Other	Group
Net sales¹	6,714	6,864	2,574	-	16,152
Intersegment sales	-	21	-	-21	-
Operating result (EBIT)²	1,149	1,280	307	-617	2,120
Depreciation	713	784	328	80	1,905
Impairment losses	34	6	2	-	42
Reversals of impairment losses	-	-	-	-	-
EBITDA²	1,896	2,070	637	-537	4,066
Adjustments ²	25	59	166	68	318
EBITDA pre (segment result)²	1,922	2,129	803	-469	4,385
EBITDA pre margin (in % of net sales) ²	28.6%	31.0%	31.2%	-	27.1%
Assets by business sector ³	7,560	21,596	10,785	3,867	43,808
Liabilities by business sector ³	-3,055	-1,519	-716	-20,605	-25,894
Payments for investments in property, plant and equipment ⁴	343	296	125	49	813
Payments for investments in intangible assets ⁴	91	86	12	19	208
Non-cash changes in provisions ⁵	44	6	25	38	112

¹ Excluding intersegment sales.² Not defined by International Financial Reporting Standard (IFRS).³ Previous year's figure have been adjusted, see Note (6) "Acquisitions and divestments".⁴ According to the consolidated cash flow statement.⁵ Without provisions for pensions and other post-employment benefits.**Information by country and region – 2020**

€ million	Europe	thereof: Germany	thereof: Switzerland	North America	thereof: USA	Asia-Pacific	thereof: China	Latin America	Middle East and Africa	Group
Net sales by customer location ¹	4,991	979	292	4,739	4,524	6,313	2,529	910	581	17,534
Net sales by company location ¹	5,515	1,501	462	4,830	4,639	5,962	2,224	868	361	17,534
Goodwill and other intangible assets ²	4,930	1,585	1,628	17,876	17,866	804	63	1	-	23,612
Property, plant and equipment	3,581	1,610	877	1,664	1,657	973	343	147	56	6,421
Research and development costs	-1,931	-884	-905	-269	-269	-63	-21	-14	-10	-2,288
Number of employees	26,586	13,292	2,383	13,312	13,131	13,518	4,275	3,384	1,296	58,096

¹ Excluding intersegment sales.² Goodwill and other intangible assets show an allocation by currency area.

Information by country and region – 2019

€ million	Europe	thereof: Germany	thereof: Switzerland	North America	thereof: USA	Asia- Pacific	thereof: China	Latin America	Middle East and Africa	Group
Net sales by customer location ¹	4,735	1,010	212	4,214	4,011	5,599	2,275	1,012	591	16,152
Net sales by company location ¹	5,233	1,475	389	4,283	4,101	5,298	2,048	965	373	16,152
Goodwill and other intangible assets ^{2,3}	5,113	1,644	1,682	20,165	20,154	1,054	77	2	–	26,335
Property, plant and equipment ²	3,386	1,590	746	1,594	1,586	996	353	159	57	6,192
Research and development costs	-1,997	-923	-945	-164	-160	-79	-34	-18	-11	-2,268
Number of employees	26,714	13,806	2,337	12,829	12,648	12,728	4,110	3,430	1,335	57,036

¹ Excluding intersegment sales.

² Previous year's figure have been adjusted, see Note (6) "Acquisitions and divestments".

³ Goodwill and other intangible assets show an allocation by currency area.

The Group divides its business activities into three business sectors: The Healthcare business sector contains the business with prescription pharmaceuticals. The customers mainly comprise wholesalers, hospitals, and pharmacies. The Life Science business sector comprises products for scientific institutions and research and analytical laboratories in the pharmaceutical/biotechnology industry and applications for customers manufacturing chemical and biological pharmaceuticals. In line with the product portfolio, customers in this business sector primarily include companies of the pharmaceuticals and biotechnology sector as well as retailers and universities. The Performance Materials business sector consists of the entire specialty chemicals business and primarily services 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 Group sales in fiscal 2020 or 2019. Transfer prices for intragroup net sales were determined on an arm's-length basis. The intersegment sales reported in the above table are valued at group production cost.

The following table presents the reconciliation of Segment results of all operating businesses to the profit before income tax of the Group:

€ million	2020	2019
EBITDA pre of the operating businesses¹	5,696	4,854
Corporate and Other	-495	-469
EBITDA pre of the Group¹	5,201	4,385
Depreciation/amortization/impairment losses/reversals of impairment losses	-1,938	-1,946
Adjustments ¹	-279	-318
Operating result (EBIT)¹	2,985	2,120
Financial result	-354	-385
Profit before income tax	2,630	1,735

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

The adjustments comprised the following:

€ million	2020	2019
Restructuring costs	-162	-120
Integration costs/IT costs	-108	-95
Gains (+)/losses (-) on the divestment of businesses	-10	-6
Acquisition-related adjustments	10	-84
Other adjustments	-9	-13
Adjustments before impairment losses/reversals of impairment losses¹	-279	-318
Impairment losses	-128	-9
Reversals of impairment losses	-	-
Adjustments (total)¹	-407	-328

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

Restructuring expenses in the amount of € 162 million (2019: € 120 million) primarily relate to the Thrive transformation program in the Healthcare business sector that was initiated in the year under review (2020: € 88 million/2019: € 0 million). Restructuring expenses were incurred for the Bright Future program in the Performance Materials business sector in the amount of € 20 million (2019: € 50 million) and the relocation of various tasks to the shared service organization in the amount of € 9 million (2019: € 26 million). Further expenses of € 15 million related to various restructuring measures in the Life Science business sector (2019: € 9 million).

Integration and IT expenses in the amount of € 108 million (2019: € 95 million) primarily resulted from the introduction of new ERP systems (2020: € 50 million/2019: € 57 million) and the integration of Versum Materials, Inc., United States (Versum) (2020: € 37 million/2019: € 12 million). Impairment losses on intangible assets increased to € 128 million (2019: € 9 million) and are primarily related to intangible assets in the Performance Materials business sector.

Acquisition-related adjustments resulted in income of € 10 million (2019: expenses of € 84 million). This resulted in particular from the adjustment of the provision for the EU Commission's competition law review of the Sigma-Aldrich acquisition (Note (27) "Other provisions") in the mid double-digit million euro range. This was offset by expenses of € 22 million (previous year: € 80 million) in connection with the acquisition of Versum, mainly resulting from the consumption of inventories revalued at the time of acquisition.

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

2020

€ million	thereof: cost of sales	thereof: marketing and selling expenses	thereof: administration expenses	thereof: research and development expenses	thereof: other operating income and expenses	Total
Restructuring expenses	-33	-55	-28	-25	-21	-162
Integration expenses/IT expenses	-1	-5	-71	-1	-30	-108
Gains (+)/losses (-) on the divestment of businesses	-	-	-	-	-10	-10
Acquisition-related adjustments	-19	-	-	-	29	10
Other adjustments	-	-	-	-	-9	-9
Adjustments before impairment losses/reversals of impairment losses¹	-53	-60	-98	-27	-41	-279
Impairment losses	-	-	-	-	-128	-128
Reversals of impairment losses	-	-	-	-	-	-
Adjustments in the operating result (total)¹	-53	-60	-98	-27	-169	-407

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

2019

€ 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	-20	-10	-40	-29	-22	-120
Integration expenses/IT expenses	-	-	-70	-	-25	-95
Gains (+)/losses (-) on the divestment of businesses	-	-	1	-	-6	-6
Acquisition-related adjustments	-35	-	-	-	-49	-84
Other adjustments	-	-	-	-	-13	-13
Adjustments before impairment losses/reversals of impairment losses¹	-56	-10	-109	-29	-114	-318
Impairment losses	-	-	-	-	-9	-9
Reversals of impairment losses	-	-	-	-	-	-
Adjustments in the operating result (total)¹	-56	-10	-109	-29	-123	-328

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

Business free cash flow was determined as follows:

€ million	2020	2019
EBITDA pre¹	5,201	4,385
Investments in property, plant and equipment, software as well as advance payments for intangible assets	-1,439	-1,026
Changes in inventories	48	-577
Changes in trade accounts receivable as well as receivables from royalties and licenses	144	-259
Lease payments ²	-144	-136
Elimination of acquisitions/divestments	-45	346
Business Free Cash Flow¹	3,765	2,732

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

² Excluding payments for low-value leases and interest components included in lease payments.

(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. To a lesser extent, the Group generates net sales from the sale of goods based on bill-and-hold arrangements. In these cases, net sales are recognized before the goods are delivered to the customer, as soon as the Group has invoiced the products and the additional criteria laid out in IFRS 15.B81 are fulfilled. In the case of equipment sales, the criteria for revenue recognition are only met after installation has been successfully completed – to the extent that the installation requires specialized knowledge, does not represent a clear ancillary service and the relevant equipment can only be used by the customer once successfully set up.

For service contracts, and customer-specific contract manufacturing of goods and equipment, the Group recognizes revenue over time based on the progress towards complete satisfaction of the performance obligation, if there is a contractual claim for payment against the customer for the services already performed. Input- and output-oriented methods are used to appropriately determine progress on a contract-specific basis. Specifically, this is largely performed on the basis of the costs incurred, the time elapsed, or the milestones achieved as of the reporting date.

Intellectual property is out-licensed to a limited extent in the Healthcare and Life Science business sectors. In the Healthcare business sector, these transactions do not usually form part of ordinary activities, meaning that the corresponding income is reported in other operating income (see Note (7) “Collaboration agreements” and Note (13) “Other operating income”).

Net sales from contracts comprising several separate performance obligations are recognized when the respective performance obligation has been fulfilled. This affects, in particular, the sale of goods in combination with services. Multiple-element arrangements of this nature exist to a limited extent in the Applied Solutions business unit in the Life Science business sector and in the Semiconductor Solutions business unit in the Performance Materials 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.

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 recognized in the separate item “refund liabilities” on the consolidated balance sheet.

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 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 Group and its customers usually range between 30 and 60 days. For some service contracts, the company receives the contractually agreed consideration before the service is delivered; in such cases, the consideration received is presented as a contract liability on the consolidated balance sheet until the revenue has been recognized.

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. 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 estimate 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 recognized in 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 € 67 million (2019: € 57 million) reduction in profit before tax.

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

Healthcare

€ million	2020		2019	
Oncology	1,116	17%	1,030	15%
thereof: Erbitux®	891	13%	871	13%
thereof: Bavencio®	156	2%	103	2%
Neurology & Immunology	1,662	25%	1,594	24%
thereof: Rebif®	1,131	17%	1,273	19%
thereof: Mavenclad®	531	8%	321	5%
Fertility	1,079	16%	1,247	19%
thereof: Gonal-f®	630	9%	743	11%
General Medicine & Endocrinology	2,585	39%	2,557	38%
thereof: Glucophage®	903	14%	877	13%
thereof: Concor®	529	8%	530	8%
thereof: Euthyrox®	455	7%	402	6%
thereof: Saizen®	234	4%	238	4%
Other	197	3%	287	4%
Total	6,639	100%	6,714	100%

Life Science

€ million	2020		2019 ¹	
Process Solutions	3,596	48%	3,002	44%
Research Solutions	2,215	29%	2,170	31%
Applied Solutions	1,704	23%	1,692	25%
Total	7,515	100%	6,864	100%

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

Performance Materials

€ million	2020		2019 ¹	
Semiconductor Solutions	1,901	56%	878	34%
Display Solutions	1,108	33%	1,256	49%
Surface Solutions	370	11%	438	17%
Other	1	–	2	–
Total	3,380	100%	2,574	100%

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

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

2020

€ million

Net sales by product type	Healthcare		Life Science		Performance Materials		Group	
Goods	6,496	98%	6,585	88%	3,029	90%	16,111	92%
Equipment	5	-	386	5%	254	7%	645	4%
Services	56	1%	535	7%	96	3%	686	4%
License income	-	-	9	-	1	-	10	-
Commission income	18	-	-	-	-	-	18	-
Income from co-commercialization agreements	65	1%	-	-	-	-	65	-
Total	6,639	100%	7,515	100%	3,380	100%	17,534	100%

Net sales by region (customer location)

Europe	2,158	32%	2,583	35%	250	8%	4,991	29%
North America	1,554	23%	2,701	36%	484	14%	4,739	27%
Asia-Pacific	1,831	28%	1,900	25%	2,582	76%	6,313	36%
Latin America	641	10%	241	3%	28	1%	910	5%
Middle East and Africa	455	7%	89	1%	37	1%	581	3%
Total	6,639	100%	7,515	100%	3,380	100%	17,534	100%

2019

€ million

Net sales by product type	Healthcare		Life Science		Performance Materials		Group	
Goods	6,531	97%	5,972	87%	2,497	97%	15,000	93%
Equipment	7	-	397	6%	50	2%	454	3%
Services	100	2%	486	7%	25	1%	611	4%
License income	-	-	8	-	-	-	8	-
Commission income	18	-	2	-	1	-	21	-
Income from co-commercialization agreements	58	1%	-	-	-	-	58	-
Total	6,714	100%	6,864	100%	2,574	100%	16,152	100%

Net sales by region (customer location)

Europe	2,241	33%	2,277	33%	217	9%	4,735	29%
North America	1,474	22%	2,474	36%	267	10%	4,214	26%
Asia-Pacific	1,816	27%	1,743	26%	2,041	79%	5,599	35%
Latin America	702	11%	278	4%	32	1%	1,012	6%
Middle East and Africa	482	7%	92	1%	17	1%	591	4%
Total	6,714	100%	6,864	100%	2,574	100%	16,152	100%

Group net sales amounted to € 17,534 million in fiscal 2020 (2019: € 16,152 million), out of which € 697 million (2019: € 683 million) was recognized over time. This related mainly to net sales from services and from customer-specific equipment in the Applied Solutions and Process Solutions business units in the Life Science business sector and in the Semiconductor Solutions business unit in the Performance Materials business sector.

The table below shows future net sales from concluded contracts:

€ million	Year of expected revenue recognition		Total
	2021	2022 or later fiscal years	
As of Dec. 31, 2020	3,892	376	4,268

€ million	Year of expected revenue recognition		Total
	2020	2021 or later fiscal years	
As of Dec. 31, 2019	2,018	145	2,163

The significant increase compared with the previous year resulted, in particular, from the positive performance of the Process Solutions business unit in the Life Science business sector.

The following table shows the change in refund liabilities:

2020

€ million	Rebates/Bonus payments		Rights of return		Total
	Total	thereof: United States	Total	thereof: United States	
Jan. 1, 2020	522	315	43	29	565
Additions due to business combinations	-	-	-	-	-
Other additions	1,713	1,234	41	20	1,754
Disposals due to divestments/Reclassification to assets held for sale	-8	-	-	-	-8
Utilizations	-1,501	-1,081	-33	-17	-1,534
Cumulative increase (-)/decrease (+) in net sales	-66	-67	-3	-4	-69
thereof: attributable to performance obligations satisfied in prior periods	-48	-48	-3	-3	-51
Currency translation difference	-39	-35	-4	-3	-42
Other	1	-	-	-	1
Dec. 31, 2020	622	368	44	26	666

2019

€ million	Rebates/Bonus payments		Rights of return		Total
	Total	thereof: United States	Total	thereof: United States	
Jan. 1, 2019	423	274	49	31	472
Additions due to business combinations	-	-	-	-	-
Other additions	1,488	1,145	36	23	1,524
Disposals due to divestments/Reclassification to assets held for sale	-	-	-	-	-
Utilizations	-1,344	-1,067	-41	-25	-1,385
Cumulative increase (-)/decrease (+) in net sales	-44	-43	-2	-	-46
thereof: attributable to performance obligations satisfied in prior periods	-43	-43	-2	-	-45
Currency translation difference	8	6	1	1	9
Other	-9	-	-	-	-9
Dec. 31, 2019	522	315	43	29	565

The development of 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 as well as the merchandise sold.

Cost comprises the following items: directly attributable costs, such as cost of materials, personnel, and energy costs, depreciation and amortization, overheads attributable to the production process, inventory impairment losses and their reversals.

Cost of sales included amortization of intangible assets (excluding amortization of internally generated or separately acquired software) in the amount of € 210 million (2019: € 188 million). Material costs amounted to € 3,074 million in 2020 (2019: € 2,743 million) and were largely reported under cost of sales.

Impairment losses on inventories in 2020 amounted to € 312 million (previous year: € 275 million); reversals of impairment losses came to € 97 million (previous year: € 74 million).

The increase in impairments compared with the previous year was primarily attributable to the Life Science business sector. Falling demand for part of the product portfolio due to the Covid-19 pandemic led to an increased need for impairments.

(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 presented under net sales.

Amortization of the intangible assets under marketing and selling expenses is mainly attributable to customer relationships, marketing authorizations, licenses and similar rights, brands, and trademarks, which can be functionally allocated to Marketing and selling.

Marketing and selling expenses comprised the following items:

€ million	2020	2019
Sales force	-910	-954
Internal sales services	-862	-845
Sales promotion	-413	-521
Logistics	-899	-794
Amortization of intangible assets ¹	-636	-923
Royalty and license expenses	-164	-200
Other marketing and selling expenses	-324	-339
Marketing and selling expenses	-4,207	-4,576

¹ Excluding amortization of internally generated or separately acquired software.

The reduction in expenses for the sales force and sales promotion is largely due to the lockdown in a number of jurisdictions in order to combat the Covid-19 pandemic. The increase in logistics expenses was due in particular to modified transportation routes and higher freight rates as a result of the Covid-19 pandemic.

The lower level of amortization of intangible assets was due to the end of the scheduled amortization of assets recognized in connection with the acquisition of Serono SA, Switzerland.

Of the royalty and license expenses, € 51 million (2019: € 68 million) related to license expenses for Glucophage® in China with the distribution partner Bristol-Myers Squibb, Corp., United States, and € 41 million (2019: € 41 million) related to the commercialization of Erbitux® in Japan.

(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 € 127 million in 2020 (2019: € 99 million). The increase was mainly due to the strategic alliance with GlaxoSmithKline plc, United Kingdom, in the field of immuno-oncology (see Note (7) "Collaboration agreements").

Net income from repayments of subsidies received and reimbursements included reimbursements from governmental institutions as well as repayments of previously recognized governmental subsidies, which amounted to net income of € 2 million in total (2019: net expenses of € 5 million).

(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 and milestone payments, royalties, and license payments 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 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	2020	2019
Income from the reversal of provisions for litigation	424	18
Income from upfront payments, milestone payments and royalties	229	557
Income from disposal of businesses and non-current assets	97	44
Income from miscellaneous services	5	3
Income from the revaluation of contingent considerations	1	8
Remaining other operating income	81	84
Other operating income	838	715

Income from the reversal of provisions for litigation totaling € 424 million (2019: € 18 million) primarily related to the legal dispute with Biogen Inc., United States, concerning the sale of the product Rebif®, as well as the adjustment of the provision for the EU antitrust proceedings in connection with the acquisition of Sigma-Aldrich Corporation, United States. Additional information can be found in Note (27) "Other provisions".

Income from upfront payments, milestone payments, and royalties totaling € 229 million (2019: € 557 million) resulted in particular from the collaboration agreement with GlaxoSmithKline plc, United Kingdom (2020: € 85 million/2019: € 92 million). The prior-year figure also included income from the strategic alliance with Pfizer Inc., United States, in the amount of € 281 million. For further information see Note (7) "Collaboration agreements". License income primarily resulted from interferon beta products (Biogen Inc., United States) in the amount of € 74 million (2019: € 89 million) and a license for the antidepressant Viibryd® (AbbVie Inc., United States) in the amount of € 38 million (2019: € 0 million). It also included a milestone payment in connection with the out-licensing of atacicept to Vera Therapeutics, Inc., United States, in the amount of € 14 million.

The income from the disposal of businesses and non-current assets was largely attributable to the sale of the Allergopharma allergy business to Dermapharm Beteiligungs GmbH, Grünwald (€ 35 million), the out-licensing of the osteoarthritis drug candidate M6495 to Novartis AG, Switzerland (€ 27 million), and the sale of atacicept to Vera Therapeutics, Inc., United States (€ 13 million).

As in the previous year, other operating income included income from services performed in connection with the Consumer Health business that was divested in 2018.

(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	2020	2019
Impairment losses on non-financial assets	-183	-42
Project expenses (including integration and IT projects)	-93	-112
Profit share agreements	-80	-60
Currency effects from operating activities	-57	-98
Non-income related taxes	-56	-55
Expenses from litigation	-52	-60
Premiums, fees and contributions	-36	-33
Restructuring expenses	-29	-24
Expenses on revaluation of contingent considerations	-17	-8
Expenses for miscellaneous services	-15	-16
Expenses for disposal of businesses and non-current assets	-5	-14
Remaining other operating expenses	-240	-212
Other operating expenses	-863	-735

Impairments of non-financial assets in the amount of € 160 million (2019: € 33 million) were attributable to intangible assets (see Note (19) "Other intangible assets") and in the amount of € 23 million (2019: € 8 million) to property, plant and equipment (see Note (20) "Property plant and equipment").

Project expenses of € 93 million (2019: € 112 million) were primarily incurred on advisory services in connection with the integration of Versum Materials, Inc., United States, as well as expenses for the global Covid-19 crisis team and for masks, tests and donations. Consulting and personnel expenses were also incurred in connection with the Syntropy joint venture with Palantir Technologies, Inc., United States, and advisory services relating to the divested Consumer Health business, as well as for the global harmonization of the IT landscape.

Expenses from profit share agreements amounting to € 80 million (2019: € 60 million) were primarily incurred in connection with the strategic alliance with Pfizer Inc., United States, in the field of immuno-oncology (see Note (7) "Collaboration agreements"), as well as the cooperation with Bristol Myers Squibb Co., United States, in Japan to a significantly lesser extent.

Information on litigation expenses is included in Note (27) "Other provisions".

Restructuring expenses totaling € 29 million (2019: € 24 million) related in particular to advisory expenses in connection with the THRIVE program (see Note (27) "Other provisions") in the Healthcare business sector that it was not possible to allocate to the respective functions.

Expenses for the revaluation of contingent considerations in the amount of € 17 million in fiscal 2020 (2019: € 8 million) resulted from the remeasurement of contingent consideration arising in connection with the sale of the shares in Prexton Therapeutics SA, Switzerland, to Lundbeck A/S, Denmark, in 2018. They also included adjustments of contingent considerations from the divestment of the biosimilars business to subsidiaries of Fresenius SE & Co. KGaA, Bad Homburg vor der Höhe, in 2017 and the Kuvan® business to BioMarin Pharmaceutical Inc., United States, in 2016.

Remaining other operating expenses included, among other things, environmental protection costs and personnel expenses that it was not possible to reliably allocate to the functional areas. This item also contained the expense for donations of Cesol® 600 tablets containing the active ingredient praziquantel to the World Health Organization (WHO).

Remaining other operating expenses also included the loss on the net monetary position in connection with hyperinflation accounting in Argentina in the amount of € 9 million (2019: € 10 million).

(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 claims and liabilities

Assessments relating to specific matters are made to calculate uncertain income tax claims 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 disclosed 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 the relevant provisions of 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 likely that taxable profit will be available in the future to apply such tax assets. This corresponds to the procedure for recognizing deferred tax assets on unused tax credits and tax loss and interest carryforwards.

The recognition of deferred tax assets requires an estimate of the probability of future use. The influencing factors considered as part of this assessment include the following:

- temporary differences relating to the same taxation authority and the same taxable entity that will be subject to taxation in the future
- results history,
- results planning, and
- existing tax planning of the respective Group company.

Deferred tax liabilities are recognized for projected dividend payments of subsidiaries. If no dividend payments are projected in the foreseeable future, no deferred tax liability is recognized for the difference between proportional equity and the investment value determined for tax purposes.

Significant discretionary decisions and sources of estimation uncertainty

Income tax

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 claims and liabilities, the interpretation of tax provisions may be subject to particular uncertainty. The possibility that the relevant tax authorities will take a different view concerning the correct application and interpretation of tax standards cannot be ruled out. Changes to the assumptions underlying the correct interpretation of tax standards, for example as a result of changes in legislation, affect the accounting treatment of uncertain income tax assets and liabilities in fiscal 2020.

Regarding deferred tax items, there were degrees of uncertainty concerning the date on which an asset is realized or a liability settled and concerning the tax rate applicable on this date. This applies in particular to deferred taxes recognized in the course of 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 in the foreseeable future is discretionary.

Income taxes in the consolidated income statement were broken down as follows:

€ million	2020	2019
Current income taxes in the period	-959	-834
Income taxes for previous periods	-11	-59
Deferred taxes in the period	333	453
thereof: from temporary differences	334	466
thereof: from tax losses carried forward	-7	-6
thereof: from changes in tax rates	6	-7
Income taxes	-637	-440

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% (2019: 31.7%).

€ million	2020	2019
Profit before income tax	2,630	1,735
Tax rate	31.7%	31.7%
Theoretical income tax expense	-834	-550
Tax rate differences	307	192
Tax effect of companies with a negative contribution to consolidated profit	-31	-26
Income tax for previous periods	-11	-59
Tax credits	-32	-17
Tax effect on tax loss carryforwards	5	16
Tax effect of non-deductible expenses/tax-free income/other tax effects	-41	4
Income tax expense according to consolidated income statement	-637	-440
Tax ratio according to consolidated income statement	24.2%	25.4%

Income taxes consisted of corporation and trade taxes for the companies domiciled in Germany as well as comparable income taxes for foreign companies. Income taxes relating to other periods recognized in fiscal 2020 resulted mainly from completed tax audits and mutual agreement procedures as well as from additions to liabilities for risks from tax audits.

Deferred taxes according to 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	2020	2019
Change in deferred tax assets (consolidated balance sheet)	121	330
Change in deferred tax liabilities (consolidated balance sheet) ¹	384	-537
Deferred taxes credited/debited to equity	-116	-67
Changes in scope of consolidation/currency translation/other changes ¹	-58	727
Deferred taxes (consolidated income statement)	333	453

¹ Previous year's figures have been adjusted, see Note (6) "Acquisitions and divestments".

The item "Changes in scope of consolidation/currency translation/other changes" primarily comprised exchange rate effects between the euro and the U.S. dollar. In the previous year, it mainly included deferred taxes recognized in connection with the acquisition of Versum Materials, Inc., United States.

Changes in tax loss carryforwards

Tax loss carryforwards were structured as follows:

€ million	Dec. 31, 2020			Dec. 31, 2019		
	Germany	Outside Germany	Total	Germany	Outside Germany	Total
Tax loss carryforwards	94	1,110	1,204	57	1,168	1,225
Tax loss carryforwards for which a deferred tax asset is recognized	4	161	165	–	198	198
Tax loss carryforwards for which no deferred tax asset is recognized	90	949	1,039	57	970	1,027
Potential deferred tax assets for tax loss carryforwards	27	257	284	17	270	287
Recognized deferred tax assets on tax loss carryforwards	–	20	20	–	27	27
Not recognized deferred tax assets on tax loss carryforwards	27	237	264	17	243	260

The majority of the tax loss carryforwards either has no expiry date or can be utilized for up to 20 years. In 2020, the income tax expense was reduced by € 5 million (December 31, 2019: € 16 million) due to the utilization of tax loss carryforwards from prior years for which no deferred tax asset had been recognized in previous periods.

Unused tax credits amounted to € 31 million as of December 31, 2020 (December 31, 2019: € 42 million). No deferred tax assets were recognized for € 17 million of these unused tax credits (December 31, 2019: € 16 million).

Deferred taxes according to consolidated balance sheet

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

€ million	Dec. 31, 2020		Dec. 31, 2019	
	Assets	Liabilities	Assets	Liabilities
Intangible assets ¹	114	1,600	141	1,965
Property, plant and equipment ¹	27	101	25	119
Current and non-current financial assets	–	26	6	1
Inventories	679	13	657	17
Current and non-current receivables/Other assets	19	6	29	6
Provisions for pensions and other post-employment benefits	697	8	546	6
Current and non-current other provisions	251	27	212	24
Current and non-current liabilities	94	22	93	6
Tax loss carryforwards	20	–	27	–
Tax refund claims/Other	51	48	73	71
Deferred taxes (before offsetting)¹	1,951	1,849	1,811	2,215
Offset deferred tax assets and liabilities	-408	-408	-390	-390
Deferred taxes (consolidated balance sheet)¹	1,543	1,441	1,421	1,825

¹ Previous year's figure have been adjusted, see Note (6) "Acquisitions and divestments".

The changes in deferred tax assets and liabilities are primarily attributable to items recognized in profit or loss. Items not recognized in profit or loss related to deferred tax effects resulting from items recognized through other comprehensive income such as the remeasurement of the net defined benefit obligation and other benefit commitments, changes in the fair value of financial assets and derivatives held for hedging purposes, and currency translation effects. In fiscal 2020, the latter were attributable in particular to deferred tax liabilities recognized for temporary differences on intangible assets. Deferred tax assets and liabilities recognized or derecognized in connection with changes in the scope of consolidation in fiscal 2020 primarily related to deferred tax assets for temporary differences on provisions for pensions and other post-employment benefits.

The reduction in deferred tax liabilities is primarily due to the reversal of deferred tax liabilities in connection with the scheduled amortization of intangible assets identified and recognized in the course of purchase price allocations made in connection with past acquisitions.

An excess of deferred tax assets in the amount of € 34 million (December 31, 2019: € 27 million) was recognized for Group companies that reported losses in the last two years, as these are expected to be realizable on the basis of the positive earnings forecasts.

Deferred tax liabilities from outside basis differences for planned dividend payouts were recorded in the amount of € 46 million (December 31, 2019: € 51 million). Temporary differences relating to the retained earnings of subsidiaries, for which no deferred taxes are recognized, amounted to € 12,609 million as of December 31, 2020 (December 31, 2019: € 10,238 million).

Income tax receivables and income tax liabilities

Income tax receivables amounted to € 530 million (December 31, 2019: € 600 million). Of this figure, € 10 million (December 31, 2019: € 11 million) are disclosed in other non-current non-financial assets. Income tax receivables resulted primarily from tax prepayments that exceeded the actual amount of tax payable for 2020 and prior fiscal years as well as from refund claims for prior years. As of December 31, 2020, income tax liabilities, including liabilities for uncertain tax obligations, amounted to € 1,505 million (December 31, 2019: € 1,402 million). Of this figure, € 45 million related to the non-current income tax liabilities included in other non-current non-financial liabilities (December 31, 2019: € 0 million).

(16) Net cash flows from operating activities

Accounting and measurement policies

Net cash flows from operating activities

The calculation and presentation of cash flows from operating activities are based on the following principles:

- The presentation of cash flows from operating activities is determined using the indirect method based on the 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 generally presented in the cash flow from operating activities. 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 totaled € 1,006 million in fiscal 2020. Tax payments amounted to € 1,018 million in the previous year, of which € 130 million was attributable to cash flows from investing activities in connection with the divestment of the Consumer Health business. Tax refunds amounted to € 140 million (2019: € 160 million).

Interest paid totaled € 340 million (2019: € 316 million). Interest received amounted to € 11 million (2019: € 60 million).

The change in provisions in fiscal 2020 was largely due to the reversal of the provision for the patent dispute with Biogen Inc., United States (see Note (27) "Other provisions").

The decline in changes in other assets and liabilities was due to the end of the recognition in profit or loss of the initial consideration for the strategic alliance with Pfizer, Inc., United States (see Note (7) "Collaboration agreements").

(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 2020. The weighted average (basic) number of shares was 434,777,878 and thus corresponded to the number of theoretical shares outstanding. In fiscal 2020, there were no shares with a potential diluting effect; as a result, the diluted earnings per share were equivalent to basic earnings per share. The earnings per share attributable to discontinued operations in fiscal 2019 resulted from the divestment of the Consumer Health business as of December 1, 2018.

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 Healthcare, Life Science and Performance Materials business sectors. These groups of cash-generating units (CGUs) are the lowest level at which goodwill at the Group is monitored for internal management purposes.

Impairment testing is performed annually and on an ad hoc basis where there are indications of impairment. The existence of indications of impairment may be analyzed using various factors, particularly changes in short-term and medium-term planning, sector studies, analyst forecasts, validation multiples based on peer group information, the Group's average market capitalization compared with its balance sheet equity, and the development of its order books.

In the second quarter of 2020, an analysis was conducted to determine the extent of which the impact of the Covid-19 pandemic could indicate potential impairment losses affecting non-financial assets. This analysis found that individual indicators of impairment within the meaning of IAS 36 were considered to have been fulfilled in the Performance Materials CGU (primarily due to negative impacts in the Display Solutions and Surface Solutions business units) and the Healthcare CGU (primarily due to negative impacts in the Fertility and Neurology franchises). This assessment was based in particular on reductions in short-term and medium-term internal earnings and cash flow forecasts as well as published analyst forecasts. The significant assumptions for determining value underlying the impairment tests and the results of the sensitivity analyses are presented below.

For both value in use and fair value, the recoverable amount is calculated less costs of disposal in accordance with the discounted cash flow method (Level 3 in the IFRS 13 fair value hierarchy). The determination of the recoverable amount for the Life Science CGU and Healthcare CGU was based on the value in use in fiscal 2020 and in the previous year. The impairment test of Performance Materials CGU was based on the fair value less costs of disposal in fiscal 2020 and in previous year. The last medium-term plan approved by the Executive Board, with a detailed planning period of four years, served as the basis for planning. The value of the net cash flows was determined on the basis of the following principles:

	Value in use	Fair value less costs of disposal
Sales growth in the detailed planning period	Based on plans approved by the Executive Board, taking into account internal past experience and largely non-observable input factors in the market, for example regarding future market shares, selling prices and volumes, and excluding new products from the development pipeline and other expansion investments	Based on plans approved by the Executive Board, taking into account internal past experience and largely non-observable input factors in the market, for example regarding future market shares, selling prices and volumes, and including new products from the development pipeline and other expansion investments
Profit margins in the detailed planning period	Based on past experiences, adjusted for expected profitability developments	

The discount factor after taxes is derived on the basis of the following input parameters:

Risk-free interest rate	Derived from the returns of long-term government bonds
Beta factor	Derived from the respective peer group
Market risk premium	Based on a combination of different estimating methods; e.g. historical and implied stock yields
Cost of debt and capital structure	Derived from the market data of the respective peer group companies

The long-term growth rate after the detailed planning period is determined taking into account expected long-term growth and long-term inflation expectations.

Significant measurement assumptions

Due to the planning uncertainty concerning the further progress of the Covid-19 pandemic, the planning used in impairment testing in fiscal 2020 is based on two scenarios condensed to form a probability-weighted expected value. In the base scenario ("V" scenario), it is assumed that the sharp downturn in global economic growth in 2020 will be followed by a recovery at a similar speed, with growth rates subsequently returning to the levels recorded prior to the outbreak of the pandemic. In addition to the base scenario, a negative scenario (extended "U" scenario) was included with a probability of occurrence of just under 20%. This scenario assumes a slower recovery from the impact of the Covid-19 pandemic and a prolonged reduction in average global GDP growth across the entire detailed planning period. The planning applied in the previous year was based solely on a base scenario.

As in the previous year, the calculation of the fair value less costs of disposal of the Performance Materials CGU in the base scenario included expected average sales growth in the detailed planning period amounting to a mid single-digit percentage rate. Taking into account Group costs allocated on a pro rata basis, the EBITDA pre margin applied in the detailed planning period in fiscal 2020 was unchanged as against the previous year at around 30%.

In the base scenario, the expected average sales growth used to determine the value in use in the Life Science CGU in the detailed planning period amounted to a high single-digit percentage rate (2019: middle single-digit percentage rate). The EBITDA pre margin in the detailed planning period, taking into account Group costs allocated on a pro rata basis, was around 30% in both fiscal 2020 and the previous year.

In the base scenario, the expected average sales growth in the Healthcare CGU in the detailed planning period amounted to a low single-digit percentage rate as in the previous year. In line with the value-in-use concept, this did not include net sales from the launch of new products.

Compared with the base scenario, the negative scenario for the Performance Materials CGU assumed a reduction in annual net sales of 6-7% (Life Science CGU: 2-3%; Healthcare CGU: 1-7%) and a reduction in annual EBITDA pre of 10-13% (Life Science CGU: 2-3%; Healthcare CGU: 1-10%).

The additional significant assumptions for determining value underlying the goodwill impairment tests are quantified below.

in %	Long-term growth rate		Discount factor					
	Q2/Q3 2020	2019	Weighted cost of capital after tax			Weighted cost of capital before tax		
			Q2 2020	Q3 2020	2019	Q2 2020	Q3 2020	2019
Healthcare ¹	0.00%	0.00%	5.6%	5.5%	5.8%	7.5%	7.5%	7.8%
Life Science	1.75%	1.75%		6.0%	7.1%		7.4%	8.9%
Performance Materials ^{1, 2}	1.00%	1.00%	5.8%	5.7%	6.3%	7.2%	7.1%	8.0%

¹ The figures for impairment testing in Q2 2020 relate to the ad hoc tests performed in response to the Covid-19 pandemic.

² In 2019 including Versum Materials Inc., United States, on the basis of the preliminary purchase price allocation.

Net cash flows were discounted using cost of capital after tax. The aforementioned cost of capital before tax was subsequently derived iteratively.

Significant discretionary decisions and sources of estimation uncertainty

Goodwill

The determination of the recoverable amount is subject to discretion and significant estimation uncertainty. Assumptions regarding the amount of net cash flows, long-term growth rates, and discount factors are considered a material source of estimation uncertainty due to their inherent uncertainty. This is particularly true in fiscal 2020 due to the uncertainty in connection with the Covid-19 pandemic.

In all the impairment tests performed, the recoverable amount in both 2020 and the previous year was more than 15% higher than the carrying amount of the respective CGU. Regardless of this, the planning data used was checked for plausibility against external analyst assessments and the recoverable amounts determined were validated using validation multiples based on peer group information.

In addition, sensitivity analyses of the key assumptions were performed as part of the impairment tests. As a result, no change of a significant assumption deemed possible by management would have resulted in an impairment. Even an increase in the probability of occurrence of the negative scenario presented above (extended "U" scenario) to 100% would not have resulted in the need to recognize impairment losses for any of the CGUs. The following table presents the minimum amount by which key assumptions would have to change before the impairment test would trigger the recognition of an impairment loss. The figures for fiscal 2020 apply to both the ad hoc and scheduled impairment tests:

	Decrease in net cash flows		Decrease in long-term growth rate		Increase in cost of capital after tax	
	%		percentage points		percentage points	
	2020	2019	2020	2019	2020	2019
Healthcare	>10	>10	>2	>2	>2	>2
Life Science	>10	>10	>2	>1	>2	>1
Performance Materials ¹	>10	>10	>2	>2	>1.5	>1.5

¹ In 2019 considering Versum Materials Inc., United States, on the basis of the preliminary purchase price allocation.

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.

€ million	Goodwill			Total ¹
	Healthcare	Life Science ¹	Performance Materials ¹	
Cost as at Jan. 1, 2019	1,534	10,896	1,334	13,764
Additions due to Versum Materials, Inc.	–	–	3,121	3,121
Other additions	–	36	17	53
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–
Transfers	–	–	–	–
Impairment losses	–	–	–	–
Currency translation difference	–	199	-23	175
Dec. 31, 2019	1,534	11,130	4,449	17,114
Cost as of Jan. 1, 2020	1,534	11,130	4,449	17,114
Additions	–	18	–	18
Disposals due to divestments/Reclassification to assets held for sale	-9	–	–	-9
Transfers	–	–	–	–
Impairment losses	–	–	–	–
Currency translation difference	–	-862	-303	-1,165
Dec. 31, 2020	1,525	10,287	4,146	15,959

¹ Previous year's figures have been adjusted, see (6) "Acquisitions and divestments".

The changes in goodwill caused by foreign exchange rates resulted almost exclusively from translating the goodwill from the acquisitions of the Sigma-Aldrich Corporation, the Versum Materials, Inc., the AZ Electronic Materials S.A., and the Millipore Corporation, which were partially denominated in U.S. dollars, into the reporting currency.

See Note (6) "Acquisitions and divestments" for further information on the additions.

The recoverable amount exceeded the respective carrying amount in all ad hoc impairment tests in the second quarter of 2020 as well as the scheduled impairment tests on October 31, 2019 and August 31, 2020.

(19) Other intangible assets

Accounting and measurement policies

Recognition and initial measurement of purchased intangible assets

In the course of in-licensing, the portion of the consideration paid by the Group to acquire intellectual property is recognized as an intangible asset. If development services are also acquired from the selling contract party, an appropriate portion of the consideration is recognized as deferred income and allocated to research and development costs in line with the service performance if capitalization is not possible.

Contingent consideration in the form of milestone payments in connection with the purchase of intangible assets arising outside a business combination is capitalized as an intangible asset and recognized as a financial liability once the milestone is reached.

Intangible assets acquired in the course of business combinations are recognized at fair value on the acquisition date. This also includes contingent considerations.

Recognition and initial measurement of internally generated intangible assets

Owing to the high risks 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 Performance Materials business sectors, development expenses are capitalized as soon as the criteria have been met. This includes expenses that arose as part of registration for REACH. Furthermore, development expenses for internally developed software are capitalized provided that the relevant criteria have been fulfilled.

Subsequent measurement

In the course of subsequent measurement, the option to remeasure intangible assets at fair value is not exercised.

Intangible assets with a finite useful life are amortized using the straight-line method. The useful lives of customer relationships, brand names, and trademarks as well as marketing authorizations, acquired patents, licenses and similar rights, and software are between three and 24 years. In determining these useful lives, the Group considers factors including the typical product life cycles for each asset and publicly available information about the estimated useful lives of similar assets.

An impairment test is performed if there are indications of impairment. Indications of impairment and the need to reverse impairment losses are determined once a year and on an ad hoc basis with the involvement of the responsible departments and taking external and internal information into consideration. The Group examines the existence of indications of impairment using various factors, particularly deviations from forecasts and the analysis of changes in medium-term planning. In the event of impairment, an impairment loss is recorded under other operating expenses. Impairment losses are reversed to the amortized cost and presented in other operating income if the original reasons for impairment no longer apply. Intangible assets with indefinite useful lives and intangible assets not yet available for use are tested for impairment when a triggering event arises or at least once a year. Amortization does not begin until the product is ready for economic use and is recognized on a straight-line basis over the shorter of the patent or contract term and the estimated useful life.

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 represent remuneration for services received or whether such payments result in an in-licensing of an intangible asset that has to be capitalized.

Determination of the useful life

Substantial assumptions and estimates are required to determine the appropriate level 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 € 86 million lower in fiscal 2020 (2019: € 112 million).

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 other intangible assets.

	Customer relationships, brands and trademarks ¹	Marketing authorizations, patents, licenses, similar rights, and other items	Software and software in development ¹	Advance payments	Total ¹
€ million		Finite useful life ¹	Not yet available for use		
Cost as of Jan. 1, 2019	7,402	10,739	885	755	19,780
Additions due to business combinations	2,401	339	181	23	2,944
Other additions	–	46	40	122	208
Disposals due to divestments/ Reclassification to assets held for sale	–	–	–	–	–
Other disposals	-2	-19	–	-4	-26
Transfers	-1	1	-1	5	5
Currency translation difference	94	34	-4	5	129
Dec. 31, 2019	9,893	11,141	1,101	906	23,040
Accumulated amortization and impairment losses as of Jan. 1, 2019	-2,326	-9,195	-596	-426	-12,544
Depreciation, amortization, and write-downs	-466	-654	–	-77	-1,197
Impairment losses	–	–	-33	-1	-33
Reversals of impairment losses	–	–	–	–	–
Disposals due to divestments/ Reclassification to assets held for sale	–	–	–	–	–
Other disposals	2	17	–	4	23
Transfers	–	6	-5	–	–
Currency translation difference	-39	-26	–	-4	-69
Dec. 31, 2019	-2,829	-9,853	-634	-503	-13,820
Net carrying amounts as of Dec. 31, 2019	7,064	1,287	467	403	9,221
Cost as of Jan. 1, 2020	9,893	11,141	1,101	906	23,040
Additions due to business combinations	–	4	–	–	4
Other additions	–	26	33	97	157
Disposals due to divestments/ Reclassification to assets held for sale	-4	-2	–	-6	-12
Other disposals	–	-11	-27	-25	-63
Transfers	–	5	-5	–	–
Currency translation difference	-741	-147	-16	-28	-933
Dec. 31, 2020	9,148	11,015	1,086	944	22,193
Accumulated depreciation and impairment losses as of Jan. 1, 2020	-2,829	-9,853	-634	-503	-13,820
Depreciation, amortization, and write-downs	-577	-281	–	-82	-940
Impairment losses	-26	-68	-62	-4	-160
Reversals of impairment losses	–	–	–	–	–
Disposals due to divestments/ Reclassification to assets held for sale	4	2	–	1	7
Other disposals	–	5	–	24	29
Transfers	–	–	–	–	–
Currency translation difference	217	104	1	21	343
Dec. 31, 2020	-3,211	-10,091	-695	-543	-14,540
Net carrying amounts as of Dec. 31, 2020	5,937	924	391	401	7,653

¹ Previous year's figures have been adjusted, see (6) "Acquisitions and divestments".

Additions/disposals due to company acquisitions and divestments

Additions due to business combinations in fiscal 2019 mainly included additions to intangible assets due to the acquisition of Versum Materials, Inc., United States. The changes in the scope of consolidation in fiscal 2020 resulted from the acquisition of Resolution Spectra Systems S.A.S., France, and the sale of the Allergopharma allergy business to Dermapharm Beteiligungs GmbH, Grünwald. See Note (6) "Acquisitions and divestments" for detailed information on the acquisitions and divestments and the related effects.

The additions to market authorizations, patents, licenses, similar rights, and other items with finite useful lives in fiscal 2020 in the amount of € 26 million (2019: € 46 million) were mainly attributable to the Performance Materials business sector.

The additions to marketing authorizations, patents, licenses, similar rights, and other items not yet available for use amounted to € 33 million in fiscal 2020 (2019: € 40 million) and were mostly attributable to the Healthcare business sector.

The additions to software and software in development in the amount of € 97 million (2019: € 122 million) resulted mainly from development costs in connection with new ERP programs.

Loss allowances

In the second quarter of 2020, an analysis was conducted of the extent to which the impact of the Covid-19 pandemic could also indicate potential impairment losses affecting non-financial assets. This analysis found that individual indicators of impairment within the meaning of IAS 36 were considered to have been fulfilled for intangible assets in the Performance Materials and Healthcare business sectors in the second quarter of 2020. The impairment tests performed as a result identified impairment of intangible assets in the Performance Materials business sector in the amount of € 96 million in the second quarter of 2020. Of this figure, € 68 million was attributable to technology-related intangible assets, the majority of which were acquired as part of the acquisition of AZ Electronic Materials S.A., Luxembourg.

In addition, impairment losses were recognized on an ad hoc basis for market authorizations, patents, licenses, similar rights, and other items not yet available for use in the amount of € 62 million (2019: € 33 million). Of this figure, € 54 million related to the Healthcare business sector, with around € 36 million resulting from the discontinuation of two pre-clinical research projects.

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	Healthcare	Life Science	Performance Materials	Total Dec. 31, 2020	Total Dec. 31, 2019 ¹
Customer relationships, brands and trademarks		–	3,849	2,088	5,937	7,064
Customer relationships	0.5-17.8	–	3,279	2,050	5,329	6,291
thereof from the following acquisitions:						
Sigma-Aldrich Corporation	15.9-16.9	–	2,893	129	3,023	3,520
Versum Materials, Inc.	5.8-17.8	–	–	1,921	1,921	2,267
Millipore Corporation	0.5-6.5	–	362	–	362	470
Brands and trademarks	2.5-6.9	–	570	38	608	773
thereof from the following acquisition:						
Sigma-Aldrich Corporation	6.9	–	450	–	450	563
Marketing authorizations, patents, licenses and similar rights and other						
Finite useful life		62	245	617	924	1,287
Marketing authorizations	–	17	–	–	17	58
Xalkori®	1.0	10	–	–	10	45
Other marketing authorizations		7	–	–	7	13
Patents, licenses and similar rights	0.3-12.3	–	241	599	840	1,151
thereof from the following acquisitions:						
AZ Electronic Materials S.A.	0.3-12.3	–	–	333	333	516
Versum Materials, Inc.	3.8-5.8	–	–	206	206	268
Others		45	4	18	67	78
Not yet available for use		212	18	161	391	467
thereof from the following acquisition:						
Versum Materials, Inc.	–	–	–	151	151	177

¹ Previous year's figures have been adjusted, see (6) "Acquisitions and divestments".

(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 depreciation 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 recorded under other operating expenses. Impairment losses are reversed to the amortized cost and presented 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 level of amortization of 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 ¹	Plant and machinery ¹	Other facilities, operating and office equipment ¹	Construction in progress and advance payments to vendors and contractors	Total ¹
Cost at January 1, 2019	4,222	4,330	1,372	1,096	11,019
Additions due to business combinations	139	270	35	84	529
Other Additions	190	45	57	812	1,104
Disposals due to divestments/Reclassification to assets held for sale	-	-	-	-	-
Other Disposals	-81	-88	-46	-8	-223
Transfers	299	327	100	-713	14
Currency translation difference	47	26	13	8	95
Dec. 31, 2019	4,816	4,910	1,532	1,278	12,537
Accumulated depreciation and impairment losses as of Jan. 1, 2019	-1,609	-3,150	-977	-4	-5,740
Depreciation	-273	-284	-150	-	-708
Impairment losses	-6	-	-	-1	-8
Reversals of impairment losses	-	-	-	-	-
Disposals due to divestments/Reclassification to assets held for sale	-	-	-	-	-
Disposals	48	85	41	1	176
Transfers	1	-21	-	-	-20
Currency translation difference	-14	-19	-10	-	-44
Dec. 31, 2019	-1,854	-3,390	-1,097	-4	-6,345
Net carrying amounts as of Dec. 31, 2019	2,962	1,520	435	1,274	6,192
Cost as of Jan. 1, 2020	4,816	4,910	1,532	1,278	12,537
Changes in the scope of consolidation	1	1	-	-	2
Additions	363	49	87	1,031	1,530
Reclassification to assets held for sale	-66	-44	-7	-1	-117
Disposals	-217	-62	-53	-4	-336
Transfers	249	510	142	-901	-
Currency translation difference	-177	-119	-52	-39	-386
Dec. 31, 2020	4,969	5,245	1,649	1,365	13,229
Accumulated depreciation and impairment losses January 1, 2020	-1,854	-3,390	-1,097	-4	-6,345
Depreciation	-297	-346	-175	-	-818
Impairment losses	-5	-5	-	-13	-23
Reversals of impairment losses	-	-	-	-	-
Disposals due to divestments/Reclassification to assets held for sale	17	27	7	-	51
Disposals	85	44	43	1	174
Transfers	1	-	-	-1	-
Currency translation difference	56	65	32	-	153
Dec. 31, 2020	-1,997	-3,605	-1,189	-17	-6,808
Net carrying amounts as of Dec. 31, 2020	2,972	1,640	460	1,348	6,421

¹ Previous year's figure have been adjusted, see Note (6) "Acquisitions and divestments".

The changes in the scope of consolidation in fiscal year 2020 primarily related to the sale of the Allergopharma allergy business, the sale of Litec-LLL GmbH, Greifswald, and the acquisition of AmpTec GmbH, Hamburg. Detailed information can be found in Note (6) "Acquisitions and divestments".

The largest individual addition was the acquisition of the previously leased land and buildings of the Life Science Campus in Burlington, United States. Other major individual additions to assets in fiscal year 2020 related to the investment projects shown below:

Business sector	Investment project	Country
Healthcare	Biotech development system	Switzerland
Healthcare	Filling and packaging center	Switzerland
Healthcare	Expansion of research center	United States
Life Science	Production plant	United States
Life Science	Filling and logistics center	Germany
Life Science	Production plant	Germany
Life Science	Production plant	Ireland
Life Science	Production plant	United States
Performance Materials	Laboratory and office building	United States
Performance Materials	Research center	Germany

Impairment losses of € 23 million (2019: € 8 million) were recognized in fiscal year 2020. These primarily related to assets under construction and production facilities in the Performance Materials business sector in Germany and Japan.

(21) Leasing

Accounting and measurement policies

IFRS 16 scope

The Group exercises the option of not recognizing leases of intangible and low-value underlying assets in the context of IFRS 16. Right-of-use assets under leases are reported in the balance sheet item "Property, plant and equipment" (see Note (20) "Property, plant and equipment").

If 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 is applicable over the same period to 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 can not be reliably determined, the incremental borrowing rate is applied in measuring the lease liability. At Merck KGaA, Darmstadt, Germany, 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

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.

These assessments may be discretionary even though they rely 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 30 largest leases accounted for around 50% of total lease liabilities. The subject matter of the leases essentially comprised 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 cash outflows of up to € 200 million (2019: € 279 million).

Where individual contracts include termination options, it was considered unlikely that these would be exercised so that additional lease payments were already considered in the corresponding lease liability.

Determining the incremental borrowing rate

Determining the risk-free interest rate and determining the risk surcharge are both discretionary.

Initial measurement of the lease liability and the right-of-use asset

In measuring the lease liability, there is discretionary scope and significant estimation uncertainty regarding:

- measuring any payments in the course of promised residual value guarantees and
- assessing the probability that existing purchase and termination options and renewal options will be exercised.

In measuring right-of-use assets under leases, the Group is subject to estimation uncertainty regarding any demolition obligations and their resulting payments.

The reconciliation of net carrying amounts of right-of-use assets from leases was as follows:

€ million	Right-of-use assets			Total
	Land, land rights and buildings	Plant and machinery	Other facilities, operating and office equipment	
Net carrying amounts as of Jan. 1, 2020	487	13	58	557
Changes in the scope of consolidation	-1	-	-	-2
Additions	130	2	55	187
Disposals	-119	-1	-9	-129
Depreciation	-107	-5	-42	-153
Impairment losses	-	-	-	-
Reversal of impairment losses	-	-	-	-
Other	-30	2	-3	-32
Net carrying amounts as of Dec. 31, 2020	360	11	58	429

€ million	Right-of-use assets			Total
	Land, land rights and buildings	Plant and machinery	Other facilities, operating and office equipment	
Net carrying amounts as of Jan. 1, 2019	391	17	67	476
Changes in the scope of consolidation	36	1	5	42
Additions	175	2	24	200
Disposals	-22	-	-2	-24
Depreciation	-100	-6	-39	-144
Impairment losses	-1	-	-	-1
Reversal of impairment losses	-	-	-	-
Other	9	-1	2	10
Net carrying amounts as of Dec. 31, 2019	487	13	58	557

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

The disposals under land, land rights, and buildings in fiscal 2020 primarily resulted from the acquisition of the previously leased land and buildings of the Life Science Campus in Burlington, United States.

The expenses and income and the payments under the leases in accordance with IFRS 16 were reported in the consolidated income statement and the consolidated statement of cash flows as follows:

€ million	2020	2019
Right-of-use assets		
Depreciation	-153	-144
Impairment losses	-	-1
Reversals of impairment losses	-	-
Expenses for leasing low-value assets	-18	-22
Expenses for leases with variable lease payments	-	-
Income from subleasing right-of-use assets	-	1
Income from sale-and-lease-back transactions	-	21
Interest expenses for lease liabilities	-15	-14
Total	-186	-160

€ million	2020	2019
Net cash flows from operating activities	-34	-33
Net cash flows from financing activities	-144	-136
Total	-178	-169

Future lease payments will be incurred in the following periods:

Dec. 31, 2020

€ million	Within 1 year	1-5 years	After more than 5 years	Total
Future lease payments	118	262	88	468
Interest portion of future payments	-8	-16	-7	-31
Present value of future lease payments	110	246	81	436

Dec. 31, 2019

€ million	Within 1 year	1-5 years	After more than 5 years	Total
Future lease payments	119	319	189	627
Interest portion of future payments	-12	-30	-20	-61
Present value of future lease payments	107	289	169	565

To date, the Group has taken advantage of reduced lease payments only to the extent that these were prescribed as government assistance for lessees. Their amount was immaterial. Accordingly, the amendment to IFRS 16 regarding rent concessions published by the IASB in May 2020 did not have a significant impact for the Group. None of the options provided were exercised.

(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:

€ million	Dec. 31, 2020			Dec. 31, 2019		
	Current	Non-current	Total	Current	Non-current	Total
Receivables from non-income related taxes	368	4	372	340	4	344
Prepaid expenses	151	14	164	153	14	167
Non-current income tax receivables		10	10		11	11
Assets from defined benefit plans	2	–	2	4	–	4
Remaining other assets	76	63	139	94	67	161
Other non-financial assets	597	91	687	591	97	688

(23) Net cash flows from investing activities

Net cash outflows from investments in financial assets amounting to € 278 million (2019: € 196 million) mainly resulted from short-term investments in securities not classified as cash and cash equivalents.

In the previous year, net cash outflows from acquisitions less cash and cash equivalents acquired included primarily the payments made for the acquisition of Versum Materials, Inc., United States, in the amount of € 4,928 million.

Net cash inflows from the disposal of other financial assets in the amount of € 340 million (2019: € 140 million) related primarily to the sale of short-term investments in securities not classified as cash and cash equivalents, as well as the sale of the equity interest in Progyny, Inc., United States.

Payments for investments in property, plant and equipment included the payment for the acquisition of the previously leased land and buildings of the Life Science Campus in Burlington, United States.

As in the previous year, the payments made and received in connection with the acquisition and disposal of other non-financial assets resulted from the short-term investment of available funds.

The proceeds from the disposal of assets held for sale less transferred cash and cash equivalents resulted largely from the sale of the Allergopharma allergy business. The payments made in connection with the disposal of assets held for sale reported in the previous year were primarily due to tax payments relating to the divested Consumer Health business.

(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. The net realizable value corresponds to the expected sale proceeds less any costs for completing and distributing the product. 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 and the applicable 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 recognized under other non-financial assets.

Significant discretionary decisions and sources of estimation uncertainty

Identification of impairment losses or reversal of impairment losses

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, 2020	Dec. 31, 2019
Raw materials and supplies	633	622
Work in progress	905	943
Finished goods/goods for resale	1,756	1,776
Inventories	3,294	3,342

The reduction of the inventories versus the previous year was primarily driven by the stock decrease of the unfinished-, as well as finished goods and merchandise. While in the Healthcare business sector a slight build-up occurred to ensure the supply demand, in the Display Solutions business unit of the Performance Materials sector, the changes in the market demand patterns led to a stock decrease.

Impairment losses on inventories amounted to € 545 million as of December 31, 2020 (December 31, 2019: € 526 million). Impairment losses that are included in the cost of sales are shown in Note (10) "Cost of sales".

As of the balance sheet date, no inventories were pledged as security for liabilities.

(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 presented under the item "Impairment losses and reversals of impairment losses on financial assets (net)" in the consolidated income statement if the asset can be characterized as operational. If the asset can be characterized as financial, it is recognized in financial income or financial expenses.

Further information on the accounting and measurement policies governing financial assets can be found in Note (36) "Other financial assets".

Significant discretion and sources of estimation uncertainty

Trade and other receivables

Information on the significant discretion and estimation uncertainty concerning trade and other receivables can be found in Note (42) "Management of financial risks".

Trade and other receivables were measured as follows:

€ million	Dec. 31, 2020			Dec. 31, 2019		
	Subsequently measured at amortized cost	Subsequently measured at fair value through other comprehensive income	Total	Subsequently measured at amortized cost	Subsequently measured at fair value through other comprehensive income	Total
Gross trade accounts receivable	3,106	19	3,125	3,227	25	3,251
Gross other receivables	196	–	196	340	–	340
Gross trade and other receivables	3,302	19	3,321	3,567	25	3,591
Loss allowances on trade accounts receivable	-73	–	-73	-77	–	-77
Loss allowances on other receivables	-2	–	-2	-4	–	-4
Net trade and other receivables	3,227	19	3,246	3,485	24	3,510
therof: current	3,202	19	3,221	3,463	24	3,488
therof: non-current	25	–	25	22	–	22

In fiscal 2020, trade accounts receivable in Italy with a nominal value of € 31 million (2019: € 22 million) were sold for € 30 million (2019: € 22 million). These receivables did not involve any further rights of recovery 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	2020	2019
Jan. 1	156	52
Additions due to business combinations	–	53
Other additions	420	311
thereof: attributable to performance obligations satisfied in prior periods	15	7
Disposals due to divestments/Reclassification to assets held for sale	–	–
Reclassification to trade accounts receivable	-402	-270
Currency effects	-5	10
Other	–	-1
Dec. 31	169	156

Contract assets resulted in particular from rendering services and manufacturing of customer-specific equipment in the Life Science and Performance Materials 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, 2020	548	135	143	21	51	179	1,077
Additions	65	128	3	46	40	91	373
Utilizations	-15	-62	-4	-8	–	-34	-123
Release	-451	-31	-1	-12	-10	-83	-589
Interest effect	11	–	8	–	–	–	19
Currency translation difference	-5	-1	–	–	-2	-8	-16
Changes in scope of consolidation/other	–	-1	–	–	–	–	-1
Reclassification to assets held for sale	–	–	–	–	–	–	–
Dec. 31, 2020	155	168	148	47	78	146	741
thereof: current	137	86	13	37	78	109	461
thereof: non-current	18	81	134	10	–	37	281

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.

The main parameters in determining the amount of the provision are

- the planned implementation date of the restructuring plan, and
- the anticipated expenses arising from the change in or termination of the employment relationships of the affected employees.

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 and duration of continued treatments of affected patients in clinical development programs,
- the expected date or period of the outflow of resources, and
- the expectations concerning future events influencing the obligations.

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.

The estimation uncertainties primarily involve assessing future events that will influence the obligation.

The legal matters described below represented the most significant legal risks.

Product-related and patent disputes

Rebif®: The Group is involved in a patent dispute with Biogen Inc., United States (Biogen), in the United States. Biogen claims that the sale of Rebif® in the United States infringes on a Biogen patent. The disputed patent was granted to Biogen in the United States in 2009. Subsequently, Biogen sued the Group and other pharmaceutical companies for damages due to the infringement of this patent. The Group defended itself against all allegations and brought a countersuit against Biogen claiming that the patent was invalid and not infringed by the Group's actions. In the first instance (district court), a jury found the patent to be invalid. This jury verdict was overturned by the judge in the same instance in September 2018. For the time being, the patent was thus deemed to be legally valid and to have been infringed. The Group filed a complaint with the United States Court of Appeals for the Federal Circuit (second instance) against the first-instance ruling in October 2018. On September 28, 2020, this court overturned the verdict of the judge in the first instance, declared Biogen's patent to be invalid, and instructed the District Court to reinstate the original jury verdict. A cash outflow is

considered to be unlikely based on this decision, and the provision of € 365 million recognized at this date for potential compensation payments for damages was reversed. The resulting income was reported in other operating income. Only a remaining low single-digit million euro amount is still recognized for outstanding legal costs.

PS-VA liquid crystals mixtures: In the Performance Materials business sector, the Group is involved in a legal dispute with JNC Corporation, Japan, (JNC). JNC claims that, by manufacturing and marketing certain liquid crystal mixtures, the Group has infringed JNC patents in China, Taiwan, and Korea. The Group maintains that these patents are invalid owing to relevant prior art. At the end of the second quarter of fiscal 2020, the actions in China and Taiwan were concluded with legally binding effect in favor of the Group. The provision was reduced to reflect this development. In Korea, however, the patent infringement action on the part of JNC, the patent nullity action on the part of the Group and an additional “correction trial” are all still pending. In addition, a new statutory provision has come into force in Korea that could have a potentially negative impact on the amount of any damages. The provision was reduced in fiscal 2020 to reflect the remaining litigation risk in Korea. After the adjustment, the remaining provision amounts to a low double-digit million euro sum. A cash outflow within the next 12 months is considered possible at present.

Antitrust and other proceedings

Antitrust review proceedings for the acquisition of Sigma-Aldrich Corporation, United States, (Sigma-Aldrich): On July 6, 2017, the Group received notice from the European Commission (EU Commission) in connection with the antitrust review proceedings for the acquisition of Sigma-Aldrich, in which the EU Commission informed the Group of its preliminary conclusion that the Group and Sigma-Aldrich allegedly transmitted incorrect and/or misleading information within the scope of the acquisition of Sigma-Aldrich. The EU Commission received registration of the merger on April 21, 2015, and granted clearance on June 15, 2015, subject to the condition that the Group and Sigma-Aldrich divest parts of the European solvents and inorganic chemicals businesses of Sigma-Aldrich in order to resolve antitrust concerns. According to the preliminary viewpoint of the EU Commission communicated in a letter dated July 6, 2017, the Group and Sigma-Aldrich withheld related important information about an innovation project. According to the EU Commission, the innovation project should have been included in the remedies package. This resulted in an administrative procedure with the EU Commission. On July 1, 2020, the EU Commission informed the Group that the parts of the procedure relating to the Group were no longer under investigation and that the procedure now related solely to the allegations against Sigma-Aldrich. The procedure could result in the issuance of a fine that would be open to appeal. In the second quarter of 2020, the existing provision in a mid double-digit euro amount was reduced to a low double-digit euro amount. A potential outflow of resources is considered possible for 2021.

Citalopram: In connection with the generics business that was divested in 2007, the Group is accused of breaching EU antitrust law through agreements concluded by its former subsidiary Generics (UK) Ltd., United Kingdom, relating to the antidepressant Citalopram patented by Lundbeck A/S, Denmark. In 2013, the EU Commission imposed a corresponding fine in a double-digit euro amount. The Group filed a lawsuit against the Commission’s decision with the European Court in August 2013. The lawsuit was rejected in 2016. The Group subsequently filed an appeal against this decision with the European Court of Justice (CJEU). In the course of these proceedings, the Advocate General of the CJEU recommended that the European Court’s verdict be confirmed. In light of the disadvantageous development in this matter, additional accounting measures have been taken for potential additional claims and the existing provision has increased by a double-digit million euro amount as a result. A decision on the fine in the first half of 2021 is considered possible.

Paroxetine: In the United Kingdom, the Group was subject to antitrust investigations by the British Competition and Market Authority (CMA) in connection with the generics business that was divested in 2007. In March 2013, the authorities informed the Group of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd. and several subsidiaries of GlaxoSmithKline plc, United Kingdom, in connection with the antidepressant drug paroxetine, violated British and European competition law. They stated that the Group was liable as the then owner of Generics (UK) Ltd. and because it was involved in the negotiations for the settlement agreement. The investigations into Generics (UK) Ltd. started in 2011, without this being known to the Group. On February 11, 2016, the CMA imposed a fine in this matter. The Group has taken legal action

against this fine. The United Kingdom Competition Appeal Tribunal (CAT) submitted the relevant legal questions to the European Court of Justice (CJEU) for a preliminary ruling. The CJEU confirmed in January 2020 that such settlement agreements may breach European competition law as a matter of principle. The action is now ongoing with the CAT. A decision is still outstanding. The Group has recognized a provision in a low double-digit million euro amount. A cash outflow within the next 12 months is considered possible.

Versum merger agreement: In 2019, some Versum shareholders accused Versum Inc., United States, (Versum) and the Board of Directors of having breached their fiduciary duties in connection with the acquisition negotiations with Entegris, Inc., United States, and of having initiated a shareholder rights agreement. After Versum announced the termination of the shareholder rights agreement on April 2, 2019, the plaintiffs withdrew their claims and requested that the court impose a “mootness fee” on Versum, which would require Versum to pay the legal costs incurred. On July 16, 2020, the court set this fee at US\$ 12 million (€ 10 million). Versum appealed this ruling and is awaiting a court decision. A provision in a low double-digit million euro amount was recognized for this matter in fiscal 2020. The provision included the “mootness fee” plus interest and additional legal costs for the appeal and was still recognized as of December 31, 2020. The costs are covered in full by the D&O insurance that has been concluded. A corresponding receivable is recognized in other receivables. A cash outflow within the next 12 months is considered possible.

Restructuring

The restructuring provisions recognized as of December 31, 2020 primarily relate to obligations for workforce reduction measures in connection with communicated restructuring projects.

The additions to the restructuring provisions in the amount of € 128 million resulted in particular from the reorganization of the global distribution structures, research and development activities and individual production areas in the Healthcare business sector that began in fiscal 2020. The addition is also due to the ongoing reorganization measures in the Performance Materials business sector.

The restructuring provisions also included obligations from the Life Science business sector, which will carry out relocations and gradually close operations at various German sites by 2022; further additions were made to provisions in fiscal 2020 for this purpose. Furthermore, they contained obligations for the ongoing expansion of shared service activities and the related relocation of activities. These provisions were already recognized in previous years.

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 considered costs in connection with discontinued development projects as well as obligation surpluses from onerous contracts. Utilizations and releases were mainly attributable to development projects discontinued in previous years.

Additions mainly resulted from the termination of a clinical trial in the Healthcare business sector.

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 mainly comprised provisions related to remaining risks from the divestment of the Consumer Health business, for warranty obligations, and for uncertain commitments from contributions, fees, and other duties.

(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 assessment to identify contingent liabilities are:

- the validity of the arguments brought forward by the opposing party or the tax authority and
- the legal situation and current court rulings in comparable proceedings in the jurisdiction in question.

The amount of the contingent liability is based on the best possible estimate which in turn is based on likelihood of possible outcomes of proceedings and on the applicable license rate in patent disputes.

Significant discretionary decisions and sources of estimation uncertainty

Contingent liabilities

The identification and the measurement of contingent liabilities are both subject to considerable uncertainty.

This applies with regard to assessing the likelihood of an outflow of resources as well as determining its amount.

Contingent liabilities were composed as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019
Contingent liabilities from litigation and tax matters	87	128
Other contingent liabilities	–	1

Contingent liabilities from litigation mainly related to obligations under labor law and tort law. In addition to exchange rate effects, the decline compared with the previous year is primarily due to changes in estimates of potential civil law obligations. The Group now believes it is more likely that a fine imposed in legal proceedings under antitrust law will ultimately be confirmed in court. The assertion of additional claims by third parties is therefore expected. These potential claims, which were previously reported as contingent liabilities, are now included in the measurement of the provision for the corresponding proceedings.

In addition, there are contingent liabilities from various legal disputes with Merck & Co., Inc., United States, of the United States (outside the United States and Canada: MSD), among other things due to breach of the co-existence agreement entered into between the two companies and/or trademark/name right infringement regarding the use of the designation “Merck”. In this context, the Group has sued MSD in various countries and

has been sued by MSD in the United States. An outflow of resources – except costs for legal defense – was not deemed sufficiently probable as of the balance sheet date to justify the recognition of a provision. Since the contingent liability from these legal disputes could not be reliably quantified as of the balance sheet date, this matter was not considered in the table presented above.

Contingent liabilities from tax matters primarily related to the determination of earnings under tax law, customs regulations, and excise tax matters.

(29) Other non-financial liabilities

Accounting and measurement policies

Other non-financial liabilities

Accruals for personnel expenses included in other non-financial liabilities comprise, in particular, liabilities resulting from vacation entitlements, bonuses, and social security contributions.

Contract liabilities include payments received by the Group prior to completion of contractual performance. In addition to consideration received within the scope of collaboration agreements, this applies particularly to service agreements.

Other non-financial liabilities comprise the following:

€ million	Dec. 31, 2020			Dec. 31, 2019		
	Current	Non-current	Total	Current	Non-current	Total
Accruals for personnel expenses	823	–	823	681	–	681
Contract liabilities	304	47	351	291	87	379
Liabilities from non-income related taxes	157	1	158	207	5	212
Non-current income tax liabilities	–	45	45	–	–	–
Other accruals	76	7	82	32	1	33
Other non-financial liabilities	1,360	100	1,460	1,211	93	1,304

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

€ million	2020			2019		
	Current	Non-current	Total	Current	Non-current	Total
Jan. 1	291	87	379	332	4	336
Additions due to business combinations	1	–	1	4	–	4
Other additions	849	1	850	693	209	902
Disposals due to divestments/Reclassification to assets held for sale	–	–	–	–	–	–
Recognition of income/reversal	-888	–	-888	-861	-3	-864
Cumulative catch-up adjustments to revenue	21	-2	19	–	–	–
Reclassification from non-current to current	39	-39	–	122	-122	–
Currency translation	-9	–	-9	2	–	2
Other	–	–	–	-1	–	-1
Dec. 31	304	47	351	291	87	379

As of January 1, 2020, contract liabilities amounted to € 379 million (January 1, 2019: € 336 million), of which a total of € 232 million (2019: € 328 million) was recognized through profit or loss in fiscal 2020.

(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 amounted to € 1,768 million (December 31, 2019: € 2,054 million). This item included accrued amounts of € 673 million (December 31, 2019: € 673 million) from outstanding invoices.

Employees

(31) Number of employees

As of December 31, 2020, the number of employees at Group was 58,096 (December 31, 2019: 57,036 employees).

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

	2020	2019
Production	17,624	16,455
Administration	11,338	10,338
Research and development	7,503	7,559
Supply chain	4,298	4,109
Marketing and sales	14,101	13,939
Other	2,716	1,207
Average number of employees	57,580	53,607

(32) Personnel expenses

Personnel expenses comprised the following:

€ million	2020	2019
Wages and salaries	4,669	4,293
Compulsory social security contributions and other costs	694	631
Pension expenses	408	357
Personnel expenses	5,771	5,281

Personnel expenses comprised expenses of € 162 million (2019: € 152 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 € 85 million (2019: € 86 million) were transferred to the German statutory pension insurance system and € 77 million (2019: € 68 million) to statutory pension insurance systems abroad.

(33) Provisions for employee benefits

Provisions for employee benefits are composed as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019
Provisions for pensions and other post-employment benefits	3,594	2,957
Non-current other employee benefit provisions	286	237
Non-current provisions for employee benefits	3,880	3,194
Current provisions for employee benefits	152	110
Provisions for employee benefits	4,032	3,303

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.

As of December 31, 2020, the Group changed the way in which it determines the discount factor for defined benefit pension plans in the eurozone. This constitutes a change in an accounting estimate within the meaning of IAS 8. The discount factor was previously determined internally by Group Treasury by reference to external rating information on the yields of high-quality bonds with similar maturities. As of December 31, 2020, the discount factor was determined by reference to the discount rates for similar maturities calculated by a globally active external actuary. As previously, this was based on bonds with ratings of at least "AA" or a comparable rating from one of the leading rating agencies as of the reporting date.

If the discount rate had still been determined using the previous method as of December 31, 2020, the discount rate for the eurozone would have been 23 basis points lower. Without the change in the accounting estimate, the present value of the defined benefit obligation would have been € 270 million higher, current service cost in 2021 would have been a low double-digit million euro amount higher, and interest expenses in 2021 would have been a single-digit million euro amount lower.

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 2015G, United Kingdom: S3PA and S2PA). The potential effects of the Covid-19 pandemic were not taken into account.

Apart from the net balance of interest expense on 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 pension systems 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	
	2020	2019	2020	2019	2020	2019	2020	2019
Discount rate	0.70%	1.30%	0.06%	0.17%	1.43%	2.06%	1.75%	2.36%
Future salary increases	2.51%	2.50%	1.57%	1.74%	–	–	2.92%	3.22%
Future pension increases	1.75%	1.74%	–	–	2.77%	2.65%	1.48%	1.56%
Duration	24	23	19	19	20	20	14	16

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.

Dec. 31, 2020

€ million	Germany	Switzerland	United Kingdom	Other countries	Total
Increase (+)/decrease (–) in present value of all defined benefit obligations if					
the discount rate were 50 basis points higher	-480	-88	-54	-25	-647
the discount rate were 50 basis points lower	569	102	62	30	763
the expected rate of future salary increase were 50 basis points higher	180	7	–	14	201
the expected rate of future salary increase were 50 basis points lower	-163	-6	–	-12	-181
the expected rate of future pension increase were 50 basis points higher	272	50	21	7	350
the expected rate of future pension increase were 50 basis points lower	-245	–	-20	-7	-272

Dec. 31, 2019

€ 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	-391	-85	-49	-25	-550
the discount rate were 50 basis points lower	460	96	56	28	640
the expected rate of future salary increase were 50 basis points higher	155	6	–	14	175
the expected rate of future salary increase were 50 basis points lower	-142	-7	–	-11	-160
the expected rate of future pension increase were 50 basis points higher	232	47	18	8	305
the expected rate of future pension increase were 50 basis points lower	-210	–	-16	-8	-234

Sensitivities are determined on the basis of the respective parameters in question, with all other measurement assumptions remaining unchanged.

Both the benefit obligations as well as the plan assets are subject to fluctuations over time. The reasons for such fluctuations could include changes in market interest rates and thus the discount rate, as well as adjustments to other actuarial assumptions (such as life expectancy or expected future increases in pension). This could lead to – or cause an increase in – underfunding. Depending on statutory regulations, it may become necessary in some countries to reduce underfunding through additions of liquid assets.

In order to minimize fluctuations of the net defined benefit liability, in managing its plan assets, the Group also pays attention to potential fluctuations in liabilities. The portfolio is structured in such a way that, in the ideal scenario, plan assets and defined benefit obligations develop in opposing directions when exposed to exogenous factors. This applies in particular to interest rate fluctuations.

Depending on the legal, economic, and fiscal circumstances prevailing in each country, different retirement benefit systems are provided for the employees. Generally, these systems are based on the years of service and salaries of the employees. Pension obligations comprise both obligations from current pensions and accrued benefits for pensions payable in the future.

In order to limit the risks of changing capital market conditions and other developments, for the past number of years newly hired employees have been offered plans that are not based on final salary.

The value recognized in the consolidated balance sheet for pensions and other post-employment benefits was derived as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019
Present value of all defined benefit obligations	6,352	5,644
Fair value of the plan assets	-2,760	-2,692
Funded status	3,592	2,952
Effects of the asset ceilings	–	1
Net defined benefit liability	3,592	2,953
Assets from defined benefit plans	2	4
Provisions for pensions and other post-employment benefits	3,594	2,957

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

Dec. 31, 2020					
€ million	Germany	Switzerland	United Kingdom	Other countries	Total
Benefit based on final salary					
Annuity	3,313	1	571	108	3,993
Lump sum	–	–	–	141	141
Installments	1	–	–	–	1
Benefit not based on final salary					
Annuity	1,054	1,002	–	83	2,139
Lump sum	–	–	6	33	39
Installments	7	–	–	–	7
Other	–	–	–	5	5
Medical plan	–	–	–	27	27
Present value of defined benefit obligations	4,375	1,003	577	397	6,352
Fair value of the plan assets	1,250	820	516	174	2,760

Dec. 31, 2019					
€ million	Germany	Switzerland	United Kingdom	Other countries	Total
Benefit based on final salary					
Annuity	3,081	1	530	99	3,711
Lump sum	–	–	–	139	139
Installments	1	–	–	–	1
Benefit not based on final salary					
Annuity	677	942	–	85	1,704
Lump sum	–	–	6	38	44
Installments	6	–	–	–	6
Other	–	–	–	10	10
Medical plan	–	–	–	29	29
Present value of defined benefit obligations	3,765	943	536	400	5,644
Fair value of the plan assets	1,222	778	518	174	2,692

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 a direct commitment for employees newly hired since January 1, 2005 that is not based on the final salary. The benefit entitlement resulted from the cumulative total of annually determined pension components that were calculated based on a defined benefit expense and an age-dependent annuity table. Statutory minimum funding obligations did not exist.

Pension obligations in Switzerland mainly comprised old-age, disability, and surviving dependent benefits regulated by law. The employer and the employees made contributions to the plans. The Group had to observe the existing statutory minimum funding obligations.

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 in 2006. The agreed benefits comprised old-age, disability, and surviving dependent benefits. The employer and the employees made contributions to the plans. The Group had to observe the existing statutory minimum funding obligations.

The following table shows the development of the net defined benefit liability:

2020

€ million	Present value of the defined benefit obligations	Fair value of the plan assets	Effects of the asset ceilings	Net defined benefit liability
January 1, 2020	-5,644	2,692	-1	-2,953
Current service cost	-197	-	-	-197
Interest expense	-69	-	-	-69
Interest income	-	30	-	30
Plan administration costs recognized in income	-	-3	-	-3
Past service cost	-1	-	-	-1
Gains (+) or losses (-) on settlement	-1	-	-	-1
Currency effects recognized in income	-1	-	-	-1
Other effects recognized in income	-	-	-	-
Items recognized in income	-269	27	-	-242
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (-) arising from changes in demographic assumptions	-4	-	-	-4
Actuarial gains (+)/losses (-) arising from changes in financial assumptions	-678	-	-	-678
Actuarial gains (+)/losses (-) arising from experience adjustments	-	-	-	-
Remeasurements of plan assets				
Actuarial gains (+)/losses (-) arising from experience adjustments	-	78	-	78
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (-)	-	-	1	1
Actuarial gains (+)/losses (-)	-682	78	1	-602
Pension payments	134	-53	-	81
Employer contributions	-	38	-	38
Employee contributions	-16	16	-	-
Payment transactions	118	1	-	119
Changes in the scope of consolidation	72	-	-	72
Reclassification to liabilities directly related to assets held for sale	-	-	-	-
Currency translation recognized in equity	49	-34	-	15
Other changes	4	-4	-	-
Other	125	-38	-	87
December 31, 2020	-6,352	2,760	-	-3,592

2019

€ 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, 2019	-4,719	2,391	-1	-2,329
Current service cost	-162	-	-	-162
Interest expense	-93	-	-	-93
Interest income	-	46	-	46
Plan administration costs recognized in income	-	-2	-	-2
Past service cost	-3	-	-	-3
Gains (+) or losses (-) on settlement	-	-	-	-
Currency effects recognized in income	-21	17	-	-4
Other effects recognized in income	-2	-	-	-2
Items recognized in income	-281	61	-	-220
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (-) arising from changes in demographic assumptions	5	-	-	5
Actuarial gains (+)/losses (-) arising from changes in financial assumptions	-727	-	-	-727
Actuarial gains (+)/losses (-) arising from experience adjustments	35	-	-	35
Remeasurements of plan assets				
Actuarial gains (+)/losses (-) arising from experience adjustments	-	199	-	199
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (-)	-	-	-	-
Actuarial gains (+)/losses (-)	-687	199	-	-488
Pension payments	125	-49	-	76
Employer contributions	-	37	-	37
Employee contributions	-15	15	-	-
Payment transactions	110	3	-	113
Changes in the scope of consolidation	-30	6	-	-24
Reclassification to liabilities directly related to assets held for sale	-	-	-	-
Currency translation recognized in equity	-42	37	-	-5
Other changes	5	-5	-	-
Other	-67	38	-	-29
December 31, 2019	-5,644	2,692	-1	-2,953

The actual income from plan assets amounted to € 108 million in the year under review (2019: € 245 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 can be allocated to the following categories:

€ million	Dec. 31, 2020			Dec. 31, 2019		
	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	80	–	80	191	–	191
Equity instruments	645	–	645	609	–	609
Debt instruments	1,317	–	1,317	1,273	–	1,273
Direct investments in real estate	–	125	125	–	121	121
Investment funds	285	208	493	395	1	396
Insurance contracts	–	72	72	–	77	77
Other	23	5	28	19	6	25
Fair value of the plan assets	2,350	410	2,760	2,487	205	2,692

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 are expected to amount to € 32 million (2019: € 37 million) and € 81 million (2019: € 79 million) respectively, next year.

The expected payments of undiscounted benefits are as follows:

Dec. 31, 2020

€ million	Expected payments of undiscounted benefits				
	Germany	Switzerland	United Kingdom	Other countries	Total
2021	72	19	18	23	132
2022	78	19	18	27	142
2023	79	19	18	19	135
2024	82	20	19	19	140
2025	86	19	19	25	149
2026-2030	485	95	106	121	807

Dec. 31, 2019

€ million	Expected payments of undiscounted benefits				
	Germany	Switzerland	United Kingdom	Other countries	Total
2020	71	19	22	23	135
2021	77	19	21	16	133
2022	79	19	22	29	149
2023	82	19	22	21	144
2024	85	19	23	20	147
2025-2029	476	92	125	128	821

The weighted duration of defined benefit obligations amounted to 22 years (2019: 22 years).

Other employee benefit provisions

Accounting and measurement policies

Other employee benefit provisions

Other employee benefit provisions include obligations from share-based compensation programs. More information on these compensation programs can be found below.

Obligations for partial retirement programs and other severance payments not recognized in connection with restructuring programs as well as obligations in connection with long-term working hour accounts and anniversary bonuses are also included in other employee benefit provisions.

Other employee benefit provisions developed as follows:

€ million	Jan. 1, 2020	Additions	Utilizations	Release	Interest effect	Currency translation difference	Changes in scope of consolidation /other	Dec. 31, 2020
Non-current other employee benefit provisions	237	176	-30	-32	1	-12	-53	286
Current other employee benefit provisions	110	138	-79	-66	-	-5	53	152
Total	347	314	-108	-98	1	-17	-	438

Share-based payments

Accounting and measurement policies

Share-based payments

Provisions are recognized for the share-based compensation program with cash settlement at 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 expected volatilities are based on the implicit volatility of 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 (carrying amount as of December 31, 2020: € 99 million/carrying amount as of December 31, 2019: € 63 million) would have been impacted by changes in the DAX® or the closing price of the share of Merck KGaA, Darmstadt, Germany, on the balance sheet date. The amounts stated would have led to a corresponding reduction or increase in profit before income tax.

€ million		Increase (+)/decrease (-) of the provision	
		Dec. 31, 2020	Dec. 31, 2019
Variation of share price of Merck KGaA, Darmstadt, Germany	10%	17	16
	-10%	-16	-16
Change in the DAX®	10%	-6	-9
	-10%	6	9

Sensitivities were determined on the basis of the respective parameters in question, with all other measurement assumptions remaining unchanged. The 2018 tranche reported under current provisions will not be subject to any value fluctuations between December 31, 2020, and the payout date and was therefore excluded from the sensitivity analysis (December 31, 2019: exclusion of 2017 tranche).

These share-based compensation programs with cash settlement in place at the Group are aligned with target achievement based on key performance indicators as well as the long-term performance of the shares of Merck KGaA, Darmstadt, Germany. Certain employees are eligible to receive a certain number of virtual shares – Share Units of Merck KGaA, Darmstadt, Germany (MSUs) – at the end of a three-year performance cycle. The number of MSUs that could be received depends on the individual grant defined for the respective person and the average closing price of the shares of Merck KGaA, Darmstadt, Germany in Xetra® trading during the last 60 trading days prior to January 1 of the respective performance cycle (reference price). When the three-year performance cycle ends, the number of MSUs to then be granted is determined based on the development of defined key performance indicators (KPIs).

These KPIs are the performance of the share price of Merck KGaA, Darmstadt, Germany, compared to the performance of the DAX® with a weighting of 50%, the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 25%, and the development of organic sales growth as a proportion of a defined target value, also with a weighting of 25%.

Depending on the development of the KPIs, at the end of the respective performance cycle the eligible participants are granted between 0% and 150% of the MSUs they could be eligible to receive. A cash payment is made based on the MSUs granted after the three-year performance cycle has ended. The value of a granted MSU, which is relevant for payment, corresponds to the average closing price of the shares of Merck KGaA, Darmstadt, Germany in Xetra® trading during the last 60 trading days prior to the end of the performance cycle. The payout amounts of the respective tranches are limited to two and a half times the individual grant.

The Executive Board members have their own Long-Term Incentive Plan, the conditions of which largely correspond to the Long-Term Incentive Plan described here. A description of the plan for the Executive Board can be found in the compensation report, which is part of the Combined Management Report.

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.

	2018 tranche	2019 tranche	2020 tranche
	Jan. 1, 2018 – Dec. 31, 2020	Jan. 1, 2019 – Dec. 31, 2021	Jan. 1, 2020 – Dec. 31, 2022
Performance cycle			
Term	3 Years	3 Years	3 Years
Reference price of shares of Merck KGaA, Darmstadt, Germany, in € (60-day average share price of Merck KGaA, Darmstadt, Germany, prior to the start of the performance cycle)	91.73	93.75	105.52
DAX® value (60-day average of the DAX® prior to the start of the performance cycle)	13,089.39	11,304.33	12,971.22
Potential number of MSUs			
Potential number offered for the first time in 2018	891,345	–	–
Forfeited	37,953	–	–
Transferred as part of the divestment of the Consumer Health business	23,760	–	–
Dec. 31, 2018	829,632	–	–
Potential number offered for the first time in 2019	–	876,061	–
Forfeited	52,957	37,122	–
Dec. 31, 2019	776,675	838,939	–
Potential number offered for the first time in 2020	–	–	871,700
Forfeited	39,996	47,622	33,825
Paid out	832	1,417	217
Dec. 31, 2020	735,847	789,900	837,658

The value of the provisions as of December 31, 2020, was € 213 million (December 31, 2019: € 113 million). Net expenses of € 149 million were incurred in fiscal 2020 (2019: net expenses of € 60 million). The three-year tranche issued in 2017 ended at the end of 2019; an amount of € 48 million was paid out in 2020. The three-year tranche issued in fiscal 2018 ended at the end of 2020; a payout of € 112 million is expected for 2021.

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.

Measurement of non-controlling interests within the scope of a company acquisition

In cases where a company was not acquired in full, non-controlling interests are measured using the fair value of the proportionate share of net assets.

Equity capital/capital reserves

The equity capital of the company consists 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 corresponds to € 1.30 of the subscribed capital. The amount resulting from the issue of shares by Merck KGaA, Darmstadt, Germany, exceeding the nominal amount was recognized in the capital reserves. The equity interest held by the general partner amounted to € 397 million. As in the previous year, there were no changes in subscribed capital in the year under review.

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 results are adjusted for trade tax and/or corporation tax and create the basis for the allocation of net profit/loss. The adjustment for corporation tax is made to compensate for the difference in the tax treatment between the general partner and the limited liability shareholders. Corporation tax is only calculated on the income received by the limited liability shareholders. Its equivalent is the income tax applicable to the partners of E. Merck KG, Darmstadt, Germany, which must be paid by them directly. The adjustment thus ensures that the share in net profit corresponds to the respective interests held by the two shareholder groups.

Appropriation of profits

The profit distribution to be resolved upon by shareholders also defines the amount of that portion of net profit/loss freely available to E. Merck KG, Darmstadt, Germany. If the shareholders resolve to carry forward or to allocate to retained earnings a portion of the net retained profit of Merck KGaA, Darmstadt, Germany, to which they are entitled, E. Merck KG, Darmstadt, Germany, shall be obliged to allocate to the profit brought forward/retained earnings of Merck KGaA, Darmstadt, Germany, a comparable sum determined according to the ratio of subscribed capital to general partner's equity. This ensures that the retained earnings and the profit carried forward of Merck KGaA, Darmstadt, Germany, correspond to the ownership ratios of the shareholders on the one hand, and E. Merck KG, Darmstadt, Germany, on the other hand. Consequently, for distributions to E. Merck KG, Darmstadt, Germany, the available amount is the amount that results from netting the profit transfer of Merck KGaA, Darmstadt, Germany, with the amount either allocated or withdrawn by E. Merck KG, Darmstadt, Germany, from retained earnings/profit carried forward. This amount corresponds to the sum paid as a dividend to the shareholders and reflects their pro rata shareholding in the company.

The reciprocal net profit/loss transfer between E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, as stipulated by the Articles of Association was as follows:

€ million		2020		2019	
		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		-44	-	-25	-
Net income of Merck KGaA, Darmstadt, Germany, before reciprocal profit transfer		-	701	-	625
Corporation tax		-	20	-	14
Basis for appropriation of profits	(100%)	-44	721	-25	639
Profit transfer to E. Merck KG, Darmstadt, Germany (ratio of general partner's equity to equity capital)	(70.274%)	506	-506	449	-449
Profit/loss transfer to Merck KGaA, Darmstadt, Germany (ratio of subscribed capital to equity capital)	(29.726%)	13	-13	7	-7
Corporation tax		-	-20	-	-14
Net income		475	181	431	169

The result of E. Merck KG, Darmstadt, Germany, on which the appropriation of profits adjusted for trade tax is based amounted to € -44 million (2019: € -25 million). This resulted in a profit/loss transfer to Merck KGaA, Darmstadt, Germany, of € -13 million (2019: € -7 million). Net income adjusted of Merck KGaA, Darmstadt, Germany, for corporation tax, on which the appropriation of its profit is based, amounted to € 721 million (2019: € 639 million). Merck KGaA, Darmstadt, Germany, transferred a profit in the amount of € 506 million to E. Merck KG, Darmstadt, Germany (2019: € 449 million). In addition, an expense from corporation tax charges amounting to € 20 million resulted (2019: expense of € 14 million).

€ million	2020		2019	
	E. Merck KG, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany	E. Merck KG, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany
Net income	475	181	431	169
Profit carried forward previous year	63	26	61	26
Withdrawal from revenue reserves	-	-	-	-
Transfer to revenue reserves	-	-	-	-
Retained earnings Merck KGaA, Darmstadt, Germany		208		194
Withdrawal by E. Merck KG, Darmstadt, Germany	-474		-430	
Dividend proposal		-181		-168
Profit carried forward	63	27	63	26

A dividend of € 1.30 per share was distributed for fiscal 2019. The dividend proposal for fiscal 2020 will be € 1.40 per share. The proposed dividend payment to shareholders amounts to € 181 million (2019: € 168 million). The amount withdrawn by E. Merck KG, Darmstadt, Germany, would amount to € 474 million (2019: € 430 million).

Appropriation of profits and changes in reserves

€ million	2020			2019		
	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	-48	-506	-555	-56	-449	-505
Profit/loss transfer from E. Merck KG, Darmstadt, Germany	-	-13	-13	-	-7	-7
Transfer to revenue reserves	-	-	-	-	2	2
Profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves	-48	-519	-567	-56	-455	-510
Result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer, adjusted for trade tax		-44			-25	
Profit transfer to E. Merck KG, Darmstadt, Germany/withdrawal by E. Merck KG, Darmstadt, Germany	-48	-474		-56	-430	

Based on the assumed appropriation of profits, the profit/loss transfer to E. Merck KG, Darmstadt, Germany, for 2020, including changes in reserves, amounted to € -567 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ -506 million), the profit/loss transfer from to Merck KGaA, Darmstadt, Germany (€ -13 million) and the profit transfer from Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany to E. Merck KG, Darmstadt, Germany (€ -48 million). In the previous year, the profit/loss transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves amounted to € -510 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ -449 million), the profit/loss transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany (€ -7 million), the change in profit carried forward of E. Merck KG, Darmstadt, Germany (€ 2 million) as well as the profit transfer from Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany (€ -56 million).

Merck & Cie, 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.

The proposed withdrawal of E. Merck KG, Darmstadt, Germany, in the amount of € 474 million (2019: € 430 million) results from the total amount of the profit/loss transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves, and the profit/loss of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer.

Non-controlling interests

The calculation of non-controlling interests was based on the reported equity of the subsidiaries concerned.

The consolidated equity and the profit attributable to non-controlling interests mainly related to the minority interests in the publicly traded company P.T. Merck Tbk., Indonesia, a subsidiary of Merck KGaA, Darmstadt, Germany as well as in Versum Materials Taiwan Co., Ltd., Taiwan, and in Merck Ltd., Thailand, 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 remaining term 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, 2020	Dec. 31, 2019
Cash, bank balances and cheques	910	618
Short-term cash investments (up to 3 months)	446	162
Cash and cash equivalents	1,355	781

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 € 246 million (December 31, 2019: € 240 million). This mainly related to cash and cash equivalents at subsidiaries that are subject to foreign exchange restrictions.

The maximum default risk was equivalent to the carrying amount of cash and cash equivalents.

(36) Other financial assets

Accounting and measurement policies

Other financial assets

This section does not cover the accounting and measurement policies for derivative financial instruments. They are presented in Note (39) "Derivative financial instruments".

Recognition and initial measurement

Financial assets are initially measured at fair value and recognized as of the settlement date. For financial assets not subsequently measured at fair value through profit or loss in subsequent periods, initial measurement also includes directly attributable transaction costs.

Detailed information on the measurement methods for financial assets measured at fair value are presented in Note (43) "Information on fair value measurement".

Classification and subsequent measurement

At 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
- 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 financial assets at fair value are presented in Note (43) "Information on fair value measurement".

Financial assets are only reclassified in rare cases in which the Group changes its business model in managing financial assets.

Derecognition

Financial assets are derecognized if there is no reasonable expectation that the contract party will fulfill its contractual obligations or if the Group transfers the contractual rights including all material risks and rewards of the financial asset to a contract partner.

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 on 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 on financial assets (net)	Group equity (upon derecognition: reclassification to other operating income or other operating expenses)	Other operating income or other operating expenses	Financial income and expenses
	Financial	Financial income and expenses	Group equity (upon derecognition: reclassification to financial income and expenses)	Financial income and expenses	
Subsequent measurement at fair value through profit or loss	Operational		Other operating income or other operating expenses	Other operating income or other operating expenses	Financial income and expenses
	Financial		Financial income and expenses	Financial income and expenses	

The following table provides details on the measurement effects of equity instruments on the consolidated balance sheet and the consolidated income statement:

Category	Asset type	Value adjustments	Foreign currency gains or losses	Dividend income
Subsequent measurement at fair value through other comprehensive income	Operational	Results recognized directly in equity (value adjustments)	Foreign currency gains and losses recognized directly in equity	Other operating income
		Reclass of the cumulative results previously recognized directly in equity in the retained earnings when asset is disposed		
	Financial	Results recognized directly in equity (value adjustments)	Foreign currency gains and losses recognized directly in equity	Financial income
		Reclass of the cumulative results previously recognized directly in equity in the retained earnings when asset is disposed		
Subsequent measurement at fair value through profit or loss	Operational	Other operating income or other operating expenses	Other operating income or other operating expenses	Other operating income
	Financial	Financial income and expenses	Financial income and expenses	Financial income

Other financial assets were composed as follows:

€ million	Dec. 31, 2020			Dec. 31, 2019		
	current	non-current	Total	current	non-current	Total
Subsequent measurement at amortized cost	1	7	7	1	8	9
Loans against third parties	–	7	7	1	8	9
Other	–	–	–	–	–	–
Subsequent measurement at fair value through other comprehensive income	5	504	509	29	408	438
Equity instruments	–	499	499	–	399	399
Debt instruments	5	4	9	29	9	39
Subsequent measurement at fair value through profit and loss	23	312	335	20	322	342
Equity instruments	–	–	–	–	–	–
Contingent consideration	–	260	260	–	258	258
Other debt instruments	7	34	41	–	50	50
Derivatives without a hedging relationship (financial transactions)	16	10	26	20	14	33
Derivatives without a hedging relationship (operational)	–	8	8	–	–	–
Derivatives with a hedging relationship (operational)	96	–	96	7	–	7
Financial assets	125	822	947	57	738	795

As in the previous year, contingent consideration included claims arising from the divestments of the biosimilars business to Fresenius SE & Co. KGaA, Bad Homburg vor der Höhe, in 2017 and the Kuvan® business to BioMarin Pharmaceuticals Inc., United States, in 2015.

Equity instruments with subsequent measurement at fair value through other comprehensive income included the shares held in Precigen Inc., United States, and M Ventures portfolio companies in particular. Please refer to Note (50) "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:

	Dec. 31, 2020 € million	Dec. 31, 2019 € million	Maturity	Interest rate %	Nominal value	
					€ million	Currency
USD bond 2015/2020	–	669	March 2020	2.400	750	USD
Eurobond 2010/2020	–	1,350	March 2020	4.500	1,350	€
Hybrid bond 2014/2074	315	–	Dec. 2074 ¹	2.625	317	€
Bonds (current)	315	2,019				
Commercial paper	200	205				
Bank loans	835	1,337				
Liabilities to related parties	817	809				
Loans from third parties and other financial debt	15	53				
Liabilities from derivatives (financial transactions)	62	19				
Lease liabilities (IFRS 16)	112	109				
Current financial debt	2,357	4,550				
USD bond 2015/2022	812	891	March 2022	2.950	1,000	USD
Eurobond 2015/2022	549	549	Sept. 2022	1.375	550	€
Eurobond 2019/2023	600	600	Dec. 2023	0.005	600	€
USD bond 2015/2025	1,295	1,419	March 2025	3.250	1,600	USD
Eurobond 2020/2025	745	–	July 2025	0.125	750	€
Eurobond 2019/2027	597	596	July 2027	0.375	600	€
Eurobond 2020/2028	746	–	July 2028	0.500	750	€
Eurobond 2019/2031	796	796	July 2031	0.875	800	€
Hybrid bond 2014/2074	–	997	Dec. 2074 ¹	2.625	1,000	€
Hybrid bond 2014/2074	499	498	Dec. 2074 ²	3.375	500	€
Hybrid bond 2019/2079	496	495	June 2079 ³	1.625	500	€
Hybrid bond 2019/2079	996	995	June 2079 ⁴	2.875	1,000	€
Hybrid bond 2020/2080	996	–	Sept. 2080 ⁵	1.625	1,000	€
Bonds (non-current)	9,126	7,835				
Bank loans	250	250				
Loans from third parties and other financial debt	42	44				
Liabilities from derivatives (financial transactions)	40	56				
Lease liabilities (IFRS 16)	327	458				
Non-current financial debt	9,785	8,644				
Financial debt	12,142	13,194				
less:						
Cash and cash equivalents	1,355	781				
Current financial assets	28	50				
Net financial debt⁶	10,758	12,363				

¹ The Group has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in June 2021.

² The Group has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in December 2024.

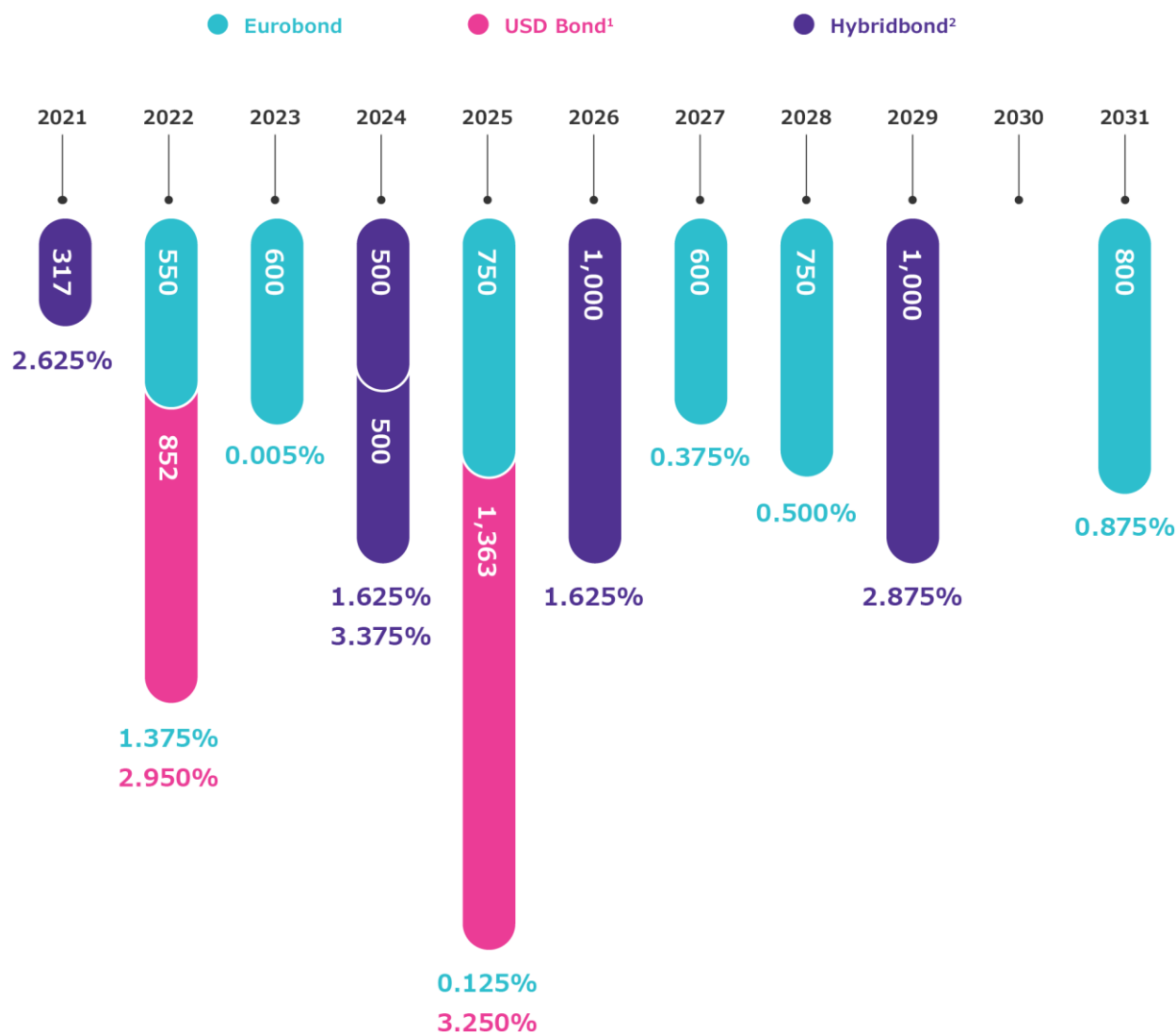
³ The Group has the right to prematurely repay this tranche of the hybrid bond issued in June 2019 for the first time in December 2024.

⁴ The Group has the right to prematurely repay this tranche of the hybrid bond issued in June 2019 for the first time in December 2029.

⁵ The Group has the right to prematurely repay this hybrid bond issued in September 2020 for the first time in September 2026.

⁶ 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, 2020.

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 rating agencies Standard & Poor's, Moody's, and Scope 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.

68.3% of the tranche of the hybrid bond 2014/2074 with an original nominal value of € 1 billion with a first optional redemption date in June 2021 was repaid ahead of schedule in the fiscal year.

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 as of the balance sheet date was 1.6% (December 31, 2019: 2.5%).

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. The responsible committees decide on the target capital structure of the balance sheet, the appropriation of net retained profit, and the dividend level. In this context, net financial debt is one of the leading capital management indicators.

Traditionally, the capital market represents a major source of financing for the Group, for instance via bond issues. As of December 31, 2020, there were liabilities of € 4.05 billion from a debt issuance program most recently renewed in 2020 (December 31, 2019: € 3.90 billion). In addition, the Group had access to a commercial paper program to meet short-term capital requirements with a volume of € 2 billion, of which € 200 million had been utilized as of December 31, 2020 (December 31, 2019: € 205 million).

Loan agreements represent a further source of financing for the Group. At the balance sheet date, the bank financing commitments vis-à-vis the Group were as follows:

€ million	Dec. 31, 2020		Dec. 31, 2019		Interest	Maturity of financing commitments
	Financing commitments from banks	Utilization	Financing commitments from banks	Utilization		
Syndicated loan	2,000	–	2,000	–	variable	2025
Loan agreement with banking syndicate for acquisition financing	569	569	1,017	1,017	variable	2022
Bilateral credit agreement with banks	250	250	250	250	variable	2022
Various bank credit lines	1,266	266	552	320	variable	<1 year
	4,085	1,085	3,820	1,587		

There are 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:

in Mio. €	Dec. 31, 2020			Dec. 31, 2019		
	Current	Non-current	Total	Current	Non-current	Total
Miscellaneous other financial liabilities	963	60	1,023	1,081	43	1,124
thereof: liabilities to related parties	558	–	558	512	–	512
thereof: interest accruals	55	–	55	119	–	119
Liabilities from derivatives (operational)	45	2	47	46	–	46
Other financial liabilities	1,008	62	1,070	1,127	43	1,170

The liabilities to related parties primarily consist of liabilities to E. Merck KG, Darmstadt, Germany.

(39) Derivative financial instruments

Accounting and measurement policies

Derivative financial instruments

The IFRS 9 provisions are applied for hedge accounting. Hedging transactions are entered into for highly probable forecast transactions in foreign currencies and for hedging fair values of assets on the balance sheet. Cash flow hedge accounting for forecast transactions in foreign currency mean the hedged item is recognized at a fixed exchange rate on a net basis instead of being recognized at the spot exchange rate at the transaction date. As a result of hedging fair values of assets on the balance sheet, the compensating changes in value of the corresponding hedged item and hedging instrument offset each other.

The Group only uses derivatives as hedging instruments. The Group uses the dollar offset method as well as regression analyses to measure hedge effectiveness.

Hedging ineffectiveness may occur in the timing of forecasted cash flows or if hedged items are dissolved. Derivatives that do not or no longer meet the documentation or effectiveness requirements for hedge accounting, whose hedged item no longer exists, or for which hedge accounting rules are not applied are classified as "financial assets or liabilities at fair value through profit or loss" depending on their balance.

In the case of hedging relationships where the Group uses options as hedging instruments, only the intrinsic value of options is designated as the hedging instrument. Changes in the fair value of the time value component of options that are used for hedge accounting are recognized in other comprehensive income and in the cost of cash flow hedge reserve within equity. The subsequent accounting of these amounts depends on the type of hedged transaction.

In the case of hedging relationships where the Group uses forward contracts as hedging instruments, only the spot element is designated as the hedging instrument. Changes in the fair value of the forward element in forward contracts are initially recognized in the cost of cash flow hedge reserve within equity. The subsequent accounting of these amounts depends on the type of hedged transaction.

Reclassifications of the cash flow hedge reserve to profit or loss are recognized in the operating result, while reclassifications of the cost of cash flow hedge reserve are recognized in financial income and expenses.

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:

Hedging relationship	Type of collateral	Type of hedged item	Market value	Presentation on the balance sheet	Changes in fair value in the consolidated income statement and the consolidated statement of comprehensive income	
					during the term	At maturity
Derivatives with a cash flow hedging relationship	Interest rate	Financial transactions	Positive market values	Other financial assets	Fair value adjustments (in equity)	Financial income and expenses
			Negative market values	Financial debt	Fair value adjustments (in equity)	
	Currency	Transactions in operating business	Positive market values	Other financial assets	Fair value adjustments (in equity)	Other operating income
			Negative market values	Other financial liabilities	Fair value adjustments (in equity)	Other operating expenses
Derivatives without a hedging relationship	Interest rate	Financial transactions	Positive market values	Other financial assets	Financial income and expenses	Financial income and expenses
			Negative market values	Financial debt		
	Currency	Financial transactions	Positive market values	Other financial assets	Financial income and expenses	Financial income and expenses
			Negative market values	Financial debt		
	Virtual power purchase agreement	Transactions in operating business	Positive market values	Other financial assets	Other operating income	Other operating income
			Negative market values	Other financial liabilities	Other operating expenses	Other operating expenses

The nominal amounts of the Group's derivative exposures were as follows:

€ million	Dec. 31, 2020		Dec. 31, 2019	
	current	non-current	current	non-current
Cash flow hedge	5,285	–	2,765	2
Interest rate	569	–	–	–
Currency	4,716	–	2,765	2
No hedge accounting	4,451	1,100	5,147	1,100
Interest rate	–	1,100	–	1,100
Currency	4,451	–	5,147	–
Virtual power purchase agreement				
	9,736	1,100	7,912	1,102

The fair values of the derivatives were as follows:

December 31, 2020

€ million	Positive market values				Negative market values			
	Financial transactions		Transactions in operating business		Financial transactions		Transactions in operating business	
	current	non-current	current	non-current	current	non-current	current	non-current
Cash flow hedge	-	-	96	-	-	-	45	-
Interest	-	-	-	-	-	-	-	-
Currency	-	-	96	-	-	-	45	-
No hedge accounting	16	10	-	8	62	40	-	2
Interest	-	10	-	-	-	40	-	-
Currency	16	-	-	-	62	-	-	-
Virtual power purchase agreement	-	-	-	8	-	-	-	2
	16	10	96	8	62	40	45	2

December 31, 2019

€ million	Positive market values				Negative market values			
	Financial transactions		Transactions in operating business		Financial transactions		Transactions in operating business	
	current	non-current	current	non-current	current	non-current	current	non-current
Cash flow hedge	-	-	7	-	-	-	46	-
Interest	-	-	-	-	-	-	-	-
Currency	-	-	7	-	-	-	46	-
No hedge accounting	20	14	-	-	19	56	-	-
Interest	-	14	-	-	-	56	-	-
Currency	20	-	-	-	19	-	-	-
Virtual power purchase agreement	-	-	-	-	-	-	-	-
	20	14	7	-	19	56	46	-

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, 2020

€ million	Gross presentation	Netting	Net presentation	Potential netting volume		Potential net amount
				due to master netting agreements	due to financial collateral	
Derivative assets	130	-	130	74	-	56
Derivative liabilities	-149	-	-149	-74	-	-75

December 31, 2019

€ million	Gross presentation	Netting	Net presentation	Potential netting volume		Potential net amount
				due to master netting agreements	due to financial collateral	
Derivative assets	40	-	40	32	-	7
Derivative liabilities	-122	-	-122	-32	-	-89

The reserves for cash flow hedges and the cost of cash flow hedging of the Group applied to the following hedging instruments:

€ million	Cost of hedging cash flows		Cash flow hedging		
	Time value of options	Forward component of currency forwards	Intrinsic value of options	Spot component of currency forwards	Interest rate swaps
Jan. 1, 2019	-	-33	1	-81	-47
Fair value adjustment (directly recognized in equity)	-1	12	13	-29	-
Reclassification to profit or loss	-22	14	-52	17	14
Reclassification to assets	22	-1	35	26	-
Tax effect	-6	-18	-10	-3	-3
Dec. 31, 2019	-8	-25	-13	-70	-36
Jan. 1, 2020	-8	-25	-13	-70	-36
Fair value adjustment (directly recognized in equity)	-2	-11	31	23	-
Reclassification to profit or loss	-	12	-5	34	15
Reclassification to assets	-	-	-	-	-
Tax effect	1	-	-9	-18	-3
Dec. 31, 2020	-9	-25	5	-31	-23

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

Finance income and expenses were as follows:

€ million	2020	2019
Interest income and similar income	39	66
Income from fair value changes from debt instruments with subsequent measurement at fair value through profit or loss	4	5
Income from the change of the fair value of share-based compensation programs	-	14
Currency differences from financing activities	-	12
Finance income	44	97
Interest expenses and similar expenses	-387	-430
Capital loss from disposal of debt instruments with subsequent measurement at amortized cost	-	-1
Expenses from fair value changes from debt instruments with subsequent measurement at fair value through profit or loss	-3	-5
Expenses from fair value changes of share-based compensation programs	-5	-
Currency differences from financing activities	-3	-
Other interest expenses	-	-46
Finance costs	-398	-481
Financial result	-354	-385

Interest income and expenses and similar income and expenses were as follows:

€ million	2020		2019	
	Interest income	Interest expenses	Interest income	Interest expenses
Financial instruments	26	-246	27	-270
Leases	-	-15	-	-14
Pension provisions	-	-39	-	-47
Other non-current provisions	-	-20	-	-26
Other interest income/expenses and similar income and expenses	13	-75	39	-86
Capitalized borrowing costs for	-	8	-	13
Property, plant and equipment	-	4	-	11
Other intangible assets	-	4	-	2
Interest income/expenses and similar income and expenses	39	-387	66	-430

The decrease in interest expenses due to financial instruments compared with the previous year is primarily attributable to lower interest payments on bonds.

The following table shows the development of net gains and losses, interest income and expenses, currency differences as well as dividend income from financial instruments (excluding items recognized in other comprehensive income) by measurement category in the period under review:

2020

€ million	Currency differences	Dividends	Interest result		Net gains and losses			
			Interest income	Interest expenses	Impairment losses	Reversals of impairment losses	Fair value adjustments	Disposal gains/losses
Financial assets								
Subsequent measurement at amortized cost	-10		5		-81	75		-
Subsequent measurement at fair value through other comprehensive income								
Equity Instruments		1						
Subsequent measurement at fair value through profit or loss	-1	-	21	-			-884	
Financial debt								
Subsequent measurement at amortized cost	1			-244				-
Subsequent measurement at fair value through profit or loss	-		-	-2			822	
Total	-10	1	26	-246	-81	75	-62	-

2019

€ million	Currency differences	Dividends	Interest result		Net gains and losses			
			Interest income	Interest expenses	Impairment losses	Reversals of impairment losses	Fair value adjustments	Disposal gains/losses
Financial assets								
Subsequent measurement at amortized cost	-31		7		-95	87		-1
Subsequent measurement at fair value through other comprehensive income								
Equity Instruments		-						
Subsequent measurement at fair value through profit or loss	1	-	20	-			-714	
Financial debt								
Subsequent measurement at amortized cost	24			-270				-
Subsequent measurement at fair value through profit or loss	-		-	-			782	
Total	-7	-	27	-270	-95	87	67	-1

In the table above, interest income or expenses related to derivatives without a hedging relationship are recognized within fair value adjustments. The currency result from equity instruments with subsequent measurement at fair value through other comprehensive income was recognized in other comprehensive income.

(41) Net cash flows from financing activities

Accounting and measurement policies

Net cash flows from financing activities

The option to recognize dividend payments and profit withdrawals in the cash flows from financing activities is exercised in determining the cash flows from financing activities.

The change in financial debt was as follows:

2020

€ million	Jan. 1, 2020	Cash			Non-cash				Changes in scope of consoli- dation	Dec. 31, 2020
		Cash inflows	Repay- ments	Other	Change in lease liabilities	Ex- change rate effects	Fair value adjust- ment	Other		
Bonds	9,854	2,486	-2,724	-	-	-184	-	9	-	9,442
Financial liabilities to E. Merck KG, Darmstadt, Germany	808	390	-382	-	-	-	-	-	-	816
Other current and non-current financial liabilities	2,531	3,561	-4,687	-15	65	33	398	-	-1	1,885
Financial debt	13,194	6,436	-7,793	-15	65	-151	398	9	-1	12,142
Derivative assets (current and non- current)	-33	521	-	-	-	-	-514	-	-	-26

2019

€ million	Jan. 1, 2019	Cash			Non-cash				Changes in scope of consoli- dation	Dec. 31, 2019
		Cash inflows	Repay- ments	Other	Change in lease liabilities	Ex- change rate effects	Fair value adjust- ment	Other		
Bonds	7,173	3,482	-1,290	-	-	59	-	9	420	9,854
Financial liabilities to E. Merck KG, Darmstadt, Germany	821	406	-418	-	-	-	-	-	-	808
Other current and non-current financial liabilities	1,367	1,193	-1,281	-11	198	24	495	-	546	2,531
Financial debt	9,361	5,080	-2,989	-11	198	84	495	9	966	13,194
Derivative assets (current and non-current)	-30	499	-	-	-	-	-502	-	-	-33

Other cash changes show interest payments for lease liabilities that are recognized in the net cash flow from operating activities. Changes in lease liabilities include additions and retirements of right-of-use from leases and the effects from unwinding of the discount on lease liabilities. Other non-cash changes resulted from the application of the effective interest method.

Fair value adjustments of other current and non-current financial liabilities are attributable to liabilities from derivatives. In the consolidated cash flow statement, cash changes of assets from derivatives were recognized together with repayments of other current and non-current financial liabilities. In the above reconciliation, changes of assets from derivatives were recognized separately because they did not form part of financial liabilities.

The amount of undrawn borrowing facilities 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 derivatives. 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.

A more rule-based hedging approach was gradually introduced for hedging foreign exchange risks as of the beginning of fiscal 2019. The entire foreign exchange exposure is divided into several defined risk levels and systematically hedged using suitable hedging instruments. The number of currencies included in hedging was also expanded. Hedging is performed based on a regularly reviewed basket of currencies. As part of the new hedging concept, the time horizon for hedging was reduced from a maximum of 36 months to 12 months. The new hedging concept aims to ensure a consistent hedging quality at lower costs.

Foreign exchange risks from the following transactions are hedged using foreign exchange contracts and currency options applying hedge accounting:

- Forecast transactions in non-functional currency, the expected probability of which is very high for the next 12 months,
- Firm purchase commitments over the next 12 months in non-functional currency.

Foreign exchange risks from the following transactions are economically hedged through the use of foreign exchange contracts and currency options:

- Intragroup financing in non-functional currency,
- Receivables from and liabilities to third parties in non-functional currency.

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, 2020

€ million		USD	CHF	CNY	TWD	JPY	KRW
Net exposure		457	-280	407	65	98	73
Exchange rate -10% (appreciation vs. €)	Consolidated income statement	46	-28	41	7	10	7
	Equity (other comprehensive income)	-119	40	-62	-18	-9	-21
Exchange rate +10% (depreciation vs. €)	Consolidated income statement	-46	28	-41	-7	-10	-7
	Equity (other comprehensive income)	115	-33	64	17	8	17

December 31, 2019

€ million		USD	CHF	CNY	TWD	JPY	KRW
Net exposure		802	-493	933	200	39	284
Exchange rate -10% (appreciation vs. €)	Consolidated income statement	80	-49	93	20	4	28
	Equity (other comprehensive income)	-114	6	-8	-12	-10	-10
Exchange rate +10% (depreciation vs. €)	Consolidated income statement	-80	49	-93	-20	-4	-28
	Equity (other comprehensive income)	83	-5	14	8	7	7

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 12 months in the respective currency less
- The nominal values of hedging instruments of these planned cash flows.

The planned cash flows in the next 12 months are usually hedged at a ratio of 25% to 90% in line with the risk management strategy and depending on market development. 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 subsidiary. 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, 2020

€ million	USD	CHF	CNY	TWD	JPY	KRW
Notional amount	1,802	358	1,071	257	97	295
thereof: current	1,802	358	1,071	257	97	295
thereof: non-current	-	-	-	-	-	-
Fair Value of the hedging instrument	65	-2	-9	3	2	-5
thereof: positive market values	71	-	6	3	2	3
thereof: negative market values	-7	-2	-15	-	-	-8
Maturity profile	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021	January 2021 – December 2021
Hedge ratio ¹	1:1	1:1	1:1	1:1	1:1	1:1
Change in value of outstanding hedging instruments since January 1, 2020	65	-2	-9	3	2	-5
Change in value of hedged item used to determine hedge effectiveness since January 1, 2020	-65	2	9	-3	-2	5
Weighted average hedging rate	1.17	1.08	8.25	33.55	124.20	1,379.00

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

December 31, 2019

€ million	USD	CHF	CNY	TWD	JPY	KRW
Notional amount	1,794	55	392	151	139	165
thereof: current	1,794	55	392	151	139	163
thereof: non-current	-	-	-	-	-	2
Fair value of the hedging instrument	-28	2	-	-6	-2	-4
thereof: positive market values	2	2	-	-	-	-
thereof: negative market values	-31	-	-	-6	-3	-4
Maturity profile	January 2020 – December 2020	January 2020 – December 2020	January 2020 – December 2020	January 2020 – December 2020	January 2020 – December 2020	January 2020 – January 2021
Hedge ratio ¹	1:1	1:1	1:1	1:1	1:1	1:1
Change in value of outstanding hedging instruments since January 1, 2019	-11	2	-	-2	-1	-
Change in value of hedged item used to determine hedge effectiveness since January 1, 2019	11	-2	-	2	1	-
Weighted average hedging rate	1.19	1.12	8.08	36.24	127.40	1,378.90

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

In addition to the transactional foreign exchange risks described previously, the Group was exposed to currency translation risks since many of the Group's subsidiaries are located outside the eurozone and have functional currencies other than the reporting currency. Exchange differences resulting from translation of the assets and liabilities of these companies into euros, 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, 2020	Dec. 31, 2019
Short-term or variable interest rate monetary deposits	1,368	811
Short-term or variable interest rate monetary borrowings	-2,607	-4,761
Net interest rate exposure	-1,240	-3,950

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	2020		2019	
Change in market interest rate	+ 100 basis points	- 100 basis points	+ 100 basis points	- 100 basis points
Effects on consolidated income statement	-21	11	-23	11
Effects on equity (other comprehensive income)	-	-	-	-

The Group does not expect the IBOR reform to have a significant impact neither on interest rate risk nor net assets, financial position or results of operations.

Share price risks

The shares in publicly listed companies amounting to € 244 million (December 31, 2019: € 209 million) are generally exposed to a risk of fluctuations in fair value. A 10% change in the price of these financial instruments would impact Group equity by € 24 million (2019: € 21 million). This change in value would be recognized in Group equity.

Electricity price risks

On October 15, 2020, the Group concluded a virtual power purchase agreement with a wind energy project developer in the United States for an expected project capacity of 50 megawatts. The wind farm is scheduled to be commissioned in 2022. The Group will receive renewable energy certificates (RECs) 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. The agreement had a carrying amount of € 8 million at the reporting date. A change in the significant valuation parameters would have had the following effect on fair value:

December 31, 2020

€ million	Change in expected future electricity prices		Change in expected annual production volume		Change in cost of capital after tax	
	percentage points	percentage points	percentage points	percentage points	percentage points	percentage points
	+10	-10	+10	-10	+1	-1
Change in the fair value of the virtual power purchase agreement	3	-3	1	-1	-1	1

Around 40% of the expected production volume under the virtual power purchase agreement is hedged via 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, 2020

€ 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	9,642	-167	-517	-478	-5,014	-189	-4,150
Bank loans	1,085	-5	-835	-1	-250	-	-
Trade accounts payable	1,768	-	-1,768	-	-	-	-
Liabilities to related parties	1,375	-	-1,375	-	-	-	-
Other financial liabilities	439	-	-405	-	-34	-	-
Loans from third parties and other financial debt	58	-4	-15	-16	-42	-	-
Subsequent measurement at fair value through profit or loss							
Contingent considerations	26	-	-	-	-26	-	-
Derivatives without a hedging relationship	104	-15	-62	-15	-	-	-
Derivatives with a hedging relationship	45	-	-46	-	-	-	-
Refund liabilities	666	-	-666	-	-	-	-
Lease liabilities	438	-8	-110	-16	-246	-7	-81
	15,646	-199	-5,799	-526	-5,612	-196	-4,231

December 31, 2019

		Cash flows <1 year		Cash flows 1 – 5 years		Cash flows >5 years	
€ million	Carrying amount	Interest	Repayment	Interest	Repayment	Interest	Repayment
Subsequent measurement at amortized cost							
Bonds and commercial paper	10,059	-120	-2,224	-519	-4,042	-223	-3,828
Bank loans	1,587	-25	-1,337	-1	-250	-	-
Trade accounts payable	2,054	-	-2,054	-	-	-	-
Liabilities to related parties	1,320	-	-1,320	-	-	-	-
Other financial liabilities	596	-	-569	-	-27	-	-
Loans from third parties and other financial debt	97	-1	-53	-8	-44	-	-
Subsequent measurement at fair value through profit or loss							
Contingent considerations	16	-	-	-	-16	-	-
Derivatives without a hedging relationship	76	-15	-19	-29	-	-	-
Derivatives with a hedging relationship	46	-	-46	-	-	-	-
Refund liabilities	565	-	-565	-	-	-	-
Finance lease liabilities	567	-12	-119	-30	-319	-20	-189
	16,982	-174	-8,305	-587	-4,698	-243	-4,017

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 continuously monitored by credit management. It additionally carries out the management of risks arising from extending credit to customers, suppliers, and in the course of other business relationships.

The Group analyzes all financial assets that are more than 90 days past due and examines whether the credit risk has risen significantly and, as a result, there is objective evidence of impairment requiring the recognition of additional risk provisions.

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 subsequently measured at amortized cost 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 risks, the assets are grouped based of 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 experience 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.

Accordingly, when a country's rating changes, the historical default rates of the rating group to which the respective country has been re-allocated have to be applied, rather than the historical default rates of the previous rating group.

The expected default rates used in the simplified impairment model for trade accounts receivable were analyzed and adjusted in the second quarter of fiscal 2020 in response to the impact of the Covid-19 pandemic. The adjustment was performed by updating the minimum default probabilities per aging category derived from market data based on the development of credit default swap prices. As part of the continuous monitoring of financial market data, credit default swap prices no longer indicated an increased credit risk in the fourth quarter of 2020; as a result, the adjustment made during the year was retracted.

If there is objective evidence that certain trade accounts receivable are fully or partially impaired, additional loss allowances are recognized to provide for expected credit losses.

A default generally exists when the debtor cannot fully meet its liabilities.

A debtor's creditworthiness is assumed to be impaired if there are objective indications that the debtor is in financial difficulties, such as the disappearance of an active market for its products or impending insolvency. On initial recognition, the lifetime expected credit losses are deducted from the nominal amount of trade accounts receivable considered as originated credit-impaired financial assets.

Impairment of other receivables

The general three-stage impairment model and the simplified approach are used to recognize loss allowances of financial instruments included in other receivables. The individual credit rating of the contract partner is used to determine the impairment loss of other receivables.

Individual cases are also analyzed to ascertain whether objective findings suggest that the value of other receivables is impaired. Such suggestions may include, for example, economic difficulties of the debtor, contractual breaches or the renegotiation of contractual payment obligations. If the analysis concludes there is a substantially increased risk of default, the expected credit loss is calculated over the entire lifetime.

Impairment of other financial assets

Investments in debt instruments subsequently measured either at amortized cost or at fair value through other comprehensive income are primarily considered to be investments with low risk, meaning that the expected credit loss in the upcoming 12 months is used to determine the impairment loss.

For financial assets with only a minimal default risk, the rules concerning the mandatory recognition of a risk provision for the lifetime expected credit loss are not applied at initial recognition or during subsequent measurement. Therefore, no assessment of whether there has been a significant increase in the credit risk is carried out for such assets. The Group does not presume an increased credit risk as of the balance sheet date if the contract partner has an investment grade rating.

If there are indications that the debtor's creditworthiness had worsened but that this was not yet reflected in its existing credit rating, the credit risk assessment is adjusted and the impairment allowances recognized for expected credit losses are increased. In all other cases, there are no new risk assessments as of the balance sheet date and the risk profile initially assumed is maintained.

Wherever a considerable increase in the default risk is assumed, the lifetime expected credit loss of the financial asset is considered.

On the balance sheet date, the theoretical maximum default risk for all items referenced above corresponds to the net carrying amounts less any compensation from credit insurance.

Significant discretionary decisions and sources of estimation uncertainty

Credit risks

Impairment of trade accounts receivable and contract assets

In terms of the impairment of trade accounts receivable and of contract assets, there is significant discretion and estimation uncertainty when it comes to

- 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.

As of December 31, 2020, trade accounts receivable were impaired by 2.3% (December 31, 2019: 2.4%). If it had been necessary to recognize impairment on trade accounts receivable and contract assets at 10% higher as of the reporting date, this would have caused a € 7 million reduction in profit before tax (2019: € 8 million).

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	2020	2019
Impairment losses	-81	-95
of trade accounts receivable	-78	-89
of contract assets	-	-
of debt instruments subsequently measured at amortized cost	-3	-5
of debt instruments subsequently measured at fair value through other comprehensive income	-	-
Reversals of impairment losses	75	87
of trade accounts receivable	71	85
of contract assets	-	-
of other debt instruments subsequently measured at amortized cost	4	2
of other debt instruments subsequently measured at fair value through other comprehensive income	-	-
Net impairment on financial assets	-6	-8

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 open positions of all its customers in the corresponding countries and takes steps to mitigate risks if necessary.

The table below contains an overview of the credit risk by business sector and country rating established by leading rating agencies as of December 31, 2020:

December 31, 2020

€ million	Healthcare	Life Science	Performance Materials	Group
External credit rating of at least AA- or comparable	781	996	481	2,257
External credit rating of at least BBB- or comparable	260	136	13	410
External credit rating lower than BBB- or comparable	425	31	2	458
Trade accounts receivable before loss allowances	1,466	1,163	496	3,125

December 31, 2019

€ million	Healthcare	Life Science	Performance Materials	Group
External credit rating of at least AA- or comparable	763	883	526	2,172
External credit rating of at least BBB- or comparable	278	164	20	463
External credit rating lower than BBB- or comparable	573	42	2	617
Trade accounts receivable before loss allowances	1,614	1,089	548	3,251

Goods were generally sold under retention of title so that a reimbursement claim exists 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, 2020, were as follows:

December 31, 2020

€ million	Not yet due	Up to 90 days past due	Up to 180 days past due	Up to 360 days past due	More than 360 days past due	Total
Expected loss rate	0.4%	2.2%	3.7%	17.7%	62.9%	
Trade accounts receivable before loss allowances	2,633	312	56	57	68	3,125
thereof: credit impaired	7	6	-	5	42	59
Loss allowances	-11	-7	-2	-10	-43	-73
thereof: credit impaired	-3	-3	-	-3	-39	-49

Prior to the recognition of additional impairment losses, purchased or originated credit impaired (POCI) trade accounts receivable totaled € 4 million as of December 31, 2020 (December 31, 2019: € 3 million). Additional impairment losses amounting to € 1 million were recognized after initial recognition (December 31, 2019: € 0 million). These POCI receivables are included in the credit impaired trade accounts receivable shown in the provision matrices.

The POCI receivables were measured at fair value on initial recognition by deducting the expected credit losses from their nominal amounts. The undiscounted expected credit losses deducted in fiscal 2020 amounted to € 17 million (2019: € 3 million). This amount related to all trade accounts receivable classified as credit impaired on initial recognition and recognized for the first time in the fiscal year, some of which have already been settled.

Loss allowances based on expected credit losses for trade accounts receivable as of December 31, 2019, were as follows:

December 31, 2019

€ 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	0.6%	1.9%	6.1%	11.1%	41.3%	
Trade accounts receivable before loss allowances	2,669	367	59	43	112	3,251
thereof: credit impaired	5	1	2	3	42	53
Loss allowances	-16	-7	-4	-5	-46	-77
thereof: credit impaired	-2	-1	-1	-2	-41	-47

Credit risks from other receivables

Gross other receivables amounted to € 196 million as of December 31, 2020 (December 31, 2019: € 340 million). Other receivables in the amount of € 194 million were allocated to Level 1 of the general three-level impairment model (December 31, 2019: € 339 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 following table shows the impairment losses recognized for other receivables.

In fiscal 2020, the nominal amount of one other receivable classified as credit impaired on initial recognition was reduced in full by expected credit losses in the amount of € 4 million (2019: € 0 million). This meant that the balance sheet as of December 31, 2020 did not include any other receivables that were already classified as credit impaired on initial recognition.

Credit risks from other financial assets

The Group limits credit risks from other financial assets by concluding 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 fortnightly on the basis of rating information.

Impairment losses on financial assets developed as follows:

2020

€ million	Jan. 1	Additions	Derecog- nition	Utilizations	Reclassifica- tion within levels	Effects of currency translation	Changes in scope of consolidation	Dec. 31
Subsequent measurement at amortized cost	-81	-81	75	7	-	5	-	-76
Trade and other receivables (including current leasing receivables)	-77	-78	71	6	-	5	-	-73
thereof: Level 1/2	-30	-64	66	-	2	2	-	-24
thereof: Level 3	-47	-13	5	6	-2	3	-	-48
thereof: POCI	-	-1	-	-	-	-	-	-1
Contract Assets	-	-	-	-	-	-	-	-1
thereof: Level 1/2	-	-	-	-	-	-	-	-1
thereof: Level 3	-	-	-	-	-	-	-	-
Other Receivables (including non-current leasing receivables)	-4	-3	4	-	-	-	-	-2
thereof: Level 1	-3	-2	4	-	-	-	-	-1
thereof: Level 2	-	-	-	-	-	-	-	-
thereof: Level 3	-1	-1	-	-	-	-	-	-2
Loss allowances for financial assets	-81	-81	75	7	-	5	-	-76

2019

€ million	Jan. 1	Additions	Derecog- nition	Utilizations	Reclassifica- tion within levels	Effects of currency translation	Changes in scope of consolidation	Dec. 31
Subsequent measurement at amortized cost	-76	-95	87	7	-	-1	-3	-81
Trade and other receivables (including current leasing receivables)	-73	-89	85	7	-	-3	-3	-77
thereof: Level 1/2	-28	-82	80	-	3	-1	-2	-30
thereof: Level 3	-45	-8	5	7	-3	-2	-1	-47
thereof: POCI	-	-	-	-	-	-	-	-
Other Receivables (including non-current leasing receivables)	-3	-5	1	-	-	2	-	-4
thereof: Level 1	-2	-4	1	-	-	2	-	-3
thereof: Level 2	-	-	-	-	-	-	-	-
thereof: Level 3	-	-1	-	-	-	-	-	-1
Loss allowances for financial assets	-76	-95	87	7	-	-1	-3	-81

(43) Information on fair value measurement

Accounting and Measurements 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		
Subsequent measurement at fair value through profit or loss			
Other debt instruments	Publicly-traded funds Other short-term cash investments	Derived from active market	Quoted prices in an active market
Financial liabilities			
Subsequent measurement at amortized cost			
Financial debt	Bonds	Derived from active market	Quoted prices in an active market

Fair value determined using input factors observable in the market (Level 2)

	Financial instruments concerned	Description of the measurement technique	Main input factors used to determine fair values
Financial assets			
Subsequent measurement at fair value through other comprehensive income			
Equity instruments	Shares	Derived from active market including a liquidity discount	Quoted prices in an active market and volatilities observable on the market
Subsequent measurement at fair value through profit or loss			
Other debt instruments	Convertible note/bond with embedded settlement option for equity in companies	Nominal value considering a liquidity discount	Volatilities observable on the market
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			
		Discounting of expected future cash flows	Expected cash flows from recent business planning, average cost of capital, expected long-term growth rate
Equity instruments	Equity investments in unlisted companies	Derived from observable prices within the scope of equity refinancing sufficiently close to the balance sheet date, considered risk allowances	Observable prices derived from equity refinancing
		Cost-based determination	Acquisition cost
Trade and other receivables	Trade accounts receivable that are intended for sale due to a factoring agreement	Nominal value less factoring fees	Nominal value of potentially sold trade accounts receivable, average fees for sales of trade accounts receivable
Subsequent measurement at fair value through profit or loss			
Derivatives (without a hedging relationship)	Virtual power purchase agreement	Discounting of expected future cash flows	Electricity future price curves, expected electricity production volumes, discount factors
Contingent consideration	Contingent considerations from the sale of businesses or shares in corporations	Discounting of probability-weighted future milestone payments and license fees	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates
Other debt instruments	Interests in unlisted funds	Consideration of the fair value of companies in which the funds are invested	Net asset values of the fund interests
	Bonds with embedded settlement option for equity in an unlisted company	Use of recognized actuarial methods	Interest rates observable on the market
Financial liabilities			
Subsequent measurement at fair value through profit or loss			
Derivatives (without a hedging relationship)	Hedging instrument for the virtual power purchase agreement	Use of recognized actuarial methods	Electricity future price curves, expected electricity production volumes, discount factors
Contingent consideration	Contingent considerations from the purchase of businesses	Discounting of probability-weighted future milestone payments and license fees	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates

Counterparty credit risk was taken into consideration for measurements of financial instruments at fair value. In the case of non-derivative financial instruments, such as other liabilities or interest-bearing securities, this was reflected using risk premiums on the discount rate, while discounts on market value (so-called credit valuation adjustments and debit valuation adjustments) were used for derivatives.

Equity investments in unlisted companies (Level 3)

The planning periods used to determine the fair value of equity investments in unlisted companies ranged from 3 to 9 years (December 31, 2019: 1 to 9 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 2.0% (December 31, 2019: 1.0% and 2.0%). The applied average cost of capital (after tax) was 7.0% on December 31, 2020 (December 31, 2019: 7.0%).

Assets from contingent considerations (Level 3)

The fair values of assets from contingent considerations are calculated by weighting the expected future milestone payments and royalties using their probability of occurrence and discounting them. The main parameters when determining contingent considerations are

- the estimated probability of reaching the individual milestone events,
- the underlying sales planning used to derive royalties,
- and the discount factor used.

When determining the probability of occurrence of the individual milestones events in connection with the development of drug candidates, the focus is on empirically available probabilities of success of development programs in comparable phases of clinical development in the relevant therapeutic areas. To determine the sales planning, internal sales plans and sales plans of external industry services are used. The discount rate (after tax) as of December 31, 2020, of between 5.4% and 6.5% (December 31, 2019: 5.9% to 6.9%) 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, 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, 2020, the carrying amount was € 208 million (December 31, 2019: € 198 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, 2020

€ million		Change in probability of regulatory approval		
		-10%	unchanged	10%
	5.0%	-22	6	33
Change of discount rate	5.5% (unchanged)	-27	-	27
	6.0%	-32	-5	21

December 31, 2019

€ million		Change in probability of regulatory approval		
		-10%	unchanged	10%
	5.4%	-28	6	40
Change of discount rate	5.9% (unchanged)	-33	-	33
	6.4%	-37	-6	26

The following table presents the carrying amounts and the fair values of the individual financial assets and liabilities as of December 31, 2020, for each individual financial instrument class pursuant to IFRS 9:

€ million	Consolidated notes	Carrying amount			Fair value ¹			
		Current	Non-current	Total	Fair value determined by official prices and quoted market values (Level 1)	Fair value determined using input factors observable in the market (Level 2)	Fair value determined using input factors not observable in the market (Level 3)	Total
Financial assets								
Subsequent measurement at amortized cost								
Cash and cash equivalents	35	1,355	–	1,355				
Trade and other receivables (excluding leasing receivables)	25	3,199	24	3,223				
Other debt instruments	36	1	7	7				
Subsequent measurement at fair value through other comprehensive income								
Equity instruments	36	–	499	499	18	226	255	499
Trade and other receivables	25	19	–	19	–	–	19	19
Other debt instruments	36	5	4	9	9	–	–	9
Subsequent measurement at fair value through profit or loss								–
Equity instruments	36	–	–	–	–	–	–	–
Contingent considerations	36	–	260	260	–	–	260	260
Other debt instruments	36	7	34	41	8	–	33	41
Derivatives without a hedging relationship	36, 39	16	18	34	–	26	8	34
Derivatives with a hedging relationship	36, 39	96	–	96	–	96	–	96
Lease receivables (measured in accordance with IFRS 16) ²	25	3	1	4				
Total		4,701	848	5,548	36	348	575	958
Financial debt								
Subsequent measurement at amortized cost								
Trade payables and other liabilities	30	1,768	–	1,768				
Financial debt	37	2,183	9,419	11,602	9,970	2,180	–	12,150
Other financial liabilities	38	963	34	997				
Subsequent measurement at fair value through profit or loss								–
Contingent considerations	38	–	26	26	–	–	26	26
Derivatives without a hedging relationship	37, 38, 39	62	42	104	–	102	2	104
Derivatives with a hedging relationship	38, 39	45	–	45	–	45	–	45
Refund liabilities	9	666	–	666				
Lease liabilities (measured in accordance with IFRS 16) ²	37	112	327	438				
Total		5,799	9,847	15,646	9,970	2,327	28	12,325

¹ The simplification option under IFRS 7.29(a) was used for disclosures of certain fair values.

² Measurements within the scope of IFRS 16 are exempted from the requirements of IFRS 13 (IFRS 13.6(b)).

The following table presents the carrying amounts and the fair values of the individual financial assets and liabilities as of December 31, 2019, for each individual financial instrument class pursuant to IFRS 9:

€ million	Consoli- dated notes	Carrying amount			Fair value ¹			
		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	781	–	781				
Trade and other receivables (excluding leasing receivables)	25	3,458	22	3,480				
Other debt instruments	36	1	8	9				
Subsequent measurement at fair value through other comprehensive income								
Equity instruments	36	–	399	399	209	–	190	399
Trade and other receivables	25	24	–	24	–	–	24	24
Other debt instruments	36	29	9	39	39	–	–	39
Subsequent measurement at fair value through profit or loss								
Equity instruments	36	–	–	–	–	–	–	–
Contingent considerations	36	–	258	258	–	–	258	258
Other debt instruments	36	–	50	50	2	22	26	50
Derivatives without a hedging relationship	36, 39	20	14	33	–	33	–	33
Derivatives with a hedging relationship	36, 39	7	–	7	–	7	–	7
Lease receivables (measured in accordance with IFRS 16) ²	25	5	–	5				
Total		4,325	761	5,086	250	62	499	810
Financial debt								
Subsequent measurement at amortized cost								
Trade payables and other liabilities	30	2,054	–	2,054				
Financial debt	37	4,422	8,129	12,551	10,183	2,706	–	12,889
Other financial liabilities	38	1,081	27	1,108				
Subsequent measurement at fair value through profit or loss								
Contingent considerations	37	–	16	16	–	–	16	16
Derivatives without a hedging relationship	37, 39	19	56	76	–	76	–	76
Derivatives with a hedging relationship	38, 39	46	–	46	–	46	–	46
Refund liabilities	9	565	–	565				
Lease liabilities (measured in accordance with IFRS 16) ²	37	109	458	567				
Total		8,295	8,687	16,982	10,183	2,828	16	13,027

¹The simplification option under IFRS 7.29(a) was used for disclosures of certain fair values.

²Measurements 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:

2020

€ million	Total	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		
		Other debt instruments	Contingent consideration	Derivatives without a hedging relationship	Equity instruments	Trade and other receivables	Contingent consideration	Derivatives without a hedging relationship
Net carrying amounts, Jan. 1, 2020	483	26	258	-	190	24	-16	-
Additions due to acquisitions/divestments/conclusion of factoring agreements	94	19	-	8	51	25	-9	-
Transfers into Level 3 from Level 1/Level 2	-	-	-	-	-	-	-	-
Fair value changes								
Gains (+)/losses (-) recognized in the consolidated income statement	-1	-	2	-		-	-1	-2
thereof: other operating result	-20	-1	-18	-		-	1	-2
thereof: attributable to assets/liabilities held as of the balance sheet date	-20	-1	-18	-		-	1	-2
thereof: financial income and expenses	19	2	20	-		-	-2	-
thereof: attributable to assets/liabilities held as of the balance sheet date	19	2	20	-		-	-2	-
Gains (+)/losses (-) recognized in other comprehensive income	22				22	-		
Currency translation difference	-1	-2	-	-	-	-	-	-
Disposals due to divestments/payments received/payments made	-33	-3	-	-	-	-31	-	-
Transfers out of Level 3 into Level 1/Level 2	-16	-	-	-	-16	-	-	-
Other	-	-9	-	-	9	-	-	-
Net carrying amounts as of Dec. 31, 2020	547	33	260	8	255	19	-26	-2

Additions during the reporting period primarily comprised acquisitions of equity instruments and trade accounts receivable that are designated to be sold on account of a factoring agreement, as well as acquisitions of convertible notes. Disposals during the reporting period related in particular to advance payments received in connection with trade accounts receivable under factoring agreements. The transfers from Level 3 to Level 1 related to the M Ventures portfolio companies F-star Therapeutics, Inc., United States, and Galecto, Inc., United States, which are now listed. The gains and losses from Level 3 assets recognized in other comprehensive income were reported in the consolidated statement of comprehensive income under the item "fair value adjustments".

The 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 2019:

2019

€ million	Financial assets						Financial liabilities
	Total	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
		Other debt instruments	Contingent consideration	Derivatives without a hedging relationship	Equity instruments	Trade and other receivables	Contingent consideration
Net carrying amounts, Jan. 1, 2019	487	27	259	45	140	21	-5
Additions due to acquisitions/divestments/conclusion of factoring agreements	73	9	-	-	53	26	-13
Transfers into Level 3 from Level 1/Level 2	-	-	-	-	-	-	-
Fair value changes							
Gains (+)/losses (-) recognized in the consolidated income statement	-22	3	19	-45		-	1
thereof: other operating result	3	2	-1	-		-	2
thereof: attributable to assets/liabilities held as of the balance sheet date	-11	2	-15	-		-	2
thereof: financial income and expenses	-25	1	20	-45		-	-
thereof: attributable to assets/liabilities held as of the balance sheet date	20	1	20	-		-	-
Gains (+)/losses (-) recognized in other comprehensive income	98				98	-	
Currency translation difference	-	-	-	-	-	-	-
Disposals due to divestments/payments received/payments made	-50	-2	-20	-	-6	-22	1
Transfers out of Level 3 into Level 1/Level 2	-104	-	-	-	-104	-	-
Other	-	-10	-	-	10	-	-
Net carrying amounts as of Dec. 31, 2019	483	26	258	-	190	24	-16

The following equity instruments measured at fair value through other comprehensive income were disposed of in 2020 and 2019:

€ 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
2020¹				
M Ventures portfolio companies	Portfolio adjustment/restructuring and full acquisition by third parties	100	91	91
2019¹				
M Ventures portfolio companies	Portfolio adjustment/restructuring and full acquisition by third parties	13	5	5

¹ Disposals due to liquidations are not included.

The M Ventures portfolio companies disposed of in fiscal 2020 related to ObsEva SA, Switzerland (fair value as of December 31, 2019: € 3 million) and shares in Progyny, Inc., United States (2019: Translate Bio, Inc., USA, Canbex Therapeutics Ltd., United Kingdom, and shares in Progyny, Inc., United States).

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, 2020	Dec. 31, 2019
Acquisition of intangible assets	850	984
Acquisition of property, plant, and equipment	135	159
Other financial obligations	985	1,143

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 not very likely event that all contract partners achieve all of their milestones, the Group would be obligated to pay up to € 850 million (December 31, 2019: € 984 million) for the acquisition of intangible assets. The decrease compared with the previous year is primarily attributable to out-licensing and clinical results in the portfolio of the in-licensing agreements concluded in the Healthcare business sector (see Note (7) "Collaboration agreements"). The table above does not contain any other financial obligations from possible future sales-based license fees and milestone payments.

The expected maturities of the obligations to acquire intangible assets were as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019
Within 1 year	33	55
In 1-5 years	152	159
After more than 5 years	665	770
Obligations to acquire intangible assets	850	984

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 or over which this group of persons can exercise significant influence.

Transactions were conducted with related parties as follows:

€ million	Income		Expenses		Receivables		Liabilities	
	2020	2019	2020	2019	Dec. 31, 2020	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2019
E. Merck KG, Darmstadt, Germany	1.3	1.2	0.5	0.5	0.1	14.3	1,373.7	1,320.0
E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, a related party of E. Merck KG, Darmstadt, Germany	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Joint ventures	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Non-consolidated subsidiaries	0.1	0.1	0.5	0.3	3.4	5.4	5.2	5.9

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 € 815.9 million (December 31, 2019: € 808.4 million), subject to standard market interest rates. Neither collateral nor guarantees existed for any of the balances either in favor or to the disadvantage of the Group.

Between January and December 2020, expenses of € 0.7 million (April 26 to December 31, 2019: € 0.1 million) for supplies of goods resulted from transactions with Engel-Apotheke, Darmstadt, whose owner has been a member of the Supervisory Board of Merck KGaA, Darmstadt, Germany, since April 26, 2019.

Information on pension funds that are classified as defined benefit plans in accordance with IAS 19 can be found in Note (33) "Provisions for employee benefits".

Information on Executive Board and Supervisory Board compensation can be found in Note (46) "Executive Board and Supervisory Board compensation". Activities above and beyond those described therein, such as the provision of services or the granting of loans, between companies of the Group and members of the Executive Board or the Supervisory Board of Merck KGaA, Darmstadt, Germany, the Executive Board or the Board of Partners of E. Merck KG, Darmstadt, Germany, or members of their immediate families did not take place in either fiscal 2020 or the previous year.

(46) Executive Board and Supervisory Board compensation

As a matter of principle, the compensation of the Executive Board of Merck KGaA, Darmstadt, Germany, is paid by the general partner, E. Merck KG, Darmstadt, Germany, and recognized in its income statement. From January to December 2020, companies included in these consolidated financial statements also recognized expenses of € 2.4 million (2019: € 3.8 million) for services rendered by members of the Executive Board of Merck KGaA, Darmstadt, Germany, at these companies.

From January to December 2020, for members of the Executive Board of Merck KGaA, Darmstadt, Germany, salaries amounting to € 27.4 million (2019: € 27.6 million) were recorded by E. Merck KG, Darmstadt, Germany, and by companies included in these consolidated financial statements, thereof fixed salaries of € 5.3 million (2019: € 5.6 million), variable compensation of € 14.0 million (2019: € 15.3 million), and additional benefits of € 0.4 million (2019: € 0.8 million); as part of the Long-Term Incentive Plan, the members of the Executive Board were eligible to receive 83,210 virtual shares – Share Units of Merck KGaA, Darmstadt, Germany (MSUs) – subject to target achievement (December 31, 2019: 92,588 MSUs). The fair value of these MSUs at the grant date was € 7.7 million (December 31, 2019: € 5.9 million). The grant value was € 8.8 million (December 31, 2019: € 8.7 million).

Furthermore, in fiscal 2020, for members of the Executive Board additions to provisions included expenses of € 17.5 million (2019: € 7.1 million) for the long-term incentive plan, and additions to pension provisions included current service costs of € 3.0 million (2019: € 3.0 million).

Payments to former members of the Executive Board or their surviving dependents are made for a limited period of time and represent continued payment of fixed compensation in the event of death, as well as pension payments. In fiscal 2020, these amounted to € 13.8 million (2019: € 13.4 million). The pension provisions for 2020 amounted to € 177.0 million (December 31, 2019: € 163.6 million).

The compensation of the Supervisory Board in fiscal 2020 amounting to € 870.5 thousand (2019: € 880.8 thousand) consisted of a fixed portion of € 822.5 thousand (2019: € 823.8 thousand) and meeting attendance compensation of € 48.0 thousand (2019: € 57.0 thousand).

As in the previous year, no compensation was paid to former members of the Supervisory Board in fiscal 2020.

As in the previous year, in fiscal 2020, members of the Executive Board and the Supervisory Board received no advance payments or loans; the Group did not enter into contingent liability relationships in favor of these persons.

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 combined management report.

(47) Auditor's fees

The costs for the auditors (KPMG) of the financial statements of the Group consisted of the following:

€ million	2020		2019	
	Group	thereof: KPMG AG Wirtschaftsprüfungsgesellschaft, Germany	Group	thereof: KPMG AG Wirtschaftsprüfungsgesellschaft, Germany
Audits of financial statements	9.3	2.6	9.6	2.8
Other audit-related services	0.5	0.4	0.7	0.3
Tax consultancy services	0.3	–	0.4	0.1
Other services	0.3	0.1	0.3	0.1
Total	10.4	3.1	11.0	3.3

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.

(48) Corporate governance

The Statement of Compliance in accordance with section 161 of the German Stock Corporation Act (Aktiengesetz) was updated and published in the corporate governance section of the website www.emdgroup.com/investors > **Corporate governance** in March 2020 and thus made permanently available.

(49) Information on preparation and approval

The Executive Board of Merck KGaA, Darmstadt, Germany, prepared the consolidated financial statements on February 16, 2021, and approved them for forwarding to the Supervisory Board. The Supervisory Board is responsible for examining the consolidated financial statements and declaring whether it approves them.

Scope of Consolidation

(50) List of shareholdings

The shareholdings of Merck KGaA, Darmstadt, Germany, as of December 31, 2020, 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	Hamburg	100.00	
Germany	AZ Electronic Materials GmbH	Darmstadt	100.00	
Germany	Biochrom GmbH A)	Berlin	100.00	
Germany	BSSN Software GmbH A)	Darmstadt	100.00	
Germany	BSSN UG (haftungsbeschränkt) A)	Darmstadt	100.00	100.00
Germany	Chemitra GmbH A)	Darmstadt	100.00	100.00
Germany	Emedia Export Company mbH	Gernsheim	100.00	
Germany	Merck 12. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck 13. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 15. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 16. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck 20. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck 21. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 24. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Accounting Solutions & Services Europe GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Weiterstadt	100.00	100.00
Germany	Merck Chemicals GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Consumer Health Holding Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Export GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Financial Services GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Financial Trading GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	
Germany	Merck Healthcare Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Healthcare KGaA, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	100.00
Germany	Merck International GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Germany	Merck Internationale Beteiligungen GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Life Science Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Life Science GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Eppenheim	100.00	100.00
Germany	Merck Life Science Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Patent GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Performance Materials Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	
Germany	Merck Performance Materials GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Wiesbaden	100.00	
Germany	Merck Performance Materials Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Real Estate GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck Schuchardt OHG, a subsidiary of Merck KGaA, Darmstadt, Germany	Hohenbrunn	100.00	100.00
Germany	Merck Serono GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany A)	Darmstadt	100.00	100.00
Germany	Merck 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	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 Produktions GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Verwaltungs GmbH	Steinheim	100.00	100.00
Germany	Versum Materials Germany GmbH	Frankfurt am Main	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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Belgium	Merck Chemicals N.V./S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Belgium	Merck N.V.-S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Belgium	Sigma-Aldrich BVBA/SPRL	Overijse	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 spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Prague	100.00	
Czech Republic	Sigma-Aldrich spol s r.o.	Prague	100.00	
Denmark	Merck A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Soborg	100.00	
Denmark	Merck Life Science A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Soborg	100.00	
Denmark	Survac ApS	Frederiksberg	100.00	100.00
Estonia	Merck Serono OÜ, a subsidiary of Merck KGaA, Darmstadt, Germany	Tallinn	100.00	
Finland	Merck Life Science OY, a subsidiary of Merck KGaA, Darmstadt, Germany	Espoo	100.00	
Finland	Merck OY, a subsidiary of Merck KGaA, Darmstadt, Germany	Espoo	100.00	
France	Gonnon S.A.S.	Lyon	100.00	
France	Merck Biodevelopment S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Merck Chimie S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Fontenay s/Bois	100.00	
France	Merck Performance Materials S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Trosly Breuil	100.00	
France	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	99.86	
France	Merck Santé S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Merck Serono S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Millipore S.A.S.	Molsheim	100.00	
France	Resolution Spectra Systems S.A.S.	Meylan	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 A.E., 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	Sigma-Aldrich Kft.	Budapest	100.00	
Ireland	Merck Finance Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Carrigtwohill	100.00	
Ireland	Merck Millipore Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Carrigtwohill	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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	Silverberry Limited	Arklow	100.00	
Ireland	Versum Materials Ireland Limited	Dublin	100.00	
Italy	Allergopharma S.r.l.	Rome	100.00	
Italy	Istituto di Ricerche Biomediche Antoine Marxer RBM S.p.A.	Colleretto Giacosa	100.00	
Italy	Merck Life Science S.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Milan	100.00	
Italy	Merck S.p.A., 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	Mats Finance S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Chemicals Holding S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Finance S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Finanz S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Holding S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Invest SCS, a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Re S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	100.00
Luxembourg	Millipore International Holdings, S.a.r.l.	Luxembourg	100.00	
Luxembourg	Sigma-Aldrich Global S.a.r.l.	Luxembourg	100.00	
Luxembourg	Sigma-Aldrich S.a.r.l.	Luxembourg	100.00	
Malta	Merck Capital Holding Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	50.29
Malta	Merck Capital Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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 Zuidooost	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 Ventures B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00	
Netherlands	Serono Tri Holdings B.V.	Schiphol-Rijk	100.00	
Netherlands	Sigma-Aldrich B.V.	Zwijndrecht	100.00	
Netherlands	Sigma-Aldrich Chemie N.V.	Zwijndrecht	100.00	
Netherlands	Versum Materials Asia B.V.	Utrecht	100.00	
Netherlands	Versum Materials Holdings Nederland B.V.	Utrecht	100.00	
Netherlands	Versum Materials International B.V.	Utrecht	100.00	
Netherlands	Versum Materials Netherlands B.V.	Utrecht	100.00	
Netherlands	Versum Materials Netherlands International B.V.	Utrecht	100.00	
Netherlands	Versum Materials Pacific B.V.	Utrecht	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 Sp.z.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Warsaw	100.00	
Poland	Sigma-Aldrich Sp.z.o.o.	Poznan	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 LLC, a subsidiary of Merck KGaA, Darmstadt, Germany	Moscow	100.00	
Russia	Sigma-Aldrich Rus LLC	Moscow	100.00	
Serbia	Merck d.o.o. Beograd, a subsidiary of Merck KGaA, Darmstadt, Germany	Belgrade	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Slovakia	Merck spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Bratislava	100.00	
Slovakia	Sigma-Aldrich, spol. s r.o.	Bratislava	100.00	
Slovenia	Merck d.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Ljubljana	100.00	
Spain	Merck Chemicals and Life Science S.A.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Spain	Merck Life Science S.L.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Spain	Merck, S.L.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Sweden	Merck AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Sweden	Merck Chemicals and Life Science AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Sweden	Sigma-Aldrich Sweden AB	Stockholm	100.00	
Switzerland	Ares Trading SA	Aubonne	100.00	
Switzerland	Merck & Cie, a subsidiary of Merck KGaA, Darmstadt, Germany	Altendorf	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	Coinsins	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 Ecz. 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	London	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	

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
North America				
Canada	EMD Chemicals Canada Inc.	Oakville	100.00	
Canada	EMD Crop BioScience Canada Inc.	Toronto	100.00	
Canada	EMD Inc.	Mississauga	100.00	
Canada	Millipore (Canada) Ltd.	Oakville	100.00	
Canada	Natrix Separations, Inc.	Burlington	100.00	
Canada	Sigma-Aldrich Canada Co.	Oakville	100.00	
United States	Aldrich Chemical Co. LLC	Milwaukee	100.00	
United States	Aldrich Chemical Foreign Holding LLC	St. Louis	100.00	
United States	Aldrich-APL, LLC	Urbana	100.00	
United States	BioControl Systems, Inc.	Wilmington	100.00	
United States	BioReliance Corporation	Rockville	100.00	
United States	Cell Marque Corporation	Rocklin	100.00	
United States	Cerilliant Corporation	Round Rock	100.00	
United States	Electron Transfer Technologies, Inc.	West Trenton	100.00	
United States	EMD Accounting Solutions & Services America, Inc.	Rockland	100.00	
United States	EMD Digital Inc.	Burlington	100.00	
United States	EMD Finance LLC	Wilmington	100.00	
United States	EMD Group Holding, Inc.	Wilmington	100.00	
United States	EMD Holding Corp.	Rockland	100.00	
United States	EMD Millipore Corporation	Burlington	100.00	
United States	EMD Performance Materials Corp.	Philadelphia	100.00	
United States	EMD Serono Holding, Inc.	Rockland	100.00	
United States	EMD Serono Research & Development Institute, Inc.	Billerica	100.00	
United States	EMD Serono, Inc.	Rockland	100.00	
United States	FloDesign Sonics, Inc.	Wilbraham	100.00	
United States	Grzybowski Scientific Inventions Ltd.	Evanston	100.00	
United States	Intermolecular, Inc.	Wilmington	100.00	
United States	J.C. Schumacher Company	Los Angeles	100.00	
United States	Millipore Asia Ltd.	Wilmington	100.00	
United States	Millipore UK Holdings I, LLC	Wilmington	100.00	
United States	Millipore UK Holdings II, LLC	Wilmington	100.00	
United States	Ormet Circuits, Inc.	San Diego	100.00	
United States	Research Organics, LLC	Cleveland	100.00	
United States	SAFC Biosciences, Inc.	Lenexa	100.00	
United States	SAFC Carlsbad, Inc.	Carlsbad	100.00	
United States	SAFC, Inc.	Madison	100.00	
United States	Serono Laboratories, Inc.	Rockland	100.00	
United States	Sigma Chemical Foreign Holding LLC	St. Louis	100.00	
United States	Sigma Redevelopment Corporation	St. Louis	100.00	
United States	Sigma-Aldrich Co. LLC	St. Louis	100.00	
United States	Sigma-Aldrich Corporation	St. Louis	100.00	
United States	Sigma-Aldrich Foreign Holding Co.	St. Louis	100.00	
United States	Sigma-Aldrich Manufacturing LLC	St. Louis	100.00	
United States	Sigma-Aldrich Missouri Insurance Company	St. Louis	100.00	
United States	Sigma-Aldrich Research Biochemicals, Inc.	Natick	100.00	
United States	Sigma-Aldrich RTC, Inc.	Laramie	100.00	
United States	Sigma-Aldrich, Inc.	Milwaukee	100.00	
United States	Sigma-Genosys of Texas LLC	The Woodlands	100.00	
United States	Supelco, Inc.	Bellefonte	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
United States	Versum Materials Formulations and Technology, LLC	Wilmington	100.00	
United States	Versum Materials Manufacturing Company, LLC	Wilmington	100.00	
United States	Versum Materials Technology LLC	Wilmington	100.00	
United States	Versum Materials US International, Inc.	Wilmington	100.00	
United States	Versum Materials US LLC	Wilmington	100.00	
United States	Versum Materials, Inc.	Wilmington	100.00	
Asia-Pacific (APAC)				
Australia	Merck Healthcare Pty. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Macquarie Park	100.00	
Australia	Merck Pty. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Bayswater	100.00	
Australia	SAFC Biociences Pty. Ltd.	Macquarie Park	100.00	
Australia	Sigma-Aldrich Oceania Pty. Ltd.	Macquarie Park	100.00	
Australia	Sigma-Aldrich Pty. Ltd.	Macquarie Park	100.00	
China	Beijing Skywing Technology Co., Ltd.	Beijing	100.00	
China	Merck Chemicals (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Display Materials (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Electronic Materials (Suzhou) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Suzhou	100.00	
China	Merck Holding (China) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Innovation Hub (Guangdong) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Guangzhou	100.00	
China	Merck Life Science Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Life Science Technologies (Nantong) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Management Consulting (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Performance Materials Hong Kong Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Pharmaceutical (HK) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Pharmaceutical Distribution (Jiangsu) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Pharmaceutical Manufacturing (Jiangsu) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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	BioReliance K.K.	Tokyo	100.00	
Japan	Merck Biopharma Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Electronics Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Holdings G.K., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Performance Materials G.K., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Sigma-Aldrich Japan G.K.	Tokyo	100.00	
Japan	Versum Materials Japan Inc.	Tokyo	100.00	
Malaysia	Merck Sdn Bhd, a subsidiary of Merck KGaA, Darmstadt, Germany	Petaling Jaya	100.00	
Malaysia	Sigma-Aldrich (M) Sdn Bhd	Kuala Lumpur	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	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
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 Korea Technology Inc.	Ansan-si	100.00	
South Korea	Versum Materials PM Korea Inc.	Ulsan	100.00	
South Korea	Versum Materials SPC Korea Ltd.	Pyeongtaek-shi	100.00	
Taiwan	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Taipei	100.00	
Taiwan	Merck Performance Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Taipei	100.00	
Taiwan	SAFC Hitech Taiwan Co., Ltd.	Kaohsiung	100.00	
Taiwan	Versum Materials Taiwan Co., Ltd.	Taipei	74.00	
Thailand	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Bangkok	45.11	
Vietnam	Merck Healthcare Vietnam Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Ho Chi Minh City	100.00	
Vietnam	Merck Vietnam Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Ho Chi Minh City	100.00	
Latin America				
Argentina	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Buenos Aires	100.00	
Argentina	Sigma-Aldrich de Argentina S.R.L.	Buenos Aires	100.00	
Brazil	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Rio de Janeiro	100.00	
Brazil	Sigma-Aldrich Brasil Ltda.	Barueri	100.00	
Chile	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Santiago de Chile	100.00	
Chile	Sigma-Aldrich Quimica Ltda.	Santiago de Chile	100.00	
Colombia	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Bogota	100.00	
Ecuador	Merck C.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Quito	100.00	
Guatemala	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Guatemala City	100.00	
Mexico	Merck Biopharma Distribution S.A. de C.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Mexico City	100.00	
Mexico	Merck, S.A. de C.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Mexico City	100.00	
Mexico	Sigma-Aldrich Quimica, S. de R.L. de C.V.	Toluca	100.00	
Panama	Mesofarma Corporation	Panama City	100.00	
Peru	Merck Peruana S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Lima	100.00	
Uruguay	Ares Trading Uruguay S.A.	Montevideo	100.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)
Middle East and Africa (MEA)				
Egypt	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Cairo	100.00	
Israel	Inter-Lab Ltd.	Yavne	100.00	
Israel	InterPharm Laboratories Ltd.	Yavne	100.00	
Israel	Merck Serono Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Herzliya Pituach	100.00	
Israel	PMatX Ltd.	Yavne	90.00	
Israel	QLight Nanotech Ltd.	Jerusalem	100.00	
Israel	Sigma-Aldrich Israel Ltd.	Rehovot	100.00	
Israel	Versum Materials Israel Ltd.	Tel Aviv	100.00	
Kenya	Merck Healthcare and Life Science Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Nairobi	100.00	
South Africa	Merck (Pty) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Halfway House	100.00	
South Africa	Sigma-Aldrich (Pty) Ltd.	Kempton Park	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				
North America				
United States	Syntropy Technologies LLC	Wilmington	50.00	

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31. 2020 (€ million)	Fair value as of Dec. 31. 2019 (€ 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	100.00	<0.5	<0.5
Germany	Merck 30. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 31. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 36. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 37. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 38. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 39. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 40. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Germany	Merck 41. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Other European countries						
Greece	Sigma-Aldrich (OM) Ltd.	Athens	100.00		<0.5	<0.5
Ireland	SAFC Arklow Ltd.	Arklow	100.00		<0.5	<0.5
Russia	Chemical Trade Limited LLC	Moscow	100.00		<0.5	<0.5

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. 2020 (€ million)	Fair value as of Dec. 31. 2019 (€ million)
United Kingdom	BioControl Systems Limited	London	100.00		<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
United Kingdom	Sigma-Aldrich Financial Services Limited	Gillingham	100.00		<0.5	-
North America						
United States	EMD Digital Holdings LLC	Wilmington	100.00		<0.5	-
United States	Fluka Chemical Corp.	St. Louis	100.00		<0.5	<0.5
United States	TocopheRx, Inc.	Burlington	100.00		B)	B)
Latin America						
Dominican Republic	Merck Dominicana, S.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Santo Domingo	100.00		<0.5	<0.5
Panama	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Panama City	100.00		<0.5	-
Middle East and Africa (MEA)						
Algeria	MDCA Pharma Promotion SARL	Hydra	49.00		<0.5	<0.5
Morocco	Merck Maroc S.A.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Casablanca	100.00		<0.5	<0.5
Nigeria	Merck Pharmaceutical and Life Sciences Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Lagos	100.00		<0.5	<0.5
IV. Majority interest in non-controlled companies						
Germany						
Germany	Merck Foundation gGmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	<0.5	<0.5
Latin America						
Venezuela	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Caracas	100.00		<0.5	<0.5
Venezuela	Representaciones MEPRO S.A.	Caracas	100.00		<0.5	<0.5

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31. 2020 (€ million)	Fair value as of Dec. 31. 2019 (€ million)
V. Associated companies not accounted for using the equity method for reasons of materiality						
Other European countries						
Netherlands	Calypso Biotech B.V.	Amsterdam	38.81		B)	B)
Netherlands	iOnctura B.V.	Amsterdam	29.44		B)	B)
Switzerland	Asceneuron SA	Lausanne	25.35		B)	B)
Switzerland	CAMAG Chemie-Erzeugnisse und Adsorptionstechnik AG	Muttenz	39.11		2	2
Switzerland	Vaximm AG	Basel	22.06		B)	B)
North America						
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)
VI. Other equity positions						
Germany						
Germany	Alcan Systems GmbH	Darmstadt	<20.00		B)	B)
Germany	Azelis Deutschland Kosmetik GmbH	Sankt Augustin	<20.00		<0.5	2
Germany	Ferroelectric Memory GmbH	Dresden	<20.00		B)	-
Germany	InfraServ GmbH & Co. Wiesbaden KG	Wiesbaden	<20.00		12	6
Germany	Inuru GmbH	Berlin	<20.00		<0.5	<0.5
Germany	IOmx Therapeutics AG	Martinsried	<20.00		B)	B)
Germany	LegenDairy Foods GmbH	Berlin	<20.00		B)	B)
Germany	micropsi industries GmbH	Berlin	<20.00		B)	-
Germany	pharma mall Gesellschaft für Electronic Commerce mbH	Sankt Augustin	<20.00		1	1
Germany	PharmLog Pharma Logistik GmbH	Boenen	<20.00		2	3
Germany	PrintCity GmbH & Co. KG	Neuried	<20.00	<20.00	<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. 2020 (€ million)	Fair value as of Dec. 31. 2019 (€ million)
Other European countries						
Belgium	ReWind Therapeutics N.V.	Leuven-Heverlee	<20.00		B)	B)
Finland	Abacus Diagnostica OY	Turku	<20.00		<0.5	<0.5
Finland	Forendo Pharma OY	Turku	<20.00		B)	B)
France	Aveni SACS	Massy	<20.00		B)	B)
France	DNA Script S.A.S.	Paris	<20.00		B)	B)
France	Scipio Bioscience S.A.S.	Montrouge	<20.00		B)	-
Netherlands	Anavo Therapeutics B.V.	Leiden	<20.00		B)	-
Netherlands	Mosa Meat B.V.	Maastricht	<20.00		B)	B)
Netherlands	SynAffix B.V.	Nijmegen	<20.00		B)	B)
Switzerland	FoRx Therapeutics AG	Basel	<20.00		B)	B)
Switzerland	Inthera Bioscience AG	Schlieren	23.28		B)	B)
United Kingdom	Artios Pharma Limited	Cambridge	<20.00		B)	B)
United Kingdom	Macrophage Pharma Limited	Cambridge	20.31		B)	B)
United Kingdom	Peratech HoldCo Limited	Brompton-on-Swale	<20.00		B)	B)
United Kingdom	Storm Therapeutics Limited	London	<20.00		B)	B)
North America						
United States	Akili Interactive Labs, Inc.	Boston	<20.00		B)	B)
United States	Allozyne, Inc.	Seattle	<20.00		<0.5	<0.5
United States	Altoida, Inc.	Suwanee	<20.00		B)	B)
United States	ApoGen Biotechnologies, Inc.	Seattle	<20.00		B)	B)
United States	Bioliq Inc.	San Diego	<20.00		B)	B)
United States	ElectronInks Inc.	Austin	<20.00		B)	B)
United States	F-star Therapeutics, Inc.	Wilmington	<20.00		B)	B)
United States	Galecto, Inc.	Wilmington	<20.00		B)	B)
United States	Hydrochlor, LLC	Wilmington	50.00		D)	
United States	Immunitas Therapeutics, Inc.	Wilmington	<20.00		B)	B)
United States	Indi Molecular, Inc.	Culver City	<20.00		B)	B)
United States	Inorganic Intelligence, Inc.	Wilmington	<20.00		B)	-
United States	Kraig Biocraft Laboratories, Inc.	Ann Arbor	<20.00		<0.5	<0.5
United States	Lumio, 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)	-
United States	Neurable Inc.	Boston	<20.00		B)	B)
United States	Pacific Light & Hologram, Inc.	Wilmington	<20.00		B)	B)

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31. 2020 (€ million)	Fair value as of Dec. 31. 2019 (€ million)
United States	Pictor Labs, Inc.	Los Angeles	<20.00		B)	-
United States	Plexium Inc.	Wilmington	<20.00		B)	B)
United States	Precigen, Inc.	Germantown	<20.00		226	101
United States	Progyny, Inc.	Menlo Park	<20.00		B)	B)
United States	Raze Therapeutics, Inc.	Cambridge	<20.00		B)	B)
United States	Ribometrix Inc.	Durham	<20.00		B)	B)
United States	Riffyn, Inc.	Oakland	<20.00		B)	B)
United States	Robert W. Baird & Co.	Chicago	<20.00		C)	C)
United States	SeeQC, Inc.	Elmsford	<20.00		B)	-
United States	Sonde Health, Inc.	Boston	<20.00		B)	B)
United States	Telios Pharma, Inc.	Wilmington	<20.00		9	9
United States	Tioga Pharmaceuticals, Inc.	San Diego	<20.00	<20.00	< 0.5	< 0.5
United States	Vera Therapeutics, Inc.	Wilmington	<20.00		11	-
United States	Xilio Therapeutics, Inc.	Waltham	<20.00		B)	B)
Asia-Pacific (APAC)						
Australia	Immutep Limited	Sydney	<20.00		<0.5	<0.5
China	Multitude Therapeutics Inc.	Shanghai	<20.00		B)	-
China	Nanjing Xinchun Neuromorphic Technology Co., Ltd.	Nanjing	<20.00		B)	-
Japan	Showa Denko Versum Materials 2 Co., Ltd.	Tokyo	35.00		D)	
South Korea	Construction Guarantee Cooperative	Seoul	<20.00		<0.5	-
Latin America						
Cayman Islands	CLEARInk Displays, Ltd.	Grand Cayman	<20.00		B)	B)

Footnotes follow at the end of the table

Country	Company	Registered office	Equity interest (%)	thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value as of Dec. 31. 2020 (€ million)	Fair value as of Dec. 31. 2019 (€ million)
Middle East and Africa (MEA)						
Algeria	Novapharm Production SARL	Wilaya de Tipiza	20.00		<0.5	1
Israel	ARTSaVIT Ltd.	Yavne	<20.00		B)	B)
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	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 Merck Ventures B.V., a subsidiary of Merck KGaA, Darmstadt, Germany, portfolio. As of December 31, 2020, the fair value of the M Ventures portfolio amounted to € 234 million (December 31, 2019: € 275 million).

C) Closed-end funds classified as debt in accordance with IFRS 9.

D) This is an affiliate within the meaning of IFRS 11 (joint activity).

Darmstadt, February 16, 2021



Stefan Oschmann



Belén Garijo



Kai Beckmann



Peter Guenter



Marcus Kuhnert

Responsibility Statement

To the best of our knowledge, and in accordance with the applicable reporting principles, the consolidated financial statements of the Group, as of December 31, 2020, give a true and fair view of the assets, liabilities, financial position and profit or loss of the Group, and the combined management report of the fiscal year 2020 includes a fair review of the development and performance of the business and the position of the Group, together with a description of the material opportunities and risks associated with the expected development of the Group.

Darmstadt, February 16, 2021



Stefan Oschmann



Belén Garijo



Kai Beckmann



Peter Guenter



Marcus Kuhnert

Reproduction of the Independent Auditor's Report

Based on the results of our audit, we have issued the following unqualified audit opinion:

Independent Auditor's Report

To MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany

Report on the Audit of the Consolidated Financial Statements and of the Combined Management Report

Opinions

We have audited the consolidated financial statements of MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, and its subsidiaries (the Group), which comprise the consolidated balance sheet as of December 31, 2020, the consolidated income statement, the consolidated statement of comprehensive income, consolidated statement of changes in net equity and consolidated cash flow statement for the financial year from January 1, 2020, to December 31, 2020, and notes to the consolidated financial statements, including a summary of significant accounting policies. In addition, we have audited the combined management report of MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, for the financial year from January 1, 2020, to December 31, 2020. In accordance with German legal requirements, we have not audited the components of the combined management report specified in the "Other Information" section of our auditor's report.

In our opinion, on the basis of the knowledge obtained in the audit,

- the accompanying consolidated financial statements comply, in all material respects, with the IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Section 315e (1) HGB [Handelsgesetzbuch: German Commercial Code] and, in compliance with these requirements, give a true and fair view of the assets, liabilities, and financial position of the Group as of December 31, 2020, and of its financial performance for the financial year from January 1, 2020, to December 31, 2020, and
- the accompanying combined management report as a whole provides an appropriate view of the Group's position. In all material respects, this combined management report is consistent with the consolidated financial statements, complies with German legal requirements and appropriately presents the opportunities and risks of future development. Our opinion on the combined management report does not cover the content of the components of the combined management report specified in the "Other Information" section of the auditor's report.

Pursuant to Section 322 (3) sentence 1 HGB, we declare that our audit has not led to any reservations relating to the legal compliance of the consolidated financial statements and of the combined management report.

Basis for the Opinions

We conducted our audit of the consolidated financial statements and of the combined management report in accordance with Section 317 HGB and EU Audit Regulation No 537/2014 (referred to subsequently as "EU Audit Regulation") and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Our responsibilities under those requirements and principles are further described in the "Auditor's Responsibilities for the Audit of the Consolidated Financial Statements and of the Combined Management Report" section of our auditor's report. We are independent of the group entities in accordance with the requirements of European law and German commercial and professional law, and we have fulfilled our other German professional responsibilities in accordance with these requirements. In addition, in accordance with Article 10 (2)(f) of the EU Audit Regulation, we declare that we have not provided non-audit services prohibited under Article 5 (1) of the EU Audit Regulation. We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our opinions on the consolidated financial statements and on the combined management report.

Key Audit Matters in the Audit of the Consolidated Financial Statements

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements for the financial year from January 1, 2020, to December 31, 2020. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, we do not provide a separate opinion on these matters.

Impairment testing of goodwill of the operating segments Life Science and Performance Materials

Explanatory notes on the impairment tests can be found in the notes to the consolidated financial statements under note 18.

The financial statement risk

The goodwill in the consolidated financial statements as of December 31, 2020 amounts to EUR 15,959 million (38.2% of the Group's total assets), with EUR 10,287 million of this attributable to Life Science and with EUR 4,146 million to Performance Materials. The goodwill of Life Science results especially from the acquisitions of the Milipore Corporation, USA, in July 2010 and of the Sigma-Aldrich Corporation, USA, in November 2015. Due to the acquisition of Versum Materials, Inc., USA, in October 2019 the goodwill of Performance Materials has increased significantly.

Goodwill is to be tested for impairment once a year, and may need be tested ad hoc if necessary. In performing the goodwill impairment test, the Group primarily determines the recoverable amount by means of the discounted cash flow method. The valuation model used to determine the recoverable amount is complex and the result of this valuation are highly dependent on the projection of future net cash flows (taking into account future revenue growth, profit margins and long-term growth rates) and the discount factor used, and therefore is subject to significant estimation uncertainty.

There is a risk for the financial statements that an existing goodwill impairment loss was not recognized as of the reporting date. In addition, there is a risk that the related disclosures in the notes to the consolidated financial statements are not complete and appropriate.

Our audit approach

Using our own sensitivity analyses, we assessed with the involvement of our own specialists in valuation the extent to which the goodwill of the cash-generating units would still be sufficiently covered by the respective recoverable amount if assumptions and parameters underlying the calculations were to change in a manner that is deemed possible.

We reconciled the expected net cash flows underlying the recoverable amount calculations with the current medium-term plan approved by management. To assess the assumptions used in preparing the medium-term plan, we obtained an understanding of the planning process through discussions with company representatives, including corporate management and representatives from the corporate divisions and the research and development department, we assessed the plausibility and consistency of the explanations received with the projections, and we compared the assumptions used with the expectations of external analysts and sources.

As part of our audit of the discount factor, we analyzed the peer group used. With regard to other assumptions and parameters (e.g. risk-free interest rate, beta factor, market risk premium), we compared those assumptions and parameters with our own assumptions and publicly available data to assess whether these were appropriate and whether they were within the range of external recommendations, to the extent available. In addition, we verified the calculation model used to determine the discount factor and qualified the method by using our own calculation model.

We assessed the appropriateness of the valuation model used. To verify arithmetical accuracy, we used a risk-based audit approach to recalculate the Company's calculations based on samples contained in the valuation model.

In addition, we assessed whether the Company's disclosures regarding the goodwill impairment test in the notes to the consolidated financial statements are complete and appropriate.

Our observations

The calculation method used for the goodwill impairment test is appropriate and in line with the applicable valuation principles. Overall, the assumptions and parameters used by management are balanced. The disclosures in the notes to the consolidated financial statements are complete and properly depict the judgment associated with the subsequent measurement of goodwill.

Recognition and measurement of income tax liabilities

Explanatory notes on the recognition and measurement of income tax liabilities can be found in the notes to the consolidated financial statements under note 15.

The financial statement risk

As of December 31, 2020, current income tax liabilities amount to EUR 1,460 million.

The Group operates in different jurisdictions with different legal systems. The application of local regulations on income tax, tax incentives and transfer pricing rules is complex. The recognition and measurement of income tax liabilities require the Group to exercise judgment in assessing tax matters and to make estimates regarding uncertain tax positions.

The measurement of income tax liabilities and the assessment of unrecognized contingent tax liabilities are subject to judgment and estimation uncertainty. The Group engages event driven external experts to support its own risk assessment with expert opinions from tax specialists.

There is a risk for the financial statements that income tax liabilities are not fully recognized or not appropriately measured.

Our audit approach

We involved our own specialists in international tax law into the audit team in order to evaluate the Group's assessment of tax risks and as far as obtained the related opinions of external experts engaged by the Group.

We obtained an understanding of existing tax risks through inquiry of employees of the tax department. We assessed the competence, capabilities and objectivity of the external experts and evaluated their expert opinions.

In addition, we analyzed correspondence with the relevant tax authorities and assessed the assumptions underlying the determination of income tax liabilities based on our knowledge and experience of how the relevant legal requirements are currently applied by the tax authorities and courts.

Our observations

The valuation model and assumptions underlying the recognition and measurement of income tax liabilities are reasonable.

Other Information

Management and the Supervisory Board are responsible for the other information. The other information comprises the following components of the combined management report, whose content was not audited:

- the corporate governance statement referred to in the combined management report,
- the components of the combined non-financial statement referred to in the combined management report,
- information extraneous to combined management reports and marked as unaudited and
- the remaining parts of the annual report.

The other information does not comprise the consolidated financial statements, the audited parts of the combined management report and our auditor's report.

Our opinions on the consolidated financial statements and on the combined management report do not cover the other information, and consequently we do not express an opinion or any other form of assurance conclusion thereon.

In connection with our audit, our responsibility is to read the other information and, in so doing, to consider whether the other information

- is materially inconsistent with the consolidated financial statements, with the information in the combined management report audited for content or our knowledge obtained in the audit, or
- otherwise appears to be materially misstated.

Responsibilities of Management and the Supervisory Board for the Consolidated Financial Statements and the Combined Management Report

Management is responsible for the preparation of the consolidated financial statements that comply, in all material respects, with IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Section 315e (1) HGB and that the consolidated financial statements, in compliance with these requirements, give a true and fair view of the assets, liabilities, financial position, and financial performance of the Group. In addition, management is responsible for such internal control as they have determined necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern. They also have the responsibility for disclosing, as applicable, matters related to going concern. In addition, they are responsible for financial reporting based on the going concern basis of accounting unless there is an intention to liquidate the Group or to cease operations, or there is no realistic alternative but to do so.

Furthermore, management is responsible for the preparation of the combined management report that, as a whole, provides an appropriate view of the Group's position and is, in all material respects, consistent with the consolidated financial statements, complies with German legal requirements, and appropriately presents the opportunities and risks of future development. In addition, management is responsible for such arrangements and measures (systems) as they have considered necessary to enable the preparation of a combined management report that is in accordance with the applicable German legal requirements, and to be able to provide sufficient appropriate evidence for the assertions in the combined management report.

The Supervisory Board is responsible for overseeing the Group's financial reporting process for the preparation of the consolidated financial statements and of the combined management report.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements and of the Combined Management Report

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and whether the combined management report as a whole provides an appropriate view of the Group's position and, in all material respects, is consistent with the consolidated financial statements and the knowledge obtained in the audit, complies with the German legal requirements and appropriately presents the opportunities and risks of future development, as well as to issue an auditor's report that includes our opinions on the consolidated financial statements and on the combined management report.

Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Section 317 HGB and the EU Audit Regulation and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer (IDW) will always detect a material misstatement. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements and this combined management report.

We exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements and of the combined management report, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinions. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal controls.
- Obtain an understanding of internal control relevant to the audit of the consolidated financial statements and of arrangements and measures (systems) relevant to the audit of the combined management report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of these systems.
- Evaluate the appropriateness of accounting policies used by management and the reasonableness of estimates made by management and related disclosures.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in the auditor's report to the related disclosures in the consolidated financial statements and in the combined management

report or, if such disclosures are inadequate, to modify our respective opinions. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to be able to continue as a going concern.

- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements present the underlying transactions and events in a manner that the consolidated financial statements give a true and fair view of the assets, liabilities, financial position and financial performance of the Group in compliance with IFRSs as adopted by the EU and the additional requirements of German commercial law pursuant to Section 315e (1) HGB.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express opinions on the consolidated financial statements and on the combined management report. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our opinions.
- Evaluate the consistency of the combined management report with the consolidated financial statements, its conformity with [German] law, and the view of the Group's position it provides.
- Perform audit procedures on the prospective information presented by management in the combined management report. On the basis of sufficient appropriate audit evidence we evaluate, in particular, the significant assumptions used by management as a basis for the prospective information, and evaluate the proper derivation of the prospective information from these assumptions. We do not express a separate opinion on the prospective information and on the assumptions used as a basis. There is a substantial unavoidable risk that future events will differ materially from the prospective information.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with the relevant independence requirements, and communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, the related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter.

Other Legal and Regulatory Requirements

Report on the Assurance in accordance with Section 317 (3b) HGB on the Electronic Reproduction of the Consolidated Financial Statements and the Combined Management Report Prepared for Publication Purposes

We have performed assurance work in accordance with Section 317 (3b) HGB to obtain reasonable assurance about whether the reproduction of the consolidated financial statements and the combined management report (hereinafter the "ESEF documents") contained in the file that can be downloaded by the issuer from the electronic client portal with access protection, „merckkgaa-2020-12-31.zip"* (SHA256-Hashwert: 241df0f72f0c90276cb0cc9737d36239903231e97d511f6e9f5ab49eee0dee53) and prepared for publication purposes complies in all material respects with the requirements of Section 328 (1) HGB for the electronic reporting format ("ESEF format"). In accordance with German legal requirements, this assurance only extends to the conversion of the information contained in the consolidated financial statements and the combined

* „Merckkgaa" in the filename refers to Merck KGaA, Darmstadt, Germany.

management report into the ESEF format and therefore relates neither to the information contained in this reproduction nor any other information contained in the above-mentioned electronic file.

In our opinion, the reproduction of the consolidated financial statements and the combined management report contained in the above-mentioned electronic file and prepared for publication purposes complies in all material respects with the requirements of Section 328 (1) HGB for the electronic reporting format. We do not express any opinion on the information contained in this reproduction nor on any other information contained in the above-mentioned file beyond this reasonable assurance opinion and our audit opinion on the accompanying consolidated financial statements and the accompanying combined management report for the financial year from January 1, 2020, to December 31, 2020 contained in the "Report on the Audit of the Consolidated Financial Statements and the Combined Management Report" above.

We conducted our assurance work on the reproduction of the consolidated financial statements and the group management report contained in the above-mentioned electronic file in accordance with Section 317 (3b) HGB and the Exposure Draft of the IDW Assurance Standard: Assurance in accordance with Section 317 (3b) HGB on the Electronic Reproduction of Financial Statements and Management Reports Prepared for Publication Purposes (ED IDW AsS 410) and the International Standard on Assurance Engagements 3000 (Revised)]. Accordingly, our responsibilities are further described below. Our audit firm has applied the IDW Standard on Quality Management 1: Requirements for Quality Management in Audit Firms (IDW QS 1).

The company's management is responsible for the preparation of the ESEF documents including the electronic reproduction of the consolidated financial statements and the group management report in accordance with Section 328 (1) sentence 4 item 1 HGB and for the tagging of the consolidated financial statements in accordance with Section 328 (1) sentence 4 item 2 HGB.

In addition, the company's management is responsible for the internal controls they consider necessary to enable the preparation of ESEF documents that are free from material intentional or unintentional non-compliance with the requirements of Section 328 (1) HGB for the electronic reporting format.

The company's management is also responsible for the submission of the ESEF documents together with the auditor's report and the attached audited consolidated financial statements and audited group management report as well as other documents to be published to the operator of the German Federal Gazette [Bundesanzeiger].

The supervisory board is responsible for overseeing the preparation of the ESEF documents as part of the financial reporting process.

Our objective is to obtain reasonable assurance about whether the ESEF documents are free from material intentional or unintentional non-compliance with the requirements of Section 328 (1) HGB. We exercise professional judgement and maintain professional scepticism throughout the assurance work. We also:

- Identify and assess the risks of material intentional or unintentional non-compliance with the requirements of Section 328 (1) HGB, design and perform assurance procedures responsive to those risks, and obtain assurance evidence that is sufficient and appropriate to provide a basis for our assurance opinion.
- Obtain an understanding of internal control relevant to the assurance of the ESEF documents in order to design assurance procedures that are appropriate in the circumstances, but not for the purpose of expressing an assurance opinion on the effectiveness of these controls.
- Evaluate the technical validity of the ESEF documents, i.e. whether the electronic file containing the ESEF documents meets the requirements of Commission Delegated Regulation (EU) 2019/815 on the technical specification for this electronic file.
- Evaluate whether the ESEF documents enable an XHTML reproduction with content equivalent to the audited consolidated financial statements and the audited group management report.
- Evaluate whether the tagging of the ESEF documents with Inline XBRL technology (iXBRL) enables an appropriate and complete machine-readable XBRL copy of the XHTML reproduction.

Further Information pursuant to Article 10 of the EU Audit Regulation

We were elected as group auditor at the annual general meeting on May 28, 2020. We were engaged by the Supervisory Board on June 30, 2020. We have been the group auditor of MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, without interruption since the financial year 1995.

We declare that the opinions expressed in this auditor's report are consistent with the additional report to the Supervisory Board pursuant to Article 11 of the EU Audit Regulation (long-form audit report).

German Public Auditor Responsible for the Engagement

The German Public Auditor responsible for the engagement is Dirk Janz.

Frankfurt am Main, February 17, 2021

KPMG AG
Wirtschaftsprüfungsgesellschaft
[Original German version signed by:]

[signature] Janz
Wirtschaftsprüfer
[German Public Auditor]

[signature] Jung
Wirtschaftsprüfer
[German Public Auditor]