Notes to the Consolidated Financial Statements

General

(1) Company information

The accompanying consolidated financial statements as of December 31, 2016 have been prepared with MERCK Kommanditgesellschaft auf Aktien (Merck KGaA), Frankfurter Strasse 250, 64293 Darmstadt as parent company. Merck KGaA, which manages the operations of the Merck Group, is registered under HRB 6164 with the Commercial Register of Darmstadt. In accordance with the provisions of the German financial reporting disclosure law (Publizitätsgesetz), consolidated financial statements are also prepared for E. Merck Kommanditgesellschaft (E. Merck KG), the ultimate parent company and general partner of Merck KGaA with an equity interest of 70.274% as of December 31, 2016. These consolidated financial statements include Merck KGaA and its subsidiaries. The authoritative German versions of these financial statements are filed with the German Federal Gazette (Bundesanzeiger) and 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 in force on the reporting date and adopted by the European Union as issued by the International Accounting Standards Board and the IFRS Interpretations Committee (IFRS and IAS, as well as IFRIC and SIC) as well as the additionally applicable provisions of section 315a of the German Commercial Code (HGB). The fiscal year corresponds to the calendar year. These financial statements have been prepared in euros, the reporting currency. The figures reported in the consolidated financial statements have been rounded, which may lead to individual values not adding up to the totals presented.

In comparison with the previous year, there were no material changes to accounting and measurement principles. The accounting and measurement policies used in the consolidated financial statements are presented in Notes [49] “Measurement policies” to [65] “Share-based compensation programs”.

The following rules take effect as of fiscal 2016:

- Amendment to IAS 1 “Presentation of Financial Statements”
- Amendments to IAS 16 “Property, Plant and Equipment”
- Amendment to IAS 19 “Employee Benefits”
- Amendment to IAS 27 “Separate Financial Statements”
- Amendment to IAS 28 “Investments in Associates”
- Amendment to IAS 38 “Intangible Assets”
- Amendment to IAS 41 “Agriculture”
- Amendment to IFRS 10 “Consolidated Financial Statements”
- Amendment to IFRS 11 “Joint Arrangements”
- Amendment to IFRS 12 “Disclosure of Interests in Other Entities”
- Annual Improvements to IFRSs 2010 – 2012 Cycle
- Annual Improvements to IFRSs 2012 – 2014 Cycle

The amendments had no material effects on the consolidated financial statements.

The following rules take effect as of fiscal 2018:

- IFRS 9 “Financial Instruments”
- IFRS 15 “Revenue from Contracts with Customers”
- Amendment to IFRS 15 “Revenue from Contracts with Customers”

In the course of introducing IFRS 9, the focus of the review is currently on analyzing the effects of the new impairment model on trade accounts receivable as well as the classification and measurement of equity instruments held by Merck. According to the present state of knowledge, the new rules will not have any material adjustment effects on Merck in terms of hedge accounting. The presentation of financial instruments in the consolidated balance sheet will change owing to the new classification and measurement rules. A final, reliable estimation of the other impacts of initial application of IFRS 9 is not yet available. Merck will make use of the possibility of modified initial application and record the cumulative adjustment from initial application as of January 1, 2018.

Since the beginning of 2015, a cross-functional project team has been analyzing the effects of the new rules on revenue recognition and is using quantitative and qualitative analyses, questionnaires and contract analyses to do so. Since Merck generates the vast majority of its sales revenues from simply structured sales of goods at a point in time and only provides longer-term services or conducts complex sales transactions with multiple performance obligations only to a small extent, from today’s perspective, the initial application of IFRS 15 is expected to have only immaterial impacts on the net assets, financial position and results of operations. According to the present state of knowledge, the new rules on variable consideration, on the costs of obtaining or fulfilling a contract, as well as on principal versus agent considerations will be of only minor relevance to Merck. Moreover, separate performance obligations from transportation or other logistics services that must be recognized separately exist only to a very minor extent. Only minor

adjustment effects will probably result from the changes in connection with the timing of when control of an asset is transferred within the context of product sales, the accounting treatment of outlicensing intellectual property as well as the accounting treatment for rights of return. According to the present state of knowledge, based on the contracts existing as of the balance sheet date, the adjustment effect resulting from the change in presentation of multiple-element arrangements that include service components will be less than € 10 million when IFRS 15 is applied for the first time. The implementation of the new rules in the systems and processes of the Group companies commenced in 2016 and will be completed in the course of 2017. The necessary system adaptations relate in particular to the expanded sales revenue disclosure requirements in the Notes to the Consolidated Financial Statements. Merck will make use of the possibility of modified initial application and record the cumulative adjustment from initial application as of January 1, 2018.

As of the balance sheet date, the following standards were published by the International Accounting Standards Board and the IFRS Interpretations Committee, but not yet endorsed by the European Union:

- IFRS 14 "Regulatory Deferral Accounts"
- IFRS 16 "Leases"
- IFRIC 22 "Foreign Currency Transactions and Advance Consideration"
- Amendment to IAS 7 "Statement of Cash Flows"
- Amendment to IAS 12 "Income Taxes"
- Amendment to IAS 28 "Investments in Associates and Joint Ventures"
- Amendment to IAS 40 "Investment Property"
- Amendment to IFRS 2 "Share-based Payment"
- Amendment to IFRS 4 "Insurance Contracts"
- Amendment to IFRS 10 "Consolidated Financial Statements"
- Amendment to IFRS 15 "Revenue from Contracts with Customers"
- Annual Improvements to IFRSs 2014 – 2016 Cycle

The impact of IFRS 16, which will become effective as of 2019 subject to a corresponding endorsement by the European Union, on the consolidated financial statements is currently being examined.

The implementation of IFRS 16 will mean that as a lessee, for all leases Merck will generally be required to recognize a liability and a corresponding right of use in its balance sheet. The possibility to classify a lease as an operating lease and to recognize the associated expenses in the period in which they are incurred will no longer exist. Merck will make use of the option under IFRS 16 to continue to refrain from recognizing utilization rights and the corresponding liabilities from leases of low-value assets in its balance sheet. At the time of initial application, Merck will make use of the transition relief provided by IFRS 16 to recognize the cumulative transition effect instead of adjusting the prior-year periods retroactively. In order to determine the impact of IFRS 16, around 7,000 leases have been identified and analyzed to date. According to the current status of the analysis, with the transition to IFRS 16, the increase in the balance sheet total will be less than 2%.

From today's perspective, the other new rules are also not expected to have any material effects on the consolidated financial statements.

(3) Changes in the scope of consolidation

The scope of consolidation changed as follows in the reporting period:

Fully consolidated companies as of December 31, 2015		**316**
Additions	Establishment	2
	Acquisition	5
	Materiality	8
Retirements	Liquidation / Merger	–13
	Divestment	– 3
	Immateriality	–
	Loss of control	– 2
Fully consolidated companies as of December 31, 2016		**313**
Non-consolidated subsidiaries as of December 31, 2015		63
Non-consolidated subsidiaries as of December 31, 2016		48

Overall, the impact of subsidiaries not consolidated due to immateriality on sales, profit after tax, assets and equity was less than 1% relative to the entire Merck Group. The interests in subsidiaries not consolidated due to immateriality were classified as available-for-sale financial assets and presented under non-current financial assets (see Note [18] "Financial Assets").

The Venezuelan entities were deconsolidated effective February 29, 2016 since management came to the conclusion that due to the nearly complete absence of dividend payments and payments for Group-internal supplies of goods, the possibility of receiving and influencing variable returns from the involvement in the Venezuelan entities was no longer given (see Note [6] "Management judgments and sources of estimation uncertainty"). Accordingly, the deconsolidations were reported as disposals due to loss of control.

The list of shareholdings presents all of the companies included in the consolidated financial statements as well as all of the shareholdings of Merck KGaA (see Note [66] "List of shareholdings").

(4) Acquisitions, assets held for sale and disposal groups

Acquisition of BioControl Systems, Inc., USA

On December 21, 2016, Merck acquired a 100% interest in BioControl Systems, Inc., Bellevue, USA (BioControl), a company that develops, manufactures and commercializes materials and systems to check food safety. BioControl was integrated into the Life Science business sector. The purchase price was US$ 167 million (€ 160 million after currency translation based on the closing rate on December 21, 2016). The purchase price allocation could not be completed by December 31, 2016. Consequently, the acquired assets and liabilities were reported on a preliminary basis at their carrying amounts.

Acquisition of Sigma-Aldrich Corporation, St. Louis, USA, in 2015

On November 18, 2015, Merck obtained control of the Sigma-Aldrich Corporation, St. Louis, USA (Sigma-Aldrich). The life science business of Sigma-Aldrich was integrated into the Life Science business sector and the SAFC Hitech business was integrated into the Performance Materials business sector.

Since the acquisition date was November 18, 2015, the acquired Sigma-Aldrich business only contributed to the results of the Merck Group in fiscal 2015 for this period. Consolidation as a member of the Group for fiscal 2016 led to significant effects, primarily on the consolidated income statement and the consolidated cash flow statement. The acquired inventories measured at fair values were recognized in cost of sales over a period of six months. Property, plant and equipment is depreciated over a period of up to 36 years. In fiscal 2016, this resulted in depreciation of € 135 million.

The intangible assets are being amortized over a period of up to 22 years. In 2016, amortization totaled € 335 million.

Purchase price allocation

The determination of fair values required extensive analyses and calculations, which were completed in November 2016. In comparison with the preliminary purchase price allocation, adjustments resulted for inventories, property, plant and equipment, intangible assets, non-current financial assets, current provisions as well as deferred tax liabilities.

The fair values as of the acquisition date were as follows:

€ million	Fair values on the acquisition date
Non-current assets	
Intangible assets (excluding goodwill)	5,808
Property, plant and equipment	838
Other non-current assets	124
	6,770
Current assets	
Cash and cash equivalents	1,235
Inventories	841
Receivables	452
Other current assets	36
Assets held for sale	124
	2,688
Assets	**9,458**
Non-current liabilities	
Non-current financial liabilities	–
Other non-current liabilities and provisions	150
Deferred tax liabilities	2,511
	2,661
Current liabilities	
Current financial liabilities	425
Other current liabilities and provisions	539
Liabilities directly related to assets held for sale	–
	964
Liabilities	**3,625**
Acquired net assets	**5,833**
Purchase price for the acquisition of shares	**14,594**
Positive difference (goodwill)	**8,761**

The most significant impact of the purchase price allocation resulted from the remeasurement of intangible assets, property, plant and equipment as well as finished and unfinished goods within inventories at fair value, and from the recognition of deferred taxes. The intangible assets identified during the purchase price allocation and recognized on the date of first-time consolidation as well as the measurement methods applied are presented in the following overview:

	Fair values on the acquisition date € million	Useful lives in years	Valuation method for determining the fair values
Customer relationships	4,623	21 – 22	multi-period excess earnings method
Trademarks and brands	958	12	relief from royalty method
Technologies (patented and non-patented)	130	10 – 12	relief from royalty method, replacement cost method
Other	97		
Total	**5,808**		
Goodwill	8,761	indefinite	
Total	**14,569**		

A major factor for the measurement of customer relationships was the assumption regarding long-term customer retention. If the annual loss of customers was one percentage point higher, the fair value of customer relationships would have been € 468 million lower and the amortization period would have had to be reduced by two years. The most significant assumption for the measurement of trademarks and brands concerned the underlying royalty rates. These were derived from available market information. If the royalty rates were reduced by 0.25 percentage points, the fair value would have been € 57 million lower.

The positive difference of € 8,761 million was recognized as goodwill. This comprised anticipated synergies from the integration of Sigma-Aldrich into the Merck Group as well as intangible assets that are not recognizable, such as the expertise of the transferred workforce. Synergies are primarily expected in the areas of administration, production and purchasing. Apart from these cost synergies, earnings synergies are expected particularly through the use of the e-commerce platform of Sigma-Aldrich for products from the legacy life science business. The goodwill was allocated to the two business sectors Life Science (€ 8,402 million) and Performance Materials (€ 359 million). It is not expected that goodwill will be deductible for tax purposes.

The development of goodwill between the two balance sheet dates was as follows:

€ million	Development of goodwill
Goodwill on December 31, 2015[1]	8,541
Exchange rate effects	336
Goodwill on December 31, 2016	**8,877**

[1] Previous year's figure has been adjusted.

No material contingent liabilities were identified in the course of the purchase price allocation. The gross amounts of the acquired receivables on the acquisition date were € 457 million. The best possible estimate of irrecoverable receivables amounted to € 5 million.

Further acquisitions in 2015

In December 2015, Merck acquired the outstanding shares (89.7%) in Ormet Circuits, Inc., San Diego, USA (Ormet) to enhance its position as a semiconductor materials supplier. Ormet was integrated into the Performance Materials business sector. US$ 30 million (€ 28 million) was spent to acquire the outstanding interest. The purchase price for 100% of the shares would have been US$ 31 million (€ 28 million). An expense of € 1 million was recorded from the remeasurement of the interests in Ormet prior to the obtainment of control. In 2015, the preliminary difference from the purchase price allocation was fully reported as goodwill due to the fact that the acquisition was completed shortly before year-end. The purchase price allocation conducted in 2016 identified technology-related intangible assets amounting to € 26 million. Overall, deferred tax liabilities amounted to € 4 million. Goodwill thus amounted to € 3 million.

At the end of July 2015, Merck acquired the remaining 52.3% interest in the start-up Qlight Nanotech Ltd., Jerusalem, Israel (Qlight). Since then, Merck has held 100% of the company. Qlight conducts research in the field of quantum materials and was integrated into the Performance Materials business sector. The purchase price comprised fixed consideration amounting to US$ 3 million (€ 3 million), milestone payments of up to US$ 4 million (€ 4 million) as well as license fees provided that certain preconditions are met. There were no adjustments to the preliminary purchase price allocation or to the measurement of the contingent consideration.

Adjustment of the consolidated balance sheet for 2015 due to the completion of the purchase price allocation in 2016

In 2016, the preliminary purchase price allocations as of December 31, 2015 for the Sigma-Aldrich Corporation, USA, and Ormet Circuits, Inc., USA, were completed.

The values in the consolidated balance sheet as of December 31, 2015 were retroactively adjusted as follows:

PREVIOUS YEAR ADJUSTMENT

	Dec. 31, 2015			
€ million	Pre adjustment	Sigma-Aldrich Corporation	Ormet Circuits, Inc.	Post adjustment
Non-current assets	**30,657**	**80**	**–**	**30,737**
of which:				
Goodwill	14,370	148	–26	14,492
Intangible assets (excluding goodwill)	10,969	–65	26	10,930
Property, plant and equipment	4,009	–2	1	4,008
Non-current financial assets	131	–1	–	130
Unadjusted other non-current assets	1,178	–	–	1,178
Current assets	**7,350**	**–10**	**4**	**7,344**
of which:				
Inventories	2,620	–10	–	2,610
Other current assets	496	–	4	500
Unadjusted other current assets	4,234	–	–	4,234
Total assets	**38,007**	**70**	**4**	**38,081**
Total equity	**12,855**	**–**	**–**	**12,855**
Non-current liabilities	**15,769**	**69**	**4**	**15,842**
of which:				
Deferred tax liabilities	2,853	69	4	2,926
Unadjusted other non-current liabilities	12,916	–	–	12,916
Current liabilities	**9,383**	**1**	**–**	**9,384**
of which:				
Current provisions	535	1	–	536
Unadjusted other current liabilities	8,848	–	–	8,848
Total equity and liabilities	**38,007**	**70**	**4**	**38,081**

Divestment of the rights to Kuvan® and Peg-Pal

On October 1, 2015, Merck entered into an agreement with BioMarin Pharmaceutical Inc., USA (BioMarin), to return the rights to Kuvan® (sapropterin dihydrochloride), a drug used to treat phenylketonuria (PKU), a rare metabolic disorder, and the related business activities. These business activities, which were allocated to the Healthcare business sector, were reported as a disposal group in fiscal 2015 and included an intangible asset of € 24 million, allocable goodwill of € 22 million, as well as inventories to a limited extent.

Moreover, an agreement was also reached on October 1, 2015 under which Merck is obligated to return its option to develop and commercialize Peg-Pal to BioMarin. Peg-Pal is an investigational drug that is also designed for the treatment of PKU.

Both agreements became effective at the beginning of January 2016. Based on the agreements, in January 2016, Merck received an upfront payment of € 340 million for the sale of the rights to Kuvan®. Moreover, Merck is entitled to milestone payments of up to € 185 million.

Divestment of Pakistani subsidiaries

On December 9, 2016, Merck divested its 75% shareholding in the Pakistani Merck (Private) Limited, its subsidiary Merck Pharmaceuticals (Private) Limited as well as its 100% shareholding in Merck Specialities (Private) Limited to Martin Dow Limited, Pakistan. The transaction involved the mutual transfer of trademarks and brands, making them accessible to the acquirer. The businesses of the Pakistani companies comprised allocated goodwill (€ 7 million), property, plant and equipment (€ 8 million), inventories (€ 16 million), cash (€ 15 million) and non-controlling interests (€ 10 million). The loss from the divestment of the three subsidiaries amounted to € 8 million and was recognized in other operating expenses.

Planned divestment of the Biosimilars business

Merck is in advanced stages of negotiations to divest its Biosimilars business. In this business, Merck develops similar subsequent versions of already registered biopharmaceuticals, primarily for the therapeutic areas of oncology and autoimmune diseases. The divestment is expected to be completed in 2017. The business activities allocable to the Healthcare business sector were reported as a disposal group as of December 31, 2016 and mainly consist of intangible assets amounting to € 2 million, the allocable goodwill of € 9 million as well as liabilities in connection with these activities.

Business activities of Sigma-Aldrich acquired with a view to resale

On December 15, 2015, Merck sold to Honeywell Specialty Chemicals Seelze GmbH of Seelze, Germany, parts of the European solvents and inorganics business that had been acquired within the scope of the acquisition of the Sigma-Aldrich Corporation, USA, in order to meet the antitrust conditions of the European Commission. In accordance with the agreement with the acquirer, during the reporting period Merck received a further payment of € 24 million, which had already been recognized as income in 2015.

(5) Collaborations of material significance

Strategic alliance with Pfizer Inc., USA, to co-develop and co-commercialize active ingredients in immuno-oncology

On November 17, 2014, Merck formed a global strategic alliance with Pfizer Inc., USA, (Pfizer) to co-develop and co-commercialize the anti-PD-L1 antibody avelumab. This antibody is currently being studied in multiple clinical trials as a potential treatment for various tumor types. The active ingredient is to be developed as a single agent as well as in various combinations with a broad portfolio of approved and investigational active ingredients. As part of the strategic alliance, the two companies will combine resources and expertise to also co-develop and co-market Pfizer's anti-PD-1 antibody. The overriding objective of the strategic alliance is to share the risks of development and to accelerate the two companies' presence in immuno-oncology.

According to the collaboration agreement, during the development period each partner will bear one-half of the development expenses. In a potentially later commercialization phase, Merck will realize the vast majority of sales from the commercialization of avelumab while Pfizer will realize the vast majority of sales from the commercialization of its anti-PD-1 antibody. At the same time, Merck and Pfizer will evenly split defined income and expense components. The execution of the collaboration agreement is not being structured through a separate vehicle. This means that the assets and liabilities attributable to the contractual arrangement are owned by the two contract partners.

Under the terms of the agreement, in 2014 Pfizer made an upfront cash payment of US$ 850 million (€ 678 million) to Merck after the closing. Pfizer also committed to make further payments of up to US$ 2 billion to Merck subject to the achievement of defined regulatory and commercial milestones. Based on the collaboration agreement, Merck additionally received the right to co-market for multiple years Xalkori® (crizotinib), a kinase inhibitor indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK)-positive. In the United States and the European Union, Xalkori® is also indicated for the treatment of metastatic NSCLC in patients whose tumors are ROS1-positive. During co-commercialization of Xalkori®, Merck receives from Pfizer a share of the profits, which are reported in net sales. In 2016, these amounted to € 64 million (2015: € 8 million). When it arose, the right was measured at fair value by an independent external expert using the multi-period excess earnings method. The right was capitalized when it was granted and will be amortized over the term of the agreement. The residual book value of these assets as of December 31, 2016 was € 153 million (2015: € 262 million). More information on the impairment of € 71 million recognized on the intangible asset in 2016 can be found in Note [6] "Management judgments and sources of estimation uncertainty."

On the date of the closing of the collaboration agreement, both the upfront payment received and the value of the right to co-market Xalkori® were recognized in the balance sheet as deferred revenues under other liabilities. Both amounts are being recognized over the expected period during which Merck is to meet certain obligations and will be disclosed under other operating income. More information on the exercise of management judgments and estimation uncertainties in this regard can be found in Note [6] "Management judgments and sources of estimation uncertainty."

Agreement with Bristol-Myers Squibb Company, USA, for the co-commercialization of Glucophage® in China

In March 2013, Merck established an agreement with Bristol-Myers Squibb Company, USA, (BMS) for the co-commercialization of the antidiabetic agent Glucophage® (active ingredient: metformin hydrochloride) for the treatment of type 2 diabetes in China. In 2016, Merck recorded commission income of € 104 million from co-commercialization (2015: € 84 million). As of 2017, Merck will book net sales instead of commission income from the distribution of Glucophage® in China and in return make license payments to BMS.

Agreement with Intrexon Corporation, USA, on the co-development and co-commercialization of CAR-T cancer therapies

In March 2015, Merck and Intrexon Corporation, USA, entered into an exclusive strategic collaboration and license agreement to develop and commercialize Chimeric Antigen Receptor T-cell (CAR-T) cancer therapies. The agreement provided Merck exclusive access to Intrexon's proprietary and complementary suite of technologies to engineer T-cells with optimized and inducible gene expression. Intrexon will be responsible for all platform and product developments until the investigational new drug application is submitted for regulatory approval. Merck will select targets of interest for which CAR-T products will be developed. Merck will also lead the regulatory submission process and pre-submission interactions with the regulatory authorities, as well as clinical development and commercialization. Intrexon received an upfront payment of US$ 115 million. This amount was recognized as part of intangible assets not yet available for use (carrying amount as of December 31, 2016: € 104 million / 2015: € 104 million). For the first two targets of interest selected by Merck, Intrexon will receive research funding and is eligible to receive up to US$ 826 million development, regulatory and commercial milestones, as well as tiered royalties on product sales. In addition, Intrexon is also eligible to receive further payments upon achievement of certain technology development milestones.

(6) Management judgments and sources of estimation uncertainty

The preparation of the consolidated financial statements requires Merck to make discretionary decisions and assumptions as well as estimates to a certain extent. The discretionary decisions, assumptions relating to the future and sources of estimation uncertainty described below are associated with the greatest potential effects on these consolidated financial statements.

Recognition and measurement of assets, liabilities and contingent liabilities acquired in the context of business combinations

The recognition and measurement of assets, liabilities and contingent liabilities at fair value during purchase price allocations involve the use of estimates. The expertise of external valuation experts is normally obtained here. The fair values of the assets and liabilities recognized as part of the purchase price allocation of the Sigma-Aldrich Corporation, a sensitivity analysis in relation to the acquired customer lists, and trademarks and brands, as well as further information on this acquisition, which closed in 2015, can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

Sales deductions

Merck grants its customers various kinds of rebates and discounts. In addition, expected returns, state compulsory charges and rebates from health plans and programs are also deducted from sales.

The most significant portion of these deductions from sales is attributable to the Healthcare business sector. The most substantial sales deductions in this business sector relate to government rebate programs in North America.

Insofar as sales deductions were not already made on payments received, Merck determines the level of sales deductions on the basis of current experience and recognizes them as a liability (carrying amount on December 31, 2016: € 443 million / 2015: € 421 million). The sales deductions reduce gross sales revenues. Adjustments of liabilities can lead to increases or reductions in net sales in later periods.

Impairment tests of goodwill and intangible assets not yet available for use

The goodwill (carrying amount as of December 31, 2016: € 15,064 million / 2015: € 14,492 million) and other intangible assets not yet available for use (carrying amount as of December 31, 2016: € 181 million / 2015: € 184 million) reported in the consolidated financial statements are tested for impairment at least once a year or when a triggering event arises.

The carrying amounts of goodwill are allocated to the following cash-generating units or groups of cash-generating units on which level the impairment tests were performed:

	Goodwill	
€ million	**as of Dec. 31, 2016**	as of Dec. 31, 2015
Biopharma	1,560	1,580
Consumer Health	251	243
Life Science[1]	11,801	11,272
Performance Materials[1]	1,452	1,397
Total	**15,064**	**14,492**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The identified cash-generating units or groups of cash-generating units represent the lowest level at which goodwill is monitored by management.

As in 2015, no impairment losses for goodwill were recorded in the year under review. Owing to the termination of development projects in the Healthcare business sector, in 2016 impairment losses of other intangible assets not yet available for use were recorded in the amount of € 12 million (2015: € 109 million).

When conducting the impairment tests the following parameters were used:

Measurement basis	Value in use
Impairment test level	Biopharma (including Allergopharma and Biosimilars[1]) Consumer Health Life Science Performance Materials
Planning basis	Most recent financial medium-term planning approved by the Executive Board and used for internal purposes
Detailed planning period	4 years
Key assumptions	Net cash flows Long-term growth rate after the detailed planning period Discount rate after tax (weighted average cost of capital after tax – WACC)
Determination of the value of the key assumptions	Net cash flows • Sales growth Based on internal planning, taking into consideration internal and external market information and market estimations, i.e. regarding market shares, excluding approvals of new compounds from the development pipeline and other expansion investments • Profit margins Based on past experiences, adjusted for expected changes
	Long-term growth rate after the detailed planning period Based on long-term inflation expectations and expected long-term sector growth
	Discount rate after tax (Weighted average cost of capital after tax – WACC) • Cost of equity Risk-free interest rate: Derived from the returns of long-term government bonds Beta factor: Derived from the respective peer group Market risk premium: Range as recommended by the Technical Committee for Business Valuation and Commerce of the Institute of Public Auditors in Germany (Institut der Wirtschaftsprüfer e.V. – IDW) • Cost of debt and capital structure Derived from the respective peer group

[1] Biosimilars was not yet reported as a disposal group when the impairment test was performed.

The long-term growth rates and weighted average costs of capital (WACC) used to conduct the goodwill impairment tests were as follows:

	Long-term growth rate		Cost of capital after tax		Cost of capital before tax	
	2016	2015	**2016**	2015	**2016**	2015
Biopharma	0.00%	0.00%	6.1%	6.2%	8.1%	8.0%
Consumer Health	2.00%	2.00%	5.9%	6.2%	7.2%	7.6%
Life Science[1]	1.75%	1.75%	6.1%	6.1%	7.5%	7.5%
Performance Materials[1]	0.50%	0.50%	6.1%	6.6%	7.9%	8.6%

[1] The disclosures for 2015 relate to the impairment test performed as of October 31, 2015 before the closing of the acquisition of the Sigma-Aldrich Corporation, USA.

For the impairment test, net cash flows were discounted using cost of capital after tax. The aforementioned cost of capital before tax was subsequently derived iteratively. All of the aforementioned assumptions are considered a source of estimation uncertainty due to their inherent uncertainty.

In all the impairment tests performed, the recoverable amount was more than 10% higher than the carrying amount of the respective cash-generating unit or group of cash-generating units. Irrespective of this, the planning data used were checked for plausibility against externally available forecasts and the recoverable amounts determined were validated using valuation multiples based on peer group information. In addition, sensitivity analyses of the key assumptions were performed as part of the impairment tests. Overall, no change of a significant assumption deemed possible by management would have resulted in an impairment. The following table presents the amount by which key assumptions would have to change before an impairment would need to be recognized as a result of the impairment tests:

	Decrease in long-term growth rate		Increase in cost of capital after tax		Decrease in net cash flows	
	2016	2015	**2016**	2015	**2016**	2015
	in percentage points		in percentage points		in %	
Biopharma	> 2.0	> 2.0	> 2.0	> 2.0	> 5%	> 5%
Consumer Health	> 2.0	> 2.0	> 2.0	> 2.0	> 5%	> 5%
Life Science[1]	> 2.0	> 2.0	> 1.5	> 2.0	> 5%	> 5%
Performance Materials[1]	> 2.0	> 2.0	> 2.0	> 2.0	> 5%	> 5%

[1] The disclosures for 2015 relate to the impairment test performed as of October 31, 2015 before the closing of the acquisition of the Sigma-Aldrich Corporation, USA.

Determination of the amortization of intangible assets with finite useful lives

In addition to goodwill and intangible assets not yet available for use, Merck has a significant amount of intangible assets with finite useful lives (carrying amount as of December 31, 2016: € 9,556 million / December 31, 2015: € 10,636 million). Substantial assumptions and estimates are required to determine the appropriate level of amortization of these intangible assets. This relates in particular to the determination of the underlying remaining useful life, which Merck reviews regularly and adjusts if necessary. Merck considers factors including the typical product life cycles for each asset and publicly available information about the estimated useful lives of similar assets.

If the amortization of intangible assets from customer relationships, marketing authorizations, patents, licenses and similar rights, brands and trademarks had been 10% higher, for example due to shortened remaining useful lives, profit before tax would have been € 122 million lower in fiscal 2016 (2015: € 95 million lower).

In fiscal 2016, a reduction of the useful life of the intangible asset reported in connection with the drug Rebif® by one year would have lowered profit before tax by € 123 million (2015: € 92 million). An extension of the useful life by one year would have increased profit before tax by € 74 million (2015: € 61 million).

Research and development collaborations as well as in- and out-licensing of intangible assets

Merck is regularly a partner of research and development collaborations with research institutions, biotechnology companies or other contract parties. These collaborations are aimed at developing marketable products. Merck also enters into in-licensing agreements regarding intellectual property of contract partners. Such agreements typically involve making upfront payments and payments for the achievement of certain milestones related to development and commercialization. In this context, Merck has to judge to what extent upfront or milestone payments represent remuneration for services received (research and development expense) or whether such payments result in an in-licensing of an intangible asset that has to be capitalized. This assessment is normally subject to judgment.

Merck regularly receives upfront and milestone payments as part of research and development collaborations or out-licensing agreements. In this context, income may only be recognized if Merck has transferred all material risks and rewards of an intangible asset to the acquirer, has no interest in the remaining business activities and has no material continuing commitment. If these criteria are not deemed to be met, the received payments are deferred and recognized over the period in which Merck is expected to fulfill its performance obligations. Both the assessment of the revenue recognition criteria and the determination of the appropriate period during which income is recognized are subject to judgment.

If the consideration that was received as part of the strategic alliance with Pfizer Inc., USA, in November 2014 and deferred as a liability had been recognized in the income statement over a shorter period reduced by one year, in 2016 this would have increased other operating income and thus profit before tax would have increased by € 64 million (2015: € 48 million). Recognition over a period extended by one year would have lowered other operating income and profit before tax by € 38 million (2015: € 32 million).

Identification of impairment of non-financial assets

Discretionary decisions are required in the identification of objective evidence of impairment of intangible assets and property, plant and equipment. As of December 31, 2016, the carrying amounts of these assets totaled € 29,219 million (2015: € 29,430 million). External and internal information is used to identify indications of impairment. For example, the approval of a competing product in the Healthcare business sector or the closure of a site can be an indicator of impairment.

In the second quarter of 2016, the intangible asset in connection with the co-commercialization right for Xalkori® (crizotinib), a medicine to treat patients with ALK-positive metastatic non-small cell lung cancer, was subjected to an impairment test owing to negative developments in the market environment. This test led to an impairment loss of € 71 million on the intangible asset, which was reported under other operating expenses. Within the scope of the impairment test, the recoverable amount was determined using a discount rate before tax of 7.9%. This included an asset-specific risk premium.

Impairment of financial assets

On every balance sheet date, Merck reviews whether there is any objective evidence that a financial asset is impaired and, if this is the case, recognizes allowances to the extent estimated as necessary. Particularly important in this context are allowances on trade accounts receivable, whose carrying amount was € 2,889 million as of December 31, 2016 (2015: € 2,738 million).

Key indicators for the identification of impaired receivables and the subsequent recoverability tests are, in particular, payment default or delay in the payment of interest or principal, negative changes in economic framework conditions as well as considerable financial difficulties of a debtor. These estimates are discretionary.

Other provisions and contingent liabilities

As a global company for high-tech products, Merck is exposed to a multitude of litigation risks. In particular, these include risks from product liability, competition and antitrust law, pharmaceutical law, patent law, tax law and environmental protection. Merck is engaged in legal proceedings and official investigations, the outcomes of which are uncertain. A description of the most important legal matters as of the balance sheet date can be found in Notes [26] “Other provisions” and [38] “Contingent liabilities”. The provisions recognized for legal disputes mainly relate to the Healthcare and Performance Materials business sectors and amounted to € 483 million as of the balance sheet date (2015: € 492 million).

To assess the existence of a reporting obligation in relation to provisions and to quantify pending outflows of resources, Merck draws on the knowledge of the legal department as well as any other outside counsel. In spite of this, both the assessment of the existence of a present obligation and the estimate of the probability of a future outflow of resources are highly subject to uncertainty. Equally, the measurement of provisions is to be considered a major source of estimation uncertainty.

To a certain extent, Merck is obliged to take measures to protect the environment and reported provisions for environmental protection of € 142 million as of December 31, 2016 (2015: € 127 million). The underlying obligations were located mainly in Germany and Latin America. Provisions were recognized primarily for obligations from soil remediation and groundwater protection in connection with the discontinued crop protection business.

The calculation of the present value of the future settlement amount requires, among other things, estimates of the future settlement date, the actual severity of the identified contamination, the applicable remediation methods, the associated future costs, and the discount rate. The measurement is carried out regularly in consultation with independent experts. The determination of the future settlement amount of the provisions for environmental protection measures is subject to a considerable degree of uncertainty.

In the event of the discontinuation of clinical development projects, Merck is regularly required to bear unavoidable subsequent costs for a certain future period of time. The measurement of these provisions requires estimates regarding the length of time and the amount of the follow-on costs.

Apart from provisions, contingent liabilities are also subject to estimation uncertainties and discretionary judgment. Accordingly, contingent liabilities from legal and tax disputes are subject to the same estimation uncertainties and discretionary judgment as provisions for litigation. Therefore, the existence and the amount of the outflow of resources, which is not remote, are subject to estimation uncertainties similarly to the date on which a potential obligation arises.

Provisions for pensions and other post-employment benefits

Merck maintains several defined benefit pension plans, particularly in Germany, Switzerland and the United Kingdom. The determination of the present value of the obligation from these defined benefit pension plans primarily requires estimates of the discount rate, future salary increases, and future pension increases.

As of the balance sheet date, the amount recorded in the consolidated balance sheet for provisions for pensions and other post-employment benefits was € 2,313 million (2015: € 1,836 million). The present value of the defined benefit pension obligation was € 4,698 million as of December 31, 2016 (2015: € 4,153 million). The following overview shows how the present value of all defined benefit obligations would have been impacted by changes to relevant actuarial assumptions.

€ million	Dec. 31, 2016	Dec. 31, 2015
Change in present value of all defined benefit obligations if		
the discount rate were 50 basis points higher	–441	–373
the discount rate were 50 basis points lower	518	444
the expected rate of future salary increases were 50 basis points higher	160	126
the expected rate of future salary increases were 50 basis points lower	–138	–112
the expected rate of future pension increases were 50 basis points higher	280	234
the expected rate of future pension increases were 50 basis points lower	–209	–176

To determine the sensitivities, in principle each of the observed parameters was varied while keeping the measurement assumptions otherwise constant. The amounts for social security vary in line with the salary trend. Further information on the existing pension obligations is provided in Note [25] “Provisions for pensions and other post-employment benefits” and under “Accounting and measurement principles” in Note [63] “Provisions for pensions and other post-employment benefits”.

Income taxes

The calculation of the reported assets and liabilities from current and deferred income taxes requires extensive discretionary judgments, assumptions and estimates. Income tax liabilities were € 883 million as of December 31, 2016 (2015: € 1,011 million). The carrying amounts of deferred tax assets and liabilities amounted to € 1,013 million and € 2,720 million respectively, as of the balance sheet date (2015: € 1,050 million and € 2,926 million, respectively).

The recognized income tax liabilities and provisions are partially based on estimates and interpretations of tax laws and ordinances in different jurisdictions.

With regard to deferred tax items, there are 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 particularly relates to deferred tax liabilities recognized in the context of the acquisitions of the Sigma-Aldrich Corporation, the Millipore Corporation, Serono SA, and AZ Electronic Materials S.A. The recognition of deferred tax assets from loss carryforwards requires an estimate of the probability of the future realizability of loss carryforwards. Factors considered in this estimate are results history, results planning and any tax planning strategy of the respective Group company.

Assets held for sale, disposal groups and discontinued operations

The assessment as to when a non-current asset, disposal group or discontinued operation meets the prerequisites for a classification as “held for sale” is subject to significant discretionary judgment. Even in the case of an existing management decision to review a disposal, an assessment subject to uncertainties has to be made as to the probability that a corresponding disposal will occur during the year or not.

Deconsolidation of the Venezuelan entities

In the past, the Merck Group imported products in Venezuela and marketed these via its local subsidiaries. Due to the nearly complete absence of dividend payments and payments for Group-internal supplies of goods, management came to the conclusion that the possibility of receiving and influencing variable returns from the involvement in the Venezuelan entities can no longer be deemed given. Owing to the lack of control, the Venezuelan subsidiaries were therefore deconsolidated effective February 29, 2016. This estimate is discretionary. Merck continues to closely monitor the development of the situation in Venezuela.

Up until deconsolidation on February 29, 2016, in Venezuela Merck generated net sales of € 1 million in fiscal 2016. In 2015, net sales amounted to € 175 million. Of this amount, sales of € 168 million were attributable to the first half of 2015 (using the CENCOEX exchange rate) and sales of € 7 million were attributable to the second half of 2015 (using the SIMADI exchange rate). Cash and cash equivalents in Venezuela amounted to € 8 million as of December 31, 2015. They were classified as restricted. The deconsolidation gain recognized in 2016 amounted to € 50 million and was reported under other operating income. This figure included the currency result of the Venezuelan entities that was previously reported in equity and subsequently reclassified to the consolidated income statement.

Other judgments, assumptions and sources of estimation uncertainty

Merck makes other judgments, assumptions and estimates in the following areas:

- Classification of financial assets and financial liabilities
- Cash flow hedging for highly probable forecast transactions
- Determination of the fair value of financial instruments classified as available-for-sale and of derivative financial instruments
- Determination of the fair value of contingent consideration
- Determination of the fair value of the liability for share-based compensation
- Determination of the fair value of plan assets.

Notes to the Consolidated Income Statement

(7) Net sales

Net sales were generated primarily from the sale of goods and to a limited degree also included revenues from services rendered, commission income as well as profit-sharing from collaborations. Merck Group net sales totaled € 15,024 million in 2016 (2015: € 12,845 million), which represented an increase of 17.0% compared with 2015. The breakdown of net sales is presented in the Segment Reporting in Note [31] "Information by business sector/countries and regions".

(8) Cost of sales

Cost of sales primarily included the cost of manufactured products sold as well as merchandise sold. Cost comprises overheads and, if necessary, inventory write-downs, in addition to directly attributable costs, such as the cost of materials, personnel and energy, as well as depreciation/amortization.

(9) Marketing and selling expenses

Marketing and selling expenses comprised the following:

€ million	**2016**	2015
Sales force	–1,063	–913
Internal sales services	–903	–740
Sales promotion	–598	–522
Logistics	–614	–471
Amortization of intangible assets[1]	–1,032	–779
Royalty, license and commission expenses	–177	–513
Other marketing and selling expenses	–140	–112
Marketing and selling expenses	**–4,526**	**–4,050**

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

Amortization of intangible assets was mainly attributable to customer relationships, marketing authorizations, licenses and similar rights, brands and trademarks, which could be functionally allocated to Marketing and Selling.

Royalty, license and commission expenses arose mainly in connection with the commercialization of Erbitux® outside the United States and Canada amounting to € 97 million (2015: € 93 million). In 2016, no further commission expenses were incurred for the commercialization of Rebif® in the United States following the expiration of a marketing agreement with Pfizer, Inc., USA (2015: € 334 million).

(10) Research and development costs

Research and development costs totaled € 1,976 million in 2016 (2015: € 1,709 million).

Reimbursements for research and development amounting to € 84 million (2015: € 88 million) were offset against research and development costs. This figure also included government subsidies of € 3 million (2015: € 3 million). As in 2015, the reimbursements were mainly from the strategic alliance with Pfizer Inc., USA.

The breakdown of research and development costs by region is presented in the Segment Reporting (see Note [31] "Information by business sector/country and region").

(11) Other operating income

Other operating income was as follows:

€ million	2016	2015
Gains on disposal of businesses and non-current assets	483	52
Income from milestone payments, rights and royalties	317	262
Reversal of allowances for receivables	59	40
Gains from the release of provisions for litigation	23	35
Income from miscellaneous services	18	22
Remaining other operating income	96	59
Other operating income	**996**	**471**

In fiscal 2016, the gains on the disposal of businesses and non-current assets in the amount of € 483 million (2015: € 52 million) were attributable to sale of the rights to Kuvan® (€ 330 million), the deconsolidation of the Venezuelan entities (€ 50 million) as well as the disposal of equity investments.

An amount of € 191 million (2015: € 191 million) of the income from milestone payments, rights and royalties totaling € 317 million (2015: € 262 million) resulted from the collaboration agreement entered into with Pfizer Inc., USA, in 2014 in the field of immuno-oncology. This related to the pro rata recognition of deferred income from the upfront payment as well as the value of the right to co-promote Xalkori® (see Note [5] "Collaborations of material significance"). Royalty and license income was mainly due to a license granted in 2016 for interferon beta products (Biogen Inc., USA) as well as for the product Viibryd® (Allergan plc, Ireland).

(12) Other operating expenses

The breakdown of other operating expenses was as follows:

€ million	2016	2015
Integration costs/IT costs	–193	–78
Impairment losses	–134	–128
Litigation	–104	–85
Non-income-related taxes	–68	–44
Premiums, fees and contributions	–65	–57
Exchange rate differences from operating activities (net)	–57	–49
Allowances for receivables	–52	–84
Profit-sharing expenses	–39	–26
Restructuring costs	–22	–48
Expenses for miscellaneous services	–15	–20
Project costs	–11	–16
Acquisition costs	–7	–102
Remaining other operating expenses	–215	–180
Other operating expenses	**–981**	**–917**

Integration and IT costs amounting to € 193 million (2015: € 78 million) were incurred for the global harmonization of the IT landscape and in connection with the integration of acquired and existing businesses. In 2016, this related mainly to the Sigma-Aldrich integration.

Impairment losses totaled € 134 million (2015: € 128 million) and related in the amount of € 93 million to sales-related assets (2015: € 0 million), in the amount of € 19 million to production plants and technologies (2015: € 0 million), in the amount of € 14 million to assets which were assigned to research and development (2015: € 121 million), and in the amount of € 2 million to administration (2015: € 7 million). Moreover, impairment losses in the amount of € 5 million (2015: € 0 million) were recognized on other financial instruments which were classified to the category "available for sale". Further information on impairments of intangible assets can be found in Note [16] "Intangible assets".

The restructuring costs incurred in fiscal 2016 amounting to € 22 million (2015: € 48 million) arose mainly in connection with the "Fit for 2018" transformation and growth program. As in the previous year, these costs largely related to personnel measures, for instance the elimination of positions in order to create a leaner and more efficient organization.

Remaining other operating expenses also included environmental protection costs as well as personnel expenses not allocable to the functional areas.

(13) Financial result

€ million	**2016**	2015
Interest income and similar income	20	32
Interest expenses and similar expenses	–277	–292
Interest expenses from interest rate derivatives	–13	–11
Interest result	**–270**	**–271**
Interest component of the additions to pension provisions and other non-current provisions	–52	–46
Currency differences from financing activities	–4	–40
Financial result	**–326**	**–357**

Currency differences from financing activities in 2015 were mainly the result of expenses for hedging intragroup transactions in foreign currency. These expenses result from hedging at forward rates while intragroup transactions are measured at spot rates. The decline in 2016 was primarily due to a lower hedging volume and changes in forward rate markups.

(14) Income tax

€ million	**2016**	2015
Current income taxes in the period	–671	–705
Income taxes for previous periods	–19	–95
Deferred taxes in the period	168	432
Income tax	**–521**	**–368**

The following table presents the tax reconciliation from theoretical income tax expense to income tax expense according to the income statement. The theoretical income tax expense is determined by applying the statutory tax rate of 30.7% of a corporation headquartered in Darmstadt.

€ million	**2016**	2015
Profit before income tax	2,154	1,487
Tax rate	30.7%	30.7%
Theoretical income tax expense	–661	–456
Tax rate differences	235	151
Tax effect of companies with a negative contribution to consolidated profit	–38	–22
Income tax for previous periods	–19	–95
Tax credits	4	521
Tax effect on tax loss carryforwards	1	16
Tax effect of non-deductible expenses/Tax-free income/Other tax effects	–43	–482
Income tax expense according to consolidated income statement	**–521**	**–368**
Tax ratio according to consolidated income statement	24.2%	24.8%

Income taxes consisted of corporation and trade taxes for the companies domiciled in Germany as well as comparable income taxes for foreign companies.

The higher tax credits in 2015 arose primarily in the United States due to the consideration of dividend income. However, this dividend income was also taxable in the United States; the related tax expense was included in 2015 under "Tax effect of non-deductible expenses/Tax-free income/Other tax effects." The change in the item "Income tax for previous periods" resulted, among other things, from the addition to provisions for tax audits in 2015.

The reconciliation between deferred taxes in the consolidated balance sheet and deferred taxes in the consolidated income statement is presented in the following table:

€ million	**2016**	2015[1]
Change in deferred tax assets (consolidated balance sheet)	–37	57
Change in deferred tax liabilities (consolidated balance sheet)	206	–2,107
Deferred taxes credited/debited to equity	–85	41
Changes in scope of consolidation/currency translation/other changes	84	2,441
Deferred taxes (consolidated income statement)	**168**	**432**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Tax loss carryforwards were structured as follows:

	Dec. 31, 2016			Dec. 31, 2015[1]		
€ million	**Germany**	**Abroad**	**Total**	Germany	Abroad	Total
Tax loss carryforwards	88	959	**1,047**	22	1,184	**1,206**
thereof: including deferred tax asset	13	322	**335**	5	469	**474**
Deferred tax asset	2	74	**76**	–	119	**119**
thereof: excluding deferred tax asset	75	637	**712**	17	715	**732**
Theoretical deferred tax asset	11	156	**167**	3	181	**184**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The decrease in non-German tax loss carryforwards was mainly due to the utilization of loss carryforwards in the United States.

Deferred tax assets are recognized for tax loss and interest carryforwards only if for tax loss carryforwards of less than € 5 million realization of the related tax benefits is probable within one year, and for tax loss carryforwards of more than € 5 million realization of the related tax benefits is probable within the next three years. The vast majority of the tax loss carryforwards either has no expiry date or can be utilized for up to 20 years.

In 2016, the income tax expense was reduced by € 1 million (2015: € 16 million) due to the utilization of tax loss carryforwards from prior years for which no deferred tax asset had been recognized in prior periods.

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

	Dec. 31, 2016		Dec. 31, 2015[1]	
€ million	**Assets**	**Liabilities**	Assets	Liabilities
Intangible assets	71	2,724	80	2,940
Property, plant and equipment	25	114	23	169
Current and non-current financial assets	4	11	10	12
Inventories	589	14	627	27
Current and non-current receivables/Other assets	27	2	26	11
Provisions for pensions and other post-employment benefits	460	85	351	70
Current and non-current other provisions	355	41	308	36
Current and non-current liabilities	106	13	125	20
Tax loss carryforwards	76	–	119	–
Tax refund claims/Other	50	467	164	427
Offset deferred tax assets and liabilities	–751	–751	–784	–784
Deferred taxes (consolidated balance sheet)	**1,013**	**2,720**	**1,050**	**2,926**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

In addition to deferred tax assets on tax loss carryforwards amounting to € 76 million (2015: € 119 million), deferred tax assets of € 937 million were recognized for temporary differences (2015: € 930 million).

As of the balance sheet date, deferred taxes for temporary differences for interests in subsidiaries were recognized to the extent that these related to planned dividend payments and, in this context, the reversal of these differences was foreseeable. Deferred tax liabilities in a total amount of € 466 million (2015: € 391 million) were recognized for the higher or lower tax expense attributable to dividend payments. Temporary differences relating to the retained earnings of subsidiaries amounted to € 5,669 million (2015: € 5,248 million).

(15) Earnings per share

Basic earnings per share are calculated by dividing the profit after tax attributable to the shareholders of Merck KGaA by the weighted average number of theoretical shares outstanding. The use of a theoretical number of shares takes into account the fact that the general partner's capital is not represented by shares. The share capital of € 168 million was divided into 129,242,252 shares. Accordingly, the general partner's capital of € 397 million was divided into 305,535,626 theoretical shares. Overall, the total capital thus amounted to € 565 million or 434,777,878 theoretical shares outstanding. The weighted average number of shares in 2016 was likewise 434,777,878.

As of December 31, 2016, there were no potentially dilutive shares. Diluted earnings per share were equivalent to basic earnings per share.

Notes to the Consolidated Balance Sheet

(16) Intangible assets

€ million	Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other[1]		Goodwill[1]	Software[1]	Advance payments and software in development	Total[1]
	Finite useful life	Not yet available for use				
Cost at January 1, 2015	**12,325**	**634**	**5,694**	**354**	**37**	**19,044**
Changes in scope of consolidation	5,743	–	8,765	29	68	14,605
Additions	303	126	–	2	43	474
Disposals	–3	–	–	–9	–	–13
Transfers	8	–2	–	37	–38	5
Classification as held for sale or transfer to a disposal group	–61	–	–22	–	–	–83
Currency translation	141	–	54	6	–	201
December 31, 2015	**18,455**	**757**	**14,492**	**418**	**111**	**34,232**
Accumulated amortization and impairment losses January 1, 2015	**–6,926**	**–465**	**–**	**–257**	**–**	**–7,648**
Changes in scope of consolidation	–	–	–	–	–	–
Amortization	–948	–	–	–36	–	–984
Impairment losses	–6	–109	–	–	–	–115
Disposals	3	–	–	9	–	12
Transfers	–4	–	–	–	–	–4
Reversals of impairment losses	–	–	–	–	–	–
Classification as held for sale or transfer to a disposal group	38	–	–	–	–	38
Currency translation	–104	–	–	–5	–	–109
December 31, 2015	**–7,948**	**–574**	**–**	**–289**	**–**	**–8,811**
Net carrying amount as of December 31, 2015	**10,507**	**184**	**14,492**	**129**	**111**	**25,422**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

€ million	Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other[1]		Goodwill[1]	Software[1]	Advance payments and software in development	Total[1]
	Finite useful life	Not yet available for use				
Cost at January 1, 2016	**18,455**	**757**	**14,492**	**418**	**111**	**34,232**
Changes in scope of consolidation	1	–	138	–	–	140
Additions	16	12	–	2	106	136
Disposals	–1	–2	–	–10	–	–13
Transfers	–3	–	–	26	–19	4
Classification as held for sale or transfer to a disposal group	–	–2	–9	–	–	–10
Currency translation	312	–	443	3	2	760
December 31, 2016	**18,780**	**766**	**15,064**	**439**	**200**	**35,248**
Accumulated amortization and impairment losses January 1, 2016	**–7,948**	**–574**	**–**	**–289**	**–**	**–8,811**
Changes in scope of consolidation	–	–	–	–	–	–
Amortization	–1,218	–	–	–59	–	–1,277
Impairment losses	–94	–12	–	–	–11	–118
Disposals	–	2	–	10	–	12
Transfers	3	–	–	–	–	3
Reversals of impairment losses	–	–	–	–	–	–
Classification as held for sale or transfer to a disposal group	–	–	–	–	–	–
Currency translation	–62	–	–	–6	–1	–69
December 31, 2016	**–9,318**	**–585**	**–**	**–344**	**–13**	**–10,259**
Net carrying amount as of December 31, 2016	**9,462**	**181**	**15,064**	**95**	**187**	**24,989**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The carrying amounts of "Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other" as well as goodwill were attributable to the business sectors as follows:

€ million	Remaining useful life in years	Healthcare	Life Science	Performance Materials	**Total Dec. 31, 2016**	Total Dec. 31, 2015[1]
Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other						
Finite useful life	**–**	**1,639**	**6,656**	**1,166**	**9,462**	**10,507**
Rebif®	3.0	1,105	–	–	1,105	1,473
Gonal-f®	2.0	190	–	–	190	285
Xalkori®	5.0	153	–	–	153	262
Saizen®	3.0	92	–	–	92	123
Other marketing authorizations	3.0 – 5.3	68	–	–	68	86
Technologies	0.1 – 16.3	–	443	957	1,400	1,542
thereof: acquisition of AZ Electronic Materials S.A.	*4.3 – 16.3*	–	–	*918*	*918*	*999*
Brands	0.2 – 10.9	5	1,087	13	1,105	1,186
thereof: acquisition of Sigma-Aldrich Corporation	*10.9*	–	*862*	*2*	*864*	*921*
Customer relationships	0.2 – 20.9	1	5,121	189	5,311	5,507
thereof: acquisition of Sigma-Aldrich Corporation	*19.9 – 20.9*	–	*4,236*	*189*	*4,425*	*4,486*
thereof: acquisition of Millipore Corporation	*1.5 – 10.5*	–	*859*	–	*859*	*988*
Others	1.2 – 17.5	25	4	8	37	44
Not yet available for use	**–**	**181**	**–**	**–**	**181**	**184**
Goodwill	**–**	**1,811**	**11,801**	**1,452**	**15,064**	**14,492**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other

The changes in the scope of consolidation in 2015 mainly included the additions to intangible assets resulting from the acquisitions of the Sigma-Aldrich Corporation, USA, and Ormet Circuits, Inc., USA. In 2016, the changes in the scope of consolidation comprised in particular the additions to intangible assets from the acquisition of BioControl Systems, Inc., USA. Detailed presentations of these acquisitions and their respective effects can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

The net carrying amount of "Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other" with finite useful lives amounting to € 9,462 million (2015: € 10,507 million) mainly included the identified and capitalized assets from the purchase price allocations for the acquisition of the Sigma-Aldrich Corporation, AZ Electronic Materials S.A., the Millipore Corporation, and Serono SA.

The additions to intangible assets with finite useful lives amounted to € 16 million in 2016 (2015: € 303 million), and at € 9 million was largely attributable to the Performance Materials business sector.

In fiscal 2016, impairment losses on intangible assets with indefinite useful lives totaled € 94 million (2015: € 6 million). An impairment loss of the co-commercialization right for Xalkori® amounting to € 71 million was attributable to the Healthcare business sector. The impairment loss was recognized owing to an increasingly intensive competitive environment for ALK inhibitors and the corresponding revision of profit participation assumptions from the co-commercialization right. In addition, in the Performance Materials business sector the SAFC Hitech brand was partly impaired since the decision was made to discontinue the use of this brand as of January 1, 2018. This led to an impairment loss of € 14 million. In the Life Science business sector, impairment losses in the amount of € 9 million were recognized, mainly attributable to a technology that is no longer used. These items were recorded in the consolidated income statement in impairment losses under other operating expenses.

The "Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other" not yet available for use mainly refer to rights that Merck had acquired in connection with active ingredients, products or technologies that were still in development stages. Owing to the uncertainty as to the extent to which these projects will lead to the commercialization of marketable products, the period for which any resulting capitalized asset would generate an economic benefit for the company could not yet be determined. Amortization will only begin once the products receive marketing authorization and is carried out on a straight-line basis over the shorter period of the patent or contract term or the expected useful life.

The impairment losses for "Customer relationships, marketing authorizations, patents, licenses and similar rights, brand names, trademarks and other" not yet available for use amounted to € 12 million (2015: € 109 million) and were related to the Healthcare business sector. These impairment losses were largely attributable to development projects that were no longer pursued. The impairment losses on "Advance payments and software in development" in the amount of € 11 million were due to discontinued software development projects. The impairment was reported in the consolidated income statement in impairment losses under other operating expenses.

In 2016, borrowing costs of € 3 million (2015: € 3 million) directly allocable to qualified assets were capitalized.

In 2016, no intangible assets were pledged as security for liabilities.

Goodwill

Goodwill was incurred mainly in connection with the acquisition of the Sigma-Aldrich Corporation, AZ Electronic Materials S.A., the Millipore Corporation, and Serono SA. The changes in goodwill caused by foreign exchange rates resulted almost exclusively from translating the goodwill from the acquisitions of the Sigma-Aldrich Corporation, AZ Electronic Materials S.A. and the Millipore Corporation, part of which is carried in U.S. dollars, into the reporting currency. More information on the acquisition of the Sigma-Aldrich Corporation can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

In 2016, goodwill was not impaired. The assumptions used in the goodwill impairment test are presented in Note [6] "Management judgments and sources of estimation uncertainty".

(17) Property, plant and equipment

€ million	Land, land rights and buildings, including buildings on third-party land[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, 2015	**2,635**	**3,410**	**1,018**	**430**	**7,493**
Changes in the scope of consolidation	510	233	18	80	840
Additions	6	27	28	502	564
Disposals	–45	–52	–54	–4	–155
Transfers	129	223	69	–417	4
Classification as held for sale or transfer to a disposal group	–	–	–	–	–
Currency translation	48	37	13	1	100
December 31, 2015	**3,284**	**3,879**	**1,091**	**592**	**8,846**
Accumulated depreciation and impairment losses January 1, 2015	**–1,187**	**–2,548**	**–767**	**–1**	**–4,503**
Changes in the scope of consolidation	–	–	–	–	–
Depreciation	–110	–197	–93	–	–399
Impairment losses	–8	–2	–4	–	–14
Disposals	41	50	52	1	143
Transfers	–4	–5	4	–	–5
Reversals of impairment losses	–	1	–	–	1
Classification as held for sale or transfer to a disposal group	–	–	–	–	–
Currency translation	–22	–30	–10	–	–62
December 31, 2015	**–1,289**	**–2,732**	**–817**	**–**	**–4,838**
Net carrying amount as of December 31, 2015	**1,995**	**1,147**	**274**	**592**	**4,008**
Cost at January 1, 2016	**3,284**	**3,879**	**1,091**	**592**	**8,846**
Changes in the scope of consolidation	–2	–10	–7	–	–20
Additions	17	36	32	669	753
Disposals	–59	–82	–68	–4	–214
Transfers	154	221	78	–460	–8
Classification as held for sale or transfer to a disposal group	–41	–2	–	–	–42
Currency translation	37	26	11	12	85
December 31, 2016	**3,391**	**4,067**	**1,136**	**807**	**9,401**
Accumulated depreciation and impairment losses January 1, 2016	**–1,289**	**–2,732**	**–817**	**–**	**–4,838**
Changes in the scope of consolidation	–	8	5	–	13
Depreciation	–147	–281	–100	–	–529
Impairment losses	–4	–1	–2	–4	–11
Disposals	47	78	64	–	189
Transfers	3	–3	–	–	–
Reversals of impairment losses	1	1	–	–	1
Classification as held for sale or transfer to a disposal group	41	1	–	–	41
Currency translation	–13	–19	–7	–	–38
December 31, 2016	**–1,361**	**–2,950**	**–857**	**–4**	**–5,171**
Net carrying amount as of December 31, 2016	**2,030**	**1,117**	**279**	**804**	**4,230**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Changes in the scope of consolidation in 2015 mainly included the additions to property, plant and equipment from the acquisitions of the Sigma-Aldrich Corporation, USA, and Ormet Circuits, Inc., USA. In fiscal 2016, the changes in the scope of consolidation included the additions to property, plant and equipment from the acquisition of BioControl Systems, Inc., USA, as well as the disposals owing to the divestment of the Pakistani subsidiaries and the deconsolidation of the Venezuelan entities. A detailed presentation of these acquisitions can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

Material additions to construction in progress were attributable to the expansion of global headquarters as well as the construction of a new Innovation Center at the Darmstadt site. Further investments at the Darmstadt site were made in a new OLED production plant and a new laboratory building. In addition, investments were made in a new pharmaceutical production plant in Nantong, China, as well as at the production sites in Bari, Italy, and Reinbek, Germany. Furthermore, construction work on a new packaging site in Aubonne, Switzerland, continued and investments were made to expand the production site. Transfers relating to construction in progress mainly included completed subprojects at Group headquarters in Darmstadt as well as investments in the United States, China, France, and Spain.

In 2016, impairment losses amounted to € 11 million (2015: € 14 million). They mainly related to assets attributable to the Life Science business sector. Reversals of impairment losses were immaterial overall.

The total amount of property, plant and equipment used to secure financial liabilities as well as government grants and subsidies was immaterial.

Directly allocable borrowing costs on qualified assets in the amount of € 6 million (2015: € 6 million) were capitalized.

The carrying amounts of assets classified as finance leases were as follows:

€ million	**Dec. 31, 2016**	Dec. 31, 2015
Land and buildings	4	6
Vehicles	1	1
Other property, plant and equipment	1	1
	6	**9**

(18) Financial assets

€ million	**current**	**non-current**	**Dec. 31, 2016**	current	non-current[1]	Dec. 31, 2015[1]
Held-to-maturity investments	–	–	–	30	–	30
Available-for-sale financial assets	43	191	233	162	109	271
Loans and receivables	44	10	55	3	17	19
Derivative assets (financial transactions)	59	17	76	33	5	37
	145	**218**	**364**	**227**	**130**	**358**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Current available-for-sale financial assets included bonds amounting to € 29 million (2015: € 143 million).

Non-current available-for-sale financial assets mainly included investments in companies amounting to € 112 million (2015: € 88 million) and investments in subsidiaries that were not consolidated due to their minor significance in the amount of € 24 million (2015: € 22 million). In addition, entitlements to future milestone payments in connection with the disposal of Kuvan® were recognized for the first time in 2016 (see Note [4] "Acquisitions, assets held for sale and disposal groups").

In 2016, impairment losses were recognized for investments in companies and other non-current financial assets held for sale in a total amount of € 5 million (2015: € 0 million). Fair value adjustments of € 50 million (2015: € 0 million) were made on available-for-sale non-current financial assets and recognized in equity. On the divestment of a minority interest, € –31 million (2015: € 0 million) of these fair value adjustments previously recognized in equity were reclassified to the consolidated income statement.

The loans and receivables contained in financial assets are neither past due nor impaired.

(19) Other assets

Other assets comprised:

€ million	current	non-current	Dec. 31, 2016	current[1]	non-current	Dec. 31, 2015[1]
Other receivables	272	5	277	152	3	155
Derivative assets (operative)	7	5	12	8	6	14
Financial items	**279**	**10**	**289**	**160**	**9**	**169**
Receivables from non-income related taxes	205	29	234	176	29	205
Prepaid expenses	71	12	82	61	20	81
Assets from defined benefit plans	–	–	–	6	–	6
Other assets	120	81	200	97	70	166
Non-financial items	**395**	**121**	**516**	**341**	**118**	**459**
	674	**131**	**805**	**500**	**128**	**628**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Other receivables included current receivables from related parties amounting to € 124 million (2015: € 35 million). This increase resulted from reimbursement claims vis-à-vis shareholders arising from taxes paid on their behalf.

Moreover, other receivables included license receivables amounting to € 38 million (2015: € 12 million).

The carrying amounts of other receivables from third parties were as follows:

€ million	Dec. 31, 2016	Dec. 31, 2015
Neither past due nor impaired	270	153
Past due, but not impaired		
up to 3 months	3	1
up to 6 months	–	1
up to 12 months	2	–
up to 24 months	1	1
over 2 years	–	–
Impaired	–	–
Other receivables	**277**	**155**

As in the prior year, there were no allowances or reversals of allowances for other receivables.

(20) Inventories

This item comprised:

€ million	Dec. 31, 2016	Dec. 31, 2015[1]
Raw materials and supplies	501	493
Work in progress	694	679
Finished goods/goods for resale	1,413	1,437
Inventories	**2,607**	**2,610**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Write-downs of inventories in 2016 amounted to € 236 million (2015: € 133 million). The increase resulted primarily from the first full-year consolidation of the Sigma-Aldrich Corporation, USA. In 2016, reversals of inventory write-downs of € 59 million were recorded (2015: € 47 million). As of the balance sheet date, no inventories were pledged as security for liabilities.

(21) Trade accounts receivable

The maturity structure of the carrying amounts of trade accounts receivable was as follows:

€ million	Dec. 31, 2016	Dec. 31, 2015
Neither past due nor impaired	2,458	2,321
Past due, but not impaired		
up to 3 months	232	234
up to 6 months	20	14
up to 12 months	8	5
up to 24 months	3	2
over 2 years	1	–
Impaired	168	162
Trade accounts receivable	**2,889**	**2,738**

The corresponding allowances developed as follows:

€ million	2016	2015
January 1	**–165**	**–126**
Additions	– 52	– 84
Reversals	59	40
Utilizations	17	9
Change in scope of consolidation	– 302	– 5
Currency translation and other changes	– 20	1
December 31	**–464**	**–165**

The changes in the scope of consolidation resulted from the allowances attributable to the divested Venezuelan entities, for which impairment losses in this amount had been recognized.

In the period from January 1 to December 31, 2016, trade accounts receivable in Italy with a nominal value of € 54 million were sold for € 53 million. Previous impairments in this context amounting to € 2 million were reversed and disclosed under other operating income. The sold receivables do not involve any further rights of recovery against Merck.

(22) Tax receivables

Income tax receivables amounted to € 403 million (2015: € 391 million). Tax receivables resulted primarily from tax prepayments that exceeded the actual amount of tax payable for 2016 and prior fiscal years, and from refund claims for prior years.

(23) Cash and cash equivalents

This item comprised:

€ million	Dec. 31, 2016	Dec. 31, 2015
Cash, bank balances and cheques	662	578
Short-term cash investments (up to 3 months)	277	255
Cash and cash equivalents	**939**	**832**

Changes in cash and cash equivalents as defined by IAS 7 are presented in the consolidated cash flow statement.

Cash and cash equivalents include restricted cash amounting to € 238 million (2015: € 327 million). Restricted cash relates mainly to cash and cash equivalents with subsidiaries which the Group only has restricted access to owing to foreign exchange controls.

The maximum default risk is equivalent to the carrying value of the cash and cash equivalents.

(24) Equity

Equity capital

The total capital of the company consists of the share capital composed of shares and the equity interest held by the general partner E. Merck KG. As of the balance sheet date, the company's share capital amounting to € 168 million was divided into 129,242,251 no-par value bearer shares plus one registered share and is disclosed as subscribed capital. The amount resulting from the issue of shares by Merck KGaA exceeding the nominal amount was recognized in the capital reserves. The equity interest held by the general partner amounted to € 397 million.

E. Merck KG's share of net profit

E. Merck KG and Merck KGaA engage in reciprocal net profit transfers. This makes it possible for E. Merck KG, the general partner of Merck KGaA, and the shareholders to participate in the net profit/loss of Merck KGaA in accordance with the ratio of the general partner's equity interest and the share capital (70.274% or 29.726% of the total capital).

The allocation of net profit/loss is based on the net income of both E. Merck KG and Merck KGaA 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 rules governing the adjustment of earnings relate partly to legal regulations that were amended in 2015 as a result of the German Accounting Directive Implementation Act. Articles 27 and 30 of the Articles of Association were thus adapted, without any changes to the contents and economic consequences of the principle of the allocation of net profit/loss. The amendments took effect in 2016. For better comparability, the previous year's presentation has been adapted to the new rules. The reciprocal net profit/loss transfer between E. Merck KG and Merck KGaA as stipulated by the Articles of Association was as follows:

€ million		2016 E. Merck KG	2016 Merck KGaA	2015 E. Merck KG	2015 Merck KGaA
Result of E. Merck KG		–6	–	–20	–
Net income of Merck KGaA		–	556	–	494
Corporation tax		–	11	–	28
Basis for appropriation of profits	**(100%)**	**–6**	**567**	**–20**	**522**
Profit transfer to E. Merck KG Ratio general partner's capital to total capital	(70.274%)	398	–398	367	–367
Profit transfer from E. Merck KG Ratio of share capital to total capital	(29.726%)	2	–2	6	–6
Corporation tax		–	–11	–	–28
Net income		**394**	**156**	**353**	**121**

The result of E. Merck KG on which the appropriation of profits adjusted for trade tax is based amounted to € –6 million (2015: € –20 million). This resulted in a profit/loss transfer to Merck KGaA of € –2 million (2015: € –6 million). Merck KGaA's net income adjusted for corporation tax, on which the appropriation of its profit is based, amounted to € 567 million (2015: € 522 million). Merck KGaA transferred a gain in the amount of € 398 million of its profit to E. Merck KG (2015: € 367 million). In addition, an expense from corporation tax charges amounting to € 11 million resulted (2015: expense of € 28 million). Corporation tax is only calculated on the income received by shareholders. Its equivalent is the income tax applicable to E. Merck KG. However, this must be paid by the partners of E. Merck KG directly and is not disclosed in the annual financial statements.

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. If the shareholders resolve to carry forward or to allocate to retained earnings a portion of Merck KGaA's net retained profit to which they are entitled, then E. Merck KG is obligated to allocate to the profit brought forward/retained earnings of Merck KGaA a comparable sum determined in accordance with the ratio of share capital to general partner's capital. This ensures that the retained earnings and the profit carried forward of Merck KGaA correspond to the ownership ratios of the shareholders on the one hand and E. Merck KG on the other hand. Consequently, for distributions to E. Merck KG, only the amount is available that results after netting the profit transfer of Merck KGaA with the amount either allocated or withdrawn by E. Merck KG from retained earnings/profit carried forward. This amount corresponds to the amount that is paid as a dividend to the shareholders, and reflects their pro rata shareholding in the company.

€ million	2016 E. Merck KG	2016 Merck KGaA	2015 E. Merck KG	2015 Merck KGaA
Net income	394	156	353	121
Profit carried forward previous year	37	15	72	30
Withdrawal from revenue reserves	–	–	–	–
Transfer to revenue reserves	–	–	–	–
Retained earnings Merck KGaA		**171**		**151**
Withdrawal by E. Merck KG	–392		–388	
Dividend proposal		–155		–136
Profit carried forward	**39**	**16**	**37**	**15**

For 2015, a dividend of € 1.05 per share was distributed. The dividend proposal for fiscal 2016 will be € 1.20 per share, corresponding to a total dividend payment of € 155 million (2015: € 136 million) to shareholders. The amount withdrawn by E. Merck KG would amount to € 392 million (2015: € 388 million).

Changes in reserves

For 2016 the profit transfer to E. Merck KG including changes in reserves amounted to € 466 million. This consisted of the profit transfer to E. Merck KG (€ –398 million), the result transfer from E. Merck KG to Merck KGaA (€ –2 million), the change in profit carried forward of E. Merck KG (€ 2 million) as well as the profit transfer from Merck & Cie to E. Merck KG (€ –68 million). Merck & Cie is a partnership under Swiss law that is controlled by Merck KGaA, but distributes its operating result directly to E. Merck KG. This distribution is a payment to shareholders and is therefore also presented under changes in equity.

Non-controlling interests

The disclosure of non-controlling interests was based on the stated equity of the subsidiaries concerned after any adjustment required to ensure compliance with the accounting policies of the Merck Group, as well as pro rata consolidation entries. The net equity and profit attributable to non-controlling interests mainly related to the minority interests in the publicly traded companies Merck Ltd., India, and P.T. Merck Tbk, Indonesia, as well as in the company Merck Ltd., Thailand.

(25) Provisions for pensions and other post-employment benefits

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

In order to limit the risks of changing capital market conditions and other developments, for many years now Merck has been offering newly hired employees 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, 2016	Dec. 31, 2015
Present value of all defined benefit obligations	**4,698**	**4,153**
Fair value of the plan assets	–2,386	–2,323
Funded status	**2,312**	**1,830**
Effects of asset ceilings	1	–
Net defined benefit liability recognized in the balance sheet	**2,313**	**1,830**
Assets from defined benefit plans	–	6
Provisions for pensions and other post-employment benefits	**2,313**	**1,836**

The calculation of the defined benefit obligations as well as the relevant plan assets was based on the following actuarial parameters:

	Germany		Switzerland		United Kingdom		Other countries	
	2016	2015	**2016**	2015	**2016**	2015	**2016**	2015
Discount rate	1.90%	2.40%	0.60%	0.70%	2.69%	3.86%	3.08%	3.72%
Future salary increases	2.51%	2.50%	1.80%	1.80%	2.53%	2.42%	3.59%	3.80%
Future pension increases	1.75%	1.75%	–	–	3.10%	3.07%	1.68%	1.91%

These are average values weighted by the present value of the respective benefit obligation.

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

€ million	Germany **Dec. 31, 2016**	Other countries **Dec. 31, 2016**	Merck Group **Dec. 31, 2016**
Benefit based on final salary			
Annuity	2,525	633	3,158
Lump sum	–	101	101
Installments	1	–	1
Benefit not based on final salary			
Annuity	457	882	1,339
Lump sum	–	47	47
Installments	7	–	7
Other	–	12	12
Medical plan	–	33	33
Present value of defined benefit obligations	**2,990**	**1,708**	**4,698**

The main benefit rules are as follows:

Merck Group companies in Germany accounted for € 2,990 million of the defined benefit obligations (2015: € 2,560 million) as well as for € 1,116 million of the plan assets (2015: € 1,104 million). Of these amounts the vast majority in each case were attributable to plans that encompass old-age, disability and surviving dependent pensions. On the one hand, these obligations are based on benefit rules comprising benefit commitments dependent upon years of service and final salary from which newly hired employees have been excluded. On the other hand, the benefit rules applicable to employees newly hired since January 1, 2005 comprise a direct commitment that is not based on the final salary. The benefit entitlement results from the cumulative total of annually determined pension components that are calculated on the basis of a defined benefit expense and an age-dependent annuity table. Statutory minimum funding obligations do not exist.

Pension plans in Switzerland accounted for € 808 million of the defined benefit obligations (2015: € 768 million) as well as for € 648 million of the plan assets (2015: € 600 million). The agreed benefits comprise old-age, disability and surviving dependent benefits. The employer and the employees make contributions to the plans. Statutory minimum funding obligations exist.

Pension plans in the United Kingdom accounted for € 549 million of the defined benefit obligations (2015: € 500 million) as well as for € 460 million of the plan assets (2015: € 466 million). These obligations 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 comprise old-age, disability and surviving dependent benefits. The employer and the employees make contributions to the plans. Statutory minimum funding obligations exist.

In the reporting period, the following items were recognized in income:

€ million	**2016**	2015
Current service cost	–140	–134
Past service cost	18	–
Gains (+) or losses (–) on settlement	11	1
Other effects recognized in income	–3	–6
Interest expense	–92	–83
Interest income	51	45
Total amount recognized as expenses (–)/income (+)	**–155**	**–177**

With the exception of the net balance of interest expense on the defined benefit obligations and interest income from the plan assets, which is recorded under the financial result, the relevant expenses for defined benefit and defined contribution pension systems are allocated to the individual functional areas.

During the reporting period, the present value of the defined benefit obligations changed as follows:

€ million	**Funded benefit obligations**	**Benefit obligations funded by provisions**	**2016**	Funded benefit obligations	Benefit obligations funded by provisions	2015
Present value of the defined benefit obligations on January 1	3,810	343	4,153	3,504	309	3,813
Currency translation differences recognized in equity	–66	2	–64	39	–3	36
Currency translation differences recognized in income	4	–	4	38	–	38
Current service cost	124	16	140	119	15	134
Past service cost	–18	–	–18	–	–	–
Gains (–) or losses (+) on settlement	–11	–	–11	–1	–	–1
Interest expense	84	8	92	76	7	83
Actuarial gains (–)/losses (+)	457	35	492	–166	–23	–189
Contributions by plan participants	10	–	10	10	–	10
Pension payments	–101	–8	–109	–146	–7	–153
Changes in the scope of consolidation	–	–2	–2	343	43	386
Other effects recognized in income	–	–	–	–	–	–
Other changes	18	–7	11	–6	2	–4
Present value of the defined benefit obligations on December 31	**4,311**	**387**	**4,698**	**3,810**	**343**	**4,153**

A sensitivity analysis of the key parameters is given in Note [6] "Management judgments and sources of estimation uncertainty".

The fair value of the plan assets changed in the reporting period as follows:

€ million	**2016**	2015
Fair value of the plan assets on January 1	2,323	1,994
Currency translation differences recognized in equity	–62	35
Currency translation differences recognized in income	3	34
Interest income from plan assets	51	45
Actuarial gains (+)/losses (–) arising from experience adjustments	69	–29
Employer contributions	35	30
Employee contributions	10	10
Pension payments from plan assets	–38	–85
Changes in the scope of consolidation	–	293
Plan administration costs paid from the plan assets recognized in income	–2	–2
Other effects recognized in income	–	–
Other changes	–3	–2
Fair value of the plan assets on December 31	**2,386**	**2,323**

The actual return on plan assets amounted to € 120 million in 2016 (2015: € 16 million).

In 2016, the effects of the asset ceilings in accordance with IAS 19.64 changed as follows:

€ million	**2016**	2015
Effects of the asset ceilings on January 1	–	–
Currency translation differences recognized in equity	–	–
Interest expense	–	–
Actuarial gains (–)/losses (+) arising from changes in the effects of the asset ceilings	1	–
Effects of the asset ceilings on December 31	**1**	**–**

The development of cumulative actuarial gains (+) and losses (–) was as follows:

€ million	**2016**	2015
Cumulative actuarial gains (+)/losses (–) recognized in equity on January 1	–1,420	–1,568
Currency translation differences	21	–12
Remeasurements of defined benefit obligations		
Actuarial gains (+)/losses (–) arising from changes in demographic assumptions	4	– 38
Actuarial gains (+)/losses (–) arising from changes in financial assumptions	– 484	217
Actuarial gains (+)/losses (–) arising from experience adjustments	–12	10
Remeasurements of plan assets		
Actuarial gains (+)/losses (–) arising from experience adjustments	69	– 29
Effects of the asset ceilings		
Actuarial gains (+)/losses (–)	–1	–
Reclassification within retained earnings	3	–
Cumulative actuarial gains (+)/losses (–) recognized in equity on December 31	**–1,820**	**–1,420**

Plan assets for funded defined benefit obligations primarily comprised fixed-income securities, stocks, and investment funds. They did not directly include financial instruments issued by Merck Group companies or real estate used by Group companies.

The plan assets serve exclusively to meet the defined benefit obligations. Covering the benefit obligations with financial assets represents a means of providing for future cash outflows, which occur in some countries (e.g. Switzerland and the United Kingdom) on the basis of legal requirements and in other countries (e.g. Germany) on a voluntary basis.

The ratio of the fair value of the plan assets to the present value of the defined benefit obligations is referred to as the degree of pension plan funding. If the benefit obligations exceed the plan assets, this represents underfunding of the pension fund.

It should be noted, however, that both the benefit obligations as well as the plan assets fluctuate over time. This could lead to an increase in underfunding. Depending on the statutory regulations, it could become necessary in some countries for the Merck Group to reduce underfunding through additions of liquid assets. 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 (e.g. life expectancy, inflation rates).

In order to minimize such fluctuations, in managing its plan assets, the Merck Group also pays attention to potential fluctuations in liabilities. In the ideal case, assets and liabilities develop in opposite directions when exposed to exogenous factors, thus creating a natural defense against these factors.

The fair value of the plan assets can be allocated to the following categories:

	Dec. 31, 2016			Dec. 31, 2015		
€ million	**Quoted market price in an active market**	**No quoted market price in an active market**	**Total**	Quoted market price in an active market	No quoted market price in an active market	Total
Cash and cash equivalents	72	–	72	27	–	27
Equity instruments	729	–	729	740	–	740
Debt instruments	968	–	968	958	–	958
Direct investments in real estate	–	102	102	–	98	98
Investment funds	379	–	379	370	–	370
Insurance contracts	–	82	82	–	79	79
Other	54	–	54	51	–	51
Fair value of the plan assets	**2,202**	**184**	**2,386**	**2,146**	**177**	**2,323**

Employer contributions to plan assets and direct payments to beneficiaries will probably amount to around € 35 million and € 72 million in 2017. The weighted duration amounted to 21 years.

The cost of ongoing contributions for defined contribution plans that are financed exclusively by external funds and for which the companies of the Merck Group are only obliged to pay the contributions amounted to € 54 million (2015: € 47 million). In addition, employer contributions amounting to € 67 million (2015: € 63 million) were transferred to the German statutory pension insurance system and € 42 million (2015: € 35 million) to statutory pension insurance systems abroad.

(26) Other provisions

Other provisions developed as follows:

€ million	Litigation	Restructuring	Personnel	Environmental protection	Acceptance and follow-on obligations	Other	**Total**
January 1, 2016[1]	**492**	**92**	**339**	**127**	**121**	**221**	**1,392**
Additions	85	17	151	27	15	54	349
Utilizations	–14	–30	–101	–10	–34	–61	–250
Release	–23	–6	–46	–5	–57	–55	–193
Interest portion	9	–	1	3	–	–	13
Currency translation	2	–	5	1	–	4	12
Changes in scope of consolidation/Other	–67	–	–13	–	–	3	–77
December 31, 2016	**483**	**73**	**336**	**142**	**45**	**167**	**1,246**
thereof: current	68	34	104	27	41	138	412
thereof: non-current	415	39	232	115	4	28	834

[1] Figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Litigation

As of December 31, 2016, the provisions for legal disputes amounted to € 483 million (2015: € 492 million). The legal matters described below represent the most significant legal risks.

Product-related and patent disputes

Rebif®: Merck is involved in a patent dispute with Biogen Inc., USA, (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 2009 in the United States. Subsequently, Biogen sued Merck and other pharmaceutical companies for infringement of this patent. Merck defended itself against all allegations and brought a countersuit claiming that the patent was invalid and not infringed on by Merck's actions. A Markman hearing took place in January 2012, leading to a decision in the first quarter of 2016 that accelerated the litigation. A first-instance ruling is now expected for September 2017. In parallel, the parties are involved in court-ordered mediation proceedings that have not yet officially ended but have not led to an agreement to date. Merck has taken appropriate accounting measures. Cash outflow is not expected to occur within the next 12 months.

PS-VA liquid crystals mixtures: In the Performance Materials business sector, Merck is involved in a legal dispute with JNC Corporation, Japan, (JNC). JNC claims that by manufacturing and marketing certain liquid crystals mixtures, Merck has infringed JNC patents. Merck maintains that JNC's patent infringement assertion is invalid owing to relevant prior art and has filed the corresponding nullity actions, which in two cases were already successful in first-instance proceedings. The competitor has meanwhile filed two patent infringement lawsuits and appeals in the case of the nullity actions. Merck has taken appropriate precautionary accounting measures. It is anticipated that a final decision will be made only within the next two to five years, leading to a potential outflow of resources.

Antitrust proceedings

Raptiva®: In December 2011, the Brazilian federal state of São Paulo sued Merck for damages because of alleged collusion between various pharmaceutical companies and an association of patients suffering from psoriasis and vitiligo. The collusion is alleged to have aimed at an increase in the sales of the involved companies' drugs to the detriment of patients and state coffers. Moreover, in connection with the product Raptiva®, patients have filed suit to receive compensatory damages. Merck has taken appropriate accounting measures for these legal disputes. These are different legal disputes. An outflow of cash in fiscal 2017 is not expected.

Paroxetine: In connection with the divested generics business, the Group is subject to antitrust investigations by the British Competition and Market Authority ("CMA") in the United Kingdom. In March 2013, the CMA informed Merck of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd. and several GlaxoSmithKline companies in connection with the antidepressant drug paroxetine violates British and European competition law. As the owner of Generics (UK) Ltd. at the time, Merck was allegedly involved in the settlement negotiations and is therefore liable. The investigations into Generics (UK) Ltd. started in 2011, without this being known to Merck. On February 11, 2016, the CMA imposed a fine in this matter. Merck took legal action against this fine. Merck has taken appropriate accounting measures. A decision and a potential outflow of resources are expected for 2017.

Trademark rights/breach of agreement: Merck is involved in various legal disputes with Merck & Co. of the United States (outside the United States and Canada: Merck Sharp & Dohme (MSD)), among other things due to breach of the co-existence agreement between the two companies and/or trademark/name right infringement regarding the use of the designation "Merck". In this context, Merck has sued MSD in various countries and has been sued by MSD in the United States. As in 2015, Merck did not consider recourse and a related outflow of resources to be likely as of the balance sheet date (see Note [38] "Contingent liabilities"). Merck has taken appropriate accounting measures for any costs of legal defense. An outflow of resources for the costs of external legal counsel is partially expected in 2017.

In addition to provisions for the mentioned litigation, provisions existed as of the balance sheet date for various smaller pending legal disputes.

Restructuring

Provisions for restructuring mainly include commitments to employees in connection with restructuring projects and provisions for onerous contracts. These were recognized once detailed restructuring plans had been prepared and communicated.

In 2012, the "Fit for 2018" transformation and growth program was established. The aim of this program is to secure the competitiveness and the growth of the Merck Group over the long term. The provisions of € 73 million as of December 31, 2016 (2015: € 92 million) in this context mainly consist of commitments to employees from partial and early retirement arrangements. The payments made in 2016 in the amount of € 30 million are primarily due to severance or early retirement payments to employees. Cash flows owing to provisions for restructuring are for the most part expected within a period until 2019.

Provisions for employee benefits / Share-based payment

Provisions for employee benefits include obligations from long-term variable compensation programs. More information on these compensation programs can be found in Note [65] "Share-based compensation programs". The following table presents the key parameters as well as the development of the potential number of Merck Share Units ("MSUs") for the individual tranches:

	2014 tranche	2015 tranche	**2016 tranche**
Performance cycle	Jan. 1, 2014 – Dec. 31, 2016	Jan. 1, 2015 – Dec. 31, 2017	Jan. 1, 2016 – Dec. 31, 2018
Term	3 years	3 years	3 years
Reference price of Merck shares in € (60-day average Merck share price prior to the start of the performance cycle)	122.84[1]	74.53	87.92
DAX® value (60-day average of the DAX® prior to the start of the performance cycle)	9,065.08	9,403.99	10,669.76
Potential number of MSUs			
Potential number offered for the first time in 2014	355,164	–	–
Forfeited	21,247	–	–
MSUs granted to employees of the AZ Electronic Materials Group on May 2, 2014	22,865	–	–
Status as on Dec. 31, 2014	356,782	–	–
Potential number offered for the first time in 2015	–	609,799	–
Forfeited	23,541	21,447	–
Further additional granted MSUs	2,167	–	–
Status as on Dec. 31, 2015	335,408	588,352	–
Potential number offered for the first time in 2016	–	–	763,463
Forfeited	28,327	35,691	24,392
Status as on Dec. 31, 2016	**307,081**	**552,661**	**739,071**

[1] Price of shares before share split in 2014.

The value of the provision was € 133 million as of December 31, 2016 (2015: € 124 million). The net expense for fiscal 2016 was € 76 million (2015: € 64 million). The three-year tranche issued in 2013 ended at the end of 2015 and was paid out in 2016 in the amount of € 68 million.

Provisions for employee benefits also include obligations for the partial retirement program and other severance pay that were not set up in connection with the "Fit for 2018" transformation and growth program as well as obligations in connection with long-term working hour accounts and anniversary bonuses.

With respect to provisions for defined-benefit pensions and other post-employment benefits, see Note [25] "Provisions for pensions and other post-employment benefits".

Environmental protection

Provisions for environmental protection, particularly for obligations from soil remediation and groundwater protection, mainly existed in connection with the crop protection business that was discontinued in 1987 in Germany and Latin America.

Acceptance and follow-on obligations

Provisions for acceptance and follow-on obligations primarily took into account costs stemming from discontinued research projects as well as obligation surpluses from onerous contracts. Utilizations and releases were attributable to research projects discontinued in previous years.

Other

Other mainly included provisions for other guarantees, for uncertain commitments from contributions, duties and fees as well as for interest and penalties from tax audits.

(27) Financial liabilities / Capital management

The composition of financial liabilities as well as a reconciliation to net financial debt are presented in the following table:

	Book value Dec. 31, 2016 € million	Book value Dec. 31, 2015 € million	Maturity	Interest rate %	Nominal volume million	Currency
Eurobond 2006/2016	–	214	June 2016	5.875%	250	€
Eurobond 2009/2016	–	60	Nov. 2016	4.000%	60	€
USD bond 2015/2017	238	–	March 2017	variable[1]	250	USD
Eurobond 2015/2017	699	–	Sept. 2017	variable[2]	700	€
Bonds (current)	**937**	**274**				
Commercial paper	918	999				
Bank loans	1,128	2,137				
Liabilities to related parties	758	578				
Loans from third parties and other financial liabilities	20	27				
Liabilities from derivatives (financial transactions)	25	80				
Finance lease liabilities	1	2				
Current financial liabilities	**3,788**	**4,097**				
USD bond 2015/2017	–	229	March 2017	variable[1]	250	USD
Eurobond 2015/2017	–	699	Sept. 2017	variable[2]	700	€
USD bond 2015/2018	380	366	March 2018	1.700%	400	USD
Eurobond 2015/2019	798	797	Sept. 2019	0.750%	800	€
Eurobond 2009/2019	69	69	Dec. 2019	4.250%	70	€
USD bond 2015/2020	712	684	March 2020	2.400%	750	USD
Eurobond 2010/2020	1,346	1,345	March 2020	4.500%	1,350	€
USD bond 2015/2022	947	910	March 2022	2.950%	1,000	USD
Eurobond 2015/2022	547	547	Sept. 2022	1.375%	550	€
USD bond 2015/2025	1,508	1,448	March 2025	3.250%	1,600	USD
Hybrid bond 2014/2074	990	988	Dec. 2074[3]	2.625%	1,000	€
Hybrid bond 2014/2074	497	497	Dec. 2074[4]	3.375%	500	€
Bonds (non-current)	**7,794**	**8,578**				
Bank loans	850	869				
Liabilities to related parties	–	–				
Loans from third parties and other financial liabilities	59	63				
Liabilities from derivatives (financial transactions)	103	104				
Finance lease liabilities	2	3				
Non-current financial liabilities	**8,809**	**9,616**				
Financial liabilities	**12,597**	**13,713**				
less:						
Cash and cash equivalents	939	832				
Current financial assets	145	227				
Net financial debt	**11,513**	**12,654**				

[1] Interest rate: 0.35% spread over 3-month U.S. dollar LIBOR.
[2] Interest rate: 0.23% spread over 3-month EURIBOR.
[3] Merck has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in June 2021.
[4] Merck has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in December 2024.

Merck issued a USD bond with a five-tranche structure in March 2015, and a further eurobond with a three-tranche structure in August 2015. Both issuances were part of the financing of the acquisition of the Sigma-Aldrich Corporation, USA. Merck repaid a eurobond with a volume of € 212 million in June 2016 as well as a further bond with a volume of € 60 million in November 2016.

For the hybrid bond 2014/2074 issued by Merck KGaA in two tranches, the rating agencies Standard & Poor's, Moody's and Scope have given equity credit treatment to half of the issuance, thus making the issuance more favorable to Merck's credit rating than a classic bond issue. The bond is recognized in full as financial liabilities in the balance sheet.

The financial liabilities of the Merck Group are not secured by liens or similar forms of collateral. The loan agreements do not contain any financial covenants. The Merck Group's average borrowing cost as of the balance sheet date was 2.0% (2015: 2.0%).

Information on liabilities to related parties can be found in Note [45] "Related-party disclosures".

Capital management

The objective of capital management is to secure financial flexibility in order to maintain long-term business operations and to 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 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 Merck, for instance via bond issues. In addition, Merck has a € 2 billion multi-currency revolving credit facility, which was renewed in fiscal 2013 ("Syndicated Loan 2013"). The credit line was underwritten by an international group of banks and has a remaining term until March 2020. This credit line had not been utilized as of December 31, 2016. Merck still had access to a commercial paper program to meet short-term capital requirements with a volume of € 2 billion, of which € 919 million had been utilized as of December 31, 2016 (2015: € 1 billion). As of December 31, 2016, there were liabilities of € 3.47 billion (2015: € 3.53 billion) from a Debt Issuance Program most recently renewed in 2015. As of the balance sheet date, € 400 million (2015: € 1,600 million) of a loan agreement for acquisition financing set up with a consortium of banks in 2014 had been used. As of December 31, 2016, further bank lines of € 336 million were available (2015: € 206 million). There are no indications that the availability of credit lines already extended was restricted.

On the balance sheet date, the bank financing commitments vis-à-vis the Merck Group were as follows:

	Dec. 31, 2016		Dec. 31, 2015			
€ million	**Financing commitments from banks**	**Utilization**	Financing commitments from banks	Utilization	Interest	Maturity of financing commitments
Syndicated loan 2013	2,000	–	2,000	–	variable	2020
Loan agreement with banking syndicate for acquisition financing	400	400	1,600	1,600	variable	2018
Bilateral credit agreement with banks	700	700	700	700	variable	2019
Bilateral credit agreement with banks	400	400	400	400	variable	2020
Bilateral credit agreement with banks	250	250	250	250	variable	2022
Various bank credit lines	336	228	206	56	variable	< 1 year
	4,086	**1,978**	**5,156**	**3,006**		

(28) Other liabilities

This item comprised:

€ million	current	non-current	Dec. 31, 2016	current	non-current	Dec. 31, 2015
Other financial liabilities	922	14	936	890	14	904
Liabilities from derivatives (operational)	71	34	105	46	14	61
Financial items	**993**	**48**	**1,041**	**936**	**29**	**965**
Accruals for personnel expenses	603	–	603	536	–	536
Deferred income	237	386	623	226	576	802
Advance payments received from customers	12	–	12	15	–	15
Liabilities from non-income related taxes	103	5	108	105	4	109
Non-financial items	**955**	**391**	**1,345**	**882**	**580**	**1,462**
Other liabilities	**1,947**	**439**	**2,386**	**1,819**	**609**	**2,427**

As of December 31, 2016, other financial liabilities included liabilities to related companies amounting to € 457 million (2015: € 454 million). These were profit entitlements of E. Merck KG. Moreover, other liabilities included interest accruals of € 98 million (2015: € 97 million) as well as payroll liabilities of € 169 million (2015: € 179 million). The remaining amount of € 212 million (2015: € 174 million) recorded under other financial liabilities included, among other things, liabilities to insurers as well as contractually agreed payment obligations vis-à-vis other companies. The deferred income resulted mainly from the collaboration agreement with Pfizer Inc., USA, in immuno-oncology and was released further as planned on a pro rata basis in 2016.

(29) Trade accounts payable

Trade accounts payable amounted to € 2,048 million (2015: € 1,921 million).

This item also included accrued amounts of € 544 million (2015: € 486 million) for outstanding invoices and € 443 million (2015: € 421 million) in sales deductions.

(30) Tax liabilities

Tax liabilities and provisions for tax liabilities resulted in total income tax liabilities of € 883 million as of December 31, 2016 (2015: € 1,011 million).

Segment Reporting

(31) Information by business sector / country and region

INFORMATION BY BUSINESS SECTOR

	Healthcare		Life Science	
€ million	**2016**	2015	**2016**	2015
Net sales[1]	**6,855**	**6,934**	**5,658**	**3,355**
Operating result (EBIT)[2]	**1,593**	**1,097**	**556**	**301**
Depreciation and amortization	746	752	797	372
Impairment losses	88	122	26	2
Reversals of impairment losses	–3	–	–1	–
EBITDA[2]	**2,425**	**1,970**	**1,378**	**674**
Exceptionals[2]	–297	31	274	182
EBITDA pre exceptionals (Segment result)[2]	**2,128**	**2,002**	**1,652**	**856**
EBITDA margin pre exceptionals (in % of net sales)[2]	31.0%	28.9%	29.2%	25.5%
Net operating assets[2,3]	5,600	5,813	21,853	21,624
Segment liabilities	–2,427	–2,479	–953	–910
Investments in property, plant and equipment[4]	315	232	254	133
Investments in intangible assets[4]	47	146	47	8
Net cash flows from operating activities	1,723	1,683	1,417	706
Business free cash flow[2]	1,648	1,581	1,144	676

[1] Without intersegment sales.
[2] Not defined by International Financial Reporting Standards (IFRS).
[3] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".
[4] According to the consolidated cash flow statement.

INFORMATION BY COUNTRY AND REGION

	Europe		thereof: Germany		thereof: Switzerland		North America	
€ million	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015
Net sales by customer location[1]	4,735	4,103	983	851	238	160	3,858	2,723
Net sales by company location[1]	5,466	4,735	1,712	1,563	327	177	3,854	2,719
Intangible assets[2]	7,047	7,753	372	352	3,345	3,979	17,131	16,787
Property, plant and equipment[2]	2,554	2,401	1,187	1,104	548	527	1,015	1,026
Research and development costs	–1,697	–1,510	–763	–835	–840	–530	–184	–124
Number of employees	24,438	23,429	12,450	11,938	2,078	1,946	10,037	9,794

[1] Without intersegment sales.
[2] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Performance Materials		Corporate and Other		Merck Group	
2016	2015	**2016**	2015	**2016**	2015
2,511	**2,556**	**–**	**–**	**15,024**	**12,845**
823	**878**	**–492**	**–432**	**2,481**	**1,843**
237	242	25	18	1,805	1,383
17	2	2	3	134	128
–	–1	–	–	–5	–1
1,077	**1,120**	**–465**	**–411**	**4,415**	**3,354**
29	12	69	51	75	276
1,106	**1,132**	**–396**	**–360**	**4,490**	**3,630**
44.1%	44.3%	–	–	29.9%	28.3%
4,146	4,170	200	113	31,798	31,720
–290	–290	–106	–61	–3,777	–3,739
96	103	51	45	716	514
13	10	25	15	132	179
1,054	1,139	–1,677	–1,333	2,518	2,195
1,011	931	–485	–421	3,318	2,766

thereof: USA		Asia-Pacific		thereof: China		Latin America		Middle East and Africa		Merck Group	
2016	2015	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015
3,668	2,567	4,736	4,241	1,356	1,105	1,136	1,265	559	513	15,024	12,845
3,691	2,587	4,450	4,014	1,041	669	1,099	1,238	154	138	15,024	12,845
17,131	16,787	803	871	46	52	2	5	6	6	24,989	25,422
1,013	1,024	504	443	172	124	110	93	49	44	4,230	4,008
–184	–121	–61	–45	–25	–12	–21	–24	–12	–7	–1,976	–1,709
9,874	9,629	10,754	11,096	2,999	2,619	4,140	4,352	1,045	942	50,414	49,613

(32) Information on Segment Reporting

Segmentation was performed in accordance with the organizational and reporting structure of the Merck Group that applied during 2016.

The Healthcare business sector comprises the businesses with prescription and over-the-counter pharmaceuticals and biopharmaceuticals as well as allergy products. The Life Science business sector offers solutions to research and analytical laboratories in the pharmaceutical/biotechnology industry or in academic institutions, and customers manufacturing large- and small-molecule drugs. The Performance Materials business sector consists of the entire specialty chemicals business. The fields of activity of the individual segments are described in detail in the sections about the business sectors in the combined management report.

Corporate and Other included income and expenses, assets and liabilities as well as cash flows that could not be directly allocated to the reportable segments presented. This related mainly to central Group functions. Moreover, the column served the reconciliation to the Group numbers. The expenses and income as well as cash flows attributable to the financial result and income taxes were also presented under Corporate and Other.

Apart from sales, the success of a segment is mainly determined by EBITDA pre exceptionals (segment result) and business free cash flow. EBITDA pre exceptionals and business free cash flow are performance indicators not defined by International Financial Reporting Standards. However, they represent important variables used to steer the Merck Group. To permit a better understanding of operational performance, EBITDA pre exceptionals excludes depreciation and amortization, impairment losses, and reversals of impairment losses as well as exceptional income and expenses presented in the following. Among other things, business free cash flow is also used for internal target agreements.

In 2016, only the Life Science business sector generated intragroup sales between business sectors. These resulted mainly from transactions with the Healthcare business sector in an amount of € 46 million and with the Performance Materials business sector (€ 2 million). Transfer prices for intragroup sales are determined on an arm's length basis.

Neither in 2016 nor in 2015 did any single customer account for more than 10% of Group sales.

The following table presents the reconciliation of EBITDA pre exceptionals of all operating businesses to the profit before income tax of the Merck Group:

€ million	2016	2015
EBITDA pre exceptionals of the operating businesses[1]	**4,887**	**3,990**
Corporate and Other	–396	–360
EBITDA pre exceptionals of the Merck Group[1]	**4,490**	**3,630**
Depreciation/amortization/impairment losses/reversals of impairment losses	–1,934	–1,511
Exceptionals[1]	–75	–276
Operating result (EBIT)[1]	**2,481**	**1,843**
Financial result	–326	–357
Profit before income tax	**2,154**	**1,487**

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

Exceptionals comprised the following:

€ million	2016	2015
Restructuring costs	–22	–48
Integration costs/IT costs	–193	–78
Gains (+)/losses (–) on the divestment of businesses	304	–2
Acquisition-related exceptionals	–153	–133
Other exceptionals	–11	–16
Exceptionals before impairment losses/reversals of impairment losses[1]	**–75**	**–276**
Impairment losses	–115	–92
Reversals of impairment losses	–	–
Exceptionals (total)[1]	**–191**	**–367**

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

Exceptionals were included in the consolidated income statement under cost of sales as well as under other operating expenses and income. The exceptionals of € 193 million recorded under integration costs/IT costs (2015: € 78 million) were largely incurred in connection with the integration of the Sigma-Aldrich Corporation, USA (€ 125 million), as well as expenses for ERP systems (€ 40 million). These amounts were recorded under other operating expenses.

The gains from the divestment of businesses amounting to € 304 million (2015: losses from the divestment of businesses amounting to € 2 million) resulted mainly from the sales of the rights to Kuvan® and the associated business transactions. These gains were included in other operating income.

The acquisition-related exceptionals amounting to € 153 million (2015: € 133 million) were due to the acquisition of the Sigma-Aldrich Corporation, USA, and primarily consisted of the step-up of the inventories from the purchase price allocation for the Sigma-Aldrich Corporation, USA, which was recognized six months after the acquisition in the income statement as part of cost of sales.

Business free cash flow was determined as follows:

€ million	**2016**	2015
EBITDA pre exceptionals[1]	**4,490**	**3,630**
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–859	–609
Changes in inventories according to the consolidated balance sheet[2]	3	–950
Changes in trade accounts receivable and receivables from royalties and licenses according to the consolidated balance sheet	–177	–514
Adjustment first-time consolidation of Sigma-Aldrich[2]	–149	1,210
Adjustment first-time consolidation of BioControl Systems	10	–
Business free cash flow[1]	**3,318**	**2,766**

[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The reconciliation of operating assets presented in the Segment Reporting to the total assets of the Merck Group was as follows:

€ million	**Dec. 31, 2016**	Dec. 31, 2015[1]
Assets	38,251	38,081
Monetary assets (cash and cash equivalents, current financial assets, loans and securities)	–1,123	–1,093
Non-operating receivables, income tax receivables, deferred taxes and net defined benefit assets	–1,542	–1,484
Assets held for sale	–12	–46
Operating assets (gross)[2]	**35,575**	**35,458**
Trade accounts payable	–2,048	–1,921
Other operating liabilities	–1,729	–1,818
Segment liabilities	**–3,777**	**–3,739**
Operating assets (net)[2]	**31,798**	**31,720**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".
[2] Not defined by International Financial Reporting Standards (IFRS).

Notes to the Consolidated Cash Flow Statement

The consolidated cash flow statement presents the changes in cash and cash equivalents as a result of cash inflows and outflows from operating, investing and financing activities. Further information on cash flows can be found in the explanation of cash and cash equivalents (see Note [23] "Cash and cash equivalents"). The amount of undrawn borrowing facilities that could be tapped for future operating activities and to meet obligations is disclosed in Note [27] "Financial liabilities/Capital management".

The cash flows reported by Group companies in non-functional currencies are in principle translated at average exchange rates. Cash and cash equivalents are translated at the closing rates. The impact of foreign exchange rate changes is disclosed separately under changes in cash and cash equivalents.

(33) Net cash flows from operating activities

In 2016, tax payments totaled € 841 million (2015: € 865 million). Tax refunds totaled € 63 million (2015: € 161 million). Interest paid totaled € 327 million (2015: € 297 million). Interest received amounted to € 22 million (2015: € 54 million).

The neutralization of the profits/losses from the disposal of assets mainly comprises the gain on the sale of the rights to Kuvan®.

(34) Net cash flows from investing activities and financing activities

In 2016, an amount of € 156 million, including acquired cash of € 4 million, was paid for the acquisition of BioControl Systems, Inc., USA. In 2015, this item mainly included the acquisition of the Sigma-Aldrich Corporation, USA, amounting to € 13,454 million.

Net cash outflows from investments in current and non-current financial assets amounting to € 344 million (2015: € 1,741 million) mainly resulted from the purchase of short-term investments in securities not classified as cash and cash equivalents.

Cash inflows from the divestment of assets held for sale included the upfront payment amounting to € 340 million received in January 2016 for the sale of the rights to Kuvan®.

Cash inflows from investing activities include € 24 million from discontinued operations in relation to those business activities of Sigma-Aldrich that were acquired with a view to resale in 2015 (see Note [4] "Acquisitions, assets held for sale and disposal groups").

Net cash flows from financing activities contained the repayment of two bonds amounting to € 272 million. The repayment of other current and non-current financial debt mainly related to the repayment of bank loans to finance the acquisition of the Sigma-Aldrich Corporation, USA.

Other Disclosures

(35) Other disclosures

The following derivatives were held by the Merck Group as of the balance sheet date:

	Nominal volume		Fair value	
€ million	**Dec. 31, 2016**	Dec. 31, 2015	**Dec. 31, 2016**	Dec. 31, 2015
Cash flow hedge	2,741	2,161	–91	–90
Interest	–	–	–	–
Currency	2,741	2,161	–91	–90
Fair value hedge	–	–	–	–
Interest	–	–	–	–
Currency	–	–	–	–
No hedge accounting	8,012	5,468	–55	–103
Interest	1,100	1,100	–87	–99
Currency	6,912	4,368	32	–4
	10,753	**7,629**	**–146**	**–193**

Cash flow hedges included currency hedges in a nominal volume of € 1,795 million (2015: € 1,387 million) with a remaining term of up to one year and hedges in a nominal volume of € 946 million (2015: € 774 million) with a remaining term of more than one year.

The maturities of the derivatives (nominal volume) were as follows as of the balance sheet date:

€ million	**Remaining maturity less than 1 year**	**Remaining maturity more than 1 year**	**Total Dec. 31, 2016**	Remaining maturity less than 1 year	Remaining maturity more than 1 year	Total Dec. 31, 2015
Forward exchange contracts	8,555	784	9,339	5,715	765	6,480
Currency options	153	162	314	40	9	49
Interest rate swaps	–	1,100	1,100	–	1,100	1,100
	8,707	**2,046**	**10,753**	**5,755**	**1,874**	**7,629**

Currency hedging serves to economically protect the company from the foreign exchange risks of the following types of transaction:

- Forecast transactions in non-functional currency, the expected probability of which is very high for the next 36 months,
- Off-balance sheet firm purchase commitments of the next 36 months in non-functional currency,
- Intragroup financing in non-functional currency as well as
- Receivables and liabilities in non-functional currency.

Exchange rate fluctuations of mainly the following currencies against the euro were hedged:

Nominal volume € million	**Dec. 31, 2016**	Dec. 31, 2015
USD	5,031	3,674
CHF	1,211	402
JPY	800	458
CNY	717	480
GBP	576	312
TWD	406	343

Forecast transactions and firm purchase commitments in non-functional currency are hedged using forward exchange contracts and currency options which are due within the next 36 months. Overall, forecast transactions and firm purchase commitments in non-functional currency were hedged in the amount of € 2,741 million (2015: € 1,921 million).

All hedging transactions for forecast transactions and firm purchase commitments in non-functional currency represent cash flow hedges in 2016.

Intragroup financing as well as receivables and payables in non-functional currency were hedged exclusively using forward exchange contracts. Overall, balance sheet items amounting to € 6,912 million (2015: € 4,608 million) were hedged. In this context, the hedging transactions in 2016 were exclusively purely economic hedges for which hedge accounting is not applied.

To fix the interest rate level of a bond issued in August 2015 for refinancing purposes with a volume of € 550 million, in 2012 and 2013 forward starting payer interest rate swaps were entered into with a nominal volume of € 550 million and interest payments from 2015 to 2022. Up until May 2015, these interest hedging relationships represented cash flow hedges. With entry into offsetting transactions in May 2015, the hedging relationship was terminated voluntarily. Therefore, in 2016 an amount of € 13 million (2015: € 4 million) was reclassified from Other Comprehensive Income under the line item "Reclassification to profit or loss" within "Derivative financial instruments" to the financial result. The original transactions as well as the offsetting transactions are now classified as "held for trading". The changes in fair value are reflected in the consolidated income statement.

In 2015, the ineffective portion from hedge accounting amounted to € –3 million. In 2016, there was no ineffectiveness.

(36) Management of financial risks

Market fluctuations with respect to foreign exchange and interest rates represent significant profit and cash flow risks for Merck. Merck aggregates these Group-wide risks and steers them centrally, also by using derivatives. Merck uses scenario analyses to estimate existing risks of foreign exchange and interest rate fluctuations. Merck is not subject to any material risk concentration from financial transactions.

Merck uses derivative financial instruments (hereinafter "derivatives") to hedge risks from currency and interest rate positions. Merck uses marketable forward exchange contracts, options and interest rate swaps as hedging instruments. Depending on the nature of the hedged item, changes in the fair values of derivatives are recorded in the consolidated income statement either in the operating result or in the financial result. 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. Extensive guidelines regulate the use of derivatives. There is a ban on speculation. Derivative transactions are subject to continuous risk management procedures. Trading, settlement and control functions are strictly separated. 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 its international business focus, Merck is exposed to foreign-exchange-related transaction risks within the scope of both ordinary business and financing activities. Different strategies are used to limit or eliminate these risks. Foreign exchange risks from transactions already recognized on the balance sheet are eliminated as far as possible through the use of forward exchange contracts. Foreign exchange risks arising from forecast transactions are analyzed regularly and reduced if necessary through forward exchange contracts or currency options by applying the hedge accounting rules. The Merck Group is exposed to currency translation risks since many Merck companies are located outside the eurozone. The financial statements of these companies are translated into euros. Exchange differences resulting from currency translation of the assets and liabilities of these companies are recognized in equity. These effects are not taken into consideration in the following tables.

The following table presents the net exposure of the Merck Group in relation to exchange rate fluctuations of the major currencies against the euro:

€ million	CHF	CNY	GBP	JPY	TWD	USD
Net exposure Dec. 31, 2016	–267	412	82	154	165	1,009
Net exposure Dec. 31, 2015	–265	203	95	135	215	1,407

The net exposure of each of the aforementioned currencies consists of the following components:

- Planned cash flows in the next 12 months in the respective currency as well as
- Derivatives to hedge these planned cash flows. Usually, the hedging ratio is 30% – 70%.

Balance sheet items in the aforementioned currencies were economically hedged in full in both 2016 and 2015 by derivatives if they did not correspond to the functional currency of the respective company. Accordingly, they do not affect the net exposure presented above.

The following table shows the effects of 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. The effects of planned cash flows of the next 12 months are not taken into consideration here. By contrast, the effects of cash flow hedges are taken into consideration in the equity of the Group and are included in the following table.

€ million Dec. 31, 2016		CHF	CNY	GBP	JPY	TWD	USD
Exchange rate +10% (Appreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	17	–31	–1	–26	–26	–148
Exchange rate –10% (Depreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	–20	38	3	25	32	159

€ million Dec. 31, 2015		CHF	CNY	GBP	JPY	TWD	USD
Exchange rate +10% (Appreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	12	–15	–	–15	–21	–109
Exchange rate –10% (Depreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	–15	19	–	17	25	133

Interest rate risks

The Merck Group's exposure to interest rate changes comprises the following:

€ million	Dec. 31, 2016	Dec. 31, 2015
Short-term or variable interest rate monetary deposits	1,085	1,059
Short-term or variable interest rate monetary borrowings	–4,587	–5,800
Net interest rate exposure	**–3,502**	**–4,741**

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, all securities classified as "available for sale" as well as all derivatives are presented in the following table.

€ million	2016		2015	
Change in market interest rate	**+100 basis points**	**–100 basis points**	**+100 basis points**	**–100 basis points**
Effects on consolidated income statement	–36	22	–47	23
Effects on equity	–	–	–	–

The scenario calculations here assumed that for material variable interest-bearing loan agreements, the risk-free interest rate component (EURIBOR) cannot fall below 0%.

Changes in market interest rates did not have effects on equity since an interest rate hedge for a bond issued in August 2015 for refinancing purposes was voluntarily terminated in 2015 with the entry into an offsetting transaction. Additionally, as in 2015, the level of interest-bearing securities was immaterial as of the balance sheet date.

Share price risks

The shares in publicly listed companies amounting to € 8 million (2015: € 16 million) are generally exposed to a risk of fluctuations in fair value. A 10% change in the value of the stock market would impact equity by € 1 million (2015: € 2 million). This change in value would initially be recognized in equity and then in profit or loss at the time of disposal.

Liquidity risks

The liquidity risk, meaning the risk that Merck cannot meet its payment obligations resulting from financial liabilities, is limited by establishing the required financial flexibility and by effective cash management. Information on bonds issued by the Merck Group and other sources of financing can be found in Note [27] "Financial liabilities/Capital management".

Liquidity risks are monitored and reported to management on a regular basis.

The following tables present the contractual cash flows such as repayments and interest on financial liabilities and derivative financial instruments with a negative fair value as well as the settlement amount of trade accounts payable:

€ million Dec. 31, 2016	Carrying amount	Cash flows < 1 year		Cash flows 1 – 5 years		Cash flows > 5 years	
		Interest	Repayment	Interest	Repayment	Interest	Repayment
Bonds and commercial paper	9,650	224	1,855	759	4,314	245	3,523
Bank loans	1,978	11	1,128	5	600	1	250
Trade accounts payable	2,048	–	2,048	–	–	–	–
Liabilities to related parties	1,215	–	1,215	–	–	–	–
Other financial liabilities	478	–	464	–	14	–	–
Loans from third parties and other financial liabilities	80	6	22	10	55	–	2
Liabilities from derivatives	233	18	95	70	34	17	–
Finance lease liabilities	4	–	1	–	3	–	–
	15,686	**259**	**6,829**	**845**	**5,020**	**263**	**3,775**

€ million Dec. 31, 2015	Carrying amount	Cash flows < 1 year		Cash flows 1 – 5 years		Cash flows > 5 years	
		Interest	Repayment	Interest	Repayment	Interest	Repayment
Bonds and commercial paper	9,851	237	1,272	852	4,201	401	4,429
Bank loans	3,006	19	2,135	13	619	2	250
Trade accounts payable	1,921	–	1,921	–	–	–	–
Liabilities to related parties	1,031	–	1,031	–	–	–	–
Other financial liabilities	451	–	437	–	14	–	–
Loans from third parties and other financial liabilities	89	6	27	11	60	–	3
Liabilities from derivatives	244	17	126	65	14	26	–
Finance lease liabilities	5	–	2	–	3	–	–
	16,599	**279**	**6,951**	**941**	**4,911**	**428**	**4,682**

Credit risks

Merck limits credit risk by only entering into financial contracts with banks and industrial companies with good credit ratings. Moreover, the broad-based business structure with a large number of different customers results in a diversification of credit risks within the Merck Group. The credit risk from financial contracts is monitored daily on the basis of rating information as well as market information on credit default swap rates.

The credit risk of customers is monitored using established credit management processes that take the individual customer risks into account. This is done in particular by continuously analyzing the age structure of trade accounts receivable. Merck continuously reviews and monitors open positions of all trading partners in the affected countries and takes risk-mitigating measures if necessary. If there is objective evidence that particular accounts receivable are fully or partially impaired, respective impairment losses are recognized to provide for credit defaults. On the balance sheet date, the theoretically maximum default risk corresponded to the net carrying amounts less any compensation from credit insurance.

There were no indications of impairment for financial assets neither past due nor impaired on the balance sheet date.

(37) Other disclosures on financial instruments

The following table presents the reconciliation of the balance sheet items to categories of financial instruments pursuant to the disclosures required by IFRS 7 and provides information on the measurement of fair value:

		Subsequent measurement according to IAS 39				
€ million	**Carrying amount Dec. 31, 2016**	Amortized cost	At cost	Fair value	Carrying amount according to IAS 17	Non-financial items
Assets						
Cash and cash equivalents	939	939	–	–	–	–
Current financial assets	145	44	–	101	–	–
Held for trading (non-derivatives)	–	–	–	–	–	–
Derivatives without a hedging relationship	59	–	–	59	–	–
Held to maturity	–	–	–	–	–	–
Loans and receivables	44	44	–	–	–	–
Available for sale	43	–	–	43	–	–
Derivatives with a hedging relationship	–	–	–	–	–	–
Trade accounts receivable	2,889	2,889	–	–	–	–
Loans and receivables	2,889	2,889	–	–	–	–
Other current and non-current other assets[1]	805	277	–	12	–	516
Derivatives without a hedging relationship	1	–	–	1	–	–
Loans and receivables	277	277	–	–	–	–
Derivatives with a hedging relationship	11	–	–	11	–	–
Non-financial items[1]	516	–	–	–	–	516
Non-current financial assets[1]	218	10	59	149	–	–
Derivatives without a hedging relationship	17	–	–	17	–	–
Held to maturity	–	–	–	–	–	–
Loans and receivables	10	10	–	–	–	–
Available for sale[1]	191	–	59	132	–	–
Derivatives with a hedging relationship	–	–	–	–	–	–
Liabilities						
Current and non-current financial liabilities	12,597	12,465	–	128	4	–
Derivatives without a hedging relationship	128	–	–	128	–	–
Other liabilities	12,465	12,465	–	–	–	–
Derivatives with a hedging relationship	–	–	–	–	–	–
Finance lease liabilities	4	–	–	–	4	–
Trade accounts payable	2,048	2,048	–	–	–	–
Other liabilities	2,048	2,048	–	–	–	–
Current and non-current other liabilities	2,386	936	–	105	–	1,345
Derivatives without a hedging relationship	3	–	–	3	–	–
Other liabilities	936	936	–	–	–	–
Derivatives with a hedging relationship	102	–	–	102	–	–
Non-financial items	1,345	–	–	–	–	1,345

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".
[2] The exemption provisions under IFRS 7.29a were applied for information on specific fair values.

		Subsequent measurement according to IAS 39					
Fair value, Dec. 31, 2016[2]	Carrying amount Dec. 31, 2015	Amortized cost	At cost	Fair value	Carrying amount according to IAS 17	Non-financial items	Fair value Dec. 31, 2015[2]
	832	832	–	–	–	–	
	227	33	–	194	–	–	
–	–	–	–	–	–	–	–
59	33	–	–	33	–	–	33
	30	30	–	–	–	–	
	3	3	–	–	–	–	
43	162	–	–	162	–	–	162
–	–	–	–	–	–	–	–
	2,738	2,738	–	–	–	–	
	2,738	2,738	–	–	–	–	
	628	155	–	14	–	459	
1	2	–	–	2	–	–	2
	155	155	–	–	–	–	
11	12	–	–	12	–	–	12
	459	–	–	–	–	459	
	130	17	81	33	–	–	
17	5	–	–	5	–	–	5
	–	–	–	–	–	–	
	17	17	–	–	–	–	
132	109	–	81	28	–	–	28
–	–	–	–	–	–	–	–
	13,713	13,524	–	184	5	–	
128	139	–	–	139	–	–	139
12,802	13,524	13,524	–	–	–	–	13,706
–	45	–	–	45	–	–	45
	5	–	–	–	5	–	
	1,921	1,921	–	–	–	–	
	1,921	1,921	–	–	–	–	
	2,427	904	–	61	–	1,462	
3	3	–	–	3	–	–	3
	904	904	–	–	–	–	
102	57	–	–	57	–	–	57
	1,462	–	–	–	–	1,462	

Net gains and losses on financial instruments mainly included measurement results from fair value adjustments, impairments and reversals of impairments, disposal gains/losses as well as the recognition of premiums and discounts. Dividends and interest were not recognized in the net gains and losses on financial instruments, except for dividends and interest in the category "held for trading". At Merck, the category "held for trading" only included derivatives that were not in a hedging relationship.

The net gains and losses on financial instruments by category (excluding amounts recognized in other comprehensive income) were as follows:

		Net gains and losses			
€ million 2016	**Interest**	**Impairments**	**Reversals of impairment**	**Fair value adjustments**	**Disposal gains/losses**
Financial instruments of the category					
Held for trading				69	
Held to maturity	–	–	–		–
Loans and receivables	18	– 52	59		–
Available for sale	2	– 5	–		34
Other liabilities	– 287				–

		Net gains and losses			
€ million 2015	Interest	Impairments	Reversals of impairment	Fair value adjustments	Disposal gains/losses
Financial instruments of the category					
Held for trading				–15	
Held to maturity	3	–	–		–
Loans and receivables	18	– 84	40		–
Available for sale	11	–	7		18
Other liabilities	– 314				–

In 2016, foreign exchange losses of € – 57 million resulting from receivables and payables in operating business, their economic hedging, as well as hedging of forecast transactions in operating business were recorded (2015: foreign exchange losses of € – 49 million). Foreign exchange losses of € – 4 million resulting from financial balance sheet items, their economic hedging as well as fair value fluctuations of option contracts to hedge forecast transactions were recorded (2015: losses of € – 40 million).

The fair value of financial assets and liabilities is based on the official market prices and market values quoted on the balance sheet date (Level 1 assets and liabilities) as well as mathematical calculation models with inputs observable in the market on the balance sheet date (Level 2 assets and liabilities). Level 1 assets comprised stocks and bonds and were classified as "available for sale", Level 1 liabilities comprised issued bonds and were classified as "other liabilities". Level 2 assets and liabilities were primarily liabilities to banks classified as "other liabilities", unlisted equity instruments classified as "available for sale" as well as derivatives with and without hedging relationships.

The fair value of the liabilities classified as "other liabilities" was determined by discounting future cash flows using market interest rates. The calculation of the fair value of forward exchange contracts and currency options used spot and forward rates observable in the market as well as foreign exchange volatilities applying recognized mathematical principles. The fair value of interest rate swaps is determined with standard market valuation models using interest rate curves available in the market. The fair values of unlisted equity instruments were derived from observable prices taken from equity refinancing transactions.

Level 3 assets were classified as "available for sale". These comprised an interest in a partnership, contingent consideration from the sale of an interest in a corporation as well as contingent consideration from the divestment of business activities in connection with the product Kuvan®. They also included equity investments in unlisted funds. The fair value of the interest in the partnership was determined through an internally performed valuation using the discounted cash flow method. Expected future cash flows based on the company's latest medium-term planning were taken

into account. The planning relates to a period of five years. Cash flows for periods beyond this were included in the terminal value calculation by applying a long-term growth rate of 0.5% (2015: 0.5%). The after-tax discount rate used was 7.0% (2015: 7.0%). To calculate the fair values of the contingent consideration components, the expected future milestone payments were weighted using the probability of occurrence and discounted using after-tax discount rates of 7.1%. The determination of the fair values of the fund investments took into account the fair values of companies in which the funds were invested.

Level 3 liabilities consisted of contingent consideration from the acquisition of a corporation. These were reported as "other liabilities" and amounted to € 1 million as of the balance sheet date.

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

The fair values of investments in equity instruments classified as "available for sale" with a carrying amount of € 59 million (2015: € 81 million) could not be reliably determined since there was no quoted price for an identical instrument in an active market and it was not possible to make a reliable estimate of fair value. They were measured at cost. Financial investments primarily included investments in equity instruments in various companies. There is currently no intention to sell these financial instruments. The Merck Group had no information on a market for these financial instruments.

The amounts of the financial instruments recognized at fair value in the balance sheet and the disclosed fair values for financial instruments were determined as follows:

€ million Dec. 31, 2016	Assets	Liabilities
Fair value determined by official prices and quoted market values (Level 1)	**54**	**9,058**
thereof: available for sale	54	–
thereof: other liabilities	–	9,058
Fair value determined using inputs observable in the market (Level 2)	**134**	**3,978**
thereof: available for sale	46	–
thereof: derivatives with a hedging relationship	11	102
thereof: derivatives without a hedging relationship	77	131
thereof: other liabilities	–	3,744
Fair value determined using inputs unobservable in the market (Level 3)	**75**	**1**
thereof: available for sale	75	–
thereof: other liabilities	–	1

€ million Dec. 31, 2015	Assets	Liabilities
Fair value determined by official prices and quoted market values (Level 1)	**178**	**9,022**
thereof: available for sale	178	–
thereof: other liabilities	–	9,022
Fair value determined using inputs observable in the market (Level 2)	**51**	**4,928**
thereof: available for sale	–	–
thereof: derivatives with a hedging relationship	12	102
thereof: derivatives without a hedging relationship	39	142
thereof: other liabilities	–	4,684
Fair value determined using inputs unobservable in the market (Level 3)	**12**	**1**
thereof: available for sale	12	–
thereof: other liabilities	–	1

The changes in financial assets and liabilities assigned to Level 3 and measured at fair value were as follows:

€ million	**2016**	2015
Net book values as of January 1	**11**	**11**
Additions due to acquisitions/disposals	46	–1
Transfers to Level 3 from previous measurement at cost/Level 1/Level 2	16	–
Fair value changes		
Gains (+)/losses (–) recognized in consolidated income statement	4	–
Gains (+)/losses (–) recognized in consolidated statement of comprehensive income	–3	1
Disposals	–	–
Transfers out of Level 3 into Level 1/Level 2	–	–
Net book values as of December 31	**74**	**11**

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" related to "available-for-sale financial assets". If the discount rate used for the determination of the fair value of the interest in the partnership had been one percentage point higher, other comprehensive income would have decreased by € 2 million. By contrast, a decline in the discount rate by one percentage point would have increased other comprehensive income by € 3 million. An increase or decrease in the discount rates used to calculate the fair values of the contingent consideration components would not have had a material impact on other comprehensive income since the corresponding calculations assume a limited planning horizon and the determination of the fair values does not include a calculation of a terminal value.

Balance sheet netting of financial instruments is not possible. From an economic perspective, netting is only possible for derivatives. This possibility results from the framework agreements on derivatives trading which Merck enters into with commercial banks. Merck does not offset financial assets and financial liabilities in its balance sheet.

The following table presents the potential netting volume of the reported derivative financial assets and liabilities:

				Potential netting volume		
€ million Dec. 31, 2016	**Gross presentation**	**Netting**	**Net presentation**	**due to master netting agreements**	**due to financial collateral**	**Potential net amount**
Derivative financial assets	88	–	88	64	–	24
Derivative financial liabilities	–233	–	–233	–64	–	–170

				Potential netting volume		
€ million Dec. 31, 2015	Gross presentation	Netting	Net presentation	due to master netting agreements	due to financial collateral	Potential net amount
Derivative financial assets	51	–	51	46	–	5
Derivative financial liabilities	–245	–	–245	–46	–	–199

(38) Contingent liabilities

€ million	Dec. 31, 2016	Dec. 31, 2015
Contingent liabilities from legal disputes and tax matters	73	64
Guarantees/Warranties	2	1

Contingent liabilities from legal disputes included potential obligations, for which the probability of an outflow of resources did not suffice to recognize a provision as of the balance sheet date. These mainly related to obligations under civil law as well as under environmental and antitrust law. The potential civil law obligations primarily related to potential liabilities to pay damages due to a legal dispute under antitrust law. It was possible that Merck would be subject to claims for compensation for damages asserted by health insurance companies due to excessively high drug prices in case of a valid judgment under antitrust law.

In addition, there were contingent liabilities from various legal disputes with Merck & Co. of the United States (outside the United States and Canada: Merck Sharp & Dohme (MSD)), among other things due to breach of the co-existence agreement between the two companies and/or trademark/name right infringement regarding the use of the designation "Merck." 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 taken into account in the table presented above.

Contingent liabilities pertaining to tax matters included various non-German income and non-income-related tax matters that mainly related to intragroup business transfers as well as legal disputes attributable to the determination of earnings under tax law, customs regulations, excise tax matters, and transfer pricing adjustments.

(39) Other financial obligations

Other financial obligations comprised the following:

€ million	Dec. 31, 2016	Dec. 31, 2015
Obligations to acquire intangible assets and to pay due to collaboration agreements	2,826	3,021
Obligations to acquire property, plant and equipment	187	109
Future operating lease payments	362	344
Long-term purchase commitments	309	384
Other financial obligations	208	35
	3,891	**3,892**

Obligations to acquire intangible assets existed in particular owing to contingent consideration and within the scope of research and development collaborations. Here Merck has obligations to make milestone payments when certain objectives are reached. In the unlikely event that all contract partners achieve all milestones, Merck would be obligated to pay up to € 1,456 million (2015: € 1,544 million) for the acquisition of intangible assets.

Moreover, within the scope of collaboration agreements, individual research and development or commercialization budgets were contractually set, upon the basis of which collaboration partners can commit Merck to make payments in the amount of up to € 1,370 million (2015: € 1,447 million).

The expected maturities of these obligations were as follows:

€ million	Dec. 31, 2016	Dec. 31, 2015
Obligations to acquire intangible assets and to pay due to collaboration agreements		
within one year	263	258
in 1–5 years	1,176	1,219
more than 5 years	1,387	1,544
	2,826	**3,021**

The increase in the other financial obligations is largely attributable to a building leasing agreement, the term of which starts in 2017.

Other financial obligations were recognized at nominal value.

The maturities of liabilities from lease agreements were as follows:

€ million Dec. 31, 2016	within 1 year	1–5 years	more than 5 years	Total
Present value of future payments from finance leases	1	2	–	4
Interest component of finance leases	–	–	–	–
Future finance lease payments	**2**	**2**	**–**	**4**
Future operating lease payments	**112**	**221**	**29**	**362**

€ million Dec. 31, 2015	within 1 year	1–5 years	more than 5 years	Total
Present value of future payments from finance leases	2	3	–	5
Interest component of finance leases	–	–	–	–
Future finance lease payments	**2**	**3**	**–**	**5**
Future operating lease payments	**99**	**207**	**38**	**344**

Operating leasing agreements related mainly to leasing arrangements to lease real estate, company fleet vehicles as well as operating and office equipment. The payments resulting from operating leasing agreements amounted to € 132 million (2015: € 113 million) and were recorded as an expense in the reporting period.

(40) Personnel expenses / Headcount

Personnel expenses comprised the following:

€ million	2016	2015
Wages and salaries	3,575	2,993
Compulsory social security contributions and special financial assistance	555	432
Pension expenses	226	210
	4,356	**3,634**

As of December 31, 2016, the Merck Group had 50,414 employees (2015: 49,613). The average number of employees during the year was 50,439 (2015: 41,511). The increase was mainly due to the acquisition of the Sigma-Aldrich Corporation, USA, which was completed on November 18, 2015.

The breakdown of personnel by function was as follows:

Average number of employees	2016	2015
Production	14,829	11,563
Logistics	3,955	2,581
Marketing and Sales	14,887	12,871
Administration	8,190	6,763
Research and Development	6,249	5,097
Infrastructure and Other	2,329	2,636
	50,439	**41,511**

(41) Material costs

Material costs in 2016 amounted to € 2,358 million (2015: € 1,737 million) and were largely reported under cost of sales.

(42) Auditors' fees

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

	2016		2015	
€ million	**Merck Group**	**thereof: KPMG Germany**	Merck Group	thereof: KPMG Germany
Audits of financial statements	8.2	2.2	7.9	2.2
Other audit-related services	0.3	0.2	1.0	0.8
Tax consultancy services	0.7	0.5	0.9	0.5
Other services	1.4	1.3	1.2	0.9
	10.6	**4.2**	**11.0**	**4.4**

(43) Corporate governance

The Statement of Compliance in accordance with section 161 of the German Stock Corporation Act (Aktiengesetz) was published in the corporate governance section of the website www.merckgroup.com/investors → corporate governance in March 2016 and thus made permanently available.

(44) Companies opting for exemption under section 264 (3) HGB or section 264b HGB

The following companies, which have been consolidated in these financial statements, opted for exemption:
Allergopharma GmbH & Co. KG, Reinbek
Allergopharma Verwaltungs GmbH, Darmstadt
Biochrom GmbH, Berlin
Chemitra GmbH, Darmstadt
Litec-LLL GmbH, Greifswald
Merck Accounting Solutions & Services Europe GmbH, Darmstadt
Merck Chemicals GmbH, Darmstadt
Merck Consumer Health Holding GmbH, Darmstadt
Merck Export GmbH, Darmstadt
Merck Life Science GmbH, Eppelheim
Merck Selbstmedikation GmbH, Darmstadt
Merck Serono GmbH, Darmstadt
Merck Versicherungsvermittlung GmbH, Darmstadt

(45) Related-party disclosures

Related parties in respect of the Merck Group are E. Merck KG, Emanuel-Merck-Vermögens-KG and E. Merck Beteiligungen KG. In principle, direct or indirect subsidiaries of Merck KGaA, associates of the Merck Group, jointly controlled companies where the Merck Group is involved, 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. This also includes the companies Merck Capital Asset Management Ltd., Malta, and Merck Pensionstreuhandverein e.V. Members of the Executive Board and the Supervisory Board of Merck KGaA, the Executive Board and the Board of Partners of E. Merck KG as well as close members of their families are also related parties.

As of December 31, 2016, there were liabilities by Merck Financial Services GmbH, Merck KGaA and Merck & Cie, Switzerland, to E. Merck KG in the amount of € 1,186.3 million (2015: € 1,031.2 million). In addition, as of December 31, 2016, Merck KGaA had receivables from E. Merck Beteiligungen KG in the amount of € 123.7 million (2015: € 35.4 million). Merck Financial Services GmbH had receivables from Merck Capital Asset Management Ltd., Malta, in the amount of € 2.5 million (2015: € 0.0 million) and from Merck Pensionstreuhandverein e.V. in the amount of € 0.1 million (2015: € 0.0 million). The balances result mainly from the profit transfers by Merck & Cie, Switzerland, to E. Merck KG as well as the reciprocal profit transfers between Merck KGaA and E. Merck KG. They included financial liabilities of € 729.2 million (2015: € 577.8 million) and financial receivables of € 2.5 million (2015: € 0.0 million), which were 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 Merck Group.

From January to December 2016, Merck KGaA performed services for E. Merck KG with a value of € 1.0 million (2015: € 0.9 million), for E. Merck Beteiligungen KG with a value of € 0.1 million (2015: € 0.3 million), and for Emanuel-Merck-Vermögens-KG with a value of € 0.2 million (2015: € 0.2 million). During the same period, E. Merck KG performed services for Merck KGaA with a value of € 0.5 million (2015: € 0.5 million).

As of December 31, 2016, there were receivables from the Venezuelan entities deconsolidated as of February 29, 2016 (see Note [3] “Changes in the Scope of Consolidation”) with a carrying amount of € 25.7 million after impairment losses and liabilities with a carrying amount of € 24.2 million. Merck no longer makes any commercial deliveries to Venezuelan entities. For ethical reasons, essential drugs to treat cancer and multiple sclerosis are provided to patients to a certain extent. Revenues are recognized when payment is received and were consequently not included in the stated receivables. From March to December 2016, the Merck Group generated revenues of € 0.4 million from these deliveries and services. During the same period, the production costs of these deliveries and services totaled € 13.7 million.

As of December 31, 2016, there were receivables of € 18.8 million (2015: € 15.5 million) and liabilities of € 12.1 million (2015: € 10.5 million) vis-à-vis non-consolidated subsidiaries. From January to December 2016, the Merck Group generated revenues of € 0.9 million (2015: € 0.8 million) with these companies. During the same period, expenses amounting to € 6.1 million (2015: € 1.7 million) were incurred as a result of transactions with these companies.

Information on pension funds that are classified as defined benefit plans in accordance with IAS 19 can be found in Note [25] "Provisions for pensions and other post-employment benefits". There were no further material transactions with these pension funds.

In 2016, there were no material transactions such as, for example, the provision of services or the granting of loans, between companies of the Merck Group and members of the Executive Board or the Supervisory Board of Merck KGaA, the Executive Board or the Board of Partners of E. Merck KG or members of their immediate families.

(46) Executive Board and Supervisory Board compensation

The compensation of the Executive Board of Merck KGaA is paid by the general partner, E. Merck KG, and recorded as an expense in its income statement. For the period from January to December 2016, fixed salaries of € 6.6 million (2015: € 6.5 million), variable compensation of € 16.8 million (2015: € 22.3 million), and additional benefits of € 0.2 million (2015: € 0.3 million) were recorded for members of the Executive Board. Furthermore, additions to the provisions of E. Merck KG for the Long-Term Incentive Plan totaled € 12.5 million (2015: € 9.9 million), and additions to the pension provisions of E. Merck KG included current service costs of € 2.8 million (2015: € 4.2 million) and past service costs of € 3.5 million (2015: € 0.0 million) for members of the Executive Board of Merck KGaA.

The compensation of the Supervisory Board amounting to € 869.0 thousand (2015: € 881.0 thousand) consisted of a fixed portion of € 822.5 thousand (2015: € 822.5 thousand) and meeting attendance compensation of € 46.5 thousand (2015: € 58.5 thousand).

Further individualized information and details can be found in the Compensation Report on pages 160 et seq.

(47) Information on preparation and approval

The Executive Board of Merck KGaA prepared the consolidated financial statements on February 14, 2017 and approved them for forwarding to the Supervisory Board. The Supervisory Board has the responsibility to examine the consolidated financial statements and to declare whether it approves them.

(48) Subsequent events

On January 11, 2017, Merck announced a licensing agreement with Vertex Pharmaceuticals Inc., Boston, USA, (Vertex). Within the scope of this agreement, Vertex will transfer to Merck the worldwide development and commercialization of four research and development programs that represent novel approaches to the treatment of cancer. In return, Merck will make an upfront payment of US$ 230 million (€ 218 million based on the exchange rate on January 11, 2017). In addition, Merck is obligated to pay royalties on future product sales.

On February 6, 2017, Merck entered into a contractual agreement according to which Merck will receive a one-time payment as compensation for future royalty and license payments. As a consequence of this agreement, in 2017 Merck will receive cash inflows of US$ 123 million (€ 114 million based on the exchange rate on February 6, 2017), which will be recognized as income in 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 and results of operations of the Merck Group.

Accounting and Measurement Policies

(49) Measurement policies

The main assets and liabilities disclosed in the consolidated balance sheet are measured as follows:

Balance sheet item	Measurement principle
ASSETS	
Intangible assets	
With finite useful life	Amortized cost
With indefinite useful life or not yet available for use	Amortized cost (subsequent measurement: impairment-only approach)
Property, plant and equipment	Amortized cost
Financial assets (current / non-current)	
Held-to-maturity investments	Amortized cost
Available-for-sale financial assets	Fair value
Loans and receivables	Amortized cost
Derivative assets (financial transactions)	Fair value
Other assets	
Derivative assets (operational)	Fair value
Receivables from non-income related taxes	Amortized cost
Other receivables	Amortized cost
Deferred tax assets	Undiscounted measurement based on tax rates that are expected to apply to the period when the asset is realized or the liability is settled
Inventories	Lower of cost and net realizable value
Trade accounts receivable	Amortized cost
Income tax receivables	Expected tax refunds based on tax rates that have been enacted or substantively enacted by the end of the reporting period
Cash and cash equivalents	Nominal value
Assets held for sale	Lower of carrying amount and fair value less costs to sell

Balance sheet item	Measurement principle
Equity and Liabilities	
Provisions for pensions and other post-employment benefits	Projected unit credit method
Other provisions (current/non-current)	Present value of the expenditures expected to be required to settle the obligation
Financial liabilities (current/non-current)	
Bonds	Amortized cost
Liabilities to related parties	Amortized cost
Bank loans	Amortized cost
Liabilities from derivatives (financial transactions)	Fair value
Finance lease liabilities	Amortized cost
Other liabilities (current/non-current)	
Liabilities from derivatives (operational)	Fair value
Liabilities from non-income-related taxes	Settlement amount
Other liabilities	Settlement amount
Deferred tax liabilities	Undiscounted measurement based on tax rates that are expected to apply to the period when the asset is realized or the liability is settled
Trade accounts payable	Amortized cost
Income tax liabilities	Expected tax payments based on tax rates that have been enacted or substantively enacted by the end of the reporting period
Liabilities directly related to assets held for sale	Fair value

(50) Consolidation methods

The consolidated financial statements are based on the single-entity financial statements of the consolidated companies as of the balance sheet date, which were prepared applying consistent accounting policies in accordance with IFRS.

Acquisitions are accounted for using the purchase method in accordance with IFRS 3. Subsidiaries acquired and consolidated for the first time were measured at the carrying values at the time of acquisition. Differences resulting in this context are recognized as assets and liabilities to the extent that their fair values differ from the values carried in the financial statements. Any remaining – and usually – positive difference is recognized as goodwill within intangible assets.

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. The option to measure non-controlling interests at fair value on the date of their acquisition (full goodwill method) was not utilized.

When additional shares in non-controlling interests are acquired, the purchase price amount that exceeds the carrying amount of this interest is recognized immediately in equity.

IFRS 11 is applied for joint arrangements. A joint arrangement exists when, on the basis of a contractual arrangement, Merck and third parties jointly control business activities. Joint control means that decisions about the relevant activities require unanimous consent. Joint arrangements are either joint operations or joint ventures. Revenues and expenses as well as assets and liabilities from joint operations are included in the consolidated financial statements on a pro rata basis in accordance with Merck's rights and obligations. By contrast, interests in joint ventures as well as in material associates over which Merck has significant influence are included in accordance with IAS 28 using the equity method of accounting.

Intragroup sales, expenses and income, as well as all receivables and payables between the consolidated companies, are eliminated. The effects of intragroup deliveries reported under non-current assets and inventories are adjusted by eliminating any intragroup profits. In accordance with IAS 12, deferred taxes are applied to these consolidation measures.

(51) Currency translation

The functional currency concept applies to the translation of financial statements of consolidated companies prepared in foreign currencies. The subsidiaries of the Merck Group generally conduct their operations independently. The functional currency of these companies is normally the respective local currency. Assets and liabilities are measured at the closing rate, and income and expenses are measured at weighted average annual rates in euros, the reporting currency. Any currency translation differences arising during consolidation of Group companies are recognized in equity. If Group companies are deconsolidated, existing currency differences are reversed and reclassified to profit or loss.

When the financial statements of consolidated companies are prepared, business transactions that are conducted in currencies other than the functional currency are recorded using the current exchange rate on the date of the transaction. Foreign currency monetary items (cash and cash equivalents, receivables and payables) in the year-end financial statements of the consolidated companies prepared in the functional currency are translated at the respective closing rates. Exchange differences from the translation of monetary items are recognized in the income statement with the exception of net investments in a foreign operation. Hedged items are likewise carried at the closing rate. The resulting gains or losses are eliminated in the consolidated income statement against offsetting amounts from the fair value measurement of derivatives.

Currency translation was based on the following key exchange rates:

	Average annual rate		Closing rate	
€ 1 =	**2016**	2015	**Dec. 31, 2016**	Dec. 31, 2015
British pound (GBP)	0.816	0.728	0.857	0.737
Chinese renminbi (CNY)	7.343	7.003	7.343	7.183
Japanese yen (JPY)	121.127	134.431	123.070	131.576
Swiss franc (CHF)	1.090	1.075	1.075	1.081
Taiwan dollar (TWD)	35.571	35.337	34.004	35.831
U.S. dollar (USD)	1.102	1.112	1.051	1.093

(52) Recognition of net sales and other income

Net sales and other income are recognized when the amount of revenue can be measured reliably, it is probable that the economic benefits will flow to the entity and when the following preconditions have been met.

Net sales are deemed realized once the goods are delivered or the services have been rendered and the significant risks and rewards of ownership have been transferred to the purchaser. In the case of sales of equipment in the Life Science business sector, these preconditions 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.

Net sales are recognized net of sales-related taxes and sales deductions. When sales are recognized, estimated amounts are taken into account for expected sales deductions, for example rebates, discounts and returns.

The vast majority of Group sales are generated by the sale of goods.

In the Healthcare business sector, products are often sold to pharmaceutical wholesalers and to a lesser extent directly to pharmacies or hospitals. In the Life Science and Performance Materials business sectors, products are largely sold to business customers, and to a lesser extent to distributors.

In addition to revenue from the sale of goods, sales also include commission income, profit-sharing and in the Life Science business sector revenue from services, but the volume involved is insignificant. In the case of long-term service agreements, Merck records the sales revenues on a pro rata basis over the term of the agreement or in accordance with the services rendered.

Revenues from multiple-element arrangements (e.g. sales of goods in combination with services) are recognized when the respective contract element is delivered or rendered.

Royalty and license income is recognized when the contractual obligation has been met.

Dividend income is recognized when the shareholders' right to receive the dividend is established. This is normally the date of the dividend resolution.

Interest income is recognized in the period in which it is earned.

(53) Research and development costs

Research and development costs comprise the costs of research departments and process development, the expenses incurred as a result of research and development collaborations as well as the costs of clinical trials (both before and after approval is granted).

The costs of research cannot be capitalized and are expensed in full in the period in which they are incurred. As internally generated intangible assets, it is necessary to capitalize development expenses if the cost of the internally generated intangible asset can be reliably determined and the asset can be expected to lead to future economic benefits. The condition for this is that the necessary resources are available for the development of the asset, technical feasibility of the asset is given, its completion and use are intended, and marketability is given. Owing to the high risks up to the time that pharmaceutical products are approved, these criteria are not met in the Healthcare business sector. Costs incurred after regulatory approval are usually insignificant and are therefore not recognized as intangible assets. Owing to the risks existing up until market launch, development expenses in the Life Science and Performance Materials business sectors can likewise not be capitalized.

Reimbursements for R&D are offset against research and development costs.

(54) Intangible assets

Acquired intangible assets are recognized at cost and are classified as assets with finite and indefinite useful lives. Self-developed intangible assets are only capitalized if the requirements specified by IAS 38 have been met. Intangible assets acquired in the course of business combinations are recognized at fair value on the acquisition date. If the development of intangible assets takes a substantial period of time, the directly attributable borrowing costs incurred up until completion are capitalized as part of the costs.

Intangible assets with indefinite useful lives and intangible assets not yet available for use

Intangible assets with indefinite useful lives and intangible assets not yet available for use are not amortized; however they are tested for impairment when a triggering event arises or at least once a year. Here, the respective carrying amounts are compared with the recoverable amount and impairments are recognized as required. Impairment losses other than goodwill recognized on indefinite-life intangible assets and intangible assets not yet available for use are reversed if the original reasons for impairment no longer apply.

Goodwill is allocated to cash-generating units or groups of cash-generating units and tested for impairment either annually or if there are indications of impairment. The carrying amounts of the cash-generating units or groups of cash-generating units are compared with their recoverable amounts and impairment losses are recognized where the recoverable amount is lower than the carrying amount. The recoverable amount of a cash-generating unit is determined as the higher of fair value less costs of disposal and value in use estimated using the discounted cash flow method.

Intangible assets with finite useful lives

Intangible assets with a finite useful life are amortized using the straight-line method. The useful lives of customer relationships, marketing authorizations, acquired patents, licenses and similar rights, brand names, trademarks and software are between three and 24 years. Amortization of intangible assets and software is allocated to the functional costs in the consolidated income statement. An impairment test is performed if there are indications of impairment. Impairment losses are determined using the same methodology as for indefinite-life intangible assets. Impairment losses are reversed if the original reasons for impairment no longer apply.

(55) Property, plant and equipment

Property, plant and equipment is measured at cost less depreciation and impairments plus reversals of impairments. The component approach is applied here in accordance with IAS 16. Subsequent costs are only capitalized if it is probable that future economic benefits will arise for the Group and the cost of the asset can be measured reliably. The cost of self-constructed property, plant and equipment is calculated on the basis of the directly attributable unit costs and an appropriate share of overheads. If the construction of property, plant and equipment takes a substantial period of time, the directly attributable borrowing costs incurred up until completion are capitalized as part of the costs. In accordance with IAS 20, costs are reduced by the amount of government grants in those cases where government grants or subsidies have been paid for the acquisition or manufacture of assets (grants related to assets). Grants related to expenses which no longer offset future expenses are recognized in profit or loss. Property, plant and equipment is

depreciated by the straight-line method over the useful life of the asset concerned. Depreciation of property, plant and equipment is based on the following useful lives:

USEFUL LIFE OF PROPERTY, PLANT AND EQUIPMENT

	Useful life
Production buildings	maximum of 33 years
Administration buildings	maximum of 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. If indications of a decline in value exist, an impairment test is performed. If the reasons for an impairment loss no longer exist, a reversal of the impairment loss recognized in prior periods is recorded.

(56) Leasing

Where non-current assets are leased and economic ownership lies with Merck (finance lease), the asset is recognized at the present value of the minimum lease payments or the lower fair value in accordance with IAS 17 and depreciated over its useful life. The corresponding payment obligations from future lease payments are recorded as liabilities. If an operating lease is concerned, the associated expenses are recognized in the period in which they are incurred.

(57) Financial instruments: Principles

A financial instrument is a contractual arrangement that gives rise to a financial asset of one entity and a financial liability or an equity instrument of another entity. A distinction is made between non-derivative and derivative financial instruments.

Merck accounts for regular way purchases or sales of non-derivative financial instruments at the settlement date and of derivatives at the trade date.

Upon initial recognition, financial assets and financial liabilities are measured at fair value, taking into account any transaction costs, if necessary.

Financial assets are derecognized in part or in full if the contractual rights to the cash flows from the financial asset have expired or have been fulfilled or if control and substantially all the risks and rewards of ownership of the financial asset have been transferred to a third party. Financial liabilities are derecognized if the contractual obligations have been discharged, cancelled, or expired. Cash and cash equivalents are carried at nominal value.

(58) Financial instruments: Categories and classes of financial instruments

Financial assets and liabilities are classified into the following IAS 39 measurement categories and IFRS 7 classes. The classes required to be disclosed in accordance with IFRS 7 consist of the measurement categories set out here. Additionally, cash and cash equivalents with an original maturity of up to 90 days, finance lease liabilities, and derivatives designated as hedging instruments are also classes in accordance with IFRS 7.

Financial assets and financial liabilities at fair value through profit or loss

"Financial assets and financial liabilities at fair value through profit or loss" can be both non-derivative and derivative financial instruments. Financial instruments in this category are subsequently measured at fair value. Gains and losses on financial instruments in this measurement category are recognized directly in the consolidated income statement. This measurement category includes an option to designate non-derivative financial instruments as "at fair value through profit or loss" on initial recognition (fair value option) or as "financial instruments held for trading". The fair value option was applied neither during the fiscal year nor the previous year. Merck only assigns derivatives to the "held for trading" measurement category. Special accounting rules apply to derivatives that are designated as hedging instruments in a hedging relationship.

Held-to-maturity investments

"Held-to-maturity investments" are non-derivative financial assets with fixed or determinable payments and a fixed maturity that are quoted in an active market. To be able to assign a financial asset to this measurement category, the entity must have the positive intention and ability to hold it to maturity. These investments are subsequently measured at amortized cost using the effective rate method. If there is objective evidence that such an asset is impaired, an impairment loss is recognized in profit or loss. Subsequent reversals of impairment losses are also recognized in profit or loss up to the amount of the amortized cost. At Merck, this measurement category is used for current financial assets.

Loans and receivables

"Loans and receivables" are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. They are subsequently measured at amortized cost using the effective rate method. If there is objective evidence that such assets are impaired, an impairment loss is recognized in profit or loss. Subsequent reversals of impairment losses are also recognized in profit or loss up to the amount of amortized cost. Long-term non-interest-bearing and low-interest receivables are measured at their present value. Merck primarily assigns trade receivables, loans, and miscellaneous other current and non-current receivables to this measurement category. Merck always uses a separate allowance account for impairment losses on trade and other receivables. Amounts from the allowance account are recognized in the carrying amount of the corresponding receivable as soon as this is derecognized due to irrecoverability.

Available-for-sale financial assets

"Available-for-sale financial assets" are those non-derivative financial assets that are not assigned to the measurement categories "financial assets and financial liabilities at fair value through profit or loss", "held-to-maturity investments" or "loans and receivables". Financial assets in this category are subsequently measured at fair value. Generally, changes in fair value are recognized immediately in equity and are only transferred to the consolidated income statement when the financial asset is derecognized. Changes in the fair values of contingent consideration resulting from adjustments to cash flow estimated are recognized in profit or loss. If there is substantial evidence of an asset impairment, the accumulated loss recognized immediately in equity is to be reclassified to the consolidated income statement, even if the financial asset has not been derecognized. Reversals of impairment losses on previously impaired equity instruments are recognized immediately in equity. Reversals of impairment losses on previously impaired debt instruments are recognized in profit or loss up to the amount of the impairment loss. Any amount in excess of this is recognized directly in equity. Financial assets in this category for which no fair value is available or fair value cannot be reliably determined are measured at cost less any accumulated impairment losses. Impairment losses on financial assets carried at cost may not be reversed. At Merck, this measurement category is used in particular for interest-bearing securities, financial assets, contingent consideration, and financial investments in equity instruments as well as interests in subsidiaries that are not consolidated due to secondary importance (affiliates). Both interests in non-consolidated subsidiaries as well as to some extent financial investments in equity instruments are measured at cost.

Other liabilities

Other liabilities are non-derivative financial liabilities that are subsequently measured at amortized cost. Differences between the amount received and the amount to be repaid are amortized to profit or loss over the maturity of the instrument. Merck primarily assigns financial liabilities such as issued bonds and bank loans, trade payables, and miscellaneous other non-derivative current and non-current liabilities to this category.

(59) Financial instruments: Derivatives and hedge accounting

Merck uses derivatives solely to economically hedge recognized assets or liabilities and forecast transactions. The hedge accounting rules in accordance with IFRS are applied to some of these hedges. A distinction is made between fair value hedge accounting and cash flow hedge accounting. Designation of a hedging relationship requires a hedged item and a hedging instrument. Merck currently only uses derivatives as hedging instruments.

The hedging relationship must be effective at all times, i.e. the change in fair value of the hedging instrument almost fully offsets changes in the fair value of the hedged item. Merck uses the dollar offset method as well as regression analyses to measure hedge effectiveness. 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 and liabilities at fair value through profit or loss". Changes in fair value are then recognized in profit or loss.

At Merck, cash flow hedges normally relate to highly probable forecast transactions in foreign currency and to future interest payments. In cash flow hedges, the effective portion of the gains and losses on the hedging instrument taking deferred taxes into consideration is recognized in equity until the hedged expected cash flows affect profit or loss. This is also the case if the hedging instrument expires, is sold, or is terminated before the hedged transaction occurs and the occurrence of the hedged item remains likely. The ineffective portion of a cash flow hedge is recognized directly in profit or loss.

(60) Other non-financial assets and liabilities

Other non-financial assets are carried at amortized cost. Allowances are recognized for any credit risks. Long-term non-interest-bearing and low-interest receivables and liabilities are carried at their present value. Other non-financial liabilities are carried at the amount to be repaid.

(61) Deferred taxes

Deferred tax assets and liabilities result from temporary differences between the carrying amount of an asset or liability in the IFRS and tax balance sheets of consolidated companies as well as from consolidation activities, insofar as the reversal of these differences will occur in the future. In addition, deferred tax assets are recorded in particular for tax loss carryforwards if and insofar as their utilization is probable in the foreseeable future. In accordance with the liability method, the tax rates enacted and published as of the balance sheet date are used.

Deferred tax assets and liabilities are only offset on the balance sheet date if they meet the requirements of IAS 12.

(62) Inventories

Inventories are carried at the lower of cost or net realizable value. When determining cost, the "first-in, first-out" (FIFO) and weighted average cost formulas are used. In addition to directly attributable unit costs, manufacturing costs also include overheads attributable to the production process, which are determined on the basis of normal capacity utilization of the production facilities.

Inventories are written down if the net realizable value is lower than the acquisition or manufacturing cost carried in the balance sheet.

Since the inventories are not manufactured within the scope of long-term production processes, the manufacturing costs do not include any borrowing costs.

Inventory prepayments are recorded under other current assets.

(63) Provisions for pensions and other post-employment benefits

Provisions for pensions and other post-employment benefits are recorded in the balance sheet in accordance with IAS 19. The obligations under defined benefit plans are measured using the projected unit credit method. Under the projected unit credit method, dynamic parameters are taken into account in calculating the expected benefit payments after an insured event occurs; these payments are spread over the entire period of service of the participating employees. Annual actuarial opinions are prepared for this purpose. The actuarial assumptions, e.g. for discount rates, salary and pension trends, which were used to calculate the benefit obligation, were determined on a country-by-country basis in line with the economic conditions prevailing in each country; the latest country-specific actuarial mortality table was used in each case. The respective discount rates are generally determined on the basis of the returns on high-quality corporate bonds issued with adequate maturities and currencies. For euro-denominated obligations, bonds with ratings of at least "AA" from one of the three major rating agencies (Standard & Poor's, Moody's or Fitch), and a euro swap rate of adequate duration served as the basis for the data. Actuarial gains and losses resulting from changes in actuarial assumptions and/or experience adjustments (the effects of differences between the previous actuarial assumptions and what has actually occurred) are recognized immediately in equity as soon as they are incurred, taking deferred taxes into account. Consequently, the consolidated balance sheet discloses – after deduction of the plan assets – the full scope of the obligations while avoiding the fluctuations in expenses that can result especially when the calculation parameters change. The actuarial gains and losses recorded in the respective reporting period are presented separately in the Statement of Comprehensive Income.

(64) Other provisions and contingent liabilities

Provisions are recognized in the balance sheet if it is more likely than not that a cash outflow will be required to settle the obligation and the amount of the obligation can be measured reliably. The carrying amount of other provisions takes into account the amounts required to cover future payment obligations, recognizable risks and uncertain obligations of the Merck Group to third parties.

Measurement of other provisions is based on the settlement amount with the highest probability or, if a large number of similar cases exist with respect to the provision being measured, it is based on the expected value of the settlement amounts. Long-term provisions are discounted and carried at their present value as of the balance sheet date if the discount rate effect is material. To the extent that reimbursement claims exist as defined in IAS 37, they are recognized separately as an asset if their realization is virtually certain and the asset recognition criteria have been met.

Contingent liabilities comprise not only possible obligations arising from past events and whose existence is subject to the occurrence of uncertain future events, but also present obligations arising from past events where an outflow of resources embodying economic benefits is not probable or where the amount of the obligation cannot be measured with reliability. Contingent liabilities that were not assumed within the context of a business combination are not recognized in the consolidated balance sheet. Unless the possibility of an outflow of resources embodying economic benefits is remote, information on the relevant contingent liabilities is disclosed in the notes.

In this context, the present value of the future settlement amount is used as the basis for measurement. The settlement amount is determined in accordance with the rules set out in IAS 37 and is based on the best estimate.

(65) Share-based compensation programs

Provisions have been set up for obligations from share-based compensation programs. These share-based compensation programs with cash settlement are aligned not only with target achievement based on key performance indicators, but above all also with the long-term performance of Merck shares. Certain executives and employees could be eligible to receive a certain number of virtual shares – Merck Share Units (MSUs) – at the end of a three-year performance cycle. The number of MSUs that could be received depends on the total value defined for the respective person and the average closing price of Merck shares in Xetra® trading during the last 60 trading days prior to January 1 of the respective fiscal year (reference price). In order for members of top management to receive payment, they must personally own an investment in Merck shares dependent on their respective fixed annual compensation. When the three-year performance cycle ends, the number of MSUs to then be granted is determined based on the development of two key performance indicators (KPIs). These are on the one hand the performance of the Merck share price compared to the performance of the DAX® with a weighting of 70%, and on the other hand the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 30%. 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.

Based on the MSUs granted, the eligible participants receive a cash payment at a specified point in time in the year 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 Merck shares in Xetra® trading during the last 60 trading days prior to January 1 after the performance cycle. The payment amount is limited to three times the reference price. The fair value of the obligations is recalculated on each balance sheet date using a Monte Carlo simulation based on the previously described KPIs. The expected volatilities are based on the implicit volatility of Merck shares and the DAX® in accordance with the remaining term of the respective tranche. The dividend payments incorporated into the valuation model orient towards medium-term dividend expectations.

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 Statement on Corporate Governance.

List of Shareholdings

(66) List of shareholdings

The shareholdings of Merck KGaA as of December 31, 2016 are presented in the following table:

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
I. Fully consolidated companies				
Germany				
Germany	Merck KGaA	Darmstadt	Parent Company	
Germany	AB Allgemeine Pensions GmbH & Co. KG	Zossen	100.00	100.00
Germany	Allergopharma GmbH & Co. KG	Reinbek	100.00	
Germany	Allergopharma Verwaltungs GmbH	Darmstadt	100.00	100.00
Germany	Biochrom GmbH	Berlin	100.00	
Germany	Chemitra GmbH	Darmstadt	100.00	100.00
Germany	Emedia Export Company mbH	Gernsheim	100.00	
Germany	IHS – Intelligent Healthcare Solutions GmbH	Darmstadt	100.00	
Germany	Litec-LLL GmbH	Greifswald	100.00	100.00
Germany	Merck 12. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	100.00
Germany	Merck 13. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	
Germany	Merck 15. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	
Germany	Merck 16. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	
Germany	Merck 20. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	
Germany	Merck 21. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	
Germany	Merck Accounting Solutions & Services Europe GmbH	Darmstadt	100.00	100.00
Germany	Merck Chemicals GmbH	Darmstadt	100.00	
Germany	Merck China Chemicals Holding GmbH	Darmstadt	100.00	
Germany	Merck Consumer Health Holding GmbH	Darmstadt	100.00	100.00
Germany	Merck Export GmbH	Darmstadt	100.00	100.00
Germany	Merck Financial Services GmbH	Darmstadt	100.00	100.00
Germany	Merck Financial Trading GmbH	Gernsheim	100.00	100.00
Germany	Merck Holding GmbH	Gernsheim	100.00	100.00
Germany	Merck International GmbH	Darmstadt	100.00	100.00
Germany	Merck Internationale Beteiligungen GmbH	Darmstadt	100.00	
Germany	Merck Life Science GmbH	Eppelheim	100.00	100.00
Germany	Merck Performance Materials GmbH	Wiesbaden	100.00	
Germany	Merck Schuchardt OHG	Hohenbrunn	100.00	100.00
Germany	Merck Selbstmedikation GmbH	Darmstadt	100.00	
Germany	Merck Serono GmbH	Darmstadt	100.00	100.00
Germany	Merck Versicherungsvermittlung GmbH	Darmstadt	100.00	100.00
Germany	Merck Vierte Allgemeine Beteiligungsgesellschaft mbH	Gernsheim	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
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
Other European countries				
Austria	Allergopharma Vertriebsgesellschaft m.b.H.	Vienna	100.00	
Austria	Merck Chemicals and Life Science GesmbH	Vienna	100.00	
Austria	Merck Gesellschaft mbH	Vienna	100.00	
Austria	Merck KGaA & Co. Werk Spittal	Spittal	100.00	99.00
Austria	Sigma-Aldrich Handels GmbH	Vienna	100.00	
Belgium	Merck Chemicals N.V./S.A.	Overijse	100.00	
Belgium	Merck Consumer Healthcare N.V.-S.A.	Overijse	100.00	
Belgium	Merck N.V.-S.A.	Overijse	100.00	
Belgium	Sigma-Aldrich BVBA/SPRL	Diegem	100.00	
Bulgaria	Merck Bulgaria EAD	Sofia	100.00	
Croatia	Merck d.o.o.	Zagreb	100.00	
Czech Republic	Merck spol.s.r.o.	Prague	100.00	
Czech Republic	Sigma-Aldrich spol.s.r.o.	Prague	100.00	
Denmark	Merck A/S	Hellerup	100.00	
Denmark	Merck Life Science A/S	Hellerup	100.00	
Denmark	Sigma-Aldrich Denmark ApS	Brøndby	100.00	
Denmark	Survac ApS	Frederiksberg	100.00	100.00
Estonia	Merck Serono OÜ	Tallinn	100.00	
Finland	Merck Life Science OY	Espoo	100.00	
Finland	Merck OY	Espoo	100.00	
Finland	Sigma-Aldrich Finland OY	Helsinki	100.00	
France	BioControl Systems S.a.r.l.	Lyon	100.00	
France	Gonnon S.A.S.	Lyon	100.00	
France	Laboratoire Médiflor S.A.S.	Lyon	100.00	
France	Merck Biodevelopment S.A.S.	Lyon	100.00	
France	Merck Chimie S.A.S.	Fontenay s/Bois	100.00	
France	Merck Médication Familiale S.A.S.	Lyon	100.00	
France	Merck Performance Materials S.A.S.	Trosly-Breuil	100.00	
France	Merck S.A.	Lyon	99.84	
France	Merck Santé S.A.S.	Lyon	100.00	
France	Merck Serono S.A.S.	Lyon	100.00	
France	Millipore S.A.S.	Molsheim	100.00	
France	Sigma-Aldrich Chimie S.a.r.l.	St. Quentin Fallavier	100.00	
France	Sigma-Aldrich Chimie SNC Partnership	St. Quentin Fallavier	100.00	
France	Sigma-Aldrich Holding S.a.r.l.	St. Quentin Fallavier	100.00	
Greece	Merck A.E.	Maroussi, Athens	100.00	
Hungary	Merck Kft.	Budapest	100.00	
Hungary	Sigma-Aldrich Kft.	Budapest	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
Ireland	Merck Millipore Ltd.	Carrigtwohill	100.00	
Ireland	Merck Serono (Ireland) Ltd.	Dublin	100.00	
Ireland	Millipore Cork Unlimited Company	Carrigtwohill	100.00	
Ireland	Shrawdine Limited	Arklow	100.00	
Ireland	Sigma-Aldrich Financial Services Limited	Carrigtwohill	100.00	
Ireland	Sigma-Aldrich Ireland Ltd.	Arklow	100.00	
Ireland	Silverberry Limited	Arklow	100.00	
Italy	Allergopharma S.p.A.	Rome	100.00	
Italy	BioControl Italia S.r.l.	Rome	100.00	
Italy	Istituto di Ricerche Biomediche Antoine Marxer RBM S.p.A.	Colleretto Giacosa	100.00	
Italy	Merck S.p.A.	Vimodrone	100.00	
Italy	Merck Serono S.p.A.	Rome	99.74	
Italy	Sigma-Aldrich Italia S.r.l.	Milan	100.00	
Italy	Sigma-Aldrich S.r.l.	Milan	100.00	
Latvia	Merck Serono SIA	Riga	100.00	
Lithuania	Merck Serono, UAB	Vilnius	100.00	
Luxembourg	AZ Electronic Materials (Luxembourg) S.a.r.l.	Luxembourg	100.00	
Luxembourg	AZ Electronic Materials Group S.a.r.l.	Luxembourg	100.00	
Luxembourg	AZ Electronic Materials S.a.r.l.	Luxembourg	100.00	
Luxembourg	AZ Electronic Materials TopCo S.a.r.l.	Luxembourg	100.00	
Luxembourg	Mats Finance S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Chemicals Holding S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Finance S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Finanz S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Holding S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Invest SCS	Luxembourg	100.00	
Luxembourg	Merck Re S.A.	Luxembourg	100.00	
Luxembourg	Millilux S.a.r.l.	Luxembourg	100.00	
Luxembourg	Millipart S.a.r.l.	Luxembourg	100.00	
Luxembourg	Millipore International Holdings, S.a.r.l.	Luxembourg	100.00	
Luxembourg	Ridgefield Acquisition S.a.r.l.	Luxembourg	100.00	
Luxembourg	Ridgefield Holdco 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.	Pietà	100.00	
Malta	Merck Capital Ltd.	Pietà	100.00	
Netherlands	BioControl Systems B.V.	Nieuwerkerk Ad Ijssel	100.00	
Netherlands	Merck B.V.	Schiphol-Rijk	100.00	
Netherlands	Merck Chemicals B.V.	Amsterdam Zuidoost	100.00	
Netherlands	Merck Holding Netherlands B.V.	Schiphol-Rijk	100.00	
Netherlands	Merck Ventures B.V.	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	
Norway	Merck Life Science AS	Oslo	100.00	
Norway	Sigma-Aldrich Norway AS	Oslo	100.00	
Poland	Merck Business Solutions Europe Sp.z.o.o.	Wroclaw	100.00	
Poland	Merck Sp.z o.o.	Warsaw	100.00	
Poland	Sigma-Aldrich Sp.z.o.o.	Poznań	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
Portugal	Merck, S.A.	Algés	100.00	
Romania	Merck Romania S.R.L.	Bucharest	100.00	
Russia	Merck LLC	Moscow	100.00	
Russia	Sigma-Aldrich Rus AOZT/ZAO	Moscow	100.00	
Serbia	Merck d.o.o. Beograd	Belgrade	100.00	
Slovakia	Merck spol.s.r.o.	Bratislava	100.00	
Slovenia	Merck d.o.o.	Ljubljana	100.00	
Spain	Merck Chemicals and Life Science S.A.	Madrid	100.00	
Spain	Merck, S.L.U.	Madrid	100.00	
Spain	Sigma-Aldrich Quimica S.L.	Tres Cantos	100.00	
Sweden	Merck AB	Solna	100.00	
Sweden	Merck Chemicals and Life Science AB	Solna	100.00	
Sweden	Sigma-Aldrich Sweden AB	Stockholm	100.00	
Switzerland	Allergopharma AG	Therwil	100.00	
Switzerland	Ares Trading SA	Aubonne	100.00	
Switzerland	Merck & Cie	Altdorf	51.63	51.63
Switzerland	Merck (Schweiz) AG	Zug	100.00	
Switzerland	Merck Biosciences AG	Läufelfingen	100.00	
Switzerland	Merck Performance Materials (Suisse) SA	Coinsins	100.00	
Switzerland	Merck Serono SA	Coinsins	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	St. Gallen	100.00	
Switzerland	Sigma-Aldrich Production GmbH	Buchs	100.00	
Turkey	Merck Ilac Ecza ve Kimya Ticaret AS	Istanbul	100.00	
United Kingdom	Aldrich Chemical Co. Ltd.	Gillingham	100.00	
United Kingdom	AZ Electronic Materials (UK) Ltd.	Feltham	100.00	
United Kingdom	BioControl Systems Limited	London	100.00	
United Kingdom	BioReliance Limited	Aberdeen	100.00	
United Kingdom	BioReliance U.K. Acquisition Limited	London	100.00	
United Kingdom	Epichem Group Limited	Bromborough	100.00	
United Kingdom	Lamberts Healthcare Ltd.	Tunbridge Wells	100.00	
United Kingdom	Merck Chemicals Ltd.	Nottingham	100.00	
United Kingdom	Merck Consumer Health Care Ltd.	Feltham	100.00	
United Kingdom	Merck Holding Ltd.	Feltham	100.00	
United Kingdom	Merck Investments Ltd.	Feltham	100.00	
United Kingdom	Merck Performance Materials Services UK Ltd.	Feltham	100.00	
United Kingdom	Merck Serono Europe Ltd.	London	100.00	
United Kingdom	Merck Serono Ltd.	Feltham	100.00	
United Kingdom	Millipore (U.K.) Ltd.	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	Bromborough	100.00	
United Kingdom	Seven Seas Limited	Feltham	100.00	
United Kingdom	Sigma-Aldrich Company Limited	Gillingham	100.00	
United Kingdom	Sigma-Aldrich Holdings Ltd.	Gillingham	100.00	
United Kingdom	Sigma-Genosys Limited	Gillingham	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
North America				
Canada	EMD Chemicals Canada Inc.	Toronto	100.00	
Canada	EMD Crop BioScience Canada Inc.	Toronto	100.00	
Canada	EMD Inc.	Mississauga	100.00	
Canada	Millipore (Canada) Ltd.	Toronto	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	Amnis Corp.	Seattle	100.00	
United States	BioControl Systems, Inc.	Bellevue	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	EMD Accounting Solutions & Services America, Inc.	Quincy	100.00	
United States	EMD Finance LLC	Wilmington	100.00	
United States	EMD Holding Corp.	Rockland	100.00	
United States	EMD Millipore Corporation	Billerica	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	KL Acquisition Corp.	St. Louis	100.00	
United States	Millipore Asia Ltd.	Wilmington	100.00	
United States	Millipore Pacific 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 Hitech, Inc.	Haverhill	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 Finance Co.	St. Louis	100.00	
United States	Sigma-Aldrich Foreign Holding Co.	St. Louis	100.00	
United States	Sigma-Aldrich Lancaster, Inc.	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	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
Asia-Pacific (APAC)				
Australia	Merck Pty. Ltd.	Bayswater	100.00	
Australia	Merck Serono Australia Pty. Ltd.	Sydney	100.00	
Australia	Proligo Australia Pty. Ltd.	Castle Hill	100.00	
Australia	SAFC Biosciences Pty. Ltd.	Castle Hill	100.00	
Australia	Sigma-Aldrich Oceania Pty. Ltd.	Castle Hill	100.00	
Australia	Sigma-Aldrich Pty. Ltd.	Castle Hill	100.00	
China	Beijing Skywing Technology Co., Ltd.	Beijing	100.00	
China	Merck Chemicals (Shanghai) Co., Ltd.	Shanghai	100.00	
China	Merck Display Materials (Shanghai) Co., Ltd.	Shanghai	100.00	
China	Merck Electronic Materials (Suzhou) Ltd.	Suzhou	100.00	
China	Merck Holding (China) Co., Ltd.	Shanghai	100.00	
China	Merck Life Science Technologies (Nantong) Co., Ltd.	Nantong	100.00	
China	Merck Ltd.	Hong Kong	100.00	
China	Merck Millipore Lab Equipment (Shanghai) Co., Ltd.	Shanghai	100.00	
China	Merck Performance Materials Hong Kong Ltd.	Hong Kong	100.00	
China	Merck Performance Materials Hong Kong Services Ltd.	Hong Kong	100.00	
China	Merck Pharmaceutical (HK) Ltd.	Hong Kong	100.00	
China	Merck Pharmaceutical Manufacturing (Jiangsu) Co., Ltd.	Nantong	100.00	
China	Merck Serono (Beijing) Pharmaceutical Distribution Co., Ltd.	Beijing	100.00	
China	Merck Serono (Beijing) Pharmaceutical R&D Co., Ltd.	Beijing	100.00	
China	Merck Serono Co., Ltd.	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	Sigma-Aldrich Hong Kong Holding Ltd.	Hong Kong	100.00	
China	Suzhou Taizhu Technology Development Co., Ltd.	Taicang	100.00	
India	Merck Life Science Pvt. Ltd.	Mumbai	100.00	
India	Merck Ltd.	Mumbai	51.80	
India	Merck Performance Materials Pvt. Ltd.	Sanpada New Mumbai	100.00	
India	Merck Specialities Pvt. Ltd.	Mumbai	100.00	
India	Sigma-Aldrich Chemicals Private Limited	Bangalore	100.00	
Indonesia	P.T. Merck Chemicals and Life Sciences	Jakarta	100.00	
Indonesia	P.T. Merck Tbk.	Jakarta	86.65	
Japan	Merck Ltd.	Tokyo	100.00	
Japan	Merck Performance Materials G.K.	Tokyo	100.00	
Japan	Merck Performance Materials IP G.K.	Tokyo	100.00	
Japan	Merck Performance Materials Manufacturing G.K.	Tokyo	100.00	
Japan	Merck Serono Co., Ltd.	Tokyo	100.00	
Japan	Sigma-Aldrich Japan G.K.	Tokyo	100.00	
Malaysia	Merck Sdn Bhd	Petaling Jaya	100.00	
Malaysia	Sigma-Aldrich (M) Sdn Bhd	Subang Jaya	100.00	
New Zealand	Merck Ltd.	Palmerston North	100.00	
New Zealand	Sigma-Aldrich New Zealand Co.	Christchurch	100.00	
Philippines	Merck Business Solutions Asia Inc.	Bonifacio Global City	99.99	
Philippines	Merck Inc.	Makati City	100.00	
Singapore	Merck Performance Materials Pte. Ltd.	Singapore	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
Singapore	Merck Pte. Ltd.	Singapore	100.00	
Singapore	Sigma-Aldrich Pte. Ltd.	Singapore	100.00	
South Korea	Merck Electronic Materials Ltd.	Seoul	100.00	
South Korea	Merck Ltd.	Seoul	100.00	
South Korea	Merck Performance Materials Ltd.	Pyeongtaek	100.00	
South Korea	Sigma-Aldrich Holding Ltd.	Yongin City	100.00	
South Korea	Sigma-Aldrich Korea Ltd.	Yongin City	100.00	
Taiwan	Merck Ltd.	Taipei	100.00	
Taiwan	Merck Performance Materials Co., Ltd.	Taipei	100.00	
Taiwan	Merck Performance Materials Ltd.	Taipei	100.00	
Taiwan	SAFC Hitech Taiwan Co. Ltd.	Kaohsuing	100.00	
Thailand	Merck Ltd.	Bangkok	45.11	
Vietnam	Merck Vietnam Ltd.	Ho Chi Minh City	100.00	
Latin America				
Argentina	Merck S.A.	Buenos Aires	100.00	
Argentina	Sigma-Aldrich de Argentina S.r.l.	Buenos Aires	100.00	
Brazil	Merck S.A.	Rio de Janeiro	100.00	
Brazil	Sigma-Aldrich Brasil Ltda.	São Paulo	100.00	
Chile	Merck S.A.	Santiago de Chile	100.00	
Chile	Sigma-Aldrich Quimica Ltda.	Santiago de Chile	100.00	
Colombia	Merck S.A.	Bogota	100.00	
Ecuador	Merck C.A.	Quito	100.00	
Guatemala	Merck, S.A.	Guatemala City	100.00	
Mexico	Merck, S.A. de C.V.	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.	Lima	100.00	
Uruguay	ARES Trading Uruguay S.A.	Montevideo	100.00	
Middle East and Africa (MEA)				
Egypt	Merck Ltd.	Cairo	100.00	
Israel	Inter-Lab Ltd.	Yavne	100.00	
Israel	InterPharm Industries Ltd.	Yavne	100.00	
Israel	InterPharm Laboratories Ltd.	Yavne	100.00	
Israel	Merck Serono Ltd.	Herzliya Pituach	100.00	
Israel	Qlight Nanotech Ltd.	Jerusalem	100.00	
Israel	Sigma-Aldrich Israel Ltd.	Rehovot	100.00	
Mauritius	Millipore Mauritius Ltd.	Cyber City	100.00	
South Africa	Merck (Pty) Ltd.	Halfway House	100.00	
South Africa	Merck Pharmaceutical Manufacturing (Pty) Ltd.	Wadeville	100.00	
South Africa	Sigma-Aldrich (Pty) Ltd.	Kempton Park	100.00	
Tunisia	Merck Promotion SARL	Tunis	100.00	
Tunisia	Merck SARL	Tunis	100.00	
United Arab Emirates	Merck Serono Middle East FZ-LLC	Dubai	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
II. Companies not consolidated due to secondary importance				
Germany				
Germany	AB Pensionsverwaltung GmbH	Zossen	100.00	100.00
Germany	Merck 17. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	100.00
Germany	Merck 18. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	100.00
Germany	Merck 19. Allgemeine Beteiligungs-GmbH	Darmstadt	100.00	100.00
Germany	Merck Patent GmbH	Darmstadt	100.00	
Germany	Merck Wohnungs- und Grundstücksverwaltungsgesellschaft mbH	Darmstadt	100.00	100.00
Other European countries				
Greece	Sigma-Aldrich (OM) Ltd.	Athens	100.00	
Ireland	SAFC Arklow Ltd.	Arklow	100.00	
Italy	BioControl Systems S.r.l.	Rome	100.00	
Netherlands	Merck Window Technologies B.V.	Eindhoven	100.00	100.00
Portugal	Laquifa Laboratorios S.A.	Algés	100.00	
Russia	Chemical Trade Limited	Moscow	100.00	
Russia	MedChem Limited	Moscow	100.00	
Russia	SAF-LAB AOZT/ZAO	Moscow	100.00	
Switzerland	Calypso Biotech SA	Plan-les-Ouates	66.51	
United Kingdom	B-Line Systems Limited	Gillingham	100.00	
United Kingdom	Bristol Organics Ltd.	Gillingham	100.00	
United Kingdom	Fluka Chemicals Ltd.	Gillingham	100.00	
United Kingdom	Merck Cross Border Trustees Ltd.	Feltham	100.00	
United Kingdom	Merck Ltd.	Hull	100.00	
United Kingdom	Merck Pension Trustees Ltd.	Hull	100.00	
United Kingdom	Nature’s Best Health Products Ltd.	Tunbridge Wells	100.00	
United Kingdom	Sigma Chemical Co. Ltd.	Poole	100.00	
United Kingdom	Sigma Entity One Limited	Gillingham	100.00	
United Kingdom	UFC Ltd.	Gillingham	100.00	
United Kingdom	Ultrafine Limited	Gillingham	100.00	
United Kingdom	Webnest Ltd.	Gillingham	100.00	
United Kingdom	Wessex Biochemicals Ltd.	Poole	100.00	
North America				
United States	BioControl Systems International, Inc.	Seattle	100.00	
United States	Fluka Chemical Corp.	St. Louis	100.00	
United States	Research Organics Foreign Trade Corporation	Cleveland	100.00	
United States	S and F Properties, Inc.	Cleveland	100.00	
United States	Sigma-Aldrich Subsidiary I Corp.	St. Louis	100.00	
United States	Techcare Systems, Inc.	St. Louis	100.00	
United States	TocopheRx, Inc.	Groton	62.83	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
Asia-Pacific (APAC)				
Australia	Biochrom Australia Pty. Ltd.	Bayswater	100.00	
Japan	BioReliance KK	Tokyo	100.00	
South Korea	SAFC Hitech Korea Ltd.	Yongin City	100.00	
Thailand	Sigma-Aldrich (Thailand) Co., Ltd.	Bangkok	100.00	
Latin America				
Dominican Republic	Merck Dominicana, S.R.L.	Santo Domingo	100.00	
Middle East and Africa (MEA)				
Kenya	Merck Healthcare and Life Science Limited	Nairobi	100.00	
Morocco	Merck Maroc S.A.R.L.	Casablanca	100.00	
Nigeria	Merck Pharmaceutical and Life Sciences Ltd.	Lagos	100.00	
South Africa	Serono South Africa Ltd.	Johannesburg	100.00	
III. Non-controlled companies majority-owned				
Latin America				
Venezuela	Merck S.A.	Caracas	100.00	
Venezuela	Representaciones MEPRO S.A.	Caracas	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA (%)
IV. Associates not included at equity due to secondary importance				
Other European countries				
Switzerland	Asceneuron SA	Lausanne	40.26	
Switzerland	CAMAG Chemie-Erzeugnisse und Adsorptionstechnik AG	Muttenz	39.11	
Switzerland	Prexton Therapeutics SA	Plan-les-Ouates	28.36	
Switzerland	Vaximm AG	Basel	24.07	
North America				
United States	Prolog Healthy Living Fund, LP	St. Louis	38.32	
United States	Prolog Healthy Living Fund II, LP	St. Louis	50.58	
Middle East and Africa (MEA)				
Israel	Neviah Genomics Ltd.	Yavne	69.00	7.75

Darmstadt, February 14, 2017

Stefan Oschmann

Udit Batra

Kai Beckmann

Walter Galinat

Belén Garijo Lopez

Marcus Kuhnert

Responsibility Statement

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

Darmstadt, February 14, 2017

Stefan Oschmann

Udit Batra

Kai Beckmann

Walter Galinat

Belén Garijo Lopez

Marcus Kuhnert

Auditor's Report

We have audited the consolidated financial statements prepared by the MERCK Kommanditgesellschaft auf Aktien, Darmstadt, comprising the Consolidated Income Statement, the Consolidated Statement of Comprehensive Income, the Consolidated Balance Sheet, the Consolidated Cash Flow Statement, the Consolidated Statement of Changes in Net Equity and the Notes to the Consolidated Financial Statements, together with the Combined Management Report for the business year from January 1 to December 31, 2016. The preparation of the consolidated financial statements and the Combined Management Report in accordance with IFRSs, as adopted by the EU, and the additional requirements of German commercial law pursuant to § 315a Abs. 1 HGB [Handelsgesetzbuch "German Commercial Code"] and supplementary provisions of the articles of association are the responsibility of the parent company's management. Our responsibility is to express an opinion on the consolidated financial statements and on the Combined Management Report based on our audit.

We conducted our audit of the consolidated financial statements in accordance with § 317 HGB [Handelsgesetzbuch "German Commercial Code"] and German generally accepted standards for the audit of financial statements promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Those standards require that we plan and perform the audit such that misstatements materially affecting the presentation of the net assets, financial position and results of operations in the consolidated financial statements in accordance with the applicable financial reporting framework and in the Combined Management Report are detected with reasonable assurance. Knowledge of the business activities and the economic and legal environment of the Group and expectations as to possible misstatements are taken into account in the determination of audit procedures. The effectiveness of the accounting-related internal control system and the evidence supporting the disclosures in the consolidated financial statements and the Combined Management Report are examined primarily on a test basis within the framework of the audit. The audit includes assessing the annual financial statements of those entities included in consolidation, the determination of entities to be included in consolidation, the accounting and consolidation principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements and Combined Management Report. We believe that our audit provides a reasonable basis for our opinion.

Our audit has not led to any reservations.

In our opinion, based on the findings of our audit, the consolidated financial statements comply with IFRSs, as adopted by the EU, the additional requirements of German commercial law pursuant to § 315a Abs. 1 HGB and supplementary provisions of the articles of association and give a true and fair view of the net assets, financial position and results of operations of the Group in accordance with these requirements. The Combined Management Report is consistent with the consolidated financial statements, complies with the German statutory requirements, and as a whole provides a suitable view of the Company's position and suitably presents the opportunities and risks of future development.

Frankfurt/Main, February 15, 2017

KPMG AG
Wirtschaftsprüfungsgesellschaft

Original German version signed by

Braun
Wirtschaftsprüfer

Rackwitz
Wirtschaftsprüfer