Heraeus

Financial report | 2019

Key financial indicators for the Group

	2019	2018	Change (%)
Financial performance (€ million)			
Revenue excluding precious metals	2,200	2,259	–2.6
Total revenue	22,378	20,295	+10.3
Earnings before interest and tax (EBIT)	222	341	–34.9
Profit after taxes	115	197	–41.6
Financial position (€ million)			
Total assets	5,497	5,068	+8.5
Shareholders' equity	3,293	3,223	+2.2
Equity-to-assets ratio (%)	60	64	
Cash flow (€ million)			
Net cash provided by operating activities	378	449	–15.8
Cash payments for investments in non-current assets*	233	257	–9.3
Depreciation, amortization, and impairment of non-current assets*	158	143	+10.5
Employees			
Employees at year-end	14,190	13,858	+2.4
In Germany	5,464	5,418	+0.8
Outside Germany	8,726	8,440	+3.4

* Figures adjusted to account for additions as well as amortization and impairment of intangible assets.

We create **high-value solutions** for our customers and substantially strengthen their competitiveness. Our customers demonstrate extraordinary loyalty and appreciate our efforts to provide outstanding services for them and generate economic growth.

We operate in **global markets** which allow for clear differentiation, long-term growth, and attractive returns. We focus on businesses in the areas of environment, healthcare, mobility, communications, steel, energy, and beyond.

We strengthen our business portfolio through **organic and external growth** and we create opportunities in every key economic region.

As a family-owned business we pursue **long-term strategies** and strive to improve every day. We are entrepreneurial and we encourage people to take on responsibility. We value solidity and we mitigate our risks.

We strive to attract and retain **highly qualified and ambitious employees**. We live by our core values and expect our employees to show loyalty and an ambition to constantly exceed expectations.

We work to preserve and strengthen the Heraeus Group's **excellent reputation**.

“Investment in new plant and machinery, automation, and improved infrastructure as well as excellence initiatives were among our key activities in 2019.”

In the letter from the Board of Managing Directors

Rolf Wetzel Jan Rinnert Dr. André Kobelt

Ladies and Gentlemen,

Overall, 2019 was a challenging year for Heraeus. Global growth weakened, global risks increased, and the ongoing trade disputes and wrangles spread uncertainty among our customers. Economic conditions deteriorated in the Electronics and Environmental fields of activity as the year progressed and in several of our sales markets. We also had to contend with weaknesses in the global economy: Asia and, in particular, China recorded lower rates of growth than in the previous years. Germany, meanwhile, only just avoided a recession in 2019. The US market was alone in maintaining its rates of expansion.

We felt the impact of these developments directly. Prices came under pressure, while customer orders and capital spending on new plant and machinery were put back or were of a lower volume than might have been expected. As a result, the operating profit (EBIT) for 2019 of €222.4 million was well below the prior-year level.

To mitigate this fall in earnings, we took extensive steps during the course of the year to reduce non-personnel costs and our use of resources. This included introducing short-time working and adjusting the personnel structure to the new situation in the affected businesses as well as the reduction of capacity and reduced consumption of resources in holding functions.

Investment in new plant and machinery, automation, and improved infrastructure as well as excellence initiatives were among our key activities in 2019. We are working at all levels to improve the efficiency of our businesses and our processes: from production processes to initiatives in procurement and HR right through to sales. The Excellence Team carried out 40 excellence modules around the world in 2019 – almost twice as many as in the previous year.

We are also working hard on the product and innovation pipeline. Our strong market position as a technology group is based chiefly on our innovation capabilities. For example, the Photovoltaics business unit consolidated its development activities at a new R&D center in Shanghai, China, while the Medical Components and Solutions business unit set up a new development center in Minneapolis, USA. Innovation projects offering significant growth potential were closely overseen by the Group Management Board to ensure the targeted release of the necessary funds. Despite the difficult conditions, research and development expenditure, at €151.7 million, was close to the prior-year level.

The founding of the Heraeus Digital Hub (HDH) represented a further important step. The digital transformation, which will be led by HDH across the Group, is now one of the main drivers of growth and innovation in the business units and functions.

Around the world, Heraeus is also actively searching for new ideas and technologies that originate from outside the company. The Heraeus Accelerator is giving us new means of stepping up our work with external start-ups as we look to focus more on open innovation. The initial selection process for start-ups began in mid-2019. From around 100 start-ups, four were chosen from the electronics and sensors segments to work with the Heraeus business units for three months to validate their technology and market prospects.

Engaging in all these activities would not have been possible were it not for the hard work of our employees. We would like to take this opportunity to thank them for this. We are aware how challenging the past year has been and how challenging the one ahead of us will be. On the other hand, this situation also provides an opportunity to question the status quo and come up with new solutions. Our businesses present a number of specific opportunities and we will be making every effort to exploit these. We firmly believe that our strategy will allow us to actively address the short-term challenges and put the company on an even stronger footing for the future. We will thus be better equipped to mitigate risks, seize opportunities, and continue on our dynamic trajectory.

For 2020, Heraeus expects that economic conditions will remain weak in the majority of its end-customer markets and that revenue growth excluding precious metals will be at the same level as the previous year. The ongoing improvement of our processes across the company will continue and will have a positive impact on the long-term performance of the business units.

The Board of Managing Directors of Heraeus Holding GmbH

Jan Rinnert
Chairman

Dr. André Kobelt

Rolf Wetzel

Management and supervisory bodies Heraeus Holding GmbH

Board of Managing Directors of Heraeus Holding GmbH

Jan Rinnert Chairman

Dr. André Kobelt

Rolf Wetzel

Supervisory Board of Heraeus Holding GmbH

Dr. Jürgen Heraeus Chairman

Joachim Reitz Vice Chairman

Dr. Simone Bagel-Trah

Dr. Hans-Tjabert Conring

Franz Haniel

Dr. Hubert Lienhard

Annette Lukas

Uwe Raschke

Beate Rohrig

Stefan Sattler

Gerhard Schullerus

Andreas Wolf

Report of the Supervisory Board

Dear shareholders,
Dear readers,

Dr. Jürgen Heraeus

In 2019, economic conditions in the Group's end-customer markets weakened significantly and global risks such as trade disputes increased. The Group's revenue and earnings declined as a result.

In response to this development, the Group is taking steps to become more competitive, including by cutting costs in the parts of the business affected by the decline and in corporate functions and thorough various excellence initiatives. At the same time, the Group is investing in the future, for example through the establishment of a direct sales function in the biomaterials business in the US, through minor acquisitions and innovation projects in the medical components and solutions business, and through an expansion of the sensors business.

The Supervisory Board believes that these steps are the right ones to take in the challenging business environment and will continue to work closely with the Board of Managing Directors and advise on its activities.

Monitoring function of the Supervisory Board and meetings with the Board of Managing Directors

In 2019, the Supervisory Board diligently performed the monitoring and advisory duties incumbent upon it by law, the articles of association, and its rules of procedure. In the meetings, the Board of Managing Directors provided us with a summary of developments and prospects in the individual business units and in the Group as a whole. We discussed in detail all fundamental matters of corporate policy, organization, and strategy with the Board of Managing Directors at these meetings, including in particular the Group's risk situation Internal Audit. The Board of Managing Directors also kept the Supervisory Board up to date with current business performance by means of a written summary in the middle of the year and quarterly reports.

In addition, the Supervisory Board conducted in-depth reviews of business transactions requiring Supervisory Board approval in accordance with the law and the articles of association at the meetings. The Supervisory Board voted on the reports and recommendations of the Board of Managing Directors, in so far as this was required by law and the articles of association, after having comprehensively reviewed and discussed them. Detailed written resolutions were prepared and the Board of Managing Directors answered any questions raised.

In addition to the meetings mentioned above, the Chairman of the Supervisory Board also maintained close contact with the Board of Managing Directors. He was regularly and comprehensively informed without delay of significant business transactions and current events of importance for assessing the situation and performance of the Group and its management, and he advised the Board of Managing Directors in its strategic decisions, in particular with regard to acquisition projects within the Group.

Throughout the reporting period, the Supervisory Board comprehensively fulfilled its duty to monitor the Board of Managing Directors.

Supervisory Board meetings and written resolutions

Three meetings of the Supervisory Board took place in 2019. A written resolution was also adopted.

As is customary, all meetings took place in an open and constructive atmosphere both within the Supervisory Board and vis-à-vis the Board of Managing Directors. All members of the Supervisory Board were present at two of the meetings. One member sent apologies for the other meeting, but was able to vote on the proposals by proxy. There were no indications of any conflicts of interest for members of the Supervisory Board or the Board of Managing Directors regarding individual agenda items.

At its meeting on April 11, 2019, the Supervisory Board mainly discussed, in the presence of the auditors, the single-entity financial statements of Heraeus Holding GmbH and the consolidated financial statements of Heraeus Holding GmbH (consolidated financial statements) for 2018, in each case including the management report. It did not raise any objections to these financial statements and approved them after thorough deliberation. It also dealt with preparations for the shareholders' meeting and the proposal for the appropriation of profits. The Board of Managing Directors reported on the 2018 financial year and on the current financial year, which included a risk report, and on new developments in cybersecurity, including the Group's own safeguards.

At its meeting on May 25, 2019, the Supervisory Board thoroughly discussed the agenda of the subsequent shareholders' meeting. The Board of Managing Directors provided the Supervisory Board with information on the deteriorating macroeconomic environment and the resulting consequences and challenges for the Group.

In a letter dated July 24, 2019, the Board of Managing Directors informed the Supervisory Board about the continuing deterioration in business performance, particularly in the business with optical fibers for the semiconductor industry, semiconductor applications, joining and coating technology, and specialty light sources. The Board of Managing Directors also presented the cost-cutting measures that had been initiated.

In a proposal dated September 24, 2019, the Board of Managing Directors requested that the Supervisory Board raise the limits for precious metal leasing specified in the borrowing framework in 2019 with an additional limit for the gold refining business. The Supervisory Board unanimously approved this proposal by written resolution and without abstentions.

The main item on the agenda of the Supervisory Board meeting on December 12, 2019, was the Heraeus Group's capital expenditure and financial plan for the period 2020 to 2022, including the borrowing framework for 2020. The plan was reviewed thoroughly and approved at the meeting. The Board of Managing Directors reported on the current financial year and ongoing projects, again including a risk report. The Supervisory Board also passed a resolution to reappoint Jan Rinnert and Rolf Wetzel as members of the Board of Managing Directors and to appoint Dr. Frank Stietz as a new member of the Board of Managing Directors with effect from April 1, 2020.

Meetings and resolutions of the committees

The Supervisory Board's Audit Committee, with Franz Haniel as its Chairman, met three times in 2019.

At its meeting on March 26, 2019, it mainly dealt with the single-entity and consolidated financial statements for 2018, including the focus of the audit specified by the auditor. The auditors responsible for the audit also participated in this meeting.

At its meeting on September 24, 2019, the Audit Committee primarily dealt with the Group's 2019 half-year report and with current business performance and decided on the focus of the audit for the 2019 consolidated annual financial statements as suggested by the auditor.

The meeting on December 12, 2019 concerned the responsibility management system, the risk management system, and Group Internal Audit, as well as current business performance.

The Supervisory Board was informed of the activities of the Audit Committee at the Supervisory Board meetings following each of these meetings. The Audit Committee, for its part, assured itself of the independence of the auditor.

The Presidial Committee discussed the reappointment of Jan Rinnert and Rolf Wetzel as members of the Board of Managing Directors and the appointment of Dr. Frank Stietz as a new member of the Board of Managing Directors.

No further meetings of the Presidial Committee and no meetings of the Mediation Committee were necessary during the reporting period.

Single-entity financial statements of Heraeus Holding GmbH and consolidated financial statements of Heraeus Holding GmbH (consolidated financial statements)

The single-entity financial statements and management report of Heraeus Holding GmbH as well as the consolidated financial statements and management report of the Heraeus Group for 2019 were audited by Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft, Eschborn, and given an unqualified audit opinion.

The Supervisory Board issued the instruction for these audits at its meeting on April 11, 2019. The audit engagement was approved at the shareholders' meeting on May 25, 2019.

Moreover, the Supervisory Board's Audit Committee discussed the single-entity financial statements of Heraeus Holding GmbH and the consolidated financial statements for 2019 and their audits at its meeting on April 2, 2020. The Audit Committee accepted the findings of the audits with no objections. The auditor also participated in this meeting.

The single-entity financial statements and the management report of Heraeus Holding GmbH and the consolidated financial statements and management report of the Heraeus Group for 2019, along with the auditors' reports, were made available to all members of the Supervisory Board in advance of the meeting on April 30, 2020. The auditors participated in the Supervisory Board's discussion of the documents to be audited in this meeting. They reported on the most important findings of their audit and were available to answer questions. The Supervisory Board comprehensively reviewed the single-entity financial statements and management report of Heraeus Holding GmbH for 2019 as well as the consolidated financial statements and management report of the Heraeus Group, along with their respective audit reports. Based on the final findings of its own review, there were no objections to be raised. Accordingly, the Supervisory Board approved the single-entity financial statements and management report of Heraeus Holding GmbH, along with the consolidated financial statements of Heraeus Holding GmbH and the Group management report.

The Supervisory Board reviewed and approved the Board of Managing Directors proposal for the appropriation of profits.

Changes to the Supervisory Board of Heraeus Holding GmbH

Beate Rohrig, previously the representative of the Mining, Chemical and Energy Industrial Union (IG BCE), resigned as a member of the Supervisory Board with effect from December 31, 2019. The local court in Hanau appointed Peter Schuld as her successor for the remainder of her term with effect from January 1, 2020.

Personnel matters relevant to the Board of Managing Directors of Heraeus Holding GmbH

Jan Rinnert was reappointed as a member of the Board of Managing Directors for a further term of five years with effect from August 1, 2020. At the same time, and for the same period, he was reappointed Chairman of the Board of Managing Directors and Labor Director of Heraeus Holding GmbH.

Rolf Wetzel was reappointed as a member of the Board of Managing Directors for a further term of three years with effect from July 1, 2020.

Dr. Frank Stietz was appointed as a member of the Board of Managing Directors for a term of three years with effect from April 1, 2020.

The Supervisory Board would like to offer special thanks to all members of the Board of Managing Directors and the works councils of the Heraeus Group, as well as to each and every employee for their hard work and dedication throughout the past year.

Hanau, April 29, 2020
The Supervisory Board

Dr. Jürgen Heraeus
Chairman

Group management report. Difficult macroeconomic conditions were a defining feature of 2019. Revenue excluding precious metals fell by 2.6 percent year on year to €2.2 billion. The decrease was 5.0 percent after adjusting for currency effects. The Group’s earnings before interest and tax (EBIT) came to €222.4 million, which was well below the level of the prior year. Research and development expenditure in 2019 amounted to €151.7 million.

Fundamentals of the Group

Business model

Heraeus, based in Hanau in Germany, is a leading global technology group as well as a family-owned company. The company was incorporated in 1851 and can trace its roots back to a pharmacy opened by the family in 1660. Today, Heraeus has a portfolio of businesses that operate in the fields of activity Health, Electronics, Industrials, and Environmental. The Group is one of the ten biggest family-owned companies in Germany and, thanks to its products, is among the leading providers in its respective markets worldwide. These include the markets for electronics, semiconductors, telecommunications, lighting, chemicals, pharmaceuticals, steel, photovoltaics, automotive, and medical equipment.

Under the umbrella of Heraeus Holding, the Group's four fields of activity remained unchanged in 2019. In the field of activity Health, Heraeus operates as a provider of components and solutions for medical equipment as well as biomaterials. The field of activity Electronics supplies customers with materials and integrated materials solutions in joining and coating technology and with high-purity quartz glass. In Industrials, Heraeus provides its customers with measurement equipment for high-temperature processes as well as sensor and electrochemical solutions. This field of activity also includes all the Group's start-up activities. The activities pooled under the field of activity Environmental make a contribution to resource-efficient power generation and product manufacturing. They include products for the photovoltaic industry, specialty light sources for industrial production, and precious metal services and products. The Corporate unit brings together the central Group functions. These fields of activity are ultimately controlled by Heraeus Holding, which is responsible for the corporate strategy of the Group. Preserving the long-term independence of the Group has priority in all corporate decisions. The key financial performance indicators relevant to the management of the business are total revenue, revenue excluding precious metals, earnings before interest and tax (EBIT), and profit after taxes. When looking at total revenue, it must be borne in mind that this figure is heavily influenced by the volatility of precious metal prices.

In order to capitalize on growth opportunities around the globe, Heraeus maintains a presence in the key economic regions of the world through its more than 100 companies and 14,190 employees.

Research and development

Technological expertise and innovation capabilities are the key drivers of success for the Heraeus Group. Heraeus currently holds over 1,390 patent families, with property rights in various countries, and employs more than 690 people in research and development (R&D). Its research and development expenditure in 2019 amounted to €151.7 million.

Numerous interdisciplinary and international R&D projects were initiated and progressed last year, aided by a consolidation of R&D activities in the innovation centers. The subsequent sections provide a detailed description of the key activities in the individual fields of activity.

Economic report

Macroeconomic and sector-specific conditions

Global economic growth slowed in 2019, marking a departure from the positive trajectory of the previous years. The latest report published by the International Monetary Fund (IMF) estimates that the global economy will have expanded by 2.9 percent compared with the prior year. The outlook from the end of 2018 has thus been downgraded from 3.7 percent, a fall of 0.8 percentage points. The economy has not grown this slowly since the financial crisis.

For the US, the eurozone including Germany, and China and the emerging markets, the expectation is that the rate of growth in 2019 will be lower than in the prior year. The growth rate for the US in 2019 is predicted to be 2.3 percent (2018: 2.9 percent). Growth of 1.2 percent is forecast for the eurozone (2018: 1.9 percent), and for Germany the IMF is anticipating growth of 0.5 percent for 2019 (2018: 1.5 percent). China's growth rate is also likely to have weakened, to 6.1 percent (2018: 6.6 percent), while growth across the emerging markets as a whole is expected to have fallen to 3.7 percent in 2019 (2018: 4.5 percent).

The IMF attributes this economic downturn mainly to an increase in trade barriers, heightened uncertainty with regard to trade and geopolitics, macroeconomic problems in a number of emerging markets, and structural factors such as lower productivity growth and an aging population.

In 2019, the impact of the global economic slowdown was also felt in a number of the markets served by Heraeus.

The automotive industry continues to face structural challenges and saw demand fall compared with 2018, when it had already recorded its first decline since the financial crisis.

The semiconductor market slumped in 2019 following years of strong growth. The decline encompassed both capital expenditure on semiconductor manufacturing equipment (down 14 percent on 2018) and chip production (down 7 percent on 2018, the sharpest fall since 2009).

In the photonics business (optical industry focused on research, medical equipment, and lasers), the market suffered the effects of the US-China trade dispute, the downturn in the automotive and smartphone industries, which are key to laser applications, and the fall in prices in the fiber laser market, driven by China.

Total revenue
€ million

Revenue excluding precious metals
€ million

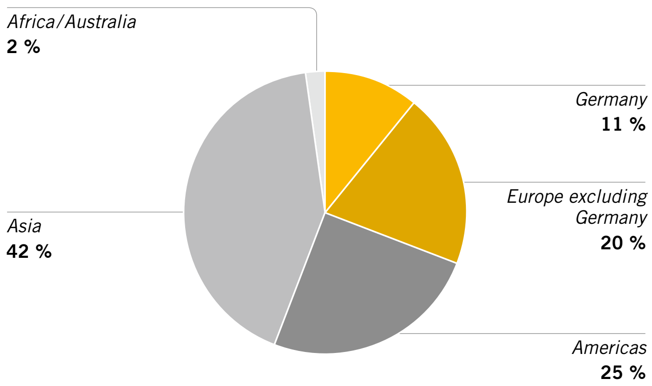
The market for optical fibers for telecommunications and data transmission contracted significantly in 2019 (down 12 percent year on year) due to lower demand, particularly in China (down 25 percent year on year), and to delays in the rollout of 5G.

On a more positive note, several of the markets that are relevant to Heraeus grew last year.

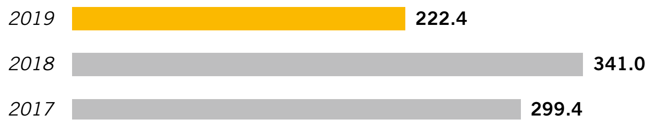
The market for medical products, for example, continued on its upward trajectory in 2019. This was driven mainly by an aging population in the industrialized countries, the introduction of new products and therapies, and the growing use of medical equipment in the emerging markets.

Demand for steel and in the related market for specialist measurement tools was slightly higher overall, albeit with varying developments in the individual regions. This growth was driven primarily by rising demand in China as a result of an expansion in the real-estate market.

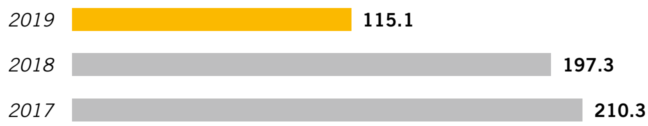
Revenue excluding precious metals by region 2019



Earnings before interest and tax (EBIT)
€ million



Profit after taxes
€ million



Comparison between actual and forecast business performance

Revenue excluding precious metals in 2019 was forecast to rise by approximately 3 to 5 percent year on year. In reality, the difficult market conditions meant that it was not possible to meet these high expectations. Despite positive currency effects, revenue excluding precious metals fell by 2.6 percent to €2.2 billion.

Weaker sales markets in the field of activity Electronics were the main reason why the company fell short of its revenue forecast. The field of activity Environmental also failed to meet expectations. Health and Industrials, however, managed to achieve their projected revenue by the end of the year.

At €115.1 million, the profit after taxes generated in 2019 was also down on the prior year and did not meet the expectations provided in the forecast. The defined and partly implemented cost-saving measures did not fully materialize last year and therefore only partly compensated for the effects resulting from the decline in revenue.

Business performance, financial position, and financial performance

Total revenue rose from €20.3 billion to €22.4 billion, a year-on-year increase of 10.3 percent. Revenue excluding precious metals fell by 2.6 percent year on year to €2.2 billion. The decrease was 5.0 percent after adjusting for currency effects.

Asia remained the strongest region in terms of revenue excluding precious metals, accounting for 42.0 percent of the total. Revenue in this region fell by 5.2 percent year on year. The proportion of revenue excluding precious metals attributable to Europe, meanwhile, rose by 1.3 percentage points to 30.9 percent.

Detailed breakdowns of revenue growth in the individual fields of activity are provided in the subsequent sections.

The Group's earnings before interest and tax (EBIT) amounted to €222.4 million in 2019, a substantial €118.6 million decrease on the prior-year figure of €341.0 million.

Despite the increase in total revenue, Heraeus reported a slight decline in gross profit – the difference between revenue generated and materials consumed (including changes in inventories) – due, in particular, to the decline in revenue excluding precious metals. This gross profit figure fell to €1,686.1 million, which equated to a decrease of 1.3 percent on the prior year.

Consolidated income statement

€ million	2019	2018	Change
Revenue	22,377.8	20,295.1	+2,082.7
Cost of materials	–20,691.7	–18,586.8	–2,104.9
Personnel expenses	–901.8	–843.3	–58.5
Amortization, depreciation, and impairment	–184.7	–142.8	–41.9
Other operating income	41.0	39.5	+1.5
Other operating expenses	–434.7	–440.1	+5.4
Net impairment losses on trade receivables	–3.4	–0.6	–2.8
Income from investments accounted for using the equity method	19.9	20.0	–0.1
Earnings before interest and tax (EBIT)	**222.4**	**341.0**	**–118.6**
Net finance costs	–64.7	–55.1	–9.6
Profit before taxes	**157.7**	**285.9**	**–128.2**
Income taxes	–42.6	–88.6	+46.0
Profit after taxes	**115.1**	**197.3**	**–82.2**

Personnel expenses went up by €58.5 million to €901.8 million in 2019. This included a year-on-year rise in severance payments to €27.7 million (2018: €17.4 million) and negative currency translation effects of €12.5 million (2018: positive currency translation effects of €14.0 million). Adjusted for non-recurring items related to acquisitions, restructuring, and currency, personnel expenses were around 4.0 percent higher than in the previous year. This was largely attributable to the increase in headcount of roughly 5.1 percent compared with 2018.

Amortization, depreciation, and impairment amounted to €184.7 million, a significant increase of €41.9 million compared with the previous year. This figure included impairment losses of €29.8 million (2018: €23.3 million). These mainly related to impaired licenses and equipment that could no longer be used as planned.

Other operating income hardly changed compared with the prior year, rising by a modest €1.5 million to €41.0 million. Impairment losses on trade receivables deteriorated year on year by €2.8 million to €3.4 million because of an increase in the risk provision.

Other operating expenses fell by €5.4 million to €434.7 million last year. Rental and lease expenses declined by €23.1 million due to initial application of the IFRS 16 accounting standard for leases, whereas there was an increase in legal costs (up €6.6 million), maintenance expenses (up €4.4 million), and expenses for external services (up €4.1 million).

The contribution from associates to earnings before interest and tax amounted to €19.9 million, which was virtually unchanged from the prior-year level (2018: €20.0 million).

Net finance costs were up by €9.6 million year on year to €64.7 million. This deterioration mainly resulted from an increase of €6.7 million in interest expenses for precious metal leases, caused by the sharp rise in leasing interest costs and prices for palladium and rhodium.

Profit before taxes came to €157.7 million, which was down by €128.2 million on the 2018 figure. The tax rate fell from 31.0 percent in 2018 to 27.0 percent last year.

Profit after taxes amounted to €115.1 million in 2019 (2018: €197.3 million).

Consolidated balance sheet

€ million	31.12.2019	31.12.2018	Change
Non-current assets	1,883.2	1,693.1	+190.1
Current assets	3,613.7	3,374.7	+239.0
Total assets	**5,496.9**	**5,067.8**	**+429.1**
Shareholders' equity	3,293.2	3,222.5	+70.7
Non-current liabilities	896.9	779.3	+117.6
Current liabilities	1,306.8	1,066.0	+240.8
Total shareholders' equity and liabilities	**5,496.9**	**5,067.8**	**+429.1**

The Heraeus Group's financial position remained positive in 2019. Heraeus continues to have a very healthy balance sheet, hold a substantial cash balance, and benefit from a secure medium- and long-term funding base. At the end of 2019, the Heraeus Group's total assets amounted to €5,496.9 million, a year-on-year increase of €429.1 million. The Group's equity ratio, at 59.9 percent, was slightly below the previous year's level (2018: 63.6 percent).

Non-current assets rose by €190.1 million year on year to reach €1,883.2 million. The most significant change in this regard was the increase of €185.9 million in property, plant, and equipment due to investment in further expansion and modernization of the infrastructure and production capacities. Property, plant, and equipment also included right-of-use assets of €78.7 million as a result of the initial application of IFRS 16.

Current assets rose by a total of €239.0 million year on year to reach €3,613.7 million. This was mainly attributable to an increase in trade receivables (up €105.0 million), advances paid (up €86.4 million), and sales tax receivables (up €29.7 million). Receivables from precious metal swaps fell by €65.9 million, however.

Non-current liabilities advanced by €117.6 million on the position as of December 31, 2018 to reach €896.9 million. The provisions for pensions and similar obligations rose by €90.1 million year on year, primarily because of the decrease in the discount rates. Non-current financial debt increased by €60.9 million year on year, mainly due to the initial application of the new IFRS 16 accounting standard for leases. Conversely, deferred tax liabilities declined by €30.3 million compared with 2018.

Current liabilities went up by €240.8 million to €1,306.8 million. Liabilities in connection with precious metal transactions (up €163.5 million), liabilities to customers (up €39.1 million), and current financial debt (up €33.2 million) accounted for the bulk of this year-on-year increase.

The Group funds itself centrally via the Corporate Treasury function at Heraeus Holding GmbH. Liquidity is secured on the basis of multi-year financial planning in which the Group's operational activities are the principal source of liquidity. The Group's sources of medium- and long-term funding are primarily the two directly placed bonds with terms through to 2032 and 2034 and a loan from Germany's KfW development bank which matures in 2026. To fund its short-term financial requirements, the Group has access to a commercial-paper program and a long-term, committed syndicated loan facility. Neither of these instruments had been utilized at the end of 2019. The Trading units also use precious metal leasing for short-term funding. At the end of 2019, the total market value of the precious metals on loan from third parties amounted to €2,479.0 million (2018: €2,055.0 million).

Net cash provided by operating activities in 2019 came to €378.0 million (2018: €448.5 million). The main factor in this change was the fall in profit after taxes.

The net cash used for investing activities of €219.8 million mainly comprised payments for investments in non-current assets (€233.2 million) and payments for acquisitions (€10.5 million). Interest received of €21.8 million was the main item of cash inflow.

Consolidated cash flow statement

€ million	2019	2018	Change
Net cash provided by operating activities	378.0	448.5	–70.5
Net cash used for investing activities	–219.8	–227.4	+7.6
Net cash used for financing activities	–97.7	–76.7	–21.0
Net change in cash and cash equivalents	60.5	144.4	–83.9

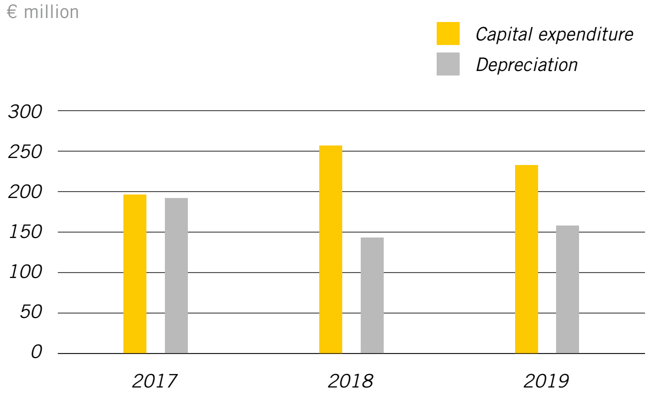
Net cash used for financing activities amounted to €97.7 million, primarily due to interest payments of €72.0 million and inflows and payments relating to the issue and redemption of interest-bearing liabilities totaling €19.1 million.

Consequently, there was a rise in cash and cash equivalents of €60.5 million. For further analysis, please refer to the cash flow statement in the notes to the consolidated financial statements.

The Group's liquidity reserves (cash and cash equivalents) increased by a total of €64.4 million to €882.6 million. The Group's financial position therefore remains very robust, which will enable it to continue to actively develop its businesses and position itself in the market.

Overall, the Group's financial performance in 2019 was unsatisfactory. The financial position remains stable, however, and is characterized by a high equity ratio and a robust funding structure as well as a strong cash balance for capital expenditure on infrastructure and production capacities.

Cash capital expenditure and depreciation on non-current assets*
€ million



* Prior-year figures adjusted for additions to and amortization of intangible assets.

Capital expenditure and divestments

In 2019, cash additions to property, plant, and equipment and intangible assets totaled €233.2 million (2018: €257.4 million – adjusted for capital expenditure on intangible assets). In addition, there were purchase commitments of €63.9 million at the year end that could be met using the available cash and cash equivalents.

Further good progress was made last year with the initiatives to modernize and expand the operational sites with the aim of significantly improving efficiency. This mainly included the successful continuation of projects to expand the Hanau, Kleinostheim, and Wehrheim sites. The project to expand capacity at the Bitterfeld site was discontinued for the time being.

Field of activity Health

Heraeus carries out continuous research and development on products that contribute to medical progress. The growth in global society and aging demographic structure are driving increasing demand for state-of-the-art materials and technologies in the medical sector. Heraeus has a long tradition of involvement in this market; indeed, the business began as a pharmacy. Today, Heraeus is one of the leading manufacturers of orthopedic products, particularly biomaterials. It is also a key supplier in the area of cardiology and minimally invasive surgery.

Business performance

The medical sector proved to be largely immune to the fluctuations in the global economy. Demand remained on a clear growth trajectory. Within the field of activity Health, revenue excluding precious metals rose year on year by 8.0 percent to €370.6 million.

In the **biomaterials** business, there was little change in revenue compared with the prior-year figure despite growth in the principal markets. Growth in Europe, Asia, and Australia was canceled out by losses in the US caused by a change to the distribution model. After work on establishing the new distribution model stalled in the first months of the year, the targets were achieved in the second half of 2019. However, the business was unable to fully compensate for the reduced volumes from the first half of the year.

Conversely, products in the **medical components and solutions** business made a particularly strong contribution to revenue growth. The business benefited mainly from the expansion of the US medical technology market.

Revenue excluding precious metals in the field of activity Health
€ million

Research and development

One focus of the research work carried out in the **biomaterials** business was on improving infection management in order to reduce the number of infections following the implantation of joint prostheses. Another key area of research during the reporting year was the development of easy-to-use bone cement products (cement simplification) for the implantation of joint prostheses.

The **medical components and solutions** business stepped up its research activities in the areas of sensors, neuromodulation leads, ablation electrodes, cardiac resynchronization therapy (CRT), and microcatheters, and this made a positive contribution to the revenue growth of the business. Furthermore, the development of innovative coating solutions further enhanced the performance of existing products.

Field of activity Electronics

Digitalization and networking are continuing to make excellent progress worldwide and have become a key element of today's society. Heraeus supports customers from the information technology, automotive, telecommunications, and consumer goods industries in making electronic components smaller, longer lasting, and more efficient thanks to its broad, globally available offering of innovative joining and coating technology solutions. Its in-depth materials expertise and its broad technology portfolio allow Heraeus to provide customized and integrated solutions. It is also a technology leader in the production and processing of high-purity quartz glass. This is the raw material for the production of optical fiber cables for the telecommunications industry, the internet's backbone, and is used to produce components for the production of ever smaller semiconductor chips.

Business performance

The field of activity Electronics can look back on a year in which it had to face a number of challenges amid difficult market conditions. Its revenue excluding precious metals fell by 15.5 percent to €638.8 million in 2019.

The **joining and coating technology** business contracted last year due to lower demand in the automotive and semiconductor markets. Revenue was also depressed by the growing trend for companies to substitute traditional precious metal products with products containing a higher proportion of non-precious materials. However, there was further growth in the relatively new metal ceramics substrate portfolio.

In the **semiconductor applications** business, the decline in capital spending and the difficult market conditions were among the reasons why Heraeus was unable to maintain its growth trajectory from previous years in 2019. Revenue in this business was down on the prior-year level.

Demand for **optical fibers for telecommunications** fell last year, particularly in China, after having increased sharply in the previous years. This was mainly due to the investment cycles for the 4G and fiber-to-home networks coming to an end and to the delayed start to the expansion of 5G networks. Revenue declined significantly in this business due to a combination of reduced demand and overcapacity in the market putting strong downward pressure on prices.

Research and development

In the **joining and coating technology** business, Heraeus continued its transformation from a supplier of materials to a solution-oriented systems provider last year. Heraeus focused its research in this area on the Die Top System (DTS®), which represents a key innovation in the power electronics industry thanks to its improved temperature properties, greater cost efficiency, and extended lifetime. In addition, Heraeus stepped up its research in the area of sinter materials, particularly with regard to the sintering of modules on heat sinks and the enhancement of the bond strength of semiconductor chips.

Revenue excluding precious metals in the field of activity Electronics
€ million

Last year, the **semiconductor applications** business focused on exploiting its capabilities in the area of synthetic quartz glass. The objective is to be able to manufacture products for the semiconductor industry with an even higher level of purity. The development of new formats and new functional materials also enabled the Group to expand its product portfolio for semiconductor applications. For example, the innovative composite material Heraeus Black Quartz (HBQ®) was introduced which has outstanding thermal properties. In the photonics business, work was focused on the development of new products for commercial applications and on highly specialist new materials, such as optical materials for extreme ultraviolet (EUV) lithography.

The business with **optical fibers for telecommunications** put the emphasis of its work on new and innovative products and the expansion of the technology portfolio for future generations of fibers. Coming up with solutions, for example by way of optimized design, that would make products more efficient for customers to use was one of the focal points of the research.

Field of activity Industrials

Heraeus, with its broad portfolio of products, has long been a partner of choice for industry, based on the Group's in-depth expertise in high-temperature processes and in various sensor applications. Heraeus is a recognized specialist in measurements for molten steel, iron, and aluminum, continuously developing its portfolio of products, ranging from high-performance sensors to complete measuring systems. The field of activity Industrials also includes start-up activities, sensors, and electronic chemicals.

Business performance

Revenue excluding precious metals in the field of activity Industrials rose by 5.7 percent to €642.7 million last year, primarily because of encouraging growth in the sensors business.

The business performance in the **steel business** was characterized by further strong demand for sensors and instruments that improve processes at steelworks, generating year-on-year growth for Heraeus in this business. This was mainly driven by an increase in global steel production, albeit with sometimes significant variations between the regions.

In the **sensors** business, Heraeus can look back on a successful year featuring strong revenue growth. The business with high-temperature sensors for diesel and petrol vehicles benefited from stricter emissions standards in a number of regions. Moreover, the trend toward electric-powered transport led to higher demand for sensors used to monitor temperatures in electric motors and in charging equipment. Alongside the core business of emissions temperature sensors, the business involving soot emissions sensors for diesel vehicles also grew and was successfully expanded by Heraeus in 2019.

The **electronic chemicals** business saw an increase in revenue as well. Heraeus products in the area of conductive polymers and organic chemicals for photoresist applications satisfy the demands that will be placed on future generations of chips, enabling the company to hold its ground in a weakening semiconductor market. The company set itself apart from the competition thanks to its technological expertise and rapid and reliable delivery times, resulting in further growth, particularly in the South Korean market. The increasing use of polymer capacitors in the automotive industry meant that revenue rose in this segment too, mostly driven by China and Japan.

Revenue excluding precious metals in the field of activity Industrials
€ million

Research and development

The **sensors** business strengthened its position in the development of automotive temperature sensors for applications of up 1,000°C and in the development of T-sensors for power electronics applications. In addition, the first generation of a soot particle sensor extended the Group's offering in the area of soot sensors for exhaust gas.

A number of improved chemicals for photoresist manufacturers were launched in the **electronic chemicals** business.
In the display segment, advances were made in initiatives to find solutions for smartphone displays and solvent-based conductive polymers. In the area of capacitor formulations, R&D activities continued to focus on high-voltage applications and on sophisticated applications designed to meet the stricter requirements placed on automotive electronics.

Research in the **start-ups** business was concentrated on three areas: improving the performance of lithium-ion and lead acid batteries for use in transport, the processing of special alloys, and the manufacture of amorphous metal alloys and amorphous components and parts.

Field of activity Environmental

The development of sustainable technologies for a clean environment represents one of the key activities at Heraeus. With its photovoltaics products, the company makes a significant contribution to resource-efficient power generation. Another key activity of Heraeus is the manufacturing of specialty light sources to purify air and water, a resource that is becoming scarcer. As a precious metal specialist, the company has extensive expertise in the manufacturing of industrial products containing precious metals for various applications. Heraeus provides services throughout the precious metal cycle, from procurement and processing through to recycling. Coating and refining processes along with colors and products for the pharmaceutical industry that contain precious metals round off Heraeus's broad expertise in the precious metal cycle and in industrial products in the field of activity Environmental.

Business performance

Revenue excluding precious metals in the field of activity Environmental decreased by 0.8 percent year on year in 2019 to reach €533.8 million.

The business with **silver conductive pastes** for solar cells in the photovoltaics industry saw its revenue decline in a persistently challenging market environment characterized by strong price pressure. Following a difficult first half of the year, Heraeus began to reassert itself in the market at the end of the year, thanks in large part to new and more efficient product lines.

In 2019, the **specialty light sources** business forged ahead with its strategy of becoming a provider of complex system solutions. Its business performance was slightly down on the prior year, however. This was mainly due to sources of political uncertainty such as the Brexit talks and the US-China trade dispute, which made companies reluctant to commit to capital expenditure on plant and systems.

Despite the challenging market environment, characterized by sluggish growth in global GDP and highly volatile precious metal prices, Heraeus further expanded its business as a provider of integrated **precious metal solutions** in 2019. Demand for precious metal chemistry products designed for use in industrial applications continued to be robust. The tightening of exhaust emissions standards by governments in a number of regions around the world also had a positive impact on demand for precious metals and related products and services.

Revenue excluding precious metals in the field of activity Environmental
€ million

Research and development

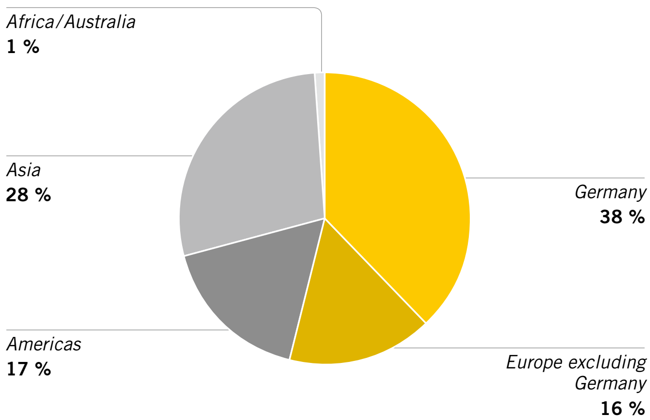
In the **photovoltaics** business, Heraeus was able to launch two products that connect cells within a module. It also conducted research into new technologies for the optimization of pastes and achieved record efficiency figures in a trial with a collaboration partner.

Further progress was made last year in the transformation of the **specialty light sources** business from a supplier of components to a provider of systems and solutions. SOFI, a UV LED light source designed specifically for the optical fiber market, was successfully launched onto the market. In the flash systems business, the humm3 technology for the lightweight materials sector was optimized and readied for volume production.

People at Heraeus

Number of employees worldwide

Employees by region in 2019



Overview: rise in the number of employees

As of December 31, 2019, Heraeus had 14,190 employees worldwide (2018: 13,858 employees).

This increase resulted mainly from the transfer of staff as a result of several small international acquisitions but also the conversion of temporary employment contracts into permanent contracts. However, there was a strong fall in the number of temporary workers employed by the Group.

Staffing levels were increased in individual growth businesses, for example in order to create a new sales unit for Heraeus Medical in the US. In declining business units, selected measures were taken to reduce staffing levels. As part of this, negotiations were completed with the works council in Bitterfeld that resulted in the signing of a redundancy scheme and social compensation plan.

Further measures to reduce costs were also initiated in light of the persistently challenging business situation.

Future focused: promoting the skills of tomorrow today

Digitalization, and the ever-shorter innovation cycles that result from this, means that the fields of activity are continually in need of new skills.

This, in turn, is driving demand for progressive approaches to employee training. For this reason, the organization has been running initial pilot projects focused on the topic of digital learning. The global rollout of a learning management system has made it much easier and faster to provide new training content. In addition, e-learning courses allow employees to learn at their own pace whenever and wherever they wish.

Training plays a key role in nurturing young talent in Germany. New topics were added to the training programmes for the traditional vocations last year and included a supplementary qualification in additive manufacturing. Technical informatics and other new training fields were also strengthened further. Heraeus gives employees without any vocational qualifications the opportunity to rectify this by working toward a recognized qualification in their field of work.

Responsibility: focus on health, safety, and sustainability

Heraeus takes responsibility for the well-being of its employees. Facilitating a flexible, health-oriented, and sustainable working environment is therefore one of the permanent focal points within the Group.

One-day events and more comprehensive campaigns were carried out in 2019 with the aim of preventing illnesses and accidents at work, and raising awareness in the workforce of issues relating to health, the environment, and safety.

In Germany, new works agreements were entered into that will ensure a better work-life balance. These covered areas such as mobile working, greater use of a system of working time based on mutual trust, and the introduction of a lifetime working hours account for employees who are not covered by the collective pay agreements.

Outlook

In 2020, Heraeus does not expect to see any significant recovery in the markets of relevance to the Group.

The latest report published by the International Monetary Fund (IMF) forecasts global economic growth of 3.3 percent for 2020, which would be higher than the growth rate for 2019.

Unlike the slowdown in economic growth in 2019, which was largely a global phenomenon, the trends in 2020 are expected to vary much more significantly across the different regions. For the emerging markets in particular, the current assumption is that the pace of expansion will increase, which is reflected in a projected growth rate of 4.4 percent (2019: 3.7 percent). The projected rate of growth is 1.3 percent for the eurozone (2019: 1.2 percent) and only 1.1 percent for Germany (2019: 0.5 percent). In the US, the world's biggest economy, economic growth is predicted to slow to 2.0 percent (2019: 2.3 percent). At 6.0 percent, the rate of growth in China is also expected to be lower than in the prior year (2019: 6.1 percent).

These growth forecasts are subject to a persistently high level of risk that is largely related to current sources of geopolitical tension. In particular, a further escalation of the trade dispute between the US and China and the associated increase in political uncertainty could weaken growth. Moreover, there continues to be uncertainty in Europe regarding the outcome of the Brexit negotiations and what impact this will have on the European economy. As well as the prevailing political tension, an increase in the spread of coronavirus may have a negative impact on global economic growth. Export-dependent industries would be particularly badly affected by a fall in demand. Also, potential safety measures taken to contain the virus could disrupt global value chains and lead to delivery bottlenecks around the world.

For 2020, Heraeus anticipates that revenue excluding precious metals will remain at approximately the same level as in the prior year. The ramp-up of direct sales in the biomaterials business in the US and revenue growth from new products are expected to largely compensate for the projected decline in revenue from businesses that are particularly affected by a challenging environment in the end markets. This will be supported by efforts that were started in previous years to continually improve sales processes and by the shift toward becoming a provider of system solutions. In 2020, Heraeus will also continue to invest in infrastructure and innovation in order to be able to exploit future sources of revenue growth.

Heraeus expects to see a slight year-on-year increase in profit after taxes in 2020. A number of excellence initiatives were developed, and in some cases launched, in 2019. These will be continued, and in some cases expanded this year, and will play a key role in achieving the defined earnings target.

Heraeus expects there to be significant revenue growth in the **field of activity Health**. The primary factors here will be the projected increase in revenue in the biomaterials business, which will be driven mainly by the further expansion of the US direct business and by gains in market share in other regions. Revenue is also expected to grow slightly in the core segment of the medical components and solutions business. Additional positive revenue effects are anticipated from a further rise in demand for the continuous glucose monitoring product.

In the **field of activity Electronics**, Heraeus anticipates that revenue will continue to decline in 2020, albeit at a slower rate than in 2019. The expected revenue increases in the joining and coating technology business, driven mainly by the ramp-up of new products, will be unable to make up for the projected decreases in the other businesses. Further weak demand is forecast for the semiconductor industry. Because of the difficult situation in the global economy, the timing of a market recovery is hard to predict. In the telecommunications business, total revenue in 2020 is projected to be slightly lower than in 2019 because the supply and demand situation remains difficult.

Business performance in the **field of activity Industrials** hinges largely on global steel production. The assumption here is that demand for steel will increase slightly in 2020 compared with 2019, which will positively impact the volume of revenue generated from sensors for steel production. In addition, new measurement applications for molten metals will be added to the product portfolio. Heraeus also expects to see an increase in demand for temperature sensors from within the automotive sector and from industry. In order to be able to meet this demand, it will continue to invest in the expansion of production capacity in 2020. Heraeus is also planning to expand its activities in the area of electric-powered transport.

Revenue in the **field of activity Environmental** is projected to decrease slightly in 2020 compared with the prior year. The precious metals business has also budgeted for a moderate decline in sales in favor of an increase in profitability. Market conditions for the specialty light sources business are expected to remain challenging following a difficult year in 2019. In the photovoltaics business, Heraeus is planning to expand and build on the business with existing customers and to attract new customer groups, which will be reflected in revenue growth.

Opportunity and risk report

Integrated risk management system

Heraeus operates a Group-wide system of risk management that is used to document and assess risks. The aim is to identify risks at an early stage and to initiate corrective action as appropriate. The material opportunities and risks are explained below.

Identified Group-wide material opportunities and risks

The risks discussed below are categorized in terms of their negative impact on the Group and presented in declining order within those categories.

Strategic opportunities and risks

Heraeus operates in international markets that are dominated by technological innovations. As an innovator, Heraeus has always offered its customers tangible competitive advantages. In order to retain these strategic opportunities in the future, the company maintains a continuous dialog with research and academia. New start-ups in the incubator and intensive R&D activities within the fields of activity are laying the foundations for long-term revenue growth and tangible competitive advantages. Targeted efforts to engage in new forms of collaboration such as partnerships and venture capital investments round off our approach to exploiting potential for organic growth.

Incorrect assessments in the definition and implementation of the strategic product and technology roadmap are a source of strategic risk for Heraeus. These include, in particular, failing to identify or wrongly assessing new market trends and disruptive technologies. The Group's Innovation Board, the Board of Managing Directors of Heraeus Holding, and the fields of activity watch the market closely and regularly monitor the business performance from a strategic perspective in order to limit risks. Strategic risks for Heraeus are regarded as low.

Market opportunities and risks

We cannot rule out the possibility of the economic situation deteriorating as a result of growing geopolitical risks. The future performance of the Chinese market is especially critical for Heraeus, and this will be determined in part by the extent to which coronavirus spreads. Heraeus closely monitors economic trends in individual countries and regions in order to be able to react to any negative developments as early as possible. On the whole, its global market presence is having a positive effect, mitigating the negative impact of regional crises on the Group. Economic risk constitutes a medium risk for the Group due to the growing geopolitical risks and the current economic situation. Conversely, stronger economic growth would open up additional sales opportunities.

Heraeus counters threats to its market positions and competitive advantages through its broadly diversified product and customer structures, which limit the degree to which individual market risks impact on the Group. Once products have been successfully launched, it is crucial for the Heraeus Group's long-term market positioning that it makes continual improvements to the products. Heraeus also minimizes risk by building close relationships with customers, securing further big-ticket accounts, and qualifying new suppliers for key products. The company combats any loss of market share by closely monitoring the markets and the development of alternative products. Heraeus regards the level of risk with regard to its market position and competitive advantages being threatened as low.

A further delay to the comprehensive rollout of the 5G network coupled with the prevailing uncertainties in the semiconductor market present a risk to future business performance in the field of activity Electronics.

Opportunities in the field of activity Health are presented by the opening up of new markets, including through certification of products in new countries and the expansion of the portfolio of cement simplification products. In the medical components and solutions business, risks could result from a potential consolidation of market players which would lead to fiercer competition.

Financial opportunities and risks

As a business with international operations, Heraeus is exposed to a range of financial risks. These include interest-rate risk, currency risk, credit risk, and liquidity risk.

Processes are in place within Corporate Treasury to identify, quantify, analyze, manage and monitor these risks, backed up by relevant policies and internal controls and systems.

Currency risk on transactions is mitigated by means of globally diversified procurement, production, and sales activities. Hedges may only be entered into with selected counterparties and only within specified limits. Currency translation risks are not hedged. A standardized global system of receivables management based on a limit system is one of the ways in which Heraeus mitigates credit risk. This is the responsibility of the operating units and is monitored and managed by a central credit management unit. Heraeus can make use of various liquidity safeguarding measures to enable it to respond to short-term as well as unexpected liquidity risk. A sufficient level of cash and cash equivalents as well as agreed lines of credit are among the means it has at its disposal for this purpose.

For a more in-depth analysis of the financial risks, see notes (38) to (42) of the notes to the consolidated financial statements.

Operational opportunities and risks

Avoiding production risks is of critical importance for Heraeus as a technology group with its broad product range and its high number of production facilities. Weaknesses in the production process could lead to deliveries being cancelled or delayed, which in turn is associated with the additional risk of contractual penalties. To minimize the impact of disruption to production processes, Heraeus has introduced a business continuity management policy and conducts routine maintenance and servicing of its equipment. Critical production processes are also safeguarded by building a degree of redundancy into the system and holding sufficient back-up inventories.

Several risks result from the global procurement process. Fluctuations in the quality of deliveries can lead to substantial risks for Heraeus. In the medical products market, the smooth and reliable delivery of raw materials and preliminary products is very important. Delayed deliveries or disruptions to supply due to the bankruptcy of a supplier could lead to production bottlenecks or even production downtime. Heraeus mitigates this risk by qualifying alternative suppliers for key products. Contractual regulations committing suppliers to maintain certain quality and delivery standards and to keep back-up stocks also help to contain risks. This is supported by the global Heraeus purchasing policy, which sets out standardized processes for the procurement of materials, goods, and services from third parties.

Quality defects in production and order execution could lead to fewer or reduced customer orders, cost-intensive reworks, product recalls and, in extreme cases, product liability cases. This concerns, in particular, product liability cases for medical products and product recalls at automotive suppliers where large numbers of parts are affected. These risks are mitigated by quality controls and by making continual improvements to the quality management systems. The excellence activities also help the units in their efforts to manufacture products to the highest standard.

In summary, Heraeus categorizes the procurement and production risks and the risks associated with quality defects as medium.

The growing interconnectedness of the world has increased the threat posed by cyberattacks and the potential misuse of IT systems. Downtime of key IT systems, the disclosure or loss of integrity of confidential data from research and business operations, and the manipulation of IT systems in process management are particularly relevant risks for Heraeus. Heraeus combats these risks using the latest protection software, network and data encryption, and clear authorization processes specified by the Information Security Management System (ISMS), which is based on the ISO 27001 international standard. The impact of IT risks and their effect on the financial position and financial performance of the Group is regarded as low.

Operational opportunities could result from even better capacity utilization of the production facilities as a result of unexpectedly high demand for certain products, which would lower unit costs.

Legal opportunities and risks

Environmental protection and health and safety at work remain key priorities for the Group. Regular campaigns and intensive communications by the global Environment, Health and Safety (EHS) organization help to raise awareness of occupational health and safety throughout the company. The endangerment of employees and third parties and potential breaches of environmental regulations represent a moderate source of risk for Heraeus.

It is impossible to completely rule out the possibility of non-compliance with financial and accounting regulations due to the global business activities and the different legal environments in which the company operates. This can also result in customs and tax risks. Heraeus reduces these risks by strictly adhering to central governance policies and continually training staff in the relevant functions. It also operates a central compliance management system in order to further reduce the likelihood of legal infractions or violations of the law. The already well advanced global rollout of a uniform enterprise resource planning (ERP) system that aims to integrate and harmonize relevant business processes is also helping to lower risk. Heraeus considers the overall level of risk to be low.

The greater complexity and number of industrial property rights that need to be observed has increased the risk of possible patent infringements. Despite the measures put in place, such as project-specific searches for property rights, infringements of industrial or intellectual property rights can still occur. Risks from patent infringements are regarded as being low at the current time.

Legal frameworks can also give rise to identifiable opportunities. Heraeus offers a range of products which help customers to meet the requirements of heightened regulations (for example with regard to the purification of water or air or the transition to electricity produced using renewable sources).

External opportunities and risks

There are potential threats that are beyond the control of Heraeus and that are difficult to quantify. These primarily include force majeure events that might cause damage to German and international locations and risks resulting from country-specific sociocultural and political developments. Heraeus reduces these risks by implementing a rigorous system of business continuity management and through global diversification of its production sites. The risk of damage to the company's sites is mitigated by taking out insurance.

Reputational risk, which can lead to financial losses and also influence other risk categories, is another potential source of negative effects. Based on the measures put in place and the current situation, Heraeus classifies aggregate external risk as low.

Precious metal opportunities and risks

Precious metal risks are the risks which exclusively arise from business processes involving trading with precious metals.

The trading companies in Hanau, New York, Hong Kong, and Shanghai are permitted to conduct precious metal transactions solely on the basis of a physical underlying customer transaction. Positions can only be accumulated and held on a daily basis within tightly defined and continuously monitored risk limits. All transactions are recorded and monitored on an ongoing basis in an electronic trading system. All the trading sites use a standardized IT system, which increases transparency and reduces the trading process risks. Heraeus regards precious metal risks as being low overall.

Commonly used hedging instruments are employed to hedge price risks. In accordance with the principle of separation of functions, the ongoing monitoring of compliance with prescribed risk limits and thresholds is carried out by employees who do not report to the Trading units.

In the precious metal trading business, opportunities arise from fluctuations in the markets and in prices for precious metals, which can trigger an increase in demand both from industrial customers and investors. There is particular potential for growth in Asia.

Overall risk evaluation

With systems in place for the measurement and limitation of risk, Heraeus is also able to meet the need for early risk detection. Based on an analysis of currently identifiable risks, there are no threats to the continued existence of the Heraeus Group as a going concern.

Compliance report*

The content and structure of the Heraeus compliance system has been continually developed since the introduction of a global Code of Conduct for the Heraeus Group on January 1, 2007. The compliance system has been part of the responsibility management system since 2016. The responsibility office is in charge of compliance and data protection structures and helps to establish and anchor reliable and efficient processes and structures around the world related to the exercise of responsibility.

Compliance activities in 2019 focused on implementing the provisions contained in the Fifth EU Money Laundering Directive, setting up appropriate processes to meet our customers' requirements with regard to dealings with conflict minerals, further developing the rules covering travel and entertainment in China, and improving the documentation of our compliance systems.

In 2019, with the implementation period for the General Data Protection Regulation having come to an end in the previous year, the data protection team worked mainly on integrating data protection into the fields of activity and Group functions, improving processes and the data protection system for the documentation of data processing, and raising awareness among employees of data protection issues.

With regard to export controls and customs, progress was made in the transfer of relevant operational tasks to the fields of activity in Germany, training and the sharing of information among experts was stepped up around the world, and key performance figures to improve management were introduced. In 2019, there was a particular focus on helping Heraeus companies outside Germany to improve their processes, with the aim of making processes developed for use in Germany available to international sites.

Uniform and minimum standards were specified for the EHS organization last year. The audit system was also upgraded.

Global training is provided to ensure that all relevant employees have been informed about new regulations and that they know and understand the rules of the Heraeus compliance system. Furthermore, the Heraeus Compliance Officer and the compliance officers in the operating units regularly share information on compliance matters.

The setting up of the Group Responsibility Committee reflects the ongoing transition at Heraeus from a compliance system toward a responsibility management system. The Group Responsibility Committee now includes the Board of Managing Directors of Heraeus Holding, the Group General Counsel, the Head of the Responsibility Office, the Head of Tax, the Head of Customs & Export Control, the Heraeus Risk Officer, the Head of Group Internal Audit, the Data Protection Officer, the Head of IT Governance & Architecture, the Head of EHS, and the external auditors.

The Group companies complete an annual compliance questionnaire on the introduction and implementation of compliance guidelines. The completed questionnaires are used to review the effectiveness of the compliance system. They are also available to Group Internal Audit as the starting point for compliance audits.

As well as submitting reports to the Group Responsibility Committee, the Heraeus Compliance Officer formally reports to the CEO once a year.

Based on all the aggregate findings, the Heraeus Compliance Officer and the Group's Board of Managing Directors inform the Supervisory Board's Audit Committee about developments and progress in the compliance management system, as well as about important individual events.

* This section is not included in the auditor's content review.

Consolidated financial statements. The Heraeus Group's financial position remained positive in 2019. The total assets of the Heraeus Group increased to €5,496.9 million as of the end of the year. The Group's liquidity reserves rose to €882.6 million. Its equity ratio fell slightly to 59.9 percent. Heraeus continues to have a very healthy balance sheet, hold a substantial cash balance, and benefit from a secure medium and long-term funding base.

Consolidated balance sheet

of Heraeus Holding GmbH, Hanau, for the year ended December 31, 2019

€ million	Note	Dec. 31, 2019	Dec. 31, 2018*
Goodwill	(10)	117.0	114.2
Other intangible assets	(10)	153.1	170.4
Property, plant, and equipment	(11)	1,245.1	1,059.2
Investments accounted for using the equity method	(12)	156.3	146.9
Other financial assets	(13)	23.6	11.1
Deferred tax assets	(33)	185.7	188.8
Other assets	(14)	2.4	2.5
Non-current assets		**1,883.2**	**1,693.1**
Precious metals	(15)	867.8	895.3
Inventories – excluding precious metals	(15)	442.7	422.5
Trade receivables	(16)	802.3	697.3
Cash and cash equivalents	(17)	882.6	818.2
Other financial assets	(13)	223.3	279.3
Income tax assets		28.1	24.9
Other assets	(14)	366.9	237.2
Current assets		**3,613.7**	**3,374.7**
Assets		**5,496.9**	**5,067.8**

€ million	Note	Dec. 31, 2019	Dec. 31, 2018*
Subscribed capital		210.0	210.0
Capital reserve		127.8	127.8
Retained earnings		2,822.1	2,784.3
Other reserves		112.4	78.3
Equity attributable to the shareholders of Heraeus Holding GmbH	(18)	**3,272.3**	**3,200.4**
Non-controlling interests	(19)	20.9	22.1
Shareholders' equity		**3,293.2**	**3,222.5**
Pensions and similar obligations	(21)	589.6	499.5
Provisions	(22)	52.7	54.8
Financial debt	(23)	178.8	117.9
Other financial liabilities	(24)	11.3	9.2
Deferred tax liabilities	(33)	62.2	92.5
Other liabilities	(25)	2.3	5.4
Non-current liabilities		**896.9**	**779.3**
Provisions	(22)	147.5	149.2
Financial debt	(23)	61.6	28.4
Trade payables	(26)	264.4	266.4
Other financial liabilities	(24)	509.0	457.0
Income tax liabilities		26.9	22.8
Other liabilities	(25)	297.4	142.2
Current liabilities		**1,306.8**	**1,066.0**
Shareholders' equity and liabilities		**5,496.9**	**5,067.8**

* See (2) for details regarding the comparability of prior-year figures.

Consolidated income statement

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2019

€ million	Note	2019	2018*
Revenue	(27)	22,377.8	20,295.1
Changes in inventories		–18.3	29.3
Cost of materials		–20,673.4	–18,616.1
Personnel expenses	(28)	–901.8	–843.3
Amortization, depreciation, and impairment	(29)	–184.7	–142.8
Other operating income	(30)	41.0	39.5
Other operating expenses	(31)	–434.7	–440.1
Net impairment losses on trade receivables	(16)	–3.4	–0.6
Income from investments accounted for using the equity method	(12)	19.9	20.0
Earnings before interest and tax (EBIT)		**222.4**	**341.0**
Finance income	(32)	21.7	21.2
Finance costs	(32)	–86.4	–76.3
Net finance costs		**–64.7**	**–55.1**
Profit before taxes		**157.7**	**285.9**
Income taxes	(33)	–42.6	–88.6
Profit after taxes		**115.1**	**197.3**
thereof attributable to the shareholders of Heraeus Holding GmbH		*109.2*	*189.0*
thereof attributable to non-controlling interests	*(19)*	*5.9*	*8.3*

* See (2) for details regarding the comparability of prior-year figures.

Consolidated statement of comprehensive income

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2019

€ million	Note	2019 Amount before taxes	2019 Tax expense / income	2019 Amount after taxes	2018 Amount before taxes	2018 Tax expense / income	2018 Amount after taxes
Profit after taxes		**157.7**	**–42.6**	**115.1**	**285.9**	**–88.6**	**197.3**
Items that will not be reclassified to profit or loss							
Remeasurement of net liability arising from defined benefit pension plans	(21)	–89.6	17.5	–72.1	2.6	–9.2	–6.6
Items that have been or can be reclassified to profit or loss							
Currency translation adjustment		28.5	–	28.5	27.6	–	27.6
Currency translation adjustment reclassified to profit or loss		–0.3	–	–0.3	–	–	–
Share of other comprehensive income of investments accounted for using the equity method		2.8	–	2.8	6.3	–	6.3
Effective portion of changes in fair value of cash flow hedges	(39a)	1.2	–0.4	0.8	–3.6	1.1	–2.5
Cash flow hedges reclassified to profit or loss	(39a)	3.6	–1.1	2.5	–3.2	1.0	–2.2
Other comprehensive income		**–53.8**	**16.0**	**–37.8**	**29.7**	**–7.1**	**22.6**
Total comprehensive income		**103.9**	**–26.6**	**77.3**	**315.6**	**–95.7**	**219.9**
thereof attributable to the shareholders of Heraeus Holding GmbH				*71.2*			*211.8*
thereof attributable to non-controlling interests				*6.1*			*8.1*

Consolidated cash flow statement

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2019

€ million	Note	2019	2018
Profit after taxes		**115.1**	**197.3**
Amortization, depreciation, impairment, and reversal of impairment of non-current assets	(10) (11)	183.9	141.3
Net finance costs	(32)	64.7	55.1
Profit distributions received from associates and joint ventures		13.6	12.5
Change in inventories		18.4	–168.6
Change in trade receivables		–98.8	111.4
Change in trade payables		–4.1	–18.6
Change in provisions and in pensions and similar obligations		–29.5	–25.5
Change in other net assets		151.1	104.7
Other non-cash transactions and other non-operating expenses		–35.0	50.3
Gains on disposal of property, plant, and equipment		–1.4	–11.4
Net cash provided by operating activities	**(34)**	**378.0**	**448.5**
Proceeds from the disposal of non-current assets		9.7	6.7
Proceeds from the disposal of other business units		–	13.1
Payments for investments in non-current assets		–233.2	–256.7
Payments for acquisitions minus acquired liquid funds		–10.5	–6.6
Payments for the acquisition of other businesses		–6.7	–3.2
Other cash payments		–0.9	–1.8
Interest received		21.8	21.1
Net cash used for investing activities	**(35)**	**–219.8**	**–227.4**
Distributions, including distributions to non-controlling interests		–6.6	–6.9
Interest paid		–72.0	–57.1
Proceeds from the issuing of interest-bearing liabilities		25.3	12.8
Payments relating to the redemption of interest-bearing liabilities		–44.4	–25.5
Net cash used for financing activities	**(36)**	**–97.7**	**–76.7**
Net change in cash and cash equivalents		**60.5**	**144.4**
Effect of exchange rate differences on cash and cash equivalents		3.9	1.2
Cash and cash equivalents at the beginning of the period		818.2	672.6
Cash and cash equivalents at the end of the period	**(37)**	**882.6**	**818.2**

Consolidated statement of changes in shareholders' equity

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2019

€ million	Note	Subscribed capital	Capital reserve	Retained earnings: Other retained earnings	Retained earnings: Remeasurement of defined benefit pension plans	Other reserves: Currency translation	Other reserves: Cash flow hedges	Equity attributable to the shareholders of Heraeus Holding GmbH	Non-controlling interests (19)	Shareholders' equity
Shareholders' equity as of Jan. 1, 2018		**210.0**	**127.8**	**2,755.2**	**–152.5**	**46.7**	**2.2**	**2,989.4**	**20.9**	**3,010.3**
Change of accounting method*		–	–	–0.8	–	–	–	–0.8	–	–0.8
Shareholders' equity as of Jan. 1, 2018 – restated		**210.0**	**127.8**	**2,754.4**	**–152.5**	**46.7**	**2.2**	**2,988.6**	**20.9**	**3,009.5**
Profit after taxes, 2018		–	–	189.0	–	–	–	189.0	8.3	197.3
Remeasurement of defined benefit pension plans		–	–	–	–6.6	–	–	–6.6	–	–6.6
Currency translation		–	–	–	–	27.8	–	27.8	–0.2	27.6
Share of income from investments accounted for using the equity method		–	–	–	–	6.3	–	6.3	–	6.3
Cash flow hedges		–	–	–	–	–	–4.7	–4.7	–	–4.7
Other comprehensive income for 2018		**–**	**–**	**–**	**–6.6**	**34.1**	**–4.7**	**22.8**	**–0.2**	**22.6**
Total comprehensive income for 2018		**–**	**–**	**189.0**	**–6.6**	**34.1**	**–4.7**	**211.8**	**8.1**	**219.9**
Distributions	(36)	–	–	–	–	–	–	–	–6.9	–6.9
Shareholders' equity as of Dec. 31, 2018		**210.0**	**127.8**	**2,943.4**	**–159.1**	**80.8**	**–2.5**	**3,200.4**	**22.1**	**3,222.5**
Shareholders' equity as of Jan. 1, 2019		**210.0**	**127.8**	**2,943.4**	**–159.1**	**80.8**	**–2.5**	**3,200.4**	**22.1**	**3,222.5**
Profit after taxes, 2019		–	–	109.2	–	–	–	109.2	5.9	115.1
Remeasurement of defined benefit pension plans		–	–	–	–72.1	–	–	–72.1	–	–72.1
Currency translation		–	–	–	–	28.0	–	28.0	0.2	28.2
Share of income from investments accounted for using the equity method		–	–	–	–	2.8	–	2.8	–	2.8
Cash flow hedges		–	–	–	–	–	3.3	3.3	–	3.3
Other comprehensive income for 2019		**–**	**–**	**–**	**–72.1**	**30.8**	**3.3**	**–38.0**	**0.2**	**–37.8**
Total comprehensive income for 2019		**–**	**–**	**109.2**	**–72.1**	**30.8**	**3.3**	**71.2**	**6.1**	**77.3**
Distributions	(36)	–	–	–	–	–	–	–	–6.6	–6.6
Other changes		–	–	0.7	–	–	–	0.7	–0.7	–
Shareholders' equity as of Dec. 31, 2019		**210.0**	**127.8**	**3,053.3**	**–231.2**	**111.6**	**0.8**	**3,272.3**	**20.9**	**3,293.2**

* Initial application of IFRS 9

Notes to the consolidated financial statements

of Heraeus Holding GmbH, Hanau, for the year ended December 31, 2019

Significant accounting policies

General disclosures

Heraeus Holding GmbH is the Group's parent company and its headquarters are in Hanau, Germany. Its registered address is Heraeusstrasse 12–14, 63450 Hanau, Germany. For details of the Group's business activities, please see the section 'Fundamentals of the Group' in the group management report.

Applying section 315e of the German Commercial Code (HGB), the consolidated financial statements of Heraeus Holding GmbH have been prepared in accordance with International Financial Reporting Standards (IFRS) as adopted by the European Union (EU). In addition to the IFRS rules, all statutory disclosure and explanation requirements in the HGB are met.

The financial year corresponded to the 2019 calendar year. The consolidated financial statements have been prepared in euros. Unless otherwise stated, all amounts are shown in millions of euros (€ million).

To improve the clarity of presentation and the transparency of the consolidated financial statements, some items on the balance sheet and in the income statement have been aggregated and are reported separately in the notes. The income statement has been prepared using the nature-of-expense method. The assets and liabilities on the balance sheet are broken down into current and non-current items. Assets and liabilities are considered to be current if they fall due or are intended to be sold within one year or within the entity's normal operating cycle. This period begins with the procurement of the resources needed for the production process and ends with the receipt of cash or cash equivalents in return for the sale of the products created or services provided in this process. Trade receivables, trade payables, and inventories are reported as current items. Deferred tax assets, deferred tax liabilities, and pensions and similar obligations are reported as non-current items.

The consolidated financial statements are generally prepared using the cost method, with the exception of derivative financial instruments, investments, and certain other financial assets and liabilities, which are measured at fair value.

On March 11, 2020, the consolidated financial statements and group management report prepared for the year ended December 31, 2019 were released by the Board of Managing Directors for approval by the Supervisory Board and for publication.

Amendments to accounting policies

(a) Initial application of new standards and interpretations

The new standards and interpretations of relevance to Heraeus are explained below. Various other amendments have been issued as well, but these are not expected to have any material impact on the consolidated financial statements.

IFRS 16 – 'Leases': IFRS 16 introduces a uniform financial reporting model pursuant to which leases are recognized on the lessee's balance sheet. A lessee recognizes a right-of-use asset representing its right to use the underlying asset, as well as a liability from the lease, representing its obligation to make lease payments. There are exemptions for short-term leases and for leases where the underlying asset has a low value. The accounting method used by the lessor is similar to that prescribed by IAS 17, i.e. lessors continue to classify leases as either finance or operating leases.

IFRS 16 replaces the previous guidance in IAS 17 – 'Leases' and IFRIC 4 – 'Determining Whether an Arrangement Contains a Lease'. Heraeus adopted IFRS 16 as of January 1, 2019 using the modified retrospective method. The effect of applying the new standard for the first time has been recognized as an adjustment of the opening balances; comparative information has not been restated. However, this has only a marginal impact on comparability with the previous year's figures.

As a result of the application of IFRS 16, additional right-of-use assets and lease liabilities have been recognized, in both cases in an amount of €81.1 million. Right-of-use assets are recognized under property, plant, and equipment; lease liabilities under financial debt. Existing lease liabilities classified as finance leases under IAS 17 were reclassified from other financial liabilities to financial debt with effect from January 1, 2019. The opening balances were adjusted as follows:

€ million	Jan. 1, 2019	Reclassifications	Initial application of IFRS 16	Jan. 1, 2019 – restated
Property, plant, and equipment*	1,059.2	–	81.1	1,140.3
Assets	**5,067.8**	**–**	**81.1**	**5,148.9**
Financial debt	146.3	2.4	81.1	229.8
thereof non-current	*117.9*	*1.7*	*60.3*	*179.9*
thereof current	*28.4*	*0.7*	*20.8*	*49.9*
Other financial liabilities	466.2	–2.4	–	463.8
thereof non-current	*9.2*	*–1.7*	–	*7.5*
thereof current	*457.0*	*–0.7*	–	*456.3*
Shareholders' equity and liabilities	**5,067.8**	**–**	**81.1**	**5,148.9**

* As of January 1, 2019, property, plant, and equipment included assets relating to finance leases in the amount of €2.9 million.

The table below provides a reconciliation of future payments on operating leases as of December 31, 2018 to lease liabilities as of January 1, 2019:

€ million	
Future payments on operating leases as of December 31, 2018	**93.3**
Effect of discounting	–12.2
Additional lease liabilities resulting from the initial application of IFRS 16 as of January 1, 2019	**81.1**
Existing lease liabilities from finance leases as of January 1, 2019	2.4
Lease liabilities as of January 1, 2019	**83.5**

Lease liabilities were discounted at the lessee's incremental borrowing rate as of January 1, 2019. The weighted average discount rate was 3.42 percent.

The implicit effects of the application of IFRS 16 reduced net income by an additional €0.3 million in 2019. This included the effects resulting from subleases.

For more information regarding the right-of-use assets that have been recognized please see our comments in section (11b).

IFRIC 23 – 'Uncertainty over Income Tax Treatments': The tax treatment of certain items and transactions may depend on their future recognition by tax authorities or tax jurisdictions. IAS 12 – 'Income Taxes' sets out how to account for current and deferred taxes. IFRIC 23 supplements the rules in IAS 12 regarding situations where there is uncertainty over how items and transactions should be treated for income tax purposes. For recognition and measurement purposes, the Group needs to make estimates and assumptions, for example as to whether it should consider uncertainties separately or together, whether to use a likely or expected amount for the uncertainty, and whether there have been any changes compared with the prior period.

The interpretation was adopted for the first time with effect from January 1, 2019. There was no significant impact on the consolidated financial statements of Heraeus.

(b) Changes in presentation

Change in inventories / cost of materials: The changes in inventories are recognized under a separate item in the income statement in 2019. In the prior year, changes in inventories were reported under cost of materials. The figures for 2018 have been restated accordingly to allow for comparison.

Financial reporting standards not applied early

Heraeus does not plan to apply the following new or amended standards and interpretations before the mandatory application date. Their application is only mandatory in subsequent annual periods. Other new standards, interpretations, and amendments have also been issued, but they are not expected to impact on the consolidated financial statements of Heraeus.

(a) Already endorsed by the EU

Amendments to IAS 1 and IAS 8 – 'Definition of Material': These amendments create a consistent and more precise IFRS definition of the materiality of information in financial statements. Relevant examples are also provided. The definitions in the Conceptual Framework, IAS 1, and IAS 8 have been harmonized. The amendments are required to be applied for the first time with effect from January 1, 2020. Earlier application is permitted.

The Group currently anticipates that there will be no material impact on the consolidated financial statements.

(b) Not yet endorsed by the EU

Amendments to IFRS 3 – 'Definition of a Business': In these amendments, the IASB clarifies that a business comprises a group of activities and assets that include, as a minimum, an input and a substantive process that together significantly contribute to the ability to create outputs. Furthermore, the definition of outputs has been narrowed to focus on goods and services provided to customers; the reference to an ability to reduce costs has been removed. The new rules also contain an optional concentration test that is designed to make it easier to identify a business. Subject to incorporation into EU law, the amendments must be applied to business combinations whose acquisition date is on or after January 1, 2020. Earlier application is permitted.

The Group currently anticipates that there will be no material impact on the consolidated financial statements.

Principles of consolidation

The financial statements of the consolidated entities have been prepared as of the balance sheet date of the consolidated financial statements in accordance with uniform accounting policies that comply with IFRS.

As part of acquisition accounting, the carrying amounts of equity investments in subsidiaries are offset against the portion of equity held in these subsidiaries. In the case of business combinations, the identified assets and liabilities acquired are recognized at fair value. Certain items, such as deferred taxes and employee benefits, are measured in accordance with the standards pertinent to them. Any excess of the purchase price over the fair value of net assets acquired after allocation of the purchase price is recognized as goodwill. A negative excess is recognized in the income statement in the period in which the acquisition takes place. Non-controlling interests are measured as of their acquisition date and recognized in proportion with the share of the identified net assets of the acquiree that they hold.

Income and expenses arising from intercompany transactions are eliminated in full. Profits and losses from intercompany sales and services are eliminated. Receivables and liabilities within the Group are offset against each other. The income tax implications of consolidation transactions that are recognized in the income statement are taken into account and deferred taxes are recognized.

Currency translation

Separate financial statements prepared in foreign currencies by subsidiaries abroad are translated into euros as the reporting currency. Because subsidiaries conduct their business independently from a financial, commercial, and organizational perspective, their functional currency is generally the same as their local currency. For five foreign subsidiaries (2018: five), the functional currency is the US dollar or euro rather than their local currency.

In the consolidated financial statements, income and expenses arising from financial statements prepared in foreign currencies are translated at the average exchange rate for the year, assets and liabilities are translated at the closing rate, and shareholders' equity is translated at historical rates. Any remaining exchange differences are reported in other comprehensive income.

Exchange differences arising from the consolidation of receivables and liabilities are recognized in profit or loss and reported in other operating income or other operating expenses in the income statement. Foreign-currency receivables and liabilities reported in local subsidiaries' separate financial statements are translated at the closing rate. Unrealized gains and losses on the balance sheet date are recognized in profit or loss.

Exchange rate gains and losses from the translation of operating receivables and liabilities in foreign currency and net gains or losses from the fair value measurement of derivatives used as operating hedges for underlying transactions in foreign currency are reported in other operating income or other operating expenses. Net exchange rate gains or losses in connection with funding are reported in net finance costs or net financial income.

The table below shows changes in the exchange rates against the euro used to translate major currencies:

		Closing rate		Average rate	
	€1 =	Dec. 31, 2019	Dec. 31, 2018	2019	2018
China	CNY	7.8205	7.8751	7.7355	7.8081
UK	GBP	0.8508	0.8945	0.8778	0.8847
Hong Jong	HKD	8.7473	8.9675	8.7715	9.2559
Japan	JPY	121.94	125.85	122.01	130.40
Canada	CAD	1.4598	1.5605	1.4855	1.5294
South Korea	KRW	1,296.28	1,277.93	1,305.32	1,299.07
Switzerland	CHF	1.0854	1.1269	1.1124	1.1550
USA	USD	1.1234	1.1450	1.1195	1.1810

Accounting policies

(a) Goodwill

Capitalized goodwill is tested for impairment on an annual basis or whenever there are indications of impairment. Impairment testing is generally based on value in use. Fair value less costs of disposal is only calculated if the value in use falls below the carrying value and it is possible to make a reliable estimate. As soon as goodwill is impaired in full, it is treated as a disposal in the consolidated statement of changes in non-current assets.

(b) Other intangible assets

Intangible assets that have been purchased are carried at cost and amortized using the straight-line method over their useful life, provided they have a finite useful life. The main intangible assets relate to customer relationships, technologies, and trademarks stemming from acquisitions. They are predominantly amortized over a period of between seven and 15 years, while a useful life of three to five years is used for software.

When accounting for internally generated intangible assets, a distinction is made between research costs and development costs. Research costs are recognized as expenses in the income statement as incurred, while development costs for future products or technologies are capitalized, provided they meet all of the relevant criteria on a cumulative basis. If they do not meet the criteria for capitalization, costs are recognized in profit or loss for the year in which they are incurred.

(c) Property, plant, and equipment

Property, plant, and equipment is recognized at cost less cumulative depreciation and impairment. Cost comprises the purchase consideration and any directly attributable purchase-related costs incurred to bring an asset into the working condition required for its intended use.

Grants, allowances, and similar government assistance are deducted from cost.

Property, plant, and equipment is depreciated over its useful economic life using the straight-line method. Depreciation is generally based on the following useful lives:

Asset item	Useful life (years)
Buildings	15–50
Leasehold improvements	5–25
Plant and machinery	10–25
Office furniture and equipment	4–25

(d) Leases

As a lessee, the Group recognizes assets for the rights to use the leased assets and liabilities for obligations entered into to make payments. The right-of-use assets are recognized at cost initially and then amortized on a straight-line basis over the term of the lease. Right-of-use assets are recognized under property, plant, and equipment. Lease liabilities are initially recognized at the present value of the outstanding lease payments and subsequently accounted for using the effective interest method. The discount rate applied is generally the lessee’s incremental borrowing rate. Lease liabilities are recognized under non-current or current financial debt depending on their residual term.

The recognition exemption is applied to leases where the underlying asset has a low value and the lease was originated during the reporting year. The payments under these leases are instead recognized as an expense on a straight-line basis.

In cases where the Group subleases a leased asset under a finance lease, it recognizes a lease receivable under other financial assets instead of a right-of-use asset.

(e) Joint ventures and associates

Investments in joint ventures and associates are measured at the relevant proportion of equity using the equity method. If these entities have different balance sheet dates, interim financial statements are used for them.

(f) Precious metals

For measurement purposes, precious metal inventories are divided into the following categories:

The unhedged precious metal inventory, consisting of precious metals tied up in processing and production processes and precious metals held for strategic reasons, is measured at the lower of weighted average cost and net realizable value. If the reasons for recognizing a write-down cease to exist, it is reversed up to a maximum of original cost.

The inventory held on demand is the stock of precious metals needed to fulfill customer orders. Precious metals for the inventory held on demand are measured at the contractual purchase price agreed for the customer (attributable cost of purchase).

The trading inventory consists of precious metals that are held by the trading companies in the Group. It is generally recognized at contracted cost of purchase. Obligations to cover forward purchases already entered into that are due to be settled after the balance sheet date are recognized in the amount required to meet the obligations as of the balance sheet date. They are shown under other liabilities.

(g) Inventories – excluding precious metals

Materials and supplies, commodities, work in progress, and finished goods are measured at the lower of cost and net realizable value. The cost of materials and supplies is generally determined on the basis of weighted average costs; the cost of work in progress and finished goods is, in some cases, also based on standard costs if these are close to the market value. Write-downs of inventories are recognized if the net realizable value is lower than the recognized cost.

(h) Financial instruments

Measurement and classification

Financial instruments include non-derivative financial instruments such as trade receivables, trade payables, financial debt, and other financial assets and liabilities. There are also derivative financial instruments, which are used to hedge currency and price risk.

With regard to debt instruments, the following categories of financial assets are of relevance for Heraeus:

- measured at amortized cost,
- measured at fair value through profit or loss.

Classification is based on the business model used to manage debt instruments and on the characteristics of the contractual cash flows.

Debt instruments are measured at amortized cost if they are held as part of a business model aimed at collecting contractual cash flows and the contractual terms give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

Debt instruments that are not measured at amortized cost are measured at fair value through profit or loss.

For equity instruments that are not held for trading purposes and are otherwise measured at fair value through profit or loss, there is an option to recognize the fair value changes in other comprehensive income. In this case, amounts recognized in other comprehensive income cannot be reclassified to profit or loss at a later date. This option is considered on a case-by-case basis for each instrument; the decision on exercising the option is irrevocable.

Financial liabilities are classified into the following categories:
- measured at amortized cost,
- measured at fair value through profit or loss.

Regular way purchases and sales of financial instruments are recognized at their settlement date, while derivatives are recognized at their trade date. Initial measurement is at fair value.

Impairment

Impairment losses are recognized in the amount of the expected credit loss for debt instruments that are measured at amortized cost. At each balance sheet date, they are adjusted to reflect the change in credit risk of the financial instrument in question since initial recognition and, as a rule, are based on the lifetime expected credit losses.

At each balance sheet date, an assessment is carried out to ascertain whether there has been a significant increase in credit risk. The individual credit risk is assessed using quantitative and qualitative information, such as data on credit default swaps, past experience, and assumptions about the future. The latter include industry-specific and country-specific expectations regarding future credit risk.

Indications of a significant increase in credit risk include, among others, the following information and expectations:
- a significant change in the external or internal credit rating of the financial instrument,
- unfavorable changes to the business situation, financial parameters, or economic conditions that have a significant influence on the credit standing of the customer in question,
- evidence that a customer is in significant financial difficulties, or
- non-compliance with payment terms.

In 2019, no significant need to recognize impairment losses on credit balances with banks or other debt instruments was identified.

By contrast, expected credit losses on trade receivables are calculated using a simplified model based on a provision matrix.

Derivative financial instruments

Derivatives are measured at fair value.

Commodity futures to which the own-use exemption pursuant to IFRS 9 does not apply are separated from the own-use portfolio and recognized at fair value as held for trading. Changes in fair value are recognized in profit or loss.

In individual cases, hedge accounting is applied to the hedging of expected future cash flows in foreign currencies (cash flow hedges).

At the inception of hedge accounting, the hedging relationship between the underlying transaction and the hedging instrument is documented, including the risk-management objectives and the corporate strategy behind entering into hedges. A record is also kept of whether the designated hedging instrument is highly effective, in terms of the risk that is being hedged, in compensating for changes in the fair value of the underlying transaction or in the cash flows arising from the underlying transaction. This is carried out at the beginning of the hedges as well as during their term.

The effective part of changes in the fair value of hedging instruments is recognized in other comprehensive income, taking deferred taxes into account. Only at the time that the corresponding gains or losses on the underlying transaction are realized are the cumulative adjustments to equity recognized in profit or loss.

Trade receivables

Trade receivables are measured at amortized cost. They are generally due within one year, so discounting is not necessary.
A simplified method is used to measure the expected credit loss on trade receivables. Under this method, the impairment loss is calculated using a provision matrix with defined time periods and taking country-specific and industry-specific characteristics into account. The default of credit-impaired trade receivables is examined separately on a case-by-case basis.

Indications that trade receivables may be credit-impaired include, but are not limited to:

- The customer is in significant financial difficulty,
- The contract is breached due to payment becoming past due, or
- The customer is faced with the threat of insolvency.

Impairment losses are recognized in profit or loss. If it becomes apparent in subsequent periods that the reasons for recognizing an impairment loss no longer apply, the impairment loss is reversed up to a maximum of the original cost.

Carrying amounts of receivables are adjusted via an allowance account. Receivables that are uncollectible are derecognized by writing them off in full.

The impairment loss, the income from the reversal, and other changes recognized in profit or loss resulting from the adjustment of measurement parameters are presented on a net basis in a separate line in the income statement.

Cash and cash equivalents

Cash and cash equivalents are reported at their nominal amounts. Cash on hand in foreign currency is translated at the closing rate. The money market funds included are not subject to significant fluctuations in value and can be converted to cash within one day.

Financial debt

Financial debt relates to registered bonds, liabilities to banks, and lease liabilities. It is recognized at amortized cost using the effective interest method.

Other financial assets and other financial liabilities

Other financial assets and liabilities are predominantly measured at amortized cost. There is a small volume of equity instruments that, depending on whether the option has been exercised, are measured at fair value through profit or loss or at fair value through other comprehensive income. There are also derivatives that are measured at fair value.

In order to manage precious metal liquidity, Heraeus concludes precious metal swaps with its counterparties. Amounts paid or received in relation to these transactions are reported under Other financial assets or Other financial liabilities.

(i) Pensions and similar obligations

Defined benefit obligations are recognized and measured separately for each defined benefit plan using the projected unit credit method, which takes into account expected increases in salaries and pensions in the future in addition to the pensions and vested pension rights known at the balance sheet date. The actuarial assumptions regarding discount rates, increases in salaries and pensions, staff turnover, and rises in healthcare costs on which the calculation of the defined benefit obligation is based are determined for each country taking into account the economic conditions in each case. The interest rates used to discount defined benefit obligations are based on market yields on high-quality bonds denominated in the same currency and for the same duration as the defined benefit obligations.

If defined benefit obligations are funded by assets held by a legally independent entity that may only be used to meet the pension obligations incurred, and are beyond the reach of any creditors, the assets are deducted from the defined benefit obligations, which are recognized as a net liability. The funds held by the Heraeus Group’s German companies and some of its companies abroad qualify as plan assets and are therefore offset against the present value of the defined benefit obligations.

The actuarial gains and losses that arise from changes in the assumptions underlying the calculations, and from variations between those assumptions and actual developments, are recognized in the Group’s other comprehensive income in the period that they arise, taking account of deferred taxes. They are shown in a separate reserve within retained earnings. If the defined benefit obligations are sold or redeemed, they are reclassified to other retained earnings.

The expenses for defined contribution plans attributable to each year are recognized directly in personnel expenses in that year.

(j) Provisions

Provisions are recognized when the Group has a current legal or constructive obligation to a third party as the result of a past event, an outflow of resources is probable, and the amount of the obligation can be reliably estimated. Provisions are recognized in the amount of the most likely settlement amount, or if there is a large number of possible scenarios, in the amount of the expected value of the possible settlement amounts. Estimates are reviewed and adjusted periodically.

If the time value of money is material, provisions that will not result in an outflow of resources until after the following year are recognized at the present value of the expenditure estimated to be needed to meet the obligation.

(k) Deferred taxes

Deferred taxes are calculated on the basis of temporary differences between the carrying amounts of assets and liabilities in the IFRS financial statements and the tax accounts, realizable loss carryforwards, and consolidation transactions. They are calculated using the tax rates anticipated in the various countries at the time these items are recognized, based on the legal provisions in force or approved at the balance sheet date.

Deferred taxes based on items not recognized in profit or loss are likewise not recognized in profit or loss. In line with their underlying transactions, they are either recognized in other comprehensive income or taken directly to equity.

Deferred tax assets are offset against deferred tax liabilities if levied by the same taxation authority and if there is a legally enforceable right to offset current tax assets against current tax liabilities.

Deferred tax assets are recognized if it is likely that future taxable profits will be available against which it will be possible to offset deductible temporary differences, unutilized tax losses, and unutilized tax credits.

(l) Revenue and other income

Revenue is reported in the amount of the consideration that Heraeus expects to receive and recognize when the customer obtains control over the agreed goods and services and can benefit from them. Control may pass at a certain point in time or over a period of time. The performance obligations arising under contracts with customers of Heraeus are predominantly fulfilled at a point in time. In trading transactions, control routinely passes with effect from the due date; in recycling transactions, this takes place on the day that the customer is reimbursed.

Revenue is recognized over a period of time only in a small number of cases and to an immaterial extent. As a rule, the period between fulfillment of the performance obligation and payment is not material. The contracts do not typically include a funding component.

The total proceeds from services included in revenue are minor. Interest income is recognized pro rata in accordance with the effective interest method; this includes interest for the leasing of precious metals.

Contract assets and contract liabilities may arise in certain cases and are shown under other assets and other liabilities respectively.

(m) Cost of materials

Cost of materials includes the costs of raw materials and supplies, goods, and precious metals.

(n) Impairment

Intangible assets and property, plant, and equipment are tested for impairment if there are indications of impairment. If the carrying amount is above the recoverable amount, impairment losses are recognized. The recoverable amount is the higher of fair value less costs of disposal and value in use.

If the reasons for recognizing impairment losses cease to apply, impairment losses are reversed. The reversal recognized in profit or loss is limited to the lower of the recoverable amount and the amortized carrying amount that would have arisen had no impairment loss been recognized in the past.

Impairment losses and reversals thereof are reviewed at the level of the cash-generating unit unless the recoverable amount can be determined for the individual asset.

Estimates and assumptions used in the preparation of the consolidated financial statements

Preparation of the consolidated financial statements in accordance with IFRS requires the use of assumptions and estimates that have an impact on the amounts reported for, and the recognition of, assets, liabilities, income, and expenses. Existing uncertainties were addressed appropriately when determining values. The main assumptions and parameters for the accounting estimates that have been made are based on the information and data available at the time and are presented in the following notes:

Business combinations (see (9)): Determination of the fair value of the consideration transferred (including contingent consideration) and determination of the fair value of the identifiable assets acquired and liabilities assumed.

Intangible assets (see (10)): Impairment test – material assumptions on which the calculation of the recoverable amount is based.

Pensions and similar obligations (see (21)): Measurement of defined benefit obligations – material actuarial assumptions.

Provisions (see (22)): Recognition and measurement of provisions – material assumptions about the probability and extent of the outflow of resources.

Deferred tax assets/liabilities (see (33)): Availability of future taxable profits against which deferred tax assets can be utilized.

Scope of consolidation

In addition to Heraeus Holding GmbH, the consolidated financial statements include subsidiaries over which Heraeus Holding GmbH exercises control.

The following table shows the breakdown of consolidated entities:

Consolidated subsidiaries

	2019			2018		
	Total	In Germany	Outside Germany	Total	In Germany	Outside Germany
Balance as of Jan. 1	**111**	**28**	**83**	**112**	**27**	**85**
Additions	4	2	2	2	1	1
Disposals	–1	–	–1	–	–	–
Mergers	–2	–1	–1	–3	–	–3
Balance as of Dec. 31	**112**	**29**	**83**	**111**	**28**	**83**

The financial year of the consolidated subsidiaries is the calendar year.

Entities included in the consolidated financial statements using the equity method

	2019			2018		
	Total	In Germany	Outside Germany	Total	In Germany	Outside Germany
Balance as of Jan. 1	**7**	**–**	**7**	**6**	**–**	**6**
Additions	–	–	–	1	–	1
Balance as of Dec. 31	**7**	**–**	**7**	**7**	**–**	**7**

Business combinations

Two (2018: three) immaterial acquisitions took place in 2019. The total purchase consideration amounted to €8.8 million (2018: €14.2 million), of which €2.3 million (2018: €6.6 million) had not yet impacted on cash as of the balance sheet date.

Notes to the consolidated balance sheet

Intangible assets

€ million	Goodwill	Patents, licenses, technologies, and similar rights	Internally generated intangible assets	Total
Cost as of Jan. 1, 2018	**126.3**	**498.1**	**2.9**	**627.3**
Currency translation	4.5	11.3	–	15.8
Additions through business combinations	1.8	9.1	–	10.9
Additions	–	2.1	0.6	2.7
Disposals	–2.6	–4.1	–	–6.7
Cost as of Dec. 31, 2018/Jan. 1, 2019	**130.0**	**516.5**	**3.5**	**650.0**
Currency translation	2.8	7.0	0.1	9.9
Additions through business combinations	0.4	5.8	–	6.2
Additions	–	8.0	0.4	8.4
Disposals	–8.6	–13.1	–	–21.7
Reclassifications	–	0.6	–	0.6
Cost as of Dec. 31, 2019	**124.6**	**524.8**	**4.0**	**653.4**
Accumulated amortization and impairment as of Jan. 1, 2018	**16.6**	**313.6**	**2.2**	**332.4**
Currency translation	0.5	6.8	–	7.3
Additions (amortization)	–	29.1	0.2	29.3
Additions (impairment)	1.3	2.1	–	3.4
Disposals	–2.6	–4.4	–	–7.0
Accumulated amortization and impairment as of Dec. 31, 2018/ Jan. 1, 2019	**15.8**	**347.2**	**2.4**	**365.4**
Currency translation	0.4	3.7	0.1	4.2
Additions (amortization)	–	27.6	0.3	27.9
Additions (impairment)	–	7.5	–	7.5
Disposals	–8.6	–13.1	–	–21.7
Accumulated amortization and impairment as of Dec. 31, 2019	**7.6**	**372.9**	**2.8**	**383.3**
Net carrying amounts as of Dec. 31, 2019	**117.0**	**151.9**	**1.2**	**270.1**
Net carrying amounts as of Dec. 31, 2018	**114.2**	**169.3**	**1.1**	**284.6**

a) Goodwill

Goodwill increased from €114.2 million as of December 31, 2018 to €117.0 million at the end of the financial year. The change mainly arose from gains of €2.4 million resulting from higher exchange rates.

Goodwill is usually monitored at global business unit level. No global business unit carried goodwill that was material when considered individually.

No impairment losses on goodwill were recognized in 2019. In 2018, an impairment test was carried out, as a result of which the goodwill of €1.3 million in Heraeus Photovoltaics was written down in full.

Goodwill was allocated to the global business units as follows:

€ million	Dec. 31, 2019	Dec. 31, 2018
Heraeus Noblelight	30.2	29.7
Heraeus Electro-Nite	25.5	24.7
Heraeus Precious Metals	25.1	24.2
Heraeus Medical Components	22.0	21.6
Heraeus Electronics	13.7	13.6
Heraeus Nexensos (2018: Heraeus Emerging Businesses)	0.5	0.4
Goodwill	**117.0**	**114.2**

b) Other intangible assets

Research and development costs amounting to €151.7 million (2018: €153.9 million) were recognized in the income statement.

The impairment losses of €7.5 million (2018: €2.1 million) mostly relate to licenses. In 2018, impairment losses were mainly recognized in connection with technologies of the Heraeus Photovoltaics global business unit. As in 2018, the impairment losses were reported in the income statement under the item ‘Amortization, depreciation, and impairment’.

Property, plant, and equipment

€ million	Dec. 31, 2019	Dec. 31, 2018
Property, plant, and equipment excluding right-of-use assets*	1,166.4	1,059.2
Right-of-use assets	78.7	–
Property, plant, and equipment	**1,245.1**	**1,059.2**

* The 2018 figure includes assets relating to finance leases in the amount of €2.9 million.

a) Property, plant, and equipment (excluding right-of-use assets)

€ million	Land, land rights and buildings, including buildings on land owned by others	Plant and machinery	Office furniture and equipment	Assets under construction	Total
Cost as of Jan. 1, 2018	**648.2**	**913.3**	**540.6**	**192.6**	**2,294.7**
Currency translation	4.9	8.8	–	2.9	16.6
Additions through business combinations	–	0.4	0.2	–	0.6
Additions	17.4	49.1	36.2	152.0	254.7
Disposals	–19.5	–41.2	–9.7	–5.9	–76.3
Reclassifications	77.3	86.4	20.4	–184.1	–
Cost as of Dec. 31, 2018/Jan. 1, 2019	**728.3**	**1,016.8**	**587.7**	**157.5**	**2,490.3**
Change of accounting method (see (2))*	–	–4.2	–1.3	–	–5.5
Reclassifications from inventories**	–	–	–	6.1	6.1
Cost as of Jan. 1, 2019 – restated	**728.3**	**1,012.6**	**586.4**	**163.6**	**2,490.9**
Currency translation	4.9	12.3	4.6	–6.0	15.8
Additions through business combinations	–	0.1	0.1	–	0.2
Additions	14.0	30.3	29.0	151.5	224.8
Disposals	–2.1	–24.6	–20.7	–1.0	–48.4
Reclassifications	15.9	49.9	35.2	–101.6	–0.6
Cost as of Dec. 31, 2019	**761.0**	**1,080.6**	**634.6**	**206.5**	**2,682.7**
Accumulated depreciation and impairment as of Jan. 1, 2018	**349.3**	**622.4**	**399.4**	**12.8**	**1,383.9**
Currency translation	5.0	7.2	–5.1	2.9	10.0
Additions (depreciation)	15.4	45.4	29.3	–	90.1
Additions (impairment)	6.4	9.1	3.9	0.6	20.0
Disposals	–17.8	–39.9	–9.3	–4.4	–71.4
Reversals of impairment losses	–	–	–1.0	–0.5	–1.5
Accumulated depreciation and impairment as of Dec. 31, 2018/Jan. 1, 2019	**358.3**	**644.2**	**417.2**	**11.4**	**1,431.1**
Change of accounting method (see (2))*	–	–1.9	–0.7	–	–2.6
Accumulated depreciation and impairment as of Jan. 1, 2019 – restated	**358.3**	**642.3**	**416.5**	**11.4**	**1,428.5**
Currency translation	1.6	7.0	4.1	–3.3	9.4
Additions (depreciation)	16.6	53.1	31.7	–	101.4
Additions (impairment)	2.8	11.7	3.3	3.5	21.3
Disposals	–1.3	–22.8	–19.4	–	–43.5
Reclassifications	–4.9	–1.4	6.4	–0.1	–
Reversals of impairment losses	–	–0.1	–0.1	–0.6	–0.8
Accumulated depreciation and impairment as of Dec. 31, 2019	**373.1**	**689.8**	**442.5**	**10.9**	**1,516.3**
Net carrying amounts as of Dec. 31, 2019	**387.9**	**390.8**	**192.1**	**195.6**	**1,166.4**
Net carrying amounts as of Dec. 31, 2018**	**370.0**	**372.6**	**170.5**	**146.1**	**1,059.2**

* As of Dec. 31, 2018 the total figure included assets relating to finance leases in the amount of €2.9 million. As a result of the transition to IFRS 16, right-of-use assets in connection with leases are detailed in a dedicated section, which means that assets relating to finance leases are derecognized from the statement of changes in property, plant, and equipment.

** Assets of €6.1 million were reclassified from inventories to non-current assets because they are intended to be used on a long-term basis.

The impairment losses recognized on property, plant, and equipment in 2019 were attributable to various businesses and sites around the world. In 2018, the bulk of the total was accounted for by the Heraeus Photovoltaics global business unit (€16.2 million). The impaired assets largely included facilities (2018: facilities and buildings) that were no longer found to be recoverable or that could no longer be used as originally intended. Most of the assets involved were written off in full because they have no significant fair value and no material benefit can be obtained by continuing to use them. As in 2018, the impairment losses were reported in the income statement under the item 'Amortization, depreciation, and impairment'.

(b) Right-of-use assets

The right-of-use assets mainly relate to rented properties outside Germany.

The following table shows a breakdown of the net carrying amount of the right-of-use assets and the depreciation on right-of-use assets by asset class:

	Net carrying amounts		Depreciation
€ million	Dec. 31, 2019	Jan. 1, 2019	2019
Land, land rights and buildings, including buildings on land owned by others	61.8	67.9	–15.7
Plant and machinery	2.4	2.3	–0.5
Office furniture and equipment	14.5	13.8	–9.4
Right-of-use assets	**78.7**	**84.0**	**–25.6**

Additions to right-of-use assets amounted to €29.1 million in 2019.

Further details on leasing can be found in the following sections:

- Impairment on right-of-use assets: amortization, depreciation, and impairment (see (29))
- Income from subleases: other operating income (see (30))
- Expenses for leases where the underlying asset has a low value: other operating expenses (see (31))
- Interest paid on lease liabilities: net finance costs (see (32))
- Total cash outflow for leases: net cash used for financing activities (see (36))

Investments accounted for using the equity method

The table below shows the aggregated financial information for the joint ventures and associates that are included in the Heraeus consolidated financial statements using the equity method:

		Non-material equity-accounted entities		
€ million	Shin-Etsu Quartz Products Co., Ltd.	Joint ventures	Associates	Total for equity-accounted entities
Amounts as of Dec. 31, 2019				
Carrying amount of investment	104.0	21.7	30.6	**156.3**
Proportionate gain	11.2	5.0	3.7	**19.9**
Amounts as of Dec. 31, 2018				
Carrying amount of investment	99.8	19.8	27.3	**146.9**
Proportionate gain	13.1	5.2	1.7	**20.0**

Joint venture: Shin-Etsu Quartz Products Co., Ltd.

The operating activities of Shin-Etsu Quartz Products Co., Ltd., based in Tokyo, Japan, include the manufacture, sale and trading of quartz glass and associated products.

The table below shows a summary of the financial information for Shin-Etsu Quartz Products Co., Ltd.:

€ million	2019	2018
Share in percent	**50.0**	**50.0**
Non-current assets	79.5	63.0
Current assets	198.2	216.6
thereof cash and cash equivalents	*79.7*	*102.2*
Non-current liabilities	14.8	13.8
thereof financial liabilities excluding trade payables and other liabilities	–	–
Current liabilities	54.9	66.2
thereof financial liabilities excluding trade payables and other liabilities	*2.4*	*3.0*
Net assets (100 %)	208.0	199.6
Share of net assets	104.0	99.8
Carrying amount of investment in joint venture	**104.0**	**99.8**
Distributions received	10.3	9.9
Revenue	187.5	195.2
Net income and total comprehensive income	22.4	26.2
Group's share in net income and total comprehensive income	**11.2**	**13.1**

Other financial assets

Other financial assets comprise the following items:

	Dec. 31, 2019			Dec. 31, 2018		
€ million	Current	Non-current	Total	Current	Non-current	Total
Receivables from precious metal swaps	181.0	–	181.0	246.9	–	246.9
Financial assets	–	16.6	16.6	–	9.1	9.1
Derivatives with positive fair value	16.0	–	16.0	15.2	–	15.2
Lease receivables	1.4	5.4	6.8	–	–	–
Miscellaneous financial assets	24.9	1.6	26.5	17.2	2.0	19.2
Other financial assets	**223.3**	**23.6**	**246.9**	**279.3**	**11.1**	**290.4**

Other financial assets included cash amounts totaling €9.0 million (2018: €4.8 million) held in margin accounts pledged as collateral for futures transactions. The pledges expire when the collateralized transactions are settled.

Other assets

Other assets are broken down as follows:

€ million	Dec. 31, 2019			Dec. 31, 2018		
	Current	Non-current	Total	Current	Non-current	Total
Advances paid	168.6	–	168.6	82.2	–	82.2
Other tax receivables	164.5	1.6	166.1	137.1	1.4	138.5
Contract assets	1.8	–	1.8	–	–	–
Miscellaneous non-financial assets	32.0	0.8	32.8	17.9	1.1	19.0
Other assets	**366.9**	**2.4**	**369.3**	**237.2**	**2.5**	**239.7**

Inventories

The table below gives a breakdown of inventories:

€ million	Dec. 31, 2019	Dec. 31, 2018
Materials and supplies	192.2	156.8
Work in progress, finished goods, and merchandise	297.6	309.9
Write-downs of inventories – excluding precious metals	–47.1	–44.2
Inventories – excluding precious metals	**442.7**	**422.5**
Precious metals	883.7	923.6
Write-downs of precious metals	–15.9	–28.3
Precious metals	**867.8**	**895.3**
Inventories	**1,310.5**	**1,317.8**

In 2019, inventories excluding precious metals were written down by €16.5 million (2018: €5.5 million). Reversals of write-downs on inventories excluding precious metals amounted to €3.8 million in 2019 (2018: €2.5 million). As in 2018, no material write-downs or reversals of write-downs were recognized on precious metals.

Trade receivables

The breakdown of trade receivables is as follows:

€ million	Dec. 31, 2019	Dec. 31, 2018
Gross trade receivables	660.5	566.7
Impairment losses	–34.9	–32.4
Net trade receivables	**625.6**	**534.3**
Notes receivables	176.7	163.0
Trade receivables	**802.3**	**697.3**

Assets arising from bills of exchange are guaranteed by banks. The credit risk is currently regarded as not material.

The table below shows changes in impairment losses recognized on gross trade receivables:

€ million	2019	2018
Impairment losses as of Jan. 1	**32.4**	**32.5**
Change of accounting method*	–	1.0
Impairment losses as of Jan. 1 – restated	**32.4**	**33.5**
Currency translation	0.2	–0.8
Additions	6.8	3.4
Utilization	–1.1	–0.9
Reversals	–3.4	–2.8
Impairment losses as of Dec. 31	**34.9**	**32.4**

* Initial application of IFRS 9.

The net impairment losses of €3.4 million recognized in the income statement (2018: loss of €0.6 million) is obtained by netting the amounts of additions and reversals.

The following table presents the provision matrix for 2019:

	Term to maturity as of December 31, 2019					
€ million	Not due	less than 30 days	between 30 and 90 days	between 90 and 180 days	more than 180 days	Total
Gross trade receivables	476.2	119.9	24.7	10.6	29.1	660.5
Weighted average default rate	0.3 %	0.3 %	9.7 %	57.5 %	85.2 %	
Impairment losses	1.3	0.3	2.4	6.1	24.8	34.9
Net trade receivables	**474.9**	**119.6**	**22.3**	**4.5**	**4.3**	**625.6**

The provision matrix for 2018 is as follows:

	Term to maturity as of December 31, 2018					
€ million	Not due	less than 30 days	between 30 and 90 days	between 91 and 180 days	more than 180 days	Total
Net receivables	434.3	70.0	27.4	8.4	26.6	566.7
Weighted average default rate	0.1 %	0.6 %	11.7 %	66.7 %	85.0 %	
Impairment losses	0.6	0.4	3.2	5.6	22.6	32.4
Net trade receivables	**433.7**	**69.6**	**24.2**	**2.8**	**4.0**	**534.3**

Cash and cash equivalents

Cash and cash equivalents comprise the following items:

€ million	Dec. 31, 2019	Dec. 31, 2018
Credit balances with banks, cash on hand, and other cash	849.3	785.4
Short-term money market funds	33.3	32.8
Cash and cash equivalents	**882.6**	**818.2**

Equity attributable to the shareholders of Heraeus Holding GmbH

The subscribed capital is the maximum amount for which the shareholders of Heraeus Holding GmbH are liable in respect of the company's liabilities to creditors.

Retained earnings include the profits generated by Heraeus Holding GmbH and the subsidiaries included in the consolidated financial statements that have not been distributed. The line item also includes income from joint ventures and associates accounted for using the equity method, consolidation transactions recognized in profit or loss, and the effects of offsetting actuarial gains and losses arising from pensions and similar obligations, net of deferred taxes, against equity.

Other reserves comprise currency translation adjustments and the effects of the measurement of hedging transactions, taking deferred taxes into account. The gains and losses reported in the cash flow hedge reserve are reclassified to the income statement when the corresponding gains and losses from the hedged item are recognized in the income statement.

The Board of Managing Directors of Heraeus Holding GmbH has proposed a distribution of €44.1 million for 2019 (2018: no distribution).

Non-controlling interests

Shares held by minority interests in the shareholders' equity of consolidated companies are reported under non-controlling interests. The profits attributable to these shareholders in 2019 were €5.9 million (2018: €8.3 million). As in 2018, no losses were attributable to non-controlling interests.

Capital management disclosures

The objectives of capital management are based on the Heraeus Group's guidelines for financial management.

They include safeguarding and managing liquidity at all times, ensuring that the Group has access to the money markets, credit markets, and capital markets at all times, and maintaining a strong capital base.

Measures aimed at achieving these objectives include the optimization of the capital structure and the reduction of borrowing.

In addition to its high equity ratio, Heraeus uses the options of obtaining funding in the money markets and capital markets. These options are supplemented by long-term loan facilities contractually agreed with investment-grade banks in different sectors.

In the Trading units, instruments common to the sector, such as precious metal leasing, are used to fund the precious metals required for production. The Heraeus Group generally enters into precious metal leases with a maximum term of twelve months.

The management of financial risk is based on the following fixed key performance indicators:
- interest coverage ratio,
- ratio of operating cash flow to debt, and
- equity ratio.

Given the international focus of its businesses, the Group has to comply with legal and regulatory requirements that differ from region to region. The status of these requirements and any amendments to them are monitored locally and centrally, and changes are reflected in the Group's capital management.

€ million	Dec. 31, 2019	Dec. 31, 2018	Change (%)
Shareholders' equity	**3,293.2**	**3,222.5**	**2.2**
Percentage of total shareholders' equity and liabilities	93.2	95.7	
Current financial debt	61.6	28.4	–
Non-current financial debt	178.8	117.9	–
Financial debt	**240.4**	**146.3**	**64.3**
Percentage of total shareholders' equity and liabilities	6.8	4.3	
Total shareholders' equity and liabilities (shareholders' equity plus financial debt)	**3,533.6**	**3,368.8**	**4.9**

The credit ratings issued by the rating agencies Moody's Investors Service and Standard & Poor's help investors to assess the Group's financial profile. Credit ratings assess and classify the ability of an issuer to meet in full the payment obligations associated with certain financial instruments as they fall due. Ratings are issued in accordance with criteria such as capital structure, profitability, cash flow generation, diversification, and competitive position.

The following table shows the current credit ratings issued by the two agencies:

	Moody's Investor Service	Standard & Poor's
Non-current financial debt	**Baa1**	**BBB+**
Current financial debt	–	**A-2**

The Baa1 rating from Moody's is at the top of the B category, just one notch below an A rating. The outlook assigned by Moody's describes its assessment of the likely change in an issuer's credit rating over the medium term. Within the 'positive', 'stable', and 'negative' categories, Moody's rated the outlook for Heraeus as 'stable'. It was not asked to assess its short-term credit quality.

Based on the expectations that Heraeus will remain financially strong in the future and that its business will remain healthy, Standard & Poor's gave Heraeus a rating of BBB+ for its long-term credit quality. This classification represents the top credit quality within the B category. The outlook assigned by Standard and Poor's also describes its assessment of the likely change in an issuer's credit rating over the medium term. Standard & Poor's assessed the outlook for Heraeus as 'stable'.

The short-term credit quality of Heraeus is rated as A-2, which is the third-highest rating in the Standard & Poor's methodology.

Pensions and similar obligations

Under the company pension scheme, employees of companies included in the consolidated financial accounts have entitlements to defined benefit and defined contribution pension schemes. Defined benefit pension schemes encompass both current pensions and entitlements to future pensions. The benefits paid by the Group usually depend on employees' years of service and earnings and are governed by different pension scheme rules. At Heraeus, defined benefit pension schemes are funded by way of both provisions and investment funds. The main pension arrangements are described below.

The payment obligations are predominantly attributable to German companies and relate to pension plans providing retirement benefits, invalidity benefits, and benefits paid to surviving dependants. These obligations are based, on the one hand, on defined benefit pension schemes with benefits based on length of service and final salary. These schemes have been closed to new members. On the other hand, employees who joined after January 1, 1988 have a direct pension entitlement under an employer-funded, contribution-based scheme that is not linked to final salary. The entitlement arises from the accumulation of pension components determined annually that are calculated on the basis of a defined pension expense and an age-related pension annuitization schedule. Since 2001, employees have also had the option of purchasing additional pension benefits by voluntarily converting remuneration into pension components that go toward a contribution-based scheme.

The contribution-based direct pension entitlements are each covered by investments in securities funds. Since their introduction, the pension schemes have been refined and adjusted in line with changes in economic conditions.

Members of the Board of Managing Directors and senior managers also have individual pension entitlements, which are predominantly based on employer-funded final salary schemes.

There are currently no statutory minimum funding requirements for the existing benefit obligations of Group companies in Germany.

Outside Germany, employees at several companies are also entitled to retirement pensions – some of which are subject to very different rules. The level of these entitlements generally depends on years of service and salary received. The bulk of the benefit obligations outside Germany are financed by investments in external funds.

The Group is exposed to various risks in connection with the defined benefit pension plans. In addition to general actuarial risks such as longevity and interest-rate risk, the Group is exposed to currency risk and – in the case of pension plan assets invested in funds – to capital-market and investment risks.

The calculation of the defined benefit obligations was primarily based on the actuarial assumptions in the table below. The figures stated for the discount rate and income growth outside Germany are averages weighted by the present value of the relevant benefit obligations.

in %	Dec. 31, 2019 In Germany	Dec. 31, 2019 Outside Germany	Dec. 31, 2018 In Germany	Dec. 31, 2018 Outside Germany
Discount rate	1.30	1.00	2.00	1.77
Income growth (annual)	3.00	1.91	3.00	2.11
Pension adjustment (annual)	1.0 – 1.5	0.0 – 2.8	1.0 – 1.5	0.0 – 3.4
Future increase in healthcare costs	–	3.9 – 7.5	–	3.9 – 7.5

The defined benefit obligations of the companies in Germany are generally based on the updated biometric factors of the Heubeck 2018 G mortality tables of Professor Dr. Klaus Heubeck. Country-specific biometric factors are used to calculate the obligations of companies outside Germany.

The 'Pensions and similar obligations' line item on the balance sheet is a net liability that can be broken down as follows:

€ million	Dec. 31, 2019	Dec. 31, 2018
Pensions and similar obligations of companies in Germany	522.3	445.1
Pensions and similar obligations of companies outside Germany	67.3	54.4
Pensions and similar obligations	**589.6**	**499.5**

The table below shows the present value of the defined benefit obligation (broken down by type of cover) and its funded status:

€ million	Dec. 31, 2019 In Germany	Dec. 31, 2019 Outside Germany	Dec. 31, 2019 Total	Dec. 31, 2018 In Germany	Dec. 31, 2018 Outside Germany	Dec. 31, 2018 Total
Present value of funded defined benefit obligation	321.3	141.6	462.9	250.7	121.4	372.1
Present value of unfunded defined benefit obligation	346.1	39.6	385.7	317.5	33.5	351.0
Present value of the defined benefit obligation	**667.4**	**181.2**	**848.6**	**568.2**	**154.9**	**723.1**
Fair value of plan assets	–145.1	–113.9	–259.0	–123.1	–100.5	–223.6
Net liability	**522.3**	**67.3**	**589.6**	**445.1**	**54.4**	**499.5**

The present value of the defined benefit obligation of Group companies changed in 2019 as follows:

€ million	2019 In Germany	2019 Outside Germany	2019 Total	2018 In Germany	2018 Outside Germany	2018 Total
Present value of the defined benefit obligation as of Jan. 1	**568.2**	**154.9**	**723.1**	**559.2**	**160.1**	**719.3**
Currency translation	–	3.8	3.8	–	2.1	2.1
Additions through business combinations	–	0.1	0.1	–	–	–
Current service cost	8.8	5.9	14.7	8.8	5.7	14.5
Actuarial gains (–)/losses (+)	88.5	18.4	106.9	–2.8	–7.6	–10.4
Interest expense	11.2	2.8	14.0	10.5	2.4	12.9
Employee contributions	6.3	1.8	8.1	6.1	1.6	7.7
Pension payments	–15.6	–6.8	–22.4	–14.7	–9.8	–24.5
Other changes	–	0.3	0.3	1.1	0.4	1.5
Present value of the defined benefit obligation as of Dec. 31	**667.4**	**181.2**	**848.6**	**568.2**	**154.9**	**723.1**

A rise or fall of half of one percentage point in the main actuarial assumptions would have the following impact on the present value of the defined benefit obligation in Germany as of the balance sheet date:

Change in present value of defined benefit obligation in Germany (€ million)	Dec. 31, 2019	Dec. 31, 2018
Discount rate		
+0.5 percentage points	–64.9	–49.8
–0.5 percentage points	76.2	60.5
Annual income growth		
+0.5% percentage points	2.6	2.6
–0.5% percentage points	–2.5	–2.5

Starting with the original actuarial measurements, sensitivity analysis was carried out in isolation on each of the parameters deemed to be material in order to highlight their separate impact on the present value of the defined benefit obligation calculated at each balance sheet date. No potential correlation between the individual assumptions was taken into account. The calculations were repeated with the amended parameters and were not based on estimates so that they reflected the full impact of the changes in isolation.

The actuarial net losses of €88.5 million reported in Germany (2018: net gains of €2.8 million) comprised losses of €87.9 million (2018: gains of €11.4 million) attributable to changes in financial assumptions and losses of €0.6 million (2018: losses of €3.4 million) resulting from experience adjustments. In 2018, the change also comprised losses of €5.2 million resulting from changes in demographic assumptions (application of the new mortality tables).

The present value of the defined benefit obligation was distributed across the following individual groups of pension beneficiaries at companies in Germany:
- active members: €374.8 million (2018: €309.4 million)
- former employees with vested rights: €80.9 million (2018: €68.6 million)
- pensioners and surviving dependants: €211.7 million (2018: €190.2 million)

The benefit obligations of companies outside Germany predominantly consist of obligations to active members of pension schemes. All of the obligations reported on the balance sheet were vested.

The weighted average duration of obligations in Germany as of December 31, 2019 was 20.8 years (2018: 19.2 years).

The defined benefit obligations in Germany are expected to result in payments as follows at the end of each of the next ten financial years:
- financial year 2020 (year 1): €15.3 million (2018: financial year 2019 – €14.8 million)
- financial years 2021–2024 (years 2 to 5): €68.9 million (2018: financial years 2020 to 2023 – €65.9 million)
- financial years 2025–2029 (years 6 to 10): €102.0 million (2018: financial years 2024 to 2028 – €98.8 million)

Outside Germany, pension entitlements are expected to result in pension payments of €10.0 million in 2020.

Changes in the fair value of the plan assets during 2019 for companies in and outside Germany are shown below:

€ million	2019			2018		
	In Germany	Outside Germany	Total	In Germany	Outside Germany	Total
Fair value of plan assets as of Jan. 1	**123.1**	**100.5**	**223.6**	**118.9**	**100.8**	**219.7**
Currency translation	–	3.2	3.2	–	1.2	1.2
Interest income	2.5	1.8	4.3	2.3	1.5	3.8
Return on plan assets excl. interest income	12.0	5.3	17.3	–5.5	–2.3	–7.8
Employer contributions	9.4	6.9	16.3	9.9	6.1	16.0
Employee contributions	–	1.8	1.8	–	1.6	1.6
Pension payments	–2.7	–5.7	–8.4	–2.8	–8.4	–11.2
Other changes	0.8	0.1	0.9	0.3	–	0.3
Fair value of plan assets as of Dec. 31	**145.1**	**113.9**	**259.0**	**123.1**	**100.5**	**223.6**

Heraeus anticipates that employer contributions to plan assets for companies in Germany will be approximately €10.3 million in 2020 (2019: €9.8 million) and approximately €6.4 million (2019: €5.7 million) for companies outside Germany.

Plan assets relating to companies in and outside Germany comprised the following financial instruments and other assets:

€ million	Dec. 31, 2019			Dec. 31, 2018		
	In Germany	Outside Germany	Total	In Germany	Outside Germany	Total
Debt instruments	98.6	20.4	119.0	86.8	20.0	106.8
Equity instruments	46.4	25.9	72.3	36.3	26.2	62.5
Money-market-linked instruments and credit balances with banks	0.1	6.1	6.2	–	7.0	7.0
Real estate	–	9.1	9.1	–	7.9	7.9
Receivables from insurance companies	–	31.4	31.4	–	28.7	28.7
Mixed funds	–	19.8	19.8	–	9.6	9.6
Other assets	–	1.2	1.2	–	1.1	1.1
Fair value of plan assets	**145.1**	**113.9**	**259.0**	**123.1**	**100.5**	**223.6**

Liquid funds intended to meet the defined benefit obligations of companies in Germany are held in several retail funds. These funds were previously managed by Heraeus Pensionstreuhand e. V. as a trustee. Mercer Treuhand GmbH took over the role of trustee from the effective date of the relevant trust agreement on February 19, 2019. As part of this change, all trust assets and responsibility for securing all pension entitlements were transferred.

A strategic asset allocation was defined under the asset management strategy. Minimum and maximum quotas were also defined for each asset class, and the allocations should not exceed or fall below these quotas. The prescribed allocation of the assets to different asset classes is based on the term to maturity of the liabilities; the acceptable risk is defined on the basis of stress test scenarios. This strategy should help to generate attractive returns with a virtually constant level of risk. The portfolio is fine-tuned regularly so that the risk can be maintained at a constant level. The costs of managing the retail funds are borne by the funds themselves. The fund’s assets do not include financial instruments issued by the company itself, or any real estate or other assets used by the company.

The table below shows a breakdown of the net pension expense reported in the income statement and the gains and losses recognized in other comprehensive income:

€ million	Note	2019 In Germany	2019 Outside Germany	2019 Total	2018 In Germany	2018 Outside Germany	2018 Total
Current service cost		–8.8	–5.9	–14.7	–8.8	–5.7	–14.5
Interest expense of defined benefit obligation	(32)	–11.2	–2.8	–14.0	–10.5	–2.4	–12.9
Interest income on plan assets	(32)	2.5	1.8	4.3	2.3	1.5	3.8
Net pension expenses – recognized in the income statement		**–17.5**	**–6.9**	**–24.4**	**–17.0**	**–6.6**	**–23.6**
Actuarial gains or losses in the present value of the defined benefit obligation		–88.5	–18.4	–106.9	2.8	7.6	10.4
Return on plan assets excl. interest income		12.0	5.3	17.3	–5.5	–2.3	–7.8
Gains/losses – recognized in other comprehensive income		**–76.5**	**–13.1**	**–89.6**	**–2.7**	**5.3**	**2.6**

Of the total expense for pensions and similar obligations, €14.7 million (2018: €14.5 million) was recognized in personnel expenses. The interest expense of €14.0 million (2018: €12.9 million) from unwinding the discount on the defined benefit obligation was offset against the interest income on plan assets of €4.3 million (2018: €3.8 million) and reported in net finance costs.

In addition to the defined benefit pension schemes, there are also defined contribution schemes. Expenses of €10.5 million (2018: €6.9 million) relating to these schemes were recognized in personnel expenses and they mainly concern companies outside Germany. Furthermore, employer contributions of €31.2 million (2018: €28.6 million) were paid into statutory pension insurance in Germany.

Provisions

Provisions consist of the following:

€ million	Current Provisions Dec. 31, 2019	Current Provisions Dec. 31, 2018	Non-current Provisions Dec. 31, 2019	Non-current Provisions Dec. 31, 2018	Total Dec. 31, 2019	Total Dec. 31, 2018
Provisions						
for personnel expenses	67.4	76.7	21.9	19.2	89.3	95.9
for restructuring	30.7	19.5	–	0.3	30.7	19.8
for outstanding costs for precious metal recycling	17.4	16.0	–	–	17.4	16.0
for patent disputes and litigation	4.6	2.4	–	–	4.6	2.4
for warranties	4.2	5.9	0.8	–	5.0	5.9
for dismantling and disposal costs	–	–	5.2	5.3	5.2	5.3
miscellaneous	23.2	28.7	24.8	30.0	48.0	58.7
Total	**147.5**	**149.2**	**52.7**	**54.8**	**200.2**	**204.0**

The current provisions for personnel expenses of €67.4 million (2018: €76.7 million) include bonus payments, severance payments, performance-related compensation, and other employee benefits. The provisions for restructuring mainly relate to programs that were initiated in the reporting year and primarily affect locations in Germany.

The non-current provisions for personnel expenses of €21.9 million (2018: €19.2 million) mainly relate to long-service awards. Plan assets to cover entitlements under part-time phased early retirement arrangements and obligations arising from long-term overtime accounts and working-time accounts were set off against obligations for part-time phased early retirement and non-current obligations for personnel expenses.

The following table shows changes in provisions in 2019:

€ million	Jan. 1, 2019	Currency translation	Additions	Unwinding of discounts	Utilizations	Reversals	Dec. 31, 2019
Provisions							
for personnel expenses	95.9	0.6	60.1	0.3	–62.2	–5.4	89.3
for restructuring	19.8	–	20.2	–	–4.3	–5.0	30.7
for outstanding costs for precious metal recycling	16.0	0.1	2.5	–	–1.2	–	17.4
for patent disputes and litigation	2.4	–	3.0	–	–0.8	–	4.6
for warranties	5.9	–	1.7	–	–2.6	–	5.0
for dismantling and disposal costs	5.3	–	–	–	–0.1	–	5.2
miscellaneous	58.7	0.1	9.5	–	–12.2	–8.1	48.0
Provisions	**204.0**	**0.8**	**97.0**	**0.3**	**–83.4**	**–18.5**	**200.2**

Financial debt

Financial debt is broken down as follows:

	Dec. 31, 2019			Dec. 31, 2018		
€ million	Term to maturity up to 1 year	Term to maturity more than 1 year	Total	Term to maturity up to 1 year	Term to maturity more than 1 year	Total
Registered bonds	–	97.9	97.9	–	97.8	97.8
Lease liabilities*	22.4	63.5	85.9	–	–	–
Liabilities to banks	39.2	17.4	56.6	28.4	20.1	48.5
Financial debt	**61.6**	**178.8**	**240.4**	**28.4**	**117.9**	**146.3**

* See (2).

The table below provides a detailed breakdown of the registered bonds:

	Dec. 31, 2019			Dec. 31, 2018		
€ million	Term to maturity up to 1 year	Term to maturity more than 1 year	Total	Term to maturity up to 1 year	Term to maturity more than 1 year	Total
Effective interest rate						
4.01 % – fixed rate	–	48.7	48.7	–	48.7	48.7
3.91 % – fixed rate	–	49.2	49.2	–	49.1	49.1
Registered bonds	**–**	**97.9**	**97.9**	**–**	**97.8**	**97.8**

Heraeus Finance GmbH issued a registered bond with a nominal amount of €50.0 million and a term of 20 years in October 2012 and a further registered bond with a nominal amount of €50.0 million and a term of 21 years in January 2013. They were recognized at their issue price of 96.452 percent and 97.792 percent respectively, and the discount will be amortized over the term of the registered bonds using the effective interest method. Heraeus Holding GmbH became the successor of Heraeus Finance GmbH in relation to these debt instruments and took over all rights and liabilities arising from and in connection with the two registered bonds upon conclusion of a debt assumption agreement on December 13, 2019.

Long-term liabilities to banks comprise one loan from KfW banking group with an effective interest rate of 0.95 percent. This loan was taken out by Heraeus Holding GmbH and is repayable in March 2026.

Other financial liabilities

Other financial liabilities are broken down as follows:

	Dec. 31, 2019			Dec. 31, 2018		
€ million	Current	Non-current	Total	Current	Non-current	Total
Liabilities from precious metal swaps	470.6	–	470.6	407.5	–	407.5
Derivatives with negative fair value	11.4	0.6	12.0	21.7	0.2	21.9
Lease liabilities*	–	–	–	0.7	1.7	2.4
Miscellaneous financial liabilities	27.0	10.7	37.7	27.1	7.3	34.4
Other financial liabilities	**509.0**	**11.3**	**520.3**	**457.0**	**9.2**	**466.2**

* See (2).

Other liabilities

Other liabilities comprise the following items:

	Dec. 31, 2019			Dec. 31, 2018		
€ million	Current	Non-current	Total	Current	Non-current	Total
Liabilities from precious metal trading contracts	113.5	–	113.5	13.1	–	13.1
Other tax liabilities	48.5	–	48.5	39.3	–	39.3
Liabilities for personnel expenses	41.6	1.2	42.8	41.1	2.6	43.7
Contract liabilities	21.2	–	21.2	13.4	–	13.4
Miscellaneous non-financial liabilities	72.6	1.1	73.7	35.3	2.8	38.1
Other liabilities	**297.4**	**2.3**	**299.7**	**142.2**	**5.4**	**147.6**

The following table shows changes in contract liabilities in 2019:

€ million	2019	2018
Contract liabilities as of Jan. 1	**13.4**	**–**
Change of accounting method*	–	12.6
Contract liabilities as of Jan. 1 – restated	**13.4**	**12.6**
Additions	22.4	11.9
Recognized as revenue	–14.6	–11.1
Contract liabilities as of Dec. 31	**21.2**	**13.4**

* Initial application of IFRS 15

Trade payables

Trade payables are current liabilities and are broken down as follows:

€ million	Dec. 31, 2019	Dec. 31, 2018
Trade payables	264.0	265.4
Notes payable	0.4	1.0
Trade payables	**264.4**	**266.4**

Notes to the consolidated income statement

Revenue

Revenue by field of activity was allocated as follows:

€ million	2019	2018
Health	370.6	343.3
Electronics	638.8	756.0
Industrials	642.7	608.2
Environmental	533.8	538.0
Corporate	13.8	13.1
Revenue excluding precious metals	**2,199.7**	**2,258.6**
Precious metal revenue	**20,178.1**	**18,036.5**
Revenue	**22,377.8**	**20,295.1**

The breakdown of revenue by region was as follows:

€ million	2019	2018
Germany	243.9	251.8
Europe excluding Germany	436.8	420.0
Americas	546.6	562.9
Asia	924.9	976.1
Other	47.5	47.8
Revenue excluding precious metals	**2,199.7**	**2,258.6**
Precious metal revenue	**20,178.1**	**18,036.5**
Revenue	**22,377.8**	**20,295.1**

Personnel expenses

Personnel expenses consist of the following:

€ million	2019	2018
Wages and salaries	–765.3	–718.8
Social security contributions and expenses for other benefits	–110.2	–102.0
Pension expenses	–26.3	–22.5
Personnel expenses	**–901.8**	**–843.3**

The breakdown of the average number of employees is as follows:

Field of activity	2019	2018
Health	1.778	1.542
Electronics	3.288	3.152
Industrials	4.154	3.881
Environmental	3.155	3.101
Corporate	1.753	1.745
Total	**14.128**	**13.421**

The remuneration for active members of the Board of Managing Directors for 2019 amounted to €3.0 million (2018: €4.0 million), of which €1.3 million (2018: €2.5 million) was performance related. The remuneration represented short-term employee benefits. In addition, post-employment benefits for the Board of Managing Directors amounted to €0.5 million in 2019 (2018: €0.5 million).

The remuneration for members of the Supervisory Board for 2019 amounted to €0.7 million (2018: €0.8 million). The total remuneration for the Shareholders' Committee was €0.1 million (2018: €0.1 million).

Former members of the Board of Managing Directors or their surviving dependants received remuneration of €1.2 million in 2019 (2018: €1.2 million). Obligations of €22.0 million (2018: €20.6 million) for current pensions and future pension rights existed for these persons as of the balance sheet date.

Amortization, depreciation, and impairment

The table below provides a breakdown of depreciation, amortization, and impairment:

€ million	Note	2019	2018
Amortization of intangible assets	(10)	–27.9	–29.3
Depreciation		–127.0	–90.1
thereof depreciation of property, plant, and equipment excluding right-of-use assets	*(11a)*	*–101.4*	*–90.1*
thereof depreciation of right-of-use assets	*(11b)*	*–25.6*	*–*
Amortization/depreciation		**–154.9**	**–119.4**
Impairment of intangible assets	(10)	–7.5	–3.4
Impairment of property, plant, and equipment		–22.3	–20.0
thereof impairment of property, plant, and equipment excluding right-of-use assets	*(11a)*	*–21.3*	*–20.0*
thereof impairment of right-of-use assets	*(11b)*	*–1.0*	*–*
Impairment		**–29.8**	**–23.4**
Amortization, depreciation, and impairment		**–184.7**	**–142.8**

Other operating income

The main individual items in other operating income were income from reversals of provisions (€10.1 million; 2018: €3.9 million) and from the sale of non-current assets (€2.1 million; 2018: €14.1 million) as well as foreign currency gains of €2.7 million (2018: foreign currency losses of €8.6 million).

It also included income from subleases of €1.5 million (see (11b)).

Other operating expenses

Other operating expenses largely comprised expenses arising from external services (€127.1 million; 2018: €123.0 million), maintenance and repairs (€79.1 million; 2018: €74.7 million), and freight out (€46.7 million; 2018: €45.3 million).

Expenses for leases where the underlying asset has a low value amounted to €0.9 million in 2019 (see (11b)).

Net finance costs

Net finance costs comprise the following income and expenses:

€ million	Note	2019	2018
Interest and similar income		21.7	21.2
Finance income		**21.7**	**21.2**
Interest expense and similar charges		–69.2	–56.9
Losses on the measurement of derivatives and loans		–4.6	–10.3
Net interest expense for pensions and similar obligations	(21)	–9.7	–9.1
Interest expenses on lease liabilities	(11b)	–2.9	–
Finance costs		**–86.4**	**–76.3**
Net finance costs		**–64.7**	**–55.1**

Income taxes

The breakdown of income taxes is as follows:

€ million	2019	2018
Current taxes in Germany	–12.3	–11.4
Current taxes outside Germany	–42.4	–44.9
Current taxes	**–54.7**	**–56.3**
thereof from prior periods	*–8.2*	*6.7*
Deferred taxes	**12.1**	**–32.3**
Income taxes	**–42.6**	**–88.6**

Deferred taxes are determined on the basis of the local tax rates applicable to each company in or outside Germany in accordance with the current legal situation in the country concerned.

The rates used to calculate deferred and current taxes in Germany were corporate income tax, including the solidarity surcharge, of 15.8 percent (2018: 15.8 percent) and trade tax, which varied from 11.2 percent to 18.2 percent (2018: 11.2 percent to 18.2 percent) depending on the local assessment rate. Consequently, tax rates of 27.0 percent to 34.0 percent (2018: 27.0 percent to 34.0 percent) applied to German Group companies.

Tax rates outside Germany varied between 6.0 percent and 39.3 percent (2018: 6.0 percent and 39.5 percent).

The table below shows the reconciliation of expected income tax expenses to the income tax expenses reported:

€ million	2019	2018
Profit before taxes	**157.7**	**285.9**
Expected income tax expense (tax rate for Hanau site: 30.8 percent; 2018: 30.8 percent)	–48.6	–88.1
Variations:		
Difference between local tax rate and Group tax rate	15.3	5.8
Change in tax rate	–1.2	3.5
Impairment losses/reversals of impairment losses	–9.1	–14.3
Tax-exempt income	1.1	12.3
Non-deductible operating expenses for tax purposes	–7.0	–7.4
Income tax for previous years	5.6	0.6
Other	1.3	–1.0
Reported tax expenses	**–42.6**	**–88.6**
Effective tax rate (%)	27.0	31.0

The following deferred tax assets and deferred tax liabilities were attributable to differences in the recognition and measurement of individual line items on the balance sheet and to losses carried forward:

	Deferred tax assets		Deferred tax liabilities		Deferred tax expense (–)/ tax income (+) reported in the income statement	
€ million	Dec. 31, 2019	Dec. 31, 2018	Dec. 31, 2019	Dec. 31, 2018	2019	2018
Intangible assets	73.4	64.3	20.9	19.2	8.1	–2.3
Property, plant, and equipment	5.6	5.4	71.0	62.5	–8.3	–7.6
Inventories	24.4	20.7	40.1	22.1	–14.3	1.9
Other assets	28.0	29.1	19.0	30.3	51.1	–7.3
Pensions and similar obligations	118.0	95.9	14.4	13.5	3.7	–2.4
Provisions	22.4	23.6	5.6	5.9	–0.9	1.3
Liabilities	30.0	26.3	12.7	25.8	–22.4	–3.0
Tax loss carryforwards	5.4	10.3	–	–	–4.9	–12.9
Total before offsetting	**307.2**	**275.6**	**183.7**	**179.3**	**12.1**	**–32.3**
Offsetting	–121.5	–86.8	–121.5	–86.8	–	–
Total	**185.7**	**188.8**	**62.2**	**92.5**	**12.1**	**–32.3**

Tax loss carryforwards as of December 31, 2019 amounted to €321.8 million (2018: €329.9 million). Deferred tax assets were recognized for €32.4 million of the total tax loss carryforwards (2018: €59.3 million). Loss carryforwards of €36.9 million (2018: €8.9 million) are subject to a time limit, with utilization of €1.5 million restricted to the next three years (2018: no restriction). There is no statutory expiration date for loss carryforwards of €284.9 million (2018: €321.0 million). No deferred tax assets were recognized for tax loss carryforwards of €289.4 million (2018: €270.6 million) or for temporary differences arising on measurements for tax purposes in the amount of €64.4 million (2018: €71.3 million).

Based on the earnings forecasts for Group companies that incurred losses in 2019 or preceding years, deferred tax assets of €5.4 million (2018: €10.3 million) were recognized on loss carryforwards, and deferred tax assets of €48.1 million (2018: €35.2 million) were not recognized. Furthermore, deferred tax assets of €19.8 million (2018: €10.7 million) attributable to tax-related differences in measurement were not recognized . There were no reversals of write-downs in 2019 (2018: €3.8 million). The utilization of previously unrecognized losses reduced the tax expense by €1.3 million (2018: €2.0 million). After deduction of the deferred tax liabilities, a deferred tax asset of €11.6 million (2018: €26.4 million) was recognized for the consolidated companies with a history of losses.

Deferred tax liabilities were recognized for temporary differences in investments in subsidiaries when a reversal of these differences was expected.

Notes to the consolidated cash flow statement

Cash flows are reported separately in the consolidated cash flow statement as net cash provided by/net cash used for operating activities, investing activities, or financing activities. Changes in the line items on the balance sheet used to prepare the consolidated cash flow statement are adjusted for the non-cash effects of currency translation and changes in the scope of consolidation. For this reason, the changes in the relevant balance sheet items cannot be directly reconciled with the figures from the consolidated balance sheet.

● Net cash provided by operating activities

Net cash provided by operating activities is derived indirectly from profit after taxes after adjustment for non-cash income and expenses.

Income tax payments in 2019 amounted to €54.3 million (2018: €69.3 million). The 'Change in other net assets' line item contains changes to other financial assets and liabilities and to other assets and liabilities.

Other non-cash transactions and other non-operating expenses essentially comprised deferred taxes, changes in the fair values of derivatives, income from investments accounted for using the equity method, and net pension expenses.

● Net cash used for investing activities

Cash and cash equivalents totaling €10.5 million (2018: €6.6 million) were used for acquisitions. This was in part attributable to amounts owed in connection with acquisitions in previous years which only caused a cash outflow in the reporting year.

Net cash used for financing activities

As in 2018, no distribution was paid to the shareholders of Heraeus Holding GmbH; a distribution of €6.6 million (2018: €6.9 million) was paid to the non-controlling interests.

The table below shows the changes in financial liabilities in 2019 for which cash flows have in the past or will in the future be included in the consolidated cash flow statement under net cash used for financing activities:

€ million	Jan. 1, 2019	Change of accounting method*	Jan. 1, 2019 – restated	Cash changes	Non-cash changes		Dec. 31, 2019
					Currency effects	Other changes	
Non-current financial debt	117.9	62.0	179.9	–2.8	0.4	1.3	178.8
Current financial debt	28.4	21.5	49.9	–16.3	0.1	27.9	61.6
Lease liabilities*	2.4	–2.4	–	–	–	–	–
Total	**148.7**	**81.1**	**229.8**	**–19.1**	**0.5**	**29.2**	**240.4**

* See (2a).

The total cash outflow for leases in 2019 amounted to €28.0 million (see (11b)).

The following table shows the corresponding changes in 2018:

€ million	01,01,2018	Cash changes	Non-cash changes		Dec. 31, 2018
			Currency effects	Other changes	
Non-current financial debt	120.6	–2.9	–	0.2	117.9
Current financial debt	37.2	–8.4	–0.4	–	28.4
Lease liabilities*	3.1	–1.4	–	0.7	2.4
Total	**160.9**	**–12.7**	**–0.4**	**0.9**	**148.7**

The cash changes in liabilities from financing activities can be reconciled to the consolidated cash flow statement as follows:

€ million	Dec. 31, 2019	Dec. 31, 2018
Cash change in liabilities from financing activities	**–19.1**	**–12.7**
Distribution paid, including distribution to non-controlling interests	–6.6	–6.9
Interest paid	–72.0	–57.1
Net cash used for financing activities	**–97.7**	**–76.7**

Cash and cash equivalents

Cash and cash equivalents at the end of the period consist exclusively of the cash and cash equivalents reported on the balance sheet, namely cash on hand, credit balances with banks, short-term money market funds, and other cash amounting to €882.6 million (2018: €818.2 million).

Further disclosures regarding financial instruments

Financial risk management

a) General

In its operational and financing activities, the Heraeus Group is primarily exposed to interest-rate risk, currency risk, price risk, credit risk, and liquidity risk. These risks are measured, managed, and monitored by the Group's risk management system and financial management system.

Corporate Treasury and Precious Metal Trading are responsible for mitigating the risks that are described in greater detail below by taking out hedges as and when appropriate. The use of such hedges is governed by clear, standard policies that apply throughout the Group. Compliance is monitored at all times, and policies are amended as required. Heraeus is not exposed to any significant concentrations of risk arising from financial transactions. For further information, please refer to the opportunity and risk report in the group management report.

(b) Interest-rate risk

Interest-rate risk is the risk of changes in interest rates adversely impacting the financial position or financial performance of the Heraeus Group. The avoidance of interest-rate risk always takes priority, but the upside potential of changes in interest rates can also be exploited. The Group's main sources of long-term funding are currently two privately placed registered bonds. Interest-rate derivatives can be used to support interest-rate management. The derivatives that are used can be standard market instruments, such as interest-rate swaps and options for placing upper and lower limits on interest rates (caps, floors, and collars).

As in 2018, Heraeus was not exposed to any material cash-flow interest-rate risk arising from liabilities in 2019, because it had primarily taken out fixed-rate loans.

(c) Currency risk

Because of its international focus, the Heraeus Group is exposed to currency risk, which arises from movements in the exchange rates of various foreign currencies. Again, the avoidance of risk takes precedence over the exploitation of opportunities arising from movements in exchange rates. All hedges relate to underlying transactions that are already in existence or highly probable. As of the balance sheet date, currency risk largely comprised US$ 23.0 million or €20.5 million (2018: US$ 12.3 million or €10.7 million).

To help manage its currency risk, Heraeus uses derivatives based on these underlying transactions. As well as spot transactions, it primarily uses currency forwards and currency swaps.

Currency forwards are used principally to hedge operational cash flows arising from transactions for the supply and purchase of goods and services that are highly probable. Currency swaps are generally entered into in connection with intercompany loans in foreign currency.

(d) Other price risks

Precious metals constitute a key resource in the Heraeus Group. They are subject to market volatility and consequently entail price risk. The Precious Metal Trading unit uses standard market hedging instruments to hedge price risk, mainly precious metal leases, cash-and-carry transactions (precious metal swaps), forwards, and futures. Futures contracts that do not qualify for the own-use exemption and therefore fall within the scope of IFRS 7 do not entail price risk from an economic perspective, because they are taken out to hedge open positions.

(e) Credit risk

Credit risk arising from financial assets consists of the risk that counterparties will default, and hence is limited to a maximum of the carrying amount of the assets transacted with each counterparty. The credit risk relating to derivatives is their replacement cost (market value). The risk of specific counterparties defaulting is constantly monitored using credit spreads and by grouping counterparties into different categories according to their credit quality.

Valuation allowances for expected defaults are recognized to reflect the risk arising from non-derivative financial instruments. Financial transactions are generally only concluded with top-quality counterparties. Investments in interest-bearing securities, if any, are predominantly limited to investment-grade securities.

(f) Liquidity risk

Liquidity risk describes the risk that a company might be unable to meet its financial obligations in full. Liquidity risk largely results from short-term trade payables, liabilities from derivatives, and other financial liabilities.

As a result of its investment-grade rating, confirmed by two independent rating agencies (see (20) Capital management disclosures), the Heraeus Group is guaranteed sufficient liquidity. Its rating ensures that it can access both the short-term commercial-paper market and the long-term capital market. It also holds sufficient cash and cash equivalents and has unutilized loan facilities with various banks. Risk concentrations are minimized by limiting the amounts invested at individual, selected investment-grade banks.

The risk of liquidity shortages is monitored by Corporate Treasury. Effective cash management and the ability to access sufficient liquidity even in times of crisis minimize the risk of the Heraeus Group being unable to meet its financial obligations.

(g) Sensitivity analysis

Heraeus uses sensitivity analysis to analyze market risk. The following table shows sensitivity to potential movements in the US dollar exchange rate within reasonable parameters. All other variables remain constant. The impact on profit before taxes is caused by changes in the fair values of financial assets and liabilities. The Group's risk arising from exchange rate movements in respect of all other currencies is not material.

€ million	Change in USD/EUR exchange rate	Impact on profit before taxes	Impact on shareholders' equity
2019	+5 %	−1.3	−4.5
	−5 %	1.2	4.1
2018	+5 %	−0.5	−11.5
	−5 %	0.5	10.4

Derivative financial instruments

a) Cash flow hedges

In 2019, the rules for hedge accounting were applied for hedging cash flows. The hedges are to protect Heraeus against fluctuations in exchange rates for transactions in 2020 that had already been contractually agreed. As of December 31, 2019, there were currency forwards in the amount of €85.6 million (2018: €213.8 million), that had been entered into in order to hedge cash flows in 2019.

The transactions for hedging cash flows arising from anticipated future sales in 2020 have been classified as highly effective. As a result, an unrealized gain of €1.2 million (2018: unrealized loss of €3.6 million), taking account of deferred tax liabilities of €0.4 million (2018: deferred tax assets of €1.1 million), was recognized in other comprehensive income.

The amounts left in other comprehensive income as of December 31, 2019 are expected to be settled in 2020 and then recognized in profit or loss. Losses in other comprehensive income in the amount of €2.5 million (2018: gains of €2.2 million) were reclassified to profit or loss during the financial year.

(b) Economic currency hedges

Currency forwards are generally entered into in connection with intercompany loans in foreign currency and their settlement dates coincide with the maturity dates of the loans. Hedge accounting is not applied to these currency forwards. Consequently, individual currency forward contracts are recognized as assets or liabilities, and changes in their fair value are recognized in profit or loss.

(c) Offsetting of derivatives

The Heraeus Group enters into derivative transactions in accordance with the German Master Agreement for Financial Derivatives Transactions (DRV FT). This agreement does not meet the criteria for offsetting on the consolidated balance sheet, because it only confers the right of offset if future events occur, such as default or insolvency of the Group or of counterparties. The following table shows the potential financial impact of offsetting the arrangements described, regardless of whether they are offset on the consolidated balance sheet pursuant to IAS 32.42.

	Dec. 31, 2019			Dec. 31, 2018		
€ million	Gross amounts of financial instruments on the consolidated balance sheet	Amounts from netting arrangements	Net amounts	Gross amounts of financial instruments on the consolidated balance sheet	Amounts from netting arrangements	Net amounts
Derivative assets	16.0	–1.9	14.1	15.2	–2.0	13.2
Derivative liabilities	12.0	–1.9	10.1	21.9	–2.0	19.9

Classification and fair values

a) Categories

The following table shows the carrying amounts of financial instruments by category and the fair values of each class of financial instrument:

			Measurement category and carrying amount pursuant to IFRS 9		
	Note	Carrying amount	Mandatorily at fair value through profit or loss	Amortized cost	Fair value
€ million		Dec. 31, 2019			Dec. 31, 2019
Financial assets					
Cash and cash equivalents	(17)	882.6	–	882.6	n.a.
Trade receivables	(16)	802.3	–	802.3	n.a.
Other financial assets:					
Derivatives with positive fair value not used as hedges	(13)	14.8	14.8	–	14.8
Derivatives with positive fair value used as hedges	(13)	1.2	1.2	–	1.2
Loans	(13)	8.0	–	8.0	8.0
Miscellaneous financial assets measured at fair value	(13)	8.5	8.5	–	8.5
Miscellaneous financial assets	(13)	214.4	–	214.4	n.a.
			24.5	**1,907.3**	
Financial liabilities					
Trade payables	(26)	264.4	–	264.4	n.a.
Financial debt:					
Liabilities to banks	(23)	56.6	–	56.6	n.a.
Registered bonds	(23)	97.9	–	97.9	129.1
Lease liabilities	(23)	85.9	–	85.9	n.a.
Other financial liabilities:					
Derivatives with negative fair value not used as hedges	(24)	12.0	12.0	–	12.0
Miscellaneous financial liabilities measured at fair value	(24)	9.8	9.8	–	9.8
Miscellaneous financial liabilities	(24)	498.5	–	498.5	n.a.
			21.8	**1,003.3**	

€ million	Note	Carrying amount	Measurement category and carrying amount pursuant to IFRS 9: Mandatorily at fair value through profit or loss	Amortized cost	Carrying amount pursuant to IAS 17	Fair value
		Dec. 31, 2018				Dec. 31, 2018
Financial assets						
Cash and cash equivalents	(17)	818.2	–	818.2	–	n. a.
Trade receivables	(16)	697.3	–	697.3	–	n. a.
Other financial assets:						
Derivatives with positive fair value not used as hedges	(13)	15.2	15.2	–	–	15.2
Investments	(13)	0.0	0.0	–	–	0.0
Loans	(13)	7.1	–	7.1	–	7.1
Miscellaneous financial assets measured at fair value	(13)	1.8	1.8	–	–	1.8
Miscellaneous financial assets	(13)	266.3	–	266.3	–	n. a.
			17.0	**1,788.9**	**–**	
Financial liabilities						
Trade payables	(26)	266.4	–	266.4	–	n. a.
Financial debt:						
Liabilities to banks	(23)	48.5	–	48.5	–	n. a.
Registered bonds	(23)	97.8	–	97.8	–	115.9
Other financial liabilities:						
Derivatives with negative fair value not used as hedges	(24)	18.3	18.3	–	–	18.3
Derivatives with negative fair value used as hedges	(24)	3.6	3.6	–	–	3.6
Lease liabilities	(24)	2.4	–	–	2.4	2.4
Miscellaneous financial liabilities measured at fair value	(24)	10.4	10.4	–	–	10.4
Miscellaneous financial liabilities	(24)	431.5	–	431.5	–	n. a.
			32.3	**844.2**	**2.4**	

Cash and cash equivalents, trade receivables, trade payables, liabilities to banks, and miscellaneous financial assets and liabilities all have predominantly short terms to maturity. No fair values were presented for these financial instruments because they were approximately equal to their carrying amounts.

(b) Fair value measurement

The fair values of derivatives that are traded in an active market are determined based on market prices. Suitable valuation methods taking into account observable market data as of the balance sheet date are used to determine the fair values of derivatives that are not traded in an active market. The fair value of currency forwards is calculated on the basis of the par method based on market data on the balance sheet date. The actual market prices achievable on the balance sheet date may differ from the values calculated in this way. Generally accepted option pricing models (Black-Scholes method) are used to measure the fair value of options. Credit risk is determined using the add-on method and deducted directly from the positive or negative fair value of derivatives.

The discounted cash flow (DCF) method based on inputs observable in the market is used to calculate the fair value of loans and registered bonds.

The fair values recognized for financial instruments were determined as follows:

	Dec. 31, 2019		Dec. 31, 2018	
€ million	Assets	Liabilities	Assets	Liabilities
Mark-to-model values determined using parameters observed in the market (Level 2)	**16.0**	**–12.0**	**15.2**	**–21.9**
Other financial assets:	16.0	–	15.2	–
Derivatives with positive fair value not used as hedges	14.8	–	15.2	–
Derivatives with positive fair value used as hedges	1.2	–	–	–
Other financial liabilities:	–	–12.0	–	–21.9
Derivatives with negative fair value not used as hedges	–	–12.0	–	–18.3
Derivatives with negative fair value used as hedges	–	–	–	–3.6
Theoretical mark-to-model values (Level 3	**8.5**	**–9.8**	**1.8**	**–10.4**
Miscellaneous financial assets	8.5	–	1.8	–
Miscellaneous financial liabilities	–	–9.8	–	–10.4

The DCF method based on unobservable inputs, such as economic growth and the discount rate, is used to determine the fair values recognized at Level 3. A change in the input factors as part of a sensitivity analysis does not have any material effect on measurement. The following table shows the change in the fair values of other financial assets and other financial liabilities at Level 3 in 2019:

	2019		2018	
€ million	Assets	Liabilities	Assets	Liabilities
Balance as of Jan. 1	**1.8**	**–10.4**	**0.0**	**–9.0**
Gains/losses recognized in profit or loss	0.2	–1.4	–	–2.1
Additions	6.5	–1.7	1.8	–2.4
Disposals/settlements	–	3.7	–	3.2
Exchange differences recognized in other comprehensive income	–	–	–	–0.1
Balance as of Dec. 31	**8.5**	**–9.8**	**1.8**	**–10.4**

At the end of each reporting period, the financial assets and liabilities measured at fair value are assessed to ascertain whether they need to be transferred between levels of the fair value hierarchy. There were no transfers during 2019.

The fair values disclosed for financial instruments measured at amortized cost were determined as follows:

€ million	Dec. 31, 2019 Assets	Dec. 31, 2019 Liabilities	Dec. 31, 2018 Assets	Dec. 31, 2018 Liabilities
Mark-to-model values determined using parameters observed in the market (Level 2)	**8.0**	**–129.1**	**7.1**	**–118.3**
Loans	8.0	–	7.1	–
Registered bonds	–	–129.1	–	–115.9
Lease liabilities	–	n. a.	–	–2.4

Notes to the consolidated income statement

The following table shows net gains/losses by measurement category:

€ million	2019	2018
Financial assets and liabilities mandatorily measured at fair value through profit and loss	–63.5	–13.2
Financial assets measured at amortized cost	19.2	–0.1
Financial liabilities measured at amortized cost	–9.5	–5.3
Net gain/loss	**–53.8**	**–18.6**

The net gain/loss on financial assets and liabilities measured at fair value through profit or loss is the result of measurement subsequent to initial recognition and includes net interest income/expense. In all other categories, net interest income/expense and net gains/losses on currency translation, impairment, and disposal were taken into account.

In 2019, interest income of €3.9 million (2018: €4.4 million) and an interest expense of €9.5 million (2018: €5.3 million) were incurred in connection with financial assets and liabilities that are not measured at fair value through profit or loss. For the first time, interest expenses also included interest paid on lease liabilities in an amount of €2.9 million (see (32)).

Maturity analysis

The following table shows the contractually agreed (undiscounted) principal payments, including estimated interest payments, of the non-derivative financial liabilities and derivative financial liabilities held on the Heraeus Group's books as of December 31, 2019:

	Cash flows			
€ million	2020	2021	2022 – 2024	from 2025
Non-derivative financial liabilities:				
Registered bonds	1.4	3.8	11.3	133.7
Liabilities to banks	42.2	2.9	8.5	3.5
Trade payables	264.4	–	–	–
Lease liabilities	25.0	18.3	27.5	29.4
Miscellaneous financial liabilities	498.0	7.3	2.7	0.8
Derivative financial liabilities:				
Derivatives with negative fair value not used as hedges	11.4	0.2	0.4	–

The contractually agreed (undiscounted) interest and principal payments for the non-derivative financial liabilities and the derivative financial liabilities as of December 31, 2018 were as follows:

	Cash flows			
€ million	2019	2020	2021 – 2023	from 2024
Non-derivative financial liabilities:				
Registered bonds	1.4	3.8	11.3	137.5
Liabilities to banks	31.4	2.9	8.6	6.3
Trade payables	266.6	–	–	–
Lease liabilities	0.7	0.7	1.0	–
Miscellaneous financial liabilities	434.6	4.2	3.2	0.7
Derivative financial liabilities:				
Derivatives with negative fair value not used as hedges	18.1	0.2	–	–
Derivatives with negative fair value used as hedges	3.6	–	–	–

Variable cash flows were recognized at the reference interest rate applicable as of each balance sheet date. Foreign currency amounts were translated at the spot rate applicable as of each balance sheet date.

Other disclosures

Other financial commitments

Other financial commitments as of the balance sheet date comprised the following:

€ million	Dec. 31, 2019 Payable in 2020	Payable 2021 to 2024	Payable from 2025	Total	Dec. 31, 2018 Payable in 2019	Payable 2020 to 2023	Payable from 2024	Total
Future payments on operating leases	n. a.	n. a.	n. a.	n. a.	23.3	43.7	26.3	93.3
Order commitments for capital expenditure on property, plant, and equipment	63.9	–	–	63.9	65.3	–	–	65.3
Other financial commitments	**63.9**	**–**	**–**	**63.9**	**88.6**	**43.7**	**26.3**	**158.6**

For the purpose of sourcing precious metals, Heraeus enters into transactions such as precious metal leases as lessee and sometimes as lessor. In a leasing transaction, the lessor transfers to the lessee a contractually determined quantity of a precious metal for a fixed period of time and receives interest in return for transferring the precious metal. The Heraeus Group generally enters into precious metal leases with a maximum term of twelve months. As lessee, Heraeus is not required to recognize the precious metals it has leased or its corresponding obligations to return them in its balance sheet.

As of the balance sheet date, the total market value of the precious metals on loan from third parties amounted to €2,479.0 million (2018: €2,055.0 million).

The Group's supply of precious metals is partly secured by medium- to long-term offtake agreements. The quantity to be purchased can be onsold at any time with no price risk.

Related party disclosures

Disclosures regarding remuneration for the Board of Managing Directors, Supervisory Board, and Shareholders' Committee can be found in note (28).

The following table shows material trading relationships between Group entities and related parties:

€ million	Receivables Dec. 31, 2019	Receivables Dec. 31, 2018	Liabilities Dec. 31, 2019	Liabilities Dec. 31, 2018	Revenue 2019	Revenue 2018	Goods and services received 2019	Goods and services received 2018
Associates	5,1	5,1	–	–	9,9	41,9	–	0,1
Joint ventures	5,1	5,4	0,6	0,5	38,5	40,9	4,4	16,2
Total	**10,2**	**10,5**	**0,6**	**0,5**	**48,4**	**82,8**	**4,4**	**16,3**

These trading relationships mainly relate to the field of activity Electronics.

Events after the reporting period

There were no significant events after the reporting period.

Additional disclosures pursuant to the German Commercial Code (HGB)

Auditors' fees

The fees paid to Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft for auditing services in 2019 amounted to €1.3 million (2018: €1.3 million). The fee for tax consultancy services was €0.0 million (2018: €0.2 million) and the fee for other services was €0.1 million (2018: €0.5 million).

Exemption pursuant to section 264 (3) HGB and section 264b HGB

The following German subsidiaries will make use of the exemption provisions of section 264 (3) HGB and section 264b HGB for 2019:

Heraeus Additive Manufacturing GmbH, Hanau
Heraeus Amloy Technologies GmbH, Hanau
Heraeus Battery Technology GmbH, Hanau
Heraeus Beteiligungsverwaltungsgesellschaft mbH, Hanau
Heraeus Deutschland GmbH & Co. KG, Hanau
Heraeus Electro-Nite GmbH & Co. KG, Hanau
Heraeus Finance GmbH, Hanau
Heraeus infosystems GmbH, Hanau
Heraeus Medical GmbH, Wehrheim
Heraeus Metals Germany GmbH & Co. KG, Hanau
Heraeus Nexensos GmbH, Hanau
Heraeus Noblelight GmbH, Hanau
Heraeus Pyrometallurgy GmbH, Hanau
Heraeus Quarzglas GmbH & Co. KG, Hanau
Heraeus Quarzglas Bitterfeld GmbH & Co. KG, Hanau
Heraeus Quarzglas International GmbH, Hanau
Heraeus Quarzglas Verwaltungsgesellschaft mbH, Hanau
Heraeus Site Operations GmbH & Co. KG, Hanau
Heraeus Site Operations III GmbH & Co. KG, Hanau
Heraeus UV Solutions GmbH, Hanau

List of shareholdings

The shareholdings of Heraeus Holding GmbH as of December 31, 2019 are listed below:

Name of company	Registered office	Country	Percentage of equity
1. Subsidiaries included in the consolidated financial statements			
In Germany			
Argor-Heraeus Deutschland GmbH	Pforzheim	Germany	100.00
Heraeus Additive Manufacturing GmbH	Hanau	Germany	100.00
Heraeus Amloy Technologies GmbH	Hanau	Germany	100.00
Heraeus Battery Technology GmbH	Hanau	Germany	100.00
Heraeus Beteiligungsverwaltungsgesellschaft mbH	Hanau	Germany	100.00
Heraeus Deutschland GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Deutschland Verwaltungs GmbH	Hanau	Germany	100.00
Heraeus Electro-Nite GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Electro-Nite Verwaltungsgesellschaft mbH	Hanau	Germany	100.00
Heraeus Finance GmbH	Hanau	Germany	100.00
Heraeus infosystems GmbH	Hanau	Germany	100.00
Heraeus Medical GmbH	Wehrheim	Germany	100.00
Heraeus Metals Germany GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Metals Germany Treuhand GmbH	Hanau	Germany	100.00
Heraeus Nexensos GmbH	Hanau	Germany	100.00
Heraeus Noblelight GmbH	Hanau	Germany	100.00
Heraeus Pyrometallurgy GmbH	Hanau	Germany	100.00
Heraeus Quarzglas Bitterfeld GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Quarzglas GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Quarzglas International GmbH	Hanau	Germany	100.00
Heraeus Quarzglas Treuhand GmbH	Hanau	Germany	100.00
Heraeus Quarzglas Verwaltungsgesellschaft mbH	Hanau	Germany	100.00
Heraeus Site Operations Energy GmbH	Hanau	Germany	100.00
Heraeus Site Operations GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Site Operations III GmbH & Co. KG	Hanau	Germany	100.00
Heraeus Site Operations Verwaltungs GmbH	Hanau	Germany	100.00
Heraeus UV Solutions GmbH	Hanau	Germany	100.00
HUVENCA 1 GmbH	Hanau	Germany	100.00
W. C. Heraeus International GmbH	Hanau	Germany	100.00

Name of company	Registered office	Country	Percentage of equity
Outside Germany			
Argor-Heraeus SA	Mendrisio	Switzerland	100.00
Argor-Heraeus Italia S.p.A.	Cavenago Brianza	Italy	100.00
Dong Yang Ceramic Inc.	Pyeongtaek-si	South Korea	100.00
Heraeus Asia Pacific Holding Pte. Ltd.	Singapore	Singapore	100.00
Heraeus (China) Investment Co., Ltd.	Shanghai	China	100.00
Heraeus Conamic UK Ltd.	Wallsend	UK	100.00
Heraeus CZ s.r.o.	Prague	Czech Rep.	100.00
Heraeus Electro-Nite (Aust.) Pty. Ltd.	Unanderra	Australia	100.00
Heraeus Electro-Nite (Pty.) Ltd.	Boksburg	South Africa	100.00
Heraeus Electro-Nite (UK) Ltd.	Chesterfield	UK	100.00
Heraeus Electro-Nite AB	Lidingö	Sweden	100.00
Heraeus Electro-Nite Termoteknik Sanayi ve Ticaret A.S.	Sincan-Ankara	Turkey	100.00
Heraeus Electro-Nite Canada Ltd.	Toronto, ON	Canada	100.00
Heraeus Electro-Nite Chelyabinsk LLC	Chelyabinsk	Russia	100.00
Heraeus Electro-Nite Co., LLC	Dover, DE	USA	100.00
Heraeus Electro-Nite Espana S.L.	Cayés-Llanera	Spain	100.00
Heraeus Electro-Nite France S.A.R.L.	Illange	France	100.00
Heraeus Electro-Nite Instrumentos Ltda.	Diadema, SP	Brazil	100.00
Heraeus Electro-Nite International N.V.	Houthalen	Belgium	100.00
Heraeus Electro-Nite Italy S.r.l.	Ornago-Milan	Italy	100.00
Heraeus Electro-Nite Japan, Ltd.	Ichikawa-shi	Japan	100.00
Heraeus Electro-Nite L.L.C.	Moscow	Russia	100.00
Heraeus Electro-Nite Mexicana S.A. de C.V.	Ramos Arizpe, COA	Mexico	100.00
Heraeus Electro-Nite Polska Sp. z o.o.	Sosnowiec	Poland	100.00
Heraeus Electro-Nite Shanghai Co. Ltd.	Shanghai	China	100.00
Heraeus Electro-Nite Shenyang Co. Ltd.	Shenyang	China	100.00
Heraeus Electro-Nite Taicang Co. Ltd.	Taicang	China	100.00
Heraeus Electro-Nite Taiwan Ltd.	Kaohsiung City	Taiwan	100.00
Heraeus Electro-Nite Ukraina LLC	Zaporozhye	Ukraine	100.00
Heraeus Epurio LLC	Dover, DE	USA	100.00
Heraeus GMSI LLC	Milford, DE	USA	100.00
Heraeus Hellas Monoprosopi EPE	Athens	Greece	100.00
Heraeus Inc.	Dover, DE	USA	100.00
Heraeus K.K.	Tokyo	Japan	100.00
Heraeus Korea Corporation	Suwon-si	South Korea	100.00
Heraeus Ltd.	Hong Kong	China	100.00
Heraeus Materials S.A.	Yverdon-les-Bains	Switzerland	100.00
Heraeus Materials Malaysia Sdn. Bhd.	Kuala Lumpur	Malaysia	100.00
Heraeus Materials Singapore Pte. Ltd.	Singapore	Singapore	100.00
Heraeus Materials Technology Shanghai Ltd.	Shanghai	China	100.00
Heraeus Materials Technology Taiwan Ltd.	Taipei City	Taiwan	100.00

Name of company	Registered office	Country	Percentage of equity
Heraeus Medical AB	Stockholm	Sweden	100.00
Heraeus Medical LLC	Dover, DE	USA	100.00
Heraeus Medical Australia Pty. Ltd.	Macquarie Park, NSW	Australia	100.00
Heraeus Medical Components LLC	Dover, DE	USA	100.00
Heraeus Medical Components S.R.L.	San Antonio de Belén	Costa Rica	100.00
Heraeus Medical Components Caribe, Inc.	San Juan	Puerto Rico	100.00
Heraeus Medical Poland Sp. z o.o.	Warsaw	Poland	100.00
Heraeus Medical Portugal Lda.	Lisbon	Portugal	100.00
Heraeus Medical Schweiz AG	Zurich	Switzerland	100.00
Heraeus Metal Processing Ltd.	Shannon	Ireland	100.00
Heraeus Metals Hong Kong Ltd.	Hong Kong	China	100.00
Heraeus Metals New York LLC	Dover, DE	USA	100.00
Heraeus Metals (Shanghai) Co., Ltd.	Shanghai	China	100.00
Heraeus Nederland B.V.	Amsterdam	Netherlands	100.00
Heraeus Noblelight America LLC	Dover, DE	USA	100.00
Heraeus Noblelight Ltd.	Cambridge	UK	100.00
Heraeus Noblelight (Shenyang) Ltd.	Shenyang	China	100.00
Heraeus Oriental HiTec Co., Ltd.	Incheon	South Korea	100.00
Heraeus Precious Metals North America LLC	Dover, DE	USA	100.00
Heraeus Precious Metals North America Conshohocken LLC	Dover, DE	USA	100.00
Heraeus Precious Metal Technology (China) Co., Ltd.	Nanjing	China	100.00
Heraeus Quartz North America LLC	Dover, DE	USA	100.00
Heraeus Recycling Technology (Taicang) Co., Ltd.	Taicang City	China	100.00
Heraeus Romania S.R.L.	Chişoda	Romania	100.00
Heraeus S.A.	Madrid	Spain	100.00
Heraeus S.A.S.	Villebon-sur-Yvette	France	100.00
Heraeus S.p.A.	Milan	Italy	100.00
Heraeus ShinEtsu Quartz China Inc.	Shenyang	China	66.67
Heraeus South Africa (Pty.) Ltd.	Port Elizabeth	South Africa	100.00
Heraeus Technologies India Private Ltd.	New Delhi	India	100.00
Heraeus (Thailand) Ltd.	Bangkok	Thailand	100.00
Heraeus Tokmak Kiymetli Madenler Sanayi A.S.	Kemalpasa-Izmir	Turkey	95.00
Heraeus Zhaoyuan Changshu Electronic Materials Co. Ltd.	Changshu	China	80.00
Heraeus Zhaoyuan Precious Metal Materials Co. Ltd.	Zhaoyuan City	China	60.00
MC Sublance Probe Technology Shanghai Co., Ltd.	Shanghai	China	100.00
Minco (Shanghai) Metallurgical Co., Ltd.	Shanghai	China	100.00
PT. Woojin Electro Nite Indonesia	Cilegon	Indonesia	100.00
Shree Ram Measurement Technologies Pvt. Ltd.	New Delhi	India	100.00
SKO A.S.	Istanbul	Turkey	100.00
Via Biomedical Inc.	Maple Crove, MN	USA	100.00
Woojin Electro-Nite Inc.	Pyeongtaek-si	South Korea	100.00
Wuhan Trot Automatic Engineering Co., Ltd.	Wuhan	China	100.00

Name of company	Registered office	Country	Percentage of equity
2. Subsidiaries not included in the consolidated financial statements			
Outside Germany			
HEN RBS Trustees Ltd.	Chesterfield	UK	100.00
PT Heraeus Materials Indonesia	Tangerang City	Indonesia	99.59
3. Associates accounted for under the equity method included in the consolidated financial statements			
Outside Germany			
Ankasa Regenerative Therapeutics, Inc.	Wilmington, DE	USA	26.28
Choksi Heraeus Private Ltd.	Udaipur, Rajasthan	India	50.00
Ravindra Heraeus Private Ltd.	Udaipur, Rajasthan	India	50.00
4. Joint ventures accounted for under the equity method included in the consolidated financial statements			
Outside Germany			
Argor-Aljba SA	Mendrisio	Switzerland	50.00
Heraeus Shin-Etsu Quartz Singapore Pte. Ltd.	Singapore	Singapore	50.00
Shin-Etsu Quartz Products Co., Ltd.	Tokyo	Japan	50.00
Young Shin Quartz Co., Ltd.	Gwanghyewon-myun	South Korea	50.00

Hanau, March 11, 2020
The Board of Management of Heraeus Holding GmbH

Jan Rinnert
Chairman

Dr. André Kobelt

Rolf Wetzel

Independent auditor's report

To Heraeus Holding GmbH

Opinions

We have audited the consolidated financial statements of Heraeus Holding GmbH, Hanau, and its subsidiaries (the Group), which comprise the consolidated statement of financial position as at 31 December 2019, and the consolidated income statement, consolidated statement of comprehensive income, consolidated statement of cash flows and consolidated statement of changes in equity for the fiscal year from 1 January to 31 December 2019, and notes to the consolidated financial statements, including a summary of significant accounting policies. In addition, we have audited the group management report of Heraeus Holding GmbH, Hanau, for the fiscal year from 1 January to 31 December 2019. In accordance with the German legal requirements, we have not audited the content of the section "Compliance report" of the group management report.

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

- the accompanying consolidated financial statements comply, in all material respects, with the IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Sec. 315e (1) HGB ["Handelsgesetzbuch": German Commercial Code] and, in compliance with these requirements, give a true and fair view of the assets, liabilities and financial position of the Group as at 31 December 2019 and of its financial performance for the fiscal year from 1 January to 31 December 2019, and
- the accompanying group management report as a whole provides an appropriate view of the Group's position. In all material respects, this group management report is consistent with the consolidated financial statements, complies with German legal requirements and appropriately presents the opportunities and risks of future development. Our opinion on the group management report does not cover the content of the abovementioned section "Compliance report" in the group management report.

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

Basis for the opinions

We conducted our audit of the consolidated financial statements and of the group management report in accordance with Sec. 317 HGB and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Our responsibilities under those requirements and principles are further described in the "Auditor's responsibilities for the audit of the consolidated financial statements and of the group management report" section of our auditor's report. We are independent of the group entities in accordance with the requirements of German commercial and professional law, and we have fulfilled our other German professional responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinions on the consolidated financial statements and on the group management report.

Other informationen

The supervisory board is responsible for the supervisory board report. In all other respects, the executive directors are responsible for the other information. The other information comprises parts to be included in the annual report, of which we received a version prior to issuing this auditor's report, in particular:

- Report of the supervisory board
- Foreword by the management board
- Multiple-year overview

In addition, the section "Compliance report" in the group management report is part of "Other information" whose disclosure in the management report is not required.

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

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

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

Responsibilities of the executive directors and the supervisory board for the consolidated financial statements and the group management report

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

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

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

The supervisory board is responsible for overseeing the Group's financial reporting process for the preparation of the consolidated financial statements and of the group management report.

Auditor's responsibilities for the audit of the consolidated financial statements and of the group management report

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

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

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

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

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

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

Eschborn/Frankfurt am Main, 11 March 2020

Ernst & Young GmbH

Wirtschaftsprüfungsgesellschaft

Bösser	Jäger
Wirtschaftsprüfer	Wirtschaftsprüferin
[German Public Auditor]	[German Public Auditor]

Multi-year overview

in Mio.€	2019	2018	2017	2016	2015
Financial performance (€ million)					
Revenue excluding precious metals	2,200	2,259	2,185	2,005	1,929
Total revenue	22,378	20,295	21,844	21,516	12,930
Earnings before interest and tax (EBIT)	222	341	299	235	96
Profit after taxes	115	197	210	144	41
Financial position (€ million)					
Total assets	5,497	5,068	4,829	4,724	4,371
Shareholders' equity	3,293	3,223	3,010	2,996	2,895
Equity-to-assets ratio (%)	60	64	62	63	66
Cash flow (€ million)					
Net cash provided by operating activities	378	449	244	216	310
Cash payments for investments in non-current assets*	233	257	196	162	123
Depreciation, amortization, and impairment of non-current assets*	158	143	192	160	203
Employees					
Employees at year-end	14,190	13,858	13,073	12,369	12,477
In Germany	5,464	5,418	4,864	4,703	4,712
Outside Germany	8,726	8,440	8,209	7,666	7,765

* Prior-year figures adjusted for additions as well as amortization and impairment of intangible assets.

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Heraeus Holding GmbH
Communications & Marketing
Heraeusstrasse 12–14
63450 Hanau, Germany
Tel: +49 (0)6181 355 100
Fax: +49 (0)6181 354 242
pr@heraeus.com
www.heraeus.de