Financial report | 2020

Key financial indicators for the Group

	2020	2019	Change (%)
Financial performance (€ million)			
Revenue excluding precious metals	2,052	2,200	–6.7
Total revenue*	31,532	21,570	+46.2
Earnings before interest and tax (EBIT)	302	222	+36.0
Profit after taxes	191	115	+66.1
Financial position (€ million)			
Total assets	5,765	5,497	+4.9
Shareholders' equity	3,280	3,293	–0.4
Equity-to-assets ratio (%)	57	60	
Cash flow (€ million)			
Net cash provided by operating activities	345	378	–8.7
Cash payments for investments in non-current assets	197	233	–15.5
Depreciation, amortization, and impairment of non-current assets	176	158	+11.4
Employees			
Employees at year-end	13,911	14,190	–2.0
In Germany	5,290	5,464	–3.2
Outside Germany	8,621	8,726	–1.2

* The comparative information for 2019 has been restated; see note (2)(b) of the notes to the consolidated financial statements.

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 service 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**.

Letter from the Board of Managing Directors

Ladies and Gentlemen,

The fallout from the coronavirus pandemic meant that 2020 was an unusual and challenging year in all kinds of ways. It demanded a great deal from us, both on a personal level and as a business. We were forced to discard many habits and try out something new. It is still too early to say what many of the ramifications of this pandemic will be. Its effects will be with us for years to come.

As early as January 2020, we took the first steps at our sites to contain the virus and set up an internal crisis management structure. The focus was on protecting employees and maintaining operational continuity in our various businesses and locations.

The Heraeus Group performed well from a financial perspective last year and benefited from its broad global positioning. Some of the fall in earnings in several of our business units was offset by the performance of other parts of the business. In particular, our field of activity Environmental with its strong international presence and healthy positioning in the precious metal markets was able to achieve very good earnings in 2020 and thus make a key contribution to overall success of the Group.

By contrast, our earnings in the fields of activity Industrials, Electronics, and Health were partially affected by the impact of the pandemic and the global weakening of economic growth. The effects of the pandemic were felt particularly strongly in the second and third quarters of the year, whereas most markets had begun to show signs of recovery toward the end of the year.

The Group's total revenue amounted to €31.5 billion in 2020. Revenue excluding precious metals fell by 6.7 percent year on year to €2.1 billion. The decrease was 5.3 percent after adjusting for currency effects. At €190.7 million, the profit after taxes generated in 2020 was higher than in the prior year. This was due to the successful completion of cost-saving measures in the past, operational enhancements, and a significant degree of price volatility in the precious metal markets, which helped to improve margins.

Thanks to this success on the operational front and our restrained dividend policy of recent years, we have the financial means to maintain our business units' commitment to research and development at a high level. The individual business units were once again able to launch many new products in growth markets. For example, new catalysts for the eco-friendly production of hydrogen or new products that use UV-C light to reliably and effectively disinfect the air and surfaces.

2020 showed us that we cannot take anything for granted. External shocks, triggered by political, economic, or health crises, can arise on any given day. This makes it a constant challenge to remain competitive. Our ongoing excellence activities play a key role here. They help us to continually improve our work processes, enhance our employees' skills, and remain competitive in the international market. Last year, we implemented almost twice as many excellence initiatives as in 2019 that involved our supply chain, production, procurement, sales, and administrative functions.

The pandemic had significant consequences for the Heraeus Group's workforce. By taking decisive action, and thanks to the support of our employees, we have so far avoided any widespread cases of infection at our sites. To mitigate the added burden that the restrictions had on childcare and family contact, we encouraged people to work from home if they could. In areas where this was not possible, extensive measures were put in place to protect our staff. We would like to take this opportunity to thank all our employees for their exceptional efforts in this most challenging of years.

Taking a look ahead to the coming year is not easy at the moment. However, Heraeus does expect that its global sales markets will gradually recover over the course of 2021 following their slump in 2020 due to the coronavirus pandemic.

The recovery of the markets is likely to vary widely by region and will largely depend on the effectiveness of the measures taken to prevent the further spread of the pandemic and on the availability of vaccines. Currently, a significant rebound is projected, particularly in China.

The Board of Managing Directors of Heraeus Holding GmbH

Jan Rinnert   Dr. André Kobelt   Dr. Frank Stietz   Rolf Wetzel

Chairman

Management and supervisory bodies Heraeus Holding GmbH

Board of Managing Directors of Heraeus Holding GmbH

Jan Rinnert Chairman

Dr. André Kobelt

Dr. Frank Stietz (from April 1, 2020)

Rolf Wetzel

Supervisory Board of Heraeus Holding GmbH

Franz Haniel Chairman (from November 10, 2020)

Dr. Jürgen Heraeus Chairman (until November 5, 2020)

Joachim Reitz Vice Chairman

Dr. Simone Bagel-Trah

Dr. Hans-Tjabert Conring

Birgit Heraeus-Roggendorf (from November 6, 2020)

Dr. Hubert Lienhard

Annette Lukas

Uwe Raschke

Stefan Sattler

Peter Schuld

Gerhard Schullerus

Andreas Wolf

Report of the Supervisory Board

**Dear shareholders,
dear readers,**

In 2020, 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 and risk management systems, compliance issues, and Group 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, we 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, together with a constitutive meeting, took place in 2020. Two written resolutions were circulated for approval outside the meetings. The Board of Managing Directors also kept the Supervisory Board comprehensively informed of all current issues.

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. This was perfectly possible, even in the partially virtual format used for the three meetings, as necessitated by the pandemic. All members of the Supervisory Board were present at one of the meetings. One member sent their apologies to the meeting on October 6, 2020, and two members sent their apologies to the meeting on December 10, 2020. 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.

In a letter dated January 31, 2020, the Board of Managing Directors updated the Supervisory Board about the latest situation in China caused by the coronavirus pandemic and about the establishment of a task force in Hanau and Shanghai.

On March 3, 2020, the Supervisory Board received a detailed report on the global spread of the coronavirus, the implications for Heraeus' business, and the action taken.

In a submission dated April 3, 2020, the Board of Managing Directors provided detailed advance information on the planned acquisition of an interest of up to 53.4 percent in global PET bottle recycling business perPETual Technologies GmbH, Germany.

At its meeting on April 30, 2020, 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 for the year ended December 31, 2019, in each case including the management report. It did not raise any objections to these financial statements and approved them after a review and thorough deliberation. Because of the coronavirus pandemic, the Supervisory Board also addressed the pandemic-related postponement of the shareholders' meeting scheduled for June 6, 2020. At the same time, it approved a proposal that a written resolution be circulated in May 2020 for shareholders to approve an advance dividend distribution from the distributable profit for the 2019 financial year. This advance dividend, which was approved as proposed, was the same as the dividend planned for the 2019 financial year and was payable on the date originally scheduled for the dividend payment at the beginning of June 2020. The Board of Managing Directors reported on the 2019 financial year and on the current financial year, which included a risk report. The Supervisory Board also consented to the acquisition of an interest of up to 53.4 percent in global PET bottle recycling business PETual Technologies GmbH, Germany.

In a letter dated June 16, 2020, the Board of Managing Directors provided detailed information on an acquisition project that subsequently did not come to fruition.

On August 27, 2020, the Chairman of the Supervisory Board and the Chairman of the Board of Managing Directors together told the Supervisory Board about the changes to the sequence of meetings because of the coronavirus pandemic.

Detailed reports on the ongoing financial year and the individual business units were received at the meeting held on October 6, 2020. This meeting also received a presentation on a project to acquire all the shares in medical technology company Pulse Systems, LLC, USA. The Supervisory Board subsequently approved this project by means of a written resolution circulated among the members in the period October 7, 2020 to October 12, 2020.

The Supervisory Board also held detailed deliberations regarding the package of documents to be circulated to the shareholders for the written adoption of resolutions in the period October 22, 2020 to November 5, 2020 in place of a physical shareholders' meeting because of the pandemic. The documents focused on resolutions covering the formal approval of the actions of the Board of Managing Directors and Supervisory Board, the appropriation of profit, and the appointment of the independent auditors for the single-entity and consolidated financial statements.

On November 6, 2020, following completion of the procedure for the written adoption of resolutions in the period October 22, 2020 to November 5, 2020, the Board of Managing Directors announced the election of new, or in some cases re-election of existing, shareholder representatives to the Supervisory Board.

The Supervisory Board, some of whose members were then new and others re-elected, held a constitutive meeting on November 10, 2020 and elected Franz Haniel as the Chairman.

At the meeting held on December 10, 2020, the Board of Managing Directors reported to the Supervisory Board in detail on the ongoing financial year and the ten most significant risks. The meeting also received a presentation on the Heraeus Group's planning for 2021 to 2023, including the borrowing framework. The planning was reviewed in depth and approved. Finally, the report on the review in accordance with the European Market Infrastructure Regulation (EMIR) was presented to the meeting.

Meetings and resolutions of the committees

The Supervisory Board's Audit Committee met three times in 2020.

At its meeting on April 2, 2020, it mainly dealt with the single-entity and consolidated financial statements for 2019, including the auditor's key audit points. The auditors responsible for the audit also participated in this meeting.

At its meeting on September 30, 2020, the Audit Committee primarily dealt with the Group's 2020 half-year report and with current business performance, and discussed the key areas of focus for the audit of the 2020 annual financial statements. It also received reports on the current status of M&A projects.

The meeting on December 10, 2020 mainly addressed current performance, the responsibility management system, the risk management system, and Group Internal Audit. Other agenda items covered the status of current M&A projects and the key areas of audit focus proposed by the auditors for the 2020 consolidated financial statements.

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 again satisfied itself of the independence of the external auditors and, in light of recent events, held thorough discussions with the Board of Managing Directors regarding the reappointment of Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft, Eschborn.

Meetings of the Presidial Committee and meetings of the Mediation Committee were not necessary during the reporting period.

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

The single-entity financial statements and management report of Heraeus Holding GmbH as well as the consolidated financial statements and group management report of the Heraeus Group for 2020 were audited by Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft, Eschborn, and given an unqualified audit opinion.

The Supervisory Board issued the engagement for these audits at its meeting on April 30, 2020. The shareholders approved the audit engagement by means of a written resolution over the period October 22, 2020 to November 5, 2020.

In addition, the Supervisory Board's Audit Committee discussed the single-entity financial statements of Heraeus Holding GmbH and the consolidated financial statements for 2020, together with the related audits, at its meeting on March 25, 2021. 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 group management report of the Heraeus Group for 2020, along with the auditors' reports, were made available to all members of the Supervisory Board in advance of the full Supervisory Board meeting on April 29, 2021. At the meeting, the auditors participated in the Supervisory Board's discussion of the documents to be reviewed. 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, together with the consolidated financial statements and group management report of the Heraeus Group, prepared for the 2020 financial year, including the associated audit reports. The Supervisory Board's concluding findings of its own review were that 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

The term of office of Dr. Jürgen Heraeus came to an end on November 5, 2020 and he did not offer himself for re-election. Following the adoption of resolutions in writing by the shareholders over the period October 22, 2020 to November 5, 2020, Birgit Heraeus-Roggendorf was elected as a new member of the Supervisory Board, and Franz Haniel and Uwe Raschke were re-elected, in each case for a term of five years as specified in the articles of association.
Dr. Hans-Tjabert Conring's membership of the Supervisory Board was also extended by a term specified in the articles of association. Under these articles, he is an ex officio member of the Supervisory Board because he was elected as the new Chairman of the Shareholders' Committee of Heraeus Holding GmbH on November 10, 2020.

At the constitutive meeting of the Supervisory Board on November 10, 2020, Franz Haniel was elected Chairman. Joachim Reitz remains Vice Chairman.

Changes in the Supervisory Board committees

Audit Committee of Heraeus Holding GmbH

Following the resignation of Dr. Jürgen Heraeus, the Audit Committee also held a constitutive meeting on November 10, 2020 at which Dr. Hubert Lienhard was elected as a new member and Chairman, and Franz Haniel was elected Vice Chairman, in each case for the duration of their respective terms of office in accordance with the articles of association. Andreas Wolf remains an ordinary member of the committee. Birgit Heraeus-Roggendorf was invited to meetings of the Audit Committee as a standing guest member.

Presidial Committee of Heraeus Holding GmbH

By virtue of his position as Chairman of the Supervisory Board, Franz Haniel is now also a member of the Presidial Committee. Joachim Reitz and Dr. Simone Bagel-Trah will remain members of the Presidial Committee until the end of their respective terms of office in accordance with the articles of association.

Changes to the Mediation Committee of Heraeus Holding GmbH

By virtue of his position as Chairman of the Supervisory Board, Franz Haniel is now also a member of the Mediation Committee. Joachim Reitz, Dr. Simone Bagel-Trah and Stefan Sattler will remain members of the Mediation Committee until the end of their respective terms of office in accordance with the articles of association.

The Supervisory Board would like to offer special thanks to all members of senior management 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, which was made especially challenging by the coronavirus pandemic.

Above all, we would like to express enormous gratitude to the former Chairman of the Supervisory Board Dr. Jürgen Heraeus for his boundless efforts in a close working relationship over many years.

Hanau, April 29, 2021
The Supervisory Board

Franz Haniel
Chairman

Group management report. Tough macroeconomic conditions were a defining feature of 2020. Revenue excluding precious metals fell by 6.7 percent year on year to €2.1 billion. The decrease was 5.3 percent after adjusting for currency effects. The Group's earnings before interest and tax (EBIT) came to €302.4 million, which was well above the level of the prior year. Research and development expenditure in 2020 amounted to €142.6 million.

Fundamentals of the Group

Business model

Heraeus, based in Hanau in Germany, is a family-owned global technology group. The company was incorporated in 1851 and can trace its roots back to a pharmacy opened by the family in 1660. Today, Heraeus encompasses a large number of businesses that operate in the fields of activity Health, Electronics, Industrials, and Environmental. Based on its range of products, the Group is one of the leading providers in each of its global sales markets. These include the markets for electronics, semiconductors, telecommunications, lighting, chemicals, pharmaceuticals, steel, photovoltaics, automotive products, and medical equipment.

Under the umbrella of Heraeus Holding, the Group's four fields of activity remained unchanged in 2020. 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 packaging 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.

With more than 100 companies and 13,911 employees, Heraeus maintains a presence in the key economic regions of the world in order to capitalize on growth opportunities around the globe.

Research and development

Technological expertise and innovation capabilities are the key drivers of success for the Heraeus Group. Heraeus currently holds over 1,300 patent families, with property rights in various countries, and employs 770 people worldwide in research and development (R&D). Its research and development expenditure in 2020 amounted to €142.6 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 in 2020 was seriously affected by the outbreak of the coronavirus pandemic. Although country-wide lockdowns in the first half of 2020 were followed by an initial recovery in the third quarter, economic activity remained well below the level of 2019, i.e. the level prior to the pandemic. The latest figures published by the International Monetary Fund (IMF) predict that the global economy will have contracted by 3.5 percent in 2020 compared with the previous year.

This negative economic growth in the reporting year will probably have varied significantly from region to region. In the US, the contraction in 2020 is expected to have been 3.4 percent compared with growth of 2.2 percent in 2019. Negative growth of 7.2 percent is forecast for the eurozone (2019: growth of 1.3 percent), and for Germany the IMF is anticipating a contraction of 5.4 percent for 2020 (2019: growth of 0.6 percent). It is anticipated that China will have experienced a significant fall in growth to 2.3 percent (2019: 6.0 percent). A similar pattern is expected for the emerging markets, with the contraction forecast at 2.4 percent (2019: growth of 3.6 percent).

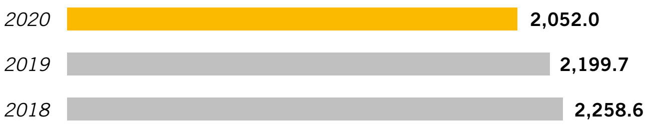
The outbreak of the coronavirus pandemic in 2020, together with the measures and far-reaching constraints imposed to deal with it, created huge challenges for the entire global economy. The virus was novel and spread rapidly, which were the main reasons why the virus led to countermeasures with an enormous negative economic fallout – and all this following a year in which uncertainty arising from geopolitical problems and trade disputes had already cast a cloud over the economy. Like most other markets, the sales markets served by Heraeus did not escape the effects of the sharp global economic downturn in 2020.

In particular, the automotive industry suffered a pandemic-induced slump in sales in the reporting year that was unprecedented. According to the German Association of the Automotive Industry (VDA), the worldwide passenger car market shrank by 15 percent in 2020. Structural challenges presented by new approaches to transportation and increasingly stringent emissions standards constituted an additional burden for the established players.

Total revenue*
€ million

* The comparative information for 2019 has been restated; see note (2)(b) of the notes to the consolidated financial statements.

Revenue excluding precious metals
€ million



The market for optical fibers for telecommunications and data transmission contracted again in 2020 (down by 5 percent year on year), notably because of weak demand in China (down by 10 percent year on year). Other main reasons for the decline were the impact of the coronavirus pandemic and further delays in the expansion of the optical fiber network for future 5G applications, while previous investment cycles relating to 4G and fiber-to-the-home came to an end.

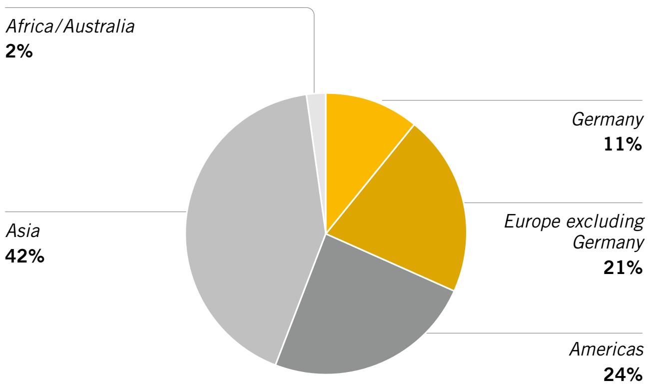
Global demand for steel also suffered from the fallout from the coronavirus pandemic and the associated drop in investment in the construction and capital equipment market. In the reporting year, global demand declined by 2.4 percent, although China notched up growth of 8.0 percent on the back of a more rapid economic rebound.

The market for medical solutions presented a mixed picture in 2020. Despite the positive underlying trend in this market (aging population, more access to medical care in emerging markets), demand fell in 2020 because COVID-19 forced the postponement of elective surgery.

Unlike the sales markets referred to above, some of the markets relevant to Heraeus proved extremely robust.

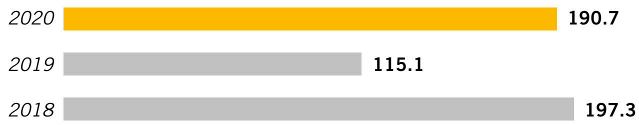
In the photonics sector (optics industry focusing on research, medical equipment, and laser technology), the market remained stable. Although the demand for industrial lasers intended for automotive applications diminished significantly, this was offset by a rise in the demand for lasers used for medical applications and for measurement technology.

Revenue excluding precious metals by region 2020



Earnings before interest and tax (EBIT)
€ million

Profit after taxes
€ million



The semiconductor market also enjoyed encouraging growth in 2020, driven by capital expenditure on semiconductor manufacturing equipment (up by 10 percent year on year) and by chip production (up by 2 percent year on year). A sustained high level of demand and significant price volatility were also notable features of the precious metals market in 2020.

Comparison between actual and forecast business performance

For 2020, Heraeus projected that revenue excluding precious metals would remain at approximately the same level as in the prior year. It was not possible to meet these expectations in full because of the coronavirus pandemic. Revenue excluding precious metals amounted to €2.1 billion and was therefore down year on year by 6.7 percent.

In particular, the fields of activity Health and the Electronics fell short of expectations. The forecast for the field of activity Industrials was only missed by a small margin, but that for the field of activity Environmental was exceeded slightly.

At €190.7 million, the profit after taxes generated in 2020 was higher than predicted. This was due to the successful completion of cost-saving measures in the past, operational enhancements, and a significant degree of price volatility in the precious metal markets, which helped to improve margins.

Business performance, financial position, and financial performance

Total revenue rose from €21.6 billion to €31.5 billion, a year-on-year increase of 46.2 percent. Revenue excluding precious metals fell by 6.7 percent year on year to €2.1 billion. The decrease was 5.3 percent after adjusting for currency effects.

Asia remained the strongest region in terms of revenue excluding precious metals, accounting for 41.8 percent of the total. Revenue in this region fell by 7.3 percent year on year. A year-on-year decrease in revenue excluding precious metals was also reported in Europe (down by 4.1 percent).

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

The Group's earnings before interest and tax (EBIT) amounted to €302.4 million in 2020, a substantial €80.0 million increase on the prior-year figure of €222.4 million.

Despite the considerable increase in total revenue, Heraeus reported just a slight rise 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 rose to €1,695.9 million, which equated to a marginal increase of 0.6 percent on the prior year.

Consolidated income statement

€ million	2020	2019	Change
Revenue*	31,531.8	21,569.6	+9,962.2
Cost of materials* incl. changes in inventories	–29,835.9	–19,883.5	–9,952.4
Personnel expenses	–877.8	–901.8	+24.0
Amortization, depreciation, and impairment	–199.9	–184.7	–15.2
Other operating income	36.3	41.0	–4.7
Other operating expenses	–374.1	–434.7	+60.6
Impairment gains (+)/losses (–) on trade receivables	0.2	–3.4	3.6
Income from investments accounted for using the equity method	21.8	19.9	1.9
Earnings before interest and tax (EBIT)	**302.4**	**222.4**	**+80.0**
Net finance costs	–39.4	–64.7	25.3
Profit before taxes	**263.0**	**157.7**	**+105.3**
Income taxes	–72.3	–42.6	–29.7
Profit after taxes	**190.7**	**115.1**	**75.6**

* The comparative information for 2019 has been restated; see note (2)(b) of the notes to the consolidated financial statements.

Personnel expenses went down by €24.0 million to €877.8 million in 2020. This figure included severance payments amounting to €28.4 million, which was virtually unchanged compared with the previous year (2019: €27.7 million), and positive currency effects of €7.7 million (2019: negative currency effects of €12.5 million). Adjusted for non-recurring items related to acquisitions, restructuring, and currency, personnel expenses were around 2.5 percent lower than in the previous year. This was largely attributable to the decrease in normalized headcount of roughly 2.5 percent compared with 2019.

Amortization, depreciation, and impairment amounted to €199.9 million, an increase of €15.2 million compared with the previous year. This figure included impairment losses of €45.2 million (2019: €29.8 million). These mainly related to impaired licenses and equipment that could no longer be used as planned.

Other operating income declined by €4.7 million year on year to €36.3 million, mainly because of a fall of €6.3 million in income from the reversal of provisions. Impairment gains on trade receivables amounted to €0.2 million in 2020 because the risk provisioning was more or less unchanged (2019: impairment loss of €3.4 million).

Other operating expenses fell by €60.6 million to €374.1 million in the reporting year. The decrease was mainly attributable to lower expenses for external services (down by €33.4 million) and for travel and entertainment (down by €32.2 million). However, freight costs rose by €7.9 million.

The contribution from associates to earnings before interest and tax amounted to €21.8 million, a slight increase of €1.9 million compared with the prior year (2019: €19.9 million). The increase was largely attributable to higher contributions from the associates in India.

Net finance costs amounted to €39.4 million, a substantial improvement of €25.3 million compared with the previous year, primarily because of the reduction in interest expenses for precious metal leases. The main contributing factors were a fall in leasing interest costs for palladium and rhodium and a substantial decline in the use of precious metal leases for palladium and rhodium in 2020.

Profit before taxes came to €263.0 million, which was up by €105.3 million on the 2019 figure. The tax rate edged up from 27.0 percent in 2019 to 27.5 percent for the reporting year.

Consolidated balance sheet

€ million	Dec. 31, 2020	Dec. 31, 2019	Change
Non-current assets	1,950.8	1,883.2	+67.6
Current assets	3,814.5	3,613.7	+200.8
Total assets	**5,765.3**	**5,496.9**	**+268.4**
Shareholders' equity	3,280.2	3,293.2	–13.0
Non-current liabilities	959.5	896.9	+62.6
Current liabilities	1,525.6	1,306.8	+218.8
Total shareholders' equity and liabilities	5,765.3	5,496.9	+268.4

Profit after taxes amounted to €190.7 million in 2020 (2019: €115.1 million).

The Heraeus Group's financial position was further consolidated in 2020. 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 2020, the Heraeus Group's total assets amounted to €5,765.3 million, a year-on-year increase of €268.4 million. The Group's equity ratio, at 56.9 percent, was slightly below the previous year's level (2019: 59.9 percent).

Non-current assets rose by €67.6 million year on year to reach €1,950.8 million. The most significant changes in this regard were the increase of €29.1 million in goodwill resulting from acquisitions during the reporting year and the rise of €25.9 million in property, plant, and equipment due to investment in further expansion and modernization of the infrastructure and production capacities.

Current assets rose by a total of €200.8 million year on year to reach €3,814.5 million. This was mainly attributable to increases in precious metal inventories (up by €160.6 million), receivables from precious metal swaps (up by €58.7 million), and fair values of derivatives (up by €38.7 million). Some of these increases were offset by a fall of €95.7 million in VAT receivables.

Non-current liabilities went up by €62.6 million compared with the figure as of December 31, 2019 to reach €959.5 million. Pensions and similar obligations rose by €47.0 million year on year, primarily because of the decrease in the discount rates. Deferred tax liabilities increased by €13.4 million year on year. Non-current financial debt rose by just a negligible amount to €181.7 million (2019: €178.8 million).

Current liabilities went up by €218.8 million to €1,525.6 million. Liabilities in connection with precious metal transactions (up by €95.3 million), liabilities to suppliers (up by €39.9 million), current financial debt (up by €24.9 million), and fair values of derivatives (up by €28.7 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 2020. The Trading units also use precious metal leasing for short-term funding. At the end of 2020, the total market value of the precious metals on loan from third parties amounted to €1,628.0 million (2019: €2,479.0 million).

Net cash provided by operating activities in 2020 came to €344.9 million (2019: €378.0 million). The main contributing factor other than the increase in profit after taxes was the rise in net current assets. After adjusting for non-cash currency effects, inventories had risen year on year by €189.9 million, trade receivables by €60.3 million, and trade payables by €50.9 million as of December 31, 2020.

The net cash used for investing activities of €256.9 million mainly comprised payments for investments in non-current

Consolidated cash flow statement

€ million	2020	2019	Change
Net cash provided by operating activities	344.9	378.0	–33.1
Net cash used for investing activities	–256.9	–219.8	–37.1
Net cash used for financing activities	–107.8	–97.7	–10.1
Net change in cash and cash equivalents	–19.8	60.5	–80.3

assets (€197.2 million) and payments for acquisitions (€76.9 million). Interest received of €20.6 million was the main item of cash inflow.

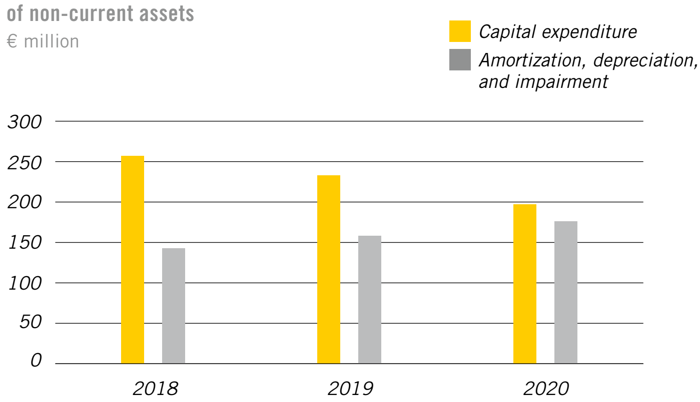
Net cash used for financing activities amounted to €107.8 million, primarily due to interest payments of €54.0 million and to dividend payments of €43.5 million.

Consequently, there was a decline in cash and cash equivalents of €19.8 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) amounted to a total of €853.6 million, just a small year-on-year decrease of €29.0 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 2020 was satisfactory. The financial position remains stable 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, amortization, and impairment of non-current assets
€ million



Capital expenditure and divestments

In 2020, cash additions to property, plant, and equipment and intangible assets totaled €197.2 million (2019: €233.2 million). In addition, there were purchase commitments of €115.0 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.

In the field of activity Health, Heraeus acquired all the shares in Contract Medical International GmbH, Germany, and all the shares in Pulse Systems, LLC, USA, in the reporting year. Contract Medical International GmbH specializes in the design, development, and integration of minimally invasive medical device systems, while Pulse Systems, LLC focuses on advanced technologies related to precision laser machining.

Field of activity Health

Global population growth and the aging demographic structure are driving increasing demand for cutting-edge 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, and a key supplier in the area of cardiology and minimally invasive surgery. Heraeus carries out research on solutions and develops products that contribute to medical progress.

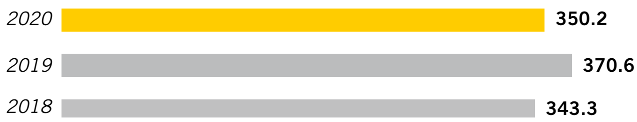
Business performance

The field of activity Health was also hit by the effects of the coronavirus pandemic in 2020. Compared with 2019, its revenue excluding precious metals fell by 5.5 percent to €350.2 million.

Following initial growth in the first quarter of 2020, the demand for **biomaterials** fell sharply in the second quarter, bouncing back again from the third quarter onward. Demand slumped as almost all elective surgery was suspended in Europe and the United States so that hospital capacity could be dedicated to COVID-19 patients. Despite the tough market conditions, it is encouraging that this field of activity still generated revenue growth because of the successful development of a new sales model in the US.

The demand for products in the **medical components and solutions** business also suffered from the lower number of hospital operations.

Revenue excluding precious metals
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 or replacement of joint prostheses. One of the outcomes of the research was the launch in 2020 of the COPAL® exchange G product, a preformed spacer containing antibiotics that supports the treatment of infected implants. This area of the business also made further progress in its development partnerships involving stem cell research.

In the **medical components and solutions** business, further advances were made in the research activities relating to diabetes sensors, neuromodulation leads and solutions, and minimally invasive delivery systems.

Field of activity Electronics

Digitalization and interconnectedness are proceeding apace around the globe, and electronic components are becoming smaller, longer lasting, and more efficient. Heraeus supports customers from the information technology, automotive, telecommunications, and consumer goods industries by offering a broad range of innovative joining and coating technology 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 and is used to make components for the production of ever smaller semiconductor chips.

Business performance

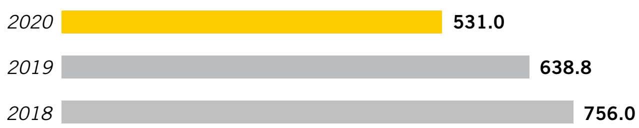
The field of activity Electronics can look back on a year in which it had to face a number of challenges amid difficult market conditions. Its revenue excluding precious metals fell by 16.9 percent to €531.0 million in 2020.

The **joining and coating technology** business contracted again in the reporting year due to lower demand in the automotive market. However, the business did benefit from a recovery in the semiconductor market and a substantial uplift in demand for products from the metal ceramics substrate portfolio.

Revenue went down in the **semiconductor applications** business in 2020 compared with the previous year. Although the semiconductor market remained stable over the year as a whole, the business was not able to make full use of this stability because of operational challenges in expanding production volume.

Demand for **optical fibers for telecommunication** continued to fall in 2020. This was particularly the case in China and Europe. While investment cycles for 4G and fiber-to-the-home networks came to an end in China, the coronavirus pandemic frustrated further expansion of fiber-to-the-home networks in Europe. Furthermore, demand suffered from an absence of stimulus caused by further delays to the development of the fiber network for 5G applications and the current focus on constructing the necessary related base stations. The persistently weak demand combined with significant ongoing downward pressure on prices resulting from market overcapacity led to a sharp drop in revenue growth in this business.

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



Research and development

A large number of product innovations were introduced in the **joining and coating technology** business in 2020 with the aim of successfully meeting greater customer requirements in terms of cost efficiency and performance. One such innovation worth mentioning is the launch of the AgCoat® Prime bonding wire for the semiconductor market. This product combines the cost efficiency of silver bonding wire with the performance properties of gold wire. 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.

In 2020, the research and development unit for **semiconductor applications** focused on enhancing the product portfolio and processing expertise so that the business could satisfy the further advances in semiconductor industry requirements in terms of material properties and purity. With this in mind, even greater efforts were devoted to development activities surrounding synthetic quartz glass and new functional materials in order to support the industry with the introduction of new generations of technology from the perspectives of quality and efficiency. In photonics, activities were focused on the development of alternative production processes and new optics products, specialty fibers, and lamp materials.

The **optical fibers for telecommunications** business forged ahead with its work on new and innovative products and the expansion of the technology portfolio for future generations of fibers.

Field of activity Industrials

Heraeus 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

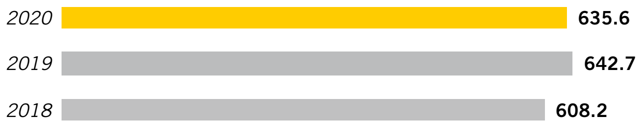
Revenue excluding precious metals in the field of activity Industrials declined by 1.1 percent to €635.6 million in the reporting year, primarily because of weak demand in the steel and automotive industries.

In the **steel business**, the weaker demand for steel in turn resulted in a fall in the demand for sensors and instruments that improve processes at steelworks.

In the **sensors** business, Heraeus managed to maintain the prior-year level of revenue and can therefore consider the performance of this business in 2020 to have been sound. Whereas the demand for high-temperature sensors used for diesel and petrol vehicles was adversely affected by the slump in global sales suffered by vehicle manufacturers, industrial demand for temperature sensors and heaters saw modest growth. In addition, the uptrend in demand for sensors used to monitor temperatures in electric motors and in charging equipment continued.

Heraeus once again generated double-digit revenue growth in the **electronic chemicals** business. There was notable growth in the demand for products involving conductive polymers for capacitors. This demand was boosted by further expansion in the basic 5G infrastructure (primarily servers for base stations) and ongoing digitalization. Heraeus also benefited from rising demand for organic chemicals for photoresists, driven by an increasing number of process steps and higher quality requirements in the semiconductor industry. The bulk of the growth was accounted for by leading customers in the US and South Korea.

Revenue excluding precious metals
Field of activity Industrials
€ million



Research and development

In the business involving measurement equipment for high-temperature processes, Heraeus continued to develop new products aimed at helping to enhance or improve the safety and efficiency of raw material transformation processes. In 2020, the **sensors** business successfully launched a new generation of automotive temperature sensors for applications up to 1,000°C, which are mainly used for measuring temperatures in exhaust gas systems. The business also presented its temperature sensors for applications in power electronics and stepped up its development of the next generation of soot particle sensors for automotive applications.

In the **electronic chemicals** business, Heraeus continued to make progress on key development projects in collaboration with its customers. Of particular note were the initiatives in the organic chemicals segment aimed at continuing the development of new high-purity materials for the next generation of semiconductors and the research into new highly conductive polymers for advanced automotive electronics applications.

The **start-ups** focused their research on four areas of activity: improving the performance of lithium-ion batteries, the processing of special alloys and the manufacture of amorphous metal alloys, the trading and processing of refractory and precious metals for 3D printing, and research and development relating to comprehensive solutions for electromagnetic interference (EMI) shielding.

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. 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, through processing, 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 grew slightly in 2020, increasing by 0.2 percent year on year to €534.7 million.

The business involving **silver conductive pastes** for solar cells in the photovoltaics industry saw a sharp revenue uplift in the reporting year. This was due both to market growth and to market share regained by Heraeus. The business benefited from a very rapid recovery in Chinese markets, as a result of which the silver conductive pastes business only felt a minor impact from the coronavirus pandemic.

The **specialty light sources** business faced huge challenges in the reporting year because of low demand from the plant and equipment industry. The primary reasons behind hesitant capital investment were the coronavirus pandemic and additional structural problems in the automotive and printing industries. Business performance did not therefore match that of the previous year, which had already been adversely impacted by the trade dispute between China and the United States and the political uncertainty caused by Brexit.

Heraeus is one of the leading suppliers of integrated **precious metal solutions** and increased its revenue from this business in 2020. Growth in the business was disproportionately strong on the back of hefty demand for precious metals, not least because of the appeal of such metals (particularly gold) as a safe-haven asset in the coronavirus pandemic. Proven compliance standards, long-standing customer relationships, transparency, and financial stability were key factors in the performance of this business. Heraeus' broad customer base also had a positive impact.

Revenue excluding precious metals
Field of activity Environmental
€ million

Research and development

In the reporting year, the **photovoltaics** business continued to carry out research into new technologies aimed at optimizing the efficiency of pastes and their components. It also continued to pursue ongoing research projects focusing on the development of new products that meet the requirements of new production technologies such as TOPCon and heterojunction technology (HJT).

In the **specialty light sources** business, the first versions of the DryStar product platform were delivered to customers. The business also presented its new Soluva® product range in mid-2020. The Soluva® family comprises innovative products aimed at disinfecting the air and surfaces using UV light and can be used for a range of applications, notably in the fight against coronavirus.

The **precious metal solutions** business continued to conduct research into new catalysis products for hydrogen-fueled transport and innovative active pharmaceutical ingredients based on precious metals and non-precious metals.

People at Heraeus

Number of employees worldwide

Overview: Number of employees

As of December 31, 2020, Heraeus had 13,911 employees worldwide (2019: 14,190 employees).

The decrease in the headcount arose predominantly because of the reduction in the number of jobs at the Bitterfeld site in Germany. In addition, the number of employees decreased at other sites in China and Germany. When restructuring the workforce, Heraeus attached great importance to explaining the changes transparently and minimizing the social impact. This also included the establishment of a German interim employment company to provide the employees concerned with training and qualifications and help them transition to a new job.

Increases in the number of employees were primarily related to a number of international acquisitions and the associated transfer of employees to Heraeus around the globe.

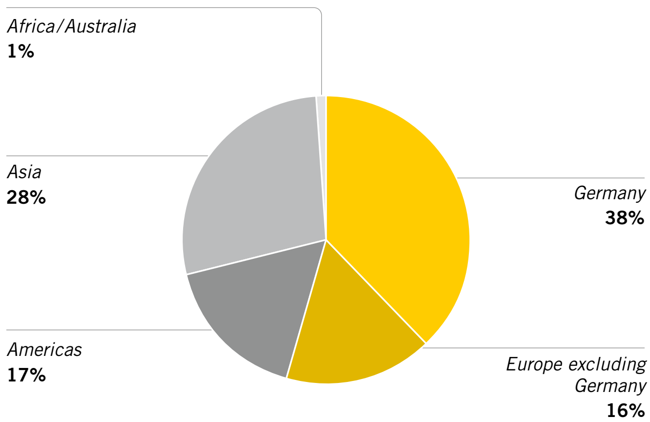
In order to ensure that the organizational structure is aligned with the portfolio strategy of the Group, some jobs were relocated from the head-office functions to the operational business units.

Responsibility: protection of employees from COVID-19

After the first cases of COVID-19, a previously unknown pulmonary disease, emerged at the end of 2019, Heraeus quickly set up global, regional, and business-specific crisis management teams.

Based on the directives and decisions issued by the relevant authorities and national governments, Heraeus drew up comprehensive hygiene protocols and determined individual measures to protect the various employee groups. Examples of such measures included the modification of production processes and the adjustment of manufacturing shift patterns. As far as office work was concerned, Heraeus benefited from the Group-wide agreement on mobile working signed in 2019, on the basis of which many employees could quickly be allowed flexibility regarding working hours

Employees by region in 2020



and place of work. It was thus possible to help employees maintain a work/life balance, especially during the closure of schools and childcare centers.

Comprehensive information campaigns within the workforce helped to raise the awareness of every individual that they should act responsibly during the period of the pandemic.

Even though individual business units experienced a drop in demand as a consequence of the coronavirus pandemic, the targeted use of short-time working enabled the Group to avoid extensive layoffs.

Digitalization drive: promoting new ways of working and communicating

The social distancing requirements introduced as a consequence of the coronavirus pandemic meant that many internal office-based events, such as training sessions, workshops, and working groups could not be held with the participants attending in person. This gave rise to new, virtual formats, which fostered the development of digital skills among Heraeus' employees.

From a communications perspective, this process was supported by posts in the 'Heraeus touch' employee app, which had been introduced throughout Heraeus worldwide in the previous year. Digital learning options were also provided in the global learning management system and virtual events were held. One example of the latter was Virtual Week, an event covering best practices and excellence in working methods at Heraeus.

Outlook

Heraeus predicts that its global sales markets will gradually recover over the course of 2021 following their slump in 2020 due to the coronavirus pandemic.

The latest figures published by the IMF forecast that the global economy will grow by 5.5 percent in 2021.

The recovery of the markets is likely to vary widely by region and will largely depend on the effectiveness of the measures taken to prevent the further spread of the pandemic and on the availability of vaccines. In particular, China is currently expected to see a significant rebound, reflected in projected growth of 8.1 percent. In addition, growth of 6.3 percent is anticipated for the emerging markets. A similarly strong recovery is predicted for the eurozone, resulting in a growth rate of 4.2 percent. In Germany, growth is likely to be 3.5 percent. In the US, the world's biggest economy, a significant recovery is also currently predicted with growth expected to be at 5.1 percent.

The current growth forecasts and recovery scenarios continue to be subject to considerable uncertainty. The primary reason for the persistent uncertainty is that there are any number of unknowns concerning the ongoing evolution of the coronavirus pandemic and its consequences. Most notably, the possibility cannot be ruled out that there could be further tightening of lockdowns or similar measures to stem the pandemic in 2021, which could result in the disruption of supply chains and potential shortages. To add to this, there is continuing uncertainty in Europe about the impact following the UK's withdrawal from the EU on December 31, 2020. Furthermore, the recovery could be put at risk if the trade disputes between China and the US were to flare up again.

For 2021, Heraeus anticipates that revenue excluding precious metals will increase, reaching the level of 2019 again. Importantly, it believes that the demand for biomaterials and medical equipment components and solutions will probably return to normal following the signs of recovery back in the second half of 2020. Heraeus also predicts that the semiconductor market and the joining and coating technology market will see significant growth in 2021, and that the field of activity Electronics will make a significant contribution to the Group's revenue growth. In 2021, Heraeus will also continue to invest in infrastructure and innovation in order to be able to exploit future sources of revenue growth.

Profit after taxes in 2021 is projected to decline moderately compared with 2020. This decrease will be mainly due to the anticipated return to normality in precious metal markets, which comprises a reduction in price volatility. In contrast, the excellence initiatives implemented in previous years will continue to have a positive impact.

Heraeus expects there to be significant revenue growth in the **field of activity Health**. The principal driver behind this growth is likely to be the widespread resumption of elective surgery and an associated rise in the demand for biomaterials. Revenue is also expected to grow significantly in the core segment of the medical components and solutions business.

Likewise, Heraeus projects that revenue will grow in the **field of activity Electronics** in 2021. Revenue from semiconductor applications will probably benefit from the sustained trend toward digitalization, some aspects of which have even been accelerated by the coronavirus pandemic. In the coming year, revenue growth in the joining and coating technology business is likely to be driven by the launch of numerous new products. Alongside the positive signals from the semiconductor market, it is anticipated that the business will also benefit from a recovery in demand from the automotive sector. In the telecommunications optical fibers business, demand is currently expected to recover slightly in 2021 leading to a rise in revenue, although this will probably still remain at a low level.

Business performance in the **field of activity Industrials** hinges largely on global steel production. The assumption here is that demand for steel will see a partial recovery in 2021, which will boost the revenue generated from sensors for steel production. The current growth trend in China is not expected to continue. However, the sensors business is projected to grow because of the increasingly stringent exhaust emission standards and the trend toward IoT applications.

Heraeus predicts that business performance in the **field of activity Environmental** will remain stable in 2021 with revenue at the level of 2020. Revenue in the precious metals business is likely to decrease moderately based on the assumption that price volatility and demand in precious metal markets will return to normal in the coming year. In the specialty light sources business, market conditions are expected to remain challenging. The business is therefore planning to make some adjustments to its product portfolio, keep a tight rein on costs, and launch new products in 2021. As a result, Heraeus only expects a moderate rise in revenue in this business. In the photovoltaics business, Heraeus predicts a further gain in market share and accompanying growth in revenue.

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 the categories.

Strategic opportunities and risks

The businesses in the Heraeus portfolio operate predominantly in international markets that are subject to rapid technological change. In these markets, Heraeus manages to stand out from its competitors and offer its customers added value based on its innovative capabilities. The company maintains close ongoing relationships with academics and researchers so that it will also be in a position to make the most of future strategic opportunities. The development of new start-ups in the incubator, together with intensive R&D activities within the fields of activity, create the foundations for growth over the medium to long term. Heraeus is also increasingly focusing on new forms of collaboration, such as partnerships and corporate venturing, complementing its organic activities.

Potentially incorrect assessments of future customer demand and resulting errors in the product and technology roadmap are a source of strategic risk for Heraeus. The primary risks in this regard are a failure to identify or correctly assess market trends or disruptive developments. The Group's Innovation Board, the Board of Managing Directors of Heraeus Holding, and the relevant bodies within the fields of activity observe the market on an ongoing basis and carry out a regular reconciliation of business performance from a strategic perspective in order to limit these risks.

Strategic risks for Heraeus are regarded as low.

Market opportunities and risks

At present, it is extremely difficult to predict future economic conditions. Even though markets are currently expected to recover in 2021, it is impossible to rule out the potential for further setbacks as a consequence of the evolution of the coronavirus pandemic going forward. 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. In this regard, Heraeus benefits from its global market presence, which helps it to mitigate the impact of individual, regionally contained crises. Economic risk constitutes a medium risk for the Group due the highly unpredictable consequences of the coronavirus pandemic and the ongoing geopolitical risks, both in the US and Europe. On the other hand, if economic conditions were to turn out better than expected, this would result in additional sales opportunities for Heraeus.

Heraeus counters threats to its market positions and competitive advantages through its broadly diversified product and customer structures, which help to limit its exposure to individual market risks. In addition, the constant refinement of Heraeus products helps to consolidate the Group's long-term market positioning and protect its competitive edge. Heraeus also minimizes any risks of this nature by building close relationships with customers, steadily adding new big-ticket accounts, and finding and validating additional suppliers for key products. Markets are monitored in detail in each of the fields of activity and alternative products are developed to counter the potential loss of market shares. Heraeus regards the risk to its market position and competitive advantages as low.

There are opportunities in the field of activity Electronics from a further rise in the demand for semiconductor products and potentially faster expansion of 5G. However, at the same time, the persistent excess capacity in the market for telecommunications optical fibers brings the risk of further downward pressure on prices.

In the field of activity Health, Heraeus believes there are opportunities for additional growth from entering new markets and from launching new products. On the other hand, there is growing pricing pressure in the business involving medical devices and medical components, together with tighter regulation resulting from the introduction of the Medical Device Regulation (MDR). In addition, the market is experiencing a trend toward consolidation and this could be accompanied by rising competitive pressure.

In the field of activity Environmental, further sales opportunities could arise from the newly launched Soluva® range of products (disinfection applications using UV radiation) because the general level of interest in infection prevention and disinfection solutions has grown markedly as a consequence of the coronavirus pandemic. At the same time, however, this field of activity is exposed to the risk of a potential further increase in pricing pressure related to LED components.

Financial opportunities and risks

As a Group 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 monitoring and control 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 a key task for Heraeus as a technology group with a broad product portfolio and a large number of sites. 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. By introducing shift systems across the board, Heraeus implemented measures at an early stage to limit the effects of potential COVID-19 cases among individual employees and safeguard the continuation of business processes.

Several risks result from the global procurement process. Fluctuations in the quality of deliveries can lead to substantial risks for Heraeus. Particularly in the medical devices market, the delivery of base materials and preliminary products, reliably and free of all defects, is very important. Delayed deliveries or disruptions to supply from a supplier could also lead to production bottlenecks or even production downtime. Heraeus mitigates this risk by constantly finding and validating alternative suppliers for key products. Contractual provisions committing suppliers to maintain certain quality and delivery standards and to keep back-up inventories 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.

In addition to the above, deficiencies in manufacturing processes and resulting defects in product quality represent a risk for Heraeus. Product quality defects could cause reputational damage, cost-intensive rework, product recalls, and, in the worst-case scenario, product liability cases. The most significant risks in this regard are product liability cases involving medical devices and product recalls at automotive suppliers. These risks are mitigated by quality controls and by making continual improvements to the quality management systems. In addition, all businesses are supported by excellence initiatives aimed at achieving the highest possible level of product quality.

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 are currently available in the form of further improvements in capacity utilization and an associated reduction of 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. Increasingly stricter environmental requirements mean there are occasional risks to the unrestricted continued operation of production facilities. Overall, the endangerment of employees and third parties, and potential breaches of environmental regulations, represent a low 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 use of a largely uniform enterprise resource planning (ERP) system also helps to lower risk by fully integrating and harmonizing relevant business processes. 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 that 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

Numerous risks are beyond the control of Heraeus. 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.

In this context, risks could arise from the continuation of the coronavirus pandemic. In particular, measures limited to local areas to contain the pandemic, such as lockdowns, could have a negative impact on production operations.

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 medium.

Precious metal trading opportunities and risks

Precious metal trading risks encompass only the risks that arise in connection with business processes involving the trading of 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 trading 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.

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 updated 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.

In 2020, compliance activities focused on improving the processes for reviewing consultants and sales agents, further expanding the compliance management system to encompass the prevention of money laundering, and introducing additional key effectiveness figures, which will allow conclusions to be drawn about the effective implementation of the regulations and processes that have been introduced. Activities also included preparations for the implementation of the requirements under the EU Conflict Minerals Regulation, which was due to come into force on January 1, 2021.

Particular challenges arose in connection with data protection from the implementation of the requirements arising from the Schrems II judgment by the Court of Justice of the European Union and from the need to ensure that, in connection with measures to contain the coronavirus, sensitive personal data was handled in accordance with data protection requirements. Work also continued on developing a strong data protection organization, primarily by means of training and close collaboration with the data protection coordinators appointed in Germany and other EU countries. In addition, data protection legislation emerging around the globe – for example, in Brazil, Turkey, Japan, and the US (California) – is presenting the organization with new challenges that require the existing processes to be adapted for application worldwide.

With regard to export controls and customs, progress was made with automation and work continued on the development of an efficient and well-trained compliance organization. Notable challenges included an assessment of the consequences and the necessary preparations for Brexit, and an assessment of the consequences of the trade dispute between the US and China for Heraeus.

The priorities for EHS in 2020 included the reorganization of Corporate EHS as a governance function and the segregation of Governance EHS from Site EHS for the German sites. The EHS Framework comprising global minimum standards, which was drawn up in collaboration with all the businesses, was rolled out to all the sites in the summer of 2020. The implementation of the standards also ensures that the requirements of ISO 14001 and ISO 45001 are carried out. A new global EHS software solution was introduced for key figures, accident reports, and risk assessments.

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 sites regularly share information on compliance matters.

The role of the Group Responsibility Committee, which includes the CEO, the Group General Counsel, the Head of the Responsibility Office, and the heads of key corporate functions, continued to be developed. Once a year, the heads of key corporate functions now inform all heads of units – taking due account of legal structures – about the latest developments relating to compliance.

The Group companies complete an annual compliance questionnaire on the introduction and implementation of compliance guidelines. The completed questionnaires are one of the components used to review the effectiveness of the compliance system.

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. Heraeus delivered a satisfactory financial performance in 2020. The total assets of the Heraeus Group increased to €5,765.3 million as of the end of the year. The Group's liquidity reserves reduced only slightly overall to €853.6 million. The financial position remains stable and is characterized by a high equity ratio (56.9 percent) and a robust funding structure as well as a strong cash balance for capital expenditure on infrastructure and production capacities.

Consolidated balance sheet

of Heraeus Holding GmbH, Hanau, for the year ended December 31, 2020

€ million	Note	Dec. 31, 2020	Dec. 31, 2019
Goodwill	(10)	146.1	117.0
Other intangible assets	(10)	154.9	153.1
Property, plant, and equipment	(11)	1,271.0	1,245.1
Investments accounted for using the equity method	(12)	171.4	156.3
Other financial assets	(13)	36.1	23.6
Deferred tax assets	(33)	169.2	185.7
Other assets	(14)	2.1	2.4
Non-current assets		**1,950.8**	**1,883.2**
Precious metals	(15)	1,028.4	867.8
Inventories – excluding precious metals	(15)	417.2	442.7
Trade receivables	(16)	833.5	802.3
Cash and cash equivalents	(17)	853.6	882.6
Other financial assets	(13)	320.4	223.3
Income tax assets		65.4	28.1
Other assets	(14)	296.0	366.9
Current assets		**3,814.5**	**3,613.7**
Assets		**5,765.3**	**5,496.9**

€ million	Note	Dec. 31, 2020	Dec. 31, 2019
Subscribed capital		210.0	210.0
Capital reserve		127.8	127.8
Retained earnings		2,907.3	2,822.1
Other reserves		19.0	112.4
Treasury shares		–8.2	–
Equity attributable to the shareholders of Heraeus Holding GmbH	**(18)**	**3,255.9**	**3,272.3**
Non-controlling interests	(19)	24.3	20.9
Shareholders' equity		**3,280.2**	**3,293.2**
Pensions and similar obligations	(21)	636.6	589.6
Provisions	(22)	54.9	52.7
Financial debt	(23)	181.7	178.8
Other financial liabilities	(24)	5.8	11.3
Deferred tax liabilities	(33)	75.6	62.2
Other liabilities	(25)	4.9	2.3
Non-current liabilities		**959.5**	**896.9**
Provisions	(22)	152.1	147.5
Financial debt	(23)	86.5	61.6
Trade payables	(26)	304.3	264.4
Other financial liabilities	(24)	481.9	509.0
Income tax liabilities		31.0	26.9
Other liabilities	(25)	469.8	297.4
Current liabilities		**1,525.6**	**1,306.8**
Shareholders' equity and liabilities		**5,765.3**	**5,496.9**

Consolidated income statement

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2020

€ million	Note	2020	2019*
Revenue	(27)	31,531.8	21,569.6
Changes in inventories		–6.3	–18.3
Cost of materials		–29,829.6	–19,865.2
Personnel expenses	(28)	–877.8	–901.8
Amortization, depreciation, and impairment	(29)	–199.9	–184.7
Other operating income	(30)	36.3	41.0
Other operating expenses	(31)	–374.1	–434.7
Impairment gains (+)/losses (–) on trade receivables	(16)	0.2	–3.4
Income from investments accounted for using the equity method	(12)	21.8	19.9
Earnings before interest and tax (EBIT)		**302.4**	**222.4**
Finance income	(32)	21.0	21.7
Finance costs	(32)	–60.4	–86.4
Net finance costs		**–39.4**	**–64.7**
Profit before taxes		**263.0**	**157.7**
Income taxes	(33)	–72.3	–42.6
Profit after taxes		**190.7**	**115.1**
thereof attributable to the shareholders of Heraeus Holding GmbH		*183.1*	*109.2*
thereof attributable to non-controlling interests	*(19)*	*7.6*	*5.9*

* Revenue and cost of materials restated as described in (2b)

Consolidated statement of comprehensive income

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2020

€ million	Note	2020 Amount before taxes	2020 Tax expense/income	2020 Amount after taxes	2019 Amount before taxes	2019 Tax expense/income	2019 Amount after taxes
Profit after taxes		**263.0**	**–72.3**	**190.7**	**157.7**	**–42.6**	**115.1**
Items that will not be reclassified to profit or loss							
Remeasurement of net liability arising from defined benefit pension plans	(21)	–49.5	–8.5	–58.0	–89.6	17.5	–72.1
Items that have been or can be reclassified to profit or loss							
Currency translation adjustment		–86.9	–	–86.9	28.5	–	28.5
Currency translation adjustment reclassified to profit or loss		–0.6	–	–0.6	–0.3	–	–0.3
Share of other comprehensive income of investments accounted for using the equity method		–7.2	–	–7.2	2.8	–	2.8
Effective portion of changes in fair value of cash flow hedges	(39a)	2.2	–0.7	1.5	1.2	–0.4	0.8
Cash flow hedges reclassified to profit or loss	(39a)	–1.2	0.4	–0.8	3.6	–1.1	2.5
Other comprehensive income		**–143.2**	**–8.8**	**–152.0**	**–53.8**	**16.0**	**–37.8**
Total comprehensive income		**119.8**	**–81.1**	**38.7**	**103.9**	**–26.6**	**77.3**
thereof attributable to the shareholders of Heraeus Holding GmbH				*31.7*			*71.2*
thereof attributable to non-controlling interests				*7.0*			*6.1*

Consolidated cash flow statement

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2020

€ million	Note	2020	2019
Profit after taxes		**190.7**	**115.1**
Amortization, depreciation, impairment, and reversal of impairment of non-current assets	(10) (11)	199.4	183.9
Net finance costs	(32)	39.4	64.7
Distributions received from associates and joint ventures		11.6	13.6
Change in inventories		–189.9	18.4
Change in trade receivables		–60.3	–98.8
Change in trade payables		50.9	–4.1
Change in provisions and in pensions and similar obligations		–18.9	–29.5
Change in other net assets		106.6	151.1
Other non-cash transactions and other non-operating expenses		19.1	–35.0
Gains on disposal of property, plant, and equipment		–3.7	–1.4
Net cash provided by operating activities	**(34)**	**344.9**	**378.0**
Proceeds from the disposal of non-current assets		8.8	9.7
Proceeds from the disposal of other business units		9.3	–
Payments for investments in non-current assets		–197.2	–233.2
Payments for acquisitions minus acquired liquid funds		–76.9	–10.5
Payments for the acquisition of other businesses		–14.1	–6.7
Payments for loans to associates		–7.4	–
Other cash payments		–	–0.9
Interest received		20.6	21.8
Net cash used for investing activities	**(35)**	**–256.9**	**–219.8**
Distributions, including distributions to non-controlling interests		–43.5	–6.6
Payments for repurchases of treasury shares	(18)	–8.2	–
Interest paid		–54.0	–72.0
Proceeds from the issuing of interest-bearing liabilities		27.9	25.3
Payments relating to the redemption of interest-bearing liabilities		–30.0	–44.4
Net cash used for financing activities	**(36)**	**–107.8**	**–97.7**
Net change in cash and cash equivalents		**–19.8**	**60.5**
Effect of exchange rate differences on cash and cash equivalents		–9.2	3.9
Cash and cash equivalents at the beginning of the period		882.6	818.2
Cash and cash equivalents at the end of the period	**(37)**	**853.6**	**882.6**

Consolidated statement of changes in shareholders' equity

of Heraeus Holding GmbH, Hanau, for the period January 1 to December 31, 2020

€ million	Note	Sub-scribed capital	Capital reserve	Retained earnings: Other retained earnings	Retained earnings: Remeasure-ment of defined benefit pension plans	Other reserves: Currency trans-lation	Other reserves: Cash flow hedges	Treasury shares	Equity attributable to the share-holders of Heraeus Holding GmbH	Non-controlling interests (19)	Shareholders' equity
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
Remeasurements of defined benefit pension plans	(21)	–	–	–	−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	(39a)	–	–	–	–	–	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**
Shareholders' equity as of Jan. 1, 2020		**210.0**	**127.8**	**3,053.3**	**−231.2**	**111.6**	**0.8**	**–**	**3,272.3**	**20.9**	**3,293.2**
Profit after taxes, 2020		–	–	183.1	–	–	–	–	183.1	7.6	190.7
Remeasurements of defined benefit pension plans	(21)	–	–	–	−58.0	–	–	–	−58.0	–	−58.0
Currency translation		–	–	–	–	−86.9	–	–	−86.9	−0.6	−87.5
Share of income from investments accounted for using the equity method		–	–	–	–	−7.2	–	–	−7.2	–	−7.2
Cash flow hedges	(39a)	–	–	–	–	–	0.7	–	0.7	–	0.7
Other comprehensive income for 2020		**–**	**–**	**–**	**−58.0**	**−94.1**	**0.7**	**–**	**−151.4**	**−0.6**	**−152.0**
Total comprehensive income for 2020		**–**	**–**	**183.1**	**−58.0**	**−94.1**	**0.7**	**–**	**31.7**	**7.0**	**38.7**
Distributions	(36)	–	–	−39.9	–	–	–	–	−39.9	−3.6	−43.5
Other changes	(18)	–	–	–	–	–	–	−8.2	−8.2	–	−8.2
Shareholders' equity as of Dec. 31, 2020		**210.0**	**127.8**	**3,196.5**	**−289.2**	**17.5**	**1.5**	**−8.2**	**3,255.9**	**24.3**	**3,280.2**

Notes to the consolidated financial statements

of Heraeus Holding GmbH, Hanau, for the year ended December 31, 2020

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 2020 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 consolidated balance sheet and in the consolidated income statement have been aggregated and are reported separately in the notes. The consolidated 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 10, 2021, the consolidated financial statements and group management report prepared for the year ended December 31, 2020 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

Amendments to standards that are of relevance to Heraeus and were applied for the first time in the reporting year are explained below. Various other amendments have been issued as well, but these are not expected to be of relevance to the consolidated financial statements of Heraeus.

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.

There was no significant impact on the consolidated financial statements of Heraeus.

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.

There was no significant impact on the consolidated financial statements of Heraeus.

(b) Changes in presentation
In 2020, specific transactions in precious metals with identical counterparties were classified as precious metal swaps in order to better reflect the substance of this type of transaction; the associated proceeds and costs are reported as a net figure. The prior-year revenue and cost of materials figures have also been stated as a net figure (€808.2 million) to ensure comparability.

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 IFRS 16 – 'COVID-19-related rent concessions':
IFRS 16 sets out rules for the presentation of changes to lease payments (for example rent concessions) in the lessee's accounts. The lessee generally has to review for each individual lease whether the rent concessions granted constitute a lease modification, and to perform any resulting remeasurements of lease liabilities.

The amendment to IFRS 16 provides the option to use a recognition exemption. However, this exemption is time-limited and tied to certain conditions. It allows the lessee to report COVID-19-related rent concessions as if no lease modification had occurred rather than requiring the application of the normal rules for lease modifications.

The amendments come into force for annual reporting periods commencing on or after June 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 IAS 37 – 'Onerous Contracts — Cost of Fulfilling a Contract':
The amendments affect the definition of the costs that a company should include when assessing whether a contract is onerous. Under this definition, the cost of fulfilling a contract comprises all costs that relate directly to the contract. This includes costs that would not be incurred if the contract had not been concluded (incremental costs) and other costs that are directly attributable to the contract.

The amendments come into force for reporting periods commencing on or after January 1, 2022, subject to incorporation into EU law. Early adoption is permitted but generally subject to endorsement for use in the EU.

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 inter-company 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 six foreign subsidiaries (2019: 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 consolidated 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.

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

		Closing rate		Average rate	
	€1 =	Dec. 31, 2020	Dec. 31, 2019	2020	2019
China	CNY	8.0225	7.8205	7.8747	7.7355
UK	GBP	0.8990	0.8508	0.8897	0.8778
Hong Kong	HKD	9.5142	8.7473	8.8587	8.7715
Japan	JPY	126.49	121.94	121.85	122.01
Canada	CAD	1.5633	1.4598	1.5300	1.4855
South Korea	KRW	1,336.00	1,296.28	1,345.58	1,305.32
Switzerland	CHF	1.0802	1.0854	1.0705	1.1124
USA	USD	1.2271	1.1234	1.1422	1.1195

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 of a cash-generating unit falls below its 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 brands 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 consolidated 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 measured 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 of interest. Lease liabilities are recognized under non-current or current financial debt depending on their residual term.

The recognition exemption is applied for leases where the underlying asset has a low value. 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 asset 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 within the Group 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 2020, 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 predicted 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 when hedges are taken out 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 consolidated income statement.

Cash and cash equivalents

Cash and cash equivalents are reported at amortized cost. 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 Group's 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.

Proceeds from services included in revenue are insignificant. 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 of intangible assets and property, plant, and equipment
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. Goodwill is excluded from the reversal of impairment losses.

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.

In 2020, the financial and business environment of Heraeus was influenced by the coronavirus pandemic. Estimates and assumptions of relevance to year-end reporting that were made as part of the preparation of the consolidated financial statements for the year ended December 31, 2020 are based on the knowledge and best information available at the time. Heraeus does not expect the current COVID-19-related conditions to persist in the long term. The likely impact of the coronavirus pandemic was estimated in particular for the purposes of determining impairment losses on trade receivables (‘expected credit loss model’) and testing goodwill for impairment. Based on the assumptions made in this context, the coronavirus pandemic is not expected to have any material impact on the financial position and financial performance of Heraeus.

Further details 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

	2020			2019		
	Total	In Germany	Outside Germany	Total	In Germany	Outside Germany
Balance as of Jan. 1	**112**	**29**	**83**	**111**	**28**	**83**
Additions	3	1	2	4	2	2
Disposals	–2	–	–2	–1	–	–1
Mergers	–2	–2	–	–2	–1	–1
Balance as of Dec. 31	**111**	**28**	**83**	**112**	**29**	**83**

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

Entities included in the consolidated financial statements using the equity method

	2020			2019		
	Total	In Germany	Outside Germany	Total	In Germany	Outside Germany
Balance as of Jan. 1	**7**	**–**	**7**	**7**	**–**	**7**
Additions	1	1	–	–	–	–
Balance as of Dec. 31	**8**	**1**	**7**	**7**	**–**	**7**

Business combinations

(a) Business combinations in 2020

The following acquisitions took place in the reporting year:

	Type of acquisition	Voting rights acquired (%)	Date of acquisition
Heraeus Medical Components			
Contract Medical International GmbH, Germany	Share deal	100.0	January 31, 2020
Pulse Systems, LLC, USA	Share deal	100.0	October 30, 2020

The total consideration transferred came to €82.4 million (of which €79.3 million in cash).

Contract Medical International GmbH extends Heraeus’ interventional device capabilities through its technology and competence in the design, development, and integration of minimally-invasive medical device systems.

The acquisition of the US company Pulse Systems, LLC enabled Heraeus to extend its capabilities by leveraging Pulse Systems' advanced technology, materials expertise, and competence in the precision laser processing business and in the processing, development, and manufacturing of Nitinol and tube-based technologies. Heraeus plans to capitalize on these strengths to offer customers even greater value for stents, laser-cut hypotubes, and flexible shaft technologies for catheters.

The following amounts were recognized for the assets and liabilities of the acquired companies as of the acquisition date:

€ million	
Non-current assets	**48.9**
Other intangible assets	36.0
Property, plant, and equipment	12.5
Other financial assets	0.4
Current assets	**16.3**
Inventories – excluding precious metals	4.1
Trade receivables	4.7
Cash and cash equivalents	7.0
Other assets	0.5
Assets acquired	**65.2**
Non-current liabilities	**8.7**
Financial debt	5.2
Deferred tax liabilities	3.4
Other liabilities	0.1
Current liabilities	**10.2**
Provisions	0.2
Financial debt	3.5
Trade payables	1.7
Other financial liabilities	1.2
Other liabilities	3.6
Liabilities acquired	**18.9**
Net assets acquired	**46.3**

After purchase price allocation, goodwill amounted to €36.1 million (of which €15.9 million is not tax-deductible). This figure mainly represents synergies arising from cost savings and the expansion of the product and service portfolio.

From the acquisition date, consolidated revenue for 2020 included revenue of €18.8 million generated by the acquired companies; the consolidated loss after taxes from these companies amounted to €3.1 million.

The hypothetical impact of the acquisition on revenue, assuming consolidation from the beginning of the year, would have been an increase of €30.8 million, and the impact on profit after taxes would have been a decrease of €3.2 million.

(b) Business combinations in 2019
Two immaterial acquisitions took place in 2019. The total purchase consideration amounted to €8.8 million, of which €2.3 million had not impacted on cash as of December 31, 2019.

Notes to the consolidated balance sheet

Intangible assets

a) Goodwill
Goodwill increased from €117.0 million as of December 31, 2019 to €146.1 million at the end of the financial year. The change arose from additions of €36.1 million in connection with acquisitions that were partially offset by valuation losses of €7.0 million resulting from lower exchange rates.

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

The coronavirus situation is constantly evolving and forecasts made in the 2020 financial year regarding the duration and scale of the pandemic's impact on cash flows are therefore subject to considerable uncertainty. Heraeus has made any underlying estimates and assumptions on the basis of the best information available at the time and a scenario which assumes that the economic impact of the current pandemic will not persist in the long term.

As in 2019, no impairment losses on goodwill were recognized in the reporting year.

Goodwill was allocated to the global business units as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019
Heraeus Medical Components	55.1	22.0
Heraeus Precious Metals	25.2	25.1
Heraeus Noblelight	28.2	30.2
Heraeus Electronics	13.2	13.7
Heraeus Electro-Nite	24.0	25.5
Heraeus Nexensos	0.4	0.5
Goodwill	**146.1**	**117.0**

b) Other intangible assets

€ million	Goodwill	Customer relationships, technologies, brands, licenses, and similar rights	Internally generated intangible assets	Total
Cost as of 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/Jan. 1, 2020	**124.6**	**524.8**	**4.0**	**653.4**
Currency translation	–7.3	–20.7	–	–28.0
Additions through business combinations	36.1	36.0	–	72.1
Additions	–	1.7	1.0	2.7
Disposals	–	–16.0	–	–16.0
Reclassifications	–	1.4	–	1.4
Cost as of Dec. 31, 2020	**153.4**	**527.2**	**5.0**	**685.6**
Accumulated amortization and impairment as of 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/Jan. 1, 2020	**7.6**	**372.9**	**2.8**	**383.3**
Currency translation	–0.3	–15.3	–	–15.6
Additions (amortization)	–	25.2	0.4	25.6
Additions (impairment)	–	6.1	–	6.1
Disposals	–	–14.8	–	–14.8
Accumulated amortization and impairment as of Dec. 31, 2020	**7.3**	**374.1**	**3.2**	**384.6**
Net carrying amounts as of Dec. 31, 2020	**146.1**	**153.1**	**1.8**	**301.0**
Net carrying amounts as of Dec. 31, 2019	**117.0**	**151.9**	**1.2**	**270.1**

Research and development costs amounting to €142.6 million (2019: €151.7 million) were recognized in the consolidated income statement.

The impairment losses of €6.1 million (2019: €7.5 million) relate to technologies and customer relationships (impairment losses in 2019 mostly related to licenses). As in 2019, the impairment losses were reported in the consolidated income statement under the item ‘Amortization, depreciation, and impairment’.

Property, plant, and equipment

€ million	Dec. 31, 2020	Dec. 31, 2019
Property, plant, and equipment excluding right-of-use assets	1,189.6	1,166.4
Right-of-use assets	81.4	78.7
Property, plant, and equipment	**1,271.0**	**1,245.1**

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, 2019	**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/Jan. 1, 2020	**761.0**	**1,080.6**	**634.6**	**206.5**	**2,682.7**
Currency translation	−13.4	−28.1	−7.0	−3.8	−52.3
Additions through business combinations	–	4.1	1.7	0.3	6.1
Additions	4.4	31.5	16.5	142.1	194.5
Disposals	−12.1	−35.2	−23.3	−2.7	−73.3
Reclassifications	8.8	57.9	33.5	−101.6	−1.4
Cost as of Dec. 31, 2020	**748.7**	**1,110.8**	**656.0**	**240.8**	**2,756.3**
Accumulated depreciation and impairment as of Jan. 1, 2019	**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	−0.0
Reversals of impairment losses	–	−0.1	−0.1	−0.6	−0.8
Accumulated depreciation and impairment as of Dec. 31, 2019/Jan. 1, 2020	**373.1**	**689.8**	**442.5**	**10.9**	**1,516.3**
Currency translation	−5.9	−17.6	−4.2	−0.1	−27.8
Additions (depreciation)	17.5	55.3	32.7	–	105.5
Additions (impairment)	–	8.4	6.0	24.7	39.1
Disposals	−10.8	−31.9	−21.3	−1.9	−65.9
Reclassifications	−7.4	4.4	9.1	−6.1	–
Reversals of impairment losses	–	−0.4	−0.1	–	−0.5
Accumulated depreciation and impairment as of Dec. 31, 2020	**366.5**	**708.0**	**464.7**	**27.5**	**1,566.7**
Net carrying amounts as of Dec. 31, 2020	**382.2**	**402.8**	**191.3**	**213.3**	**1,189.6**
Net carrying amounts as of Dec. 31, 2019	**387.9**	**390.8**	**192.1**	**195.6**	**1,166.4**

The impairment losses of €24.2 million recognized on property, plant, and equipment in 2020 mainly relate to the Bitterfeld site and its activities in the field of optical fibers for telecommunications technology. Delays in the expansion of the 5G infrastructure and growing competition mean that capacities in this area cannot be fully utilized. Further impairment losses relate to various areas of business primarily at sites in Germany. In the previous year, they were attributable to various businesses and sites around the world.

As in 2019, the impaired assets largely included facilities that were no longer found to be recoverable or that could no longer be used as originally intended. 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 2019, the impairment losses were reported in the consolidated 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, 2020	Dec. 31, 2019	2020	2019
Land, land rights and buildings, including buildings on land owned by others	67.5	61.8	–15.2	–15.7
Plant and machinery	1.4	2.4	–0.7	–0.5
Office furniture and equipment	12.5	14.5	–7.7	–9.4
Right-of-use assets	**81.4**	**78.7**	**–23.6**	**–25.6**

Additions to right-of-use assets amounted to €27.0 million in the reporting year (2019: €29.1 million), of which €6.4 million (2019: €0.1 million) was attributable to acquisitions.

Further details on leasing can be found in the following sections:
- Impairment on right-of-use assets: see (29)
- Income from subleases: see (30)
- Expenses for leases where the underlying asset has a low value: see (31)
- Interest paid on lease liabilities: see (32)
- Total cash outflow for leases: 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:

€ million	Shin-Etsu Quartz Products Co., Ltd.	Non-material equity-accounted entities: Joint ventures	Non-material equity-accounted entities: Associates	Total for equity-accounted entities
Amounts as of Dec. 31, 2020				
Carrying amount of investment	101.4	33.4	36.6	**171.4**
Proportionate gain	9.5	4.8	7.5	**21.8**
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**

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	Dec. 31, 2020	Dec. 31, 2019
Share in percent	**50.0**	**50.0**
Non-current assets	72.1	79.5
Current assets	201.1	198.2
thereof cash and cash equivalents	*85.0*	*79.7*
Non-current liabilities	14.4	14.8
thereof financial liabilities excluding trade payables and other liabilities	–	–
Current liabilities	56.0	54.9
thereof financial liabilities excluding trade payables and other liabilities	–	*2.4*
Net assets (100%)	202.8	208.0
Share of net assets	101.4	104.0
Carrying amount of investment in joint venture	**101.4**	**104.0**

€ million	2020	2019
Distributions received	8.4	10.3
Revenue	176.5	187.5
Profit after taxes/total comprehensive income	19.0	22.4
Group’s share in profit after taxes/total comprehensive income	**9.5**	**11.2**

Other financial assets

Other financial assets comprise the following items:

	Dec. 31, 2020			Dec. 31, 2019		
€ million	Current	Non-current	Total	Current	Non-current	Total
Receivables from precious metal swaps	239.7	–	239.7	181.0	–	181.0
Financial assets	–	25.1	25.1	–	16.6	16.6
Derivatives with positive fair value	54.7	5.1	59.8	16.0	–	16.0
Lease receivables	1.2	4.2	5.4	1.4	5.4	6.8
Margin accounts	14.1	–	14.1	9.0	–	9.0
Miscellaneous financial assets	10.7	1.7	12.4	15.9	1.6	17.5
Other financial assets	**320.4**	**36.1**	**356.5**	**223.3**	**23.6**	**246.9**

Margin accounts represent cash amounts that are being pledged as collateral for futures transactions. The pledges expire when the collateralized transactions are settled.

Other assets

Other assets are broken down as follows:

	Dec. 31, 2020			Dec. 31, 2019		
€ million	Current	Non-current	Total	Current	Non-current	Total
Advances paid	163.6	0.1	163.7	168.6	–	168.6
Other tax receivables	69.4	1.3	70.7	164.5	1.6	166.1
Contract assets	3.4	–	3.4	1.8	–	1.8
Miscellaneous non-financial assets	59.6	0.7	60.3	32.0	0.8	32.8
Other assets	**296.0**	**2.1**	**298.1**	**366.9**	**2.4**	**369.3**

Inventories

The table below gives a breakdown of inventories:

€ million	Dec. 31, 2020	Dec. 31, 2019
Materials and supplies	197.1	192.2
Work in progress, finished goods, and merchandise	287.1	297.6
Write-downs of inventories – excluding precious metals	–67.0	–47.1
Inventories – excluding precious metals	**417.2**	**442.7**
Precious metals	1,045.8	883.7
Write-downs of precious metals	–17.4	–15.9
Precious metals	**1,028.4**	**867.8**
Inventories	**1,445.6**	**1,310.5**

Impairment losses of €19.0 million (2019: €16.5 million) were recognized on inventories excluding precious metals in 2020. Reversals of write-downs on inventories excluding precious metals amounted to €3.6 million in 2020 (2019: €3.8 million). As in 2019, 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, 2020	Dec. 31, 2019
Gross trade receivables	664.2	660.5
Impairment losses	–32.4	–34.9
Net trade receivables	**631.8**	**625.6**
Assets arising from bills of exchange	201.7	176.7
Trade receivables	**833.5**	**802.3**

Default risk is taken into account by the recognition of appropriate impairment losses. Risk-specific default rates are determined on the basis of historical default data. This process takes account of forward-looking macroeconomic indicators and duly considers the economic impact of the coronavirus crisis. The default rates determined in this way were not materially higher than in 2019.

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	2020	2019
Impairment losses as of Jan. 1	**–34.9**	**–32.4**
Currency translation	0.7	–0.2
Additions	–4.8	–6.8
Utilization	1.6	1.1
Reversals	5.0	3.4
Impairment losses as of Dec. 31	**–32.4**	**–34.9**

The net impairment gain of €0.2 million that was recognized in the consolidated income statement (2019: net loss of €3.4 million) represents the net balance of write-downs and reversals.

The following table presents the provision matrix for 2020:

	Term to maturity as of December 31, 2020					
€ million	Not due	less than 30 days	between 30 and 90 days	between 91 and 180 days	more than 180 days	Total
Gross trade receivables	534.8	69.1	25.6	6.1	28.6	664.2
Weighted average default rate	0.2%	1.0%	5.5%	54.1%	91.3%	
Impairment losses	–0.9	–0.7	–1.4	–3.3	–26.1	–32.4
Net receivables	**533.9**	**68.4**	**24.2**	**2.8**	**2.5**	**631.8**

The provision matrix for the previous year can be presented as follows:

€ million	Term to maturity as of December 31, 2019 Not due	less than 30 days	between 30 and 90 days	between 91 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 receivables	**474.9**	**119.6**	**22.3**	**4.5**	**4.3**	**625.6**

Cash and cash equivalents

Cash and cash equivalents comprise the following items:

€ million	Dec. 31, 2020	Dec. 31, 2019
Credit balances with banks, cash on hand, and other cash	704.1	849.3
Short-term money market funds	149.5	33.3
Cash and cash equivalents	**853.6**	**882.6**

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 consolidated income statement when the corresponding gains and losses from the hedged item are recognized through profit or loss.

Treasury shares worth €8.2 million were purchased in the reporting year and deducted from the shareholders' equity.

The Board of Managing Directors of Heraeus Holding GmbH proposed a dividend distribution of €40.9 million (2019: €44.1 million) for the 2020 financial year.

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 2020 were €7.6 million (2019: €5.9 million). As in 2019, no losses were attributable to non-controlling interests.

Capital management disclosures

The objective of capital management is to ensure financial flexibility in order to secure the continued existence of the company as a going concern over the long term, further develop the business portfolio, and enable the company to seize strategic opportunities. The target capital structure is defined by the competent decision-making bodies, taking due consideration of selected key financials such as the debt level and the equity ratio.

As of the balance sheet date, the capital structure was as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019	Change (%)
Shareholders' equity	**3,280.2**	**3,293.2**	**–0.4**
Percentage of total shareholders' equity and liabilities	92.4	93.2	
Current financial debt	86.5	61.6	
Non-current financial debt	181.7	178.8	
Financial debt	**268.2**	**240.4**	**11.6**
Percentage of total shareholders' equity and liabilities	7.6	6.8	
Total shareholders' equity and liabilities (shareholders' equity plus financial debt)	**3,548.4**	**3,533.6**	**0.4**

Access to a broad range of financial instruments is deemed a crucial aspect of financial flexibility. In this context, Heraeus uses the capital markets for both public placements to institutional investors and private placements. In addition, it also makes use of the bank market via a broadly diversified group of major international banks.

The funding strategy is reflected in the credit ratings awarded by the rating agencies Moody's and Standard & Poor's.

The following table provides an overview of the corporate ratings of Heraeus:

	Dec. 31, 2020		Dec. 31, 2019	
	Moody's Investors Service	**Standard & Poor's**	**Moody's Investors Service**	**Standard & Poor's**
Non-current financial debt	Baa1	BBB+	Baa1	BBB+
Current financial debt	–	A-2	–	A-2
Outlook	**negative**	**stable**	**stable**	**stable**

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.

(%)	Dec. 31, 2020 In Germany	Dec. 31, 2020 Outside Germany	Dec. 31, 2019 In Germany	Dec. 31, 2019 Outside Germany
Discount rate	1.00	0.61	1.30	1.00
Income growth (annual)	3.00	1.82	3.00	1.91
Pension adjustment (annual)	1.0 – 1.5	0.0 – 2.8	1.0 – 1.5	0.0 – 2.8
Future increase in healthcare costs	–	4.0 – 6.3	–	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 consolidated balance sheet is a net liability that can be broken down as follows:

€ million	Dec. 31, 2020	Dec. 31, 2019
Pensions and similar obligations of companies in Germany	565.2	522.3
Pensions and similar obligations of companies outside Germany	71.4	67.3
Pensions and similar obligations	**636.6**	**589.6**

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, 2020 In Germany	Dec. 31, 2020 Outside Germany	Dec. 31, 2020 Total	Dec. 31, 2019 In Germany	Dec. 31, 2019 Outside Germany	Dec. 31, 2019 Total
Present value of funded defined benefit obligation	367.1	152.1	519.2	321.3	141.6	462.9
Present value of unfunded defined benefit obligation	357.2	39.7	396.9	346.1	39.6	385.7
Present value of the defined benefit obligation	**724.3**	**191.8**	**916.1**	**667.4**	**181.2**	**848.6**
Fair value of plan assets	−159.1	−120.4	−279.5	−145.1	−113.9	−259.0
Net liability	**565.2**	**71.4**	**636.6**	**522.3**	**67.3**	**589.6**

The present value of the defined benefit obligation of Group companies changed in 2020 as follows:

€ million	2020 In Germany	2020 Outside Germany	2020 Total	2019 In Germany	2019 Outside Germany	2019 Total
Present value of the defined benefit obligation as of Jan. 1	**667.4**	**181.2**	**848.6**	**568.2**	**154.9**	**723.1**
Currency translation	–	−2.9	−2.9	–	3.8	3.8
Additions through business combinations	–	–	–	–	0.1	0.1
Current service cost	10.5	7.4	17.9	8.8	5.9	14.7
Actuarial gains (–)/losses (+)	47.9	8.4	56.3	88.5	18.4	106.9
Interest expense	8.6	1.7	10.3	11.2	2.8	14.0
Employee contributions	6.0	1.8	7.8	6.3	1.8	8.1
Pension payments	−16.1	−5.8	−21.9	−15.6	−6.8	−22.4
Other changes	–	–	–	–	0.3	0.3
Present value of the defined benefit obligation as of Dec. 31	**724.3**	**191.8**	**916.1**	**667.4**	**181.2**	**848.6**

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, 2020	Dec. 31, 2019
Discount rate		
+ 0.5 percentage points	–72.2	–64.9
– 0.5 percentage points	84.8	76.2
Annual income growth		
+ 0.5 percentage points	2.5	2.6
– 0.5 percentage points	–2.5	–2.5
Annual pension adjustment		
+ 0.5 percentage points	33.4	31.2
– 0.5 percentage points	–30.2	–28.4

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 €47.9 million reported in Germany (2019: losses of €88.5 million) comprised losses of €44.7 million (2019: losses of €87.9 million) attributable to changes in financial assumptions and losses of €3.2 million (2019: losses of €0.6 million) resulting from experience adjustments.

The present value of the defined benefit obligation was distributed across the following individual groups of pension beneficiaries at companies in Germany:

- active members: €412.0 million (2019: €374.8 million)
- former employees with vested rights: €88.3 million (2019: €80.9 million)
- pensioners and surviving dependants: €224.0 million (2019: €211.7 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 consolidated balance sheet were vested.

The weighted average duration of obligations in Germany as of December 31, 2020 was 21.3 years (2019: 20.8 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 2021 (year 1): €15.8 million (2019: financial year 2020 – €15.3 million)
- financial years 2022–2025 (years 2 to 5): €70.4 million (2019: financial years 2021 to 2024 – €68.9 million)
- financial years 2026–2030 (years 6 to 10): €103.1 million (2019: financial years 2025 to 2029 – €102.0 million)

Outside Germany, pension entitlements are expected to result in pension payments of €9.0 million in 2021 (prior-year expectation for 2020: €10.0 million).

Changes in the fair value of the plan assets during 2020 for companies in and outside Germany are shown below:

€ million	2020			2019		
	In Germany	Outside Germany	Total	In Germany	Outside Germany	Total
Fair value of plan assets as of Jan. 1	**145.1**	**113.9**	**259.0**	**123.1**	**100.5**	**223.6**
Currency translation	–	−2.1	−2.1	–	3.2	3.2
Interest income	1.9	1.1	3.0	2.5	1.8	4.3
Return on (+)/expenses (–) from plan assets excl. interest income	4.1	2.7	6.8	12.0	5.3	17.3
Employer contributions	4.1	6.9	11.0	9.4	6.9	16.3
Employee contributions	6.0	1.7	7.7	–	1.8	1.8
Pension payments	−2.1	−3.8	−5.9	−2.7	−5.7	−8.4
Other changes	–	–	–	0.8	0.1	0.9
Fair value of plan assets as of Dec. 31	**159.1**	**120.4**	**279.5**	**145.1**	**113.9**	**259.0**

Heraeus anticipates that employer contributions to plan assets for companies in Germany will be approximately €4.7 million in 2021 (2020: €10.3 million) and approximately €6.0 million (2020: €6.4 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, 2020			Dec. 31, 2019		
	In Germany	Outside Germany	Total	In Germany	Outside Germany	Total
Debt instruments	108.6	26.4	135.0	98.6	20.4	119.0
Equity instruments	50.4	27.9	78.3	46.4	25.9	72.3
Money-market-linked instruments and credit balances with banks	0.1	5.5	5.6	0.1	6.1	6.2
Real estate	–	7.9	7.9	–	9.1	9.1
Receivables from insurance companies	–	32.3	32.3	–	31.4	31.4
Mixed funds	–	18.7	18.7	–	19.8	19.8
Other assets	–	1.7	1.7	–	1.2	1.2
Fair value of plan assets	**159.1**	**120.4**	**279.5**	**145.1**	**113.9**	**259.0**

Liquid funds intended to meet the defined benefit obligations of companies in Germany are held in several retail funds. These funds were initially 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 consolidated income statement and the gains and losses recognized in other comprehensive income:

		2020			2019		
€ million	Note	In Germany	Outside Germany	Total	In Germany	Outside Germany	Total
Current service cost		–10.5	–7.4	–17.9	–8.8	–5.9	–14.7
Interest expense of defined benefit obligation	(32)	–8.6	–1.7	–10.3	–11.2	–2.8	–14.0
Interest income on plan assets	(32)	1.9	1.1	3.0	2.5	1.8	4.3
Net pension expense – reported in the income statement		**–17.2**	**–8.0**	**–25.2**	**–17.5**	**–6.9**	**–24.4**
Actuarial gains/losses in the present value of the defined benefit obligation		–47.9	–8.4	–56.3	–88.5	–18.4	–106.9
Return on/expenses from plan assets excl. interest income		4.1	2.7	6.8	12.0	5.3	17.3
Gains/losses – recognized in other comprehensive income		**–43.8**	**–5.7**	**–49.5**	**–76.5**	**–13.1**	**–89.6**

The current service cost is reported in personnel expenses. The interest expense from unwinding the discount on the defined benefit obligation is offset against the interest income on plan assets and reported in net finance costs.

In addition to the defined benefit pension schemes, there are also defined contribution schemes. Expenses of €6.9 million (2019: €10.5 million) relating to these schemes were recognized in personnel expenses and they mainly concern companies outside Germany. Furthermore, employer contributions of €30.7 million (2019: €31.2 million) were paid into statutory pension insurance in Germany.

Provisions

Provisions consist of the following:

	Current provisions		Non-current provisions		Total	
€ million	Dec. 31, 2020	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2019
Provisions						
for personnel expenses	77.7	67.4	21.6	21.9	99.3	89.3
for restructuring	30.1	30.7	2.6	–	32.7	30.7
for outstanding costs for precious metal recycling	11.5	17.4	–	–	11.5	17.4
for warranties	8.0	4.2	0.6	0.8	8.6	5.0
for patent disputes and litigation	5.5	4.6	–	–	5.5	4.6
for dismantling and disposal costs	–	–	4.8	5.2	4.8	5.2
miscellaneous	19.3	23.2	25.3	24.8	44.6	48.0
Total	**152.1**	**147.5**	**54.9**	**52.7**	**207.0**	**200.2**

The current provisions for personnel expenses of €77.7 million (2019: €67.4 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 2019 or 2020 and primarily affect locations in Germany.

The non-current provisions for personnel expenses of €21.6 million (2019: €21.9 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 2020:

€ million	Jan. 1, 2020	Currency translation	Additions	Unwinding of discount	Utilization	Reversal	Dec. 31, 2020
Provisions							
for personnel expenses	89.3	–2.0	75.1	0.2	–55.2	–8.1	99.3
for restructuring	30.7	–0.2	15.1	–	–7.7	–5.2	32.7
for outstanding costs for precious metal recycling	17.4	–0.2	10.8	–	–16.5	–	11.5
for warranties	5.0	–	4.9	–	–1.3	–	8.6
for patent disputes and litigation	4.6	–	3.5	–	–2.6	–	5.5
for dismantling and disposal costs	5.2	–0.1	0.2	–	–0.5	–	4.8
miscellaneous	48.0	–0.4	10.8	–	–10.7	–3.1	44.6
Provisions	**200.2**	**–2.9**	**120.4**	**0.2**	**–94.5**	**–16.4**	**207.0**

Financial debt

Financial debt is broken down as follows:

	Dec. 31, 2020			Dec. 31, 2019		
€ million	Current	Non-current	Total	Current	Non-current	Total
Registered bonds	–	98.0	98.0	–	97.9	97.9
Lease liabilities	19.8	68.8	88.6	22.4	63.5	85.9
Liabilities to banks	66.7	14.9	81.6	39.2	17.4	56.6
Financial debt	**86.5**	**181.7**	**268.2**	**61.6**	**178.8**	**240.4**

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

	Dec. 31, 2020			Dec. 31, 2019		
€ million	Current	Non-current	Total	Current	Non-current	Total
Effective interest rate						
4.01% – fixed rate	–	48.8	48.8	–	48.7	48.7
3.91% – fixed rate	–	49.2	49.2	–	49.2	49.2
Registered bonds	**–**	**98.0**	**98.0**	**–**	**97.9**	**97.9**

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, 2020			Dec. 31, 2019		
€ million	Current	Non-current	Total	Current	Non-current	Total
Liabilities from precious metal swaps	414.7	–	414.7	470.6	–	470.6
Derivatives with negative fair value	40.1	0.1	40.2	11.4	0.6	12.0
Miscellaneous financial liabilities	27.1	5.7	32.8	27.0	10.7	37.7
Other financial liabilities	**481.9**	**5.8**	**487.7**	**509.0**	**11.3**	**520.3**

Other liabilities

Other liabilities comprise the following items:

	Dec. 31, 2020			Dec. 31, 2019		
€ million	Current	Non-current	Total	Current	Non-current	Total
Liabilities from precious metal trading contracts	264.7	–	264.7	113.5	–	113.5
Other tax liabilities	30.9	–	30.9	48.5	–	48.5
Liabilities for personnel expenses	35.7	3.7	39.4	41.6	1.2	42.8
Contract liabilities	47.7	–	47.7	21.2	–	21.2
Miscellaneous non-financial liabilities	90.8	1.2	92.0	72.6	1.1	73.7
Other liabilities	**469.8**	**4.9**	**474.7**	**297.4**	**2.3**	**299.7**

The following table shows changes in contract liabilities in 2020:

€ million	2020	2019
Contract liabilities as of Jan. 1	**21.2**	**13.4**
Currency translation	–1.3	–
Additions from acquisitions	0.4	–
Additions	45.5	22.4
Recognized as revenue	–18.1	–14.6
Contract liabilities as of Dec. 31	**47.7**	**21.2**

Trade payables

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

€ million	Dec. 31, 2020	Dec. 31, 2019
Trade payables	304.3	264.0
Notes payable	–	0.4
Trade payables	**304.3**	**264.4**

Notes to the consolidated income statement

Revenue

Revenue by field of activity was allocated as follows:

€ million	2020	2019*
Health	350.2	370.6
Environmental	534.7	533.8
Electronics	531.0	638.8
Industrials	635.6	642.7
Corporate	0.5	13.8
Revenue excluding precious metals	**2,052.0**	**2,199.7**
Precious metal revenue	**29,479.8**	**19,369.9**
Revenue	**31,531.8**	**21,569.6**

* Precious metal revenue restated, see (2b)

The breakdown of revenue by region was as follows:

€ million	2020	2019*
Germany	223.4	243.9
Europe excluding Germany	429.5	436.8
Americas	496.2	546.6
Asia	857.3	924.9
Other	45.6	47.5
Revenue excluding precious metals	**2,052.0**	**2,199.7**
Precious metal revenue	**29,479.8**	**19,369.9**
Revenue	**31,531.8**	**21,569.6**

* Precious metal revenue restated, see (2b)

Personnel expenses

Personnel expenses consist of the following:

€ million	2020	2019
Wages and salaries	–746.0	–765.3
Social security contributions and expenses for other benefits	–105.7	–110.2
Pension expenses	–26.1	–26.3
Personnel expenses	**–877.8**	**–901.8**

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

Field of activity	2020	2019
Health	2,162	1,778
Environmental	2,963	3,155
Electronics	4,354	3,288
Industrials	3,169	4,154
Corporate	1,475	1,753
Total	**14,123**	**14,128**

The remuneration for active members of the Board of Managing Directors for 2020 amounted to €5.3 million (2019: €3.0 million); of which €2.9 million (2019: €1.3 million) was performance related. The remuneration represented short-term employee benefits. In addition, post-employment benefits for the Board of Managing Directors amounted to €0.7 million in 2020 (2019: €0.5 million).

The remuneration for members of the Supervisory Board for 2020 amounted to €0.7 million (2019: €0.7 million). The total remuneration for the Shareholders' Committee was €0.1 million (2019: €0.1 million).

Former members of the Board of Managing Directors or their surviving dependants received remuneration of €1.3 million in 2020 (2019: €1.2 million). Obligations of €22.1 million (2019: €22.0 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	2020	2019
Amortization on intangible assets	(10)	–25.6	–27.9
Depreciation on property, plant, and equipment		–129.1	–127.0
thereof on property, plant, and equipment excluding right-of-use assets	*(11a)*	*–105.5*	*–101.4*
thereof on right-of-use assets	*(11b)*	*–23.6*	*–25.6*
Amortization/depreciation		**–154.7**	**–154.9**
Impairment on intangible assets	(10)	–6.1	–7.5
Impairment on property, plant, and equipment		–39.1	–22.3
thereof on property, plant, and equipment excluding right-of-use assets	*(11a)*	*–39.1*	*–21.3*
thereof on right-of-use assets	*(11b)*	*–*	*–1.0*
Impairment		**–45.2**	**–29.8**
Amortization, depreciation, and impairment		**–199.9**	**–184.7**

Other operating income

The main individual items in other operating income were income from the sale of non-current assets (€4.5 million; 2019: €2.1 million) and income from the reversal of provisions (€3.8 million; 2019: €10.1 million). Other operating income also included foreign currency gains of €0.9 million (2019: €2.7 million).

The 2019 figure furthermore included income from subleases in the amount of €1.5 million.

Other operating expenses

Other operating expenses largely comprised expenses arising from external services (€93.7 million; 2019: €127.1 million), maintenance and repairs (€61.4 million; 2019: €67.5 million), and freight out (€54.6 million; 2019: €46.7 million).

Expenses for leases where the underlying asset has a low value amounted to €1.6 million (2019: €0.9 million) in the reporting year (see (11b)).

Net finance costs

Net finance costs comprise the following income and expenses:

€ million	Note	2020	2019
Interest and similar income		20.7	21.7
Net change in the fair value of financial assets measured at fair value		0.3	–
Finance income		**21.0**	**21.7**
Interest expenses and similar charges		–48.8	–69.2
Losses on the measurement of derivatives and loans		–1.5	–4.6
Net interest expense for pensions and similar obligations	(21)	–7.3	–9.7
Interest expenses on lease liabilities	(11b)	–2.8	–2.9
Finance costs		**–60.4**	**–86.4**
Net finance costs		**–39.4**	**–64.7**

Income taxes

The breakdown of income taxes is as follows:

€ million	2020	2019
Current taxes in Germany	0.5	–12.3
Current taxes outside Germany	–54.8	–42.4
Current taxes	**–54.3**	**–54.7**
thereof from prior periods	*4.6*	*–8.2*
Deferred taxes	**–18.0**	**12.1**
Income taxes	**–72.3**	**–42.6**

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 (2019: 15.8 percent) and trade tax, which varied from 10.8 percent to 18.2 percent (2019: 11.2 percent to 18.2 percent) depending on the local assessment rate. Consequently, tax rates of 26.6 percent to 34.0 percent (2019: 27.0 percent to 34.0 percent) applied to German Group companies.

Tax rates outside Germany varied between 4.0 percent and 39.3 percent (2019: 6.0 percent and 39.3 percent).

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

€ million	2020	2019
Profit before taxes	**263.0**	**157.7**
Expected income tax expense (tax rate for Hanau site: 30.8 percent; 2019: 30.8 percent)	–81.0	–48.6
Variations:		
Difference between local tax rate and Group tax rate	22.4	15.3
Change in tax rate	1.7	–1.2
Impairment losses/reversals of impairment losses	–17.8	–9.1
Tax-exempt income	0.7	1.1
Non-deductible operating expenses for tax purposes	–4.5	–7.0
Income tax for previous years	5.0	5.6
Other	1.2	1.3
Reported tax expenses	**–72.3**	**–42.6**
Effective tax rate (%)	27.5	27.0

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, 2020	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2019	2020	2019
Intangible assets	50.8	73.4	18.5	20.9	–17.0	8.1
Property, plant, and equipment	4.4	5.6	71.1	71.0	–1.3	–8.3
Inventories	29.9	24.4	60.3	40.1	–14.7	–14.3
Other assets	10.3	28.0	31.8	19.0	–30.2	51.1
Pensions and similar obligations	114.2	118.0	14.1	14.4	4.9	3.7
Provisions	22.4	22.4	9.2	5.6	–3.6	–0.9
Liabilities	36.9	30.0	3.6	12.7	16.0	–22.4
Tax loss carryforwards	33.3	5.4	–	–	27.9	–4.9
Total before offsetting	**302.2**	**307.2**	**208.6**	**183.7**	**–18.0**	**12.1**
Offsetting	–133.0	–121.5	–133.0	–121.5	–	–
Total	**169.2**	**185.7**	**75.6**	**62.2**	**–18.0**	**12.1**

Tax loss carryforwards as of December 31, 2020 amounted to €456.0 million (2019: €321.8 million). Deferred tax assets were recognized for €216.8 million of the total tax loss carryforwards (2019: €32.4 million). Loss carryforwards of €46.8 million (2019: €36.9 million) are subject to a time limit, with utilization of €1.0 million restricted to the next three years (2019: €1.5 million). There is no statutory expiration date for loss carryforwards of €409.2 million (2019: €284.9 million). No deferred tax assets were recognized for tax loss carryforwards of €239.2 million (2019: €289.4 million) or for temporary differences arising on measurements for tax purposes in the amount of €206.1 million (2019: €64.4 million).

Based on the earnings forecasts for Group companies that incurred losses in 2020 or preceding years, deferred tax assets of €33.3 million (2019: €5.4 million) were recognized on loss carryforwards, and deferred tax assets of €40.2 million (2019: €48.1 million) were not recognized. Reversals of impairment losses were recognized in the amount of €80.5 million in the reporting year (2019: no reversals). The utilization of previously unrecognized losses reduced the tax expense by €1.7 million (2019: €1.3 million). After deduction of the deferred tax liabilities, a deferred tax asset of €42.7 million (2019: €11.6 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 2020 amounted to €87.3 million (2019: €54.3 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

Outflows of cash and cash equivalents in connection with acquisitions amounted to €76.9 million (2019: €10.5 million). This figure includes 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

In 2020, a dividend of €39.9 million was paid to the shareholders of Heraeus Holding GmbH (2019: no dividend paid); a dividend of €3.6 million (2019: €6.6 million) was paid to the non-controlling interests.

The table below shows the changes in financial liabilities in 2020 for which cash flows have in the past been included or will in the future be included in the consolidated cash flow statement under net cash used for financing activities:

€ million	Jan. 1, 2020	Cash changes	Non-cash changes			Dec. 31, 2020
			Acquisitions	Currency effects	Other changes	
Non-current financial debt	178.8	–2.5	5.2	–3.6	3.8	181.7
Current financial debt	61.6	0.4	4	–1.5	22.0	86.5
Total	**240.4**	**–2.1**	**9.2**	**–5.1**	**25.8**	**268.2**

In the reporting year, a total cash outflow of €27.0 million (2019: €28.0 million) was recognized in connection with leases (see (11b)).

The following table shows the corresponding changes in 2019:

€ million	Jan. 1, 2019	Cash changes	Non-cash changes		Dec. 31, 2019
			Currency effects	Other changes	
Non-current financial debt	179.9	–2.8	0.4	1.3	178.8
Current financial debt	49.9	–16.3	0.1	27.9	61.6
Total	**229.8**	**–19.1**	**0.5**	**29.2**	**240.4**

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

€ million	Dec. 31, 2020	Dec. 31, 2019
Cash change in liabilities from financing activities	**–2.1**	**–19.1**
Distributions, including distributions to non-controlling interests	–43.5	–6.6
Payments for repurchases of treasury shares	–8.2	–
Interest paid	–54.0	–72.0
Net cash used for financing activities	**–107.8**	**–97.7**

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 consolidated balance sheet, namely cash on hand, credit balances with banks, short-term money market funds, and other cash amounting to €853.6 million (2019: €882.6 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 2019, Heraeus was not exposed to any material cash-flow interest-rate risk arising from liabilities in 2020, 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$ 237.3 million or €193.4 million (2019: US$ 23.0 million or €20.5 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 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)), 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 of the Heraeus Group 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
2020	+5%	−10.2	−4.1
	−5%	9.2	3.7
2019	+5%	−1.3	−4.5
	−5%	1.2	4.1

Derivative financial instruments

a) Cash flow hedges

In 2020, 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 2021 that had already been contractually agreed. As of December 31, 2020, there were currency forwards in the amount of €77.9 million € (2019: €85.6 million) that had been entered into in order to hedge cash flows.

The transactions for hedging cash flows arising from anticipated future sales in 2021 have been classified as highly effective. As a result, an unrealized gain of €2.2 million (2019: €1.2 million), taking account of deferred tax liabilities of €0.7 million (2019: €0.4 million), was recognized in other comprehensive income.

The amounts left in other comprehensive income as of December 31, 2020 are expected to be settled in 2021 and then recognized in profit or loss. Gains in other comprehensive income in the amount of €0.8 million (2019: losses of €2.5 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, 2020			Dec. 31, 2019		
€ 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	59.8	–7.9	51.9	16.0	–1.9	14.1
Derivative liabilities	40.2	–7.9	32.3	12.0	–1.9	10.1

Classification and fair values of financial instruments

a) Categories

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

€ million	Note	Carrying amount Dec. 31, 2020	Measurement category and carrying amount pursuant to IFRS 9: Mandatorily at fair value through profit or loss	Fair value through other comprehensive income	Amortized cost	Fair value Dec. 31, 2020
Financial assets						
Cash and cash equivalents	(17)	853.6	–	–	853.6	n/a
Trade receivables	(16)	833.5	–	–	833.5	n/a
Other financial assets:						
Derivatives with positive fair value not used as hedges	(13)	57.6	57.6	–	–	57.6
Derivatives with positive fair value used as hedges	(13)	2.2	2.2	–	–	2.2
Loans	(13)	14.4	–	–	14.4	14.4
Other financial assets measured at fair value	(13)	10.6	10.2	0.4	–	10.6
Other financial assets	(13)	271.7	–	–	271.7	n/a
			70.0	**0.4**	**1,973.2**	
Financial liabilities						
Trade payables	(26)	304.3	–	–	304.3	n/a
Financial debt:						
Liabilities to banks	(23)	81.6	–	–	81.6	n/a
Registered bonds	(23)	98.0	–	–	98.0	134.6
Lease liabilities	(23)	88.6	–	–	88.6	n/a
Other financial liabilities:						
Derivatives with negative fair value not used as hedges	(24)	40.2	40.2	–	–	40.2
Other financial liabilities measured at fair value	(24)	7.5	7.5	–	–	7.5
Other financial liabilities	(24)	440.0	–	–	440.0	n/a
			47.7		**1,012.5**	

€ million	Note	Carrying amount Dec. 31, 2019	Measurement category and carrying amount pursuant to IFRS 9: Mandatorily at fair value through profit or loss	Measurement category and carrying amount pursuant to IFRS 9: Amortized cost	Fair value 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
Other financial assets measured at fair value	(13)	8.5	8.5	–	8.5
Other 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
Other financial liabilities measured at fair value	(24)	9.8	9.8	–	9.8
Other financial liabilities	(24)	498.5	–	498.5	n/a
			21.8	**1,003.3**	

Cash and cash equivalents, trade receivables, trade payables, liabilities to banks, and other 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, 2020		Dec. 31, 2019	
€ million	Assets	Liabilities	Assets	Liabilities
Mark-to-model values determined using parameters observed in the market (Level 2)	**59.8**	**–40.2**	**16.0**	**–12.0**
Other financial assets:	59.8	–	16.0	–
Derivatives with positive fair value not used as hedges	57.6	–	14.8	–
Derivatives with positive fair value used as hedges	2.2	–	1.2	–
Other financial liabilities:	–	–40.2	–	–12.0
Derivatives with negative fair value not used as hedges	–	–40.2	–	–12.0
Theoretical mark-to-model values (Level 3)	**10.6**	**–7.5**	**8.5**	**–9.8**
Other financial assets	10.6	–	8.5	–
Other financial liabilities	–	–7.5	–	–9.8

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 2020:

	2020		2019	
€ million	Assets	Liabilities	Assets	Liabilities
Balance as of Jan. 1	**8.5**	**–9.8**	**1.8**	**–10.4**
Gains/losses recognized in profit or loss	0.1	0.4	0.2	–1.4
Additions	2.0	–3.1	6.5	–1.7
Disposals/settlements	–	4.6	–	3.7
Exchange differences recognized in other comprehensive income	–	0.4	–	–
Balance as of Dec. 31	**10.6**	**–7.5**	**8.5**	**–9.8**

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. As in 2019, there were no transfers during the reporting year.

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

	Dec. 31, 2020		Dec. 31, 2019	
€ million	Assets	Liabilities	Assets	Liabilities
Mark-to-model values determined using parameters observed in the market (Level 2)	**14.4**	**–134.6**	**8.0**	**–129.1**
Loans	14.4	–	8.0	–
Registered bonds	–	–134.6	–	–129.1

Net gains and losses on financial instruments

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

€ million	2020	2019
Financial assets and financial liabilities mandatorily measured at fair value through profit and loss	14.7	–63.5
Financial assets measured at amortized cost	–20.7	19.2
Financial liabilities measured at amortized cost	–11.9	–9.5
Net gain/loss	**–17.9**	**–53.8**

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/expenses. In all other categories, net interest income/expenses and net gains/losses on currency translation, impairment, and disposal were taken into account.

In 2020, interest income of €2.3 million (2019: €3.9 million) was generated and interest expenses of €11.9 million (2019: €9.5 million) were incurred in connection with financial assets and liabilities that are not measured at fair value through profit or loss.

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, 2020:

	Cash flows			
€ million	2021	2022	2023 – 2025	from 2026
Non-derivative financial liabilities:				
Registered bonds	1.4	3.8	11.3	130.0
Liabilities to banks	69.7	3.0	8.6	0.7
Trade payables	305.6	–	–	–
Lease liabilities	22.5	17.3	31.9	31.3
Other financial liabilities	441.8	4.9	1.0	0.1
Derivative financial liabilities:				
Derivatives with negative fair value not used as hedges	40.1	0.1	–	–

The contractually agreed (undiscounted) interest and principal payments for the non-derivative financial liabilities and the derivative financial liabilities as of December 31, 2019 were as follows:

	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
Other 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	–

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

Contingent liabilities

There is a risk that a loss in the mid double-digit millions of euros could arise for the Group in connection with a legal dispute. As of the balance sheet date, the probability of this loss being incurred was deemed not sufficiently high to require the recognition of a provision. A decision in this respect is expected over the further course of 2021.

Other financial commitments

As of the balance sheet date, order commitments for capital expenditure on property, plant, and equipment payable in 2021 amounted to €115.0 million (2019: €63.9 million payable in 2020).

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 consolidated balance sheet.

As of the balance sheet date, the total market value of the precious metals on loan from third parties amounted to €1,628.0 million (2019: €2,479.0 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:

	Receivables		Liabilities		Revenue		Goods and services received	
€ million	Dec. 31, 2020	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2019	2020	2019	2020	2019
Associates	10.1	5.1	–	–	13.9	9.9	–	–
Joint ventures	5.2	5.1	0.7	0.6	30.9	38.5	12.5	4.4
Total	**15.3**	**10.2**	**0.7**	**0.6**	**44.8**	**48.4**	**12.5**	**4.4**

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

Receivables include loans to associates in an amount of €10.0 million (2019: €5.0 million) and loans to joint ventures in an amount of €2.4 million (2019: €0.0 million). These loans have a long term to maturity and are not collateralized.

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 2020 amounted to €1.6 million (2019: €1.5 million). The fee for other services was €0.4 million (2019: €0.1 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 2020:

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 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, 2020 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
Contract Medical International GmbH	Dresden	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 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 Italia S.p.A.	Cavenago Brianza	Italy	100.00
Argor-Heraeus SA	Mendrisio	Switzerland	100.00
Contract Medical International, spol. s.r.o.	Hradec Králové	Czech Republic	100.00
Dong Yang Ceramic Inc.	Pyeongtaek-si	South Korea	100.00
Heraeus (China) Investment Co., Ltd.	Shanghai	China	100.00
Heraeus (Thailand) Ltd.	Bangkok	Thailand	100.00
Heraeus Asia Pacific Holding Pte. Ltd.	Singapore	Singapore	100.00
Heraeus Conamic North America LLC	Milford, DE	USA	100.00
Heraeus Conamic UK Ltd.	Wallsend	UK	100.00
Heraeus CZ s.r.o.	Prague	Czech Republic	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 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 Termoteknik Sanayi ve Ticaret A.S.	Sincan, Ankara	Turkey	100.00
Heraeus Electro-Nite Ukraina LLC	Zaporozhye	Ukraine	100.00
Heraeus Epurio LLC	Dover, 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 Malaysia Sdn. Bhd.	Kuala Lumpur	Malaysia	100.00
Heraeus Materials S.A.	Yverdon-les-Bains	Switzerland	100.00

Name of company	Registered office	Country	Percentage of equity
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
Heraeus Medical AB	Stockholm	Sweden	100.00
Heraeus Medical Australia Pty. Ltd.	Macquarie Park, NSW	Australia	100.00
Heraeus Medical Components Caribe, Inc.	San Juan	Puerto Rico	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 LLC	Dover, DE	USA	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 (Shanghai) Co., Ltd.	Shanghai	China	100.00
Heraeus Metals Hong Kong Ltd.	Hong Kong	China	100.00
Heraeus Metals New York LLC	Dover, DE	USA	100.00
Heraeus Nederland B.V.	Amsterdam	Netherlands	100.00
Heraeus Noblelight (Shenyang) Ltd.	Shenyang	China	100.00
Heraeus Noblelight America LLC	Dover, DE	USA	100.00
Heraeus Noblelight Ltd.	Cambridge	UK	100.00
Heraeus Precious Metal Technology (China) Co., Ltd.	Nanjing	China	100.00
Heraeus Precious Metals North America Conshohocken LLC	Dover, DE	USA	100.00
Heraeus Precious Metals North America LLC	Dover, DE	USA	100.00
Heraeus Quartz North America LLC	Dover, DE	USA	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 Tokmak Kiymetli Madenler Sanayi A.S.	Kemalpasa, Izmir	Turkey	95.00
Heraeus TROT (Wuhan) Engineering and Technology Co., Ltd.	Wuhan	China	100.00
Heraeus Zhaoyuan Changshu Electronic Materials Co. Ltd.	Changshu	China	80.00
Heraeus Zhaoyuan Precious Metal Materials Co. Ltd.	Zhaoyuan	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
Pulse Systems, LLC	Wilmington, DE	USA	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

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	27.94
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			
In Germany			
perPETual Technologies GmbH	Hanau	Germany	33.75
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 10, 2021
The Board of Managing Directors of Heraeus Holding GmbH

Jan Rinnert
Chairman

Dr. André Kobelt

Dr. Frank Stietz

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 2020, and the consolidated income statement, consolidated statement of comprehensive income, consolidated statement of changes in equity and consolidated statement of cash flows for the fiscal year from 1 January to 31 December 2020, 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 2020. 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 2020 and of its financial performance for the fiscal year from 1 January to 31 December 2020, 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 information

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, we did not audit the content of the section "Compliance report" in the group management report, which is part of "Other information" and 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, 10 March 2021

Ernst & Young GmbH

Wirtschaftsprüfungsgesellschaft

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

Multi-year overview

€ million	2020	2019	2018	2017	2016
Financial performance (€ million)					
Revenue excluding precious metals	2,052	2,200	2,259	2,185	2,005
Total revenue*	31,532	21,570	20,295	21,844	21,516
Earnings before interest and tax (EBIT)	302	222	341	299	235
Profit after taxes	191	115	197	210	144
Financial position (€ million)					
Total assets	5,765	5,497	5,068	4,829	4,724
Shareholders' equity	3,280	3,293	3,223	3,010	2,996
Equity-to-assets ratio (%)	57	60	64	62	63
Cash flow (€ million)					
Net cash provided by operating activities	345	378	449	244	216
Cash payments for investments in non-current assets	197	233	257	196	162
Depreciation, amortization, and impairment of non-current assets	176	158	143	192	160
Employees					
Employees at year-end	13,911	14,190	13,858	13,073	12,369
In Germany	5,290	5,464	5,418	4,864	4,703
Outside Germany	8,621	8,726	8,440	8,209	7,666

* The comparative information for 2019 has been restated; see note (2)(b) of the notes to the consolidated financial statements.

Legal notice

Publisher
Heraeus Holding GmbH
Communications & Marketing
Heraeusstrasse 12–14
63450 Hanau, Germany

Concept and design
MPM Corporate Communication Solutions, Mainz

Printing
Schleunungdruck GmbH, Marktheidenfeld

This financial report contains the full consolidated financial statements and group management report of Heraeus Holding GmbH, Hanau, for 2020 as well as additional voluntary disclosures.

climate neutral print
www.klima-druck.de
ID-No. 21100246
bvdm.

FSC
www.fsc.org
MIX
Paper from responsible sources
FSC® C105039

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