Financial Results

Financial Results

Consolidated Financial Statements

QIAGEN N.V. AND SUBSIDIARIES CONSOLIDATED BALANCE SHEETS (in thousands)

		As of December 31,	
	Note	2019	2018
Assets			
Current assets:			
Cash and cash equivalents	(3)	$ 623,647	$ 1,159,079
Restricted cash	(3)	5,743	—
Short-term investments	(7)	129,586	234,606
Accounts receivable, net of allowance for doubtful accounts of $12,115 and $9,270 in 2019 and 2018, respectively	(3, 24)	385,117	351,612
Income taxes receivable		42,119	34,936
Inventories, net	(3)	170,704	162,912
Fair value of derivative instruments — current	(14)	107,868	102,754
Prepaid expenses and other current assets (of which $13,697 and $3,873 in 2019 and 2018 due from related parties, respectively)	(8)	105,464	109,161
Total current assets		1,570,248	2,155,060
Long-term assets:			
Property, plant and equipment, net of accumulated depreciation of $699,130 and $603,430 in 2019 and 2018, respectively	(9)	455,243	511,659
Goodwill	(11)	2,140,503	2,108,536
Intangible assets, net of accumulated amortization of $776,520 and $1,194,679 in 2019 and 2018, respectively	(11)	632,434	475,043
Deferred income tax assets	(17)	56,542	42,896
Fair value of derivative instruments — long-term	(14)	192,266	295,363
Other long-term assets (of which $16,830 and $24,300 in 2019 and 2018 due from related parties, respectively)	(10, 12, 24)	188,380	159,775
Total long-term assets		3,665,368	3,593,272
Total assets		$ 5,235,616	$ 5,748,332

The accompanying notes are an integral part of these consolidated financial statements.

QIAGEN N.V. AND SUBSIDIARIES CONSOLIDATED BALANCE SHEETS (in thousands, except par value)

	Note	As of December 31, 2019	2018
Liabilities and equity			
Current liabilities:			
Current portion of long-term debt	(16)	$ 285,244	$ 503,116
Accounts payable	(24)	84,767	69,415
Fair value of derivative instruments — current	(14)	103,175	106,594
Accrued and other current liabilities (of which $15,404 and $5,488 due to related parties in 2019 and 2018, respectively)	(10, 13, 22)	444,303	263,017
Income taxes payable		33,856	30,047
Total current liabilities		951,345	972,189
Long-term liabilities:			
Long-term debt, net of current portion	(16)	1,421,108	1,671,090
Deferred income tax liabilities	(16)	23,442	63,411
Fair value of derivative instruments — long-term	(14)	196,929	317,393
Other long-term liabilities	(12, 15)	106,201	89,279
Total long-term liabilities		1,747,680	2,141,173
Commitments and contingencies	(20)		
Equity:			
Preference shares, 0.01 EUR par value, authorized—450,000 shares, no shares issued and outstanding		—	—
Financing preference shares, 0.01 EUR par value, authorized—40,000 shares, no shares issued and outstanding		—	—
Common Shares, 0.01 EUR par value, authorized—410,000 shares, issued — 230,829 shares in 2019 and 2018, respectively		2,702	2,702
Additional paid-in capital		1,777,017	1,742,191
Retained earnings		1,178,457	1,379,624
Accumulated other comprehensive loss	(18)	(309,619)	(310,644)
Less treasury shares, at cost— 3,077 and 5,320 shares in 2019 and 2018, respectively	(18)	(111,966)	(178,903)
Total equity		2,536,591	2,634,970
Total liabilities and equity		$ 5,235,616	$ 5,748,332

The accompanying notes are an integral part of these consolidated financial statements.

QIAGEN N.V. AND SUBSIDIARIES CONSOLIDATED STATEMENTS OF (LOSS) INCOME
(in thousands, except per share data)

		Years ended December 31,		
	Note	2019	2018	2017
Net sales	(3, 4, 24)	$ 1,526,424	$ 1,501,848	$ 1,417,536
Cost of sales				
Cost of sales		449,651	444,165	422,226
Acquisition-related intangible amortization		71,511	56,723	72,749
Total cost of sales		521,162	500,888	494,975
Gross profit		1,005,262	1,000,960	922,561
Operating expenses:				
Research and development	(3)	157,448	161,852	154,084
Sales and marketing		391,906	392,281	375,562
General and administrative	(3)	112,262	104,568	102,080
Acquisition-related intangible amortization		29,973	39,032	39,398
Restructuring, acquisition, integration and other, net	(6)	199,778	28,659	98,018
Long-lived asset impairments	(6)	140,031	7,987	—
Total operating expenses		1,031,398	734,379	769,142
(Loss) income from operations		(26,136)	266,581	153,419
Other income (expense):				
Interest income		22,113	20,851	10,645
Interest expense		(74,185)	(67,293)	(49,685
Other income (expense), net	(6)	432	5,598	(4)
Total other expense, net		(51,640)	(40,844)	(39,044)
(Loss) income before income tax (benefit) expense		(77,776)	225,737	114,375
Income tax (benefit) expense	(3, 17)	(36,321)	35,357	73,981
Net (loss) income		(41,455)	190,380	40,394
Basic (loss) earnings per common share	(19)	$ (0.18)	$ 0.84	$ 0.18
Diluted (loss) earnings per common share	(19)	$ (0.18)	$ 0.82	$ 0.17
Weighted-average common shares outstanding				
Basic	(19)	226,777	226,640	228,074
Diluted	(19)	226,777	233,456	233,009

The accompanying notes are an integral part of these consolidated financial statements.

QIAGEN N.V. AND SUBSIDIARIES CONSOLIDATED STATEMENTS OF COMPREHENSIVE (LOSS) INCOME (in thousands)

		Years ended December 31,		
	Note	2019	2018	2017
Net (loss) income		$ (41,455)	$ 190,380	$ 40,394
Other comprehensive income (loss) to be reclassified to profit or loss in subsequent periods:				
Gains (losses) on cash flow hedges, before tax	(14)	17,052	25,207	(50,067)
Reclassification adjustments on cash flow hedges, before tax	(14)	(3,888)	(9,774)	26,136
Cash flow hedges, before tax		13,164	15,433	(23,931)
Losses on marketable securities, before tax		—	—	(854)
Gains on pensions, before tax		(796)	1,325	886
Foreign currency translation adjustments, before tax		(12,156)	(108,045)	135,945
Other comprehensive income (loss), before tax		212	(91,287)	112,046
Income tax relating to components of other comprehensive income (loss)		813	460	1,034
Total other comprehensive income (loss), after tax		1,025	(90,827)	113,080
Comprehensive (loss) income		$ (40,430)	$ 99,553	$ 153,474

The accompanying notes are an integral part of these consolidated financial statements.

QIAGEN N.V. AND SUBSIDIARIES CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY

(in thousands)	Note	Common Shares		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Treasury Shares		Total Equity
		Shares	Amount				Shares	Amount	
Balance at December 31, 2016		239,707	$ 2,812	$ 1,794,665	$ 1,263,464	$ (333,839)	(5,147)	$ (120,006)	$ 2,607,096
Capital repayment	(18)	(8,878)	(110)	(244,319)	—	—	191	—	(244,429)
Issuance of warrants		—	—	45,307	—	—	—	—	45,307
Net income		—	—	—	40,394	—	—	—	40,394
Unrealized gain, net on pension		—	—	—	—	620	—	—	620
Unrealized loss, net on hedging contracts	(14)	—	—	—	—	(42,489)	—	—	(42,489)
Realized loss, net on hedging contracts	(14)	—	—	—	—	19,602	—	—	19,602
Unrealized loss, net on marketable securities	(7)	—	—	—	—	(786)	—	—	(786)
Translation adjustment, net		—	—	—	—	136,133	—	—	136,133
Purchase of treasury shares	(18)	—	—	—	—	—	(1,909)	(60,970)	(60,970)
Issuance of common shares in connection with stock plan	(22)	—	—	—	(55,913)	—	2,593	61,989	6,076
Share-based compensation	(22)	—	—	34,442	—	—	—	—	34,442
Balance at December 31, 2017		230,829	$ 2,702	$ 1,630,095	$ 1,247,945	$ (220,759)	(4,272)	$ (118,987)	$ 2,540,996
ASU 2016-01 impact of change in accounting policy		—	—	—	(942)	942	—	—	—
ASU 2016-16 impact of change in accounting policy		—	—	—	(16,096)	—	—	—	(16,096)
ASC 606 impact of change in accounting policy		—	—	—	(1,306)	—	—	—	(1,306)
Issuance of warrants	(18)	—	—	71,983	—	—	—	—	71,983
Net income		—	—	—	190,380	—	—	—	190,380
Unrealized gain, net on pension		—	—	—	—	754	—	—	754
Unrealized gain, net on hedging contracts	(14)	—	—	—	—	22,365	—	—	22,365
Realized gain, net on hedging contracts	(14)	—	—	—	—	(7,331)	—	—	(7,331)
Translation adjustment, net		—	—	—	—	(106,615)	—	—	(106,615)
Purchase of treasury shares	(18)	—	—	—	—	—	(2,871)	(104,685)	(104,685)
Issuance of common shares in connection with stock plan	(22)	—	—	—	(40,357)	—	1,823	44,769	4,412
Share-based compensation	(22)	—	—	40,113	—	—	—	—	40,113

(in thousands)	Note	Common Shares		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Treasury Shares		Total Equity
		Shares	Amount				Shares	Amount	
Balance at December 31, 2018		230,829	$ 2,702	$ 1,742,191	$ 1,379,624	$ (310,644)	(5,320)	$ (178,903)	$ 2,634,970
ASC 842 impact of change in accounting policy		—	—	—	(316)	—	—	—	(316)
Net loss		—	—	—	(41,455)	—	—	—	(41,455)
Conversion of warrants	(18)	—	—	(31,067)	(37,698)	—	2,056	68,761	(4)
Unrealized loss, net on pension		—	—	—	—	(437)	—	—	(437)
Unrealized gain, net on hedging contracts	(14)	—	—	—	—	17,052	—	—	17,052
Realized gain, net on hedging contracts	(14)	—	—	—	—	(3,888)	—	—	(3,888)
Translation adjustment, net		—	—	—	—	(11,702)	—	—	(11,702)
Purchase of treasury shares	(18)	—	—	—	—	—	(1,987)	(74,450)	(74,450)
Issuance of common shares in connection with stock plan	(22)	—	—	—	(121,698)	—	3,622	123,773	2,075
Tax withholding related to vesting of stock awards	(22)	—	—	—	—	—	(1,448)	(51,147)	(51,147)
Share-based compensation	(22)	—	—	65,893	—	—	—	—	65,893
Balance at December 31, 2019		230,829	$ 2,702	$ 1,777,017	$ 1,178,457	$ (309,619)	(3,077)	$ (111,966)	$ 2,536,591

The accompanying notes are an integral part of these consolidated financial statements.

QIAGEN N.V. AND SUBSIDIARIES CONSOLIDATED STATEMENTS OF CASH FLOWS

		Years ended December 31,		
(in thousands)	Note	2019	2018	2017
Cash flows from operating activities:				
Net (loss) income		$ (41,455)	$ 190,380	$ 40,394
Adjustments to reconcile net (loss) income to net cash provided by operating activities, net of effects of.active businesses acquired:				
Depreciation and amortization		231,458	206,436	216,448
Non-cash impairments	(6)	144,830	17,020	5,137
Amortization of debt discount and issuance costs		40,763	35,537	24,773
Share-based compensation expense	(22)	65,893	40,113	34,442
Deferred income tax (benefit) expense	(17)	(55,362)	(23,272)	60,176
Loss (gain) on marketable securities		2,867	(2,725)	1,055
Reversals of contingent consideration	(15)	(10,433)	—	(3,269)
Other items, net including fair value changes in derivatives		(3,394)	(8,834)	(4,521)
Net changes in operating assets and liabilities:				
Accounts receivable	(4)	(39,578)	(41,813)	(34,165)
Inventories	(4)	(30,028)	(36,918)	(21,633)
Prepaid expenses and other current assets	(8)	18,626	(9,942)	(5,245)
Other long-term assets		(1,406)	(30,312)	(16,786)
Accounts payable		9,252	6,993	4,321
Accrued and other current liabilities	(13)	19,913	(13,317)	2,828
Income taxes	(17)	(6,782)	14,239	(41,266)
Other long-term liabilities		(14,321)	15,911	24,090
Net cash provided by operating activities		330,843	359,496	286,779
Cash flows from investing activities:				
Purchases of property, plant and equipment		(117,950)	(109,773)	(90,081)
Proceeds from sale of equipment		—	—	42
Purchases of intangible assets		(156,934)	(40,990)	(34,324)
Purchases of investments, net		(5,170)	(9,398)	(4,777)
Cash paid for acquisitions, net of cash acquired	(5)	(68,058)	(172,832)	(50,549)
Purchases of short-term investments	(7)	(293,959)	(568,002)	(450,564)
Proceeds from redemptions of short-term investments	(7)	396,098	691,765	189,006
Proceeds from divestiture	(5)	1,000	16,394	—
Cash received (paid) for collateral asset	(14)	22,685	(3,461)	(20,707)
Other investing activities		10	(15,059)	(2,310)

		Years ended December 31,		
(in thousands)	Note	2019	2018	2017
Net cash used in investing activities		(222,278)	(211,356)	(464,264)
Cash flows from financing activities:				
Proceeds from long-term debt, net of issuance costs	(16)	—	—	329,875
Proceeds from issuance of cash convertible notes, net of issuance costs	(16)	—	494,879	394,391
Purchase of call option related to cash convertible notes	(16)	—	(97,277)	(73,646)
Proceeds from issuance of warrants, net of issuance costs	(18)	—	72,406	45,396
Capital repayment	(18)	—	—	(243,945)
Proceeds from exercise of call option related to cash convertible notes	(16)	134,737	—	—
Payment of intrinsic value of cash convertible notes	(16)	(133,763)	—	—
Repayment of long-term debt	(16)	(506,400)	—	—
Principal payments on capital leases		—	(1,308)	(1,402)
Proceeds from issuance of common shares		2,075	4,412	6,075
Tax withholding related to vesting of stock awards		(49,998)	—	—
Purchase of treasury shares	(18)	(74,450)	(104,685)	(60,970)
Other financing activities		(11,281)	(8,019)	(8,587)
Net cash (used in) provided by financing activities		(639,080)	360,408	387,187
Effect of exchange rate changes on cash, cash equivalents and restricted cash		826	(7,183)	8,832
Net (decrease) increase in cash, cash equivalents and restricted cash		(529,689)	501,365	218,534
Cash and cash equivalents, beginning of period		1,159,079	657,714	439,180
Cash, cash equivalents and restricted cash, end of period		$ 629,390	$ 1,159,079	$ 657,714
Supplemental cash flow disclosures:				
Cash paid for interest		$ 29,721	$ 25,902	$ 20,252
Cash paid for income taxes		$ 41,474	$ 29,317	$ 40,499
Supplemental disclosure of non-cash investing activities:				
Equipment purchased through capital lease		$ —	$ —	$ 88

The accompanying notes are an integral part of these consolidated financial statements.

Notes to consolidated financial statements December 31, 2019

1. Corporate Information and Basis of Presentation

Corporate Information

QIAGEN N.V. is a public limited liability company ('naamloze vennootschap') under Dutch law with registered office at Hulsterweg 82, 5912 PL Venlo, The Netherlands. QIAGEN N.V., a Netherlands holding company, and subsidiaries (we, our or the Company) is the leading global provider of Sample to Insight solutions that are used by over 500,000 customers worldwide to transform biological samples into valuable molecular insights. Our sample technologies are used to isolate and process DNA, RNA and proteins - the building blocks of life - from blood, tissue and other materials. Assay technologies are used to make these biomolecules visible and ready for analysis. Bioinformatics software and knowledge bases are used to analyze and interpret complex genomic data to report relevant, actionable insights. Automation solutions are used to tie these technologies together in seamless and cost-effective workflows. We provide this portfolio to two major customer classes: Molecular Diagnostics (human healthcare) and Life Sciences comprised of Academia / Applied Testing (life sciences research, forensics and food safety) and Pharma. With approximately 5,100 employees in over 35 locations worldwide, we market our products in more than 130 countries.

Basis of Presentation

The accompanying consolidated financial statements were prepared in accordance with U.S. generally accepted accounting principles (GAAP) and all amounts are presented in U.S. dollars rounded to the nearest thousand, unless otherwise indicated. The consolidated financial statements have been prepared on a historical cost basis, except for derivative financial instruments, contingent consideration and available-for-sale financial instruments that have been measured at fair value.

We undertake acquisitions to complement our own internal product development activities. In 2019, we completed three immaterial acquisitions, including the January 2019 acquisition of N-of-One, Inc., a privately-held U.S. molecular decision support company and pioneer in clinical interpretation services for complex genomic data located in Concord, Massachusetts. On April 27, 2018, we acquired all shares in STAT-Dx Life, S.L. (STAT-Dx), a privately-held company located in Barcelona, Spain and on April 19, 2018, we acquired all remaining shares of a privately held entity in which we held a minority interest. On January 6, 2017, we acquired OmicSoft Corporation, located in Cary, North Carolina (U.S.). Accordingly, at their respective acquisition dates, all the assets acquired and liabilities assumed were recorded at their respective fair values and our consolidated results of operations include the operating results from the acquired companies from the acquisition dates.

Certain prior year amounts have been reclassified to conform to the current year presentation. Beginning in 2019 in the Consolidated Statements of (Loss) Income, the line item "Acquisition-related intangible amortization" in cost of sales is presented separately. Previously, these amounts were presented together in one line in cost of sales. Additionally beginning in 2019, "Restructuring, acquisition, integration and other, net" and "Long-lived asset impairments" within operating expenses are presented separately. Previously, these amounts were presented together with general and administrative expenses in one line as "General and administrative, restructuring, integration and other, net." These reclassifications had no effect on (loss) income from operations.

2. Effects of New Accounting Pronouncements

The following new Financial Accounting Standards Board (FASB) Accounting Standards Updates (ASU) were adopted in 2019, 2018 and 2017:

Adoption of New Accounting Standards in 2019

The FASB issued guidance codified in Accounting Standards Codification (ASC) Topic 842, *Leases (Topic 842)*, which supersedes the lease requirements in ASC Topic 840 and aims to increase transparency and comparability among organizations and requires disclosure of key information about leasing arrangements. The main principle of ASC 842 requires lessees to recognize the assets and liabilities that arise from nearly all leases on the consolidated balance sheet. Lessor accounting remains mainly consistent with the former guidance, with the majority of changes allowing for better alignment with the new lessee model and ASC Topic 606. We adopted these standards as per the effective date of January 1, 2019, using the modified retrospective approach and did not restate comparative periods. Under this approach, the cumulative effect of initially applying the standard was recognized as an adjustment to the opening balance of retained earnings on the date of initial application. As a lessee, the classification of our leases did not change, but we recognized a lease liability and corresponding right-of-use asset on our consolidated balance sheets for all our operating leases. We have elected the package of practical expedients which allows us to not reassess (1) whether existing contracts contain leases, (2) the lease classification for existing leases, and (3) whether existing initial direct costs meet the new definition. We also elected the hindsight practical expedient which permits entities to use hindsight in determining the lease term when transitioning to ASC 842. Our initial lease liabilities and right-of-use assets totaled $57.7 million and $57.4 million, respectively, as recorded in our consolidated balance sheet as of January 1, 2019, primarily relating to leased office space. The difference between the additional lease assets and lease liabilities was recorded as a $0.3 million adjustment to retained earnings. Further disclosure is found in Note 12 "Leases".

ASU 2017-12, *Derivatives and Hedging (Topic 815)*: Targeted Improvements to Accounting for Hedging Activities, makes more financial and nonfinancial hedging strategies eligible for hedge accounting. It also amends the presentation and disclosure requirements and changes how companies assess effectiveness. It is intended to more closely align hedge accounting with companies' risk management strategies, simplify the application of hedge accounting, and increase transparency as to the scope and results of hedging programs. The new guidance became effective for public entities beginning on January 1, 2019 by applying a modified retrospective approach to existing hedging relationships as of the adoption date. Under the modified retrospective approach, entities with cash flow or net investment hedges will make (1) a cumulative-effect adjustment to accumulated other comprehensive income so that the adjusted amount represents the cumulative change in the hedging instruments' fair value since hedge inception (less any amounts that should have been recognized in earnings under the new accounting model) and (2) a corresponding adjustment to opening retained earnings as of the most recent period presented on the date of adoption. We adopted ASU 2017-12 on January 1, 2019 without any cumulative effect.

ASU 2017-04, *Intangibles—Goodwill and Other (Topic 350)*: Simplifying the Test for Goodwill Impairment, removes Step 2 of the goodwill impairment test. A goodwill impairment will now be the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. ASU 2017-04 is effective for public entities for annual periods beginning January 1, 2020 and early adoption is permitted. The new guidance is required to be applied on a prospective basis. We adopted ASU 2017-04 on January 1, 2019 and applied the new guidance prospectively as required.

ASU 2018-13, *Fair Value Measurement (Topic 820)*: Disclosure Framework, provides guidance that eliminates, adds and modifies certain disclosure requirements for fair value measurements. ASU 2018-13 is effective for public entities for annual periods beginning January 1, 2020. Entities are permitted to early adopt either the entire standard or only the provisions that eliminate or modify the requirements. We adopted ASU 2018-13 on January 1, 2019 and applied the entire standard to disclosures as required beginning in 2019.

ASU 2018-15, *Intangibles–Goodwill and Other–Internal-Use Software (Subtopic 350-40)*: Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract, provides guidance on a customer's accounting for implementation, set-up, and other upfront costs incurred in a cloud computing arrangement that is hosted by the vendor, i.e. a service contract. Under the new guidance, customers will apply the same criteria for capitalizing implementation costs as they would for an arrangement that has a software license. ASU 2018-15 is effective for public entities for annual periods beginning January 1, 2020, and early adoption is permitted and should be applied either retrospectively or prospectively to all implementation costs incurred after the date of adoption. We adopted ASU 2018-15 on January 1, 2019 and applied the guidance to all implementation costs prospectively.

ASU 2018-17, *Consolidation (Topic 810)*: Targeted Improvements to Related Party Guidance for Variable Interest Entities, amends how a decision maker or service provider determines whether its fee is a variable interest entity (VIE) when a related party under common control also has an interest in the VIE. We adopted ASU 2018-17 on January 1, 2019, on a prospective basis.

Adoption of New Accounting Standards in 2018

ASU 2014-09, *Revenue from Contracts with Customers (Topic 606)* and additional related accounting standard updates to clarify and provide implementation guidance were adopted with a date of initial application of January 1, 2018. The comparative information for 2017 has not been adjusted and continues to be reported under ASC Topic 605 Revenue Recognition. As a result, we changed our accounting policy for revenue recognition as further discussed in the Notes below. We applied the Topic 606 using the "modified retrospective method" by recognizing the effect of initially applying Topic 606 as an $1.3 million decrease to the opening balance of retained earnings at January 1, 2018, for all contracts not completed at January 1, 2018.

ASU 2016-01, *Financial Instruments - Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities* as well as an additional clarifying accounting standard update became effective for our financial statements beginning in the first quarter of 2018. This ASU makes targeted improvements to existing U.S. GAAP for both the recognition and measurement of financial assets and financial liabilities. Changes in accounting to our equity investments as a result of this standard are further discussed in Notes below. As required, we adopted using a cumulative-effect adjustment to the balance sheet as of the beginning of 2018 and recorded an adjustment to decrease opening retained earnings at January 1, 2018 by $0.9 million as required for our equity investments recorded at fair value.

ASU 2016-05, *Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments and ASU 2016-18*, Statement of Cash Flows (Topic 320): Restricted Cash, addresses classification issues and presentation related to the statement of cash flows and was adopted on January 1, 2018 without any impact from the adoption.

ASU 2016-16, *Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory*, aims to improve the accounting for the income tax consequences of intra-entity transfers of assets other than inventory. This standard was adopted on a modified retrospective basis resulting in a decrease to opening retained earnings of $16.1 million at January 1, 2018.

ASU 2017-01, *Business Combinations (Topic 805): Clarifying the Definition of a Business*, clarifies and provides a more robust framework to use in determining when a set of assets and activities is a business. We adopted this update beginning January 1, 2018, without impact.

ASU 2017-09, *Compensation-Stock Compensation (Topic 718): Scope of Modification Accounting*, clarifies when to account for a change to the terms and conditions of a share-based payment award as a modification. This guidance is effective prospectively and was adopted as of January 1, 2018.

ASU 2018-02, *Income Statement - Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income*, permits reclassification of stranded tax effects of the U.S. Tax Cuts and Jobs Act (Tax Act). We adopted this standard as of April 1, 2018 with no impact as we had no stranded tax effects. This guidance only relates to the effects of the Tax Act. For all other tax law changes that have occurred or may occur in the future, we reclassify the tax effects to the consolidated statement of income (loss) on an item-by-item basis when the pre-tax item in accumulated other comprehensive income (loss) is reclassified to income.

ASU 2018-07, *Compensation-Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting*, aligns most of the accounting for share-based payment awards issued to employees and non-employees. We early adopted this standard as of July 1, 2018, without material impact.

Adoption of New Accounting Standards in 2017

ASU 2015-11, *Inventory (Topic 330): Simplifying the Measurement of Inventory*, requires in scope inventory to be measured at the lower of cost and net realizable value. We adopted this standard without material impact.

ASU 2016-07, *Investments - Equity Method and Joint Ventures (Topic 323): Simplifying the Transition to the Equity Method of Accounting*, eliminates the requirement to retroactively adopt the equity method of accounting when an investment qualifies for use of the equity method as a result of an increase in the level of ownership or degree of influence. We adopted this standard without impact.

ASU 2016-09, *Compensation - Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting*, simplifies several aspects of accounting for share-based payment transactions, including income tax consequences. We adopted this standard on January 1, 2017 on a prospective basis.

New Accounting Standards Not Yet Adopted

The following new FASB Accounting Standards Updates, which are not yet adopted as of December 31, 2019, have been grouped by their required effective dates:

First Quarter of 2020

ASU 2016-13, *Financial Instruments-Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*, provides financial statement users with more decision-useful information about the expected credit losses on financial instruments and other commitments to extend credit held by a reporting entity at each reporting date. To achieve this objective, the amendments in ASU 2016-13 replace the incurred loss impairment methodology in current GAAP with a methodology that reflects expected credit losses and requires consideration of a broader range of reasonable and supportable information to inform credit loss estimates. The measurement of expected credit losses under Topic 326 is applicable to financial assets measured at amortized cost, including loan receivables and held-to-maturity debt securities. It also applies to off-balance sheet credit exposures not accounted for as insurance (loan commitments, standby letters of credit, financial guarantees, and other similar instruments) and net investments in leases recognized by a lessor in accordance with Topic 842 on leases. In addition, Topic 326 made changes to the accounting for available-for-sale debt securities. One such change is to require credit losses to be presented as an allowance rather than as a write-down on available-for-sale debt securities management does not intend to sell or believes is more likely than not they will be required to sell.

Topic 326 is effective for us for annual periods beginning on January 1, 2020 and we will adopt using the modified retrospective approach. Under this approach, the cumulative effect of initially applying the standard is recognized as adjustment to the opening balance of retained earnings on the date of initial application. We currently expect a transition adjustment of approximately $14.0 million due primarily to expected credit losses on loans, notes and accounts receivable.

ASU 2018-18, *Collaborative Arrangements (Topic 808): Clarifying the Interaction between Topic 808 and Topic 606*, precludes an entity from presenting consideration from a transaction in a collaborative arrangement as revenue from contracts with customers if the counterparty is not a customer of that transaction. The guidance amends ASC 808 to refer to unit-of-account guidance in ASC 606 and requires it to be used only when assessing whether a transaction is in the scope of ASC 606. ASU 2018-18 is effective for us for annual periods beginning on January 1, 2020. Entities are required to apply the amendments retrospectively to the date they initially applied ASC 606. We adopted ASU 2018-18 on January 1, 2020 without any cumulative effect.

First Quarter of 2021

ASU 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*, removes certain exceptions for recognizing deferred taxes for investments, performing intraperiod tax allocations and calculating income taxes in interim periods. The ASU also adds guidance to reduce complexity in certain areas, including recognizing deferred taxes for tax goodwill and allocating income taxes to members of a consolidated group. ASU 2019-12 is effective for annual periods beginning on January 1, 2021, with earlier adoption permitted. We intend to adopt the ASU on the effective date of January 1, 2021 and are evaluating the potential impact ASU 2019-12 may have on our consolidated financial statements.

ASU 2020-01, *Investments-Equity Securities (Topic 321), Investments-Equity Method and Joint Ventures (Topic 323), and Derivatives and Hedging (Topic 815)-Clarifying the Interactions between Topic 321, Topic 323, and Topic 815*, addresses accounting for the transition into and out of the equity method and measuring certain purchased options and forward contracts to acquire investments. We intend to adopt the ASU on the effective date of January 1, 2021 and are evaluating the potential impact ASU 2020-01 may have on our consolidated financial statements.

3. Summary of Significant Accounting Policies

Principles of Consolidation

The consolidated financial statements include the accounts of QIAGEN N.V. and its wholly-owned subsidiaries. All significant intercompany accounts and transactions have been eliminated. Investments in either common stock or in-substance common stock of companies where we exercise significant influence over the operations but do not have control, and where we are not the primary beneficiary, are accounted for using the equity method. All other investments are accounted for as discussed under "Non-marketable Investments" below. When there is a portion of equity in an acquired subsidiary not attributable, directly or indirectly, to the Company, we record the fair value of the noncontrolling interests at the acquisition date and classify the amounts attributable to noncontrolling interests separately in equity in the consolidated financial statements. Any subsequent changes in the Company's ownership interest while the Company retains its controlling financial interest in its subsidiary are accounted for as equity transactions.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities and disclosure of contingencies at the date of the financial statements as well as the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Concentrations of Risk

We buy materials for products from many suppliers, and are not dependent on any one supplier or group of suppliers for the business as a whole. However, key components of certain products, including certain instrumentation components and chemicals, are available only from a single source. If supplies from these vendors were delayed or interrupted for any reason, we may not be able to obtain these materials timely or in sufficient quantities in order to produce certain products and sales levels could be negatively affected. Additionally, our customers include researchers at pharmaceutical and biotechnology companies, academic institutions, and government and private laboratories. Fluctuations in the research and development budgets of these researchers and their organizations for applications in which our products are used could have a significant effect on the demand for our products.

The financial instruments used in managing our foreign currency, equity and interest rate exposures have an element of risk in that the counterparties may be unable to meet the terms of the agreements. We attempt to minimize this risk by limiting the counterparties to a diverse group of highly-rated international financial institutions. The carrying values of our financial instruments incorporate the non-performance risk by using market pricing for credit risk. However, we have no reason to believe that any counterparties will default on their obligations. In order to minimize our exposure with any single counterparty, we have entered into master agreements which allow us to manage the exposure with the respective counterparty on a net basis.

Other financial instruments that potentially subject us to concentrations of credit risk are cash and cash equivalents, short-term investments, and accounts receivable. We attempt to minimize the risks related to cash and cash equivalents and short-term investments by dealing with highly-rated financial institutions and investing in a broad and diverse range of financial instruments. We have established guidelines related to credit quality and maturities of investments intended to maintain safety and liquidity. Concentration of credit risk with respect to accounts receivable is limited due to a large and diverse customer base, which is dispersed over different geographic areas. Allowances are maintained for potential credit losses and such losses have historically been within expected ranges.

Foreign Currency Translation

Our reporting currency is the U.S. dollar and the functional currencies of our subsidiaries are generally the local currency of the respective countries in which they are headquartered. All amounts in the financial statements of entities whose functional currency is not the U.S. dollar are translated into U.S. dollar equivalents at exchange rates as follows: (1) assets and liabilities at period-end rates, (2) income statement accounts at average exchange rates for the period, and (3) components of equity at historical rates. Translation gains or losses are recorded in equity, and transaction gains and losses are reflected in net income as a component of other expense, net. Realized gains or losses on the value of derivative contracts entered into to hedge the exchange rate exposure of receivables and payables are also included in net (loss) income as a component of other expense, net. The net loss on foreign currency transactions was \$5.7 million, \$12.3 million, and \$3.3 million in 2019, 2018 and 2017, respectively, and is included in other income (expense), net.

The exchange rates of key currencies were as follows:

(US$ equivalent for one)	Closing rate at December 31, 2019	2018	Annual average rate 2019	2018	2017
Euro (EUR)	1.1234	1.1450	1.1196	1.1813	1.1292
Pound Sterling (GBP)	1.3204	1.2800	1.2768	1.3356	1.2882
Swiss Franc (CHF)	1.0350	1.0161	1.0062	1.0228	1.0156
Australian Dollar (AUD)	0.7023	0.7059	0.6954	0.7478	0.7666
Canadian Dollar (CAD)	0.7696	0.7337	0.7535	0.7719	0.7710
Japanese Yen (JPY)	0.0092	0.0091	0.0092	0.0091	0.0089
Chinese Yuan (CNY)	0.1437	0.1454	0.1448	0.1514	0.1480

Segment Information

We determined that we operate as one operating segment in accordance with the Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) Topic 280, Segment Reporting. Our chief operating decision maker (CODM) makes decisions based on the Company as a whole. In addition, we have a common basis of organization and types of products and services which derive revenues and consistent product margins. Accordingly, we operate and make decisions as one reporting unit.

Revenue Recognition

Beginning January 1, 2018, we recognize revenues when control of promised goods or services transfers to our customers in an amount that reflects the consideration that is expected to be received in exchange for those goods or services. The majority of our sales revenue continues to be recognized when products are shipped to the customers at which point control transfers. Prior to January 1, 2018, payments for milestones, generally based on the achievement of substantive and at-risk performance criteria, were recognized in full at such time as the specified milestone had been achieved according to the terms of the agreement. See Note 4 "Revenue" for further discussion of accounting for milestone payments after adoption of ASC 606 *Revenue from Contracts with Customers*.

Warranty

We provide warranties on our products against defects in materials and workmanship for a period of 1 year. A provision for estimated future warranty costs is recorded in cost of sales at the time product revenue is recognized. Product warranty obligations are included in accrued and other current liabilities in the accompanying consolidated balance sheets.

Research and Development

Research and product development costs are expensed as incurred. Research and development expenses consist primarily of salaries and related expenses, facility costs, and amounts paid to contract research organizations and laboratories for the provision of services and materials as well as costs for internal use or clinical trials.

Government Grants

We recognize government grants when there is reasonable assurance that all conditions will be complied with and the grant will be received. Our government grants generally represent subsidies for specified activities and are therefore recognized when earned as a reduction of the expenses recorded for the activity that the grants are intended to compensate. Thus, when the grant relates to research and development expense, the grant is recognized over the same period that the related costs are incurred. Otherwise, amounts received under government grants are recorded as liabilities in the balance sheet. When the grant relates to an asset, the nominal amount of the grant is deducted from the carrying amount of the asset and recognized over the same period that the related asset is depreciated.

Borrowing Costs

Borrowing costs directly attributable to the acquisition, construction or production of an asset that takes a substantial period of time to get ready for its intended use or sale are capitalized as part of the cost of the respective assets (qualifying asset) when such borrowing costs are significant. All other borrowing costs are expensed in the period they occur.

Shipping and Handling Income and Costs

Shipping and handling costs charged to customers are recorded as revenue in the period that the related product sale revenue is recorded. Associated costs of shipping and handling are included in sales and marketing expenses. For the years ended December 31, 2019, 2018 and 2017, shipping and handling costs totaled $27.9 million, $28.4 million and $28.6 million, respectively.

Advertising Costs

The costs of advertising are expensed as incurred and are included as a component of sales and marketing expense. Advertising costs for the years ended December 31, 2019, 2018 and 2017 were $8.1 million, $8.1 million and $7.2 million, respectively.

General and Administrative

General and administrative expenses primarily represent the costs required to support administrative infrastructure. These costs include licensing costs in connection with continued investments information technology improvements, including cyber security, across the organization as well as personnel in administrative functions.

Restructuring, Acquisition, Integration and Other

We incur indirect acquisition and business integration costs in connection with business combinations. These costs represent incremental costs that we believe would not have been incurred absent the business combinations. Major components of these costs include consulting and related fees incurred to integrate or restructure the acquired operations, payroll and related costs for employees remaining with the Company on a transitional basis and public relations, advertising and media costs for re-branding of the combined organization.

Restructuring costs include personnel costs (principally termination benefits) as well as contract and other costs, primarily contract termination costs. Termination benefits are accounted for in accordance with FASB ASC Topic 712, *Compensation - Nonretirement Postemployment Benefits*, and are recorded when it is probable that employees will be entitled to benefits and the amounts can be reasonably estimated. Estimates of termination benefits are based on the frequency of past termination benefits, the similarity of benefits under the current plan and prior plans, and the existence of statutory required minimum benefits. Contract and other costs are accounted for in accordance with FASB ASC Topic 420, Exit or Disposal Cost Obligations and are recorded when the liability is incurred. The specific restructuring measures and associated estimated costs are based on management's best business judgment under the existing circumstances at the time the estimates are made. If future events require changes to these estimates, such adjustments will be reflected in the period of the revised estimate.

Income Taxes

We account for income taxes under the liability method. Under this method, total income tax expense is the amount of income taxes expected to be payable for the current year plus the change from the beginning of the year for deferred income tax assets and liabilities established for the expected further tax consequences resulting from differences in the financial statement carrying amount and the tax basis of assets and liabilities. Deferred tax assets and/or liabilities are determined by multiplying the differences between the financial statement carrying amount and the tax reporting bases for assets and liabilities by the enacted tax rates expected to be in effect when such differences are recovered or settled. Deferred tax assets are reduced by a valuation allowance to the amount more likely than not to be realized. The effect on deferred taxes of a change in tax rates is recognized in income in the period that includes the enactment date.

Tax benefits are initially recognized in the financial statements when it is more likely than not that the position will be sustained upon examination by the tax authorities. Such tax positions are initially and subsequently measured as the largest amount of tax benefit that is greater than 50 percent likely of being realized upon settlement with the taxing authority using the cumulative probability method, assuming the tax authority has full knowledge of the position and all relevant facts. Our policy is to recognize interest accrued related to unrecognized tax benefits in interest expense and penalties within the income tax expense.

Derivative Instruments

We enter into derivative financial instrument contracts to minimize the variability of cash flows or income statement impact associated with the anticipated transactions being hedged or to hedge fluctuating interest rates. As changes in foreign currency or interest rate impact the value of anticipated transactions, the fair value of the forward or swap contracts also changes, offsetting foreign currency or interest rate fluctuations. Derivative instruments are recorded on the balance sheet at fair value. Changes in fair value of derivatives are recorded in current earnings or other comprehensive income, depending on whether a derivative is designated as part of a hedge transaction.

Share-Based Payments

Compensation cost for all share-based payments is recorded based on the grant date fair value, less an estimate for pre-vesting forfeitures, recognized in expense over the service period using an accelerated method.

Forfeiture Rate — This is the estimated percentage of grants that are expected to be forfeited or canceled on an annual basis before becoming fully vested. We estimated the forfeiture rate based on historical forfeiture experience.

Restricted Stock Units and Performance Stock Units: Restricted stock units and performance stock units represent rights to receive Common Shares at a future date. The fair market value of restricted and performance stock units is determined based on the number of stock units granted and the fair market value of our shares on the grant date. The fair market value at the time of the grant, less an estimate for pre-vesting forfeitures, is recognized in expense over the vesting period. At each reporting period, the estimated performance achievement of the performance stock units is assessed and any change in the estimated achievement is recorded on a cumulative basis in the period of adjustment.

Cash and Cash Equivalents

Cash and cash equivalents consist of cash on deposit in banks and other cash invested temporarily in various instruments that are short-term and highly liquid, and having an original maturity of less than 90 days at the date of purchase.

(in thousands)	2019	2018
Cash at bank and on hand	$ 189,569	$ 208,083
Short-term bank deposits	434,078	950,996
Cash and Cash Equivalents	$ 623,647	$ 1,159,079

Restricted Cash

Restricted cash includes cash that is subject to legal restriction in connection with a tender offer and not available for general operating purposes. As of December 31, 2019, we have $5.7 million of restricted cash.

Short-Term Investments

Short-term investments are classified as “available for sale” and stated at fair value, which is equivalent to the amortized cost, in the accompanying balance sheet. Interest income is accrued when earned and changes in fair market values are reflected in other income (expense), net. The amortization of premiums and accretion of discounts to maturity arising from acquisition is included in interest income. A decline in fair value that is judged to be other-than-temporary is accounted for as a realized loss and the write-down is included in the consolidated statements of income. Realized gains and losses, determined on a specific identification basis on the sale of short-term investments, are included in income.

Fair Value of Financial Instruments

The carrying amount of cash and cash equivalents, notes receivable, accounts receivable, accounts payable and accrued liabilities approximate their fair values because of the short maturities of those instruments. The carrying value of our variable rate debt and capital leases approximates their fair values because of the short maturities and/or interest rates which are comparable to those available to us on similar terms. The fair values of the Cash Convertible Notes are based on an estimation using available over-the-counter market information. The fair values of the Private Placement Senior Notes were estimated using the changes in the U.S. Treasury rates and the fair value of the German Private Placement is based on an estimation using changes in the euro swap rates

Accounts Receivable and Allowance for Doubtful Accounts

Our accounts receivable are unsecured and we are at risk to the extent such amounts become uncollectible. We continually monitor accounts receivable balances, and provide for an allowance for doubtful accounts at the time collection becomes questionable based on payment history or age of the receivable. Amounts determined to be uncollectible are written off against the allowance. For the years ended December 31, 2019, 2018 and 2017, write-offs of accounts receivable totaled $5.8 million, $2.8 million and $3.2 million, respectively, while provisions for doubtful accounts which were charged to expense totaled $8.7 million, $4.4 million and $3.1 million, respectively. For all years presented, no single customer represented more than ten percent of accounts receivable or consolidated net sales.

Inventories

Inventories are stated at the lower of cost or net realizable value, determined on either a weighted average cost basis or a standard cost basis which is regularly adjusted to actual. Inventories include material, direct labor and overhead costs and are reduced for estimated obsolescence. Inventories consisted of the following as of December 31, 2019 and 2018:

(in thousands)	2019	2018
Raw materials	$ 26,077	$ 25,819
Work in process	45,729	38,659
Finished goods	98,898	98,434
Total inventories, net	$ 170,704	$ 162,912

Property, Plant and Equipment

Property, plant and equipment, including equipment acquired under capital lease obligations, are stated at cost less accumulated amortization. Capitalized internal-use software costs include only those direct costs associated with the actual development or acquisition of computer software solely to meet internal needs and cloud-based applications to deliver our service and comprise costs associated with the design, coding, installation and testing of the system. Costs associated with preliminary development, such as the evaluation and selection of alternatives, as well as training, maintenance and support are expensed as incurred. Costs for software to be sold, leased or otherwise marketed that are related to the conceptual formulation and design are expensed as incurred. Costs incurred to produce software products and the software components of products to be sold, leased or marketed after technological feasibility is established are capitalized and amortized in accordance with the accounting standards for the costs of software to be sold, leased, or otherwise marketed. All other depreciation is computed using the straight-line method over the estimated useful lives of the assets (3 to 40 years). Amortization of leasehold improvements is computed on a straight-line basis over the lesser of the remaining life of the lease or the estimated useful life of the improvement asset. We have a policy of capitalizing expenditures that materially increase assets' useful lives and charging ordinary maintenance and repairs to operations as incurred. When property or equipment is disposed of, the cost and related accumulated depreciation and amortization are removed from the accounts and any gain or loss is included in earnings.

Business Combinations

We include the results of operations of the businesses that we acquire as of the acquisition date. The purchase price of an acquired business is allocated to the individual assets acquired and liabilities assumed based on their fair values at the date of acquisition. Those fair values are determined using income, cost and market approaches, most of which depend upon significant inputs that are not observable in the market, or level 3 measurements. The excess of purchase price over the fair value of identifiable assets acquired and liabilities assumed is recorded as goodwill. Acquisition-related expenses are recognized separately from the business combinations and are expensed as incurred.

The purchase price for some business combinations includes consideration that is contingent on the achievement of net sales or earnings targets by the acquired business. Contingent consideration is measured initially and on a recurring basis at fair value. Payments to settle the acquisition-date fair value of contingent consideration are presented as financing activities on the statement of cash flows; any payments in excess of the acquisition-date fair value are presented as operating activities.

Acquired Intangibles and Goodwill

Acquired intangibles with alternative future uses are carried at cost less accumulated amortization and consist of licenses to technology held by third parties and other acquired intangible assets. Amortization is computed over the estimated useful life of the underlying patents, which has historically ranged from 1 to 20 years. Purchased intangible assets acquired in business combinations, other than goodwill, are amortized over their estimated useful lives unless these lives are determined to be indefinite. Intangibles are assessed for recoverability considering the contract life and the period of time over which the intangible will contribute to future cash flow. The unamortized cost of intangible assets, where cash flows are independent and identifiable from other assets, is evaluated periodically and adjusted, if necessary, if events and circumstances indicate that a decline in value below the carrying amount has occurred. Intangible asset impairments recorded during the year ended December 31, 2019 are further discussed in Note 6 "Restructuring".

Amortization expense related to developed technology and patent and license rights which have been acquired in a business combination is included in cost of sales. Amortization of trademarks, customer base and non-compete agreements which have been acquired in a business combination is recorded in operating expense under the caption 'acquisition-related intangible amortization'. Amortization expenses of intangible assets not acquired in a business combination are recorded within either the cost of sales, research and development or sales and marketing line items based on the use of the asset.

We dispose the gross carrying amount and accumulated amortization of fully amortized intangible assets from historic business combinations once they are considered fully integrated into our business.

The fair value of in-process research and development (IPR&D) acquired in a business combination is capitalized as an indefinite-lived intangible asset until completion or abandonment of the related research and development activities. IPR&D is tested for impairment annually or when any event or circumstance indicates that the fair value may be below the carrying value. If and when research and development is complete, the associated asset is amortized over the estimated useful life.

Goodwill represents the difference between the purchase price and the estimated fair value of the net assets acquired arising from business combinations. Goodwill is subject to impairment tests annually or earlier if indicators of potential impairment exist, using a fair-value-based approach. We have elected to perform our annual test for indications of impairment as of October 1st of each year. Following the annual impairment tests for the years ended December 31, 2019, 2018 and 2017, goodwill has not been impaired.

Non-Marketable Investments

We have investments in non-marketable equity securities issued by privately held companies. These investments are included in other long-term assets in the accompanying consolidated balance sheets. Non-marketable investments through which we exercise significant influence but do not have control are accounted for using the equity method. We monitor for changes in circumstances that may require a reassessment of the level of influence. Following the adoption of ASU 2016-01 on January 1, 2018, our non-marketable equity securities not accounted for under the equity method are either carried at fair value or under the measurement alternative. Under the measurement alternative, the carrying value is measured at cost, less any impairment, plus or minus changes resulting from observable price changes in orderly transactions for identical or similar investments of the same issuer. Adjustments are determined primarily based on a market approach as of the transaction date.

Investments are evaluated periodically, or when impairment indicators are noted, to determine if declines in value are other-than-temporary. In making that determination, we consider all available evidence relating to the realizable value of a security. This evidence includes, but is not limited to, the following:

- adverse financial conditions of a specific issuer, segment, industry, region or other variables;
- the length of time and the extent to which the fair value has been less than cost; and
- the financial condition and near-term prospects of the issuer.

We consider whether the fair values of any of our non-marketable investments have declined below their carrying value whenever adverse events or changes in circumstances indicate that recorded values may not be recoverable. If any such decline is considered to be other than temporary (based on various factors, including historical financial results, product development activities and the overall health of the affiliate’s industry), then a write-down of the investment would be recorded in operating expense to its estimated fair value.

Variable Interest Entities

We evaluate at the inception of each arrangement whether we have made an investment in an entity that is considered a variable interest entity (VIE) or if we hold other variable interests in an arrangement that is considered a variable interest entity (VIE). We consolidate VIEs when we are the primary beneficiary. The primary beneficiary of a VIE is the party that meets both of the following criteria: (1) has the power to make decisions that most significantly affect the economic performance of the VIE; and (2) has the obligation to absorb losses or the right to receive benefits that in either case could potentially be significant to the VIE. Periodically, we assess whether any changes in our interest or relationship with the entity affect our determination of whether the entity is still a VIE and, if so, whether we are the primary beneficiary. If we are not the primary beneficiary in a VIE, we account for the investment or other variable interests in a VIE as an investment in a non-marketable investment or in accordance with other applicable GAAP.

Impairment of Long-Lived Assets

We review our long-lived assets for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset or a group of assets may not be recoverable. We consider, amongst other indicators, a history of operating losses or a change in expected sales levels to be indicators of potential impairment. Assets are grouped and evaluated for impairment at the lowest level for which there are identifiable cash flows that are largely independent of the cash flows of other groups of assets. If an asset is determined to be impaired, the loss is measured as the amount by which the carrying amount of the asset exceeds fair value which is determined by applicable market prices, when available. When market prices are not available, we generally measure fair value by discounting projected future cash flows of the asset. Considerable judgment is necessary to estimate discounted future cash flows. Accordingly, actual results could differ from such estimates.

4. Revenue

Nature of Goods and Services

Our revenues are reported net of sales and value added taxes and accruals for estimated rebates and returns and are derived primarily from the sale of consumable and instrumentation products, and to a much lesser extent, from the sale of services, intellectual property and technology. Revenue is recognized upon transfer of control of promised products or services to customers in an amount that reflects the consideration we expect to receive in exchange for those products or services. We enter into contracts that can include various combinations of products and services, which are generally distinct and accounted for as separate performance obligations. The transaction price is allocated to performance obligations based on their relative stand-alone selling prices.

We offer warranties on our products. Certain of our warranties are assurance-type in nature and do not cover anything beyond ensuring that the product is functioning as intended. Based on the guidance in Topic 606, assurance-type warranties do not represent separate performance obligations. The Company also sells separately-priced service contracts which qualify as service-type warranties and represent separate performance obligations.

We sell our products and services both directly to customers and through distributors generally under agreements with payment terms typically less than 90 days and in most cases not exceeding one year and therefore contracts do not contain a significant financing component.

Consumable and Related Revenue

Consumable Products: In the last three years, revenue from consumable product sales has accounted for approximately 78-80% of our net sales and revenue is recognized when performance obligations under the terms of a contract with a customer are satisfied. The majority of our contracts have a single performance obligation to transfer a product or multiple performance obligations to transfer multiple products concurrently. Accordingly, we recognize revenue when control of the products has transferred to the customer, which is generally at the time of shipment of products as this is when title and risk of loss have been transferred. In addition, invoicing typically occurs at this time so this is when we have a present right to payment. Revenue is measured as the amount of consideration we expect to receive in exchange for transferring products and is generally based upon a negotiated formula, list or fixed price.

Related Revenue: Revenues from related products include software-as-a-service (SaaS), licenses, intellectual property and patent sales, royalties and milestone payments and over the last three years has accounted for approximately 8-10% of our net sales.

SaaS arrangements: Revenue from SaaS arrangements, which allow customers to use hosted software over the contract period without taking possession of the software, is recognized over the duration of the agreement unless the terms of the agreement indicate that revenue should be recognized in a different pattern, for example based on usage.

Licenses: Licenses for on-site software, which allow customers to use the software as it exists when made available, are sold as perpetual licenses or term licenses. Revenue from on-site licenses are recognized upfront at the point in time at the later of when the software is made available to the customer and the beginning of the license term. When a portion of the transaction price is allocated to a performance obligation to provide support and/or updates, revenue is recognized as the updates/support are provided, generally over the life of the license. Fees from research collaborations include payments for technology transfer and access rights. Royalties from licensees of intellectual property are based on sales of licensed products and revenues are recognized at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied).

Milestone Payments: At the inception of each companion diagnostic co-development arrangement that includes development milestone payments, which represent variable consideration, we evaluate whether the milestones are probable of being reached and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within our control, such as milestones which are achieved through regulatory approvals, are considered to be constrained and excluded from the transaction price until those approvals are received. Revenue is recognized following the input method as this is considered to best depict the timing of the transfer of control. This involves measuring actual hours incurred to date as a proportion of the total budgeted hours of the project. At the end of each subsequent reporting period, the proportion of completion is trued-up. We also re-evaluate the probability of achievement of development milestones and any related constraint on a periodic basis, and if necessary, adjust our estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect revenues and earnings in the period of adjustment.

Instruments

Revenue from instrumentation includes the instrumentation equipment, installation, training and other instrumentation services, such as extended warranty services or product maintenance contracts and over the last three years has accounted for approximately 11-12% of net sales. Revenue from instrumentation equipment is recognized when the customer obtains control of the instrument which is predominantly at the time of delivery or when title has transferred to the customer. Service revenue is recognized over the term of the service period as the customers benefit from the service throughout the service period. Revenue related to services performed on a time-and-materials basis is recognized when performed.

Contract Estimates

The majority of our revenue is derived from contracts (i) with an original expected length of one year or less and (ii) contracts for which we recognize revenue at the amount in which we have the right to invoice as product is delivered. We have elected the practical expedient not to disclose the value of remaining performance obligations associated with these types of contracts.

However, we have certain companion diagnostic co-development contracts in which our performance obligations extend over multiple years. As of December 31, 2019, we had $20.4 million of remaining performance obligations for which the transaction price is not constrained related to these contracts of which we expect to recognize over the next 12 to 18 months.

Revenue expected to be recognized in any future year related to remaining performance obligations, excluding revenue pertaining to contracts that have an original expected duration of one year or less, contracts where revenue is recognized as invoiced and contracts with variable consideration related to undelivered performance obligations, is not material.

Contract Balances

The timing of revenue recognition, billings and cash collections can result in billed accounts receivable, unbilled receivables (contract assets), and customer advances and deposits (contract liabilities) in the consolidated balance sheet.

Contract assets as of December 31, 2019 and 2018 totaled $5.5 million and $6.9 million, respectively, and are included in prepaid expenses and other current assets in the accompanying consolidated balance sheets and relate to the companion diagnostic co-development contracts discussed above.

Contract liabilities primarily relate to advances or deposits received from customers before revenue is recognized and is primarily related to instrument service and software subscription revenue. As of December 31, 2019 and 2018, contract liabilities totaled $56.2 million and $54.3 million, respectively, of which $48.5 million and $45.3 million is included in accrued and other current liabilities, respectively, and $7.7 million and $9.0 million in included in other long-term liabilities, respectively. During the twelve months ended December 31, 2019 and 2018, we satisfied the associated performance obligations and recognized revenue of $48.3 million and $44.5 million, respectively, related to advance customer payments previously received.

Disaggregation of Revenue

We disaggregate our revenue based on product categories and customer class as shown in the tables below for the years ended December 31, 2019, 2018 and 2017:

	2019		
(in thousands)	Consumables and related	Instruments	Total
Molecular Diagnostics	$ 665,866	$ 71,266	$ 737,132
Life Sciences	688,281	101,011	789,292
Academia / Applied Testing	*418,518*	*69,114*	*487,632*
Pharma	*269,763*	*31,897*	*301,660*
Total	$ 1,354,147	$ 172,277	$ 1,526,424

	2018		
	Consumables and related	Instruments	Total
Molecular Diagnostics	$ 649,602	$ 82,197	$ 731,799
Life Sciences	665,857	104,192	770,049
Academia / Applied Testing	*407,370*	*72,131*	*479,501*
Pharma	*258,487*	*32,061*	*290,548*
Total	$ 1,315,459	$ 186,389	$ 1,501,848

	2017		
(in thousands)	Consumables and related	Instruments	Total
Molecular Diagnostics	$ 605,462	$ 77,702	$ 683,164
Life Sciences	637,253	97,119	734,372
Academia / Applied Testing	*392,066*	*67,477*	*459,543*
Pharma	*245,187*	*29,642*	*274,829*
Total	$ 1,242,715	$ 174,821	$ 1,417,536

Refer to Note 21 "Segment Information" for disclosure of revenue by geographic region.

5. Acquisitions and Divestitures

Business Combinations and Asset Acquisitions

For acquisitions which have been accounted for as business combinations, the acquired companies' results have been included in the accompanying consolidated statements of income from their respective dates of acquisition. Our acquisitions have historically been made at prices above the fair value of the acquired net assets, resulting in goodwill, due to expectations of synergies of combining the businesses. These synergies include use of our existing infrastructure, such as sales force, shared service centers, distribution channels and customer relations, to expand sales of an acquired business' products; use of the infrastructure of the acquired businesses to cost-effectively expand sales of our products; and elimination of duplicative facilities, functions and staffing.

If the acquired net assets do not constitute a business under the acquisition method of accounting, the transaction is accounted for as an asset acquisition and no goodwill is recognized. In an asset acquisition, the amount allocated to acquired IPR&D with no alternative future use is charged to expense at the acquisition date.

2019 Business Combinations

In January 2019, we completed the acquisition of N-of-One, Inc., a privately-held U.S. molecular decision support company and pioneer in clinical interpretation services for complex genomic data located in Concord, Massachusetts. The cash consideration, net of cash acquired, was $24.5 million. This acquisition was not significant to the overall consolidated financial statements and as of December 31, 2019, the allocation of the purchase price was final. The acquisition did not have a material impact to net sales, net income or earnings per share and therefore no pro forma information has been provided herein.

In the third quarter of 2019, we acquired two additional companies for total cash consideration, net of cash acquired, of $43.5 million. The purchase price allocations for these acquisitions are preliminary and are based upon preliminary estimates which used information that was available to management at the time the financial statements were prepared and these estimates and assumptions are subject to change within the measurement period, up to one year from the acquisition date. Accordingly, the allocation may change. We continue to gather information about the assets and liabilities acquired, including the acquired tax balance. These acquisitions were not significant to the overall consolidated financial statements and the acquisitions did not have a material impact to net sales, net income or earnings per share. Thus, no pro forma information has been provided herein.

2018 Business Combination

In April 2018, we acquired all shares in STAT-Dx Life, S.L. (STAT-Dx), a privately-held company located in Barcelona, Spain, which is developing the next generation of multiplex diagnostics for one-step, fully integrated molecular analysis of common syndromes using a novel system based on real-time PCR technology and proven QIAGEN chemistries.

The cash consideration totaled $148.8 million. The acquisition included contingent consideration which is recorded as part of the purchase price based on the acquisition date fair value. Potential contingent payments through 2024 under the purchase agreement total $44.3 million, of which the fair value of $37.4 million was recorded as purchase price using a probability-weighted analysis of the future milestones applying discount rates between 6.5% and 6.9%. Direct acquisition costs totaled $2.0 million.

The final purchase price allocation differed from the initial preliminary purchase price allocation as follows:

(in thousands)	Final	Preliminary As of April 27, 2018	Difference
Purchase Price:			
Cash consideration	$ 148,780	$ 148,780	$ —
Fair value of contingent consideration	37,377	36,751	626
	$ 186,157	$ 185,531	$ 626
Final Allocation:			
Cash and cash equivalents	$ 7,357	$ 7,357	$ —
Prepaid expenses and other current assets	1,432	1,432	—
Inventories	1,868	1,868	—
Income tax receivables	2,213	2,213	—
Accounts payable	(1,412)	(1,412)	—
Accruals and other current liabilities	(1,785)	(560)	(1,225)
Fixed and other long-term assets	6,306	6,434	(128)
Developed technology	31,300	80,100	(48,800)
In-process research and development	24,300	—	24,300
Goodwill	117,621	97,268	20,353
Deferred tax liability on fair value of identifiable intangible assets acquired	(3,043)	(9,169)	6,126
Total	$ 186,157	$ 185,531	$ 626

The changes in the values of in-process research and development assets and developed technology relate to new information obtained, that existed at the acquisition date, regarding key assumptions in the valuation model since the initial purchase price allocation. The weighted average amortization period for the developed technology is 10 years. The goodwill acquired is not deductible for tax purposes.

In-process research and development relates to technologies that remain in development at the time of acquisition and which had not yet obtained regulatory approval. During 2019, one development project was completed and a portion of in-process research and development costs were reclassified into developed technology as further discussed in Note 11 "Goodwill and Intangible Assets". The remaining technologies within in-process research and development are expected to be completed within the next two years.

Revenue and earnings in the reporting periods since the acquisition date have not been significant. No pro forma financial information has been provided herein as the acquisition of STAT-Dx did not have a material impact to our net sales, net income or earnings per share on a pro forma basis.

Other 2018 Business Combination

In April 2018, we acquired all remaining shares of a privately held entity in which we held a minority interest. The value of the minority interest investment was revalued in connection with the acquisition by $4.8 million and a corresponding gain was recorded in general and administrative, restructuring, integration and other, net in the accompanying consolidated statement of income for the year ended December 31, 2018. This acquisition was not significant to the overall consolidated financial statements. The acquisition did not have a material impact to net sales, net income or earnings per share and therefore no pro forma information has been provided herein.

2019 Asset Acquisition

On January 31, 2019, we acquired the digital PCR asset of Formulatrix, Inc., a developer of laboratory automation solutions. We paid Formulatrix $125.0 million in cash upon closing and will pay future milestone payments of $135.9 million in 2020. As of December 31, 2019, $134.3 million is included in accrued and other current liabilities in the accompanying consolidated balance sheet for the present value of the future expected payments.

Divestitures

In 2019, we sold a portfolio of protein catalysation products for $1.0 million. An immaterial gain was recorded on the sale. In 2018, we sold a portfolio of veterinary testing products for a total of €15.1 million ($18.5 million), of which $16.4 million was received in cash and the balance due in April 2020. An $8.0 million gain was recorded on the sale to other income (expense), net in the accompanying consolidated statements of income for the year-ended December 31, 2018.

6. Restructuring and Impairments

As part of our restructuring activities, we incur expenses that qualify as exit and disposal costs under U.S. GAAP including severance and employee costs as well as contract and other costs, primarily contract termination costs, as well as inventory write-offs and other implementation costs primarily related to consulting fees. Personnel related costs primarily relate to cash severance and other termination benefits including accelerated share-based compensation. We also incur expenses that are an integral component of, and are directly attributable to, our restructuring activities which do not qualify as exit and disposal costs under U.S. GAAP, which consist of asset-related costs such as intangible asset impairments and other asset related write-offs.

Personnel costs are primarily determined based on established benefit arrangements, local statutory requirements, or historical benefit practices. We recognize these benefits when payment is probable and estimable. Other benefits which require future service and are associated to non-recurring benefits are recognized ratably over the future service period. Other assets, including inventory, are impaired or written-off if the carrying value exceeds the fair value. All other costs are recognized as incurred.

2019 Restructuring

In the second half of 2019, we decided to suspend development of NGS-related instrument systems and entered into a new strategic partnership with Illumina to commercialize IVD kits worldwide on Illumina's diagnostic sequencers. In order to align our business with this new strategy, we began restructuring initiatives to target resource allocation to growth opportunities in our Sample to Insight portfolio.

Impairments to property, plant and equipment primarily impacted computer software and machinery and equipment. Costs incurred to either purchase software or produce software products and the software components of products to be sold, leased or marketed after technological feasibility is established were previously capitalized during the development of certain NGS-related instrument systems. These long-lived assets were fully impaired due to the decision to suspend further development. In addition to computer software, certain machinery and equipment assets were fully impaired given that these assets had no alternative use following the changes announced for this program and it was estimated that no value was recoverable in a market disposal.

Due to the suspended development, intangible assets were also assessed for recoverability. The abandoned assets include developed technology related to the suspended projects as well as the termination of licenses which were used exclusively in connection with this program. As a result, we recorded intangible asset impairment charges due to the conclusion that the identified assets have no alternative use outside of the suspended program and thus are fully impaired.

We also conducted an impairment review of inventory and prepaid and other assets and recorded the charges noted in the table below. As these charges, including inventory, are a direct result of the decision to suspend further development of NGS-related instrument systems and are not related to external market factors, the impairment charges were recorded in the line item restructuring, acquisition, integration and other, net in the consolidated statements of (loss) income due to the assets being deemed excess and no longer utilized due to the discontinued development and related actions discussed above.

In addition, we have initiated measures to:

- shift Commercial Operations activities into Business Areas;
- transition manufacturing activities into a regional structure; and
- expand the scope of activities at QIAGEN Business Services (QBS) centers in Wroclaw, Poland and Manila, Philippines

The following is a summary of the charges recorded during the year ended December 31, 2019.

Consolidated Statement of (Loss) Income Classification and Type of Charge (in thousands)	Note	Year ended December 31, 2019 Total
Restructuring, acquisition, integration and other, net		
Personnel related (of which $2,956 due to related parties)	(22)	$ 70,578
Contract termination costs (of which $15,676 due to related parties)		42,099
Consulting fees		10,150
Accounts receivable (of which $5,984 due from related parties)		10,825
Inventories		12,336
Prepaid expenses and other assets (of which $12,915 was long-term and $2,270 due from related parties)		17,012
		163,000
Long-lived asset impairments		
Property, plant and equipment	(9)	98,472
Intangible assets	(11)	40,301
		138,773
Other (expense) income, net		
Equity method investment impairment	(10)	4,799
Total		$ 306,572

Of the total costs incurred, $60.2 million are accrued as of December 31, 2019 in accrued and other current liabilities in the accompanying consolidated balance sheet as summarized in the following table that includes the cash components of the restructuring activity.

(in thousands)	Personnel Related	Contract Termination	Consulting Fees	Total
Costs incurred in 2019	$ 44,640	$ 42,099	$ 10,150	$ 96,889
Payments	(17,272)	(18,294)	(2,162)	(37,728)
Foreign currency translation adjustment	631	493	(53)	1,071
Liability at December 31, 2019	$ 27,999	$ 24,298	$ 7,935	$ 60,232

Future pre-tax costs between $15 - $23 million are expected to be incurred primarily related to personnel, consulting and contract termination costs before completion of the program in 2020.

2017 Restructuring

We initiated restructuring initiatives in 2017 to mitigate the negative impacts stemming from the U.S. tax reform. Total pre-tax costs for the initiatives, which were concluded in 2018, were $24 million and no additional costs will be incurred related to this program. Cumulative costs for this program were as follows:

(in thousands)	Personnel Related	Contract and Other Costs	Inventory Write-offs & Asset Impairments	Total
Cost of sales	$ —	$ —	$ 3,039	$ 3,039
Restructuring, acquisition, integration and other, net	6,174	4,583	—	10,757
Total 2017 costs	6,174	4,583	3,039	13,796
Cost of sales	424	1,193	—	1,617
Restructuring, acquisition, integration and other, net	4,207	4,232	1,610	10,049
Total 2018 costs	4,631	5,425	1,610	11,666
Restructuring, acquisition, integration and other, net	(1,100)	—	—	(1,100)
Total 2019 releases	(1,100)	—	—	(1,100)
Total cumulative costs	$ 9,705	$ 10,008	$ 4,649	$ 24,362

The following table summarizes the cash components of the restructuring activity.

(in thousands)	Personnel Related	Consulting Costs	Total
Liability at December 31, 2017	$ 6,222	$ 4,585	$ 10,807
Additional costs in 2018	6,468	5,554	12,022
Release of excess accrual	(1,837)	(129)	(1,966)
Payments	(6,892)	(7,149)	(14,041)
Foreign currency translation adjustment	(141)	(17)	(158)
Liability at December 31, 2018	$ 3,820	$ 2,844	$ 6,664
Release of excess accrual	(1,100)	—	(1,100)
Payments	(2,269)	(2,828)	(5,097)
Foreign currency translation adjustment	(49)	(16)	(65)
Liability at December 31, 2019	$ 402	$ —	$ 402

During 2018, fixed asset impairments of $1.6 million were recorded in connection with this initiative and are included within restructuring, acquisition, integration and other, net in the accompanying consolidated statements of income. As of December 31, 2019 and 2018, liabilities of $0.4 million and $6.7 million, respectively, are included in accrued and other current liabilities in the accompanying consolidated balance sheets.

2016 Restructuring

During 2016, we initiated a series of targeted actions to support faster sales momentum and improve efficiency and accountability. The objective with these actions is to ensure that we grow sustainably and consistently. Measures included simplifying our geographic presence with site reductions, focusing resources to shared service centers, and streamlining selected organizational structures. The cumulative cost for this program was $97.1 million and no additional costs will be incurred related to this program. During the year ended December 31, 2017, we incurred $19.7 million of costs, of which $1.4 million was included in cost of sales and $18.3 million was included in restructuring, acquisition, integration and other, net. During the years ended December 31, 2019 and 2018, releases of excess accruals as included in the table below were included in restructuring, acquisition, integration and other, net.

The following table summarizes the cash components of the restructuring activity.

(in thousands)	Personnel Related	Facility Related	Contract and Other Costs	Total
Liability at December 31, 2017	$ 4,294	$ 1,052	$ 1,066	$ 6,412
Release of excess accrual	(343)	(838)	(546)	(1,727)
Payments	(3,648)	(214)	(494)	(4,356)
Foreign currency translation adjustment	(48)	—	(26)	(74)
Liability at December 31, 2018	$ 255	$ —	$ —	$ 255
Release of excess accrual	(31)	—	—	(31)
Payments	(225)	—	—	(225)
Foreign currency translation adjustment	1	—	—	1
Liability at December 31, 2019	$ —	$ —	$ —	$ —

7. Short-Term Investments

At December 31, 2019 and 2018, we had $129.6 million ($65.0 million and €57.5 million) and $234.3 million ($134.1 million and €87.5 million), respectively, of money market deposits, commercial paper and loan receivables due from financial and nonfinancial institutions as summarized below. These instruments are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market and are carried at fair market value, which is equal to the cost. All instruments are classified as current assets in the accompanying balance sheets as they either have a maturity of less than one year or are redeemable at our discretion. Interest income is determined using the effective interest rate method.

(in thousands)	December 31, 2019	December 31, 2018
Money market deposits	$ 87,468	$ 20,000
Commercial paper	22,459	179,219
Loans receivable	19,659	35,037
Total	$ 129,586	$ 234,256

8. Prepaid Expenses and Other Current Assets

Prepaid expenses and other current assets are summarized as follows as of December 31, 2019 and 2018:

(in thousands)	Notes	2019	2018
Prepaid expenses		$ 45,409	$ 48,250
Other receivables		37,025	11,127
Value added tax		20,347	24,416
Cash collateral	(14)	2,683	25,368
Total prepaid expenses and other current assets		$ 105,464	$ 109,161

9. Property, Plant and Equipment

Property, plant and equipment, including equipment acquired under capital lease obligations, are summarized as follows as of December 31, 2019 and 2018:

(in thousands)	Estimated useful life(in years)	2019	2018
Land	—	$ 17,684	$ 17,938
Buildings and improvements	5-40	341,032	322,751
Machinery and equipment	3-10	292,294	306,750
Computer software	3-7	301,604	277,006
Furniture and office equipment	3-10	102,901	109,770
Construction in progress	—	98,858	80,874
		1,154,373	1,115,089
Less: Accumulated depreciation and amortization		(699,130)	(603,430)
Property, plant and equipment, net		$ 455,243	$ 511,659

Amortization of assets acquired under capital lease obligations is included within accumulated depreciation and amortization above for the years ended December 31, 2019 and 2018, respectively.Amortization of assets acquired under capital lease obligations is included within accumulated depreciation and amortization above for the years ended December 31, 2019 and 2018, respectively.

We recorded asset impairment charges as follows below for the years ended December 31, 2019 and 2018.

	Year ended December 31,	
($ in thousands)	2019	2018
Machinery and equipment	$ 9,177	$ —
Computer software	44,649	2,911
Furniture and office equipment	4,030	—
Construction in progress	41,870	4,979
Total impairment in property, plant and equipment	$ 99,726	$ 7,890

During the year ended December 31, 2019, $98.5 million of impairments were related to the 2019 Restructuring program discussed in Note 6 "Restructuring" while the remaining $1.2 million were related to other identified impairments during the year. In 2018, we recorded asset impairment charges of $7.9 million of internal-use software of which $1.6 million related to the 2017 Restructuring program discussed in Note 6 "Restructuring" and $6.3 million related to strategic shifts in our business. No impairments to property, plant and equipment were recognized during the year ended December 31, 2017.

For the years ended December 31, 2019, 2018 and 2017 depreciation and amortization expense totaled $86.0 million, $87.9 million and $82.5 million, respectively. For the years ended December 31, 2019, 2018 and 2017 amortization related to computer software to be sold, leased or marketed totaled $18.3 million, $17.2 million and $13.9 million, respectively. Impairment charges related to computer software to be sold, leased or marketed are included in computer software and construction in progress in the table above and totaled $65.9 million for the year ended December 31, 2019. As of December 31, 2019 and 2018, the unamortized balance of computer software to be sold, leased or marketed was $36.6 million and $100.5 million, respectively.

Repairs and maintenance expense was $10.7 million, $12.1 million and $12.7 million in 2019, 2018 and 2017, respectively. For the year ended December 31, 2019 and 2018, construction in progress primarily includes amounts related to ongoing software development projects. For the years ended December 31, 2019, 2018 and 2017, interest capitalized in connection with construction projects was not significant.

10. Investments

The following discusses our marketable investments, non-marketable investments and the realized and unrealized gains and losses on these investments.

Marketable Equity Securities

A summary of our investments in marketable equity securities that have readily determinable fair values that are classified as available-for-sale follows below. These investments are reported at fair value with gains and losses recorded in earnings beginning in January 2018 upon adoption of ASU 2016-01. Prior to adoption, these investments were reported at fair value with unrealized gains and losses recognized in accumulated other comprehensive income on the balance sheet. Accordingly, upon adoption, we recorded a cumulative effect adjustment to decrease opening retained earnings at January 1, 2018 by a net of tax amount of $0.9 million (pre-tax $1.1 million) for unrealized losses as of the adoption date.

(in thousands, except shares held)	As of December 31, 2019 HTG Molecular Diagnostics, Inc (HTGM)	Oncimmune Holdings plc(Oncimmune)
Shares held	833,333	560,416
Cost basis	$ 2,000	—
Fair value	$ 585	$ 285
Total cumulative unrealized (loss) gain	$ (1,415)	$ 285

(in thousands)	As of December 31, 2018 HTGM	Curetis N.V. (Curetis)
Shares held	833,333	204,000
Cost basis	$ 2,000	$ 1,444
Fair value	$ 2,117	$ 350
Total cumulative unrealized gain (loss)	$ 117	$ (1,094)

During 2019, we received 560,416 shares in Oncimmune in settlement of a zero-book value financial instrument held with a third party. On the date of receipt, these shares held a fair value of $0.7 million which was recorded as a gain in other income (expense), net in the accompanying statements of (loss) income. Also during 2019, we sold the remaining 204,000 Curetis shares and recognized an immaterial loss in other income (expense), net.

During the year ended December 31, 2018, we sold 116,424 shares of Curetis and recognized a gain of $0.3 million in other income (expense), net in the accompanying statements of (loss) income.

During the years ended December 31, 2019 and 2018, losses recognized for the change in fair market value of all marketable equity securities totaled $2.1 million and $0.1 million, respectively. As of December 31, 2019 and 2018, these marketable securities are included in other long-term assets in the accompanying consolidated balance sheets.

Non-Marketable Investments

We have made strategic investments in certain privately-held companies without readily determinable market values.

Non-Marketable Investments Accounted for Under the Equity Method

A summary of our non-marketable investments accounted for as equity method investments is as follows:

		Equity investments as of December 31,		Share of income (loss)for the years ended December 31,		
(in thousands)	Ownership Percentage	2019	2018	2019	2018	2017
PreAnalytiX GmbH	50.00 %	$ 5,452	$ 5,405	$ 3,971	$ 4,062	$ 3,818
Suzhou Fuda Business Management and Consulting Partnership	33.67 %	3,100	3,138	—	—	—
TVM Life Science Ventures III	4.80 %	1,219	—	(330)	—	—
Apis Assay Technologies Ltd	19.00 %	719	770	(51)	—	—
Hombrechtikon Systems Engineering AG	19.00 %	(761)	378	(1,124)	(668)	(346)
MAQGEN Biotechnology Co., Ltd	40.00 %	—	5,154	(383)	(579)	(542)
Biotype Innovation GmbH	0.00 %	—	—	—	(123)	39
Pyrobett	19.00 %	—	—	—	(100)	195
		$ 9,729	$ 14,845	$ 2,083	$ 2,592	$ 3,164

Of the $9.7 million of non-marketable investments accounted for as equity method investments, $10.5 million is included in other long-term assets and $0.8 million, where we are committed to fund losses, is included in other long-term liabilities in the accompanying consolidated balance sheets as of December 31, 2019.

During 2019, we made an investment in TVM Life Science Ventures III and as of December 31, 2019 we hold a 4.8% ownership stake in this limited partnership that is accounted for under the equity method as we have the ability to exercise significant influence over the limited partnership. Also during the year ended December 31, 2019, we recorded an impairment of $4.8 million in other income (expense), net in the accompanying consolidated statements of income, following changes in circumstances of MAQGEN Biotechnology Co., Ltd that indicated the carrying value was no longer recoverable. Accordingly, the investment was fully impaired.

In 2018, we recorded impairments totaling $6.1 million in other (expense) income, net in the accompanying consolidated statements of income, following changes in the investees' circumstances that indicated the carrying value was no longer recoverable. During 2017, we sold our interest in QIAGEN (Suzhou) Institute of Translation Research Co., Ltd., which had no book value at the time of sale, for $3.5 million and recorded a corresponding gain in other income (expense), net in the accompanying statements of income.

Three of our equity method investments are variable interest entities and we are not the primary beneficiary as we do not hold the power to direct the activities that most significantly impact the economic performance. Therefore, these investments are not consolidated. As of December 31, 2019 and 2018, these investments had a total net carrying value of $1.2 million, of which $1.9 million is included in other long-term assets and $0.8 million is included in other long-term liabilities in the accompanying consolidated balance sheet. As of December 31, 2018, these investments held a balance of $1.1 million which is included in other long-term assets in the consolidated balance sheet. These balances represent our maximum exposure to loss.

Non-Marketable Investments Not Accounted for Under the Equity Method

At December 31, 2019 and 2018, we had investments in non-publicly traded companies that do not have readily determinable fair values with carrying amounts that totaled $70.8 million and $59.5 million, respectively. The changes in these investments which are measured at cost, less any impairment, plus or minus changes resulting from observable price changes in orderly transactions for the identical or a similar investment of the same issuer for the years ended December 31, 2019 and 2018 are as follows:

(in thousands)	2019	2018
Balance at beginning of year	$ 59,484	$ 33,605
Cash investments in equity securities, net	3,619	9,633
Net increases due to observable price changes	7,760	13,104
Conversion of note receivable to equity securities	—	11,369
Sale of equity securities	—	(5,400)
Full acquisition of equity securities	—	(2,710)
Foreign currency translation adjustments	(14)	(117)
Balance at end of year	$ 70,849	$ 59,484

During 2019, we made additional investments of $3.6 million in non-marketable investments not accounted for under the equity method. As of December 31, 2019 and December 31, 2018, investments in variable interest entities had a total carrying value of $41.0 million which is included in other long-term assets in the consolidated balance sheets, representing our maximum exposure to loss.

Since adoption of ASU 2016-01, upward adjustments in the carrying value of these investments have been recognized for observable price changes totaling $20.9 million, of which $7.8 million occurred in 2019 and $13.1 million was recognized in 2018 in other income (expense), net in the accompanying consolidated statements of income. These adjustments were due to equity offerings at a higher price from the issuer in orderly transactions for identical or similar investments as those we hold.

During 2018, we made investments of $9.6 million in equity securities, of which $9.3 million was an additional investment in NeuMoDx Molecular, Inc. (NeuMoDx). The investment is part of a strategic partnership with NeuMoDx to commercialize two new fully integrated systems for automation of PCR (polymerase chain reaction) testing. Under the agreement, we will initially distribute the NeuMoDx™ 288 (high-throughput version) and NeuMoDx™ 96 (mid-throughput version) in Europe and other major markets worldwide outside of the United States. NeuMoDx will distribute these instruments within the United States directly. The two companies have also entered into an agreement under which we can acquire all NeuMoDx shares not currently owned by QIAGEN at a predetermined price of approximately $234 million, subject to the achievement of certain regulatory and operational milestones.

During 2018, we converted a note receivable from a non-publicly traded company, considered a related party, into an equity interest in that company. This note held a balance of $11.4 million including principal balance and accrued interest at conversion which was a non-cash investing activity and is therefore not included in the consolidated statement of cash flows. Also during 2018, we sold our interest in a non-publicly traded company which had a book value of $5.4 million. Proceeds from the sale totaled $10.5 million in cash resulting in a corresponding gain of $5.1 million recorded in other income (expense), net in the accompanying consolidated statement of income. Additionally during 2018, we acquired all remaining shares of a privately held entity in which we held a minority interest as discussed in Note 5 "Acquisitions and Divestitures".

In 2017, we recorded total impairments to non-marketable investments not accounted for under the equity method of $5.1 million in other income (expense), net in the accompanying consolidated statement of income.

11. Goodwill and Intangible Assets

The following sets forth the intangible assets by major asset class as of December 31, 2019 and 2018:

		2019		2018	
(in thousands)	Weighted Average Life(in years)	Gross Carrying Amount	Accumulated Amortization	Gross Carrying Amount	Accumulated Amortization
Amortized Intangible Assets:					
Patent and license rights	10.19	$ 320,406	$ (216,554)	$ 448,220	$ (310,040)
Developed technology	10.96	766,966	(346,085)	770,955	(561,615)
Customer base, trademarks, and non-compete agreements	11.68	314,638	(213,881)	427,512	(323,024)
	10.95	$ 1,402,010	$ (776,520)	$ 1,646,687	$ (1,194,679)
Unamortized Intangible Assets:					
In-process research and development		$ 6,944		$ 23,035	
Goodwill		2,140,503		2,108,536	
		$ 2,147,447		$ 2,131,571	

The in-process research and development is associated to the acquisition of STAT-Dx as further discussed in Note 5 "Acquisitions and Divestitures". The estimated fair value of acquired in-process research and development projects which have not reached technological feasibility at the date of acquisition are capitalized and subsequently tested for impairment through completion of the development process, at which point the capitalized amounts are amortized over their estimated useful life. If a project is abandoned rather than completed, all capitalized amounts are written-off immediately. During 2019, one development project was completed and, after testing for impairment, $15.9 million of in-process research and development costs were reclassified into developed technology.

Developed technology includes the digital PCR asset from Formulatrix as discussed in Note 5 "Acquisitions and Divestitures" which is being amortized over 10 years.

The changes in intangible assets for the years ended December 31, 2019 and 2018 are as follows:

(in thousands)	2019	2018
Balance at beginning of year	$ 475,043	$ 499,318
Additions	286,159	32,159
Additions from acquisitions	36,458	81,200
Amortization	(122,560)	(118,576)
Disposals	—	(4,426)
Impairments	(40,301)	—
Foreign currency translation adjustments	(2,365)	(14,632)
Balance at end of year	$ 632,434	$ 475,043

During the year ended December 31, 2019, we recorded an impairment charge of $40.3 million related to the restructuring activities discussed further in Note 6 "Restructuring and Impairments" of which $28.1 million is related to patent and license rights and $12.1 million is related to developed technology. Amortization expense on intangible assets totaled approximately $122.6 million, $118.6 million and $133.8 million, respectively, for the years ended December 31, 2019, 2018 and 2017.

Cash paid for purchases of intangible assets during the year ended December 31, 2019 totaled $156.9 million, of which $11.5 million is related to current year payments for licenses that were accrued as of December 31, 2018 and $0.5 million is related to prepayments recorded in other long-term assets in the accompanying consolidated balance sheet. Intangible asset additions of $286.2 million includes $144.9 million of cash paid during the year ended December 31, 2019, together with $137.8 million of additions that were accrued as of December 31, 2019 and $3.5 million of additions which were previously recorded as prepayments.

Cash paid for intangible assets during the year ended December 31, 2018 totaled $41.0 million of which $11.9 million is related to current year payments for licenses that were accrued as of December 31, 2017 and $3.3 million is related to prepayments recorded in other long-term assets in accompanying consolidated balance sheet. Intangible asset additions of $32.2 million includes $25.8 million of cash paid during the year ended December 31, 2018, together with $4.2 million of additions that were accrued as of December 31, 2018 and $2.2 million of additions which were previously recorded as prepayments.

Amortization of intangibles for the next five years is expected to be approximately:

(in thousands)	Amortization
Years ended December 31:	
2020	$ 100,891
2021	$ 92,512
2022	$ 78,454
2023	$ 76,239
2024	$ 71,910

The changes in goodwill for the years ended December 31, 2019 and 2018 are as follows:

(in thousands)	2019	2018
Balance at beginning of year	$ 2,108,536	$ 2,012,904
Business combinations	34,807	142,287
Purchase adjustments	(236)	—
Disposals	(225)	(5,682)
Foreign currency translation adjustments	(2,379)	(40,973)
Balance at end of year	$ 2,140,503	$ 2,108,536

The changes in the carrying amount of goodwill during the year ended December 31, 2019 resulted primarily from the acquisition of N-of-One, Inc. and other acquisitions and divestitures discussed in Note 5 "Acquisitions and Divestitures" and changes in foreign currency translation. The changes in goodwill during the year ended December 31, 2018 resulted primarily from the acquisition of STAT-Dx and other acquisitions and divestitures also discussed in Note 5 Note 5 "Acquisitions and Divestitures".

12. Leases

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842) and additionally in July 2018, the ASU 2018-11, Leases (Topic 842) Targeted Improvements, which superseded ASC Topic 840, Leases. The new standard increases transparency and comparability by requiring the recognition by lessees of right-of-use ("ROU") assets and lease liabilities on the balance sheet for those leases classified as operating leases. Under the standard, disclosures are required to meet the objective of enabling users of financial statements to assess the amount, timing and uncertainty of cash flows arising from leases.

Accounting Policies

We adopted Topic 842 Leases on its effective date on January 1, 2019 and the comparative information has not been adjusted and continues to be reported under ASC Topic 840 Leases. As a result, we changed our accounting policy for leases as detailed below.

We implemented the standard using the required modified retrospective approach and have also elected to utilize the package of practical expedients, which permitted us to not reassess (1) whether any expired or existing contracts are or contain leases, (2) the lease classification for any expired or existing leases, and (3) any initial direct costs for any existing leases as of the effective date. We also elected the practical expedient to use hindsight in determining the appropriate lease term and in assessing impairment of its right-of-use assets. In using the modified retrospective approach, we were required to recognize and measure leases existing at, or entered into after, the beginning of the earliest comparative period presented.

Adoption of the new standard resulted in the recording of additional net lease assets and lease liabilities of approximately $57.4 million and $57.7 million, respectively as of January 1, 2019. The difference between the additional lease assets and lease liabilities was recorded as a $0.3 million adjustment to retained earnings. The standard did not materially impact our consolidated income statements and had no impact on cash flows.

Nature of Existing Leases

We have operating and finance leases for equipment, cars, machinery, other equipment, office and buildings. Our leases have remaining lease terms of 1 year to 9 years, some of which include options to extend or early renew the leases, and some of which include options to early terminate the leases. As of December 31, 2019, no such options have been recognized as part of the right-of-use assets and lease liabilities.

Operating leases can contain variable lease charges based on an index like consumer prices or rates. During 2019, amounts recorded as variable lease payments not included in the operating lease liability were not material.

When we cannot readily determine the interest rate implicit in the operating lease contracts, we apply our incremental borrowing rate based on information available at the commencement date in determining the present value of lease payments. We use the implicit rate when it is readily determinable.

Supplemental balance sheet and other information related to leases was as follows:

(in thousands, except lease term and discount rate)	Location in balance sheet	December 31, 2019
Operating lease right-of-use assets	Other long-term assets	$ 57,305
Current operating lease liabilities	Accrued and other current liabilities	$ 18,739
Long-term operating lease liabilities	Other long-term liabilities	$ 39,631
Weighted average remaining lease term - operating leases (in years)		3.71
Weighted average discount rate - operating leases		2.39 %

The components of lease expense were as follows:

(in thousands)	Year Ended December 31, 2019
Operating lease cost	$ 24,378

Supplemental cash flow information related to leases was as follows:

(in thousands)	Year Ended December 31, 2019
Cash paid for amounts included in the measurement of lease liabilities:	
Operating cash flows from operating leases	$ (26,113)
Right-of-use assets obtained in exchange for lease obligations:	
Operating leases	$ 24,670

Maturities of lease liabilities were as follows:

(in thousands)	Operating Leases
2020	$ 19,914
2021	16,009
2022	11,885
2023	7,119
2024	3,391
Thereafter	3,202
Total lease payments[1]	61,520
Less imputed interest	(3,150)
Total	$ 58,370

[1] Total lease payments exclude payments associated to the lease agreement discussed below that has not yet commenced.

As of December 31, 2019, we had an additional operating lease for a facility related primarily to research and development that has not yet commenced but will create significant rights and obligations for the Company. The agreement commences in 2020 with future undiscounted aggregate lease payments of $44.5 million to be paid over a lease term of 15 years.

We did not hold any material finance leases as of December 31, 2019 or January 1, 2019.

13. Accrued and Other Current Liabilities

Accrued and other current liabilities at December 31, 2019 and 2018 consist of the following:

(in thousands)	Note	2019	2018
Accrued contingent consideration and milestone payments	(15)	$ 142,604	$ 27,820
Accrued expenses and other liabilities		93,204	103,449
Payroll and related accruals		66,866	66,871
Restructuring	(6)	62,227	6,850
Deferred revenue	(4)	48,525	45,358
Operating lease liabilities	(12)	18,739	—
Accrued royalties	(22)	5,481	5,469
Accrued interest on long-term debt	(16)	5,257	6,200
Cash collateral	(14)	1,400	1,000
Total accrued and other current liabilities		$ 444,303	$ 263,017

14. Derivatives and Hedging

Objective and Strategy

In the ordinary course of business, we use derivative instruments, including swaps, forwards and/or options, to manage potential losses from foreign currency exposures and interest bearing assets or liabilities. The principal objective of such derivative instruments is to minimize the risks and/or costs associated with our global financial and operating activities. We do not utilize derivative or other financial instruments for trading or other speculative purposes. We recognize all derivatives as either assets or liabilities on the balance sheet on a gross basis, measure those instruments at fair value and recognize the change in fair value in earnings in the period of change, unless the derivative qualifies as an effective hedge that offsets certain exposures. We have agreed with almost all of our counterparties with whom we had entered into cross-currency swaps, interest rate swaps or foreign exchange contracts, to enter into bilateral collateralization contracts under which we will receive or provide cash collateral, as the case may be, for the net position with each of these counterparties. As of December 31, 2019, cash collateral positions consisted of $1.4 million recorded in accrued and other current liabilities and $2.7 million recorded in prepaid expenses and other current assets in the accompanying consolidated balance sheet. As of December 31, 2018, we had a liability position of $1.0 million recorded in accrued and other current liabilities and $25.4 million recorded in prepaid expenses and other current assets in the accompanying consolidated balance sheet.

Non-Derivative Hedging Instrument

Net Investment Hedge

In 2017, we entered into a foreign currency non-derivative hedging instrument that is designated and qualifies as net investment hedge. The objective of the hedge is to protect part of the net investment in foreign operations against adverse changes in the exchange rate between the Euro and the functional currency of the U.S. dollar. The non-derivative hedging instrument is the German private corporate bond ("Schuldschein") which was issued in the total amount of $331.1 million as described in Note 16 "Lines of Credit and Debt". Of the $331.1 million, which is held in both U.S. dollars and Euro, €255.0 million is designated as the hedging instrument against a portion of our Euro net investments in our foreign operations. The relative changes in both the hedged item and hedging instrument are calculated by applying the change in spot rate between two assessment dates against the respective notional amount. The effective portion of the hedge is recorded in the cumulative translation adjustment account within other accumulated comprehensive income (loss). Based on the spot rate method, the unrealized loss recorded in equity as of December 31, 2019 and 2018 is $0.4 million and $5.9 million, respectively. Since we are using the debt as the hedging instrument, which is also remeasured based on the spot rate method, there is no hedge ineffectiveness related to the net investment hedge as of December 31, 2019 and 2018.

Derivatives Designated as Hedging Instruments

Cash Flow Hedges

As of December 31, 2019 and 2018, we held derivative instruments that are designated and qualify as cash flow hedges where the effective portion of the gain or loss on the derivative is reported as a component of other comprehensive (loss) income and reclassified into earnings in the same period or periods during which the hedged transaction affects earnings. Gains and losses on the derivative representing either hedge ineffectiveness or hedge components excluded from the assessment of effectiveness are recognized in current earnings. In 2019 and in 2018, we did not record any hedge ineffectiveness related to any cash-flow hedges in earnings. Based on their valuation as of December 31, 2019, we expect approximately $1.9 million of derivative losses included in accumulated other comprehensive loss will be reclassified into income during the next 12 months. The cash flows derived from derivatives are classified in the consolidated statements of cash flows in the same category as the consolidated balance sheet account of the underlying item.

We use interest rate derivative contracts to align our portfolio of interest bearing assets and liabilities with our risk management objectives. During 2015, we entered into five cross currency interest rate swaps through 2025 for a total notional amount of €180.0 million which qualify for hedge accounting as cash flow hedges. We determined that no ineffectiveness exists related to these swaps. As of December 31, 2019 and 2018, interest receivables of $1.5 million and $1.4 million, respectively are recorded in prepaid expenses and other current assets in the accompanying consolidated balance sheet.

Fair Value Hedges

As of December 31, 2019 and 2018, we held derivative instruments that qualify for hedge accounting as fair value hedges. For derivative instruments that are designated and qualify as a fair value hedge, the effective portion of the gain or loss on the derivative is reflected in earnings. This effect on earnings is offset by the change in the fair value of the hedged item attributable to the risk being hedged that is also recorded in earnings. In 2019 and 2018, we concluded there was no ineffectiveness. The cash flows derived from derivatives are classified in the consolidated statements of cash flows in the same category as the consolidated balance sheet account of the underlying item.

We hold interest rate swaps which effectively fixed the fair value of a portion of our fixed rate private placement debt and qualify for hedge accounting as fair value hedges. We determined that no ineffectiveness exists related to these swaps. As of December 31, 2019, an interest receivable of $0.1 million is recorded in prepaid and other current assets, and as of December 31, 2018, accrued and unpaid interest of $0.1 million is recorded in accrued and other current liabilities, respectively, in the accompanying balance sheet.

Derivatives Not Designated as Hedging Instruments

Call Options

We entered into Call Options which, along with the sale of the Warrants, represent the Call Spread Overlay entered into in connection with the Cash Convertible Notes and which are more fully described in Note 16 "Lines of Credit and Debt". In these transactions, the Call Options are intended to address the equity price risk inherent in the cash conversion feature of each instrument by offsetting cash payments in excess of the principal amount due upon any conversion of the Cash Convertible Notes.

Aside from the initial payment of premiums for the Call Options, we will not be required to make any cash payments under the Call Options. We will, however, be entitled to receive under the terms of the Call Options, an amount of cash generally equal to the amount by which the market price per share of our common stock exceeds the exercise price of the Call Options during the relevant valuation period. The exercise price under the Call Options is equal to the conversion price of the Cash Convertible Notes.

The Call Options, for which our common stock is the underlying security, are derivative assets that requires mark-to-market accounting treatment due to the cash settlement features until the Call Options settle or expire. The Call Options are measured and reported at fair value on a recurring basis, within Level 2 of the fair value hierarchy. For further discussion of the inputs used to determine the fair value of the Call Options, refer to Note 15 "Financial Instruments and Fair Value Measurements".

The Call Options do not qualify for hedge accounting treatment. Therefore, the change in fair value of these instruments is recognized immediately in our consolidated statements of income in other income (expense), net. Because the terms of the Call Options are substantially similar to those of the Cash Convertible Notes' embedded cash conversion option, discussed below, we expect the effect on earnings from the two derivative instruments to mostly offset each other.

Cash Convertible Notes Embedded Cash Conversion Option

The embedded cash conversion option within the Cash Convertible Notes discussed in Note 16 "Lines of Credit and Debt" is required to be separated from the Cash Convertible Notes and accounted for separately as a derivative liability, with changes in fair value reported in our consolidated statements of income in other income (expense), net until the cash conversion option settles or expires. The embedded cash conversion option is measured and reported at fair value on a recurring basis, within Level 2 of the fair value hierarchy. For further discussion of the inputs used to determine the fair value of the embedded cash conversion option, refer to Note 15 "Financial Instruments and Fair Value Measurements".

Embedded Conversion Option

During 2017, we purchased a convertible note for $3.0 million from a publicly listed company considered a related party. The embedded conversion option within the convertible note is required to be separated from the convertible note and accounted for separately as a derivative liability, with changes in fair value reported in our consolidated statements of income in other income (expense), net. The embedded cash conversion option is measured and reported at fair value on a recurring basis, within Level 2 of the fair value hierarchy. For further discussion of the inputs used to determine the fair value of the embedded cash conversion option, refer to Note 15 "Financial Instruments and Fair Value Measurements".

Foreign Exchange Contracts

As a globally active enterprise, we are subject to risks associated with fluctuations in foreign currencies in our ordinary operations. This includes foreign currency-denominated receivables, payables, debt, and other balance sheet positions including intercompany items. We manage balance sheet exposure on a group-wide basis using foreign exchange forward contracts, foreign exchange options and cross-currency swaps.

We are party to various foreign exchange forward, option and swap arrangements which had, at December 31, 2019 and December 31, 2018, aggregate notional values of $701.4 million and $792.7 million which expire at various dates through March 2020. The transactions have been entered into to offset the effects from short-term balance sheet exposure to foreign currency exchange risk. Changes in the fair value of these arrangements have been recognized in other income (expense), net.

Fair Values of Derivative Instruments

The following table summarizes the fair value amounts of derivative instruments reported in the consolidated balance sheets as of December 31, 2019 and 2018:

	As of December 31, 2019		As of December 31, 2018	
(in thousands)	Current Asset	Long-Term Asset	Current Asset	Long-Term Asset
Assets:				
Derivative instruments designated as hedges				
Interest rate contracts - fair value hedge [1]	$ —	$ 2,474	$ —	$ —
Total derivative instruments designated as hedges	$ —	$ 2,474	$ —	$ —
Undesignated derivative instruments				
Embedded conversion option	$ —	$ —	$ —	$ 349
Call options	101,179	189,792	100,081	295,014
Foreign exchange contracts	6,689	—	2,673	—
Total undesignated derivative instruments	$ 107,868	$ 189,792	$ 102,754	$ 295,363
Total Derivative Assets	$ 107,868	$ 192,266	$ 102,754	$ 295,363

(in thousands)	As of December 31, 2019 Current Liability	As of December 31, 2019 Long-Term Liability	As of December 31, 2018 Current Liability	As of December 31, 2018 Long-Term Liability
Liabilities:				
Derivative instruments designated as hedges				
Interest rate contracts - cash flow hedge [1]	$ —	$ (6,027)	$ —	$ (17,574)
Interest rate contracts - fair value hedge [1]	—	—	(473)	(721)
Total derivative instruments designated as hedges	$ —	$ (6,027)	$ (473)	$ (18,295)
Undesignated derivative instruments				
Cash convertible notes embedded conversion option	$ (101,361)	$ (190,902)	$ (100,164)	$ (299,098)
Foreign exchange contracts	(1,814)	—	(5,957)	—
Total undesignated derivative instruments	$ (103,175)	$ (190,902)	$ (106,121)	$ (299,098)
Total Derivative Liabilities	$ (103,175)	$ (196,929)	$ (106,594)	$ (317,393)

[1] The fair value amounts for the interest rate contracts do not include accrued interest.

Gains and Losses on Derivative Instruments

The following tables summarize the gains and losses on derivative instruments for the years ended December 31, 2019, 2018 and 2017:

(in thousands)	Year ended December 31, 2019 Other income (expense), net	2018 Other income (expense), net	2017 Other income (expense), net
Total amounts presented in the Consolidated Statements of Income in which the effects of cash flow and fair value hedges are recorded	$ 432	$ 5,598	$ (4)
Gains (Losses) on Derivatives in Cash Flow Hedges			
Interest rate contracts			
Amount of (loss) gain reclassified from accumulated other comprehensive income	$ (3,888)	$ (9,774)	$ 26,136
Amounts excluded from effectiveness testing	—	—	—
Gains (Losses) on Derivatives in Fair Value Hedges			
Interest rate contracts			
Hedged item	(3,668)	2,051	2,199
Derivatives designated as hedging instruments	3,668	(2,051)	(2,199)
Gains (Losses) Derivatives Not Designated as Hedging Instruments			
Embedded conversion option	(349)	131	217
Call options	(104,125)	74,682	37,414
Cash convertible notes embedded cash conversion option	106,998	(76,500)	(36,741)
Foreign exchange contracts	1,835	(19,857)	11,813
Total gains (losses)	$ 471	$ (31,318)	$ 38,839

Balance Sheet Line Items in which the Hedged Item is included

The following tables summarizes the balance sheet line items in which the hedged item is included as of December 31, 2019 and 2018:

	Carrying Amount of the Hedged Assets (Liabilities)		Cumulative Amount of Fair Value Hedging Adjustment Included in the Carrying Amount of Hedged Assets (Liabilities)	
(in thousands)	December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2018
Current portion of long-term debt	$ —	$ (72,483)	$ —	$ (473)
Long-term debt	$ (129,290)	$ (126,030)	$ 2,474	$ (721)

15. Financial Instruments and Fair Value Measurements

Assets and liabilities are measured at fair value according to a three-tier fair value hierarchy which prioritizes the inputs used in measuring fair value as follows:

Level 1. Observable inputs, such as quoted prices in active markets;

Level 2. Inputs, other than the quoted price in active markets, that are observable either directly or indirectly; and

Level 3. Unobservable inputs in which there is little or no market data, which require the reporting entity to develop its own assumptions.

Our assets and liabilities measured at fair value on a recurring basis consist of short-term investments, which are classified in Level 1 and Level 2 of the fair value hierarchy, marketable securities discussed in Note 10 "Investments", which are classified in Level 1, derivative contracts used to hedge currency and interest rate risk and derivative financial instruments entered into in connection with the Cash Convertible Notes discussed in Note 16 "Lines of Credit and Debt", which are classified in Level 2 of the fair value hierarchy, and contingent consideration accruals which are classified in Level 3 of the fair value hierarchy, and are shown in the tables below. Non-marketable equity securities remeasured during the year ended December 31, 2019 and 2018 are classified within Level 3 in the fair value hierarchy following the adoption of ASU 2016-01. There were no transfers between levels for the year ended December 31, 2019.

In determining fair value for Level 2 instruments, we apply a market approach, using quoted active market prices relevant to the particular instrument under valuation, giving consideration to the credit risk of both the respective counterparty to the contract and the Company. To determine our credit risk, we estimated our credit rating by benchmarking the price of outstanding debt to publicly-available comparable data from rated companies. Using the estimated rating, our credit risk was quantified by reference to publicly-traded debt with a corresponding rating. The Level 2 derivative financial instruments include the Call Options asset and the embedded conversion option liability. See Note 16 "Lines of Credit and Debt", and Note 14 "Derivatives and Hedging", for further information. The derivatives are not actively traded and are valued based on an option pricing model that uses observable market data for inputs. Significant market data inputs used to determine fair values included our common stock price, the risk-free interest rate, and the implied volatility of our common stock. The Call Options asset and the embedded cash conversion option liability were designed with the intent that changes in their fair values would substantially offset, with limited net impact to our earnings. Therefore, the sensitivity of changes in the unobservable inputs to the option pricing model for such instruments is substantially mitigated.

Our Level 3 instruments include non-marketable equity security investments for which we estimate the value based on valuation methods using the observable transaction price at the transaction date and other unobservable inputs. These investments are carried at fair value or under the measurement alternative. Under the measurement alternative, the carrying value is measured at cost, less any impairment, plus or minus changes resulting from observable price changes in orderly transactions for identical or similar investments of the same issuer. Adjustments are determined primarily based on a market approach as of the transaction date.

Our Level 3 instruments also include contingent consideration liabilities. We value contingent consideration liabilities using unobservable inputs, applying the income approach, such as the discounted cash flow technique, or the probability-weighted scenario method. Contingent consideration arrangements obligate us to pay the sellers of an acquired entity if specified future events occur or conditions are met such as the achievement of technological or revenue milestones. We use various key assumptions, such as the probability of achievement of the milestones (0% to 100%) and the discount rate (between 2.4% and 6.9%), to represent the non-performing risk factors and time value when applying the income approach. We regularly review the fair value of the contingent consideration, and reflect any change in the accrual in the consolidated statements of income in the line items commensurate with the underlying nature of milestone arrangements.

The following table presents our fair value hierarchy for our financial assets and liabilities measured at fair value on a recurring basis:

	As of December 31, 2019				As of December 31, 2018			
(in thousands)	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Assets:								
Short-term investments	$ —	$ 129,586	$ —	$ 129,586	$ 350	$ 234,256	$ —	$ 234,606
Marketable equity securities	870	—	—	870	2,117	—	—	2,117
Non-marketable equity securities	—	—	70,849	70,849	—	—	59,484	59,484
Call option	—	290,971	—	290,971	—	395,095	—	395,095
Foreign exchange contracts	—	6,689	—	6,689	—	2,673	—	2,673
Embedded conversion option	—	—	—	—	—	349	—	349
Interest rate contracts	—	2,474	—	2,474	—	—	—	—
	$ 870	$ 429,720	$ 70,849	$ 501,439	$ 2,467	$ 632,373	$ 59,484	$ 694,324
Liabilities:								
Foreign exchange contracts	$ —	$ (1,814)	$ —	$ (1,814)	$ —	$ (5,957)	$ —	$ (5,957)
Interest rate contracts	—	(6,027)	—	(6,027)	—	(18,768)	—	(18,768)
Cash conversion option	—	(292,263)	—	(292,263)	—	(399,262)	—	(399,262)
Contingent consideration	—	—	(162,160)	(162,160)	—	—	(48,971)	(48,971)
	$ —	$ (300,104)	$ (162,160)	$ (462,264)	—	$ (423,987)	$ (48,971)	$ (472,958)

Refer to Note 10 "Investments" for the change in non-marketable equity securities with Level 3 inputs during the year ended December 31, 2019. For contingent consideration liabilities with Level 3 inputs, the following table summarizes the activity for the years ended December 31, 2019 and 2018:

(in thousands)	2019	2018
Balance at beginning of year	$ (48,971)	$ (11,539)
Additions from acquisitions	(132,422)	(53,962)
Payments	11,800	16,530
Gain included in earnings	7,433	—
Balance at end of year	$ (162,160)	$ (48,971)

As of December 31, 2019, of the total $162.2 million accrued for contingent consideration, $142.6 million is included in accrued and other current liabilities and $19.6 million is included in other long-term liabilities in the accompanying consolidated balance sheet. For the year ended December 31, 2019 the gain for the reduction in the fair value of contingent consideration related to unmet milestones of $7.4 million was recognized in restructuring, acquisition, integration and other, net in the accompanying consolidated statements of income. December 31, 2019, the $132.4 million of additions is primarily related to the asset acquisition of Formulatrix discussed in Note 5 "Acquisitions and Divestitures".

The carrying values of financial instruments, including cash and cash equivalents, accounts receivable, accounts payable and other accrued liabilities, approximate their fair values due to their short-term maturities. The estimated fair value of long-term debt as disclosed in Note 16 "Lines of Credit and Debt" was based on current interest rates for similar types of borrowings. The estimated fair values may not represent actual values of the financial instruments that could be realized as of the balance sheet date or that will be realized in the future. There were no fair value differences in the years ended December 31, 2019 and 2018 for nonfinancial assets or liabilities required to be measured at fair value on a nonrecurring basis other than the impairment of non-marketable investments not accounted for under the equity method as discussed in Note 10.

The table below presents the carrying values and the estimated fair values of financial instruments not presented in the tables above.

	As of December 31, 2019			As of December 31, 2018		
(in thousands)	Carrying Amount	Level 1	Level 2	Carrying Amount	Level 1	Level 2
Long-term debt including current portion:						
Cash convertible notes	$ 1,046,511	$ 1,296,334	$ —	$ 1,439,931	$ 1,794,000	$ —
U.S. Private placement	328,984	—	329,157	398,107	—	391,700
German private placement	330,857	—	334,371	336,168	—	337,768
	$ 1,706,352	$ 1,296,334	$ 663,528	$ 2,174,206	$ 1,794,000	$ 729,468

The fair values of the financial instruments presented in the tables above were determined as follows:

Cash Convertible Notes: Fair value is based on an estimation using available over-the-counter market information on the Cash Convertible Notes due in 2021, 2023 and 2024.

U.S. Private Placement: Fair value of the outstanding bonds is based on an estimation using the changes in the U.S. Treasury rates.

German Private Placement: Fair value is based on an estimation using changes in the euro swap rates.

The estimated fair values may not represent actual values of the financial instruments that could be realized as of the balance sheet date or that will be realized in the future. There were no adjustments in the twelve-month periods ended December 31, 2019 and 2018 for nonfinancial assets or liabilities required to be measured at fair value on a nonrecurring basis.

16. Lines of Credit and Debt

Our credit facilities available and undrawn at December 31, 2019 total €426.6 million (approximately $479.2 million). This includes a €400.0 million syndicated multi-currency revolving credit facility expiring December 2021 of which no amounts were utilized at December 31, 2019 or at December 31, 2018, and three other lines of credit amounting to €26.6 million with no expiration date, none of which were utilized as of December 31, 2019 or as of December 31, 2018. The €400.0 million facility can be utilized in Euro, British pounds sterling, Swiss franc or U.S. dollar and bears interest of 0.4% to 1.2% above three months EURIBOR, or LIBOR in relation to any loan not in euro, and is offered with interest periods of one, two, three or six months. The commitment fee is calculated based on 35% of the applicable margin. In 2019 and 2018, $1.0 million of commitment fees were paid, respectively. The revolving facility agreement contains certain financial and non-financial covenants, including but not limited to, restrictions on the encumbrance of assets and the maintenance of certain financial ratios. We were in compliance with these covenants at December 31, 2019. The credit facilities are for general corporate purposes.

During 2019, we repaid $506.4 million of long-term debt including $430.0 million for the amount due for the 2019 Cash Convertible Notes, $73.0 million for amounts due for the U.S. Private Placement and $3.4 million for a portion of the 2021 Cash Convertible Notes which was converted during the contingent conversion period as discussed further below.

At December 31, 2019 and 2018, total current long-term debt, net of debt issuance costs of $10.8 million and $14.2 million, respectively, consists of the following:

(in thousands)	2019	2018
0.375% Senior Unsecured Cash Convertible Notes due 2019	$ —	$ 427,445
0.875% Senior Unsecured Cash Convertible Notes due 2021	285,244	279,492
0.500% Senior Unsecured Cash Convertible Notes due 2023	347,995	335,201
1.000% Senior Unsecured Cash Convertible Notes due 2024	413,272	397,793
3.19% Series A Senior Notes due October 16, 2019	—	72,483
3.75% Series B Senior Notes due October 16, 2022	302,040	298,691
3.90% Series C Senior Notes due October 16, 2024	26,944	26,933
German Private Placement (Schuldschein)	330,857	336,168
Total long-term debt	$ 1,706,352	$ 2,174,206
Less current portion	285,244	503,116
Long-term portion	$ 1,421,108	$ 1,671,090

Beginning on January 1, 2020 and ending at the close of business on March 31, 2020, the 2021 Notes became convertible pursuant to the indenture as discussed below. The notes are all unsecured obligations that rank pari passu. Interest expense on long-term debt was $68.0 million, $61.2 million and $43.6 million for the years ended December 31, 2019, 2018 and 2017, respectively.

Future maturities (stated at the carrying values) of long-term debt as of December 31, 2019, are as follows:

Year ending December 31,	(in thousands)
2020	$ 285,244
2021	38,716
2022	471,432
2023	347,995
2024	546,716
thereafter	16,249
	$ 1,706,352

Cash Convertible Notes due 2019, 2021, 2023 and 2024

On March 19, 2014, we issued $730.0 million aggregate principal amount of Cash Convertible Senior Notes in two tranches consisting of $430.0 million due in 2019 (2019 Notes) and $300.0 million due in 2021 (2021 Notes). The aggregate net proceeds of the 2019 and 2021 Convertible Notes were $680.7 million, after payment of the net cost of the Call Spread Overlay described below and transaction costs. Additionally, we used $372.5 million of the net proceeds to repay other debt. During the first quarter of 2019, $430.0 million was paid at maturity (2019 Notes) and $3.4 million of the 2021 Notes was redeemed.

On September 13, 2017, we issued $400.0 million aggregate principal amount of Cash Convertible Senior Notes which is due in 2023 (2023 Notes). The net proceeds of the 2023 Notes were $365.6 million, after payment of the net cost of the Call Spread Overlay described below and transaction costs paid.

On November 13, 2018, we issued $500.0 million aggregate principal amount of Cash Convertible Senior Notes which is due in 2024 (2024 Notes). The net proceeds of the 2024 Notes were $468.9 million, after payment of the net cost of the Call Spread Overlay described below and transaction costs paid through December 31, 2019.

We refer to the 2019 Notes, 2021 Notes 2023 Notes and 2024 Notes, collectively as the "Cash Convertible Notes".

Interest on the Cash Convertible Notes is payable semi-annually in arrears and will mature on the maturity date unless repurchased or converted with their terms prior to such date. The interest rate and corresponding maturity of each Note are summarized in the table below. The Cash Convertible Notes are solely convertible into cash in whole, but not in part, at the option of noteholders under the circumstances described below and during the contingent conversion periods as shown in the table below.

Cash Convertible Notes	Annual Interest Rate	Date of Interest Payments	Maturity Date	Contingent Conversion Period	Conversion Rate per $200,000 Principal Amount
2021 Notes	0.875%	March 19 and September 19	March 19, 2021	From April 29, 2014 to September 18, 2020	7,063.1647
2023 Notes	0.500%	March 13 and September 13	September 13, 2023	From October 24, 2017 to March 13, 2023	4,829.7279
2024 Notes	1.000%	May 13 and November 13	November 13, 2024	From December 24, 2018 to August 2, 2024	4,360.3098

Additionally, conversion may occur at any time following a Contingent Conversion Period through the fifth business day immediately preceding the applicable maturity date.

Upon conversion, noteholders will receive an amount in cash equal to the Cash Settlement Amount, calculated as described below. The Cash Convertible Notes are not convertible into shares of our common stock or any other securities.

Noteholders may convert of the Cash Convertible Notes into cash at their option at any time during the Contingent Conversion Periods described above only under the following circumstances (Contingent Conversion Conditions):

- if the last reported sale price of our common stock for at least 20-consecutive trading days during a period of 30-consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price on each applicable trading day;
- if we undergo certain fundamental changes as defined in the agreement;
- during the five-business day period immediately after any 10 consecutive trading day period in which the quoted price for the 2021 Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of our common stock and the conversion rate on each such trading day;
- if parity event or trading price unavailability event, as the case maybe occurs for the 2023 Notes and 2024 Notes during the period of 10 days, including the first business day following the relevant trading price notification date.

- if we elect to distribute assets or property to all or substantially all of the holders of our common stock and those assets or other property have a value of more than 25% of the average daily volume-weighted average trading price of our common stock for the prior 20 consecutive trading days;
- if we elect to redeem the Cash Convertible Notes; or
- if we experience certain customary events of default, including defaults under certain other indebtedness until such event has been cured or waived or the payment of the Notes have been accelerated.

The Contingent Conversion Conditions in the 2021, 2023 and 2024 Notes noted above have been analyzed under ASC 815, Derivatives and Hedging, and, based on our analysis, we determined that each of the embedded features listed above are clearly and closely related to the 2021, 2023 and 2024 Notes (i.e., the host contracts). As a result, pursuant to the accounting provisions of ASC 815, Derivatives and Hedging, these features noted above are not required to be bifurcated as separate instruments.

Beginning on January 1, 2020 and ending at the close of business on March 31, 2020, the 2021 Notes became convertible pursuant to the indenture. The 2021 Notes became convertible pursuant to Section 12.01(b)(iv) of the indenture because the arithmetic mean of the last reported sale prices of our common stock, in each trading day in at least one 20-consecutive trading day period during the 30-consecutive trading day period ending on the last trading day of the preceding fiscal quarter, was greater than 130% of the conversion price in effect on such last trading day.

No Contingent Conversion Conditions were triggered for the 2023 Notes and 2024 Notes as of December 31, 2019.

Upon conversion, holders are entitled to a cash payment (Cash Settlement Amount) equal to the average of the conversion rate multiplied by the daily volume-weighted average trading price for our common stock over a 50-day period. The conversion rate is subject to adjustment in certain instances but will not be adjusted for any accrued and unpaid interest. In addition, following the occurrence of certain corporate events that may occur prior to the applicable maturity date, we may be required to pay a cash make-whole premium by increasing the conversion rate for any holder who elects to convert Cash Convertible Notes in connection with the occurrence of such a corporate event.

We may redeem the Cash Convertible Notes in their entirety at a price equal to 100% of the principal amount of the applicable Cash Convertible Notes plus accrued interest at any time when 20% or less of the aggregate principal amount of the applicable Cash Convertible Notes originally issued remain outstanding.

Because the Cash Convertible Notes contain an embedded cash conversion option, we have determined that the embedded cash conversion option is a derivative financial instrument, which is required to be separated from the Cash Convertible Notes and accounted for separately as a derivative liability, with changes in fair value reported in our consolidated statements of income until the cash conversion option transaction settles or expires. The initial fair value liability of the embedded cash conversion option for the 2019 and 2021 Notes was $51.2 million and $54.0 million, respectively, $74.5 million for the 2023 Notes, and $98.5 million for the 2024 Notes, which simultaneously reduced the carrying value of the Cash Convertible Notes (effectively an original issuance discount). For further discussion of the derivative financial instruments relating to the Cash Convertible Notes, refer to Note 14 "Derivatives and Hedging".

As noted above, the reduced carrying value on the Cash Convertible Notes resulted in a debt discount that is amortized to the principal amount through the recognition of non-cash interest expense using the effective interest method over the expected life of the debt, which is five and seven for the 2019 Notes and 2021 Notes, and six years for the 2023 Notes and 2024 Notes, respectively. This resulted in our recognition of interest expense on the Cash Convertible Notes at an effective rate approximating what we would have incurred had nonconvertible debt with otherwise similar terms been issued. The effective interest rate of the 2019 Notes, 2021 Notes, 2023 Notes and 2024 Notes is 2.937%, 3.809%, 3.997% and 4.782% respectively, which is imputed based on the amortization of the fair value of the embedded cash conversion option over the remaining term of the Cash Convertible Notes.

In connection with the issuance of the 2019 and 2021 Cash Convertible Notes, we incurred approximately $13.1 million in transaction costs. We incurred approximately $6.2 million in transaction costs for the 2023 Cash Convertible Notes. For 2024 Cash Convertible Notes, we incurred $5.7 million transaction costs of which $0.2 million was accrued as of December 31, 2019. Such costs have been allocated to the Cash Convertible Notes and deferred and are being amortized to interest expense over the terms of the Cash Convertible Notes using the effective interest method.

Interest expense related to the Cash Convertible Notes was comprised of the following:

	Year-Ended December 31	
(in thousands)	2019	2018
Coupon interest	$ 9,954	$ 6,890
Amortization of original issuance discount	36,966	32,114
Amortization of debt issuance costs	3,014	3,485
Total interest expense related to the Cash Convertible Notes	$ 49,934	$ 42,489

Cash Convertible Notes Call Spread Overlay

Concurrent with the issuance of the Cash Convertible Notes, we entered into privately negotiated hedge transactions (Call Options) with, and issued warrants to purchase shares of our common stock (Warrants) to, certain financial institutions. We refer to the Call Options and Warrants collectively as the "Call Spread Overlay". The Call Options are intended to offset any cash payments payable by us in excess of the principal amount due upon any conversion of the Cash Convertible Notes. During 2014, we used $105.2 million of the proceeds from the issuance of the 2019 and 2021 Cash Convertible Notes to pay for the Call Options, and simultaneously received $69.4 million from the sale of the Warrants, for a net cash outlay of $35.8 million for the Call Spread Overlay.

During 2017, we used $73.7 million of the proceeds from the from the issuance of the 2023 Cash Convertible Notes to pay for the premium for the Call Option, and simultaneously received $45.3 million from the sale of Warrants, for a net cash outlay of $28.3 million for the Call Spread Overlay. Issuance costs incurred in connection with the Warrant and the Call Option were $0.3 million and $0.1 million respectively.

In November 2018, we used $97.3 million of the proceeds from the from the issuance of the 2024 Cash Convertible Notes to pay for the premium for the Call Option, and simultaneously received $72.4 million from the sale of Warrants, for a net cash outlay of $24.9 million for the Call Spread Overlay. Issuance costs incurred in connection with the Warrant and the Call Option were $0.5 million and $0.5 million respectively, of which $48.0 thousand was accrued as of December 31, 2019.

The Call Options are derivative financial instruments and are discussed further in Note 14 "Derivatives and Hedging". The Warrants are equity instruments and are further discussed in Note 18 "Equity".

Aside from the initial payment of a premium of $105.2 million (2019 and 2021 Notes), $73.7 million (2023 Notes), and $97.3 million (2024 Notes) for the Call Option, we will not be required to make any cash payments under the Call Options, and will be entitled to receive an amount of cash, generally equal to the amount by which the market price per share of our common stock exceeds the exercise price of the Call Options during the relevant valuation period. The exercise price under the Call Options is initially equal to the conversion price of the Cash Convertible Notes.

During the first quarter of 2019, we received $133.2 million in cash upon the exercise of the call options in connection with the repayment of the 2019 Notes. In the same transaction, we paid $132.7 million for the intrinsic value of the 2019 Notes' embedded cash conversion option. Not all of the 2019 Note holders tendered the required conversion notice, and as a result the net effect of the cash paid and received of $0.5 million was recognized as a gain in other income, net.

In connection with the early conversion of a portion of the 2021 Notes during the first quarter of 2019, we received $0.4 million in cash and recorded an other receivable of $0.7 million upon the exercise of the related call options. In the same transaction, we paid $1.1 million for the intrinsic value of the 2021 Notes' embedded cash conversion option. During the second quarter of 2019, we collected the $0.7 million receivable balance and received $0.4 million in cash upon the exercise of additional call options. As a result of these early conversions, we have recognized a $0.4 million gain in other income, net.

The Warrants that were issued with our Cash Convertible Notes, could have a dilutive effect to the extent that the price of our common stock exceeds the applicable strike price of the Warrants. For each Warrant that is exercised, we will deliver to the holder a number of shares of our common stock equal to the amount by which the settlement price exceeds the exercise price, plus cash in lieu of any fractional shares. We will not receive any proceeds if the Warrants are exercised.

U.S. Private Placement

In October 2012, we completed a private placement through the issuance of new senior unsecured notes at a total amount of $400.0 million with a weighted average interest rate of 3.66% (settled on October 16, 2012). The notes were issued in three series: (1) $73.0 million 7-year term due and paid in 2019 (3.19%); (2) $300.0 million 10-year term due in 2022 (3.75%); and (3) $27.0 million 12-year term due in 2024 (3.90%). We paid $2.1 million in debt issuance costs which will be amortized through interest expense using the effective interest method over the lifetime of the notes. The note purchase agreement contains certain financial and non-financial covenants, including but not limited to, restrictions on priority indebtedness and the maintenance of certain financial ratios. We were in compliance with these covenants at December 31, 2019. Based on an estimation using the changes in the U.S. Treasury rates, the Level 2 fair value of these senior notes as of December 31, 2019 and December 31, 2018 was approximately $329.2 million and $391.7 million, respectively. During 2014, we entered into interest rate swaps, which effectively fixed the fair value of $200.0 million of this debt, which was reduced to $127.0 million following the 2019 $73.0 million repayment. These interest rate swaps qualify for hedge accounting as fair value hedges as described in Note 14 "Derivatives and Hedging".

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German Private Placement (Schuldschein)

In 2017, we completed a German private placement bond ("Schuldschein") which was issued in several tranches totaling $331.1 million due in various periods through 2027. The Schuldschein consists of U.S. dollar and Euro denominated tranches. The Euro tranches are designated as a foreign currency non-derivative hedging instrument that qualifies as a net investment hedge as described in Note 14 "Derivatives and Hedging". Based on the spot rate method, the change in the carrying value of the Euro denominated tranches attributed to the net investment hedge as of December 31, 2019 totaled $0.4 million of unrealized loss and is recorded in equity. We paid $1.2 million in debt issuance costs which are being amortized through interest expense over the lifetime of the notes. A summary of the tranches as of December 31, 2019 and December 31, 2018 is as follows:

				Carrying Value (in thousands) as of	
Currency	Notional Amount	Interest Rate	Maturity	December 31, 2019	December 31, 2018
EUR	€11.5 million	Fixed 0.4%	March 2021	$ 12,905	$ 13,143
EUR	€23.0 million	Floating EURIBOR + 0.4%	March 2021	25,811	26,286
EUR	€21.5 million	Fixed 0.68%	October 2022	24,112	24,561
EUR	€64.5 million	Floating EURIBOR + 0.5%	October 2022	72,335	73,684
EUR	$45.0 million	Floating LIBOR + 1.2%	October 2022	44,919	44,891
EUR	€25.0 million	Floating EURIBOR + 0.5%	October 2022	28,026	28,543
EUR	€64.0 million	Fixed 1.09%	June 2024	71,747	73,097
EUR	€31.0 million	Floating EURIBOR + 0.7%	June 2024	34,753	35,406
EUR	€14.5 million	Fixed 1.61%	June 2027	16,249	16,557
EUR				$ 330,857	$ 336,168

The financial markets regulators in the United Kingdom and the Eurozone have passed regulations that will become effective in 2021 under which LIBOR and EURIBOR in their current form will not be compliant. Market participants and regulators are working on establishing new interest rate benchmarks. While the outcome of this work is not clear yet, the Schuldschein our syndicated loan facility, and our interest rate swaps continue to make reference to the current LIBOR and EURIBOR benchmark rates. These agreements contain language for the determination of interest rates in case the benchmark rate is not available. However, it appears likely that the agreements will need to be adjusted in line with still to be developed market practice once new benchmark rates become available.

17. Income Taxes

(Loss) income before income taxes for the years ended December 31, 2019, 2018 and 2017 consisted of:

(in thousands)	2019	2018	2017
Pretax income in The Netherlands	$ 17,455	$ (1,675)	$ 42,220
Pretax (loss) income from foreign operations	(95,231)	227,412	72,155
	$ (77,776)	$ 225,737	$ 114,375

Income tax (benefit) expense for the years ended December 31, 2019, 2018 and 2017 are as follows:

(in thousands)	2019	2018	2017
Current—The Netherlands	$ 5,670	$ 5,794	$ 3,430
—Foreign	13,371	52,835	10,375
	19,041	58,629	13,805
Deferred—The Netherlands	4,177	2,551	151
—Foreign	(59,539)	(25,823)	60,025
	(55,362)	(23,272)	60,176
Total income tax (benefit) expense	$ (36,321)	$ 35,357	$ 73,981

The Netherlands statutory income tax rate was 25% for the years ended December 31, 2019, 2018 and 2017. Income from foreign subsidiaries is generally taxed at the statutory income tax rates applicable in the respective countries of domicile. The principal items comprising the differences between income taxes computed at The Netherlands statutory rate and our reported income taxes and effective tax rate for the years ended December 31, 2019, 2018 and 2017 are as follows:

	2019		2018		2017	
(in thousands)	Amount	Percent	Amount	Percent	Amount	Percent
Income taxes at The Netherlands statutory rate	$ (19,444)	25.0 %	$ 56,434	25.0 %	$ 28,594	25.0 %
Taxation of foreign operations, net[1]	(25,720)	33.1	(33,994)	(15.1)	(38,635)	(33.8)
Tax impact from intangible property transfer	(21,122)	27.2	—	—	—	—
Unrecognized tax benefits[2]	10,962	(14.1)	13,570	6.0	23,189	20.3
Tax impact from nondeductible items	7,986	(10.3)	2,949	1.3	2,645	2.3
Excess tax benefit related to share-based compensation	(3,989)	5.1	(4,740)	(2.1)	(5,237)	(4.6)
Government incentives and other deductions[4]	(7,516)	9.7	(2,892)	(1.2)	(6,519)	(5.7)
Changes in tax laws and rates[3]	331	(0.4)	1,907	0.8	12,958	11.3
Other items, net	1,306	(1.7)	(1,170)	(0.5)	(5,658)	(4.9)
Valuation allowance[3]	20,885	(26.9)	3,293	1.5	62,644	54.8
Total income tax (benefit) expense	$ (36,321)	46.7 %	$ 35,357	15.7 %	$ 73,981	64.7 %

(1) Our effective tax rate reflects the benefit of our global operations where certain income or loss is taxed at rates higher or lower than The Netherlands' statutory rate of 25% as well as the benefit of some income being partially exempt from income taxes due to various intercompany operating and financing activities. The most significant tax benefits from these foreign operating and financing activities are attributable to subsidiaries in Germany, Singapore, Switzerland, Ireland, Dubai, and Luxembourg. These foreign tax benefits are due to a combination of favorable tax laws, regulations, rulings, and exemptions in these jurisdictions.

(2) During 2019, we reassessed accruals for tax contingencies, primarily related to ongoing income tax audits.

(3) The Netherlands' top statutory corporate income tax rate will be reduced to 21.7% from 25% beginning in 2021. Valuation allowance related to U.S. disallowed interest totaled $12.7 million in 2019 and $60.5 million in 2017.

(4) Government incentives include favorable tax regulations in the U.S., Spain and the U.K. relating to research and development expense and other government incentives.

We conduct business globally and, as a result, file numerous consolidated and separate income tax returns in The Netherlands, Germany, and the U.S. federal jurisdiction, as well as in various other state and foreign jurisdictions. In the normal course of business, we are subject to examination by taxing authorities throughout the world. Tax years in The Netherlands are potentially open back to 2007 for income tax examinations by tax authorities. The German group is open to audit for the tax years starting in 2014 and in 2019, the German tax authority commenced an audit for the 2014-2016 tax years. The U.S. consolidated group is subject to federal and most state income tax examinations by tax authorities beginning with the year ending December 31, 2016 through the current period. Our other subsidiaries, with few exceptions, are no longer subject to income tax examinations by tax authorities for years before 2015.

Changes in the amount of unrecognized tax benefits for the years ended December 31, 2019, 2018, and 2017 are as follows:

(in thousands)	2019	2018	2017
Balance at beginning of year	$ 55,780	$ 44,033	$ 18,294
Additions based on tax positions related to the current year	5,770	3,359	12,212
Additions for tax positions of prior years	14,532	11,984	9,933
Decrease for tax position of prior years	(9,073)	—	—
Decrease related to settlements	(7,605)	—	—
Decrease due to lapse of statute of limitations	(409)	(1,238)	—
(Decrease) increase from currency translation	(993)	(2,358)	3,594
Balance at end of year	$ 58,002	$ 55,780	$ 44,033

At December 31, 2019 and 2018, our net unrecognized tax benefits totaled approximately $58.0 million and $55.8 million, respectively, which, if recognized, would favorably affect our effective tax rate in any future period. It is reasonably possible that approximately $31.4 million of the unrecognized tax benefits may be released or utilized during the next 12 months due to lapse of statute of limitations or settlements with tax authorities; however, various events could cause our current expectations to change in the future. The above unrecognized tax benefits, if ever recognized in the financial statements, would be recorded in the statements of income as part of the income tax expense.

Our policy is to recognize interest accrued related to an underpayment of income taxes in interest expense and penalties within income tax expense. For the years ended December 31, 2019, 2018 and 2017, we recognized a net expense for interest and penalties of $1.6 million, $1.1 million and $1.5 million, respectively. At December 31, 2019 and 2018, we have accrued interest of $2.5 million and $4.1 million, respectively, which are not included in the table above.

We have recorded net deferred tax assets of $33.1 million at December 31, 2019 and net deferred tax liabilities of $20.5 million at December 31, 2018, respectively. The components of the net deferred tax asset and liability at December 31, 2019 and 2018 are as follows:

	2019		2018	
(in thousands)	Deferred Tax Asset	Deferred Tax Liability	Deferred Tax Asset	Deferred Tax Liability
Net operating loss and tax credit carryforward	$ 50,274	$ —	$ 27,293	$ —
Accrued and other liabilities	17,977	—	15,480	—
Inventory	4,726	(1,439)	3,978	(1,725)
Unrealized gain (loss) on investments	—	(4,973)	3,280	(4,855)
Property, plant and equipment	5,297	(20,332)	3,604	(25,448)
Intangible assets	1,078	(26,294)	1,721	(63,990)
Share-based compensation	13,787	—	17,998	—
Disallowed interest carryforwards	73,690	—	60,458	—
Convertible notes	7,104	—	8,102	—
Other	5,998	(6,174)	5,854	(3,614)
	179,931	(59,212)	147,768	(99,632)
Valuation allowance	(87,619)	—	(68,651)	—
	$ 92,312	$ (59,212)	$ 79,117	$ (99,632)
Net deferred tax assets (liabilities)		$ 33,100		$ (20,515)

At December 31, 2019, we had $682.5 million in total net operating loss (NOL) carryforwards which included $394.0 million for Germany, $133.8 million for the U.S., $52.4 million for The Netherlands and $102.3 million for other foreign jurisdictions. Of the total $394.0 million NOL in Germany, there is no expiration and expect to be fully utilized in future years. The entire NOL in the U.S. is subject to limitations under Section 382 of the U.S. Internal Revenue Code. The NOLs in the U.S. will expire between 2024 through 2034. At December 31, 2019, we have $52.4 million of Netherlands net operating loss carryforwards before valuation allowance, which will expire in the year 2027. Of the total $102.3 million foreign NOL carryforwards, $25.4 million will expire between 2020 and 2028 while the rest of the NOLs can be carried forward indefinitely. At December 31, 2019, we had $280.0 million of disallowed interest carryforwards which can be carried forward indefinitely. At December 31, 2019, tax credits total $1.3 million which expire between 2030 and 2039.

For the years ended December 31, 2019, 2018 and 2017, the changes in the valuation allowance charged to income tax expense totaled $19.0 million, $0.8 million and $62.3 million, respectively. The valuation allowance relates to disallowed interest carryforwards and net operating loss carryforwards. The Company can only recognize a deferred tax asset to the extent it is "more likely than not" that these assets will be realized. Judgments around realizability depend on the availability and weight of both positive and negative evidence.

As of December 31, 2019, a deferred tax liability has not been recognized for residual income taxes in The Netherlands on the undistributed earnings of the majority of our foreign subsidiaries as these earnings are considered to be either indefinitely reinvested or can be repatriated tax free under the Dutch participation exemption. The indefinitely reinvested earnings retained of our subsidiaries that would be subject to tax if distributed amounted to $699.0 million at December 31, 2019. Estimating the amount of the unrecognized deferred tax liability on indefinitely reinvested foreign earnings is not practicable. Should the earnings be remitted as dividends, we may be subject to taxes including withholding tax. We have $26.4 million of undistributed earnings that we do not consider indefinitely reinvested and have recorded a deferred tax liability at December 31, 2019 and December 31, 2018, of $1.5 million and $0.9 million, respectively.

18. Equity

Shares

The authorized classes of our shares consist of Common Shares (410 million authorized), Preference Shares (450 million authorized) and Financing Preference Shares (40 million authorized). All classes of shares have a par value of €0.01. No Financing Preference Shares or Preference Shares have been issued. Like all shareholders' equity accounts, common shares are translated to U.S. dollars at the foreign exchange rates in effect when the shares are issued.

Issuance and Conversion of Warrants

In connection with the issuance of the Cash Convertible Notes as described in Note 16 "Lines of Credit and Debt", we issued Warrants as summarized in the table below. The number of warrants and exercise prices are subject to customary adjustments under certain circumstances. The proceeds, net of issuance costs, from the sale of the Warrants are included as additional paid in capital in the accompanying consolidated balance sheets.

Cash convertible notes	Issued on	Number of share warrants (in millions)	Exercise price per share	Proceeds from issuance of warrants, net of issuance costs (in millions)	Warrants expire over a period of 50 trading days beginning on
2019	March 19, 2014	15.2	$32.0560	$40.6	December 27, 2018
2021	March 19, 2014	10.6	$32.0560	$28.3	December 29, 2020
2023	September 13, 2017	9.7	$50.9664	$45.3	June 26, 2023
2024	November 13, 2018	10.9	$52.1639	$72.4	August 27, 2024

The Warrants are exercisable only upon expiration. For each Warrant that is exercised, we will deliver to the holder a number of shares of our common stock equal to the amount by which the settlement price exceeds the exercise price, divided by the settlement price, plus cash in lieu of any fractional shares. The Warrants could separately have a dilutive effect on shares of our common stock to the extent that the market value per share of our common stock exceeds the applicable exercise price of the Warrants (as measured under the terms of the Warrants).

During 2019, 2.1 million common shares were issued in connection with the conversion of the 15.2 million warrants related to the 2019 Notes which resulted in a $31.1 million decrease to additional paid in capital, a $37.7 million decrease in retained earnings, a decrease of 68.8 million in treasury shares and an approximately $4 thousand cash payment for fractional shares.

Share Repurchase Programs

On May 6, 2019, we announced our sixth share repurchase program of up to $100 million of our common shares. During 2019, no shares were repurchased under this program.

On January 31, 2018, we announced our fifth share repurchase program of up to $200 million of our common shares. During 2018, we repurchased 2.9 million QIAGEN shares for $104.7 million (including transaction costs). During 2019, we repurchased 2.0 million QIAGEN shares for $74.5 million (including transaction costs), bringing the total shares repurchased under this program to 4.9 million for $179.1 million (including transaction costs).

On April 27, 2016, we announced the launch of our fourth $100 million share repurchase program. During 2017, 1.9 million QIAGEN shares were repurchased for $61.0 million (including transaction costs).

The cost of repurchased shares is included in treasury stock and reported as a reduction in total equity when a repurchase occurs. Repurchased shares will be held in treasury in order to satisfy various obligations, which include exchangeable debt instruments, warrants and employee share-based remuneration plans.

Synthetic Share Repurchase

In August 2016, we announced our plan to return approximately $250.0 million to shareholders through a synthetic share repurchase program that combines a direct capital repayment with a reverse stock split. The synthetic share repurchase was implemented through a series of amendments to our Articles of Association which were approved by our shareholders at an Extraordinary General Meeting (EGM) held on October 26, 2016. The first amendment involved an increase in share capital by an increase in the nominal value per common share from EUR 0.01 to EUR 1.04 and a corresponding reduction in additional paid in capital. The second amendment involved a reduction in stock whereby 27 existing common shares with a nominal value of EUR 1.04 each were consolidated into 26 new common shares with a nominal value of EUR 1.08 each. The third amendment was a reduction of the nominal value per common share from EUR 1.08 to EUR 0.01. As a result of these amendments, which in substance constitute a synthetic share buyback, $243.9 million was repaid to our shareholders and the outstanding number of common shares was reduced by 8.9 million, or 3.7%. The capital repayment program was completed in January 2017. Expenses incurred related to the capital repayment and share consolidation amounted to $0.5 million and were charged to equity.

Accumulated Other Comprehensive Loss

The following table is a summary of the components of accumulated other comprehensive loss as of December 31, 2019 and 2018:

(in thousands)	2019	2018
Net unrealized loss on hedging contracts, net of tax	$ (2,289)	$ (15,453)
Net unrealized loss on pension, net of tax	(561)	(124)
Foreign currency effects from intercompany long-term investment transactions, net of tax of $9.7 million and $9.3 million in 2019 and 2018, respectively	(22,587)	(21,662)
Foreign currency translation adjustments	(284,182)	(273,405)
Accumulated other comprehensive loss	$ (309,619)	$ (310,644)

19. Earnings per Common Share

We present basic and diluted earnings per share. Basic earnings per share is calculated by dividing the net (loss) income by the weighted average number of common shares outstanding. Diluted earnings per share reflect the potential dilution that would occur if all "in the money" securities to issue common shares were exercised. Due to the net loss for the year ended December 31, 2019, stock options and restricted stock units representing approximately 3.9 million weighted-average shares of common stock and warrants representing 1.7 million shares of common stock were excluded from the computation of diluted net loss because the impact would have been antidilutive.

The following schedule summarizes the information used to compute earnings per common share:

	Years ended December 31,		
(in thousands, except per share data)	2019	2018	2017
Net (loss) income	$ (41,455)	$ 190,380	$ 40,394
Weighted average number of common shares used to compute basic net income per common share	226,777	226,640	228,074
Dilutive effect of stock options and restrictive stock units	—	4,613	4,760
Dilutive effect of outstanding warrants	—	2,203	175
Weighted average number of common shares used to compute diluted net income per common share	226,777	233,456	233,009
Outstanding options and awards having no dilutive effect, not included in above calculation	107	272	52
Outstanding warrants having no dilutive effect, not included in above calculation	32,938	35,939	30,434
Basic (loss) earnings per common share	$ (0.18)	$ 0.84	$ 0.18
Diluted (loss) earnings per common share	$ (0.18)	$ 0.82	$ 0.17

20. Commitments and Contingencies

Licensing and Purchase Commitments

We have licensing agreements with companies, universities and individuals, some of which require certain up-front payments. Royalty payments are required on net product sales ranging from 0.45 percent to 25 percent of covered products or based on quantities sold. Several of these agreements have minimum royalty requirements. The accompanying consolidated balance sheets include accrued royalties relating to these agreements in the amount of $5.5 million at December 31, 2019 and 2018. Royalty expense relating to these agreements amounted to $13.5 million, $14.0 million, and $16.8 million for the years ended December 31, 2019, 2018 and 2017, respectively. Royalty expense is primarily recorded in cost of sales, with a small portion recorded as research and development expense depending on the use of the technology under license. Some of these agreements also have minimum raw material purchase requirements and requirements to perform specific types of research.

At December 31, 2019, we had commitments to purchase goods or services, and for future license and royalty payments. They are as follows:

(in thousands)	Purchase Commitments	License & Royalty Commitments
2020	$ 126,121	$ 11,434
2021	35,915	9,012
2022	26,337	6,507
2023	3,223	4,382
2024	3,000	1,823
Thereafter	—	4,297
	$ 194,596	$ 37,455

As of December 31, 2019, future license payments of $10.0 million and $14.5 million are included in accrued and other current liabilities and other long-term liabilities, respectively.

Contingent Consideration Commitments

Pursuant to the purchase agreements for certain acquisitions and other contractual arrangements, we could be required to make additional contingent cash payments totaling up to $179.4 million based on the achievement of certain revenue and operating results milestones as follows:

(in thousands)	Contingent Cash Payments
2020	$ 152,750
2021	11,800
2022	5,900
2024	5,900
Anytime 12-month period from now until 2028	3,000
	$ 179,350

Of the $179.4 million total contingent obligation as discussed further in Note 15 "Financial Instruments and Fair Value Measurements", we have assessed the fair value at December 31, 2019 to be $162.2 million, of which $142.6 million is included in accrued and other current liabilities and $19.6 million is included in other long-term liabilities in the accompanying consolidated balance sheet.

Employment Agreements

Certain of our employment contracts contain provisions which guarantee the payments of certain amounts in the event of a change in control, as defined in the agreements, or if the executive is terminated for reasons other than cause, as defined in the agreements. At December 31, 2019, the commitment under these agreements totaled $6.2 million.

Contingencies

In the ordinary course of business, we provide a warranty to customers that our products are free of defects and will conform to published specifications. Generally, the applicable product warranty period is one year from the date of delivery of the product to the customer or of site acceptance, if required. Additionally, we typically provide limited warranties with respect to our services. From time to time, we also make other warranties to customers, including warranties that our products are manufactured in accordance with applicable laws and not in violation of third-party rights. We provide for estimated warranty costs at the time of the product sale. We believe our warranty reserves as of December 31, 2019 and 2018 appropriately reflect the estimated cost of such warranty obligations. The changes in the carrying amount of warranty obligations for the years ended December 31, 2019 and 2018 are as follows:

(in thousands)	2019	2018
Balance at beginning of year	$ 2,848	$ 3,051
Provision charged to cost of sales	3,229	2,892
Usage	(2,921)	(2,760)
Adjustments to previously provided warranties, net	(1)	(243)
Currency translation	(14)	(92)
Balance at end of year	$ 3,141	$ 2,848

Litigation

From time to time, we may be party to legal proceedings incidental to our business. As of December 31, 2019, certain claims, suits or legal proceedings arising out of the normal course of business have been filed or were pending against QIAGEN or our subsidiaries. These matters have arisen in the ordinary course and conduct of business, as well as through acquisition. Although it is not possible to predict the outcome of such litigation, we assess the degree of probability and evaluate the reasonably possible losses that we could incur as a result of these matters. We accrue for any estimated loss when it is probable that a liability has been incurred and the amount of probable loss can be estimated.

Litigation accruals recorded in accrued and other current liabilities totaled $0.8 million and $6.0 million as of December 31, 2019 and 2018, respectively. The estimated amount of a range of possible losses is between $0.3 million and $2.2 million. During the year ended December 31, 2019, payments of $5.4 million related to previous matters were made. Based on the facts known to QIAGEN and after consultation with legal counsel, management believes that such litigation will not have a material adverse effect on our financial position or results of operations above the amounts accrued. However, the outcome of these matters is ultimately uncertain, thus any settlements or judgments against us in excess of management's expectations could have a material adverse effect on our financial position, results of operations or cash flows.

For the year ended December 31, 2017, we had settlement amounts related to various acquisition-related litigation matters totaling $49.2 million, primarily related to PCR-based biomarker disputes and patent litigation, which were settled during 2017 of which $45.3 million was recorded to restructuring, acquisition, integration and other, net and $3.9 million was recorded as a license right. $44.8 million of the settlement amounts were paid during 2017 and as of December 31, 2017, $4.4 million was accrued in accrued and other current liabilities.

21. Segment Information

We operate as one operating segment in accordance with the Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) Topic 280, Segment Reporting. We have a common basis of organization and our products and services are offered globally. Considering the acquisitions made during 2019 and our continued restructuring and streamlining of the growing organization, our chief operating decision maker (CODM) continues to make decisions with regards to business operations and resource allocation based on evaluations of QIAGEN as a whole. Accordingly, we operate and make decisions as one business segment. Product category and geographic information follows below.

Product Category Information

Net sales for the product categories are attributed based on those revenues related to sample and assay products and similarly related revenues including bioinformatics solutions, and revenues derived from instrumentation sales. Refer to Note 4 "Revenue" for disaggregation of revenue based on product categories and customer class.

Geographical Information

Net sales are attributed to countries based on the location of the customer. QIAGEN operates manufacturing facilities in Germany, China, and the United States that supply products to customers as well as QIAGEN subsidiaries in other countries. The intersegment portions of such net sales are excluded to derive consolidated net sales. No single customer represents more than ten percent of consolidated net sales. Our country of domicile is the Netherlands, which reported net sales of $15.8 million, $15.9 million and $15.0 million for the years ended 2019, 2018 and 2017, respectively, and these amounts are included in the line item Europe, Middle East and Africa as shown in the table below.

(in thousands)	2019	2018	2017
Net Sales			
Americas:			
United States	$ 663,869	$ 632,660	$ 579,906
Other Americas	58,121	60,359	73,478
Total Americas	721,990	693,019	653,384
Europe, Middle East and Africa	487,476	490,301	462,980
Asia Pacific, Japan and Rest of World	316,958	318,528	301,172
Total	$ 1,526,424	$ 1,501,848	$ 1,417,536

Long-lived assets include property, plant and equipment. The Netherlands, which is included in the balances for Europe, reported long-lived assets of $1.3 million and $1.8 million as of December 31, 2019 and 2018, respectively.

(in thousands)	2019	2018
Long-lived assets		
Americas:		
United States	$ 147,027	$ 152,381
Other Americas	3,507	3,748
Total Americas	150,534	156,129
Europe, Middle East and Africa:		
Germany	229,225	284,601
Other Europe, Middle East and Africa	49,004	50,051
Total Europe, Middle East and Africa	278,229	334,652
Asia Pacific and Japan	26,480	20,878
Total	$ 455,243	$ 511,659

22. Share-Based Compensation

We adopted the QIAGEN N.V. Amended and Restated 2005 Stock Plan (the 2005 Plan) in 2005 and the QIAGEN N.V. 2014 Stock Plan (the 2014 Plan) in 2014. The 2005 Plan expired by its terms in April 2015 and no further awards will be granted under the 2005 Plan. The plans allow for the granting of stock rights and incentive stock options, as well as non-qualified options, stock grants and stock-based awards, generally with terms of up to 5 or 10 years, subject to earlier termination in certain situations. The vesting and exercisability of certain stock rights will be accelerated in the event of a Change of Control, as defined in the plans. All option grants have been at the market value on the grant date or at a premium above the closing market price on the grant date. We issue Treasury Shares to satisfy option exercises and award releases and had approximately 15.7 million Common Shares reserved and available for issuance under the 2005 and 2014 Plans at December 31, 2019.

Stock Options

We have not granted stock options since 2013. A summary of the status of employee stock options as of December 31, 2019 and changes during the year then ended is presented below:

All Employee Options	Number of Shares (in thousands)	Weighted Average Exercise Price	Weighted Average Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding at January 1, 2019	898	$ 20.04		
Exercised	(104)	$ 19.95		
Expired	(2)	$ 17.51		
Outstanding at December 31, 2019	792	$ 20.06	1.78	$ 10,891
Vested at December 31, 2019	792	$ 20.06	1.78	$ 10,891
Vested and expected to vest at December 31, 2019	792	$ 20.06	1.78	$ 10,891

The total intrinsic value of options exercised during the years ended December 31, 2019, 2018 and 2017 was $2.0 million, $5.0 million and $3.3 million, respectively. The actual tax benefit for the tax deductions from option exercises totaled $0.5 million, $0.8 million, and $0.7 million during the years ended December 31, 2019, 2018 and 2017, respectively. At December 31, 2019, there was no unrecognized share-based compensation expense related to employee stock option awards.

At December 31, 2019, 2018 and 2017, 0.8 million, 0.9 million and 1.1 million options were exercisable at a weighted average price of $20.06, $20.04 and $19.54 per share, respectively. The options outstanding at December 31, 2019 expire in various years through 2023.

Stock Units

Stock units represent rights to receive Common Shares at a future date and include restricted stock units which are subject to time-vesting only and performance stock units which include performance conditions in addition to time-vesting. The final number of performance stock units earned is based on the performance achievement which for some grants can reach up to 120% of the granted shares. There is no exercise price and the fair market value at the time of the grant is recognized over the requisite vesting period, generally up to 5 or 10 years. The fair market value is determined based on the number of stock units granted and the market value of our shares on the grant date. Pre-vesting forfeitures were estimated to be approximately 6.2%. At December 31, 2019, there was $60.1 million remaining in unrecognized compensation cost including estimated forfeitures related to these awards, which is expected to be recognized over a weighted average period of 2.57 years. The weighted average grant date fair value of stock units granted during the years ended December 31, 2019, 2018 and 2017 was $37.28, $35.37 and $31.12, respectively. The total fair value of stock units that vested during the years ended December 31, 2019, 2018 and 2017 was $123.9 million, $54.3 million and $69.2 million, respectively.

A summary of stock units as of December 31, 2019 and changes during the year are presented below:

Stock Units	Stock Units (in thousands)	Weighted Average Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding at January 1, 2019	8,343		
Granted	1,618		
Vested	(3,517)		
Forfeited	(1,261)		
Outstanding at December 31, 2019	5,183	2.57	$ 175,199
Vested and expected to vest at December 31, 2019	3,972	2.26	$ 134,254

Compensation Expense

Share-based compensation expense before taxes for the years ended December 31, 2019, 2018 and 2017 totaled approximately $65.9 million, $40.1 million and $34.4 million, respectively, as shown in the table below.

Compensation Expense (in thousands)	2019	2018	2017
Cost of sales	$ 2,493	$ 2,879	$ 2,641
Research and development	5,810	6,457	6,102
Sales and marketing	7,947	9,372	6,820
General and administrative	23,706	21,405	19,614
Restructuring, acquisition, integration and other, net	25,938	—	(735)
Share-based compensation expense	65,894	40,113	34,442
Less: income tax benefit (1)	12,153	8,277	7,407
Net share-based compensation expense	$ 53,741	$ 31,836	$ 27,035

(1) Does not include the excess tax benefit realized for the tax deductions of the share-based payment arrangements which totaled $4.0 million, $4.7 million and $5.2 million, respectively, for the years ended December 31, 2019, 2018 and 2017.

Share-based compensation expense includes amounts related to the restructuring programs discussed in Note 6 "Restructuring and Impairment", including accelerated expense in 2019 and net forfeitures in 2017. No share-based compensation costs were capitalized for the years ended December 31, 2019, 2018 or 2017 as the amounts were not material.

23. Employee Benefits

We maintain various benefit plans, including defined contribution and defined benefit plans. Our U.S. defined contribution plan is qualified under Section 401(k) of the Internal Revenue Code, and covers substantially all U.S. employees. Participants may contribute a portion of their compensation not exceeding a limit set annually by the Internal Revenue Service. This plan includes a provision for us to match a portion of employee contributions. Total expense under the 401(k) plans, including the plans acquired via business acquisitions, was $4.0 million, $4.0 million and $3.6 million for the years ended December 31, 2019, 2018 and 2017, respectively. We also have a defined contribution plan which covers certain executives. We make matching contributions up to an established maximum. Matching contributions made to the plan, and expensed, totaled approximately $0.2 million, $0.2 million and $0.3 million in each year ended December 31, 2019, 2018 and 2017, respectively.

We have five defined benefit, non-contributory retirement or termination plans that cover certain employees in Germany, France, Japan, Italy and the United Arab Emirates. These defined benefit plans provide benefits to covered individuals satisfying certain age and/or service requirements. For certain plans, we calculate the vested benefits to which employees are entitled if they separate immediately. The benefits accrued on a pro-rata basis during the employees' employment period are based on the individuals' salaries, adjusted for inflation. The liability under the defined benefit plans was $8.2 million at December 31, 2019 and $7.4 million at December 31, 2018, and is included as a component of other long-term liabilities on the accompanying consolidated balance sheets.

24. Related Party Transactions

From time to time, we have transactions with other companies in which we hold an interest, all of which are individually and in the aggregate immaterial, as summarized in the table below.

	For the years ended December 31,		
(in thousands)	2019	2018	2017
Net sales	$ 20,002	$ 23,358	$ 3,852

Net sales with related parties primarily reflects our ventures in China including our partnership to externalize the HPV test franchise for cervical cancer screening in China as well as our joint venture with Sichuan Maccura Biotechnology Co., Ltd which was terminated in conjunction with the 2019 restructuring activities discussed further in Note 6 "Restructuring and Impairments" which also details related party restructuring charges.

	As of December 31,	
(in thousands)	2019	2018
Accounts receivable	$ 7,589	$ 10,109
Prepaid expenses and other current assets	$ 13,697	$ 3,873
Other long-term assets	$ 16,830	$ 24,300
Accounts payable	$ 1,775	$ 4,888
Accrued and other current liabilities	$ 15,404	$ 5,488

Prepaid expenses and other current assets include short-term loan receivables and supplier advances from companies with which we have an investment or partnership interest.

In connection with the 2019 Restructuring further discussed in Note 6 "Restructuring and Impairments", we entered into a agreement with a non-publicly traded company considered a related party to reduce future purchase commitments to $25.2 million through 2022. The commitment was reduced by $12.8 million which will be paid in 2020 and is included in accrued and other current liabilities as of December 31, 2019 in the accompanying consolidated balance sheet.

During 2018, we purchased a convertible note for $15.0 million from a privately held company. The note is due in December 2021 and bears interest at 8%. In the event the company goes public, the note will convert into common shares in the company ranking pari-passu with existing common shares. As of December 31, 2019, the principal and accrued interest of this note totals $16.3 million and is included in other long-term assets.

Financial Results

Auditor’s Report

Report of Independent Registered Public Accounting Firm

To the Shareholders and Supervisory Board

QIAGEN N.V.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of QIAGEN N.V. and subsidiaries (the “Company”) as of December 31, 2019 and 2018, the related consolidated statements of (loss) income, comprehensive (loss) income, changes in equity, and cash flows for each of the years in the three-year period ended December 31, 2019, and the related notes and financial statement schedule as listed in Item 18 (A) (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2019, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company’s internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission, and our report dated February 28, 2020 expressed an unqualified opinion on the effectiveness of the Company’s internal control over financial reporting.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company has changed its method of accounting for leases in 2019 due to the adoption of Accounting Standards Codification Topic 842 - *Leases*. In 2018, the Company has changed its method of accounting for revenue from contracts with customers due to the adoption of Accounting Standards Codification Topic 606 - *Revenue from Contracts with Customers*.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Evaluation of certain long-lived asset impairments

As discussed in Notes 3 and 6 to the consolidated financial statements, the Company performs impairment testing for its long-lived assets whenever events or changes in circumstances indicate that the carrying value of an asset or a group of assets may not be recoverable and exceeds its fair value. In the second half of 2019, the Company began a restructuring initiative as a result of the suspended development of the NGS-related instrument systems. Due to the restructuring initiative, the Company fully impaired certain long-lived assets, based on the Company's assumption that these assets had no alternative use. The Company estimated that no value was recoverable in a market disposal and recorded impairment expenses related to the certain long-lived assets during the year ended December 31, 2019 of $138.8 million.

We identified the evaluation of the impairment analysis for certain long-lived assets associated with the restructuring initiative as a critical audit matter due to a high degree of complex auditor judgment in evaluating the Company's assumption of related alternative uses.

The primary procedures we performed to address this critical audit matter included the following. We tested certain internal controls over the Company's impairment assessment process for long-lived assets, including the control related to the assessment of alternative highest and best uses for these assets. For a selection of assets within the long-lived asset group, we evaluated the Company's conclusion over their alternative uses through a combination of (1) inspecting application descriptions and uses in underlying license agreements, software documentation and other contracts, (2) inquiring with operational management and performing independent research into patents' and other intangible assets' potential uses outside of the Company's other product areas, and, (3) considering the collective results of the procedures performed to assess the sufficiency of the audit evidence obtained related to the Company recording a full impairment charge.

Evaluation of the Formulatrix asset purchase agreement as an asset acquisition

As discussed in Notes 5 and 11 to the consolidated financial statements, on January 31, 2019, the Company acquired the digital PCR asset of Formulatrix Inc. (Formulatrix) in an asset acquisition. Consistent with other business combination type transactions, the Company determines whether an acquired entity is considered to be a business, or an asset or group of assets, including whether substantially all of the fair value of the acquired gross assets is concentrated in a single asset or group of similarly identifiable assets. The purchase price of the digital PCR asset, determined as the acquired asset in the Formulatrix acquisition, was $260.9 million, of which $125.0 million was paid upon closing.

We identified the evaluation of the Formulatrix asset purchase transaction as an asset acquisition as a critical audit matter. Complex auditor judgment and specialized skills were required to assess the Company's determination that substantially all of the fair value of the Formulatrix assets acquired was concentrated in a single identifiable asset or group of similar identifiable assets.

The primary procedures we performed to address this critical audit matter included the following. We tested certain internal controls over the Company's acquisition-date evaluation process including controls to (1) identify assets acquired and (2) assess the application of the substantially all threshold in determining the asset acquisition criterion is met. We inspected the Formulatrix asset purchase agreement, including the transaction terms and specific assets listed in the agreement, to evaluate the Company's identification of assets acquired. We evaluated the Company's assessment that substantially all the fair value of the assets acquired was concentrated in a single identifiable asset or group of similar identifiable assets by inspecting the nature of these assets and comparisons to external cost and external market research studies to assess for indications of dissimilar characteristics. In addition, we involved valuation professionals with specialized skills and knowledge, who assisted in:

- evaluating the identification of the intangible assets acquired from the Formulatrix asset purchase transaction by inspecting and evaluating legal terms that would give rise to identifiable intangible assets; and
- assessing the Company's determination of combining the Formulatrix intangible assets into a single developed technology intangible asset.

Assessment of unrecognized tax benefits

As discussed in Note 17 to the consolidated financial statements, the Company conducts its business globally and operates more than 50 consolidated subsidiaries in multiple tax jurisdictions. This multi-jurisdictional business operation involves complex intercompany operating and financing activities. The nature of these activities can result in uncertainties in the estimation of the related tax exposures. The Company initially recognizes and subsequently measures the largest amount of tax benefit in its consolidated financial statements when it is more likely than not that the position will be sustained upon examination by the tax authorities. As at 31 December 2019, the Company recorded unrecognized tax benefits of $58.0 million.

We identified the assessment of unrecognized tax benefits as a critical audit matter because complex auditor judgment and specialized skills were required in evaluating the Company's interpretation and application of tax laws in the jurisdictions where it operates and its estimate of the ultimate resolution of the tax position.

The primary procedures we performed to address this critical audit matter included the following. We tested certain internal controls over the Company's unrecognized tax benefit process, including controls over (1) its identification and application of tax statutes and legislation, and changes thereto, in the various jurisdictions in which it operates and (2) its application in the process to estimate the associated unrecognized tax benefit. We inspected the Company's legal composition to identify and assess changes in operating structures and financing arrangements. We inquired of the Group's tax department in combination with inspecting correspondence with the responsible tax authorities. We involved professionals with specialized skills and knowledge, who assisted in:

- evaluating the Company's interpretation and application of multi-jurisdictional tax laws, and changes thereto, and its impact on the unrecognized tax benefit,
- inspecting the lapse of statute of limitations and settlements with tax authorities over a selection of unrecognized tax benefits to compare the amount in the settlement documents to the unrecognized tax benefit, and
- inspecting a selection of intercompany operating and financing activities between group entities to assess the sustainability of tax positions based on their technical merits and the probabilities of possible settlement alternatives.

/s/ KPMG AG Wirtschaftsprüfungsgesellschaft

We have served as the Company's auditor since 2015.

Düsseldorf, Germany

February 28, 2020

Report of independent registered public accounting firm

To the Shareholders and Supervisory Board

QIAGEN N.V.:

Opinion on Internal Control Over Financial Reporting

We have audited QIAGEN N.V.'s and subsidiaries' (the "Company") internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2019 and 2018, the related consolidated statements of (loss) income, comprehensive (loss) income, changes in equity, and cash flows for each of the years in the three-year period ended December 31, 2019, and the related notes and financial statement schedule as listed in Item 18 (A) (collectively, the consolidated financial statements), and our report dated February 28, 2020 expressed an unqualified opinion on those consolidated financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying 'Report of Management on Internal Control over Financial Reporting'. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG AG Wirtschaftsprüfungsgesellschaft

Düsseldorf, Germany

February 28, 2020

List of Subsidiaries

The following is a list of the Registrant's subsidiaries as of December 31, 2019, other than certain subsidiaries that did not in the aggregate constitute a significant subsidiary.

Company Name	Jurisdiction of Incorporation
Amnisure International, LLC	USA
Cellestis Pty. Ltd.	Australia
STAT-Dx Life S.L.	Spain
QIAGEN Aarhus A/S	Denmark
QIAGEN AB	Sweden
QIAGEN AG	Switzerland
QIAGEN Australia Holding Pty. Ltd.	Australia
QIAGEN Benelux B.V.	Netherlands
QIAGEN Beverly, LLC	USA
QIAGEN China (Shanghai) Co. Ltd.	China
QIAGEN Deutschland Holding (Luxembourg) SARL	Luxembourg
QIAGEN Deutschland Holding GmbH	Germany
QIAGEN Finance (Malta) Ltd.	Malta
QIAGEN France S.A.S.	France
QIAGEN Gaithersburg LLC	USA
QIAGEN GmbH	Germany
QIAGEN Hamburg GmbH	Germany
QIAGEN Inc. (Canada)	Canada
QIAGEN Instruments AG	Switzerland
QIAGEN K.K.	Japan
QIAGEN Lake Constance GmbH	Germany
QIAGEN LLC	USA
QIAGEN Ltd.	UK
QIAGEN Manchester Ltd.	UK
QIAGEN Marseille S.A.S.	France
QIAGEN North American Holdings Inc.	USA
QIAGEN Pty. Ltd.	Australia
QIAGEN Redwood City, Inc.	USA
QIAGEN Sciences LLC	USA
QIAGEN S.r.l.	Italy
QIAGEN TRM Services Ltd.	UAE
QIAGEN U.S. Finance Holdings (Luxembourg) SARL	Luxembourg
QIAGEN U.S. Finance LLC	USA
QIAGEN U.S. Finance Ltd	Ireland