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VALUATION OF A GERMAN PRIVATE HOLDING IN THE CLIMATE TECHNOLOGY
SECTOR

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Abstract

Academic literature on the subject of company valuation focuses predominantly on large, international and listed companies. Using the example of a medium-sized company in Germany, this paper applies and evaluates widely utilized valuation methods from the academic literature to a private company. The analysis provides the management of the company with valuation ranges for the enterprise value of the company. Application of the valuation methods results in an enterprise value range between €60.80mm (million) and €67.56mm in a case based on macroeconomic data and a valuation range between €57.60mm and €65.10mm in a case based on management assumptions.

Keywords

Corporate valuation, private companies, discounted cash flow method, adjusted present value method, flow to equity method, leveraged buyout.

Privacy

As this paper contains confidential data from the company in question, the company name has been replaced by "the Group" throughout the paper.

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1. Introduction

This Master's thesis is concerned with the practical application of business valuation methods to a German medium-sized company. The aim of the thesis is to provide the management of the company with an evidence-informed enterprise value based on five academic valuation methods. The valuation is of interest to the company due to a possible change in the shareholder structure. The topic of the thesis is particularly interesting because it concerns a private holding company and thus a valuation case which is highly relevant in practice but often receives less attention in theory. Factors such as the anonymity of private firms, the lower amount of financial data as well as the lower generation of external information complicate the valuation of private firms (Depamphilis 2019, 267). The present topic therefore offers several challenges: On the one hand, the focus is on a private company from the crafts business in the German SME (small and medium-sized enterprise) sector, an area that is not in the focus of large institutional investors and therefore has a relatively thin data base. On the other hand, the thesis poses the difficulty of applying theoretical concepts that are predominantly based on listed companies to a private company, which requires a transfer from limited theory to detailed practice.

A company with a history of more than 150 years in the heating, ventilation and air conditioning sector (HVAC) was chosen as the subject of the analysis, which today is one of Germany's leading medium-sized companies in building services technology with 25 subsidiaries at 18 locations throughout Germany. With more than 800 employees, the Group generates a total operating income of around €115.00mm.

2. The Groups business model

The Group operates in the HVAC segment as well as in the building technology segment, but the company's core business lies in the HVAC segment, where around 70.00% of Group revenue is generated. Through its 25 subsidiaries (App. 1.1), the Group is also invested in other non-core business areas that are currently being developed. These include the renewable

energies and PV division, the passive fire protection division, the water technology division and the online branch. All of the non-core business units listed above are currently being established, therefore they do not yet have any significant or even negative contributions to earnings. The deliberative reasoning behind the expansion is to extend the Group's range of services in order to generate economies of scale. In doing so, the company is positioned as a fully integrated service provider for building technology with a unique selling point. The Groups management holding acts as the parent company for the 25 individual subsidiaries, which continue to operate as independent companies after takeover, but receive extensive support from the parent company. In the past, the Group has mainly purchased companies from problematic succession situations or from insolvency. This successful M&A buy and build strategy has enabled the company to achieve considerable growth over the past 10 years, well above the industry average (CAGR of the Group between 2013 and 2022 of 8.56% vs. HVAC industry CAGR of 3.86%) (ZVSHK (b) 2023).

In principle, the Groups business is very similar to that of a traditional craftsman's business: Private and commercial customers request the company's services for new construction projects or repairs and are provided with the corresponding services by mobile teams of technicians. The company earns revenue from the hours billed by the technicians as well as the materials used, which are provided with a corresponding margin. The main revenue drivers are the number of technician hours billed, the rate per hour billed, the margin added to the materials used and the quantity of materials used. In the last years, around 50.00% of the Group's total revenue was generated from invoiced installation hours and 50.00% from materials used. The company is primarily active in the B2B segment, with 75.00% of its orders coming from the commercial sector. Due to its size and the extensive geographical coverage of Germany by its subsidiaries, the Group has the capacity to tackle service orders for the refrigeration, ventilation,

and heating systems of supermarket chains throughout Germany from a single source and is therefore well positioned to handle large B2B orders.

3. The HVAC sector

At the end of 2022, the HVAC sector in Germany comprised around 48,900 companies with more than 392,000 employees. A total turnover of €57.50bn was generated, which corresponds to a y-o-y growth of +8.70% compared to 2021. For 2023, the ZVSHK (German HVAC Association) expects total industry turnover of around €63.00bn (y-o-y growth +9.57%) (ZVSHK (a) 2023). The sector has also developed very positively over the past years, recording a CAGR of 3.86% between 2013 and 2022 (App. 1.2) (ZVSHK (b) 2023). Several factors have contributed to the dynamic growth in the sector. The primary driver is and remains the trend towards sustainability and renewable energies. Increased environmental awareness and the resulting measures to optimize the energy efficiency of properties have led to high-capacity utilization in recent years as a result of climate-related investment activity. Based on legal requirements such as the German GeG Act (Building Energy Act) and the massive demand for energy optimization in German real estate, it can be assumed that the sector will remain attractive in the future. The GeG Act comes into force in Germany on January 1, 2024 and is intended to end the use of fossil fuels in buildings by 2045. From 2024, newly installed heating systems must be powered by at least 65.00% renewable energy (Bundesregierung 2023). The impact of this legislation on the Group's business is examined separately in the capital budgeting chapter. Furthermore, another key factor contributing to the dynamic development of the industry is the increasing digitalization and networking of building technology. It has expedited and advanced the integration of smart technologies such as intelligent control systems, networked solutions and IoT applications in HVAC systems. Technical progress is generating more frequent technical upgrades and requires more expertise during installation. Both factors

in turn lead to an increased order situation in the HVAC segment and contribute to the industry's positive long-term market outlook.

Despite many potential opportunities for the HVAC sector, there are also some sector-specific risks. The biggest risk in this respect is the shortage of skilled workers. An increasing amount of young people in Germany are opting to study rather than completing an apprenticeship, which is leading to acute staff shortages especially in the HVAC sector (KOFA 2023). At the Group, for example, the limiting factor for business in recent years has been the staff available to process orders rather than the order situation itself. The limited supply of skilled workers consequently leads to upward pressure on wages and salaries, which is further exacerbated by high inflation and the resulting wage adjustments. Another problem for companies in the HVAC sector is supply chain issues, for example in the supply of heat pumps. Due to globally disrupted supply chains and extremely volatile prices, it is at times very difficult to plan orders or even carry them out at all. Delivery times for heat pumps, for example, have been over a year at times, making order execution and planning almost impossible despite very high demand (Lincke 2023).

The Group's competitors can be divided into two groups: Firstly, local competitors, which largely consist of small to medium-sized craft businesses, and secondly, larger competitors, which, like the Group, cover a broader range of sectors through several subsidiaries and are also geographically diversified at a national level. Local competition is highly fragmented throughout Germany and is characterized by small businesses that are often owner-managed and employ an average of around nine employees (Destatis (a) 2021). 99.60% of skilled crafts businesses in Germany are classified as small and medium-sized enterprises, which are defined as businesses with up to 249 employees and turnover of up to €50.00mm (Destatis (b) 2021). These companies are well networked locally and extremely agile, but have the disadvantage compared to the Group that large orders often cannot be handled due to the small size of the

company and because there is less cross-divisional expertise. Larger competitors are often structured similarly to the Group in the form of a holding company and are active nationwide. An additional overview over the Group's main competitors can be found in App. 1.3.

4. Capital budgeting process – Underlying assumptions and macroeconomic trends

A key factor influencing the value of any company is the expectation of the future business activity and profitability of the company. The discounted cash flow valuation method used for this thesis is essentially based on discounting the expected future cash flows and therefore ultimately on a forecast of the future development of the income statement (Depamphilis 2019, 190).

A total of five cases of the Group's P&L were modeled, which are intended to depict a possible future business development of the Group until 2032 and can be selected in Excel (sheet "Forecast Input") as input for the cash flow models and the leveraged buyout (LBO). The first case ("Management case") is based on the business development envisaged by the management and was agreed upon in meetings with the managing directors of the Group. The second case ("Valuation case") is based on macroeconomic inputs on the one hand and on the business development of the Group in the past on the other. The third case ("Historical financials") is based exclusively on the historical development of the Group and the HVAC industry and thus represents a "going-forward" business plan that transfers the growth rates of the past into the future. Case four and five ("Downside case" and "Upside case") represent a downside and upside case of the valuation case. A detailed comparison of the five cases can be found in Table 1 on page 12.

4.1 Revenue forecast

The y-o-y revenue growth rates of the management case were based on the expected future increases in the price per technician hour, the expected development of material costs and a GeG-Act premium. Management plans to increase the hourly rate for technicians from the

current €65.50 to €72.00 per hour by 2025. In the further course of the forecast period up to 2032, a gradual increase in prices to a level of €85.00 per hour has been calculated. In the forecast period between 2023 and 2032, the assumed price increases correspond to a CAGR of 2.94%. In addition, a premium of up to 2.00% per year was added to the calculated growth rate in the forecast years 2025 to 2029 to factor in the expected positive impact of the GeG Act. Due to the novelty and complexity of the law, there is no reliable data on the economic impact of the law on craft businesses that could be used as numerical basis for growth rate calculations. Therefore, a general assumption of up to 2.00% additional growth of the Group's revenues for six years was made for the premium, what was made as a reasonable assumption. Other revenue-relevant events known to management were modeled based on the individual subsidiaries. In 2024, two major projects will be completed, which will lead to a certain decline in revenue of around €7.00mm. At the same time, as previously mentioned, four companies are currently in the start-up phase. For each of these companies, a gradual increase in annual revenues from €0.02mm in 2023 to €2.00mm in 2032 was assumed. Taking all adjustments into account, this results in a total revenue CAGR in the management case of 3.30% in the period from 2022 to 2032.

The y-o-y top line growth rate of the valuation case was determined based on three growth rates. The standard procedure in this case would normally be to predict the growth rates for the company's various business units and derive the consolidated revenue from this. In the case of the Group, however, this approach is very difficult to implement, as the company operates with 25 subsidiaries in a large number of sub-sectors due to its holding structure. Moreover, it is not always possible to clearly differentiate between business units within the subsidiaries. The alternative approach pursued here is to determine an average revenue growth rate for the Group from several past and future-oriented indicators. For example, it was examined how the Group developed during the period under review in direct comparison to general gross domestic

product (GDP) growth in Germany or turnover in the HVAC sector. The resulting over- or underperformance of the Group compared to the benchmark in the period between 2013 and 2022 was used as the basis for the future forecast. The following example illustrates the procedure for the three indicators used: The annual growth of the HVAC sector in Germany was a median of 3.53% between 2013 and 2022 (App. 1.2) (ZVSHK (b) 2023). The Group generated a median annual growth rate of 5.83% in the same period. In the long term, the Group therefore managed to outperform the HVAC sector (calculating the median difference between the y-o-y growth of the HVAC sector and the Group on an annualized basis yields a value of 112 basis points (bps) p.a.). If it is now assumed that the HVAC sector will continue to generate average growth of 3.53% in the medium term and that the Group is still able to outperform the sector by 112 bps in the medium term, this results in a growth rate of 4.65% p.a. To take into account factors such as increasing competition in the long term, the growth rate within the forecast period was reduced to a value of 1.22%. The same principle applied to GDP growth in Germany leads to a median growth rate of 1.50% p.a. between 2012 and 2022 (App. 2.1) (Destatis (b) 2023) which was exceeded by the Group by a median of 358 bps p.a. Based on the assumption that the German economy will return to median growth of 1.50% p.a. from 2025 (Historic median growth rate between 2013 and 2022), a growth rate of 5.08% p.a. can be calculated. This growth rate was in turn gradually reduced over the course of the forecast period, as in the previous example.

The annual total operating income growth rate of the Group between 2013 and 2022 of 6.94% was used as the third growth rate. Including the growth rates described above, this results in a median annual growth rate of 4.87% before adjustments from 2026 onwards. In the next step, the same annual GeG-Act premium of up to 2.00% was added to the growth rate between 2025 and 2029 as was used in the management case. Finally, a weighting factor was used to gradually transition the growth rates at the end of the forecast period to a perpetuity growth rate, which

on the one hand is below the long-term growth of the overall economy and on the other hand reflects the fact that the Group will not outperform the overall economy forever. In the final step, identical adjustments were made regarding revenues at the level of the individual subsidiaries, as previously described in the management case. The total revenue CAGR of the valuation case calculated in this way is 3.67% p.a. between 2022 and 2032.

The upside and downside cases are based on the identical assumptions of the valuation case, with the exception of the GeG-Act premium. In the downside case, the GeG-Act premium was excluded and a weaker revenue development of the new business areas water technology, passive fire protection, solar and online (annual revenue of €0.75mm instead of €2.00mm by 2032) and a lower contribution from acquisitions (€1.00mm per year instead of €2.50mm) were assumed. Overall, this leads to a total revenue CAGR of 2.43% between 2022 and 2032. In contrast, the upside case includes the double impact of the GeG-Act premium and the assumption that follow-up orders with a volume of €4.00mm can be generated in 2027 following the termination of orders with a volume of €7.00mm at two subsidiaries. Furthermore, revenue in the new business areas and the additional revenue from M&A activity were increased by a factor of 1.5 compared to the valuation case. Overall, this leads to a total revenue CAGR of 5.07% between 2022 and 2032. The last case considered ("Historical Financials") is intended to represent that the Group will continue to develop without major changes in the future with the same growth rates and margins as it did in the observation period.

4.2 Forecast of costs of goods sold (COGS)

The main cost items such as the COGS and personnel costs were modeled in detail for the management case and the valuation case (App. 2.2 & 2.3). For the COGS in the management case, a development was modeled that, starting from an average COGS ratio of 49.04% between 2020 and 2022, represents a slight increase in the COGS ratio to a peak of 50.88% in 2024 and then falls to an average level of 46.95% by 2032. The deliberative thought behind this

development is, firstly, the assumption that the high increases in material prices since 2022 will slowly subside and normalize from 2024 onwards. Secondly, it is assumed that the Group will operate less material-intensively in the future due to the increasing technologization of the industry but will increasingly operate in the service sector as a result of increasing technical complexity.

In the valuation case, an average future growth rate of the Group's COGS was modeled based on the average y-o-y growth rate of the Group's COGS between 2013 and 2022 (5.23% p.a.) and the y-o-y growth rates of the construction price index Germany between 2016 and 2023 (4.36% p.a.) (Destatis (a) 2023). Starting from an average of 49.04% COGS ratio between 2020 and 2022, a significant increase in material costs to a material cost ratio of 51.86% in 2024 was modeled based on own calculations. Towards the end of the forecast period, the ratio reduces to a level below the observation period with a value of 47.62%. As indicated by the construction price index Germany (App. 2.4), companies in Germany were exposed to significant price increases in 2021 and 2022, which will in all likelihood slowly normalize in the course of 2023 and 2024 (Bauindustrie 2023). However, as can be seen from the observation period, purchase price increases were passed on directly to customers by the Group and did not result in a reduction of the gross margin. In line with this assumption, only a relatively small increase in COGS as a percentage of revenue was modeled despite the large price increases. At the same time, it must be noted that the increase in material prices also increases Group revenue, as the same margin of 30.00% is calculated on the more expensive purchase prices, which generate a corresponding absolute increase in revenue.

4.3 Forecast of personnel costs

Personnel costs are a significant cost factor for a company like the Group, which is directly linked to revenues, because the more technicians deployed, the more orders and revenues generated. At the same time, the crafts sector in Germany suffers from a significant shortage of

skilled workers, which has a direct impact on salary dynamics in the industry (KOFA 2023). This is accompanied by inflationary dynamics in Germany, which trigger demands for wage increases from trade unions. The “Industriegewerkschaft Metall”, the largest single trade union in Germany, has already negotiated inflation compensation premiums and wage increases of 5.20% from June 2023 and has achieved wage increases by 3.30% from June 2024 (IG Metall 2023). A 3.30% increase in the Group's personnel costs based on the 2023 level would lead to additional personnel costs of €1.24mm without any additional output generated.

This influence was taken into account in both the management and the valuation case (App. 2.2 & 2.3). In the management case, starting from an average personnel cost ratio of 33.14% (2020-2022), an increase to 35.53% in 2024 can be observed, which in absolute terms means an increase in personnel costs of €1.80mm per year. High absolute additional personnel costs of at least €1.80mm per year were modeled until 2028. Over the entire forecast period, the personnel cost ratio of the management case averages 33.62%.

A similar approach was taken in the valuation case: Based on macroeconomic factors such as the historical salary development of the metal construction industry in Germany and the general salary development in Germany (App. 2.5), the development of personnel costs was modeled. Based on a personnel cost ratio of 33.14% (average of the years 2020-2022), the underlying dynamics of salaries in the metal sector and increased inflation, an increase in personnel costs to 34.87% in 2024 was modeled. Over the entire forecast period, personnel costs reach an average level of 33.27% and are 13 bps above the average personnel cost ratio from the observation period.

Other cost items such as depreciation and amortization (D&A), other operating expenses and taxes were modelled identically for all cases. All line items are based on the historical development in relation to revenues. The mean value from the observation period of 1.37% of revenues was used for D&A, the historical median of 8.25% of revenues was used as the cost

ratio for other operating costs and the historical value of 31.26% of pre-tax income was used for taxes.

	Management Case	Valuation Case	Historical Financials	Downside Case	Upside Case
Top line CAGR 2022-2032	3.30%	3.67%	3.41%	2.43%	5.07%
Total operating income 2023	115,658,022	115,440,031	115,440,031	115,440,031	115,470,031
Total operating income 2032	158,774,826	164,574,818	160,416,550	145,845,058	188,044,419
Average COGS ratio 2023-2032	48.55%	48.60%	49.61%	50.20%	47.73%
Average Personnel expense ratio 2023-2032	33.62%	33.27%	33.97%	34.17%	32.99%
EBITDA Margin 2023	9.71%	9.92%	9.92%	10.01%	9.78%
EBITDA Margin 2032	11.90%	11.54%	9.46%	6.10%	12.94%
Average EBITDA Margin 2023-2032	9.59%	9.88%	8.18%	6.48%	11.03%

Table 1: Comparison of the five different P&L forecast cases. **Source:** Own calculations.

In the remaining three cases (upside, downside and historical financials), the cost items were adjusted based on the valuation case so that three different EBITDA margins can be observed. The historical financials case, with an EBITDA margin of 9.46% in 2032, almost exactly reflects the EBITDA margin from 2022 and therefore shows no major change over the forecast period. With an EBITDA margin of just under 13.00% in 2032, the upside case represents a business development that is significantly above the industry average. The downside case, on the other hand, represents a situation in which a below-average performance is achieved with an EBITDA margin of 6.10%.

5. Cost of capital estimation

For the correct valuation using the methods applied in this paper, different costs of capitals are required. The most common form of the discount rate is the weighted average cost of capital (WACC). The WACC represents the opportunity cost of capital of an investor who would invest proportionately in the capital structure of the company (Koller et al. 2020, 321). The WACC is composed of the cost of equity, cost of debt, the marginal tax rate on income and the targeted capital structure. By including the tax rate, the after-tax borrowing costs are incorporated in the WACC calculation to reflect the benefit of the tax shield (Berk and DeMarzo 2007, 674).

The first step in determining the cost of capital is to identify a suitable peer group for the company under review (App. 3.1). In the case of the Group, it is extremely difficult to identify an appropriate peer group for determining the equity beta. On the one hand, the Group operates

in the HVAC sector: A market segment that is usually active within the private market and does not require a stock exchange listing due to the average size of the companies alone. For this reason, the peer group for the Group was composed of companies that either operate in very similar sectors or in sectors that are very closely interlinked with the Group. Additional criteria included business activity predominantly in German-speaking countries and a small size in terms of total assets. Of the total seven companies in the peer group, four operate in the construction sector and have their headquarters or main business activities in German-speaking countries. Two companies are operating within the German building materials sector, making them suitable peer group candidates as potential direct suppliers for the Group. Of all the companies in the peer group, Friedrich Vorwerk Group is the most similar peer to the Group from a business segment perspective with its activities in the area of plant construction. The companies in the peer group have a median equity-based financing of 67.04%, debt-based financing of 32.96% and an unlevered beta of 0.79. The average corporate tax rate in Germany of 29.72% was assumed as the tax rate (PwC 2023).

The calculation of the cost of equity is particularly challenging in the context of a private company because the assumption that nonsystematic risk can be eliminated by a sufficiently diversified portfolio of assets often does not apply to privately held companies due to the owner's proprietary concentration on one asset. When factors such as the aforementioned non diversification of the investor and the riskiness of the operating cash flows are taken into account, the leveraged cost of equity for a privately held firm can be up to 33.00% higher than the levered cost of equity of a comparable levered public firm (Depamphilis 2019, 274). Since owners of private firms have mostly invested their net worth in the firm, they are not well diversified and therefore more exposed to the asset risks of the firm. This leads on the one side to a higher rate of return requirement for the owners of the firm and on the other side to the fact that for owners of private firms the combination of systematic and nonsystematic risk is decisive

- the so-called total risk (Depamphilis 2019, 274). To determine the total risk, the median unlevered beta of 0.79 determined by the peer group was adjusted to obtain the total unlevered beta.

In the first step, the German benchmark index DAX was regressed with the sector index of the industrial sector in Germany over a period of five years in order to determine the correlation coefficient. The correlation coefficient R^2 calculated using Excel stands at 86.32% and indicates a high correlation between the industrial sector and the German benchmark index DAX (App. 3.2). In the second step the capital asset pricing model (CAPM) beta was divided by the square root of the correlation coefficient R^2 to represent the risk of a stand-alone asset and not the risk of an asset that is part of a well-diversified portfolio (Depamphilis 2019, 274). The inclusion of this additional factor leads to a median total unlevered beta of 0.85. The median total unlevered beta was subsequently re-levered with the optimal capital structure, which is based on the median values of the peer group and has a debt over value ratio of 32.96% and a corresponding equity over value ratio of 67.04%. This leads to a levered beta of 1.14 for the Group with an optimal capital structure. Based on the CAPM formula, a risk-free rate of 2.58% and a market risk premium of 8.00% resulted in a cost of equity of 11.69%. The risk-free rate is the interest rate of 10-year German government bonds (FactSet as of November 01, 2023) and the market risk premium is an academically recognized value of 8.00% (PwC 2023).

The cost of debt is very difficult to determine in the case of the Group due to the lack of external liabilities. Therefore, as an approximation, an interest rate was determined that would presumably apply to the Group under current financing conditions if new debt capital were raised from the bank. This interest rate is calculated from the current key interest rate in the Eurozone of 4.50% (European Central Bank 2023) plus an interest margin of 350 bps for a loan in the low-risk range that is usual in the industry. This results in a cost of debt of 8.00%.

Overall, the calculated cost of equity of 11.69% and the cost of debt of 8.00% lead to a WACC of 11.68% when weighted according to equity and financial debt of the Group (App. 3.3). As there are currently only interest-bearing financial liabilities of €0.01mm and at the same time total assets of €42.80mm, the Group is financed almost exclusively by equity. Consequently, the weighting of the cost of debt in the WACC calculation is correspondingly low and results in the WACC being almost equal to the cost of equity. Similarly, the observation can be made that the unlevered cost of capital with a value of 11.68% closely corresponds to the WACC, as the distinction between levered and unlevered naturally makes no difference for an all-equity company.

6. Cash flow-based valuation – WACC, APV, FTE

The academic literature provides a variety of valuation methods which are appropriate depending on the targeted debt-equity ratio of the company under consideration (Berk and DeMarzo 2007, 673). In the following chapter, three valuation methods that take factors such as existing financial debt or market imperfections into account, are applied. The methods used are the weighted average cost of capital method (WACC), the adjusted present value method (APV) and the flow to equity method (FTE) (Berk and DeMarzo 2007, 672). *Ceteris paribus*, the three methods should generate the same output and only differ in the simplicity of application depending on the case at hand (Berk and DeMarzo 2007, 672). In practice, however, it is hard to arrive at an identical result in all three cases due to different implicit assumptions. The starting point for all three methods used is the determination of the future cash flows generated. A distinction is made between free cash flow to common equity holders (FCFE), used in the FTE method, and free cash flow to firm (FCFF), used in the WACC method. In order to arrive at the FCFF for the WACC method, the NOPLAT (net operating profit/loss after taxes) is determined by hypothetically taxing EBIT at the marginal tax rate (Berk and DeMarzo 2007, 275; Depamphilis 2019, 190). In addition, depreciation and amortization is added back

to the NOPLAT, as it is not a real cash outflow, which reduces the cash flow to the company. After deducting the change in working capital, i.e. investments in the working capital of the company, and after deducting the gross capital expenditures, i.e. payments in capital expenditures of the operating business, the free cash flow to firm is determined (Depamphilis 2019, 190). FCFE represents the cash flow available to all investors in the company, irrespective of how the company is financed. In contrast, the calculation of FCFE starts with net income, to which non-cash expenses and net borrowings are added and investments in working capital or capex are deducted. The resulting cash flow represents the free cash flow available to equity investors after all debt related payments (Koller et al. 2020, 204; Berk and DeMarzo 2007, 684). The WACC method is based on discounting the after-tax free cash flow to firm with the weighted average cost of capital (Depamphilis 2019, 190). The WACC method thus represents a very specific case of APV, in which the risk profile of the tax shield corresponds to the risk of the unlevered company. The leverage ratio of the WACC precisely reflects the debt to value ratio of the company in each year and therefore reflects the benefits from the tax shield (Koller et al. 2020, 199).

Applied to the Group, the WACC method in the valuation case results in an implied enterprise value of €61.27mm with a terminal EBITDA multiple of 4.7x and €61.47mm using the perpetuity growth model with a perpetual growth rate of 1.50% (Table 2).

WACC outputs (in €mm)	Lower bound	Median valuation	Upper bound
	<i>Valuation case</i>		
Terminal EBITDA Multiple @ 4.7x	54.98	61.27	67.56
Terminal growth rate @ 1.50%	59.65	61.47	63.53
	<i>Management case</i>		
Terminal EBITDA Multiple @ 4.7x	52.58	58.84	65.10
Terminal growth rate @ 1.50%	57.60	59.44	61.51

Table 2: WACC valuation outputs. **Source:** Own calculations.

Taking into account an upside and a downside case, which each suggest a deviation of the terminal EBITDA multiple one unit upwards and downwards in the sensitivity analysis, the

range of the pricings lies between €54.98mm and €67.56mm in the valuation case (App. 4.1). The management case leads to a valuation range between €52.58mm and €65.10mm and results in a lower valuation due to a lower average EBITDA margin and top line growth rate compared to the valuation case.

The multiple for the terminal EBITDA was determined based on the assumed terminal growth rate. The median German GDP growth rate of 1.50% p.a. between 2012 and 2022 (Destatis (b) 2023) was used for the terminal growth rate based on the assumption that the Group will develop in line with German GDP growth into perpetuity. Based on the formula stated below (Formula 1), the terminal growth rate of 1.50% results in an implied terminal EBITDA multiple of 4.73x.

$$\textbf{Formula 1: Implied EBITDA multiple} = \frac{\text{Present value of perpetuity growth terminal value}}{(\text{Terminal year EBITDA} * \text{Terminal year discount factor})}$$

The cross-check created in this way ensures that the terminal growth assumptions do not suggest growth that exceeds the development of the economy as a whole.

The adjusted present value method (APV) first calculates the value of the company as if it was financed solely by equity and adds up all other side effects arising from financial debt such as the value of tax shields, bankruptcy costs or issuance costs. By separately discounting the annual unlevered free cash flows with the opportunity costs of the unlevered equity and discounting the annual tax shield with the opportunity costs of the tax shield, the value of the company is calculated (Koller et al. 2020, 201; Berk and DeMarzo 2007, 672). Due to the precise division between the value contributed by the operating business and that contributed by corporate financing, the APV method is inherently the most accurate method for valuation. Since the APV method, unlike the WACC and FTE methods, does not require adjustment for a change in leverage, it is the easiest method to use when capital structures change significantly over time (Berk and DeMarzo 2007, 703). When applied to the Group, the APV method results in an enterprise valuation range between €52.54mm and €67.58mm (Table 3). The lower and

upper bound were determined by adjusting the unlevered cost of capital by 100 bps up and down (App. 4.2). The management case yields a lower valuation range of €50.37mm and €65.29mm due to the aforementioned reduced profitability and growth of the management case.

APV outputs (in €mm)	Lower bound	Median valuation	Upper bound
	<i>Valuation case</i>		
APV valuation @ 11.68%	52.54	59.30	67.58
	<i>Management case</i>		
APV valuation @ 11.68%	50.37	57.07	65.29

Table 3: APV valuation outputs. **Source:** Own calculations.

As expected, the valuation result of the APV method is very close to the result of the WACC method, because the Group is a company with virtually no expected changes in its capital structure over time and furthermore owns almost no financial debt. Therefore, the deviation between the WACC method with its rigid discount rate and the APV method with its annual capital structure adjusted discounting is very small. In this particular case the "valuation error" of the WACC method without significant financial debt is almost zero. In 2022, the Group had financial debt of only €0.01mm, which will be reduced to zero in the future. Becoming free of financial debt coincides with the drawback of not profiting from future tax shields. In the modeled APV, it is not difficult to explain why the unlevered enterprise value and the leveraged enterprise value are very closely related. With almost no financial debt there is nothing that separates the two valuation approaches, and the leveraged value approximates the unlevered value. The low debt level indicates a discounted tax shield value of €217 in 2023, which on the downside also shows that the Group does not make use of the benefits of a tax shield. The discounted value of the net financial debt is also low due to the limited use of financial liabilities and, with a value of €0.01mm, has a very limited impact on the difference between the levered enterprise value and the equity value (App. 4.3).

The flow-to-equity method (FTE) uses the cash flow available to the equity holders after all payments to and from the debt holders have been made. This means that, in contrast to the methods described earlier, interest expenses and net borrowings as well as nonoperating items

are included in the free cash flow to equity. By discounting the FCFE with the equity cost of capital, the equity value is determined (Koller et al. 2020, 204; Berk and DeMarzo 2007, 684). One advantage of the FTE method over the previously described methods is that the equity value is determined directly and does not have to be calculated using the enterprise value. Therefore, the FTE is more transparent from the point of view of the shareholders (Berk and DeMarzo 2007, 687). A major disadvantage of the FTE method is that in the course of the calculation there is often a risk of unknowingly changing the capital structure, for example, by changing the debt-to-value ratio and not including this change in the cost of equity (Koller et al. 2020, 205).

Unsurprisingly, the FTE method yields valuations that are very close to those obtained by the WACC or the APV method. Based on the valuation case, the FTE method yields a median enterprise value of €59.30mm, while the management case yields a value of €57.06mm (Table 4). The downside and upside cases considered, which are based on a deviation of the cost of equity by 100 bps, result in a pricing range between €52.47mm and €67.65mm in the valuation case and a range of €50.31mm and €65.35mm in the management case (App. 4.4).

FTE outputs (in €mm)	Lower bound	Median valuation	Upper bound
	<i>Valuation case</i>		
FTE valuation @ 11.69%	52.47	59.30	67.65
	<i>Management case</i>		
FTE valuation @ 11.69%	50.31	57.06	65.35

Table 4: FTE valuation outputs. **Source:** Own calculations.

7. Cash flow-based valuation – leveraged buyout

In Germany, the craftsmanship sector has long been neglected or even shunned by private equity investors. However, the sector offers interesting opportunities due to a number of factors: The market is highly fragmented, demand has been much higher than supply for years, and in addition, laws such as the GeG Act create political incentives that should lead to expanding order books in the near future. In addition, many companies are not run by managers but by

master craftsmen and have upside potential in terms of efficiency and digitalization, which private equity investors can use for value creation. Examples of financial investors in this specific market space are Triton Partners, Auctus Capital Partners and Adiuva Capital. Due to its position in the market, the Group is also a potentially attractive target for financial investors who would acquire the majority of the shares of the Group in the course of an investment via a leveraged buyout (LBO). Within the scope of an LBO, the entry/exit multiple is one of the most important factors for achieving targeted return requirements. Due to this connection, an LBO can be used as a reverse valuation model by setting the return requirement and continuing on to use the LBO to determine the entry factor that a financial investor would be willing to pay. The modeled LBO is based on an acquisition and exit EBITDA multiple of 5.5x on the 2022 EBITDA, resulting in an enterprise value of €59.43mm. For the new acquisition financing, the common assumption in practice of a debt capacity of 3.5x EBITDA was made, resulting in debt of €37.82mm via a term loan A. In the overall structure of the acquisition sources, debt thus accounts for a percentage share of 56.63%, which corresponds to the average of the leverage typically applied in the course of an LBO (Zeisberger, Prahl, and White 2017, 44). The debt assumption of 3.5x EBITDA implies an equity investment of the private equity fund in the total amount of €18.26mm. For Term Loan A, an interest rate of 8.00% was assumed, a term of 8 years and scheduled payments which increase from 1.00% of the loan volume in 2023 to 10.00% in 2026. The interest rate of 8.00% is based on the assumed cost of debt indicated in the cost of capital section. In addition, a financing fee of 0.50% on the loan volume was assumed for the loans. The annual repayments and interest payments resulting from the loan totaling €5.64mm in 2029 can be serviced from the cash flow of the Group. The coverage and credit ratios in App. 5.1 show the development of leverage over the course of the investment period. Starting from 3.3x total debt/EBITDA in 2023, the ratio of total debt to EBITDA decreases steadily over time, with the exception of 2024, to a moderate value of 1.2x in the exit year.

The analysis shows that after the entry in 2023 an exit of the investment in year 2029 would be ideal in terms of return optimization. With an EBITDA of €17.63mm and an exit factor of 5.5x EBITDA, an implied enterprise value of €96.98mm results. This represents a total equity value creation of €77.91mm over the term of the investment when including the transaction fees and the initial equity investment of €18.26mm. The resulting IRR to sponsor is 23.03% and the MOIC to sponsor (multiple on invested capital) is 4.27x. Appendix 5.2 shows how these return figures develop with a change in the exit multiple: By increasing the exit factor by 0.5 units, the IRR can be increased by 190 bps to 24.93%. In a downside case with an exit factor reduced by 0.5 units, however, the IRR deteriorates to a value of 20.94%.

Based on the assumption made at the beginning of this chapter, that an LBO can be used as a valuation method to determine the enterprise value, an entry and exit multiple must be determined which leads to an average targeted IRR in the investment case. The assumption for this IRR is 22.10%, based on the median global buyout deal IRR in the period between 2009 and 2018 (Bain & Company 2023). Under otherwise unchanged assumptions regarding financing, deal structuring and holding period, this results in an entry/exit multiple of 5.5x EBITDA for the Group. In a real investment case, a private equity investor could achieve a targeted IRR of 23.03% at this purchase price under realistic financing assumptions, making the Group an attractive potential target. Considering an upside and downside case with a change of the multiple by one unit each, the LBO valuation for the Group results in an enterprise value ranging between €48.63mm and €70.24mm in the valuation case.

8. Comparable company valuation

In addition to the valuation methods described above, valuation using comparable companies is widely used in practice. According to the "law of one price", investments that have the same payoff in the future should also be worth the same amount (Berk and DeMarzo 2007, 326). This principle holds in the case of listed firms and is therefore applied in the valuation of comparable

companies: The value of the company is determined based on companies that will presumably have very similar cash flows in the future as the company to be valued. Therefore, the value of the comparable company can be used to determine the value of the company under analysis. The valuation multiple used for this purpose helps to take into account differences in the size of the companies by setting the firm value in relation to another key parameter of the company (Berk and DeMarzo 2007, 327; Depamphilis 2019, 209). Since the Group is a private company, the usual and frequently used stock-based valuation multiples such as the price-earnings ratio are not used in this valuation. Another difficulty in the multiple valuation in this particular case is the industry in which the Group operates: The crafts industry in Germany is a very fragmented market with many small owner-operated businesses that are not listed and rarely are the subject of M&A transactions due to their small size. There are relatively few larger firms like the Group, and at the same time the sector has not yet come into the broad focus of financial investors. Accordingly, the data basis in the industry is very weak.

A universe of five comparable companies was compiled for the valuation based on trading comparables (App. 6.1). Due to the difficulty of identifying listed craft companies, firms were selected that are active in closely related sectors, are as small as possible and are predominantly active in German-speaking countries. Of the five companies, three operate in the construction sector (Hochtief AG, PORR AG and Implenia AG), one as a building materials supplier (Villeroy & Boch AG) and one as a plant engineering company (Friedrich Vorwerk AG). For the valuation, the enterprise values of the companies were calculated subsequently, and enterprise value multiples were formed based on the expected future EBITs and EBITDAs between 2023 and 2025, the mean value of which was applied to the Group. On average, EV/EBITDA multiples of between 4.11x and 5.04x and EV/EBIT multiples of between 6.58x and 7.43x were calculated. Applied to the EBIT and EBITDA of the Group, the enterprise value implied by the trading comparables is between €38.89mm and €57.71mm in the case of the

EBITDA multiples and between €30.72mm and €72.52mm in the case of the EBIT multiples (App. 6.2).

Due to the factors mentioned above, valuation based on precedent transactions is also very difficult. During the research, many transactions in the segment could be identified, but very few associated valuation figures. Therefore, the Finance Magazine database was used instead, which is a valid source for German industry multiples. In the latest issue for multiples in the construction and trades industry from March 2022, EBIT multiples of between 5.5x and 9.6x are given for the HVAC industry, depending on the company size, whereby the multiples in the mid cap segment relevant for the Group are between 6.9x and 8.8x (Finance Magazin 2022). Based on the 2022 EBIT, this implies a valuation range of €62.66mm and €79.91mm. Considering that the Group with its total revenue of around €115.00mm is exactly in the middle of the revenue range of mid cap companies, the application of mid cap multiples seems appropriate. Considering the expected EBIT of 2023, a mean valuation of €77.46mm results (App. 6.3). Based on the revenue multiples of Finance Magazine, the valuation of the company is significantly higher. Overall, the range is between 0.53x and 0.95x from the lower small cap bound to the upper large cap bound, with the mid cap sector having a range of 0.61x to 0.88x. Thus, based on the total operating income of 2022, a median valuation of €85.47mm results and in the case of 2023 revenue a valuation of €86.00mm (App. 6.3).

9. Valuation summary and conclusion

The valuation ranges achieved by the methods applied were compiled in the form of a football field chart. In addition to the calculated median enterprise values, the respective upper and lower thresholds of the valuation method were included to present a valuation range that represents possible deviations from the expected business plan. The determination of the upper and lower thresholds depends on the respective valuation method and is shown in Appendix 7.1. The valuation case shows a fairly homogeneous picture of the football field chart overall.

In particular, the cash flow-based valuation methods lie close together with median values that diverge by only €2.18mm. It is noticeable here that the three cash flow-based methods DCF, APV and FTE have almost identical enterprise values on average and differ mainly in the width of the valuation range. This observation confirms the previous statement that the three cash-flow based methods should deliver the same results with the same assumptions. The largest deviation from the median valuation in the football field can be seen in the trading comps for EBITDA/EV multiples for the years 2024 and 2025. This is because the management and valuation case with the modeled wage increases with simultaneous declines in revenues in 2024 show significantly reduced EBITDAs in that specific year and therefore result in correspondingly low valuations. Looking at the largest possible intersection of the valuation methods, i.e. a vertical line that intersects most of the bars in the football chart, an enterprise value of €63.48mm is determined (Table 5). The intersection comprises 9 of the 15 methods shown. A valuation range that also has the largest possible intersection is shown in blue and comprises 10 of the 15 valuation methods. Based on the valuation case, a reasonable value of the Group would therefore lie in a range between €60.80mm and €67.56mm.

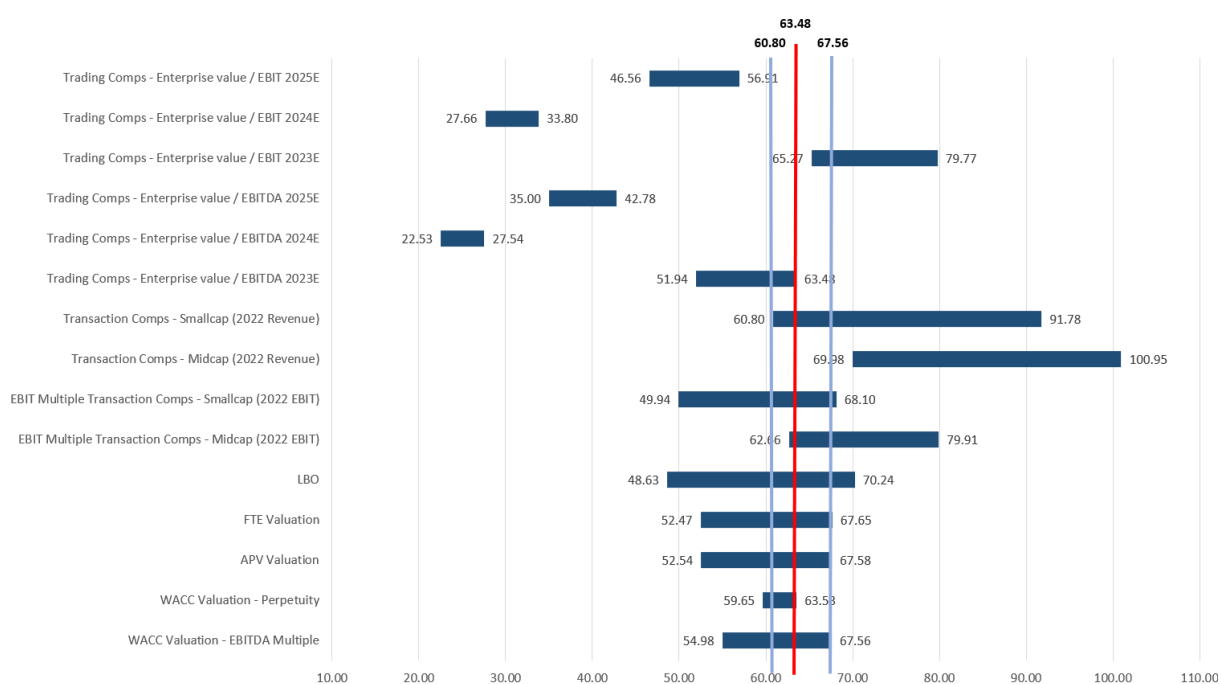


Table 5: Football field chart for the valuation case (in € mm). Source: Own calculations.

In the management case, a similar overall picture emerges, but with different mean valuations. With an enterprise value of €60.80mm, a maximum intersection of 8 of the 15 valuation methods is possible. A sound valuation range with the largest possible intersection in the management case is depicted in blue and lies between €57.60mm and €65.10mm (Table 6).

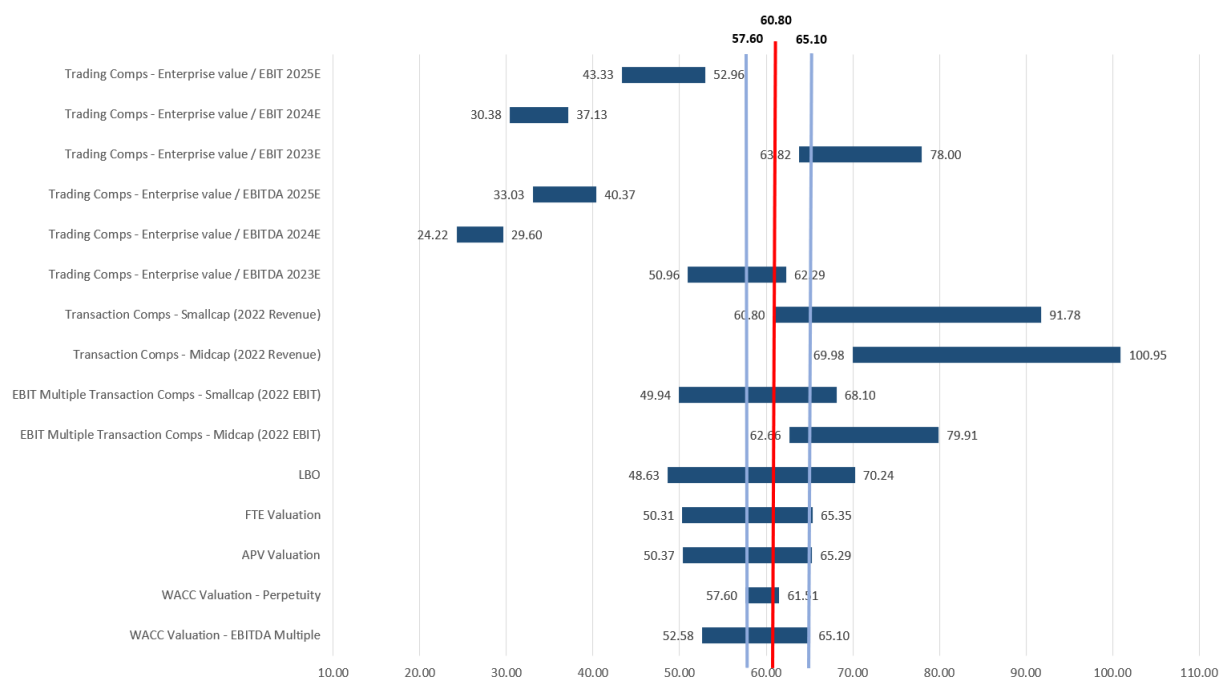


Table 6: Football field chart for the management case (in € mm). **Source:** Own calculations.

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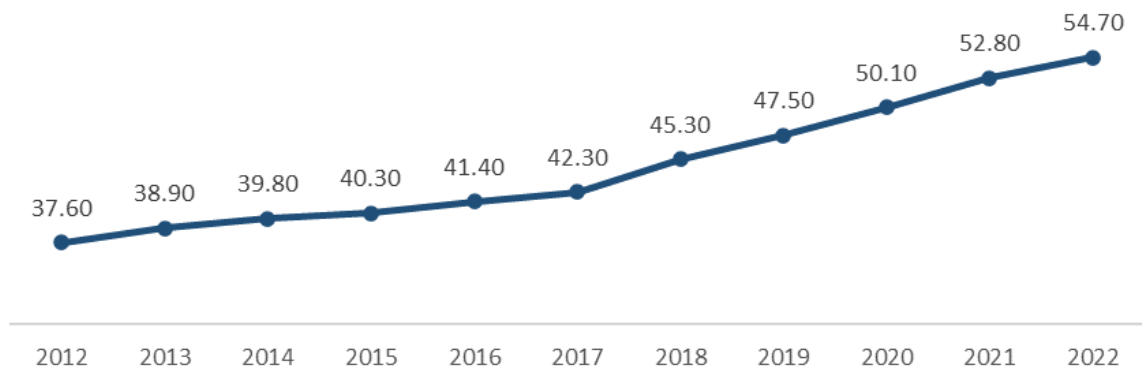
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Appendix

App. 1.1: Subsidiaries of the Group (names have been removed for privacy reasons). **Source:** Company information.

Subsidiary number	Ownership	Revenue 2021	EBIT 2021
1	100.0%	10,380,609	823,959
2	100.0%	5,679,674	495,921
3	100.0%	19,568,646	2,618,738
4	60.0%	6,408,296	160,792
5	100.0%	4,008,113	(143,456)
6	100.0%	3,004,272	230,372
7	100.0%	1,988,764	146,949
8	100.0%	6,167,801	277,255
9	100.0%	10,203	(68,744)
10	100.0%	8,419,010	465,482
11	75.5%	2,836,969	(202,973)
12	55.0%	2,720,069	111,294
13	100.0%	857,718	71,045
14	100.0%	3,682,554	252,784
15	100.0%	1,835,993	106,983
16	100.0%	2,865,732	214,300
17	55.0%	14,987,536	2,345,489
18	100.0%	4,366,827	510,509
19	100.0%	6,463,344	130,874
20	51.0%	3,299,119	321,934
21	100.0%	2,902,603	128,854
22	100.0%	-	(7,663)
23	100.0%	-	-
24	49.0%	3,694	1,271
25	30.0%	1,007,333	52,492
		113,464,878	9,044,460

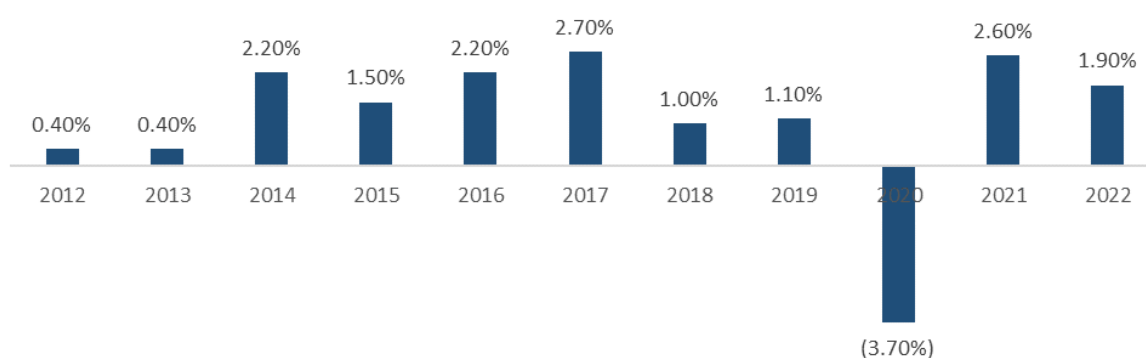
App. 1.2: Development of the revenues in the German HVAC sector (in €bn). **Source:** ZVSHK (b). 2023.



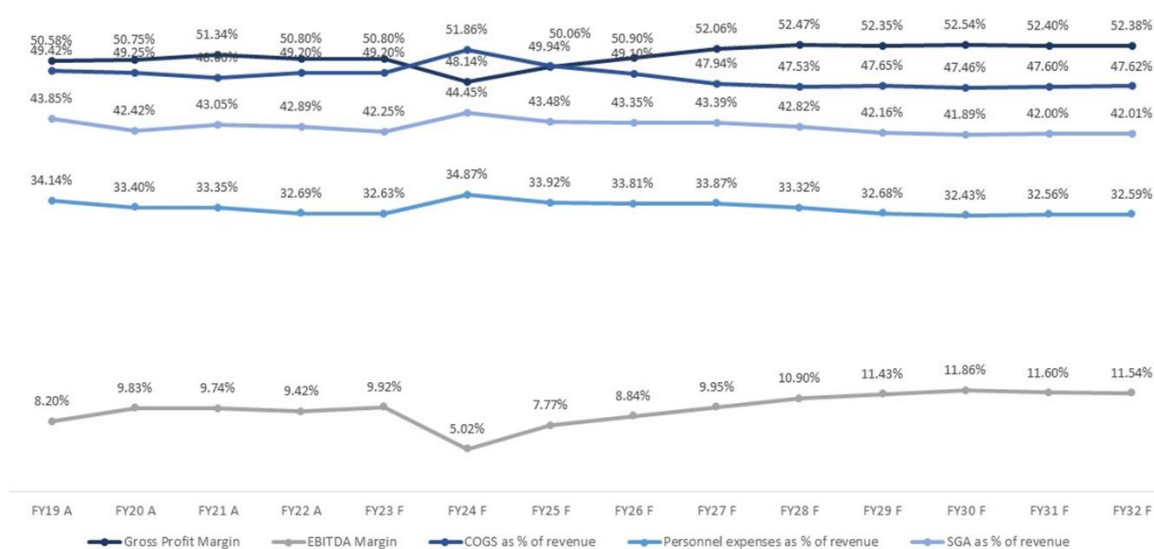
App. 1.3: Main competitors of the Group in the HVAC sector. **Source:** Company information.

Company	Headquarter	Locations	Employees	Revenue (Latest available) (in €mm)	EBITDA-Margin	Industry Focus
1KOMMA5	Hamburg, Germany	65	1,500	~500	n.a.	HVAC & Solar
HPM Die Handwerkergruppe	Hamburg, Germany	>150	4,279	502	7.46%	All sectors
HWP Handwerkspartner	Harrislee, Germany	15	1,000	130	10.03%	HVAC, painting
Builtch Holding	Berlin, Germany	18	797	173	11.99%	HVAC
Daume GmbH Duderstadt	Duderstadt, Germany	>30	452	76	10.33%	HVAC
Diehl GmbH Baumholder	Baumholder, Germany	4	274	49	7.82%	HVAC
Dornhöfer GmbH Mainz	Mainz, Germany	10	350	52	11.30%	HVAC
GA-tec GmbH Heidelberg	Heidelberg, Germany	12	1,166	195	1.64%	HVAC
The Group	Germany	27	758	114	9.42%	HVAC, Water, Renewables

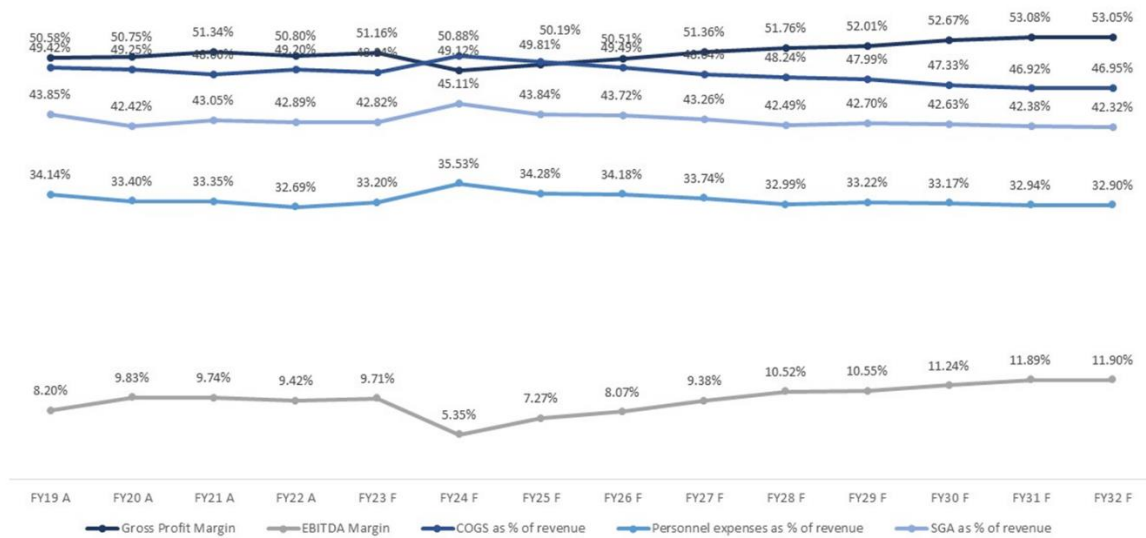
App. 2.1: Historical y-o-y GDP growth in Germany. **Source:** Destatis (b) 2023.



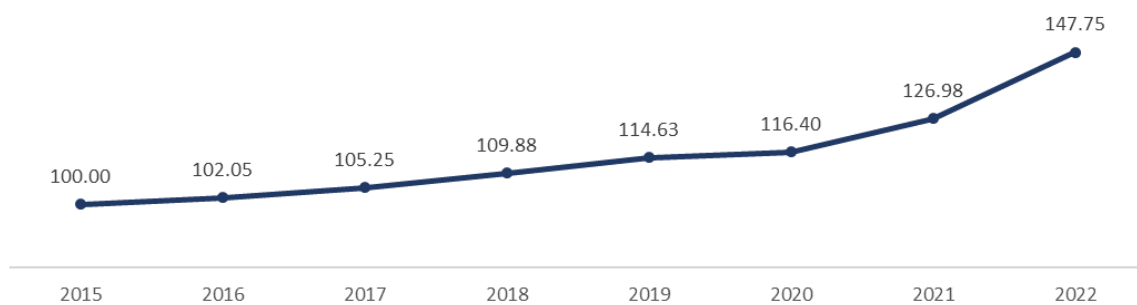
App. 2.2: Core P&L ratios of the valuation case. **Source:** Own calculations.



App. 2.3: Core P&L ratios of the management case. **Source:** Own calculations.



App. 2.4: Development of the construction price index Germany. **Source:** Destatis (a) 2023.



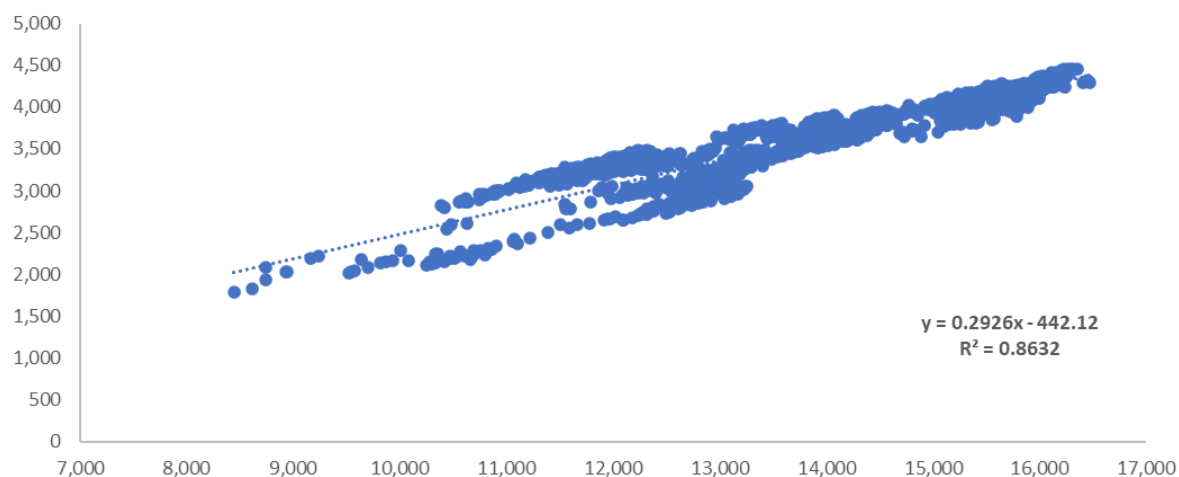
App. 2.5: Y-o-Y wage growth in Germany and in the metal sector. **Source:** Destatis (b) 2021.



App. 3.1: Peer group for beta determination. **Source:** FactSet and company information.

Name	Business Segment	Levered Beta	Debt	% Debt	Equity value	% Equity	Tax Rate	Unlevered beta
Hochtief AG	Construction company	1.18	5,266.8	41.68%	7,370.6	58.32%	29.72%	0.79
Ed. Züblin / Strabag	Construction company	1.12	966.6	19.99%	3,868.0	80.01%	29.72%	0.95
Helma Eigenheimbau AG	Construction company	0.89	230.0	55.40%	185.2	44.60%	29.72%	0.48
Bauer AG	Construction company	1.15	436.2	64.50%	240.0	35.50%	29.72%	0.51
Friedrich Vorwerk Group	Plant engineering	1.52	13.5	4.85%	264.8	95.15%	29.72%	1.47
Villeroy & Boch	Construction supplier	0.64	75.5	25.95%	215.5	74.05%	29.72%	0.51
Steico	Construction supplier	1.74	199.7	32.96%	406.2	67.04%	29.72%	1.29
Median			230.0	32.96%	264.8	67.04%	29.72%	0.79
Mean			1,026.9	35.05%	1,792.9	64.95%	29.72%	0.86

App. 3.2: Regression of the DAX index with the DAX Industrial index (DAXSECTOR INDUS.PR, WKN: 966029). **Source:** Onvista.de.



App. 3.3: WACC calculation. Source: Own calculations.

WACC based on current capital structure		
Risk free rate		2.58%
Re-levered beta		1.14
Equity risk premium		8.00%
Cost of equity		11.69%
Cost of deductible debt		8.00%
Marginal tax rate		31.26%
After-tax cost of deductible debt		5.50%
Cost of non-deductible debt		8.00%
Cost of preferred stock		
Percentage of capital	%	Wavg Cost
Financial debt	0.02%	0.00%
Equity	99.98%	11.68%
Weighted Average Cost of Capital		11.68%

APV Assumptions	
Unlevered cost of capital	11.68%

App. 4.1: WACC valuation sensitivity analysis valuation case. Source: Own calculations.

		Implied Enterprise Value							
		Perpetuity growth rate							
Discount rate		0.90%	1.10%	1.30%	1.50%	1.70%	1.90%	2.10%	
		(0.60%)	(0.40%)	(0.20%)		0.20%	0.40%	0.60%	
	3.00%	48,755,241	49,203,808	49,669,654	50,153,797	50,657,337	51,181,463	51,727,465	
	2.00%	52,077,831	52,567,453	53,075,937	53,604,393	54,154,021	54,726,120	55,322,096	
	1.00%	55,699,415	56,234,266	56,789,720	57,366,991	57,967,389	58,592,335	59,243,363	
	11.68%	59,651,219	60,235,936	60,843,177	61,474,269	62,130,645	62,813,856	63,525,582	
	10.68%	63,968,120	64,607,865	65,272,253	65,962,738	66,680,886	67,428,394	68,207,101	
	9.68%	68,689,120	69,389,643	70,117,151	70,873,234	71,659,609	72,478,133	73,330,820	
	8.68%	73,857,882	74,625,596	75,422,882	76,251,485	77,113,284	78,010,317	78,944,790	
	(3.00%)								
		Implied Enterprise Value							
		Terminal Multiple of FY32 F EBITDA							
Discount rate		3.20x	3.70x	4.20x	4.70x	5.20x	5.70x	6.20x	
		(1.5)	(1.0)	(0.5)		0.5	1	1.5	
	3.00%	42,755,113	45,168,510	47,581,907	49,995,303	52,408,700	54,822,097	57,235,494	
	2.00%	45,528,523	48,162,813	50,797,103	53,431,393	56,065,683	58,699,973	61,334,264	
	1.00%	48,545,128	51,422,756	54,300,383	57,178,010	60,055,638	62,933,265	65,810,892	
	11.68%	51,829,912	54,975,831	58,121,750	61,267,669	64,413,588	67,559,507	70,705,426	
	10.68%	55,410,746	58,852,729	62,294,712	65,736,695	69,178,678	72,620,660	76,062,643	
	9.68%	59,318,762	63,087,746	66,856,731	70,625,716	74,394,701	78,163,686	81,932,671	
	8.68%	63,588,770	67,719,256	71,849,741	75,980,226	80,110,712	84,241,197	88,371,682	
	(3.00%)								

App. 4.2: APV valuation sensitivity analysis valuation case. **Source:** Own calculations.

		Implied Enterprise Value						
		Cost of debt						
Unlevered cost of capital		7.40%	7.60%	7.80%	8.00%	8.20%	8.40%	8.60%
		(0.60%)	(0.40%)	(0.20%)		0.20%	0.40%	0.60%
	14.68%	3.00%	42,202,676	42,202,697	42,202,718	42,202,738	42,202,759	42,202,780
	13.68%	2.00%	46,931,781	46,931,802	46,931,823	46,931,844	46,931,864	46,931,885
	12.68%	1.00%	52,543,851	52,543,872	52,543,892	52,543,913	52,543,934	52,543,954
	11.68%		59,301,076	59,301,097	59,301,118	59,301,139	59,301,159	59,301,180
	10.68%	(1.00%)	67,579,985	67,580,006	67,580,027	67,580,048	67,580,068	67,580,089
	9.68%	(2.00%)	77,941,299	77,941,320	77,941,341	77,941,362	77,941,383	77,941,403
	8.68%	(3.00%)	91,258,143	91,258,164	91,258,184	91,258,205	91,258,226	91,258,246

App. 4.3: APV valuation. **Source:** Own calculations.

APV	FY23 F
Unlevered free cash flow	4,902,693
Discount factor unlevered cost of capital @ 11.68%	11.68%
Unlevered enterprise value	63,750,108
Interest expenses	(694)
Interest tax shield	217
Discount factor unlevered cost of capital @ 11.68%	11.68%
Discounted tax shield / value of the tax shield	269
Enterprise value (levered)	63,750,377
Financial debt	8,676
Change in financial debt	(671)
Interest on financial debt	(694)
Cash flow financial debt (excl. Interest tax shield)	(1,148)
Discount factor cost of debt @ 8.00%	8.00%
Value of net financial debt	(7,967)
Cash flow of minority interest	(138,524)
Discount factor cost of equity @ 11.69%	11.69%
Value of minority interest	931,133
Shareholders equity value	64,673,543

App. 4.4: FTE valuation sensitivity analysis valuation case. **Source:** Own calculations.

		Implied Enterprise Value						
		Interest on financial debt						
Cost of equity		5.00%	6.00%	7.00%	8.00%	9.00%	10.00%	11.00%
		(3.00%)	(2.00%)	(1.00%)		1.00%	2.00%	3.00%
	14.69%	3.00%	42,021,802	42,021,802	42,021,802	42,021,802	42,021,802	42,021,802
	13.69%	2.00%	46,802,349	46,802,349	46,802,349	46,802,349	46,802,349	46,802,349
	12.69%	1.00%	52,472,194	52,472,194	52,472,194	52,472,194	52,472,194	52,472,194
	11.69%		59,295,057	59,295,057	59,295,057	59,295,057	59,295,057	59,295,057
	10.69%	(1.00%)	67,649,610	67,649,610	67,649,610	67,649,610	67,649,610	67,649,610
	9.69%	(2.00%)	78,099,708	78,099,708	78,099,708	78,099,708	78,099,708	78,099,708
	8.69%	(3.00%)	91,523,256	91,523,256	91,523,256	91,523,256	91,523,256	91,523,256

App. 5.1: Coverage and credit ratios in the LBO. **Source:** Own calculations.

Coverage and credit ratios								
	FY22 A	FY23 F	FY24 F	FY25 F	FY26 F	FY27 F	FY28 F	FY29 F
Senior Debt / EBITDA	NA	3.27x	6.48x	3.66x	2.85x	2.08x	1.56x	1.21x
Total Debt / EBITDA	NA	3.27x	6.48x	3.66x	2.85x	2.08x	1.56x	1.21x
EBITDA / Cash Interest	NA	3.8x	1.90x	3.33x	4.27x	5.63x	7.44x	9.48x

App. 5.2: LBO return analysis. **Source:** Own calculations.

LBO return analysis			
Exit multiple	5.00x	5.50x	6.00x
EBITDA	17,632,368	17,632,368	17,632,368
Implied enterprise value	88,161,840	96,978,025	105,794,209
(-) Net debt	(2,777,230)	(2,777,230)	(2,777,230)
Implied equity value	85,384,611	94,200,795	103,016,979
(+) Fees and expenses	1,972,026	1,972,026	1,972,026
Initial equity investment	(18,258,247)	(18,258,247)	(18,258,247)
Total equity value created	69,098,390	77,914,574	86,730,758
IRR to sponsor	20.94%	23.03%	24.93%
MOIC to sponsor	3.78x	4.27x	4.75x

App. 6.1: Trading comparables. **Source:** Company information and own calculations.

Trading comparables		The Group	Hochtief AG	PORR AG	Implenia	Friedrich Vorwerk GmbH	Villeroy & Boch
Share price	(€)	-	98.40	11.38	28.62	12.58	17.35
Shares outstanding	(mm)	-	77.71	39.28	18.47	20.00	14.04
Market cap	(€mm)	-	7,646.79	446.99	528.58	251.60	243.68
Net debt	(€mm)	-	1,446.50	224.58	1,144.50	13.43	(61.90)
Non-controlling interest	(€mm)	-	72.60	32.70	7.38	0.02	3.70
Investments in associates	(€mm)	-	(212.30)	(76.60)	(45.59)	(24.70)	(2.80)
Enterprise value (undiluted)	(€mm)	-	8,953.59	627.67	1,634.86	240.35	182.68
EBITDA 2023E	(€mm)	11.45	1,233.65	354.46	227.56	31.43	136.10
EBITDA 2024E	(€mm)	5.63	1,276.36	379.76	244.07	42.96	142.20
EBITDA 2025E	(€mm)	9.46	1,330.39	416.46	252.09	52.10	150.40
Enterprise value / EBITDA 2023E	(x)	n.m.	7.26x	1.77x	7.18x	7.65x	1.34x
Enterprise value / EBITDA 2024E	(x)	n.m.	7.01x	1.65x	6.70x	5.59x	1.28x
Enterprise value / EBITDA 2025E	(x)	n.m.	6.73x	1.51x	6.49x	4.61x	1.21x
EBIT 2023E	(€mm)	9.87	903.33	148.81	123.62	13.04	89.50
EBIT 2024E	(€mm)	4.14	939.63	170.17	139.39	23.41	94.50
EBIT 2025E	(€mm)	7.87	984.50	197.59	147.23	31.19	101.50
Enterprise value / EBIT 2023E	(x)	n.m.	9.91x	4.22x	13.23x	n.m.	2.04x
Enterprise value / EBIT 2024E	(x)	n.m.	9.53x	3.69x	11.73x	10.27x	1.93x
Enterprise value / EBIT 2025E	(x)	n.m.	9.09x	3.18x	11.10x	7.71x	1.80x

App. 6.2: Trading comparables output. **Source:** Company information and own calculations.

Trading comparables output	Comparables Multiple	Group Metric	Implied Group EV
Enterprise value / EBITDA 2023E	5.04x	11,449,525	57,711,110
Enterprise value / EBITDA 2024E	4.45x	5,627,811	25,038,451
Enterprise value / EBITDA 2025E	4.11x	9,462,388	38,890,538
Enterprise value / EBIT 2023E	7.35x	9,867,997	72,520,296
Enterprise value / EBIT 2024E	7.43x	4,136,116	30,727,977
Enterprise value / EBIT 2025E	6.58x	7,867,265	51,737,611

App. 6.3: Transaction multiple valuation. **Source:** Finance Magazin 2022.

Construction and handicraft sector EBIT multiple			EBIT 2022			9,080,583	EBIT 2023			9,867,997
	Lower bound	Upper bound	Lower bound	Average	Upper bound		Lower bound	Average	Upper bound	
Small cap <€50mm	5.50x	7.50x	49,943,208	59,023,791	68,104,374		54,273,983	64,141,980	74,009,977	
Mid cap €50-250mm	6.90x	8.80x	62,656,024	71,282,578	79,909,133		68,089,178	77,463,775	86,838,372	
Large cap >€250mm	7.60x	9.60x	69,012,433	78,093,016	87,173,599		74,996,776	84,864,773	94,732,770	

Construction and Handicraft sector revenue multiple			Revenue 2022			114,719,328	Revenue 2023			115,440,031
	Lower bound	Upper bound	Lower bound	Average	Upper bound		Lower bound	Average	Upper bound	
Small Cap <€50mm	0.53x	0.80x	60,801,244	76,288,353	91,775,463		61,183,217	76,767,621	92,352,025	
Mid Cap €50-250mm	0.61x	0.88x	69,978,790	85,465,900	100,953,009		70,418,419	86,002,823	101,587,227	
Large Cap >€250mm	0.63x	0.95x	72,273,177	90,628,269	108,983,362		72,727,220	91,197,625	109,668,030	

App. 7.1: Determination of bounds for football field analysis. **Source:** Own calculations.

DCF Valuation - EBITDA Multiple	DCF Valuation - Perpetuity	APV Valuation	FTE Valuation	LBO	Transaction multiples	Trading comps
Plus/Minus one terminal EBITDA multiple	Plus/Minus 60 bps on the perpetuity growth rate	Plus/Minus 100 bps on the unlevered cost of capital	Plus/Minus 100 bps on the cost of equity	Plus/Minus one purchase price multiple	Lower and upper bound of published multiples	Plus/Minus 10% based on default case