HSE·AG

2025

Annual Report

The Lab of the Future

"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency."

Bill Gates

Hans Noser,
Chairman HSE·AG

Michael Collasius,
CEO HSE·AG

Focusing on new opportunities

New corporate clients, the successful launch of the product business in collaboration with partners, and promising follow-up projects: Chairman Hans Noser and CEO Michael Collasius anticipate growth in the coming years – even if the world will be a different place.

Michael Collasius: Hans, 2025 was not an easy year for us. The numerous economic and political uncertainties – including tariffs and changes in research policy in the U.S., sluggish growth in Europe, and sharp reductions in diagnostic funding in China – led many of our customers to postpone investment decisions. What do you think characterizes our 2025 fiscal year?

Hans Noser: That's certainly true. Although the results fell short of our expectations, HSE·AG is on the right track, and we remain focused on the automation of sample preparation. The market currently perceives us as the experts in sample preparation, with mastery of all aspects of the field.

"We are currently perceived by the market as the experts in automated sample preparation."

M. C.: That aligns with my perception. Over the past year, we've been approached much more frequently by potential customers we hadn't known before, asking if we could provide concrete assistance. That's why I see 2025 above all as a year of new opportunities with new customers and new contacts.

H. N.: I see it exactly the same way, Michael. We no longer have to explain our strengths.

This is also evident in the fact that follow-up projects now almost automatically arise from active projects.

M. C.: With our focus, we clearly complement our clients perfectly. Their core competencies lie either in the innovative analytical methods they've developed or in specific device technologies like liquid handling. Sample preparation, on the other hand, is generally not part of their core expertise. It also helps us that medical and biological samples are extremely diverse and that their reliable preparation requires a great deal of experience.

"It also helps us that the reliable preparation of medical and biological samples requires a great deal of experience."

H. N.: We also benefit from the ever-increasing pressure to automate. Costs must continue to be reduced in the long term, and the shortage of skilled workers is also growing. And the biggest gaps in automation that exist today are in our focus area: pre-analytics. This annual report clearly demonstrates that this applies just as much to high-throughput lines as it does to smaller laboratories where equipment is operated individually. With our exceptionally broad and deep expertise in sample handling and processing, we are the ideal partner to drive automation in preanalytics.

M. C.: We were able to make a major mark in automation highlight in 2025 with the launch of several products in collaboration with manufacturer partners. With the eviDense photometer and the eviFluor fluorometer, manufacturers now have two on-deck modules at their disposal that allow the determination of the concentration and purity of nucleic acid samples to be integrated directly into molecular biology workflows. Beckman Coulter Life Sciences is the first major provider to have already integrated both modules into its liquid-handling workstations.

H. N.: Another example is the Microlab PuriFY benchtop device from Hamilton, it is not only a milestone in the automation of the preparation of all kinds of nucleic acid samples.

Microlab PuriFY – developed in collaboration with Hamilton

"Due to the tight labor market situation, intuitive operation is a must."

It also sets new standards in terms of user interface, as it can be controlled using gestures familiar from smartphones. I am convinced that such simple and intuitive operation is becoming more and more of a must due to the tight labor market situation.

M. C.: Another example of how innovative ideas combined with new technologies can make a decisive difference is the prototype of a pipetting assistant, which was completed at the end of 2025. We created it within a few months using 3D printing techniques, and in software development, we made tar-

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geted use of the capabilities of AI. Our latest product fills the automation gap in liquid handling for smaller labs, where the use of full-scale liquid handlers isn't cost-effective. The device was deliberately designed for ease of use and to prevent errors.

"The pipetting assistant fills the automation gap in liquid handling for smaller laboratories."

H. N.: The Pipetting Assistant is a typical dedicated solution that minimizes manual labor in a specific process. We are convinced that it is particularly attractive for manufacturers of purification and analysis kits. They can use the automation solution to simplify access to their reagents. It can be used, for example, for the normalization of NGS samples, for single-cell technologies, or for the preparation of samples for antibody panels.

M. C.: And what developments do you expect in the coming years, Hans?

H. N.: The Chinese diagnostics market did indeed collapse for European and U.S. providers in 2025 due to the 30% reduction in reimbursement per test. However, it will start growing again from a lower base in the coming years. After Western companies initially responded by cutting costs, they now need to take the initiative again. This means they will have to do everything in their power to reduce costs in the long term through innovation and automation. I see great opportunities for us there.

M. C.: In the U.S., the outlook is not so clear. Tariffs have indeed been lowered again in recent months for some countries and products. But that can change quickly. On top of that, there's research policy. Just as uncertain as the size of the NIH's budgets is which research areas will have more funding in the future and which will have less. What is clear: The world has changed significantly since Covid, and it will never be the same as it was before the pandemic.

"With Alexandre Thermet, we now have our first Head of Business Development North America."

H. N.: Regardless of the direction the U.S. takes in the coming years, it will become increasingly important to us. That is why HSE·AG has appointed Alexandre Thermet as its first Head of Business Development North America. The molecular biologist has many years of experience in the U.S. diagnostics market, most recently in business development at Bio-Rad Laboratories.

M. C.: In Alexandre, we have found the ideal leader for our North American operations. He understands both the biology behind diagnostic applications and device engineering, making him a perfect fit for the HSE·AG culture. With him, we will be able to fully leverage our strengths in the U.S. and translate innovations into commercially successful hardware solutions for our customers.

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H. N.: I am convinced of that as well. Especially since cost pressures will also have a positive long-term impact for us in the U.S.

M. C.: In my view, we are at the beginning of a global phase of cost engineering. Devices must be developed from the ground up with a focus on continuous cost optimization. And this applies not only to hardware, but also to consumables and maintenance. Every component must be capable of modular upgrades, and more efficient new technologies must be seamlessly integrated. This is a major challenge for the industry – and a major opportunity for us.

Topic: Laboratory of the Future

The challenges facing lab operators – and HSE·AG's solution expertise

Automation is a must for all lab operators. It is the answer to growing cost pressures, the increasing shortage of skilled workers, and the customer demand for analysis results that are as fast and reliable as possible. Market analysts therefore agree: The lab of the future will be fully automated, modular in design, fully digitized, and flexibly networked. We spoke with Alex Louis from the U.S. diagnostics group Quest Diagnostics and with Nina Beikert from Labor Berlin, Europe's largest hospital laboratory, about their visions for the future and their current challenges – and how these differ for their central high-volume laboratories and smaller regional sites.

According to the lab operators, the greatest potential for automation currently lies in the field of preanalytics. With a focus on sample preparation, HSE·AG's engineering expertise addresses precisely this area. In the second part of the annual report, current examples demonstrate how HSE·AG supports equipment and reagent manufacturers in specifically addressing the challenges faced by diagnostic laboratories and step-by-step turning their vision of the laboratory of the future into reality.

However, HSE·AG always looks beyond its own horizons and toward the future of the industry. In an opinion piece, CEO Michael Collasius reflects on the purpose and significance of humanoid robots.


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Faster, more reliable, and more affordable

The challenges in diagnostics are the same worldwide. Everywhere, continuous cost reduction and quality improvement are top priorities, to be achieved primarily through process automation – from sample acceptance to storage for possible repeat samples. In detail, however, the requirements sometimes differ considerably. Alex Louis from Quest Diagnostics in the US and Nina Beikert from Labor Berlin in Germany talk about their specific automation challenges and strategies.

For Quest Diagnostics, quality, turnaround time, and cost per test are the most important factors for laboratory automation, emphasizes Alex Louis: "Quality and turnaround time are the main criteria for our customers. For Quest, productivity and cost per test are other important factors."

According to Louis, Senior Vice President of Enterprise Operations & Operational Excellence at one of the largest US laboratory diagnostics companies, automation is the answer to all these requirements. Reducing manual work speeds up results, increases process quality, reduces dependence on manual labor, and increases throughput to lower the cost per test.

Automation also optimizes another important quality and cost factor: space requirements. Automated lines help ensure that samples are handled consistently and traceably, improving structure, quality, and reliability. Employees focus on ensuring that automation delivers high-quality results.

Gradual introduction of automated lines

Quest is strategically driving automation forward. In 2019, end-to-end automation was fully implemented in the first of approximately 20 large clinical laboratories in the US, from sample management to storage. Three laboratories now have this fully automated process with sample transport lines for each department, permanently connecting the analyzers to each other.

"These permanently installed lines are the first step on our path to automation," ex-

plains Louis. “We are now turning to a more modular automation strategy that is more flexible and cost-effective than end-to-end automation. One element of this strategy is our collaborative robots, which we are currently testing in a molecular diagnostics laboratory. These robots pick up samples from sample management devices, transport them to analyzers, load them onto the device, and unload them again. This not only increases process flexibility, but also enables more efficient use of space and easier modular integration of new devices.”

Greater flexibility through robotics

The robots use lidar (light detection and ranging) technology, similar to that used in self-driving cars. Since the robotics must be specifically tailored to Quest, the first version is still expensive. Costs will decrease with further installations. “Since end-to-end automation is not always cost-effective for our smaller laboratories, this modular strategy will help us scale automation, which will reduce unit costs over time,” says Louis.

Pre-analytics and storage offer the greatest potential

Louis currently sees the greatest potential in automating pre-analysis and the mandatory storage of tested samples for several days for possible follow-up tests. At present, a considerable number of employees sort, scan, and aliquot the samples in sample management and then store them for retrieval for retesting – very manual processes.

This is not only costly, but also associated with operational risks. Quest competes with companies such as Amazon for labor, and wage inflation in the US is significant. “Turnover is high and recruitment is costly,” notes Louis. In addition, employees can often be transferred to better-paid positions.

End-to-end high-throughput lines

Fully automated analysis lines are also found in large European laboratories on the other side of the Atlantic. The Berlin-based hospital laboratory diagnostics group Labor Berlin, for example, has set up a fully automated high-throughput line in its central laboratory for the analysis areas of clinical chemistry, hematology, and coagulation, including pre-analysis and sample storage. The samples pass through the sequence of analyses requested by the doctors in a largely automated process. They are transported from one analysis device to the next by conveyor belt, with robot arms taking care of loading and unloading.

“Analytics is now largely automated in our routine testing, which involves large volumes,” explains Managing Director Nina Beikert. And this applies not only to the performance of analyses in the lines. The Berlin-based company has also automated pre-analysis, including sorting, opening, and aliquoting samples, as well as storing samples for possible follow-up analysis. This is ensured by a fully automated storage system.

Wanted: automated emergency analysis

At Labor Berlin, the greatest need for automation currently exists in the laboratories of the individual clinic locations, especially in emergencies. There, for example, serological tests must be able to be performed around the clock. The emergency service requires that appropriately trained laboratory personnel be on site 24/7. This is costly.

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"In addition, it is becoming increasingly difficult to find the right specialists," says Beikert, describing the challenge. Fully automated emergency analysis, including transfusion medicine tests, could provide a solution here.

Integration of additional steps into the devices

However, many tasks at Labor Berlin will remain manual work for some time to come. In addition to standard analyses, many special tests are also required. Not least, the shortage of skilled workers is also increasing the pressure to automate in this area.

In the field of special diagnostics, the company benefits, among other things, from the increased integration of individual steps into the analysis devices by the manufacturers. This eliminates intermediate steps in sample preparation or quality control, for example.

Complex technologies in widespread use

However, automation does not only affect the existing range of analytics, which can now be offered more quickly and cost-effectively. When complex devices are fully automated, analyses that would otherwise only be available from specialist laboratories can also be carried out in routine laboratories.

In 2025, for example, Labor Berlin put the first fully automated mass spectrometer system into operation in a hospital laboratory. This system can now be used to precisely monitor hormone or drug concentrations in the blood. The resulting personalized control of drug dosages and treatment decisions based on laboratory diagnostic data can significantly improve the success of therapy.

Continuously driving innovation

In order to bring innovations into healthcare as quickly as possible, Labor Berlin has set up its own innovation management system. Employees work together with external specialists to continuously evaluate technology trends and new opportunities.

This currently includes digital automation. The data from individual areas of analysis must be merged and all results incorporated into the findings. This is the only way to obtain a holistic picture. "Automation of evaluation and artificial intelligence are indispensable for making diagnoses across specialist areas. Humans are no longer able to evaluate these enormous amounts of data," Beikert points out.

This fails simply because of the vocabulary. An average active vocabulary of 12,000 to 16,000 words is contrasted with more than 30,000 known clinical pictures. Added to this is not only the specific technical vocabulary, but also the exponentially growing specialist knowledge about all these diseases.

Optimizing companies as a network

Louis also looks at a higher level: "We want to manage Quest as a single network with all laboratories, sampling points, and logistics, and optimize all processes end to end." A new software layer that integrates all components will support this vision. "Quest is moving toward lean manufacturing and is aiming for an annual cost reduction of around three percent," explains Louis. To achieve this, device manufacturers must provide robust status and quality data from their instruments.

Quest: a diagnostic service provider for the entire US

As one of the largest US laboratory diagnostics companies, Quest Diagnostics operates a nationwide network of over 20 large laboratories and around 7,000 patient collection sites, including approximately 2,000 patient service centers. Its logistics infrastructure includes around 20 aircraft, which are used to transport samples to the appropriate laboratory as quickly as possible.

The group offers over 3,500 different tests and, with more than 55,000 employees, processes over 200 million laboratory test requests per year. In addition to clinics and doctors, its customers include private individuals, insurance companies, government agencies, and companies for whom occupational health examination and drug testing programs are offered. The company is also increasingly becoming a provider for consumers, acting as a laboratory partner for several leading wellness brands and offering consumer-initiated tests through its own platform, questhealth.com.

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As Senior Vice President of Enterprise Operations & Operational Excellence at Quest Diagnostics, **Alex Louis** is responsible for the standardization, optimization, digitization, and automation of processes at one of the largest US diagnostic laboratory providers. Before joining Quest, the business economist and supply chain specialist worked for the global French bioanalytics group Eurofins Scientific, which offers laboratory testing in the areas of food, environment, pharmaceuticals, and product testing.

Nina Beikert has been managing director of Labor Berlin – Charité Vivantes GmbH for 13 years. In this role, she has played a key role in shaping the development of Europe's largest hospital laboratory. The company is regularly listed by WirtschaftsWoche magazine among the top 100 most innovative companies in the German SME sector. Before joining Labor Berlin, the business economist worked in various roles at Roche Diagnostics for over five years.

A service provider for over 25,000 hospital beds and numerous private practitioners

The diagnostics subsidiary of the world-renowned Charité University Hospital in Berlin (around 3,000 beds) and Europe's largest municipal hospital group Vivantes (around 6,000 beds) operates a large central laboratory in the German capital on the campus of the Charité Virchow Clinic, as well as 13 other laboratory locations at other Charité sites, Vivantes clinics, and other hospitals. In addition to Charité and the Vivantes Group, the customers of Europe's largest hospital laboratory include numerous private medical practices as well as the German Red Cross clinics in Berlin, the Berlin Accident Hospital, and the Caritas clinics, among others.

The company is organized into ten specialist areas and offers an extremely wide range of analyses, from routine analyses to special diagnostics in the fields of human genetics, hematology/oncology, microbiology, immunology, endocrinology and metabolic diagnostics, toxicology, virology, autoimmune diagnostics, allergology, and forensic genetics. In addition, it provides round-the-clock analytical services in the emergency laboratories at the clinic locations, as well as individual services for university research and the diagnostic and pharmaceutical industries.

HSE·AG expertise paves the way to the laboratory of the future

The gradual evolution of diagnostic laboratories into highly flexible and fully automated testing networks requires the step-by-step introduction of new technologies and innovative processes at all levels. With its focus on sample preparation, HSE·AG has key competencies in what is currently the most important area of laboratory automation: pre-analytics. Current projects show how HSE·AG supports equipment and reagent manufacturers in not only meeting the requirements of their laboratory customers, but also opening up new opportunities for them.

Labor Berlin

- **Today, sensors and AI** can be used to correct errors directly in the test process. In an interview, HSE·AG Chief Innovation Officer Hans-Jürgen Tiedtke explains what is important when using sensors and how equipment service can benefit from the data in terms of preventive maintenance. (Page 21)

- The bottleneck in high-throughput laboratories, which are already largely automated by means of analysis lines, occurs at the beginning: in the sorting and aliquoting of samples, which are usually extremely heterogeneous. HSE·AG has developed **a shaker funnel-based system for automatic rack loading** and a modular aliquoting device for this purpose. They can handle a wide variety of tube formats and closure types. (Page 24)

- The two on-deck modules eviDense UV and eviFluor Duo enable **the direct integration of concentration and purity determination of nucleic acid samples into a liquid handler.** With this built-in quality control, liquid handler manufacturers can offer their customers additional added value. (Page 26)

- Designed for applications in smaller laboratories where end-to-end automation is not yet cost-effective, **the Microlab PurIFY sample preparation device and a new type of pipettor feature intuitive gesture control.** The latter opens up the automation possibilities of a liquid handler for smaller sample batches as well. (Page 28)

Automated DNA quantification – developed in collaboration with Beckman Coulter

Detecting errors with sensors and fixing them automatically

As Chief Innovation Officer at HSE·AG, Hans-Jürgen Tiedtke sees two major sensor technology trends in diagnostics. On the one hand, sensors are increasingly being used for independent fault detection and correction. On the other hand, they provide the data basis for more efficient service in the sense of preventive maintenance. However, there are still a number of implementation hurdles standing in the way of the much-discussed predictive maintenance.

Mr. Tiedtke, sensors are now installed everywhere, from cars and smartphones to refrigerators. What is currently the most important sensor trend in laboratory analytics?
In my view, the most exciting development is the use of sensors for error detection and subsequent correction. The goal is devices that are as autonomous as possible, able to detect on their own when a sample is unsuitable or when an analytical step has not been carried out correctly. In the first case, samples are sorted out for individual inspection. In the second case, a well-designed device initiates a second attempt, which often succeeds. If, for example, a cap does not open even on the second attempt, the tube must be routed to an error handling routine.

What role does artificial intelligence (AI) play in this type of error detection?
When camera images are automatically analyzed, AI is almost always involved. Thanks to its ability to learn, AI becomes increasingly better over time at recognizing problematic samples. In other areas, however, AI adds little value. An air pressure sensor, for example, reliably detects on its own when there is no longer any liquid in the tube and the process has therefore ended. Using AI in such a case offers no real benefit.

Are there other areas where sensors are increasingly being used?
Today, sensors are also an integral part of service-oriented device design. Tempera-

ture sensors, fill level measurements, recordings of motor currents, or pressure curves are used to identify the causes of malfunctions. This makes it possible, for example, to specifically improve components that are prone to failure by manufacturing them from materials better suited to the specific loads involved. In the sense of preventive maintenance, heavily stressed parts can also be replaced at sensible intervals based on sensor data, before damage occurs.

You are describing preventive maintenance here. What about predictive maintenance, where damage can be detected during its development using sensor data and AI and then remedied at the optimal time?

Such scenarios are currently discussed a great deal, but I have not yet seen a concrete implementation. There are several reasons for this. First, the frequency of individual damage events in devices is usually low. As a result, there is not enough data available for predictive models. From my perspective, with high-quality engineering, this should actually be the case.

Second, remote monitoring by the manufacturer raises data protection issues. Users do not want an external company to see exactly what they are doing and how. In addition, diagnostic results are generally confidential, and third parties must not have access to them.

Are modern diagnostic devices networked?

No. For security reasons, in the vast majority of cases the devices are not connected to the internet. This means there is no permanent external access to sensor data. The data can only be read locally on site. Sporadic evaluations are sufficient for preventive maintenance analyses, but not for predictions.

Could AI-supported predictions not also be implemented directly within the devices themselves?

What is certainly possible are "health checks," in which AI detects abnormal values. For example, if the processing time of a tube increases from 10 to 15 minutes while a temperature rise is measured at the same time, the AI can raise an alarm.

Under what conditions is such a system worthwhile?

This question cannot be answered in general terms. How much sensor technology and AI make economic sense in a given case depends on the specific cost–benefit ratio. Sensors are not cheap, and data analysis also comes at a cost. In addition, space inside the devices is usually limited. As a result, priorities almost always have to be set when it comes to the use of sensors.

Hans-Jürgen Tiedtke

In your opinion, which aspect of sensor use receives too little attention?
Many people focus too strongly on error detection and pay too little attention to how non-functions or malfunctions are handled. This is especially true in the gray areas where it is not clearly evident whether a result is acceptable or not. The handling of all possible measurement outcomes must be precisely defined and then repeatedly validated in practice.

Sort and distribute accurately and quickly

Sorting samples is a labor-intensive step in the preanalytical phase of high-throughput laboratories. A well-designed separation system combined with a robotic arm enables fully automated and reliable delivery to the transport line.

Analysis samples arrive at the laboratory in a wide variety of formats. Different blood collection systems are used depending on the practice, pharmacy, or clinic. In order to feed the different samples into a high-throughput automation line, they must first be sorted in preanalytics and filled into the standard racks of the analytical devices.

Automating this step in the process not only saves a lot of manual labor, but also costly laboratory space. It is extremely efficient with a multi-stage conveyor system. The contents of the shipping packages in which the samples arrive at the laboratory are first emptied into a bucket hopper. A serial separation system then allows the tubes to be separated and placed into the racks, where they are reliably pressed into the holders with the aid of a robotic arm.

To ensure that all tubes are filled in the correct orientation, an intelligent camera system detects the alignment of the tubes and instructs the robotic arm accordingly. Reliability is crucial here – if a sample tube is inserted upside down and remains undetected, it can cause costly errors in the subsequent process steps. One of the biggest challenges for automation here is the high variability in tube geometry. Depending on the sample type and volume, the lengths and diameters of the tubes can vary by a factor of up to 2, which makes separation challenging. In particular, it is important to ensure that the conveyor stages and their interfaces can also transport the largest samples efficiently without the smallest ones getting in the way.

Thomas Müller

Compatibility with future systems

There is a great deal of innovation and increasingly efficient transport systems. The modules of a preanalytical system should therefore be designed in such a way that they can be integrated into future systems that currently only exist on the drawing board with minimal adjustments. This may involve different transport racks with different transfer requirements, or higher throughput, different clocking, or even just industrial design.

The serviceability of the device is a decisive factor in its operating costs. If, for example, a tube was not closed properly, it must be possible to clean the device quickly and easily.

Automated DNA quantification using UV absorbance and fluorescence analysis

Award-winning on-deck nucleic acid quantification

The recently introduced **eviDense UV Photometer** and **eviFluor Duo Fluorometer** set a new benchmark in automated preanalytics. Honored as the **winner of the 2026 New Product Award** from the Society for Laboratory Automation and Screening (SLAS), the eviDense UV demonstrates HSE·AG's innovative contribution to laboratory automation.

Together, these compact modules integrate nucleic acid quantification and purity assessment directly into automated liquid handling workflows. By embedding UV absorbance and fluorescence-based analysis on deck, laboratories eliminate manual intervention while enhancing data quality and laboratory efficiency.

Accurate nucleic acid quantification is critical in preanalytics. Contaminated DNA samples or inconsistent DNA concentrations can lead to unreliable results and costly rework. Traditionally performed using benchtop spectrophotometers or microplate readers, DNA quantification involves manual pipetting and data transcription, increasing hands-on time and creating workflow bottlenecks – particularly in medium- to high-throughput environments.

The eviDense UV and eviFluor Duo modules address these challenges by integrating UV absorbance and fluorescence-based quantification directly into automated liquid handling workflows, requiring only a single SBS deck position. A micro-cuvette attached to the pipette tip enables in-process measurement, eliminating manual pipetting variability and ensuring consistent sample handling. Automation provides standardized, traceable processing for every sample, improving precision and reproducibility while reducing errors and saving time. Digital data capture ensures data integrity and enables data-driven pipetting decisions for downstream analytics.

By integrating preanalytical quality control directly into liquid handling platforms, laboratories can significantly increase workflow efficiency and reliability. At the same time, liquid handler manufacturers can leverage the eviDense UV and eviFluor Duo to expand application capabilities and enable end-to-end-automated workflows, increasing the overall attractiveness of their automation solutions.

Microlab PuriFY: sample preparation, optimized for ease of use

Intuitive smartphone-like operation for sample preparation

With Microlab PuriFY, Hamilton offers automated nucleic acid clean-up that not only reliably purifies NGS libraries and PCR reactions. The device is also extremely easy and intuitive to operate.

Skilled laboratory personnel are invaluable. We must enable them to focus on their core expertise by automating routine processes that do not require human judgment. By relieving them of repetitive, non-specialized tasks, we enhance efficiency and help address the growing shortage of qualified professionals. Microlab PuriFY addresses both.

The system automates the purification of PCR products and NGS libraries for downstream processes such as sequencing and cloning, as well as many other biological workflows. The results emphasise that the Microlab PuriFY can replace manual clean-up without sacrificing yield and quality, thereby improving reproducibility in environments with frequently changing users.

It is also extremely simple and intuitive to use. Advanced guidance features further reduce complexity and support laboratory personnel in their daily work. Clear loading instructions, enhanced by intuitive animations, as easy to use as a smartphone, guide users through each process. LED lighting highlights exactly where buffers need to be placed, while strip-scan technology verifies correct loading. Integrated liquid level control ensures that sample volumes are handled properly.

These features create a highly supportive environment in which users can operate the system with confidence, minimizing the risk of errors and making correct handling almost intuitive.

The true strength lies in its ease of use and intuitive operation. The user interface is designed to provide a seamless and straightforward experience, allowing laboratory personnel to focus entirely on their work without having to think about the underlying process. As a result, users can rely on the system to guide them naturally through each step. It delivers reliable and reproducible results within a compact footprint.

An additional benefit is the substantial reduction in plastic consumption, up to 80% for this specific workflow.

Finally, the system's distinctive design makes it a strong visual highlight in showrooms and at trade fairs.

Working together to find the optimal solution

The idea was developed during innovation workshops at HSE·AG. A desktop device was designed to automate the labor-intensive preparation of DNA libraries for sequencing and PCR applications. Hamilton Bonaduz recognized the device's potential for research and diagnostic laboratories and entered into a development partnership with HSE·AG. The idea, which was initially proof of concept, was turned into a marketable product in just two and a half years. Marco Trinkler, who managed the project on behalf of Hamilton Bonaduz as Director of Application Development, discusses the success factors of the collaboration with Project Manager Roman Erne and Principal System Engineer Thomas Müller from HSE·AG.

Marco Trinkler: The specifications were certainly very ambitious. The launch was set at the beginning of the project for the SLAS conference in San Diego in January 2025. And the price was also fixed. In addition, we didn't just develop a standard device but ventured into unknown technical territory. In my opinion, this only worked because both partners always focused on the product and its maturity. Your team took responsibility from the outset and didn't just complete the task.

Roman Erne: I completely agree with you. Microlab PuriFY is a flagship project for how a development partnership should work. Both sides know all too well what it means to develop a new product from scratch to market readiness. And when problems arise, the quality of the collaboration becomes apparent.

Thomas Müller: I remember how we had problems with droplet formation during the development of consumables. Thanks to the open culture of communication, it quickly became clear that Hamilton has extensive fluidics simulation expertise in-house. This enabled us to find an optimized geometry more quickly.

Marco Trinkler: Being able to discuss things so openly was only possible because personal trust had developed between all those involved. It helped that we were able to build on previous, smaller projects, such as the development of FluorEye, a liquid handler module for determining nucleic

acid concentrations. Incidentally, FluorEye has since become very successful.

Roman Erne: We are very pleased with its market success. It shows how successful such co-developments can be. I believe the decisive factor was that we worked intensively together to define the requirements and set clear milestones with due dates. In between, we introduced checkpoints at HSE·AG, which allowed us to respond in an agile way to difficulties while consistently pursuing the overall roadmap of "deliverables in time and quality." In other words, it was a hybrid project development in action.

Marco Trinkler: Unlike many of our competitors, we at Hamilton produce most of the devices and also a large part of the product-specific parts ourselves. This results in very clear specifications for the supply chain. This information was not yet flowing optimally at FluorEye. For Microlab PuriFY, we expanded the project organization and created direct contacts for the individual disciplines on our side. This made it possible to have technical discussions on an equal footing.

Thomas Müller: These comparisons were very helpful for both sides. This increased understanding on both sides and enabled important decisions to be made quickly. What particularly impressed me was that this was practiced at all levels, from the individual developers to the project management and up to the steering group.

Marco Trinkler: That suits my nature. I'd rather make a wrong decision than make no decision at all. Mistakes can be corrected. In this respect, too, the cultures of our companies are a good fit. You want to move forward, learn from mistakes, and not waste time looking for someone to blame.

Thomas Müller: This attitude was demonstrated, among other things, by the fact that stage gates in the project were not always rigidly enforced if it made sense for the product and the schedule. This meant that we were sometimes able to continue working by mutual agreement, even though not all deliverables were finished. There were never any divisions between the teams. In fact, we speak the same language.

Marco Trinkler: I remember one evening after a retrospective of the entire project organization. When I joined later, I could no longer tell from the outside who worked for which company. Everyone was engaged in intense discussion. It was a great atmosphere.

Roman Erne: Yes, the collaboration was really enjoyable. We think it's a great shame that the project is now slowly coming to an end.

Marco Trinkler I can only agree. For me, too, the development of Microlab PuriFY has been unique so far – and I've been in the business for quite a few years. But it's not over yet. This much I can say: We will continue the collaboration on our side.

Automated solutions for diversity in sample reception

According to Roger Hüppi, Head of Product Development at HSE·AG, aliquoting samples involves a high level of manual work. Automating this pre-analytical process step is made particularly difficult by the wide variety of different sample tubes. A modular device developed by HSE·AG meets this challenge: it processes a wide variety of tube formats and closure types and reliably checks both barcodes and fill levels.

In a modern laboratory, up to 50 different test tubes can be used. For high-throughput analyses, they must be reliably identified, checked, sorted, and transferred to standardized secondary tubes. This interface, which is crucial for the quality of the analysis, is extremely labor-intensive — no other area of a large laboratory still employs as many people today.

Innovative automation solutions specifically address these challenges in sample reception. In a modular device, all work steps are fully automated: from tube recognition and barcode attachment control to opening a wide variety of lid types, sample collection, and resealing to fill level detection.

The high reliability with which all process steps are carried out is central to this. This starts with the recognition and reading of barcodes. These are often irregular or attached multiple times, which can lead to errors in downstream processes. The system must reliably identify incorrectly attached barcodes and feed them into a suitable error handling routine.

Opening and resealing the large number of different tubes and closure types poses a particular technical challenge. What requires concentration for humans, but is comparatively easy, places high demands on a machine. Here, image recognition and mechanics must work together seamlessly. Among other things, the device must clearly identify the tube diameter and closure type and treat them accordingly. At the same time, it must be ensured that no contamination occurs during opening and resealing or during aliquot removal.

Roger Hüppi

Various methods are available for determining the fill level. For example, image-based recognition can be used if the tube geometry and space conditions allow. Another very reliable method is capacitive measurement with conductive pipette tips, which, however, requires a minimum conductivity of the sample. Alternatively, pressure-based systems can be used, which react immediately as soon as the liquid level is reached.

Regardless of the measurement method used, it is advisable to integrate structured error handling processes into the system. Process steps that are recognized as faulty should be repeated automatically and, if success is still not achieved, the affected samples should be specifically discarded. This increases the overall reliability of the system and saves time and money by avoiding unnecessary or faulty analyses.

Automation must outperform humanoids

Humanoids are set to take over our households and factory floors in the near future. Even if they are still clumsy at present, it is only a matter of engineering time before their abilities become increasingly human-like. However, it is questionable whether humanoid workers will ever make sense. Simpler robots specialized in individual tasks will not only outperform humanoids in their field. They are also likely to show significantly less wear and tear.

Automation is the catalyst of progress. This has been true since the beginning of industrialization in the 18th century, and even more so today, when machines not only perform mechanical tasks much more efficiently than we can, but as artificial intelligence, they are also outperforming us in more intellectual tasks.

Humanoids should work for us

No wonder tech visionaries like Elon Musk are already setting their sights on the next iteration in the automation spiral: humanoid robots, the synthesis of mechanical automation and artificial intelligence. According to Musk, machine humans will not only soon be helping us in the household but will also replace workers in production facilities. In laboratories, too, robots would then operate the equipment instead of humans.

Millions of machine humans soon

In fact, humanoid robots are no longer just a distant vision of the future, but are already on their way to becoming reality. Elon Musk has launched the first pilot production line for his Optimus humanoids in California. In just a few years, he wants to produce more than a million per year and then have a growing “army” of robots at his disposal.

The progress made in recent years is also remarkable. Musk’s Optimus robots can now jog quite briskly. Even though they still have flat feet and stiff hips, the difference from their first clumsy attempts at walking two years ago is striking.

CEO Michael Collasius

Fine motor skills are several levels too complex

However, progress is not quite as impressive in another skill that is crucial for taking over human activities. Touch and grasping seem to function only rudimentarily.

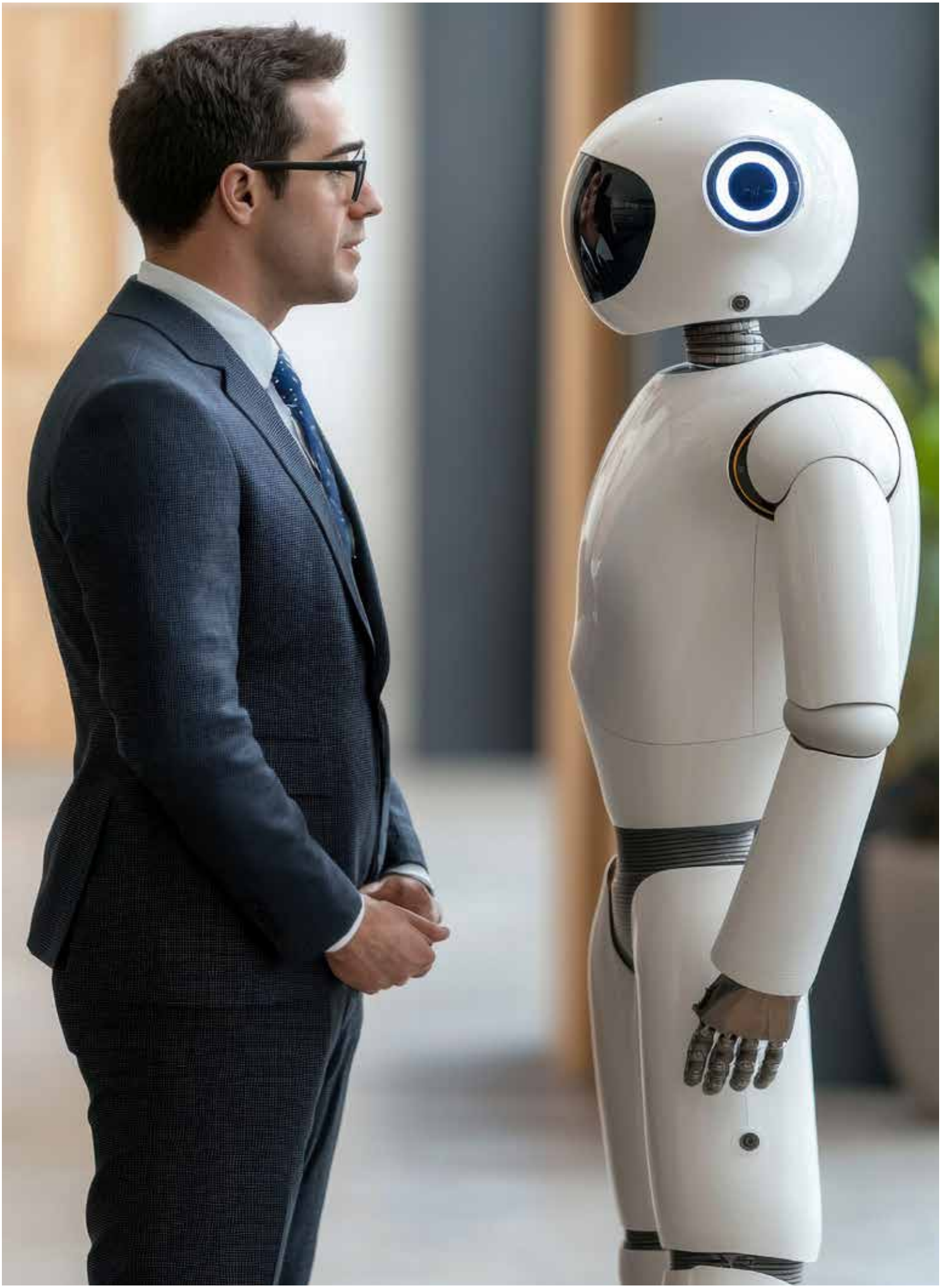
This is where the contradiction to Musk's visions from other robotics specialists, such as the former director of the MIT Computer Science and Artificial Intelligence Laboratory Rodney Brooks, comes in. For the co-founder of iRobot, which launched the first usable robot vacuum cleaner Roomba on the market, the sense of touch of machines is currently still several levels of complexity away from human sensitivity.

A question of engineering time

As an engineering company, we at HSE·AG know that this is hardly an insurmountable hurdle, but rather a question of time. In my opinion, whether humanoids will one day take over the work of laboratory staff depends only to a small extent on gross and fine motor skills. The much more fundamental question is whether the concept of humanoids makes any sense at all for advancing automation. What are the bottom-line advantages of robots with human capabilities?

No vacations and no sleep

One argument that is usually one of the first to be put forward is the nonstop availability of machine-humans. They don't take vacations, don't need sleep, and we certainly don't need to worry about their work-life balance.



That may be true in principle, but it doesn't mean they will work nonstop. Every machine needs regular service because every material wears out over time. The more moving parts and mechanical complexity there are, the more and greater the damage.

While stationary factory machines can cope with annual service cycles, this figure is much higher for cars, for example. A garage break is recommended every 30,000 kilometers. If the car drives continuously at an average speed of 30 kilometers per hour, it would have to go on a "garage wellness vacation" every 42 days or around nine times a year.

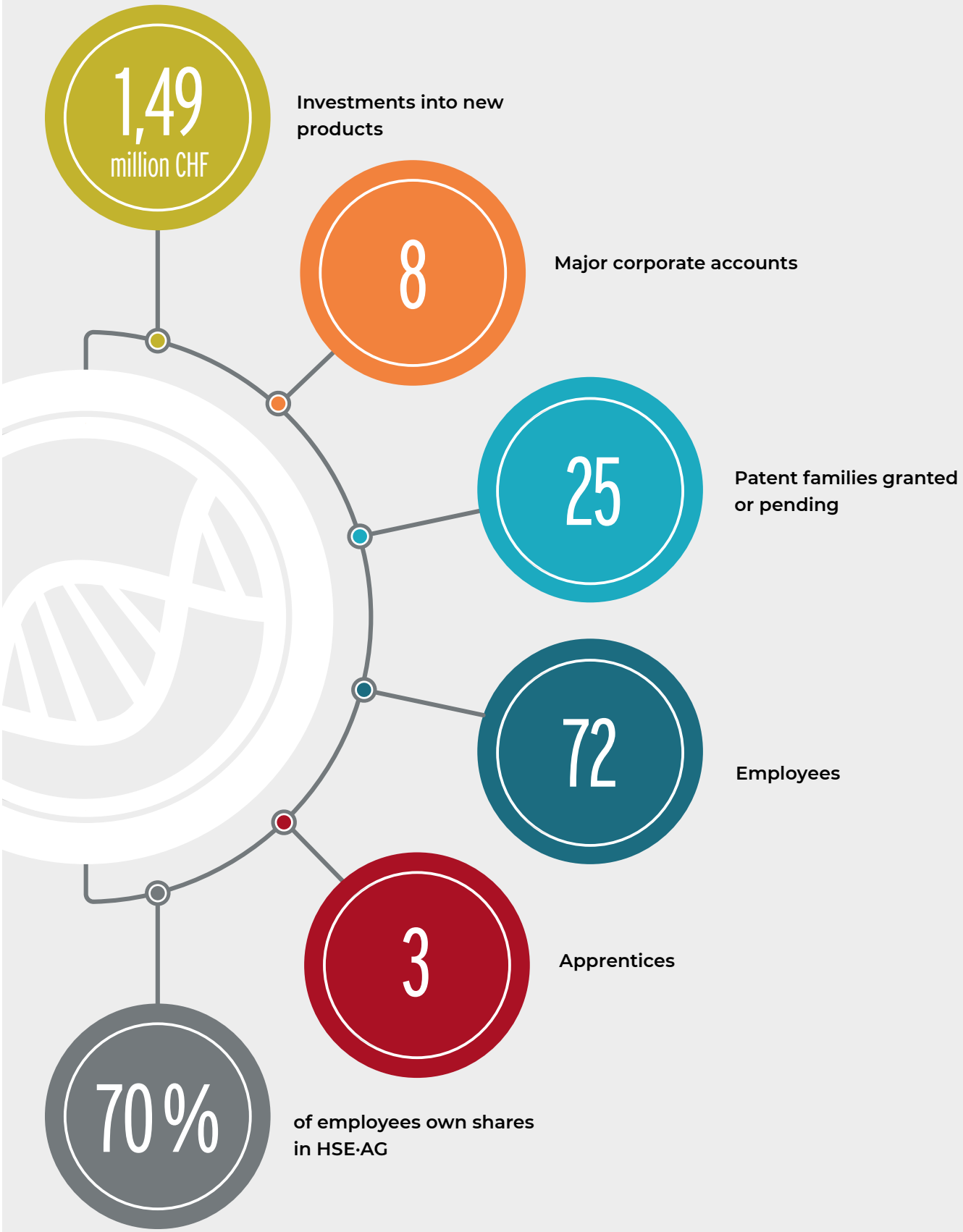
Work-life balance of humanoids

Given that the mechanics of a humanoid robot will be orders of magnitude more complex than those of a car, it can be assumed that they will require more frequent servicing. Humanoids will therefore be just as unlikely as their natural counterparts to be available 24/7, 365 days a year. Humanoids will also need time off and will have to find their work-life balance.

However, it is also clear that these downtimes could be systematically reduced in robots through engineering. So, is that just a matter of time? Yes and no: the greatest lever for optimizing service requirements would undoubtedly be to abandon the idea of overall humanoid capabilities. Simple robots focused on specific tasks would be less complex and less prone to error. In addition, they could be tailored more specifically to their tasks and thus become more efficient than humanoids in those tasks.

Most human characteristics are superfluous

A robot designed to transport test tubes between devices, load and unload them, and operate them does not need to be able to climb or swim, nor does it need to be able to paint pictures. That would be a lot of effort for nothing. Instead, this robot needs to be able to move quickly from place to place on the flat laboratory floor – and there are certainly more efficient ways of doing this than balancing on two legs.


1,49
million CHF
Investments into new products
8
Major corporate accounts
25
Patent families granted or pending
72
Employees
3
Apprentices
70%
of employees own shares in HSE·AG

Facts and Figures

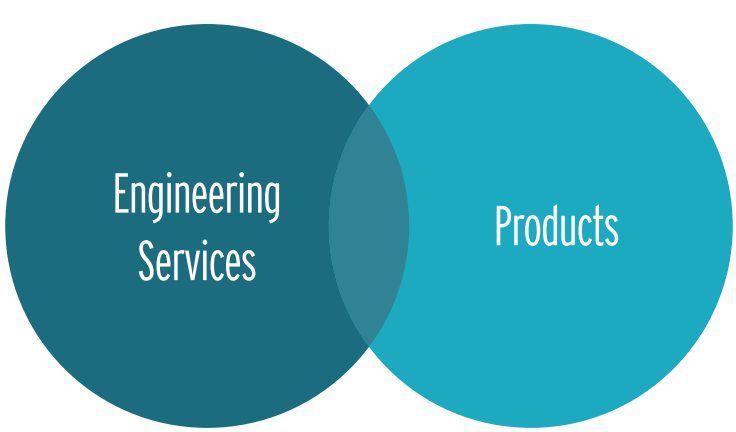
Audit of the annual financial statements
The financial statements of Hombrechtikon Systems Engineering AG for the financial year 2025, which covers the period from January 1, 2025, to December 31, 2025, were audited by Treu Control AG as external auditors in accordance with the Swiss Standard on Limited Statutory Audits.

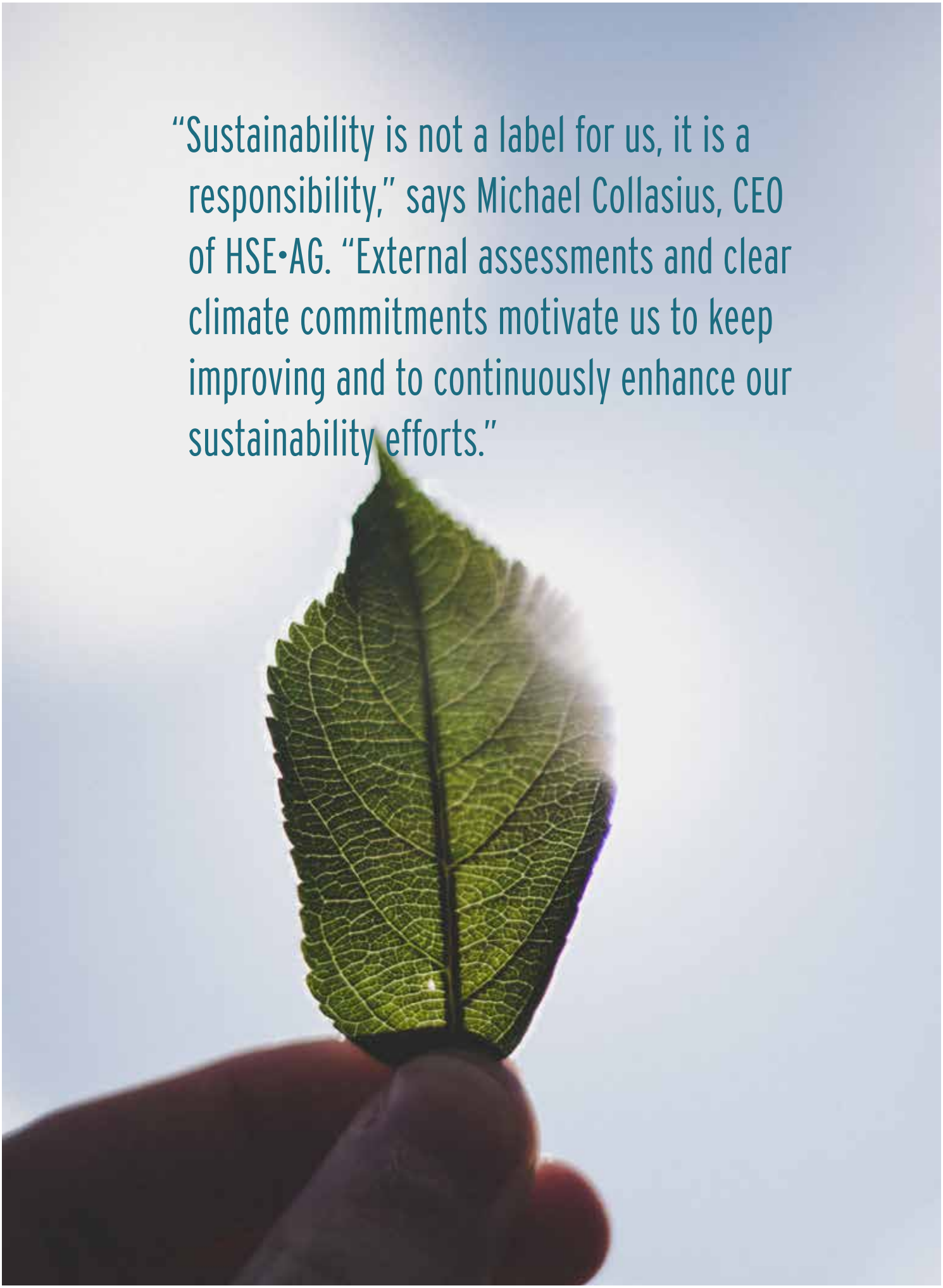
Risk assessment
In the first year of its existence, HSE·AG established a quality management system in accordance with ISO 13485:2016 for the development of IVD systems (in-vitro diagnostics). This was successfully re-certified in November 2023. Risk management is an integral part of the system. In order to identify both risks and opportunities at an early stage, HSE·AG regularly reviews internal and external factors in the entire company environment. This review is based on the financial data determined for the financial statements in accordance with the Swiss Code of Obligations and the risk finance figures in accordance with regulatory requirements.

Employee competencies
HSE·AG is characterized by its comprehensive and in-depth know-how. The skills of its employees cover the entire spectrum of technology and project implementation requirements, including the development and implementation of automation solutions in the field of molecular biology life science and diagnostics solutions. This in-depth knowledge, combined with many years of experience, gives HSE·AG a decisive competitive advantage.

Employee development
HSE·AG's workforce comprised 72 employees, including 3 apprentices. The low fluctuation rate of less than 10% has been maintained. The fact that HSE·AG is still able to attract employees underlines its competitiveness in the international labor market for highly qualified specialists.

Employee participation program
An important pillar for the long-term business success of HSE·AG is the participation program for employees. This enables selected employees to acquire participation certificates. Their value is strongly linked to the success of the company. To date, around 70% of HSE·AG employees have participated in the company. This high proportion shows that employees also have great confidence in the sustainability of HSE·AG 's business model.





"Sustainability is not a label for us, it is a responsibility," says Michael Collasius, CEO of HSE•AG. "External assessments and clear climate commitments motivate us to keep improving and to continuously enhance our sustainability efforts."

Sustainability is key

Sustainability is an integral part of HSE·AG's corporate strategy and operational management. The company is deeply committed to responsible business practices across environmental protection, ethical conduct, labor standards, and sustainable procurement.

To ensure transparency and continuous improvement, HSE·AG undergoes annual external audits of its sustainability activities. These independent reviews help strengthen internal processes, enhance compliance structures, and drive measurable progress year after year.

HSE·AG is also part of the Science Based Targets initiative (SBTi), highlighting its commitment to aligning its climate ambitions with internationally recognized scientific frameworks and contributing to global climate objectives.

OUR VISION

is to enable the next break-through in the life sciences.

OUR MISSION

is to create tools to unravel the principles of life, by combining our applications and engineering know-how. We create and maintain systems and workflows in line with our customers' needs.

OUR ASPIRATION

Enjoyment
We like what we do and we enjoy working with the people around us.

Usefulness
Whatever we do should be useful to our customers, colleagues, and society. We continuously improve as individuals and as a company.

Ambition
We strive for excellence and continuously push past our limits to build something that is greater than ourselves. This is the source of our satisfaction.

Sense of reality
We utilize deliberate, fact-driven, decision-oriented thinking. We explore the harsh realities, draw conclusions, and focus on optimal execution. Time constraints do not compromise excellence.

Search for the best solution
We are curious and open-minded. Truth and transparency guide us. We encourage feedback and use this to learn quickly.

Fairness and respect
We treat everyone fairly and with respect. We communicate openly and honestly. This forms the basis for thoughtful disagreement.

With special thanks to Labor Berlin.

Imprint

Publisher
Hombrechtikon Systems Engineering AG,
Hombrechtikon, Switzerland

Concept / Design / Photography
Jacqueline Wallach Communications, Basel
gabrielabeutter gmbh, Uetikon am See
Alex Kaeslin | Photography Film
Kai Abresch Photography, Berlin
Justin Hession Photography
Photos pages 36 and 40: freepik.com

Content / Text
inhalte.ch GmbH, Zurich

Print
DAZ Druckerei Albisrieden AG, Zurich

Languages
German, English

The Hombrechtikon Systems Engineering AG 2025 Annual Report covers the financial year from 1/1/2025 through 12/31/2025.

Gender-neutral pronouns and role descriptions have been used whenever possible and are to be understood in all cases.

For environmental reasons, our annual report is carbon neutral and printed on FSC-certified paper.

myclimate neutral Printed Matter
myclimate.org/01-23-503402

FSC www.fsc.org MIX Paper | Supporting responsible forestry FSC® C019382

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