



Rethinking production

PLCnext Factory

PLCnext Technology 

Designed by Phoenix Contact

“

In a rapidly changing world, we have to rethink our production processes every single day.

Digitalization is the key to this.

We push boundaries every day, are flexible, and are open to new ways of working together.

As is the case for our products.

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Welcome to the PLCnext Factory

I am very pleased to introduce you to our production facility in Bad Pyrmont, Germany. This is where we bring sustainability to life and develop innovative solutions through creative approaches.

The PLCnext Factory represents a new mindset – where it is about taking new paths and making them accessible. In addition to the principles of openness and modularity, the way in which we collaborate and work together also plays a major role. This is why we are also integrating social sustainability into our production operations. With the help of psychological methods, we work daily to improve our decisions so that we can respond more swiftly and effectively to the challenges we face in a constantly changing world.

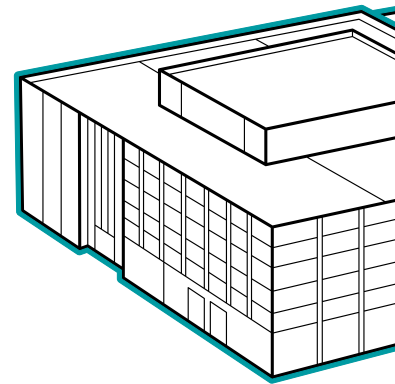
Discover how we use digitalization, continuous process optimization, and interdisciplinary collaboration to create real innovations and increase our productivity. With our commitment to sustainable products and the networking of production and buildings, we are actively working towards a green future.



Best regards,
Dr. Till Potente,
Vice President Operations and Sustainability

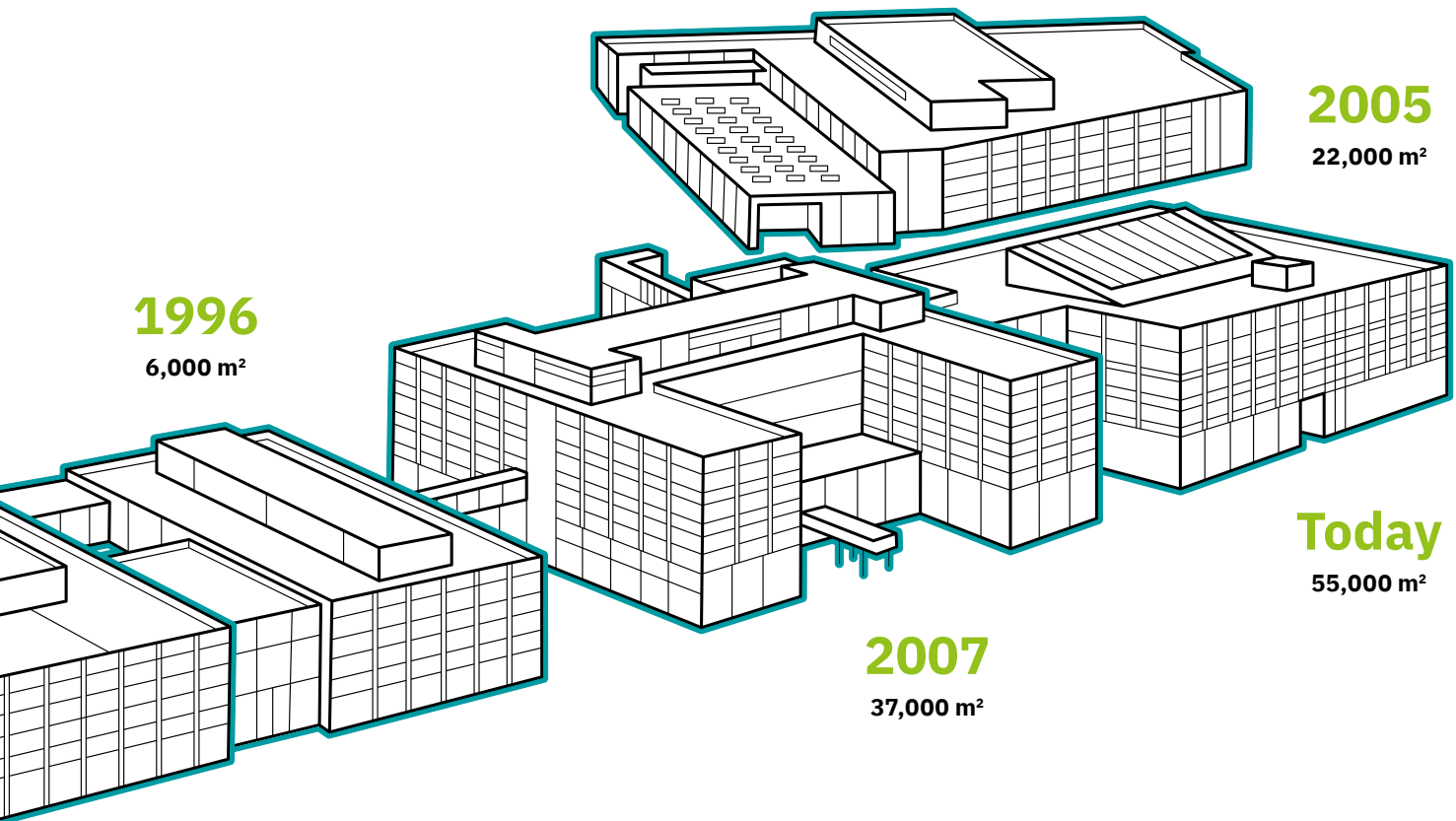
2001

10,000 m²



Please join us in shaping the future
of production together.





Our background

The Bad Pyrmon site started out in 1996 with a 6,000 m² production hall. The building has been extended several times. Now we have an area of 55,000 m² and currently have 645 employees. This expansion has also had an impact on our processes within production. New systems, modified processes, environmental and climate-related requirements – production is an organism that is constantly evolving. In addition, changes need to be implemented without disrupting ongoing operations.



Always in view: The 1.5°C target

PLCnext Factory and sustainability

We firmly believe that sustainability is increasingly becoming a key success and differentiation factor that significantly influences business success and resilience. Our response to this challenge is the vision of the All Electric Society: “A world in which renewable energy is available for the benefit of everybody. With our expertise in the fields of electrification, networking, and automation, we are making a crucial contribution to this.”

When people think about sustainability, they often think about climate protection first. We also see it as our responsibility to make our contribution to the 1.5°C target. To ensure that our plan for the net zero Factory meets the 1.5°C specifications, we use the XDC software from right. based on science.



Who wants to work for a **3.3°C company** in the future?”

Hannah Helmke, CEO of right. based on science

As well as climate protection, we pursue a holistic sustainability strategy and take all ESG (Environmental Social Governance) aspects into account equally. We can only master future challenges together: Digitalization, innovation, our employees, and close collaboration with our suppliers and customers are the keys to successfully achieving this goal.

Rethinking collaboration

How do we make better decisions? In the PLCnext Factory, we believe that transparency and openness are essential. Our production and process data is becoming more and more accessible through digitalization, and we want our collaboration to be accessible too. This means that we are breaking down rigid hierarchies, promoting diverse teams, and applying psychological methods to improve our decision-making.

We achieve innovation and change by overcoming silo mentality. A growth mindset, equal communication (peer-to-peer approaches), and consciously designed structures that enable cross-divisional collaboration are crucial. These approaches promote the exchange of ideas and create a dynamic, innovative corporate culture.



You can't talk about **digitalization** and the **future of production** without rethinking established processes and ways of working. That's why **collaboration** without **rigid hierarchies** is the key for us."

Sascha Klose, Director Operational Excellence



We push boundaries every day, are flexible, and are open to new ways of working together



Collaboration without rigid hierarchies is a fundamental part of our corporate culture



Social sustainability: Focusing on growth while preserving our core values as a family-owned company

Despite our size (21,700 employees worldwide), we are a family-owned company. Our corporate culture is based on collaboration in a spirit of mutual trust and reliability. These values form the basis for our success and the satisfaction of our employees and customers. But how can we preserve these core values while at the same time responding to future developments in a dynamic and innovative way? By strengthening and actively developing the existing corporate culture. Psychology and diversity are key to success.

Find out why we believe diversity is an important factor for innovation.



Diversity: The key to greater success

Promoting diversity is not only a matter of fairness, but also a key success factor for us. Diverse teams bring different perspectives and ideas to the table, which has been shown to lead to more innovation, better decisions, and higher performance. Diversity makes companies more resilient. Just as monocultures are susceptible to diseases and pests in nature, companies that rely on homogeneity are less flexible and adaptable. Diversity fosters resilience and efficiency, as different perspectives and skills allow us to respond better to changes and challenges.



We see our own **individual diversity** and differences as vital **drivers of innovation**. Diversity contributes to a **sustainable world** and strengthens our independence.”

Hannah Peter, Project Manager Sustainability Management



Collaboration across different teams and departments leads to better results



Diversity includes dimensions such as age, gender, and professional qualifications

Key question for a better understanding of diversity: How do we achieve gender equality?



Dare to be more diverse

An important starting point for greater diversity is the promotion of gender equality. By creating equal opportunities for all genders, we are laying the foundation for a comprehensive understanding of diversity and opening the door to further measures and other dimensions of diversity.

To increase diversity, we need to take bold steps, such as equal representation when filling management positions. This means that when selecting managers, care should be taken to ensure that men and women are equally represented. Such measures not only promote equality, but also improve the company's performance. To achieve this goal, we address unconscious bias in all processes and make small changes to create structures that enable us to make better, more objective decisions.

Decisions made jointly on an equal footing

In our company, we make decisions on an equal footing. In this type of working environment, all employees feel valued and heard.

Our layout weeks are one example of this. Here, we work free of any hierarchies, across departments and levels, on their implementation. This also means that young colleagues give their superiors to-dos. This approach not only helps us achieve good results, but also strengthens team spirit and ensures a high level of employee satisfaction.



Psychology as the driver for the next surge in productivity and innovation in industry

The integration of psychological findings and methods will lead to a significant surge in productivity and innovation in industry.

In order to tackle the challenges of sustainability and digitalization, psychologists are increasingly being brought in to support the relevant teams. They bring new qualification profiles into production and help companies to achieve their goals in these areas more effectively.

Three key technologies of the future:

1 Bias engineering

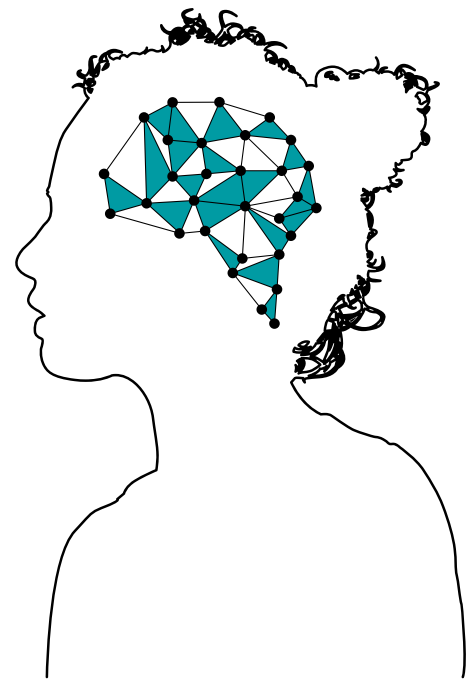
The systematic redesign of decision-making processes by consciously controlling cognitive distortions.

2 Choice architecture (nudging)

The design of decision-making situations to promote desired behaviors.

3 Habit stacking

A method of establishing new habits by linking them to existing routines.



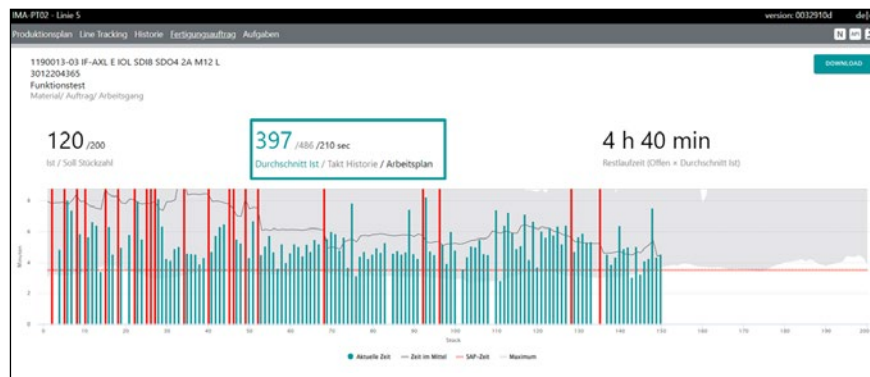


People front and center

Better decisions and actions with nudging

Through targeted nudging – a gentle push in the desired direction – companies can bring about behavioral changes in employees that lead to greater efficiency and satisfaction. The aim is to ensure that employees perform the right actions almost intuitively.

One example is the attachment of orange clips to the workstations, on which feeder trolleys for PCBs are assembled. These clips are used to mark frequently used components, which considerably simplifies and speeds up replacement. In conjunction with other measures, we have been able to reduce the setup times of the SMT machines by 38%, which saves both time and money. In addition, we make relevant information more readily available and usable through targeted digital changes.



Digital nudging leads to faster problem solving

We use a range of tools and methods to keep an eye on our daily processes and continuously work on improvements.





150 hours saved per year by behavioral economic interventions



Shopfloor management includes processes, rules, behaviors, methods, and systems to ensure efficient production



Shopfloor management: Managing day-to-day operations

Shopfloor management is an important habit for us: We meet every morning to discuss the most important key figures from production and determine where there are discrepancies or even problems. This gives us a quick overview and enables us to act more effectively. Shopfloor management can be compared to the preflight checklists in airplanes. Meticulously working through the checklists is essential for flight safety. And it is the same in production. For us, there is no question that this is an indispensable tool for keeping production on track and running smoothly.



A T-card system makes our day-to-day work easier

Value stream management: Continuous improvement

Value stream management has also become an established habit for us. Here we work on major improvement projects and there is room for ambitious projects and visions. In addition, we hold regular mock-up workshops in which we hone new ideas. For example, we first test new arrangements of the systems with Lego, before we convert them and thus bring them to a standstill for a short time.

At the same time, we try to ensure that adjustments in the PLCnext Factory lead to a real improvement in the process as quickly as possible. Agile methods, especially idea-to-cash methods, are the name of the game here. We specifically identify potential that can be implemented quickly and will achieve real savings immediately. At the same time, we also work on solutions with significant savings potential and a longer implementation time.



Solution with greater potential

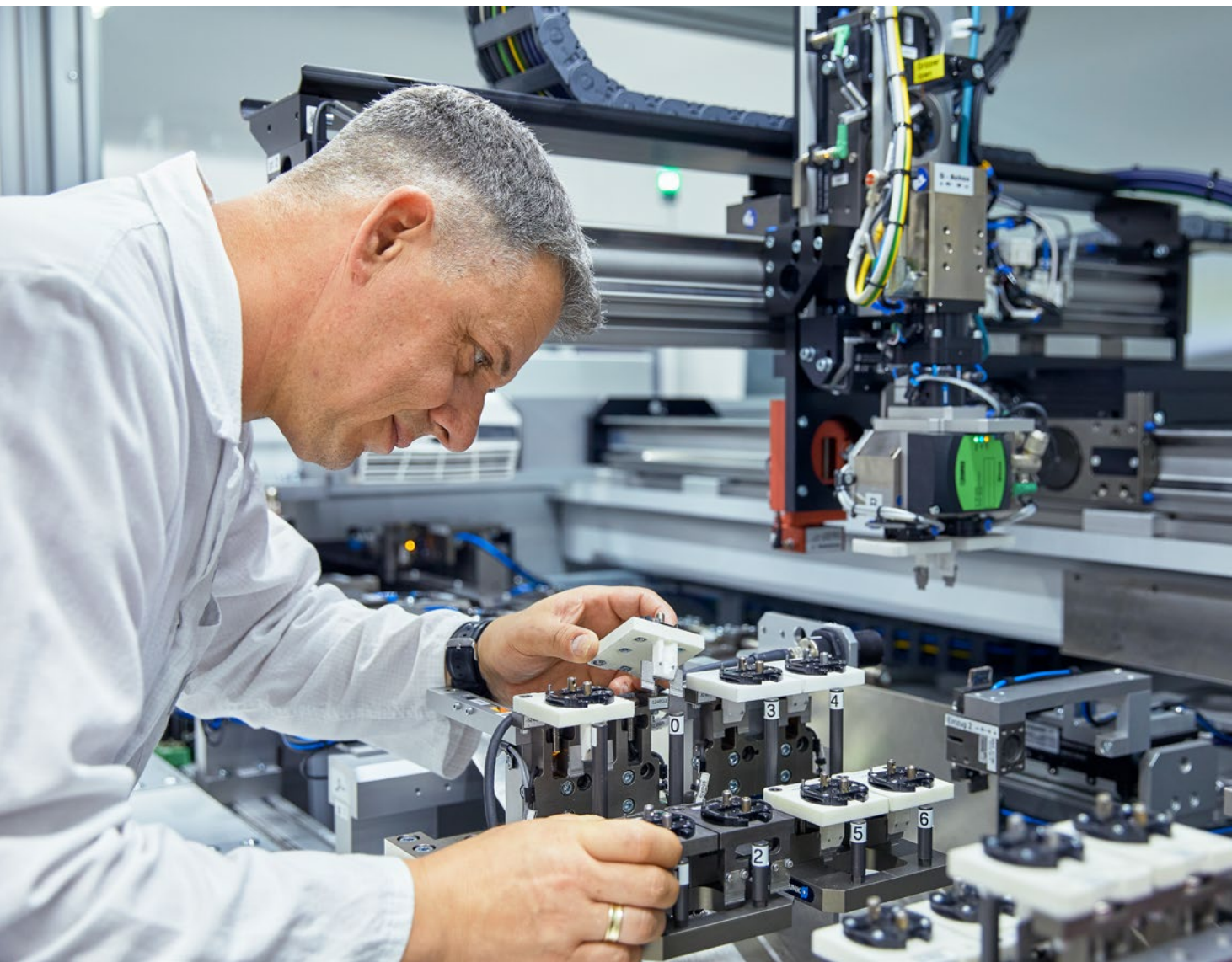
€40,000	€20,000	2 years	3 years	€20,000
Investment	Savings per year	Return on investment (ROI)	Idea-to-cash	Savings after 4 years

Agile solution with smaller potential

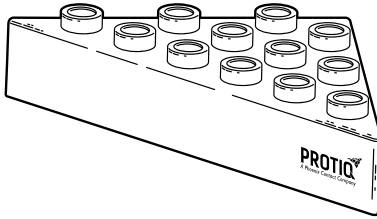
€2,500	€10,000	3 months	6 months	€35,000
Investment	Savings per year	Return on investment (ROI)	Idea-to-cash	Savings after 4 years



Value stream management is a basic principle of lean production



3D printed parts offer new possibilities and are quickly available



IoT equipment: New opportunities with cobots and 3D printing

Cooperative robots (cobots) are a very good example of how agile processes can be implemented directly on the shop floor. Here, the process is not fully automated, but the flexibility of employees is improved in simple ways.

3D-printed parts are another example. We can easily upload 3D models, configure them, and order them directly online via the PROTIQ Marketplace. They are used, for example, in the tool devices in the depaneling system, which have to be replaced regularly. The respective part is available within a week. This saves us up to €20,000 a year.

€800

**Cost of machine
tool holder device**

€150

**3D printed part
from PROTIQ**

5 weeks

**Time to procure
tool holder**

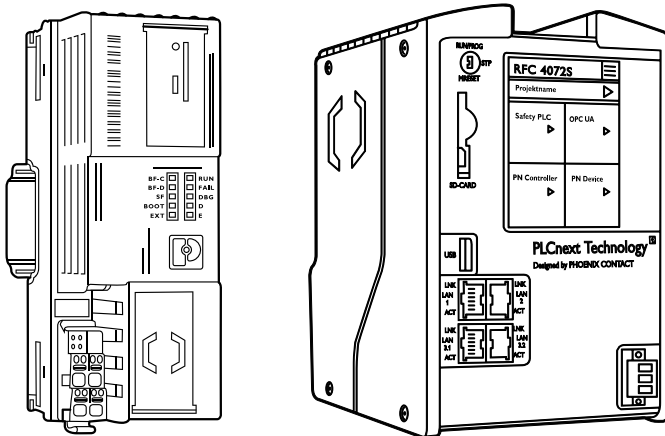
1 week

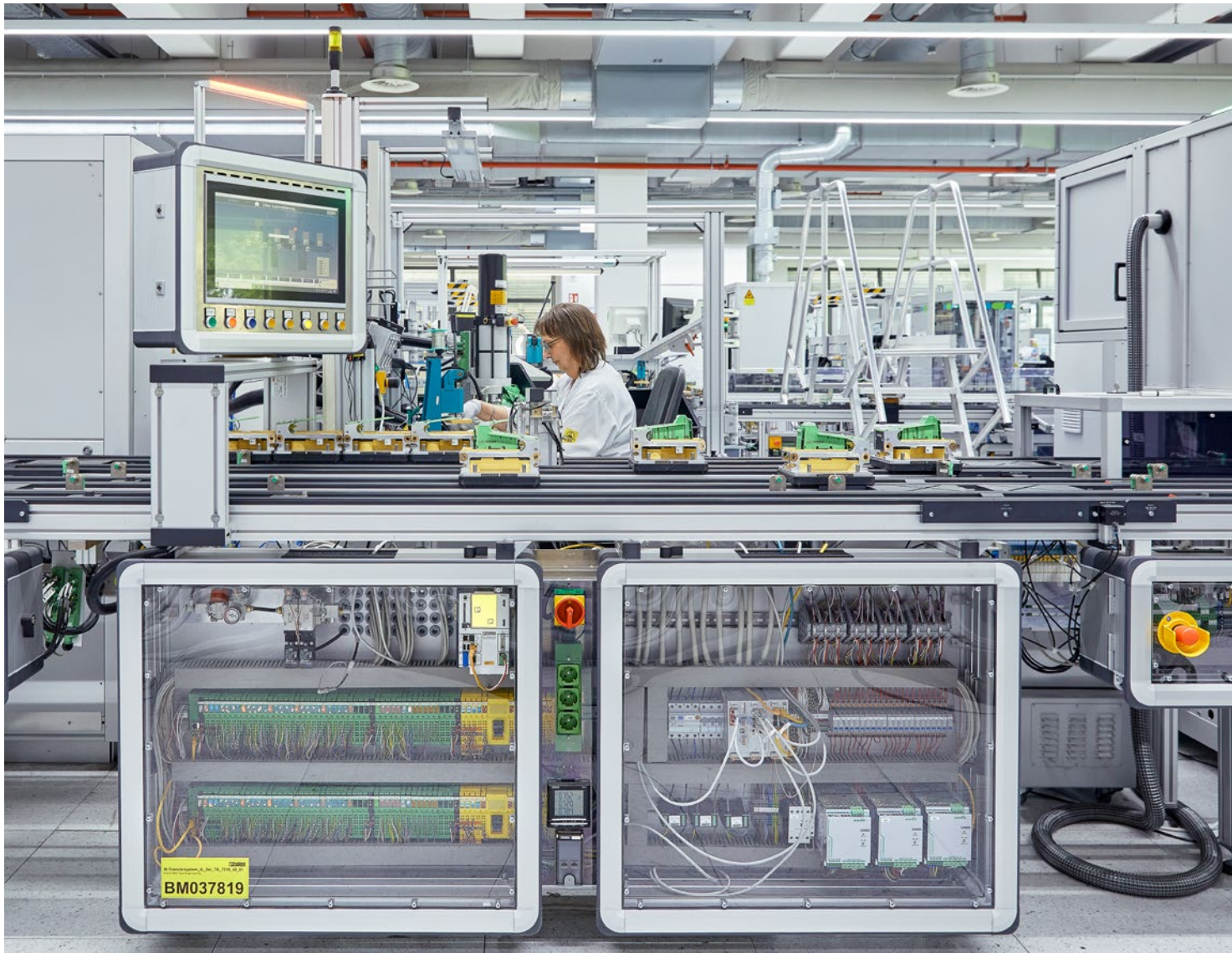
**Time to procure
3D device**

Rethinking innovative products

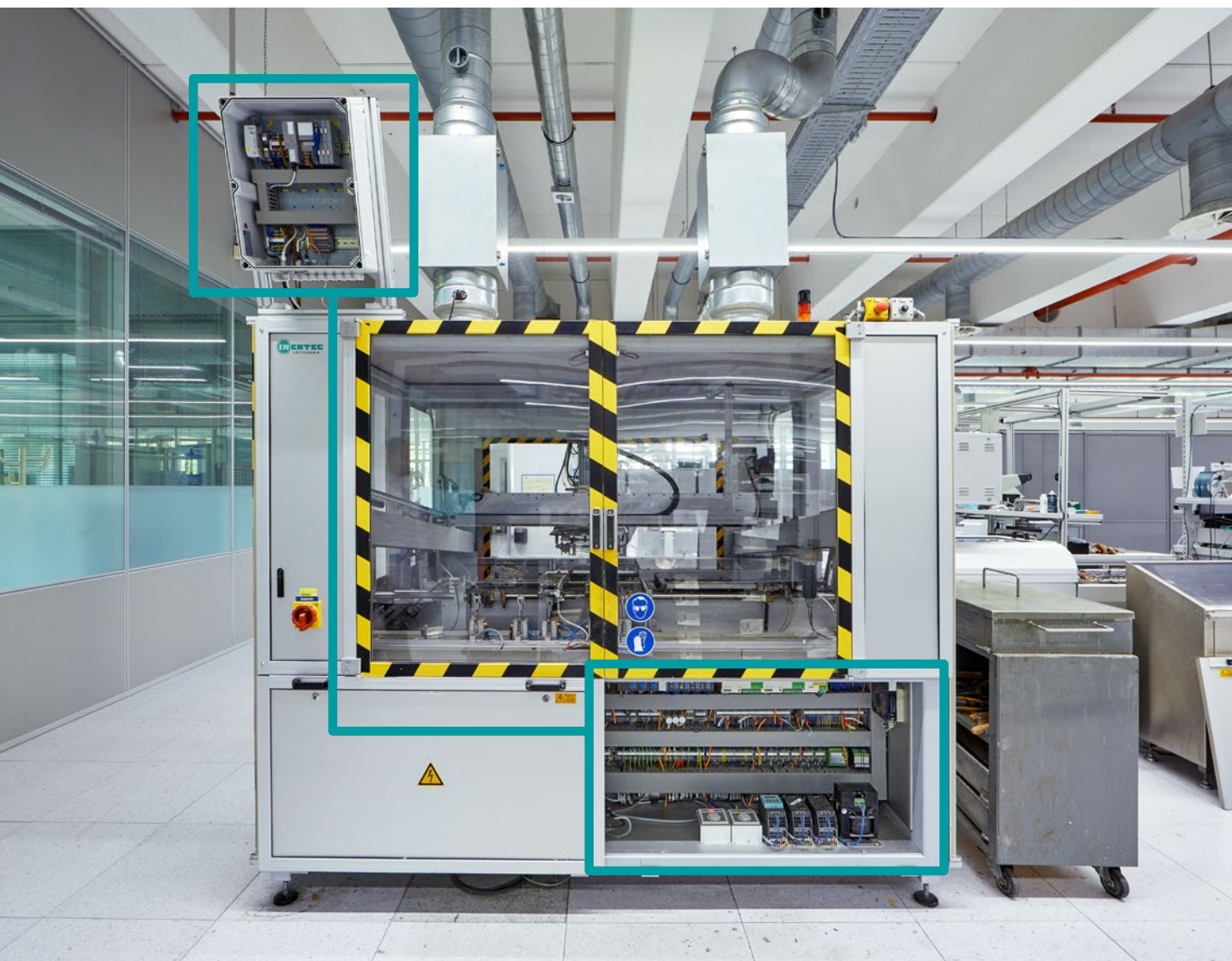
In the PLCnext Factory, we manufacture products for automation and components for safety and security. Our products and solutions are the key to the successful realization of the All Electric Society and are instrumental in achieving a sustainable world.

A good example of this is PLCnext Control, the control platform for limitless automation. In contrast to classic programmable logic controllers, it has the openness and flexibility that you would expect from the IT sphere. This means that it can be used for a wide range of tasks in the field of automation. Since PLCnext Control is compatible with a wide range of software, apps can be easily installed on the controller.





In the PLCnext Factory, we manufacture products for automation and components for safety and security



Minimally invasive – an upgrade to future technologies

3 ... 5%

of all I/Os used for
process monitoring

Obtaining minimally invasive process insights

With our Data Collection Box, at the heart of which is the PLCnext Control, we are able to collect data from the system in a minimally invasive way. It is possible to map processes comprehensively by connecting just 3 to 5% of the system's I/Os. This means that the system CE is not affected and recertification is not required. Put simply, the Data Collection Box listens to the heart of the machine like a stethoscope, without any major intervention. The data can be analyzed and visualized as desired and is ready for any cloud.

By using our own products in practice, we gain valuable experience and insights that we use to continuously develop new product and system solutions. These innovations are based on our practical experience and feedback from our customers.

We support our product lines with tailored and future-oriented solutions. This enables us to create real added value and overcome the challenges of modern industry together with our customers.



“

As the **Production Department**, we are not only the manufacturer of our products, but also the first customer for new solutions. We test our products in **practice**. This is how **continuous improvement and further development** succeed.”

Joachim Hochgräbe, Director Production SMT

Sustainable products: Our path to a green future

We are committed to ensuring that sustainability is an integral part of all of our processes – from developing new products to revising the existing portfolio.

Transparency and responsibility

Transparency regarding the Product Environmental Footprint (PEF) is a central component of our strategy. A PEF, also known as a lifecycle assessment, is a compilation and assessment of input and output flows as well as potential environmental impacts, for example, the carbon emissions of a product over its entire lifecycle. This includes development, material procurement, manufacturing, distribution, usage, and end-of-life considerations.

Our goal is to continuously reduce the environmental footprint of our products and achieve CO₂ savings of 25% by 2030 compared to 2022.



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The **PEF** makes the **environmental impact** of our products **measurable and transparent**. It is an important step on the path to a **circular economy**.”

Dr. Frauke Reinders, Head of Sustainability Management IMA

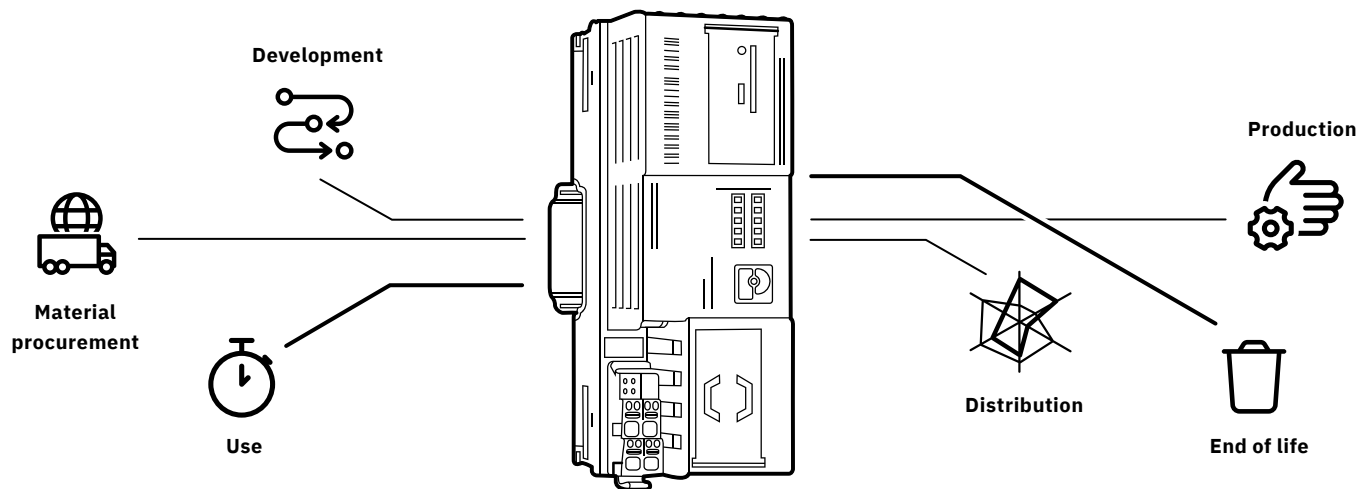
Economic success
and ecological
responsibility go
hand in hand.



Increased efficiency and CO₂ reduction

Most of the carbon emissions associated with our electronics products occur during their use. For us, the design phase is therefore the most important lever for improving the energy efficiency of our products. If we look at the impact of the raw materials used, 80 to 90% of the emissions come from the electronic components. We see further potential for reducing CO₂ here by making optimal use of resources and avoiding unnecessary complexity. Optimizing production processes also helps us to reduce waste and thus save resources.

The lifecycle of our products



Rethinking digital production

Digitalization is the turbocharger for our production operations and sustainability. It enables us to work more efficiently, conserve resources, and protect our environment at the same time.

Microservice architecture

The key to successful digitalization lies in our modern microservice architecture. This architecture allows us to respond flexibly and quickly to changes and to integrate new technologies. We are committed to technological openness and offer a wide range of services that are individually tailored to the needs of our customers and employees.

Core elements of our microservice architecture:

- Communication exclusively via APIs for seamless integration and interoperability
- Great flexibility by avoiding vendor lock-in and using peer-to-peer communication instead of centralized solutions
- Scalable and updatable systems with Docker and Kubernetes
- Highest cybersecurity and compliance standards with our declaration of conformity

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270 TB of process and machine data is **read** from our systems **annually.**”





Our microservice architecture networks the entire PLCnext Factory and promotes sustainable development

Networking production and buildings

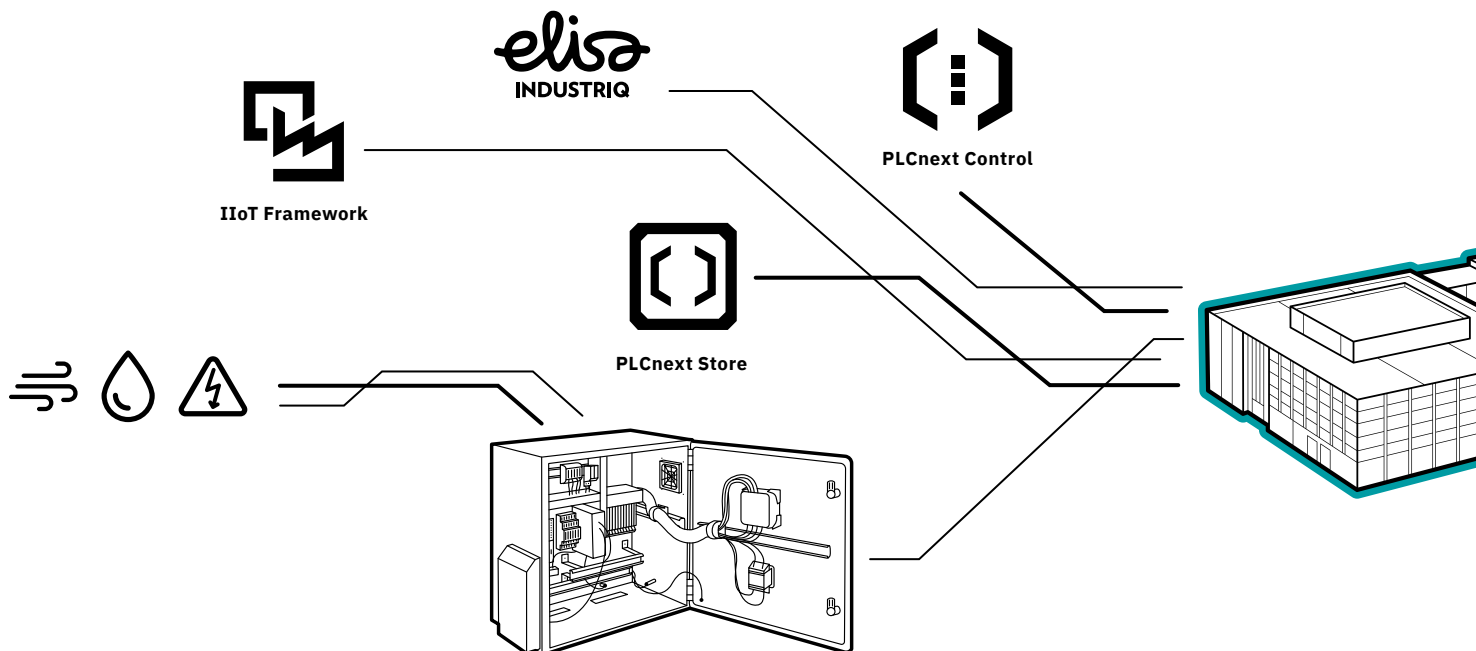
Thanks to the openness and modularity of PLCnext Technology, we were able to network production data with building management: 66,500 data points in the building and over 10,000 data points in production to be exact. This enables us to intelligently control and optimize our energy flows and reduce costs.

Asset management

We have used Manufacturing X technology to realize the efficient management and integration of all relevant data points and assets via standardized interfaces. By using the Asset Administration Shell (AAS), we are able to ensure seamless communication and interoperability between different systems.

31,800

SMT data points per hour



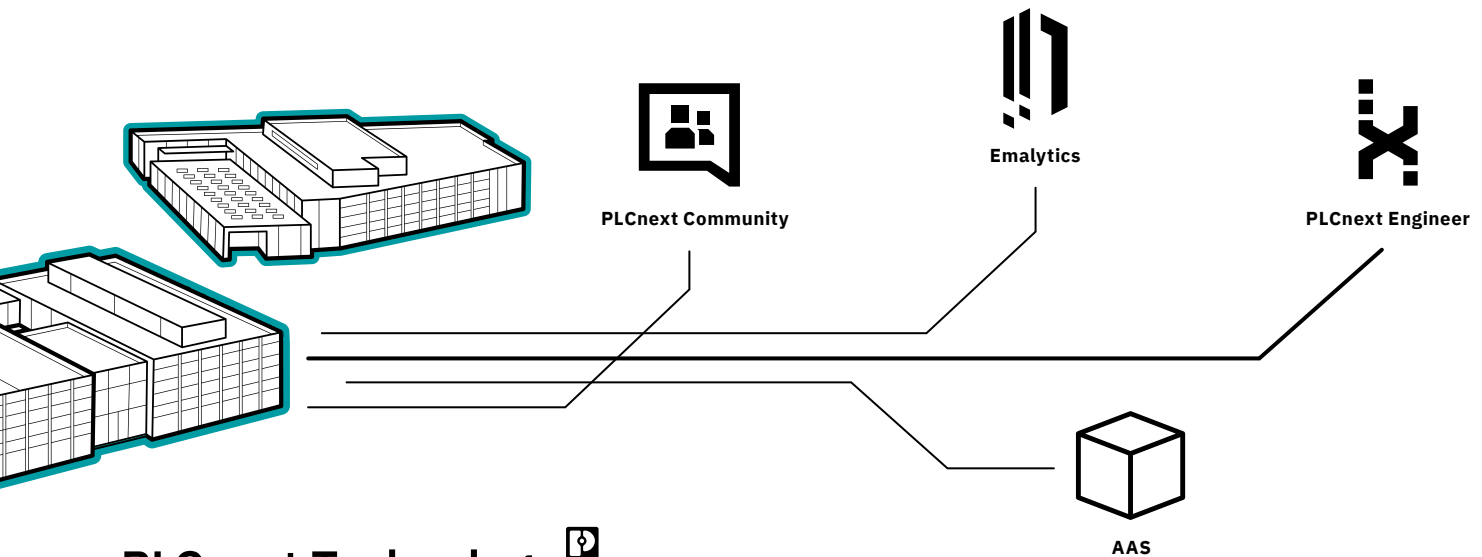
2.7 million

data points per day

Situational awareness with Emalytics View

Taking a holistic view of the process chain and the intelligent interaction of production and building management opens up new possibilities. Energy flows become transparent and can be automatically harmonized and optimized via the Emalytics building management system.

With Emalytics View, we offer a comprehensive solution that brings together data from the building and production and ensures situational awareness. Automated configuration via Asset Hub enables us to efficiently manage data points and user interfaces (UI). This improves transparency and control over all operational processes.



PLCnext Technology 

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Managing processes

We have introduced the Alert Management Service in the PLCnext Factory to make processes even more efficient. We are able to monitor and analyze our production processes in real time using tools such as Elisa and Grafana. A practical example of this is the automatic shutdown of infrastructures when production is not running.

For example, overtime was planned in production on a Saturday, i.e., Facility Management provided the corresponding infrastructure. In the end, the shift was canceled due to illness. The building then determined based on energy consumption that there was no production taking place. As a result, the systems were automatically shut down and we were able to save 400 kilowatt hours of electricity, which corresponds to around one fourth of the annual electricity consumption of a single-family home and 200 kg of CO₂.



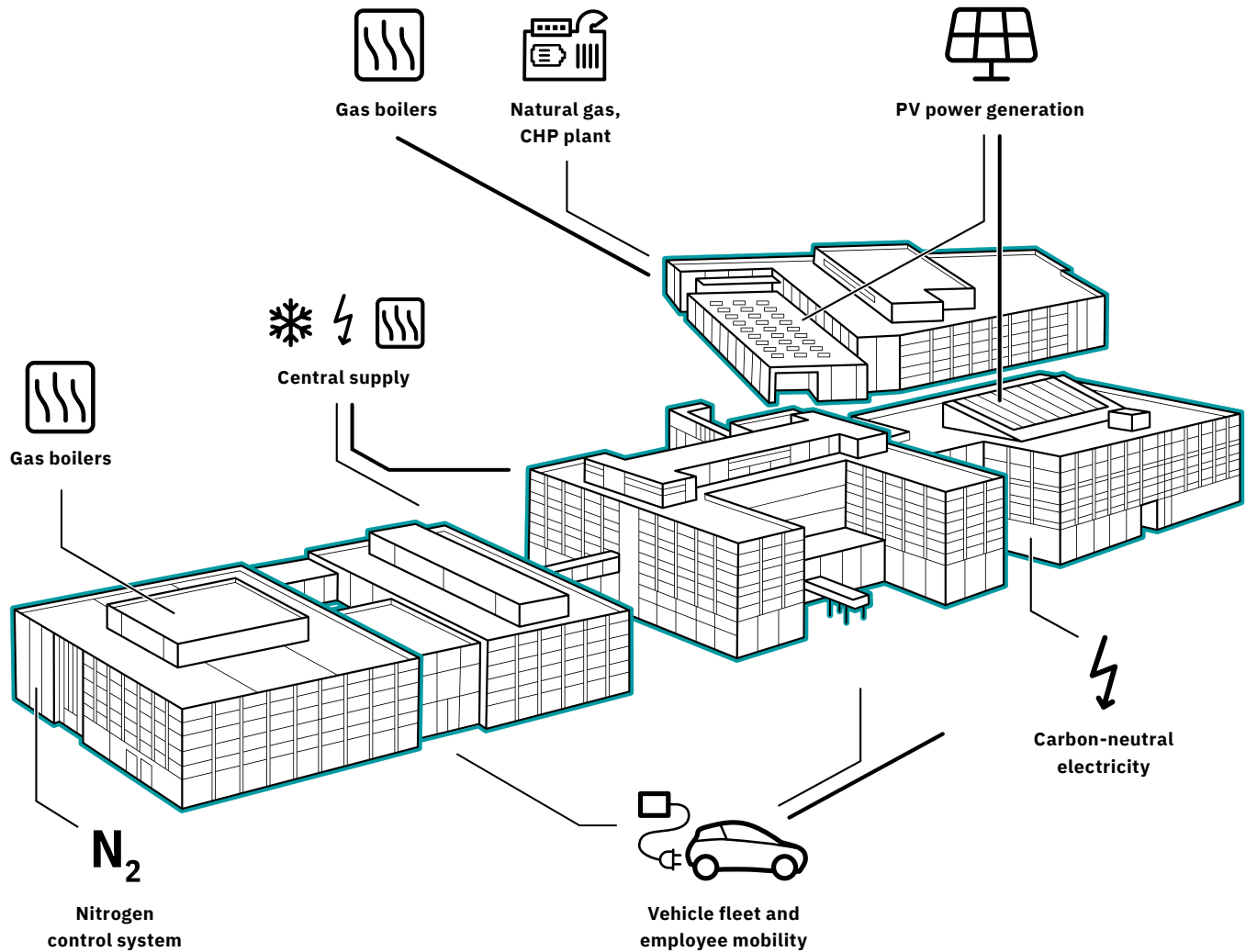
Together, the **microservice architecture**, **Asset Administration Shell**, and the open **PLCnext Technology Ecosystem** are a real **game changer** for the Digital Factory.”

Stefan Schnake, Head of Manufacturing Data Support



Current production orders can be displayed in the production lines using the Elisa tool

Overview of CO₂ sources and the infrastructure at our site



50%

**CO₂ reduction in direct emissions
in 2023 compared to the previous
year**

9%

**electricity savings through
efficiency measures in 2023
compared to the previous year**

Sector coupling

Digitalization is helping us to achieve our net zero targets. Thanks to our open and modular solutions, we are able to easily integrate distributed, renewable energies such as photovoltaic systems and wind turbine generators, as well as charging management. At our site in Bad Pyrmont, we are already using sector coupling to further reduce our energy consumption. We are creating a proof of concept for the connection of energy, industry, infrastructure, and mobility. Through innovative automation, we are making our energy consumption more efficient and making strides in achieving a net zero factory.



“

If I know that the sun will be shining on Sunday, why not plan for the available **PV electricity** to be used for production and **benefit** from it? For this to work, a **data interface** between **facility management** and **production** is crucial.”

Frank Schröder, Head of Facility Management

Our contribution to climate protection – net zero factory

The vision of a net zero factory is not impossible to achieve; it is both technically and economically feasible. Digitalization and our microservice architecture provide the basis for managing the complexity and implementing the transformation. Important points that we take into account:

Thinking beyond the factory boundaries in the district:

It is important to strengthen regional networking. By integrating a local heating network, we can utilize and distribute excess heat efficiently. In addition, we are committed to the expansion of photovoltaic systems, wind turbine generators, and biogas plants in order to contribute to sustainable power generation. Close cooperation with local politicians and other stakeholders is crucial to obtain the necessary approvals and support.



Energy and heating transition

Intelligent cooling and heating management is the key to ensuring the most energy-efficient operation of our factory and buildings.

We are currently able to use the heat generated as a by-product in the combined heat and power plant for heating. In the future, however, the operation of the CHP plant will be further reduced in order to save CO₂.

We therefore need to adapt our heating infrastructure while ensuring security of supply.



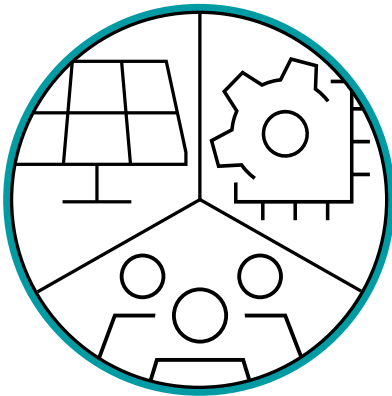
With our photovoltaic systems on buildings 3 and 4, we are already able to cover 9% of our electricity requirements



Together, we are making our infrastructure more sustainable

Moving away from classic ROI considerations towards risk mitigation approaches:

In order to move away from classic ROI considerations towards risk mitigation approaches, we should focus on risk distribution in power supply. For example, a combined heat and power plant could be operated with biogas, while the electricity mix consists of grid electricity, electricity exchange, and power purchase agreements (PPAs). In terms of our global footprint, it is also about distributing risks across the entire network. With this strategy, we are not only able to manage costs more efficiently, but also increase the resilience of our company.



Our financing of the energy transition:

- **33% replacement investments**
One third of investments should go towards replacing outdated technologies.
- **33% transformation investments**
Another third should be invested in transformation projects with a positive ROI, such as photovoltaic systems.
- **33% community cooperation**
The rest should be invested in long-term cooperation with the community, such as PPAs.

Net zero is possible, both technically and financially:
Together, we can master the challenges of the energy transition and
create a sustainable future.





Our mission statement at the entrance to the production facility in Bad Pyrmont welcomes employees and visitors to the site



Supporting your digital transformation

Digital transformation is a step-by-step process – for you too. We make it easy to get started: no large initial investments, but instead continuous expansion towards digitalization through automation and networking. We welcome you to take a closer look at our PLCnext Factory – visit us and experience the future of production at first hand.



YouTube

<https://phoe.co/yt-digitalfactorynow>

About

PLCnext Technology

PLCnext Technology is the ecosystem for industrial automation. The combination of an open control platform, modular engineering software, and a digital software marketplace enables easy adaptation to changing requirements and the efficient use of existing and future software services. With simple cloud integration, the option of using open source software, and the ever-expanding expertise of the user community, PLCnext Technology is able to meet all the challenges of the IoT world.

Digital Factory now

Data is the most important asset in digitalized production for reducing carbon emissions. Building a forward-thinking Digital Factory requires intelligent solutions to increase productivity, improve availability, and generate new business models. With Digital Factory now, Phoenix Contact offers a holistic and scalable concept that provides various products, solutions, and services for your sustainable production. We have already successfully used and tested the various segments of digitalization in our PLCnext Factory. This includes intelligent data acquisition and evaluation, a smart data infrastructure, the secure connection between OT and IT, and an open and flexible automation standard.

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**DIGITAL
FACTORY**
now

Visit us and experience how we
are rethinking production:

PLCnext Factory

plcnext-community.net/news/plcnext-factory

Digital Factory now

phoenixcontact.com/digitalfactorynow

The All Electric Society

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Have we piqued your interest? Do you have any questions or feedback?

Then please send us an email to plcnextfactory@phoenixcontact.com



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