

Standardisation in the automotive industry

A key factor for quality and efficiency



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1 | Executive Summary

The automotive industry is undergoing an extensive process of transformation that is set to continue for a long time. Megatrends like digitisation, electrification or automation pose huge technical challenges for the entire mobility sector. Standards and norms play an important role in implementing the transformation in a successful and, above all, in a marketable way.

An ever-increasing variety of car models and drive technologies demand flexible production processes and the faster commissioning of new production plants. Consequently, optimising cost and revenue structures is more important than ever. Standardisation is a useful tool for responding to this development.

This White Paper provides insight into the role of standardisation in this transformation. It also shows how it is not only an enabler for innovation, but can also help support a competitive, efficient and sustainable future for mobility.



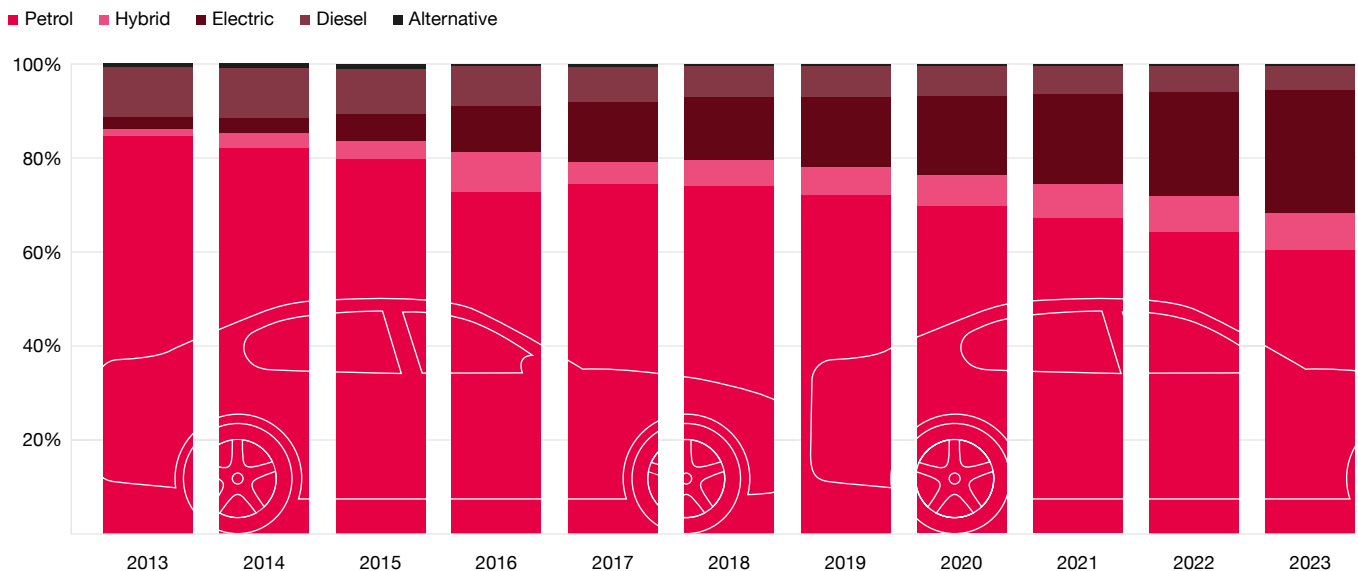
2 | The new mobility: Structural change in the automotive industry

The vehicle industry is facing the biggest change in its history. The electrification of drives, the increasing introduction of autonomous driving functions, the emergence of new mobility services and the growing automation and

networking of manufacturing processes are profoundly changing the value creation networks and production processes of suppliers and automobile manufacturers.



Proportion of passenger cars by type of drive or fuel
(Stock in percent, figures as of December 2023)



Source: Statista Market Insights

The pressure for transformation has grown even further due to the tightening of climate targets. One key component of this is the changeover from conventional drives with internal combustion engines to electric vehicles. This poses major challenges for the automotive industry: Time pressure, unplanned and sometimes chaotic cost hikes due to inflation and a shortage of skilled workers are just a few of the problems facing companies.




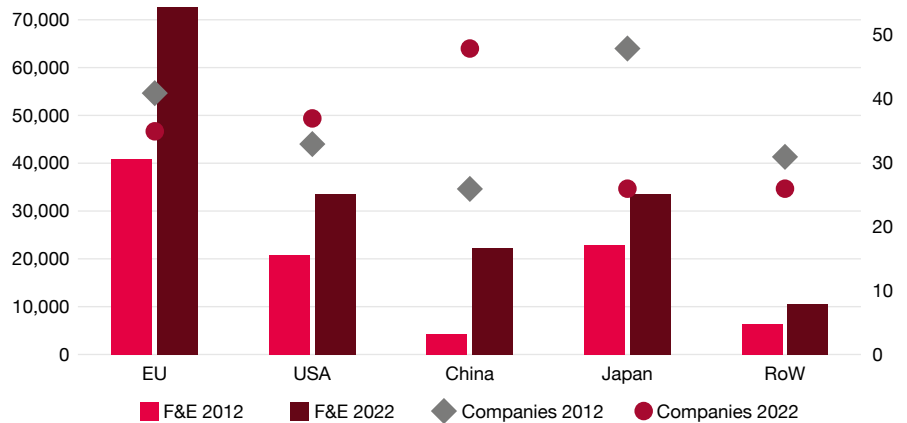
Top 5 challenges in the automotive industry

1. Sustainability targets and emission limits
2. Technological changes and consumer demand
3. Labour shortage
4. Supply chain problems
5. Increasing threat from cyber attacks

Source: Statista Market Insights

To successfully meet these challenges, it is essential to invest in an efficient production infrastructure. The amounts planned for research and development are continuously growing into the billions, particularly with a focus on electric mobility, autonomous driving and digitisation.

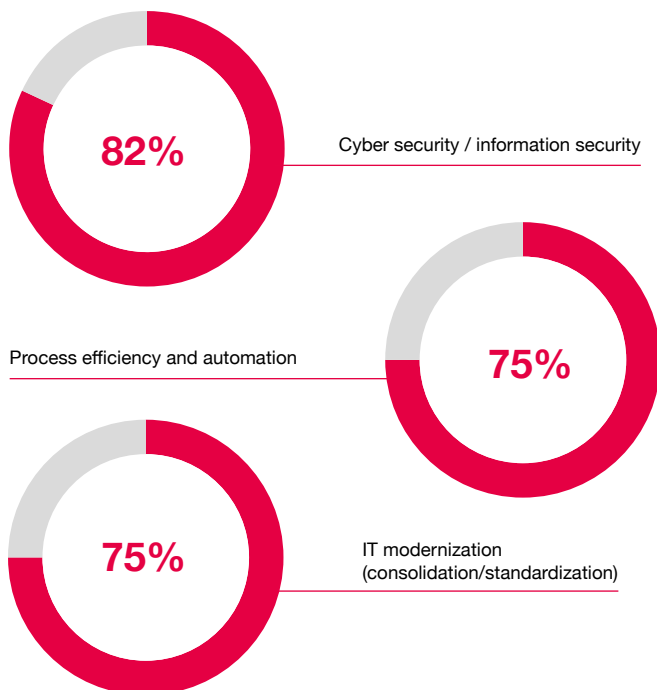
 **Number of automotive companies and R&D investments by region/country, 2012 and 2022**



Left-hand axis: R&D investments in million EUR; right-hand axis: Number of companies
Source: The 2023 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG R&I



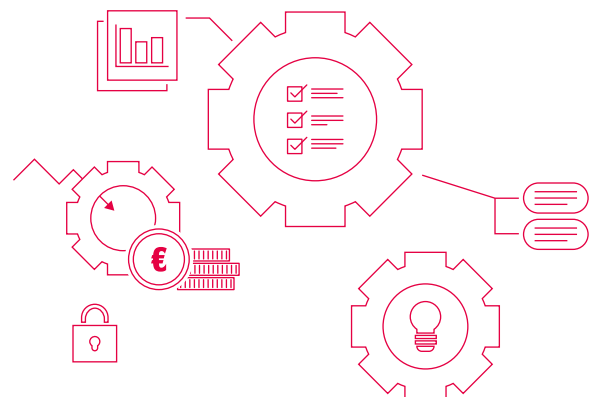
In 2024/2025, CIOs will prioritise many parallel IT investment areas



n = 113 German CIOs; Question: "What will your company be investing in the next 2 years?" From 1 = "not at all" to 4 = "very strongly"; values relate to "strongly" to "very strongly"
Source: Lünendonk study

Cost savings are being sought through a variety of measures, including reducing complexity and increasing the introduction of standardisation.

Standardising plants offers clear advantages as it greatly simplifies the entire planning process. Standardised modules ensure that the desired quality is always achieved worldwide and in different cultural contexts. By making use of existing experience, the entire planning process becomes considerably simpler, faster and more cost-effective. In the automotive industry, CIOs use standardisation as a strategic tool to respond to market changes more quickly and to reduce costs.



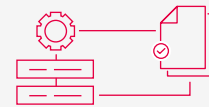
3 | Efficiency through unity: Standardisation in the automotive industry

It takes more than just innovative designs and cutting-edge technology, to remain competitive in the rapidly developing automotive industry. The importance of cost optimisation is growing given the fierce competition, fluctuating market demand and increasing regulatory pressure. It is not just about cutting costs, but also about intelligently managing and cutting product costs to increase profitability without compromising on quality or customer satisfaction.

Standardisation is one way to save time and costs in automotive production and it offers the chance of relieving the burden on specialists. Procedures can be unified and optimised by standardising processes and components. This provides greater efficiency and flexibility in production. Standardisation also allows flexibility, right across the globe.



Standardisation refers to uniform dimensions, types, procedures and structures



This is mainly achieved through standards and type approval. The higher objective is to increase compatibility, which in turn leads to a more efficient use of resources.

The benefits of standardisation in the automotive industry: **Efficiency, quality and flexibility**



Boosting efficiency

Automakers can save time and resources by standardising processes, components and systems. This leads to shortened development and production times, in turn reducing time-to-market.



Quality assurance

Standardised processes and components ensure consistently high quality. The elements have already been tested and validated under real-world conditions, so reducing the risk of errors and failures and increasing customer satisfaction while improving the company's image.



Catalyst for innovation

Standardisation creates a framework for testing innovations and quickly introducing them following a successful test phase. It offers a uniform testing environment and makes it easier to integrate new technologies and collaborate with suppliers and partners. This way, automobile manufacturers can respond more flexibly to changing market demands and bring innovative products to market more quickly. In addition, standardisation permits better compatibility between individual components and thus minimises sources of error.



Relieving the burden on skilled workers

Standardisation means that repetitive tasks can be automated and employees can concentrate on more demanding activities. This not only leads to greater employee satisfaction but also to increased productivity due to reduced planning efforts.

4 | Enclosure 4.0: optimised value creation through standards

The enclosure is a central element of every production plant; its technical quality influences the entire production process. In the automotive industry, enclosure procurement is still frequently marked by individual solutions, which may lead to challenges in planning, installation and operation. Uniform and efficient measures throughout the entire supply chain ensure that full use is made of automation's potential. This allows competitive and smooth production, despite growing demands and tighter delivery deadlines.



Top 5 business risks of German industrial companies in 2024

1.	Energy and raw materials prices	60%
2.	Economic policy framework	57%
3.	Shortage of skilled labour	56%
4.	Domestic demand	55%
5.	Labour costs	53%

Source: DIHK



Standardised enclosures: A win-win situation along the entire supply chain

The challenges in vehicle production have increased significantly: ever shorter start-up times, individual design efforts and new control technologies, as well as high demands on maintenance and servicing.

To remain competitive in the years to come, an increased focus on standardisation and harmonising manufacturing processes offers great potential. This not only helps avoid mistakes, it also lowers the burden on employees by reducing the amount of training needed. A rethink towards a conceptual, standardised structure offers many advantages throughout the entire supply chain.

Add value



Planning

Standardisation **reduces the complexity involved in planning factories** by providing clear guidelines and minimising uncertainties. Moreover, specifications can be easily copied for future projects, saving time and resources. Standardisation simplifies the construction of identical plants in different countries, particularly in the case of international projects.



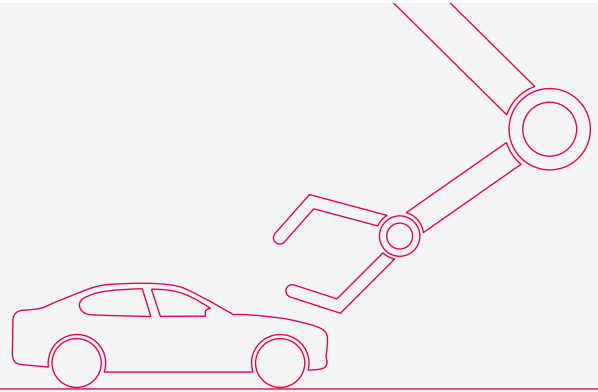
Purchasing

Standardisation **optimises the procurement process** considerably. Offers from suppliers can be compared more easily by reducing the number of suppliers and the number of items to be procured. This leads to improved transparency and the global availability of the components needed.



Supplier and plant constructors

Standards also offer benefits for suppliers and plant constructors: **high planning security** and secure procurement even in different markets. This helps to **minimise risks** and increase efficiency along the entire supply chain.



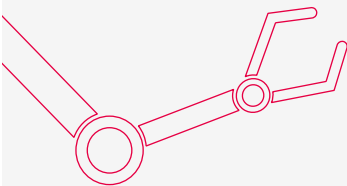
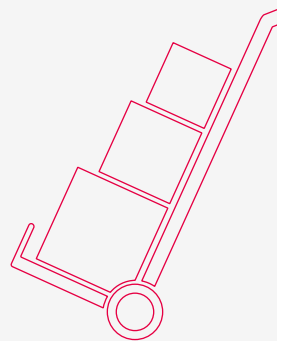
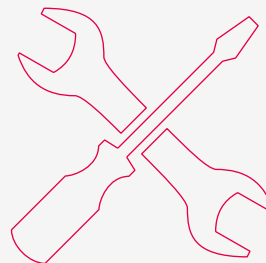
Maintenance

Standardisation **cuts the number of spare parts and thus storage costs**. Clearly defined parts and a reduced number of components mean less complexity in the systems being maintained and time saved when training employees.

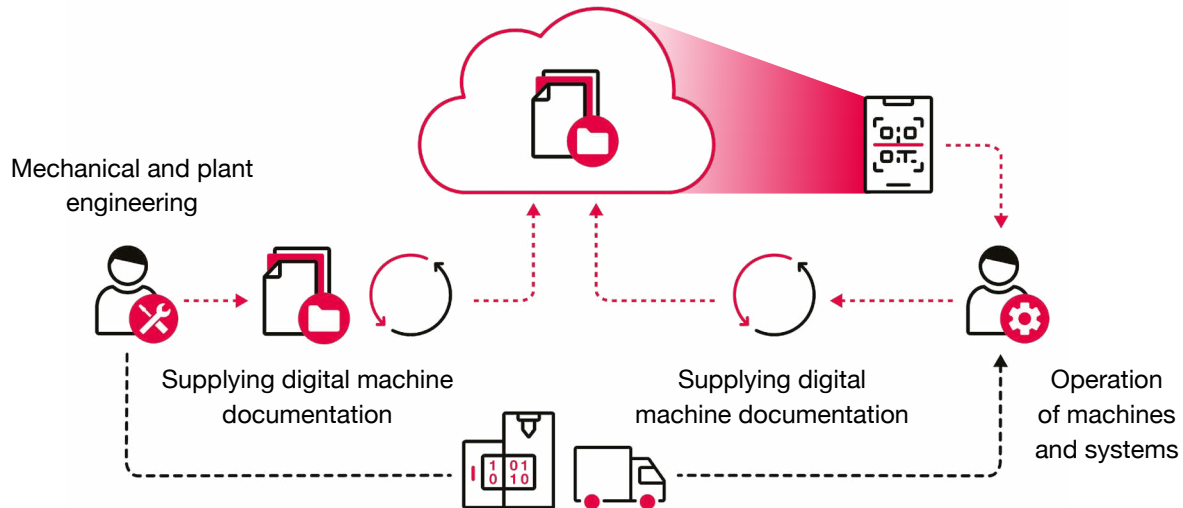


Manufacturing

Through standardisation, plant operators have a direct **influence on the system's quality and performance, as well as energy and follow-up costs**. Standards also enable faster commissioning.



Rittal ePOCKET



Standardisation calls for automation

One additional advantage of standardisation is the increased level of automation in production. The creation of a central database plays an important role here. In the interaction between different actors, seamless digitisation is made difficult by isolated solutions, some of which are paper-based. Paper documentation may be missing or difficult to read. The ability to later reuse data created in development, production and maintenance represents a major simplification.

Rittal ePOCKET offers automation technology a digital home by providing digital data storage in the Eplan Cloud. With Rittal ePOCKET, each enclosure has its own place in the secure cloud. All documents are digitally accessible, to all project participants and at any time via a QR code on the enclosure.

Manufacturers can significantly reduce their costs and time by accessing fully prepared reference enclosures and accessories in 3D during engineering. "This greatly reduces the effort involved in engineering, since component placement can begin directly after a few clicks".

3D data based on Eplan Pro Panel can be used to create complete digital images of enclosures and the components installed within them.

For suppliers, this forms the basis for introducing and further developing automated production steps in control and switchgear construction, from machine NC processing and automated terminal assembly to cable assembly and wiring support.

The companies benefit from the developed design templates as a basis for faster and high-quality design, production and commissioning of the systems.

Engineering offices also benefit from the integrated collision control and thermal power loss analysis of components, enabling optimised component placement inside the enclosure and the energy-efficient design of cooling systems.

The digital twin accompanies the real enclosure in the digital wiring plan pocket. Changes are documented more easily and without errors. Tracking options ensure constant communication between operators, planners, switchgear manufacturers and maintenance staff.

This results in shorter development times, faster production cycles, and ultimately increased added value throughout the supply chain.

5 | Guideline to standardisation in the automotive industry



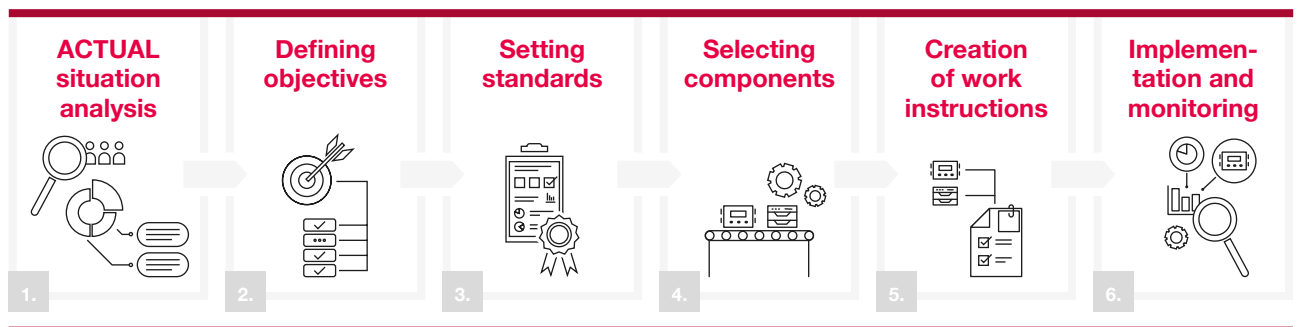
Standardisation based on the example of cable entry in enclosures

Enclosure procurement is divided into numerous segments in which the pressures of deadlines and cost are omnipresent. Companies place high demands on practical solutions, short procurement times and the highest quality of enclosures at the lowest possible cost.

Despite these challenges, the procurement process has considerable potential to increase value creation. The example of cable entry shows how standardising modules not only improves reliability and quality in the enclosure, but also slashes the need for spare parts.



Guideline to standardisation



1.



Analysis of the actual situation

Examine the current cable entry process

- Find out who in your company is dealing with the topic of cable entry (e.g. electrical planning, standards department, equipment construction, maintenance, and so on)
- Identifying the different ways in which cable entry is currently practised
- Analysis of the state of standardisation in your company
- Investigate why different ideas and philosophies exist when it comes to cable routing

2.



Defining objectives

Set clear goals for the standardisation cable entry

- Uniform layout for future planning
- Safe and standard-compliant system
- Reducing downtime costs by improving quality and reliability
- Reduced need for spare parts

3.



Setting the standards

Define uniform standards and specifications for cable entry

- Define the requirements for protection categories and standards
- Define permissible cable bending radii
- Define the position of the cable entry (from below, from above, through the cable enclosure, through the base/plinth, etc.)
- Define the cable clamping
- Bring together different ideas/philosophies as much as it makes sense
- Define the cable entry
- Define – if necessary – permissible exceptions and deviations
- Define the components needed to realise cable entry (see next point)
- Define the sector/plants/countries for which standardisation should apply
- Find out if there are any digital tools for standardisation (e.g. Eplan)

4.



Selecting components

Select high-quality components that meet the defined standards and consider factors like reliability, availability and service

- Only release components for cable entry that meet your quality requirements
- Choose only components that are available in all those countries where the standardisation is to apply
- Where possible, only select components that are immediately available as standard and do not have a longer delivery time
- Do not release too many components to reduce the spare parts inventory
- With components, find a sensible compromise between the possible and the absolutely necessary
- Clarify the spare parts inventory with the maintenance department

5.



Creation of work instructions and documentation

Write clear work instructions for cable entry and document the standardised layout

- Form of documentation
- Equipment specification/release list/product data sheet for special solutions
- Customised product catalogue with all approved (Rittal) products
- Eplan Data Portal integration of applications

6.



Implementation and monitoring

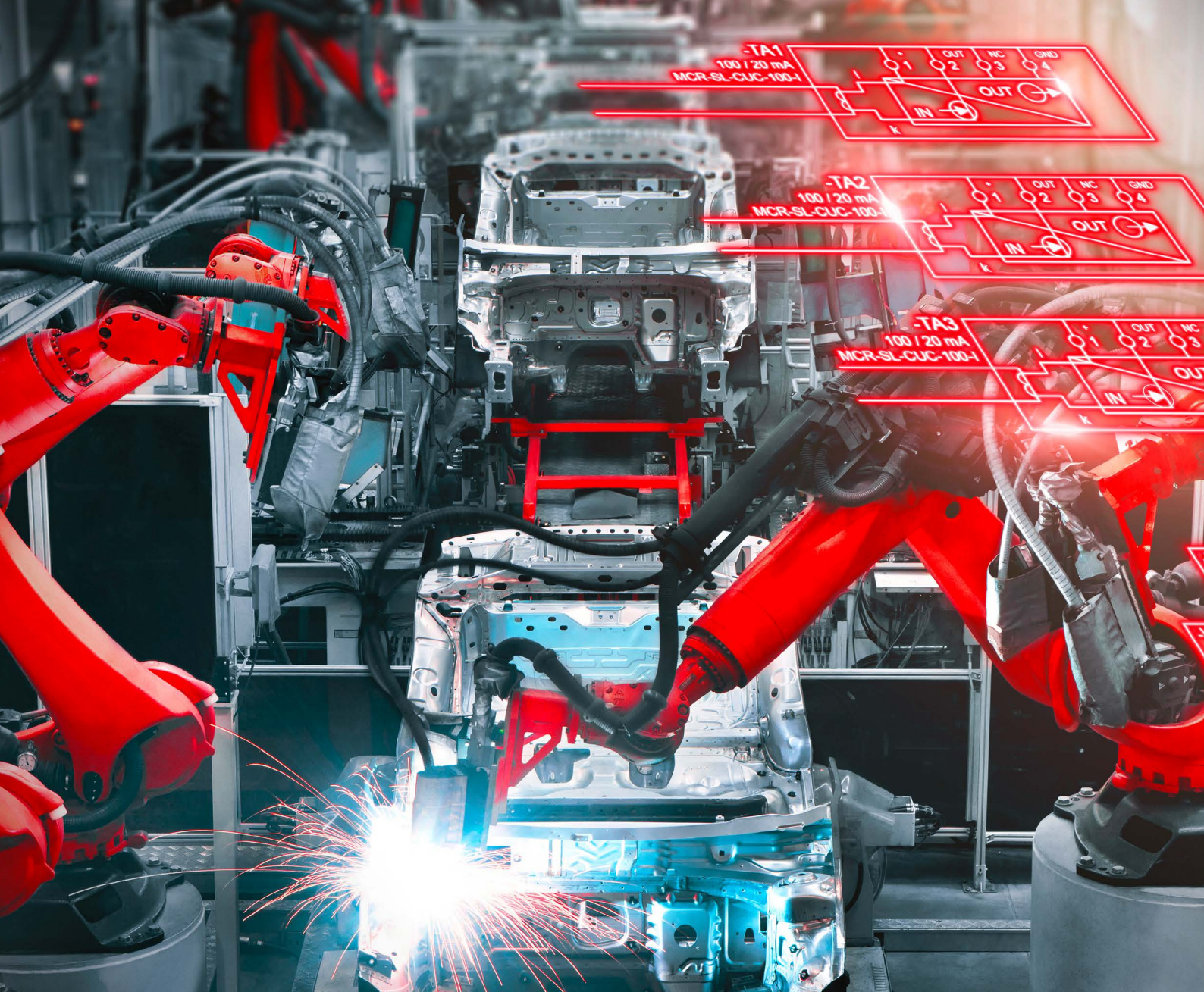
Implement the new standardised processes and continuously monitor the performance

However, these standardisation principles apply to all the components on and in the enclosure. Standardisation considerably simplifies product commissioning and maintenance, as it allows the use of familiar, template-based structures. Using standardised components ensures tried and tested safety and

substantially reduces the planning effort. Rittal solutions streamline your processes and boost your productivity. You will optimise your value chain at every stage and across the entire process, from engineering, procurement and manufacturing to operation and IT.



As a reliable partner with extensive expertise, Rittal is on hand to support and advise you on implementing these standardisation processes.



Place your trust in manufacturing expertise

You can rely on proven Rittal service:

Planning and design • Implementation and commissioning • Operation and optimisation

2024

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