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How To Avoid Electrical Mistakes Getting Through to Production: An Electrical Design GUIDE

A practical guide on how to help you reduce errors, minimize costs, and improve productivity and transparency in electrical design projects.

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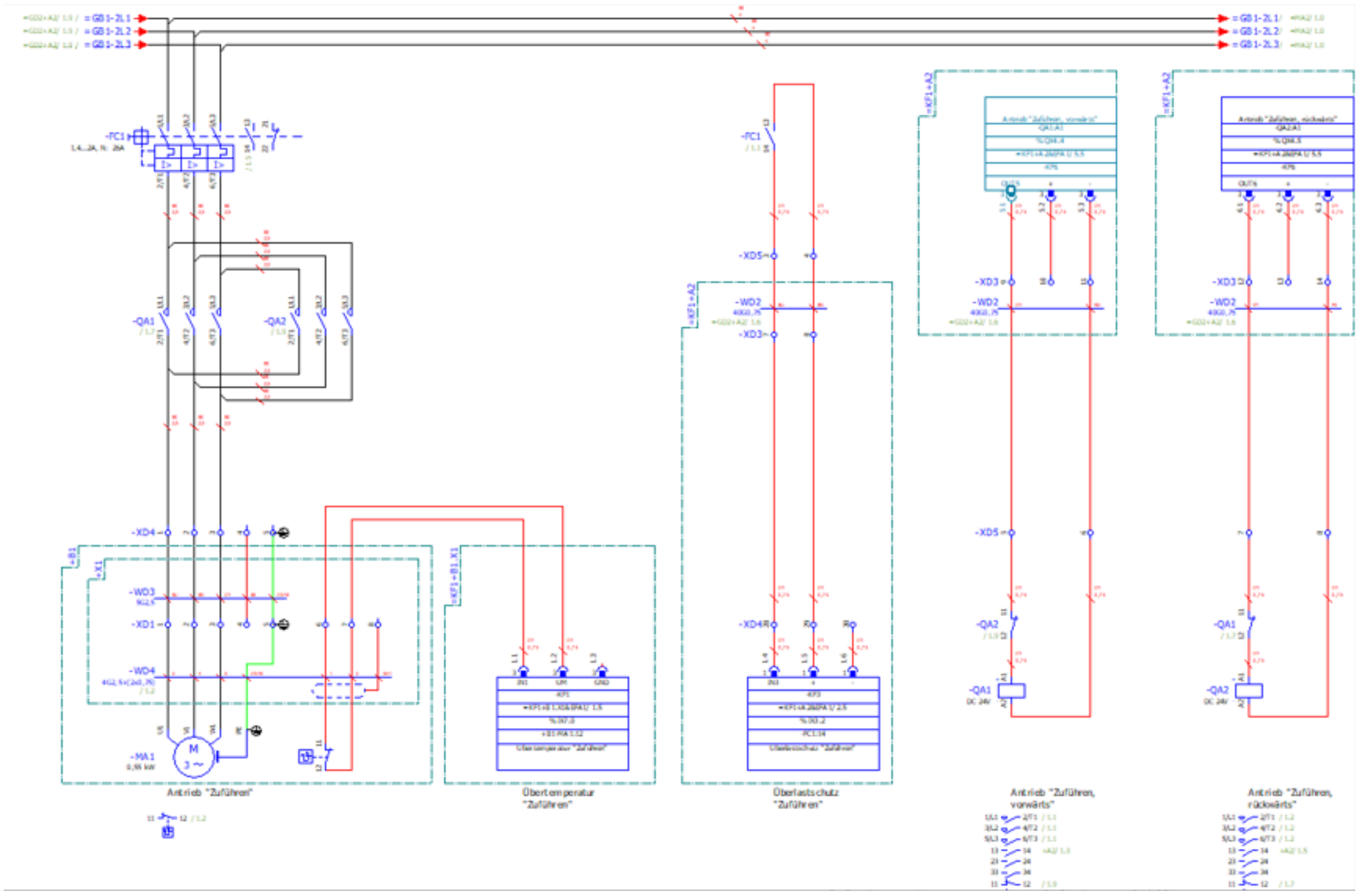
Introduction: How To Avoid Electrical Mistakes Getting Through To Production

Engineering managers have the responsibility to ensure that all electrical designs that their teams produce are of the highest quality and free from mistakes when it comes to production. Unfortunately, even with the most rigorous process in place, design errors can still make it through to the shop floor.

The following are some of the most common issues that have the potential to cause expensive design errors, mistakes and project overruns:

- Components don’t fit in the cabinet, or cables do not fit in the wire duct.
- Copying and pasting from old projects leads to the shop floor working from out-of-date drawings and documents.
- Multiple versions of the same electrical design exist, with no revision management process or chain of accountability to determine the most up-to-date and accurate version.
- Poor communication between design engineers, procurement, and production/assembly technicians leads to avoidable issues and wasted resources.
- Duplicate device tags or identities lead to the wrong parts being ordered.
- Part numbers missing, incorrect or duplicated lead to time wasted on unnecessary manual searches.
- Schematics are modified but the panel layout drawings are not updated.
- Wire numbers are missing.
- Drilling information is missing or incorrect.

This guide will provide you with helpful tips and a checklist for how to avoid making these (and other) expensive mistakes and get your designs through to production without issue.



Why it’s important to spot mistakes early

It is important to spot electrical design mistakes early in the process because even minor errors, miscommunications, and faults of omission can be expensive and time-consuming to correct later down the line.

The longer a design mistake goes unnoticed, the more likely it will become a major problem during production and assembly. This can lead to frustration among teams, project delays and overruns, wastage and scrap, costly parts ordered in error, customer dissatisfaction, and even potential legal issues. The list goes on.

Spotting these design mistakes before they become a production problem is essential for reducing costs and keeping projects on track.

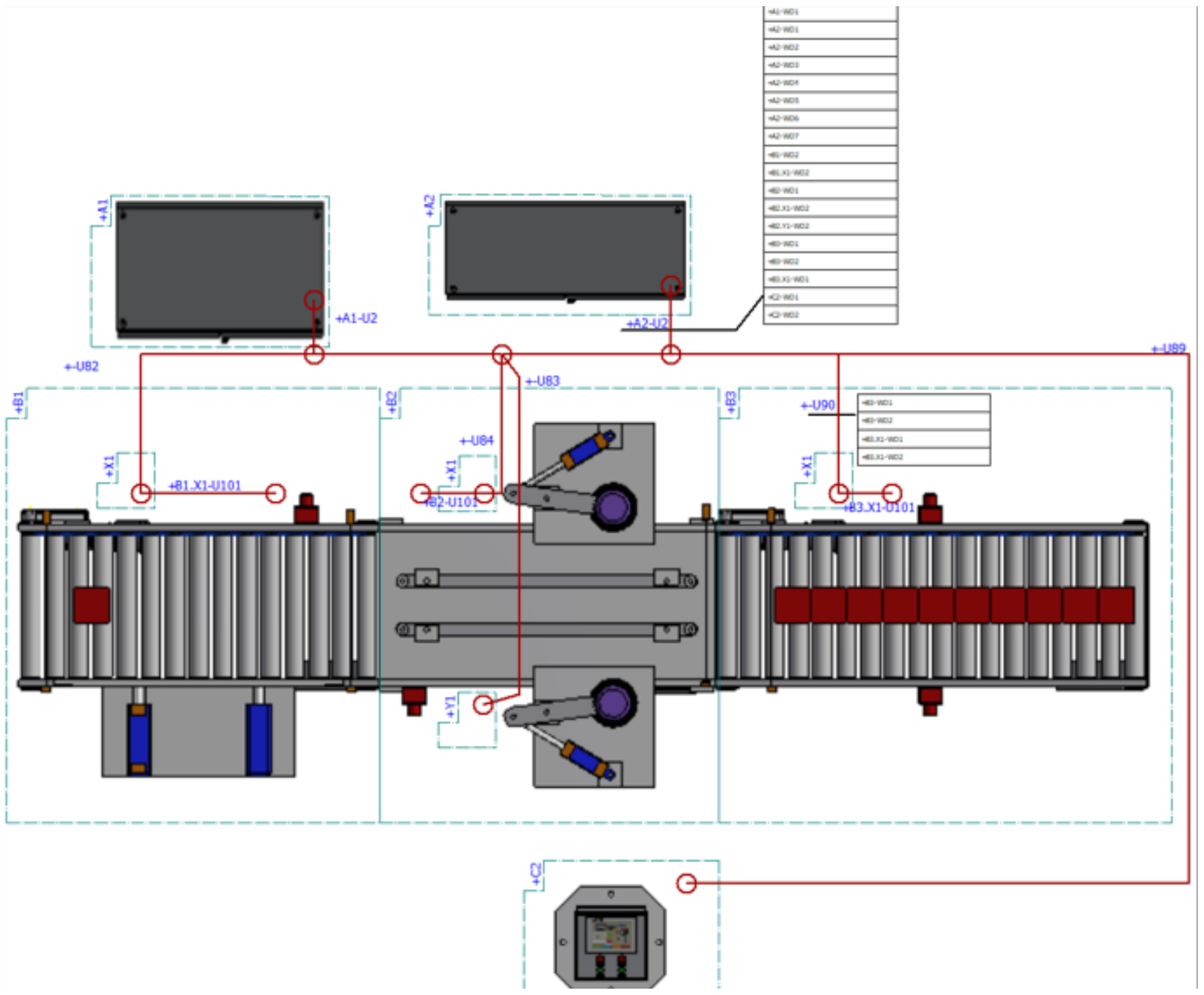
By following the best practices outlined in this guide, you can mitigate the risks of making unnecessary electrical design mistakes and get your designs finalized on time and within budget, completing your projects efficiently and to the highest standard.

Our Electrical Design Checklist

The following checklist is a series of best practices and considerations that can help engineering managers identify electrical design errors at an early stage before they filter down to production – and often pre-empt these errors so that they don’t occur.

We have divided the checklist into four parts for convenience: data management, change management, virtual prototyping, and project documentation.

The points raised are broad and flexible enough to be applied to any electrical design project. If you’d like specific advice about any aspects of project troubleshooting or how to apply this checklist to your own electrical design requirements, please complete the contact form and someone will be in touch.



Part One: Data Management

The objective of data management in electrical design is to ensure a continuous flow of data throughout different aspects of the project, with a centralized database and repository of truth that is accessible to all engineers and stakeholders working on the project.

***Problems to look out for**: Part numbers may be missing, incorrect, or duplicated. There may be discrepancies across your designs because the parts used are not standardized or become obsolete.*

Establish a centrally located parts database

Creating a central parts database that contains all available parts is an essential component of any effective electrical design process. The database will give your engineers advanced insight into the parts you can use for different applications, as well as their operation and possible alternatives, and will establish a single source of truth on which to base collaboration and design decisions.

A central database facilitates the easy tracking, storage and retrieval of important design data and components, eliminating much of the confusion caused by disparate manual record keeping systems.

It also reduces the risk of human error and helps ensure that no mistakes are made which could lead to costly delays or production issues, streamlining the design process in accordance with best practices.

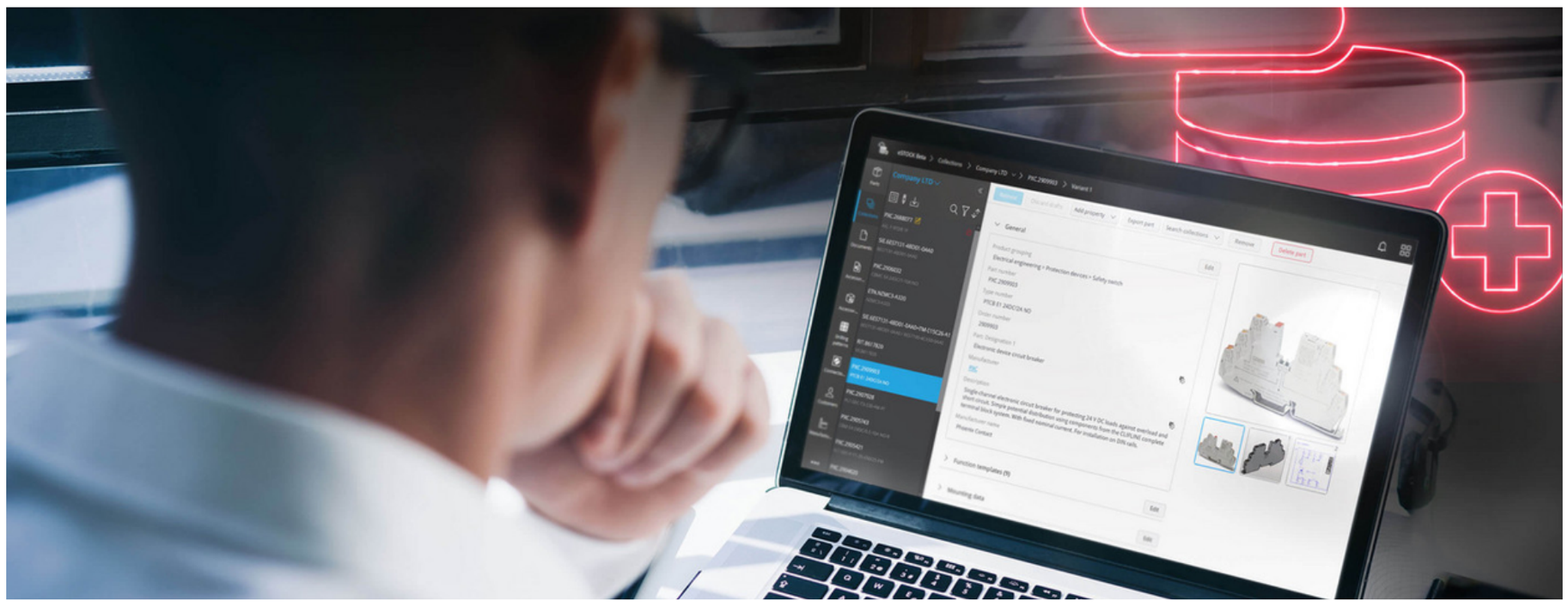
Encourage standardization across your designs

Standardization of electrical designs is a key part of avoiding mistakes in production. A wide range of parts and routines can be standardized within a design – and these can be stored within your centralized database.

To promote standardization, teams should strive to use common component libraries and adhere to established design schematics wherever possible. This not only cultivates consistency between different projects, but it also makes it more straightforward for team members to collaborate on the same project without misunderstandings.

Standardization makes it simpler for engineers to identify early-stage problems and mistakes before they become obvious – making the entire process more efficient and cost-effective.

Standardization does not reduce flexibility. In contrast, having the right combination of pre-programmed standardized solutions immediately to hand gives your teams more scope to work flexibly, combining established and proven parts and routines to implement efficient solutions with fewer mistakes.



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Ensure that your part numbers are correct

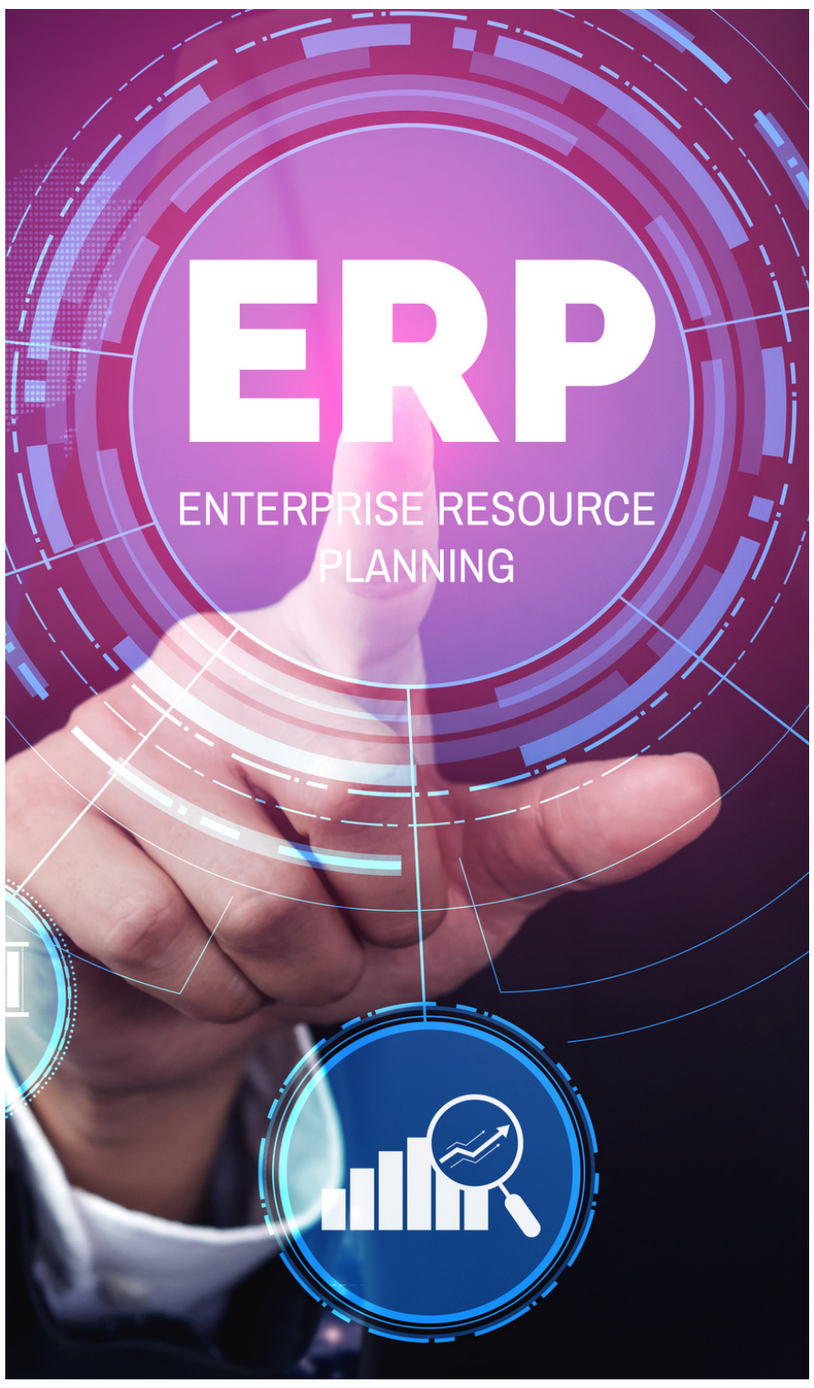
To be confident that all part numbers within an electrical design are correct, it is essential to keep your standardized reference materials up to date. Every part in your centralized database should be correct. This includes catalogs, schematics and manuals, which should be regularly checked for any changes or manufacturer updates. It is also crucial to double-check any new components added to the project against the original source material to make sure the correct part numbers have been included.

In some ECAD design solutions, you may be able to implement automated checks to verify the components used in a schematic are valid and up to date, reducing production errors even further.

The **Eplan Data Portal** gives your teams direct online access to up-to-date, high quality product catalogs provided by the parts manufacturers of electrical, mechanical, fluidic and pneumatic components, giving the assurance that your data is accurate.

Link data bank to your ERP

Digitizing your project from start to finish is the best way to ensure an efficient ‘flow of data’. In a flow of data, components and parts data is taken from your central parts database, and is then enriched inside an electrical design platform – such as Eplan. The data can then be fed into your ERP and other production and assembly management platforms as required.



In practice, this will involve integrating your centralized parts database with your ERP system. By doing so, the data stored in the parts database can be automatically updated and verified, so that there are no discrepancies between production parts lists and your latest design schematics, as any changes made in either will be automatically updated and synced between the two systems. You’ll also gain a better insight into the real time cost and availability of various parts, allowing you to make contingency/substitution plans to avoid delays.

Ultimately, this can significantly decrease your project lead times and save costs – leaving less room for errors.

Part Two: Change Management

Enforce a commonly agreed change management process.

***Problems to look out for**: Inadequate change management procedures may result in your production teams working from an older design that may contain errors. With no established path of feedback, there is also a reduced ability to learn from mistakes, meaning that errors could easily happen again.*

A standardized change management process is of the utmost importance when it comes to preventing electrical design mistakes slipping through to production. An effective system gives engineers full visibility of current processes and design versions, while enabling them to keep their designs up-to-date with the latest updates and revisions.

Without such a system, most electrical designs will require frequent manual reviews of every component before release into production. The process is time consuming and error prone when attempting to detect errors line by line, as manual checks may not account for every potential problem or inconsistency between documents and drawings.

With multiple contractors and departments involved, the chances of design elements being misinterpreted, forgotten, or dropped are high. Some people may avoid or put off difficult conversations until a late stage – while others may choose to prioritize certain changes over others, without communicating their decisions and reasoning to other stakeholders.

Good change management leads to better conversations between design and production, improving collaboration and efficiency.

By introducing a standardized framework that automatically assesses all components in each iteration of the design, inconsistencies can be identified and corrected much faster and more accurately.

- ✓ **Use editable digital drawings**: Digital drawings are easier to access and change than static paper drawings or PDF documents. Some electrical solutions, such as Eplan eVIEW, make it easier to for information to be shared, revised, approved, and sent to production, as it enables structured collaboration with co-workers, customers and service providers.

- ✓ **Create a feedback loop to relay changes from production back to engineering**: This will improve communication and help avoid the same errors recurring in future designs. For example, Eplan **Smart Mounting & Smart Wiring** software can be used by the production team to relay messages directly and instantaneously back to the design engineering team through a tablet or PC, without having to leave the workshop.

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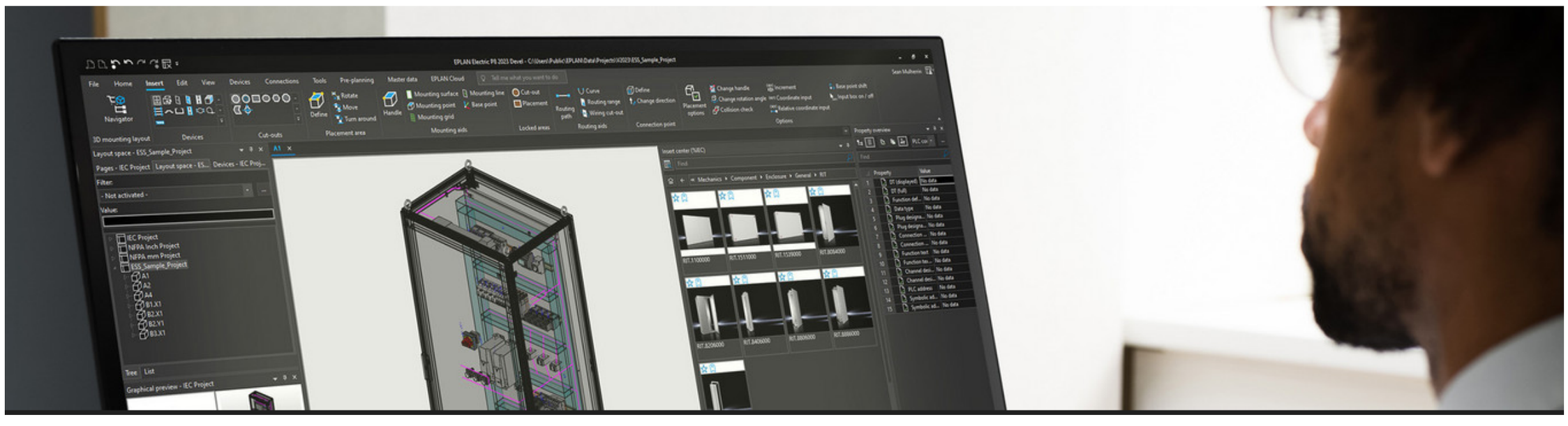


Part Three: Electrical Virtual Prototyping

Virtual prototyping using an electrical 3D digital twin can ensure that sufficient space is given to the required switchgear, wiring routes, and part configurations, avoiding unforeseen issues during production and assembly.

Problems to look out for*: 2D schematics can't always determine the amount of space available in a cabinet for electrical items, cabling etc. This can lead to frustrating and time-consuming engineering issues when it comes to production, with delays and budget overruns.*

What is virtual prototyping?

Virtual prototyping is a method of designing and visualizing 3D models in a digital environment before committing to physical production. This lets engineers assess a design's functionality and performance without having to construct a physical prototype. With 3D digital twin technology, engineers can create an exact virtual replica of their product/component and its context that accurately reflects all its dimensions, internal components, and behavior in both the virtual and physical realms.

Engineers and production teams can quickly identify problems with design elements and make rapid changes to improve its overall performance– cutting back on the revision time needed to approve a design.

Designing with 3D models can also aid assembly and production – For example, your electrical engineers could design in 3D using Eplan Pro Panel and then use the virtual assistant applications like Smart Mounting & Smart Wiring to assemble and wire the enclosure

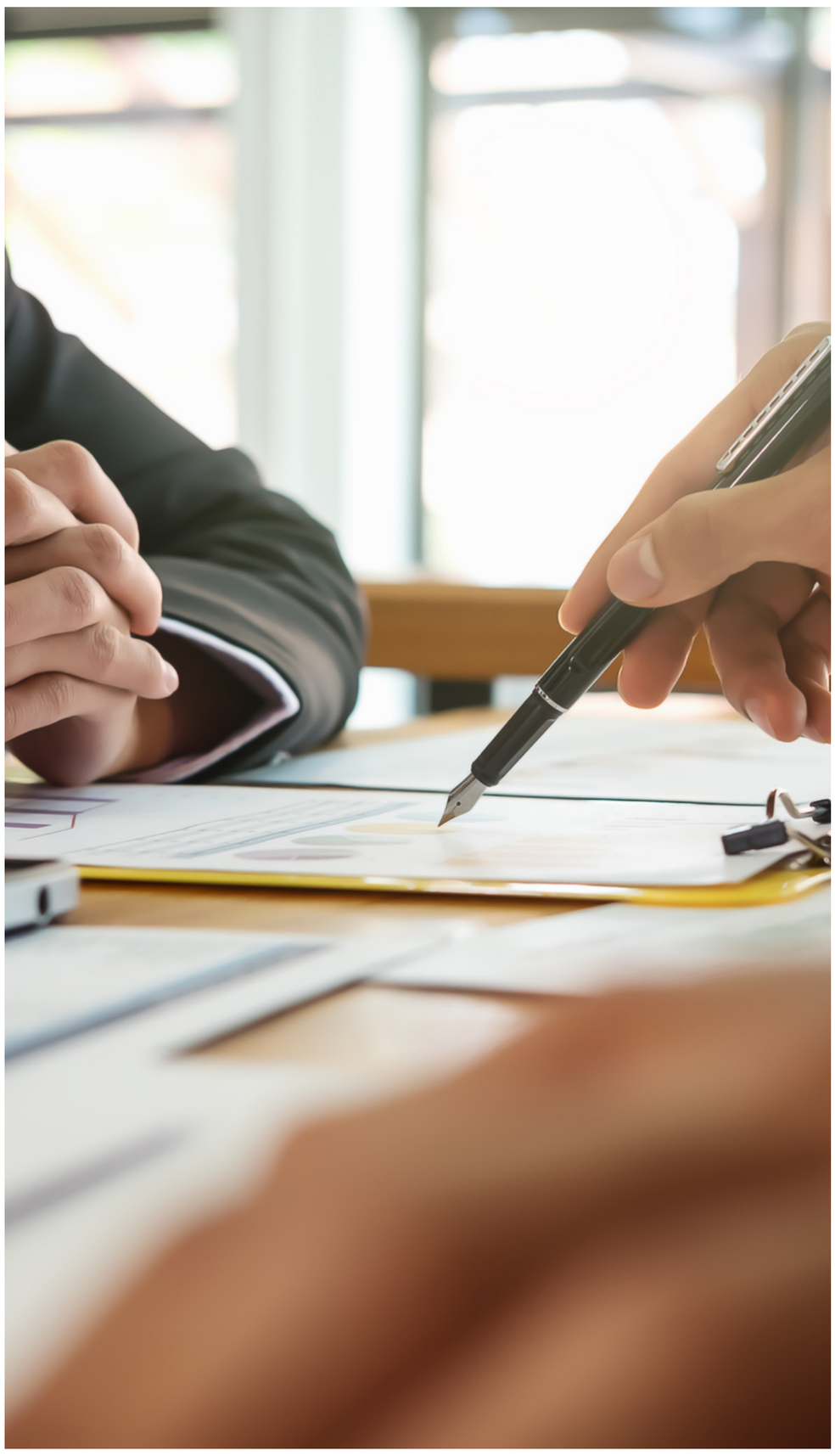
- ✓ **Establish an integrated environment where the engineering team can use both 2D and 3D design applications** – within the same interface.
- ✓ **Develop standard rules that define how engineers should approach designing with electrical 3D models** to maximize accuracy and minimize errors.
- ✓ **Educate the engineering team on how to use the software and its associated applications.**
- ✓ **Designate the responsibility of maintaining and operating the software** to a specific individual or team within the engineering department.
- ✓ **Utilize virtual prototyping to validate all electrical design decisions** before committing to
- ✓ production. **Establish a process for accurately capturing and archiving data** to track and communicate design changes over time.
- ✓ **Monitor the results of virtual prototyping regularly** to identify any nascent problems before they develop into costly errors.
- ✓ **Implement data analytics tools** to help the engineering team assess their performance to make further improvements in the way they use virtual prototyping.

Part Four: Project Documentation

Start each project with flawless project documentation and up-to-date working drawings.

***Problems to look out for**: Inaccurate or outdated electrical design documentation can lead to production errors, purchasing errors, and delays. Procurement may order the wrong parts due to misunderstandings or the wrong part numbers – affecting production schedules and lead times.*

‘Perfectly accurate’ project documentation is the gold standard to aim for in the electrical design process, as this ensures that mistakes are caught at the earliest stages of planning, and designs are corrected before moving on. Without it, there could be inconsistencies between the planned design and the actual product that gets presented. Documentation provides a source record for design choices, materials and process specifics – creating accountability at each stage of the project.



High-quality documentation, not only helps project situations where faults might arise, but also in developing best practices during revisions to completed designs. Accurate project documentation keeps track of design techniques and implementations, and provides insight reports as to how various parts interact with one another.

When mistakes are detected in a timely manner, drawn out reworkings or additional production steps can be avoided or minimized. Through thorough digital record keeping in project documentation, failure points can be clearly identified and rooted out of the final design, making it easier for teams to avoid repeating the same mistakes in subsequent designs.

Engineering managers should keep the following best practices in mind to ensure that their project documentation and drawings are accurate and up-to-date:

- ✓ **Identify all stakeholders early in the design process** and make sure everyone is on the same page with expectations, project milestones, etc.
- ✓ **Establish clear communication lines** between engineering, production, and assembly.
- ✓ **Make sure all drawings and documents meet industry standards and regulations.**
- ✓ **Regularly review design documents through a centralized digital interface** and make changes to address any issues or discrepancies identified.
- ✓ **Utilise automated version control systems** to manage document versions during the design process.
- ✓ **Perform regular part-level reviews** to ensure the accuracy of working drawings and documents.
- ✓ **Maintain high quality standards throughout the design process** by building rigorous review and compliance procedures into each stage.
- ✓ **Monitor and document all changes to the design process,** with a clear flow of data throughout development and production.
- ✓ **Use an ECAD platform,** such as Eplan, to make it easy to create and modify accurate and detailed documentation – including bills of materials, project reports, drilling details for production, and so on.

The right tools for the job – why invest in Eplan?

Using a fully digital electrical design/ECAD platform, such as Eplan, has several advantages that help streamline every stage of the design process, while improving two-way communication with procurement, production and assembly teams.

The full platform integrates all elements of electrical design into one comprehensive software package with the same graphical user interface and collaborative cloud user dashboard. The full platform includes:

- The ability to create and edit drawings and documents
- A centralized database of part numbers, and standardized routines and workflows
- Advanced 3D electrical design software
- Up-to-date parts catalogue for purchasing, with information available on alternative options if parts are unavailable.
- A shared interface for assembly instructions

Eplan reduces mistakes in the electrical design process itself by automatically flagging discrepancies or issues as they arise throughout the project – before they can become damaging production problems.

Eplan's version control capabilities also enable real-time tracking of changes to your drawings and documents as the project progresses, further helping to keep all stakeholders on the same page and reduce errors.

Overall, investing in a digital electrical design platform improves efficiency and reduces project costs throughout development, while also eliminating the avoidable but all too common production issues that arise from poor communication, data entry mistakes, and human error. The continuous flow of data and enforced change process from engineering to production further increases both product quality and speed of production, as all data is from a single source of truth, therefore accurate and up-to-date.

Find out more

If you would like to find out more about how Eplan can help you maintain accurate and up-to-date electrical designs and avoid mistakes getting through to production, either fill out the contact form and a specialist will be in touch.