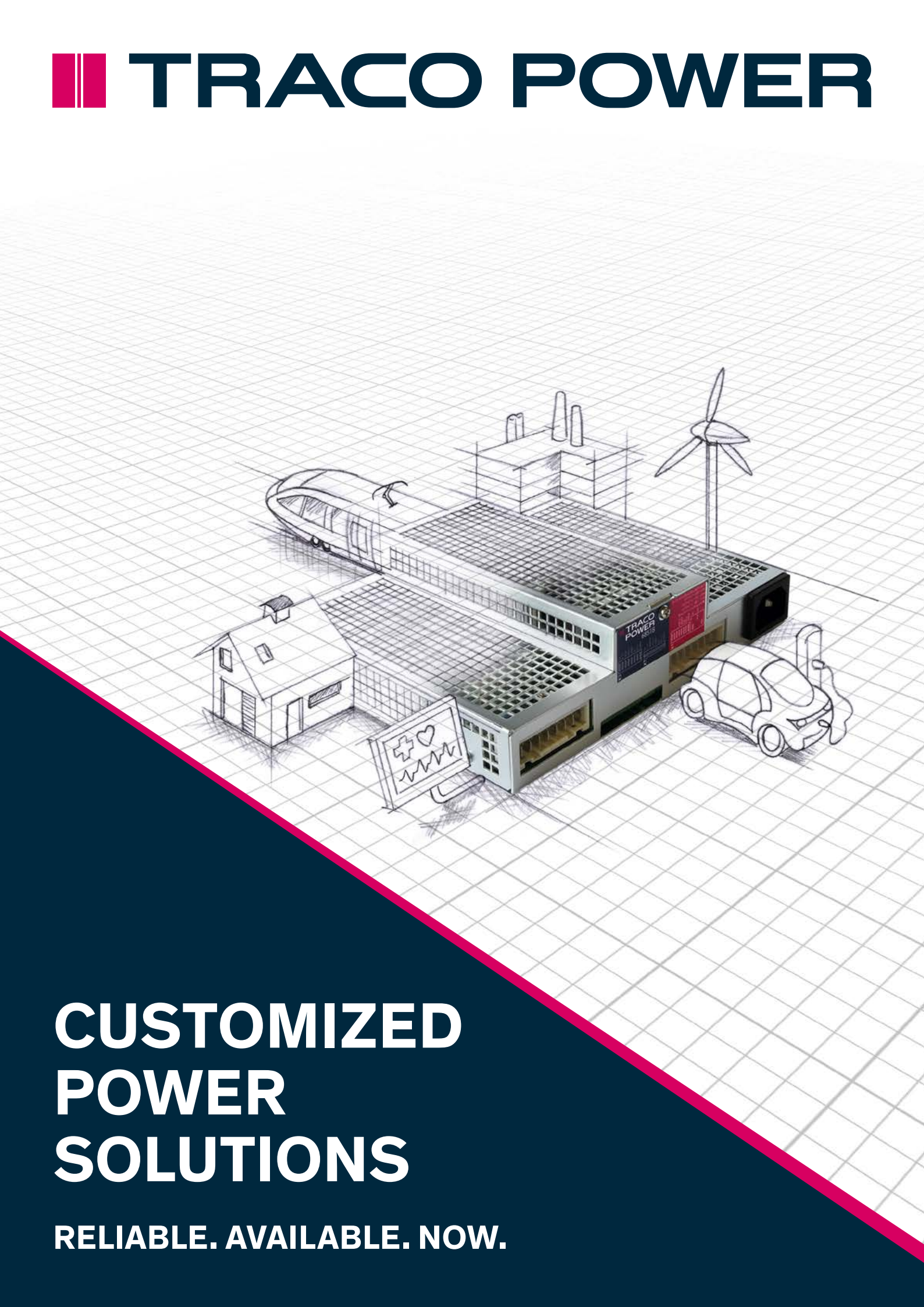
TRACO POWER



CUSTOMIZED POWER SOLUTIONS

RELIABLE. AVAILABLE. NOW.

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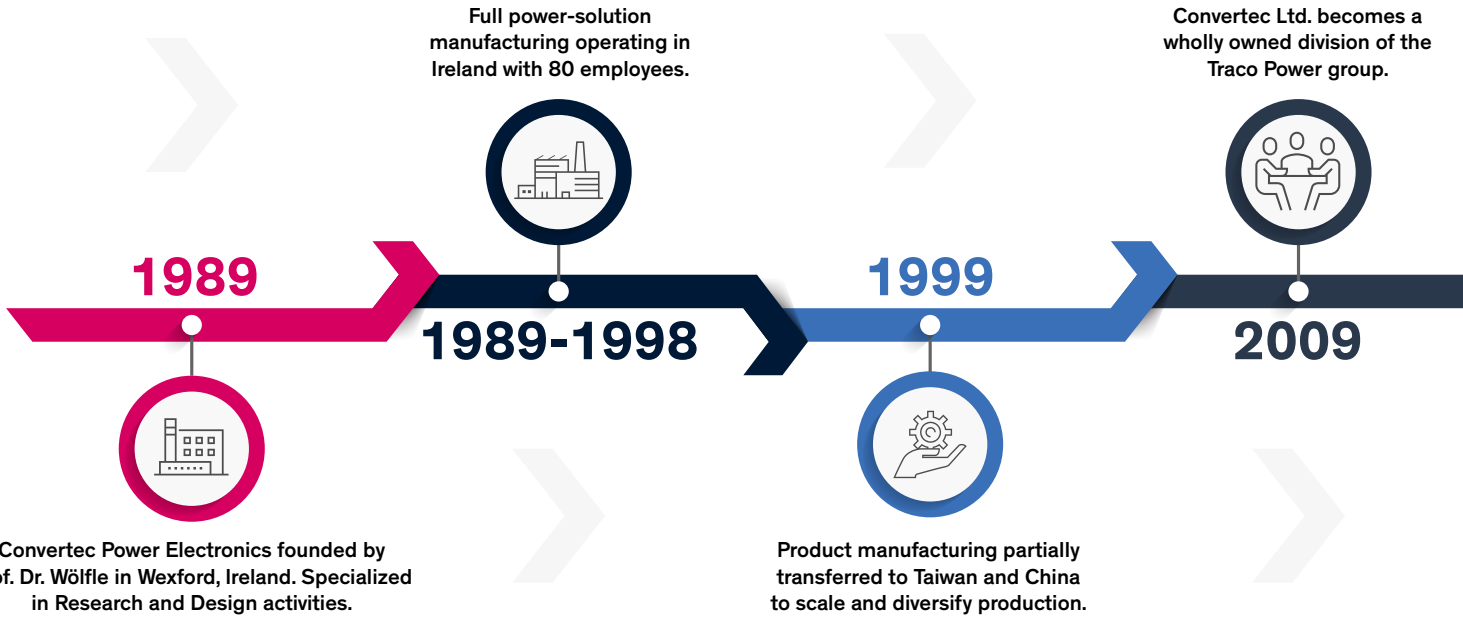
TIMELINE.



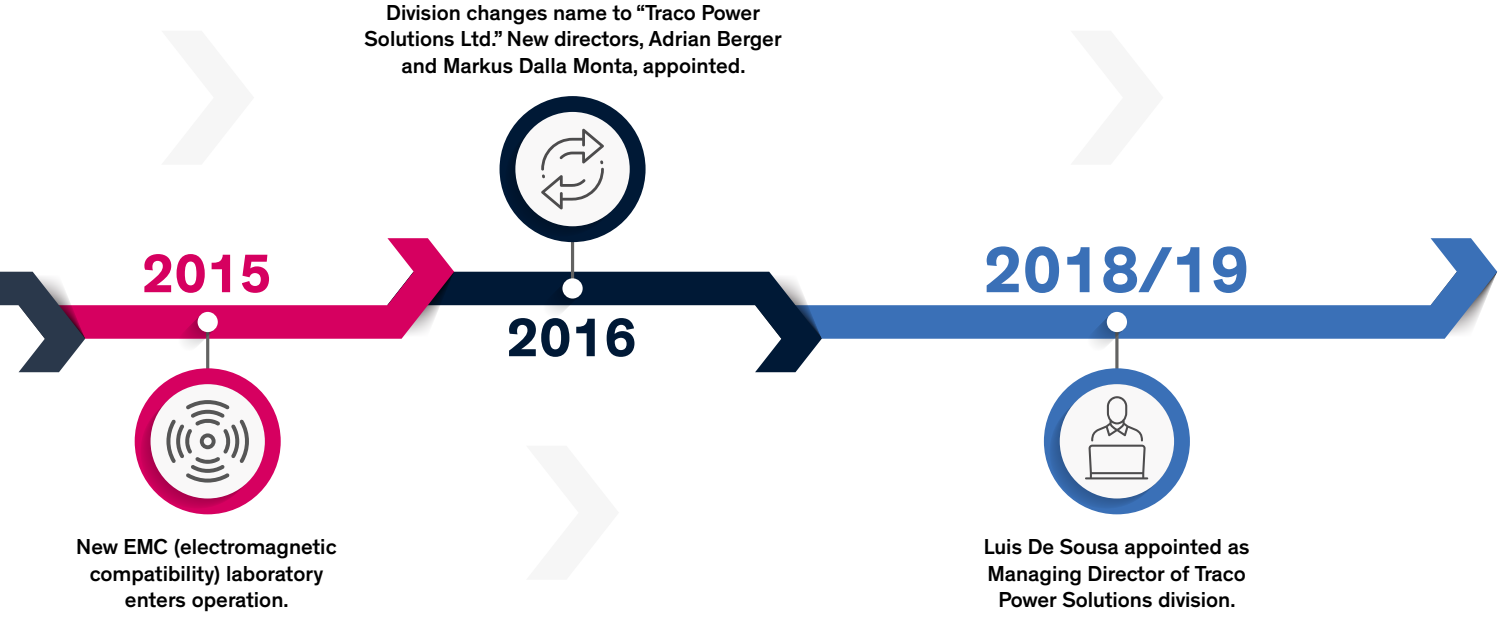
CUSTOMIZED SOLUTIONS.

While everyone appreciates the convenience of off-the-shelf solutions, there are times when we can't quite find what we need. This is where my team comes in. A globally-reaching division of Traco Power, we draw on almost 30 years of history to fulfill the customized power supply needs of our customers.

From simple modifications of existing designs, to a completely new solution supporting demanding environmental requirements, my passionate design engineers draw upon all our resources and years of know-how to fulfill your needs.

This brochure has been carefully curated to provide you with some insights on what it is like to work with Traco Power on a customized power solution. We've started by sharing our insights into a range of key market segments, described how the custom development relationship works, and then introduce key members of my team. I hope that, by the end, you'll have a great insight into what we do and how my team approaches what is a critical part of your application.

Our passion is for your power supply, and we hope you'll allow us the opportunity to show you.



OUR CUSTOMIZED INNOVATION. YOUR INDIVIDUALIZED SOLUTION.

"Design requests range from the relatively simple, such as additional certification, to the complex, such as a ground up design to fulfill demanding environmental requirements."

Mark Schoppel, Traco Power Project Engineer

The delivery of power is essential to every application, but the requirements are often diverse, complex and distinct. It is no surprise then that Traco Power regularly receives enquiries for power supply solutions that differ from our wide portfolio of existing standard products. Requests range from the relatively simple, such as additional certification or differing output parameters, to the complex, such as a ground up design to fulfil demanding environmental standards. With decades of experience across a broad range of application areas and industries, we are able to tackle such challenges to deliver reliable, certified solutions individualized to meet your needs.

INDUSTRIAL

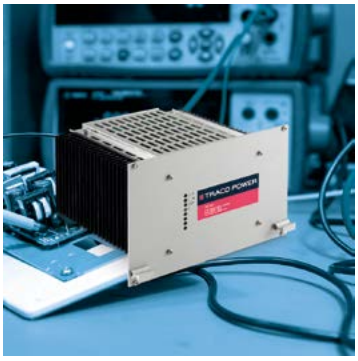
Efficiency, reliability and excellence in EMC are essential elements in any industrial system. Traco Power's solutions use carefully selected branded standard components together with the latest design techniques to create power delivery solutions that engineers can trust.

MEDICAL APPLICATIONS

With its list of carefully curated standards, medically-approved products are one of the most demanding to bring to market. Our team understands the challenges of IEC 60601 and ISO 14971 and how to ensure the safety of both operators and patients with 2 × MOPP rated power supplies.

RAIL AND RUGGEDISED

Whether on our railways, equipment on the building site, or machines clearing snow in the Alps, the environmental challenges for power solutions are sometimes immense. Rail standards such as EN 50155 and EN 61373 serve as de-facto prerequisites for such rugged use cases.



INNOVATIVE OR RENEWABLE

Unusual size or shape, new market, or demanding environmental conditions? Not an issue. Our design team have seen growth in renewables, electromobility and almost every extreme for every power solution requirement. Your requirements are neither unusual nor unattainable – they simply require a little more endeavor!

DETERMINING WHAT YOU NEED.

WHEN DO I NEED A CUSTOM SOLUTION?

Although the Traco Power portfolio includes more than 6000 products, every customer application is different and it can still be challenging to find the power solution that fits your requirements every time. However, just because the precise solution you desire is not available doesn't automatically mean that a full-custom power supply development is needed. Sometimes an existing product can be modified to bridge the gap between requirement and data sheet. Other times it can be as simple as undertaking a certification to ensure a power supply can be used in a specific application with confidence.

By working closely with our team we'll review the challenges you are currently facing and advise on the best approach. Only if no alternative approach is found will we recommend undertaking a full custom development to achieve your desired outcome. We pride ourselves on being able to bring full-custom power solutions to our customers in a short time-frame at an equitable total cost of ownership.

HAVE YOU FOUND A STANDARD PRODUCT THAT…

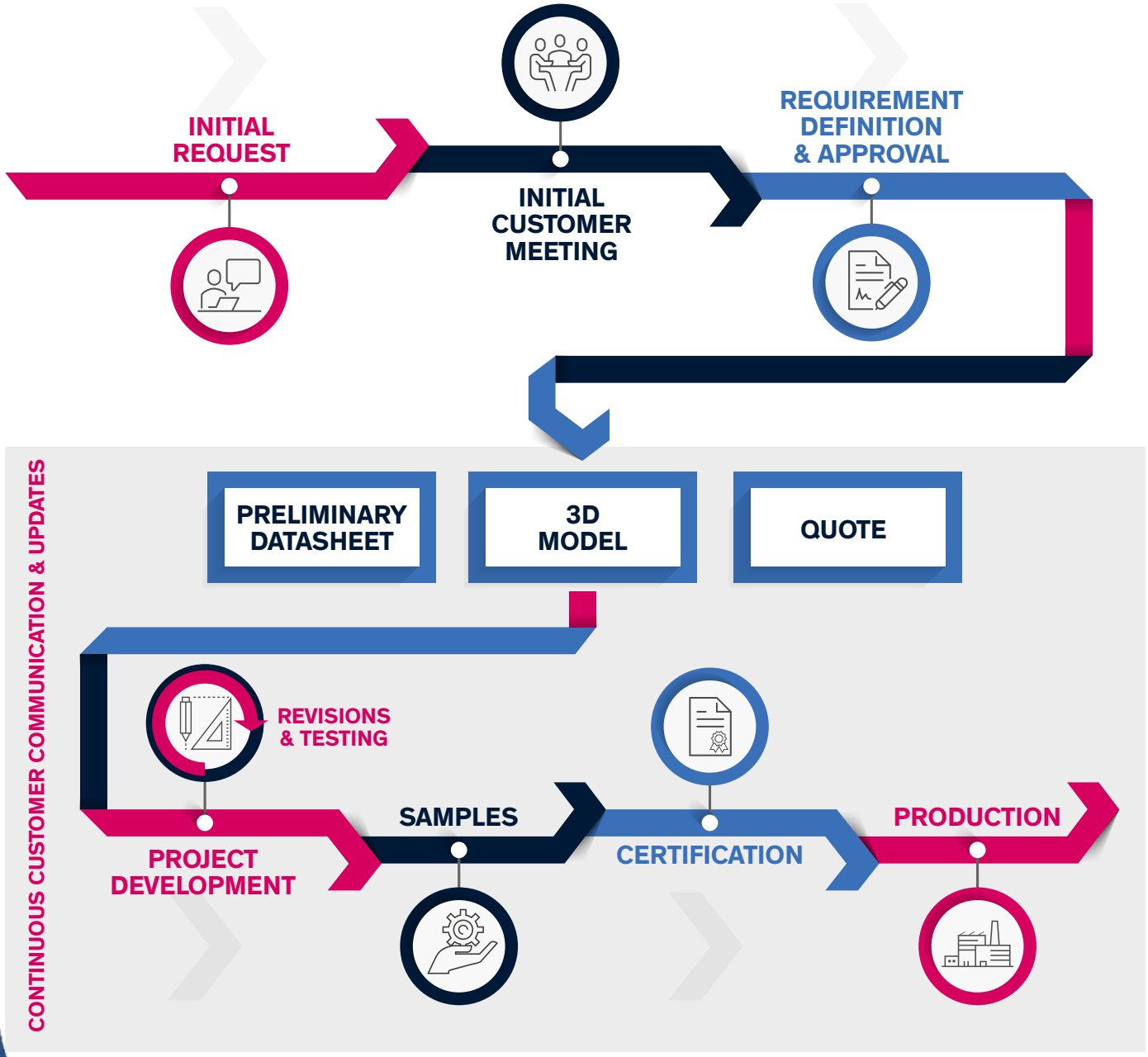
…is missing a specific certification?	…needs changes to fulfill your output voltage needs?	… almost fulfills your input voltage needs?	…doesn't quite meet your power requirements?	…differs in environmental or temperature range demands?
YES	YES	YES	YES	YES
If a specific certification is missing, it may be possible to certify the existing product.	Within certain limits it may be possible to modify the existing product.	Changes to input voltage parameters tend to require more significant design changes.	Such changes are likely to require significant changes.	It is highly likely that a custom design will be required in such cases.

HOW WE MEET YOUR CUSTOMIZED REQUIREMENTS.

GETTING STARTED

Every journey starts with a first step and, in the case of power solution development, this means a clear definition of as many parameters as possible. Key requirements are obviously the input and output voltages and ranges, power to be delivered, and support for over-voltage situations. However, multi-disciplinary collaboration here is essential to ensure that not only electrical but also mechanical and environmental factors have all been considered. This includes the package dimensions and pinning of the final solution, along with any certifications that may be required.

Consideration should also be made as to the target solution price, the volume of devices required per year, as well as the lifetime of the solution. By taking a step back and reviewing the complete system, a custom solution can often result in cost savings when compared to alternative approaches.



THE DEVELOPMENT PROCESS

With the technical requirements clarified, our clients then start along our development process. Our team works quickly to develop the design to allow you to review an initial 3D model together with a preliminary product data sheet. This ensures that all specifications are captured and that the mechanical requirements meet your needs. As development progresses, regular test reports are provided along with the initial samples of the solution. Once it has been deemed that the design is final, all necessary certifications will be undertaken in order that the final product can be shipped to the agreed delivery schedule.

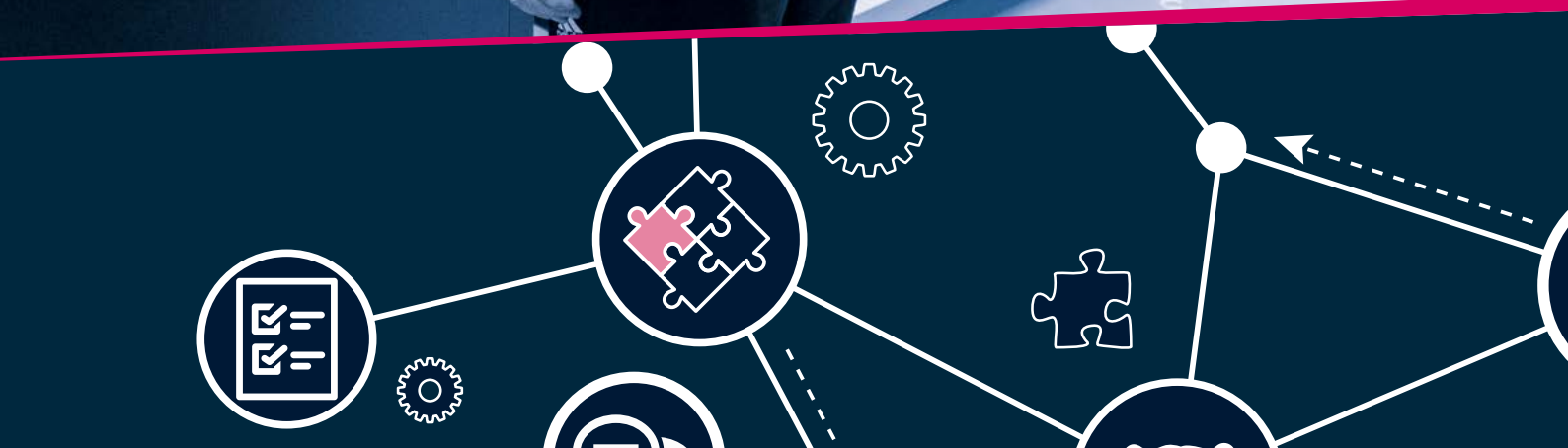
DESIGNS THAT LAST, AND LAST, AND LAST...

We understand that our customers are often committed to delivering and maintaining their solutions for years, if not decades. The potential impact of a power supply failure on the image of our clients is also our central concern.

Just because an application demands a custom power solution shouldn't mean that availability or reliability is impacted. At Traco Power our design processes ensure that there is an approved second-source for critical components and that our solutions are designed with as few components as required. This approach, together with continuous reviews of our supply chain and component selection, ensures that you receive a solution that lasts.

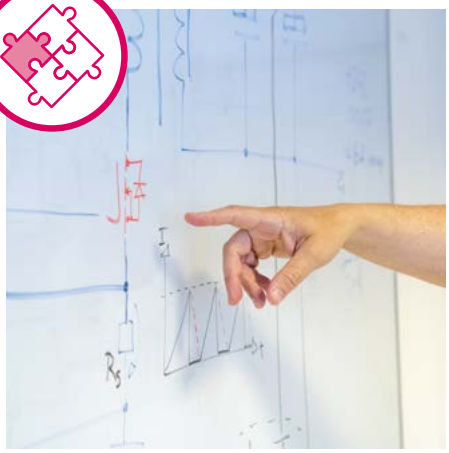
Some of the provisions we put in place include:

- Production monitoring according to IPC-A-610 Class 3
- System monitoring according to ISO 9001
- Quality management according to ISO 13485
- Fully automated testing
- Supervision of production by an external organization



LONG-TERM AVAILABILITY & RELIABILITY

Suppliers are carefully assessed prior to becoming part of the Traco Power supply chain. Long-term cultivation of these relationships are essential in order that we can pre-empt allocation, end-of-life, or other delivery issues. With this in place, every component is carefully reviewed to ensure that the overall quality meets with our expectations. Our design approach ensures that the minimum number of components are used, as every additional device has the potential to unnecessarily impact the reliability of the end result.



CHANGE? WE LIVE CHANGE.

A custom solution does not imply inflexibility. It is not unusual for design requirements to expand, extend or tighten. Our approach helps our customers to be as sure as possible of their exact needs before a design is started. However, through close and continuous communication, we are always able to accommodate the unexpected, or advise on potentical alternative approaches.

STRONG PARTNERSHIPS – STRONG NETWORKS

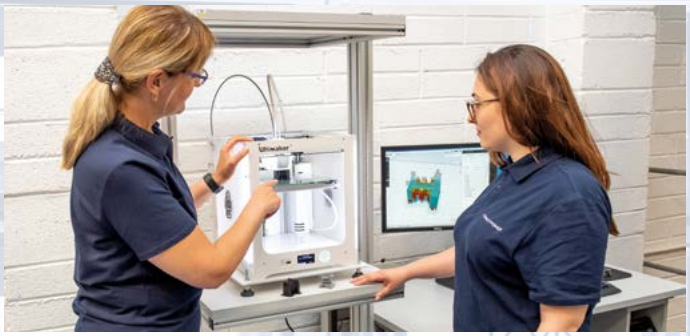
Today's world demands tighter integration with partners to remain nimble and counter the unexpected. All of our manufacturing partners have worked with us for more than ten years and are closely monitored and regularly audited to ensure that quality standards are maintained. Our relationships with academia provide cutting-edge insights into new approaches, topologies and advances in material science and component development.

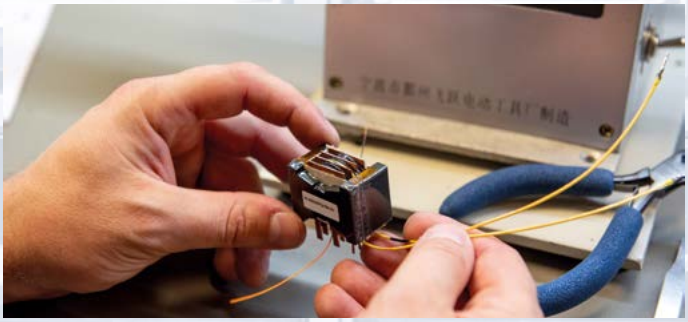
> **"All of our technical consulting, design, development, certification and validation is located in Europe. This enables our engineers to collaborate with ease and deliver responses and results in a timely manner."**
>
> Luis De Sousa, Director R&D and Managing Director

YOUR CUSTOM DESIGN IN GREAT HANDS.

INNOVATIVE AND ESTABLISHED TEAMS

Our sales team will probably be your first interaction with Traco Power. Our experienced sales engineers can help you to determine the amount of customization required and answer detailed questions on the development process. This leads on to interaction with our development team. Here the details of the proposed design are examined further from the electrical through to the mechanical. Our quality team engage too, reviewing the environmental demands that must be achieved and determining the certifications and testing needed for the final solution.





As the design progresses, our hardware design engineers will be providing initial reports on electrical characteristics along with details on the mechanical design. Design for manufacturability is also an essential part of our design process. In-house 3D printing capability along with pick-and-place for prototypes and small pre-production runs also help to provide as much insight as early as possible to minimize the risk of surprises later on.

Towards the end of the design it is our quality team who provide the bulk of the support. Utilizing a range of customized test equipment and automated test approaches, they lay the foundation for a successful move to fully-automated mass production. Finally, our logistics division ensures that products are available for delivery when you need them.

TESTING TO MEET THE HIGHEST STANDARDS

Reliability is integrated into both our design processes and component selection. All components used are subjected to addition testing prior to acceptance into our design library and are always used within the specified limits. Components undergo burn-in at our suppliers before being subjected to a range of automated tests at goods-inwards. Every power solution is fully simulated to perform a worst-case analysis using our insights into component aging. Machine tools for casings and plastic parts are also developed in-house to ensure availability over the lifetime of the product. In fact, we are still shipping power solutions designed more than 15 years ago.

OUR COMPETENCIES AND SERVICES

- Research and design
- Commercial and technical support
- Pre-compliance safety and EMI test
- Mechanical and thermodynamic tests
- HALT and performance test
- 100% functional testing and burn-in
- Project attendance with external test and certification authorities
- Production of OEM and white label power supplies

SUCCESS STORIES.

DC18 DISPLAY COMPUTER, DUAGON

A RUGGED SOLUTION FOR ONE OF THE WORLD'S HARSHEST ENVIRONMENTS

In the open seas, miles from home, work on offshore oil platforms is perhaps one of the world's most challenging jobs. The equipment in use must fulfil strict safety standards and be highly reliable, which depends on power delivery of the highest standard. After all, there is no quick way to acquire a replacement should a unit fail in the field.

The ultra-robust DC18 Display Computer from duagon targets the oil industry, providing IoT-linked data management and analysis via its 12.1" display. With a robust projective capacitive touch screen and an IP66 housing, it is suitable for both indoor and outdoor applications in Class I Division 2 and Zone 2 hazardous environments.

"To ensure high reliability it was decided during the initial design phase to implement a power supply specifically tailored to the needs of the DC18," said Bryan Miller, Product Solution Manager. "The Traco Power team provided us with an exceptionally dependable power supply that can withstand extreme vibrations, shocks and temperature variations. Furthermore, special attention had to be paid to electromagnetic compatibility to ensure proper operation of the rugged touch screen. The technical insights we received together with proactive support were an essential element in the successful launch and roll-out of our product."

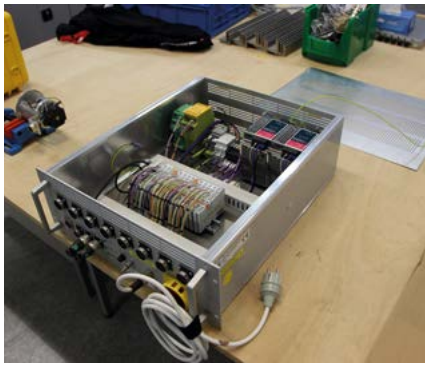
PARTICLE ACCELERATOR, DESY

RELIABLE POWER DELIVERY AT THE PEAK OF SCIENTIFIC RESEARCH

Walking along 3.3km of particle accelerator at 2 am to replace faulty equipment is not a favorite pastime of DESY engineers and tends to frustrate the scientists undertaking experiments at the end of “the tube”. Thus, it was clear from the beginning of their project that the reliability of the power supplies used would be high on the list of requirements. But this was just one of several key items on the specifications list.

The basis for the final solution was an existing, compact 24 V 240 W power supply that required some modifications to fulfil the needs of the application. But, perhaps most critical, was the requirement to complete CE certification for the application into which the power supplies are integrated. Availability over a timeframe of ten years also had to be guaranteed.

“We have implemented a redundant system using two power supplies per module to ensure reliable power delivery to each section of the accelerator,” said Carsten Müller, Laboratory Manager and Plant Technician. “For us it was critical that our partner on this project could cater to our individual needs, especially with regard to modifications and undertaking CE certification. Availability over the many years of this project, as well as fast delivery of replacement devices of what is a custom product, have proven invaluable. With the support of Traco Power we have been able to continue delivering scientific excellence.”

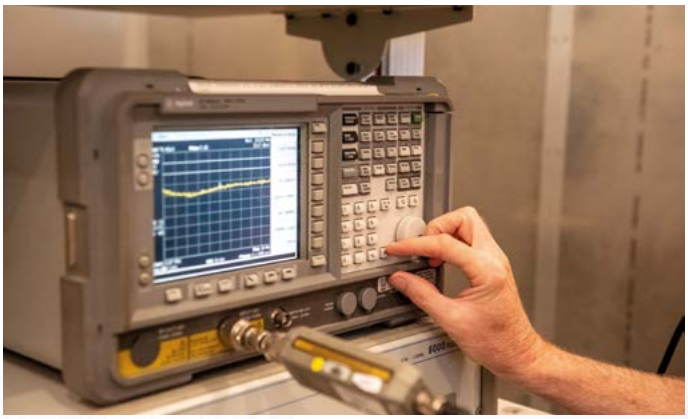


IT'S ALL ABOUT THE PEOPLE.

MARK SCHOPPEL

Having worked as Traco's Project Engineer for Custom Power Suppliers in Ireland for some time now, I am able to draw upon the decades of experience within our team when supporting customers. We have a wealth of proven technical concepts and circuit designs that we draw upon when tackling the challenging requirements that our customers pose. This, coupled with my many years of experience in hardware design, allows us to review everything from the high-level challenges, to the deepest technical details.

As I travel between our business locations, supporting customers, I am also grateful for the welcoming atmosphere provided by our various Traco Power teams and the ease with which we all communicate. I see this as an essential element in our success as it enables efficient exchanges on design requirements and development status, all of which contribute to delivery of power solutions that fulfill my customer's requirements first time.



JEFF COOPER

My passion is quality and, as our resident QA Manager, I've been with Traco Power for over 20 years. I studied electronics and attained a degree in Electronics and Electrical Engineering, providing me with the technical basis needed to lead the QA team and its activities. As the primary interface to customers on all aspects of quality and technology, my team and I resolve quality challenges and use those learnings as part of Traco Power's Continuous Improvement Program. One particular source of pride is the development of our wide range of customized automated test solutions, a result of more than two years of effort. This is of especial importance in the context of custom power solutions, as these require dedicated test processes to ensure their conformance with the agreed specifications.

I'm proud of how the entire organization is focused on exceeding expectations, enabling our group to consistently assure quality from beginning to end. This relies upon our close cooperation across the entire organization, from the design and development team through to our manufacturing partners.

DESIGNED WITH PASSION.

DELIVERED TO THE WORLD.

Wherever you are located, your access to Traco Power's design consultancy is never far away. Our local engineering experts will be more than happy to review your power solution needs and help you establish contact with our design division.

Our head office in Baar, Switzerland, also functions as a key logistics center, ensuring that your power solutions are available when you need them. Offices in Germany and France, along with two further locations in North America, provide local access to our resources when required. Finally, our design and development team operates out of Wexford, Ireland, drawing upon a skilled workforce and is well placed to utilize European academic relationships and research opportunities.

If you would like to explore the options open to you for your power supply challenge, we'd be more than happy to review your needs.

Traco Power, Design and Development Centre , Wexford, Ireland

TRACO POWER GROUP HEADQUARTER

TRACO ELECTRONIC AG
Sihlbruggstrasse 111
6340 Baar
Switzerland
+41 43 311 45 11
info@tracopower.com

TRACO POWER SUBSIDIARIES

TRACO ELECTRONIC GMBH
Oskar-Messter-Strasse 20a
85737 Ismaning/München
Germany
+49 89 96 11 82-0
info@tracopower.de

TRACO POWER NORTH AMERICA, INC.
2025 Gateway Place #330
San Jose, CA 95110
United States
+1 (408) 916-4570
salesusa@tracopower.com

TRACO POWER FRANCE
2 rue du noveau bercy
Bâtiment Le Levant
94220 Charenton Le Pont
France
+33 (0)9 70 66 76 74
info@tracopower.fr

TRACO POWER RESEARCH AND DEVELOPMENT

TRACO POWER SOLUTIONS LTD.
Whitemill Industrial Estate
Whitemill Road, Wexford
Y35 YH66
Ireland
+353 53 9167 700
info@tracopower.ie

TRACO POWER

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www.tracopower.com