



SERVICE PRODUCTS & SOLUTIONS

OUR HISTORY SINCE 1969

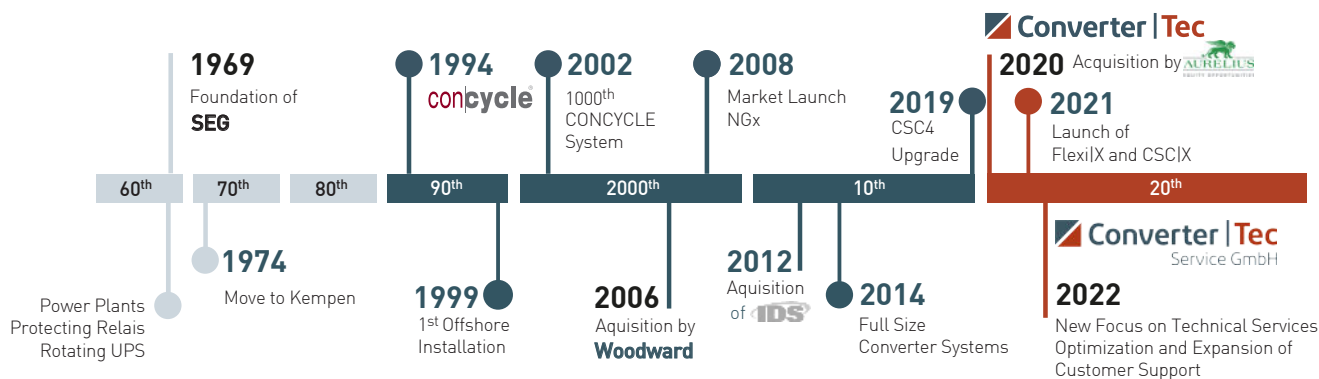
COMPANY HISTORY

ConverterTec's brand **CONCYCLE®** stands for excellent quality in both in both technical expertise and service support. Our technology has made a significant contribution to the success of wind turbines in the megawatt class.

Founded in 1969 as SEG in Krefeld, Germany - grown under Woodward for more than 10 years - ConverterTec is a worldwide specialist for the conversion of electrical energy. Since 1995, **CONCYCLE®** frequency inverters have been used in variable-speed ship applications, uninterruptible power supplies, solar inverters and windturbine applications.

Today ConverterTec specializes in the field of power electronics in wind turbines and thus reliable supports the availability of decentralized and renewable energy supply with its know-how to improve and secure the operation of your assets for 20 years and beyond.

We continuously invest in the development of **Service Products and Solutions** to secure the energy yield. Based on a state-of-the-art lean manufacturing site, a team of production experts with relevant know-how in power electronics, ConverterTec Service GmbH also offers Build-to-Print, Build-to-Spec and Service Solutions to a global customer base.





24,500+

CONVERTER INSTALLED
GLOBALLY

6 MW+

LARGEST SINGLE
CONVERTER POWER

~270 /80

EMPLOYEES

45 GW+

INSTALLED POWER

237

CUSTOMERS
WORLDWIDE

47

COUNTRIES W/
INSTALLATIONS

Headquarters

Germany

Kempen
Service
Sales
Engineering
Business Development

Spain

Madrid
Service
Sales

USA

Loveland, CO
Service
Sales

Brazil

Campinas
Service
Sales

Bulgaria

Sofia
Service
Engineering
Repairs

Japan

Chiba
Service
Sales

SOLUTIONS TO SUPPORT YOUR ASSETS

With a service life of over 20 years and similar investment obligations, you need a strong partner that offers excellent service and support. ConverterTec is the partner you can rely on today, in 20 years and beyond.

We offer a wide range of Service Products & Solutions to support you during the commissioning phase and throughout the entire service life of your installed system, enabling you to operate your asset reliably without disruption, cost-effectively and with maximized yields.



SUPPORT

Availability is a key factor for the reliable energy production, which is why ConverterTec's experienced technicians are available around the clock. Our experts offer technical support also during (re)commissioning and maintenance of your system.

All requests and customer correspondence are recorded in our unique service management system. This enables us to track detailed historical data of every converter system and allows for fast technical clarification and identification of possible solutions.

We measure our success in the service organization based on customer satisfaction: While we will have in-depth discussions during annual handshake meetings, we are happy to include any ideas or concerns you may have at any time.



CONTRACTS, TRAINING & TOOLS

Select the appropriate elements from the ConverterTec Service Contract portfolio that suits your needs best. Depending on the required service intensity, we can offer guaranteed repair or response times, management of spare parts inventory and provide recommendations for future service.

With the right training you will be able to carry out your own maintenance work and troubleshooting. Modular training courses to cover everything from basic technical information on power electronics, to commissioning and maintenance, up to extensive error analysis. As trained technician you will receive access to our service tools enabling information access and in-depth analysis.



PRODUCTS

ConverterTec invests in product upgrades, retrofits and appropriate obsolescence management in order to maintain high availability and ensure improvements. Our primary focus is on the main components of the converter systems. The ConverterTec Service team develops aftermarket replacement parts with extended availability and up-to-date technology to keep your converter system performing as new and extend its operational life.



TECHNICAL SUPPORT



TECHNICAL SUPPORT

When a turbine fails it is important to get it running again as quickly as possible. It is of great value when you can rely on a professional and efficient service to **minimize downtime**.

Our technical support line connects you with our highly qualified experts. Our technicians have a wealth of experience in the field and are on hand 24/7, worldwide.

Our service management database combines all relevant information, making it available at a glance – enabling rapid results. The remote diagnostic system supplements the information you supply on the telephone or via email. Our global service-CRM enables comprehensive analysis to ensure that all processes and actions can be traced. Hence all of our technicians can support your case while having an overview of the entire service life of your converter system.

Technical expertise, fast response times and reliable technology are decisive factors for ensuring that your system is back in operation as fast as possible. You can rely on **ConverterTec's** technical support as we are here for you: Any time and anywhere.



MAINTENANCE

Ensure that the converter is always operating to its full potential by carrying out regular maintenance work on your **CONCYCLE®** systems.

In addition to our expert Field Service support to troubleshoot and fix any problems to get your wind turbine back online, we also offer a Health-Check program for your site in which our Field Technicians check the status of the converters at all of your turbines and provide a detailed report per turbine including recommended improvements, updates, functional expansion solutions and preventive maintenance.



MAINTENANCE PORTFOLIO

Performance review

Inspection of the installed **CONCYCLE®** systems in terms of performance, and recommended actions for further optimization.

Safety package

Inspection of all safety relevant functions and recommendations for actions.

Performance improvement package

Performance improvements and extended functions of **CONCYCLE®** systems using upgrades and retrofit kits. Lifecycle management engineering based on our practical experience.

Preventive maintenance

Preventive maintenance of **ConverterTec** systems can help you extend your converter's useful life and to avoid unplanned downtime at your installed asset.

Emergency support

In the case of unexpected operating conditions, we can support you quickly and competently on site through our international service centres.

(RE)COMMISSIONING

ConverterTec Service engineers can support your on-site teams during the (re)commissioning or dismantling phase. If required, we can carry out the entire (re)commissioning or dismantling process for you.

To ensure that everything runs smoothly during and after the commissioning phase, we recommend our initial spare part package – tailor-made to suit your project.

SERVICE PERFORMANCE

We are a reliable partner and are able to support you throughout the entire lifecycle of your asset. Our service performance on-site shows a first fix rate of more than 99 percent and an average response time of less than 2 hours for the technical remote support.

We are continually improving our service performance and regularly incorporate your feedback into our future service offerings. We always aim to ensure that your system reaches its full potential.

CSC UPGRADE (CSC3 TO CSC4)

UPGRADE TO CSC4



Customers upgrading the installed **CSC3** controller to the latest generation will benefit from state-of-the-art technology and **ConverterTec's** decades of in-house development as one of the leading independent converter manufacturers.

The **CSC4** control belongs to ConverterTec's core competencies and has proven its outstanding reliability and robustness through its application in more than 14,000 installed converter systems. Its functionality has been continuously improved.

The **Upgrade to CSC4** was developed for the remaining lifetime of the installed frequency converter and provides new functions as added value. The new device is maintenance-free and works stably.

In addition the end-customer receives easy access via Level 1 password, enabling access to the system and basic information.



SERVICE FRIENDLY

- Software installation and upgrades can be carried out by your trained technicians
- Prefabricated adapters for installation
- Multi language tool
- All converter equipped with a CSC4 can be connected to ConverterTec (CMS) condition monitoring solution



IMPROVED TROUBLESHOOTING

- Extended monitoring functions
- Faster and more stable remote access to the converter's control and analysis unit
- Improved trigger and event recorder supporting in-depth analytics



REDUCED SERVICE COSTS

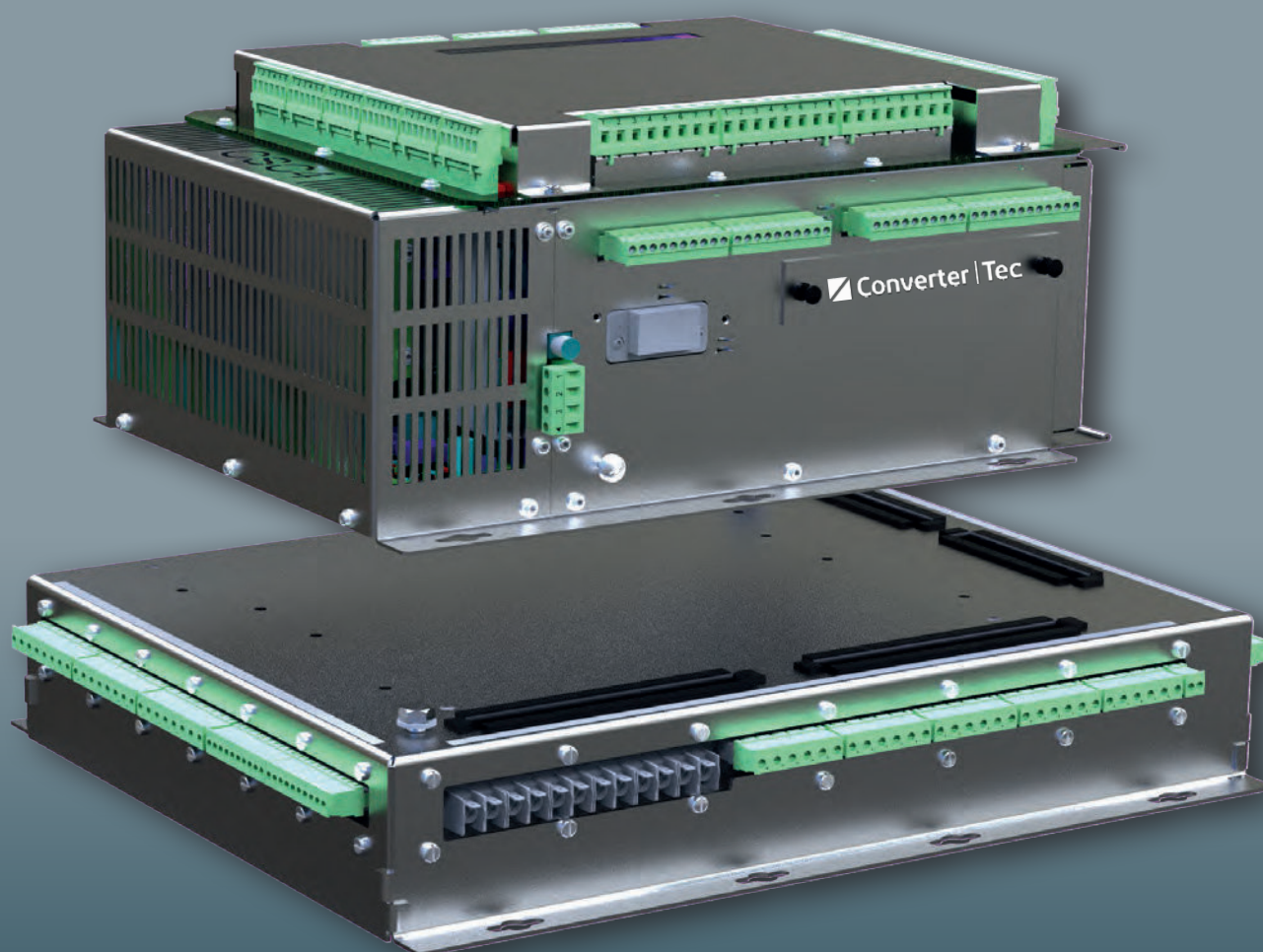
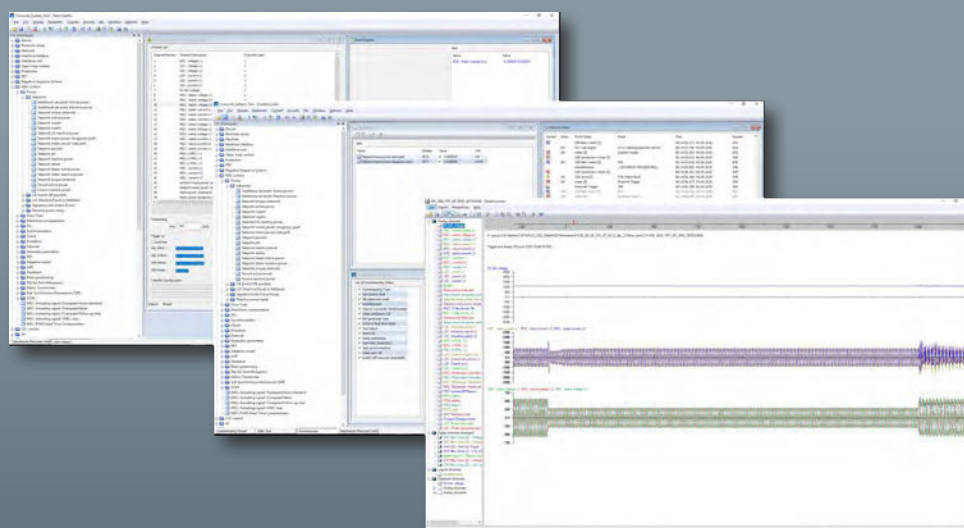
- Reduced system price
- Reduces storage costs due to less variants
- Higher system stability
- Downtime reduction by factor 10*

* related to former CSC3 based systems



IMPROVED OPERATING CHARACTERISTICS

- State-of-the-art control technology
- Higher operational reliability proven in more than 14,000 systems worldwide



CSC UPGRADE

MULTI-BRAND SOLUTION CSC I X

YOUR REPLACEMENT PRODUCT FOR **PROWIND** CONVERTERS

WE SUPPORT THE LIFETIME EXTENSION OF THE AGED CONVERTER SYSTEMS.

THE **CSC I X** IS A NEW SOLUTION FOR INSTALLED GE/CONVERTEAM PROWIND SYSTEMS.

The **CSC I X** controller is based on the existing and proven CSC4 controller in more than 14,000 converter systems globally. New upgrade to the CSC I X is **suitable for** the installed GE/Converteam **ProWind** systems - so called **A10 control board**. This product has been extensively tested and validated and has been available to all interested customers for nearly two years.

All converter equipped with a CSC4 or CSC I X can be optionally connected to ConverterTec's **CMS** system.

The CMS solution enables remote and in-depth condition monitoring of the power converter's conditions.

Customers who choose **CSCIX** will have access to ConverterTec's toolchain, which allows for accessing parameters and data and troubleshooting the converter system using software such as **SystemTool** and **DataVisualizer**.

These software tools significantly reduce downtime of wind turbines to a minimum.



SERVICE FRIENDLY

- Software installation and upgrades can be carried out by your trained technicians
- Prefabricated adapters for installation
- Multi language tool
- All converter equipped with a CSC I X can be connected to ConverterTec condition monitoring solution



IMPROVED TROUBLESHOOTING

- Extended monitoring functions
- Faster and more stable remote access to the converter's control and analysis unit
- Improved trigger and event recorder supporting in-depth analytics



REDUCED SERVICE COSTS

- Reduced spare part costs through the use of current series components
- Higher system stability
- Replacement within 8 hours max.



IMPROVED OPERATING CHARACTERISTICS

- State-of-the-art control technology
- Higher operational reliability proven in more than 14,000 systems worldwide



BEFORE

AFTER

EXCHANGE WITHIN ONE WORKING DAY (8h)

SERVICE STACK – ONE UNIVERSAL SOLUTION



DISCOVER THE LATEST GENERATION OF **IGBT TECHNOLOGY, FLEXIBILITY AND BENEFIT** FROM SIGNIFICANTLY **IMPROVED PERFORMANCE AND SAVINGS**.

This product provides you a retrofit solution that can be used for **RAC 3xx** and **ModSTACK™** variants installed in **CONCYCLE®** converter application.

Numerous advantages, such as the use of only one replacement type for different stack variants will reduce your service costs and simplify the troubleshooting.

The service-friendly arrangement of the components and the accurate selection of long-term provision spare parts are only a few improvements that are based on our long-lasting experience.

This solution with **FLEXiIX** board enables reliable parallel operation of various stack technologies (service stack together with legacy stack) through closed-loop control and active asymmetry compensation.

IN CONNECTION WITH THE SERVICE STACK, THE USE OF **FLEXiIX BOARD** OPENS UP THE POSSIBILITY OF USING POWER STACKS FROM INFINEON and/or SEMIKRON IN THE CONVERTER SYSTEM AT THE SAME TIME



ONE SOLUTION FITS ALL

- Universal solution to service RAC 3xx and Mod STACK™ systems
- Reduces storage costs by universal stack design
- Application specific communication boards
- Optional Parallel Board for Master functionality



IMPROVED TROUBLESHOOTING

- Operation status at a glance by LED indicator
- Defined LED error codes to support troubleshooting without additional tools
- Sporadic errors are logged per IGBT



REDUCED SERVICE COSTS

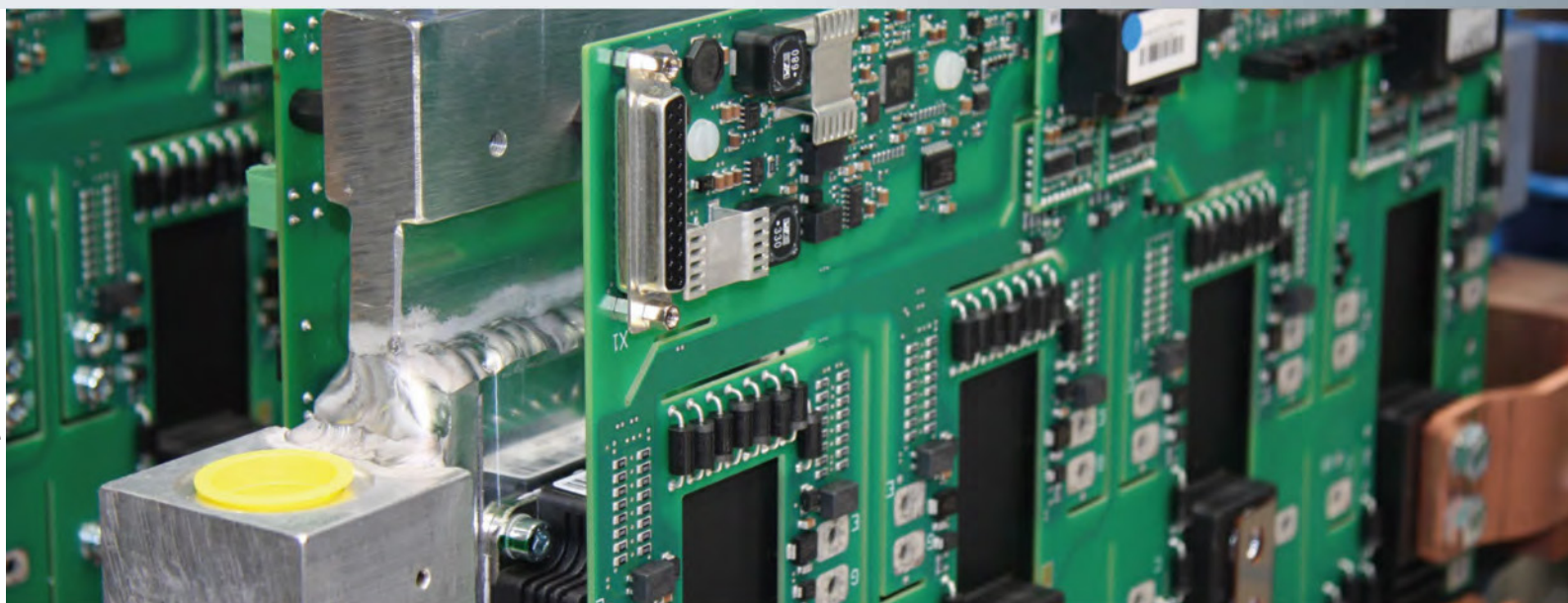
- **Single Stack exchange in combination with FlexiIX**
- Reduced product price
- Reduced lifecycle cost by defined on-site exchange components
- Improved shelf life using film capacitors
- Improved turn-around time for Repairs



IMPROVED PERFORMANCE

- State-of-the-art IGBT technology
- ConverterTec IGBT driver boards
- Higher system stability
- up to **1,500 €** higher earning per year*
- Extended temperature range due to optimized cooling concept
- Symmetry Supervision

*Due to higher efficiency of approx. 1%-pt. and based on a 2.5MW system and a capacity factor of 0.4



 **Converter | Tec**
Service GmbH



exemplary view: Service Stack solution with FlexilX board

LOWER LCOE* AND STORAGE COSTS FOR EXISTING SYSTEMS

*Levelized Costs Of Energy - measures lifetime costs divided by energy production

CONDITION MONITORING – ONEACCESS

With increasing significance of renewable energy supply, utilities and grid operators are concerned about grid stability, load management and forecasting quality. More safety is required for operational planning. New condition monitoring systems for power electronics of **CONCYCLE®** converter systems can contribute to achieving this target. The aim of planners is to maintain a constant balance between energy generation and consumption. With an availability of around 98 %, e.g. wind turbines are already regarded as being very reliable, but considering the remaining 2 % downtime, the role that power electronics play is statistically relevant.

Causes range from component aging and overvoltage resulting from lightning strikes up to grid instabilities. Revenues decrease if e.g. wind turbines remain idle due to malfunctions. Conventional power plants are often used to compensate, thus putting excess burden on the CO₂ budget.

The fleet and condition monitoring of power electronics developed by **ConverterTec Service GmbH** uses fault management to significantly reduce the often long process chains and unplanned downtimes. Installed ConverterTec frequency converters convert variable-speed energy from e.g. a wind turbine generator into grid-compliant energy, while also protecting the turbine from grid failures.

Any frequency converter equipped with a CSC4 or CSCIX controller can connect to OneAccess in a simple way. All relevant data could be stored centrally and saved automatically.

Data can be processed using statistical models, artificial intelligence, and an interactive user interface. Artificial intelligence (AI) systems can identify damage patterns and provide recommendations for action. Early failure detection and quick intervention can significantly increase the energy yield based on past experiences.

CONVERTERTEC ONEACCESS

OneAccess is ready for future enhancements to enable full Predictive Maintenance even beyond today's metrics for recognizing deviations. If you are interested in getting further detailed information do not hesitate to contact the ConverterTec Service team.



CONTRACTS AND SUPPORT

SERVICES & BENEFITS

HANDSHAKE MEETINGS

- Optimizing economic viability and operation by reducing the probability of unexpected events
- Optimized technical support and training preparation due to expert knowledge of the installed technology
- Dual optimization of partner's service performance utilizing KPI analysis
- Improving the partner service strategy throughout the entire service life of the converter
- Early planning in terms of future demand for material and personnel
- Regular systematic overview of your installed fleet as well as any possible modifications and recommendations

ON-CALL TECHNICAL SUPPORT

- Fast and accurate support by our technical support team – reducing possible downtime and service costs
- Direct, precise and helpful instructions make it easier for you to repair any faults through our remote support
- Unlimited number and duration of phone calls

SOFTWARE ACCESS LEVEL

- Ensuring that any errors are reliably fixed on-site or by remote access
- You receive a clear picture of the converter's performance
- Allows error diagnostics by remote access

PERFORMANCE REVIEW

- Optimized technical support by improved system knowledge
- Recommendations for preventive replacement of individual components in order to reduce downtime

SPARE PART MANAGEMENT

- You can reduce your initial material investment
- We take over the handling and storage costs for spare parts
- Your inventory space is reduced
- Avoiding parts becoming obsolete due to extended storage periods
- Limited risk of defects through non-compliance to storage requirements / conditions

RESPONSE TIMES FOR CORRECTIVE MAINTENANCE

- Experienced ConverterTec service engineers travel to your site to quickly resolve errors on site.
- Fast solutions for unplanned converter downtime
- ConverterTec experts have excellent first time fix rates

REPAIRING COMPONENTS

- We do offer local repairs for a select group of high used items and can provide repair through our European facilities for all repairable components
- We do offer re-conditioned parts based on core availability

TOOLS & TRAINING

- Get access to tooling, enabling in-depth analysis
- With expert training you can perform the maintenance independently, thereby reducing downtimes and operational costs



SERVICE PACKAGES

ConverterTec offers comprehensive service performance packages. You can select the basic variant 'solid' or the premium variant 'fast', which offers even faster and more extensive service support.

Our service program includes guaranteed response times, spare part management or longer support periods via our technical hotline – even around the clock if needed.

Our offers include:

PORTFOLIO	WITHOUT CONTRACT	SOLID	FAST
Handshake Meeting	–	1 x / year	2 x / year
On-call technical support	Limited*	Access 16/7 including public holidays**	Access 24/7 including public holidays
Software access levels	Limited****	CSC4: levels 1 & 2 CSC3: access	
Performance review	–	Is flexible in terms of planning but limited to once per converter during the contractual period (2 years)	
Spare part management (ensuring optimal availability)	–	Definition and administration of a recommended customer-specific spare parts list	
	–	Optional: Selected parts can be dispatched within 24 hours from the ConverterTec warehouse*	
Corrective maintenance (excluding spare parts)	Dependent upon availability	Service engineer is ready to travel within 3 working days	Service engineer is ready to travel within 24 hours
Repair of components	–	–	Guaranteed repair time for ConverterTec components: internal repair time of 20 days
	–	Rapid Exchange Programme gives you the option of receiving spare parts quickly (used spare parts dispatched within 24 hours)***	
Access to tools & training	Introduction & raising awareness	Maintenance, commissioning, basic troubleshooting	

* limited to receiving orders and any technical questions relating to this

** during local and on-call times from 6:00am – 10:00pm

*** based on assigned spare parts list

**** CSC4 read only access, CSC3 no access

TRAININGS AND TOOLS

► **Module 1: BASICS**

Components & installation of the converter

Optimized adjustment with technical support through basic technical knowledge of the frequency converter.

► **Module 2: SOFTWARE**

Software usage & data analysis

Structure, use and options for individual programs
Goal: independent troubleshooting.

► **Module 3: COMMISSIONING**

Commissioning, fault repair & replacing components

Independent commissioning of the system including practical troubleshooting & replacement components.

► **Module 4: MAINTENANCE**

Independent maintenance

Maintenance theory including maintenance manual & maintenance protocol, practical implementation of maintenance work.

► **Module 5: TROUBLESHOOTING**

...is currently not offered...

Please contact us if you require assistance with a related matter.

► **Module 6: REFRESHER**

Refreshing modules 1 to 4

CONCYCLE® basics, functions of frequency converter systems, software, commissioning, maintenance, smart repair.

► **Module 7: CUSTOMIZED COURSE**

Content tailor-made to suit you

You can define the theoretical and practical focus of the training course for the frequency converter or related areas. We are happy to advise you and help devise a tailor-made training package for your technicians.

► **Module 8: UPGRADE TO CSC4**

Controller upgrade

Specific Training to Upgrade an installed **CSC3** controller to the state-of-the-art **CSC4**.



REGULARLY IMPROVE YOUR TEAM'S SKILLS

The new modular training program shares the knowledge of **ConverterTec** experts and allows you to perform maintenance and servicing on complex converter systems competently and safely

Your benefits:

- **High first fix rate**
- **More flexibility**
- **Cost optimization and higher energy yield**

Select the right level to meet your individual technical trainings. Training courses take place either in the **ConverterTec** Training Center, or alternatively in your company or in field if possible.

Courses are offered in German, English, Spanish or Turkish language according to your requirements and what suits you best.

This special program is exclusively available to Fast-Contract customers only.

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Pictures on pages 5,7,21,24 @ unsplash

