



# Under Control.

Test Execution efficient and reliable

## WTCS

Wind Tunnel  
Control System

## Efficient Management of Complex Test Centers

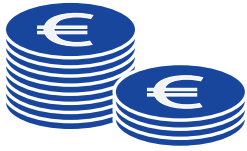
Large-scale, multi-purpose test facilities like wind tunnels, energy efficiency or e-mobility test beds play an important role in the development of any kind of vehicles engine technology and can be found in various application fields.

WTCS as a platform is developed for the requirements present in aerodynamic, climatic or supersonic wind tunnels as well as associated test and preparation facilities, be it newly built or refurbished ones.

The system provides flexible supervisory control for complex test beds and integrates all subcomponents involved. Various test configurations can be managed and manual or automated control can be exercised over the entire parameters. While being highly adaptable and easy to use, WTCS integrates itself into an enterprise's overall test process and helps optimizing efficiency.

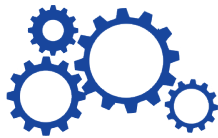
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## Today's challenge



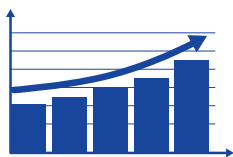
### Minimized lifecycle cost

Cost sensitivity is key today. Hence, also engineering activities need to be cost efficient. Spendings have to be reviewed in terms of return on invest. Easy adaption of new procedures or enhancing the capabilities without replacing or reworking the whole system is of utmost importance. The modularity and flexible configuration of WTCS facilitate the continuous enhancements of a test bed as well as adaption to changing needs. Particularly making changes to the subsystems and expanding functionality can be achieved easily with minimal cost. This way, WTCS safeguards the initial investment fostering adaption to changing needs for the whole lifetime of the facility.



### Seamless process flow

Exchanging data with engineers preparing their tests and waiting eagerly for their results, process managers scheduling test sessions or maintenance departments monitoring system health is part of the business process of testing. Established processes often use varied tools for different user groups and tasks, resulting in mostly manual transfer of data between the test facility and the actual process chain. WTCS offers seamless integration into test process management systems. It receives planned and scheduled test sessions, provides information about capabilities and the test facility's process data acquisition and delivers test results. By this the entire test context is available at the facility through one system – which simplifies and fosters interaction between facility operators and their customers. Also planning and data analysis benefit from consistent and timely provision of information from the facility as it allows more efficient scheduling, shorter iterations on test cycles and traceable test results.



### Increased efficiency

Consecutive setup and test phases usually cause idle times due to run map definition at the facility. The capacity utilization can be increased by preparing tests offline in parallel to running tests. This and the integration into process management systems reduce times between test runs. Moreover, shorter setup times can be achieved by rigging instructions that are managed and provided by WTCS. Automated test execution concerted for all subsystems guarantees higher throughput.



### Improved quality assurance

Tests for releases of developments or standardized certificates require transparency of all circumstances and parameters. Reuse of configurations and run maps guarantees reproducibility and validity of tests while rigorous documentation of all events ensures transparency and traceability. Necessary proof of evidence is ensured by the use of the central database, which keeps track about setups, rigging, parameters and procedures.



## Capabilities provided by WTCS

WTCS is a modular platform for test bed control systems consisting of core modules and customer-specific extensions.

The core modules provide standard functionality, which is independent of specific applications and enables configuration, operation and maintenance of the test bed:

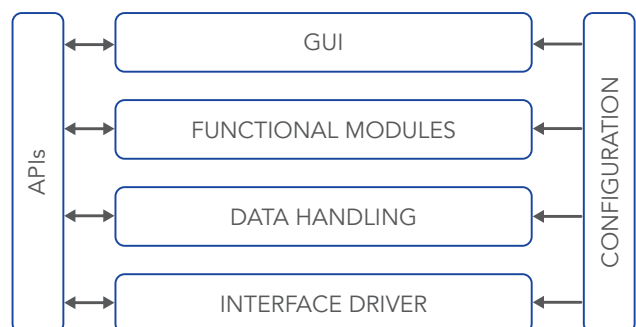
- Management of tests and measurements
- Configuration management
- Standardized subsystem integration
- Full manual control of the test bed
- Automatic test sequencing
- Centralized data storage
- Online data distribution
- Online calculations (math library)
- Online and offline data visualization
- Process data acquisition
- Test process integration

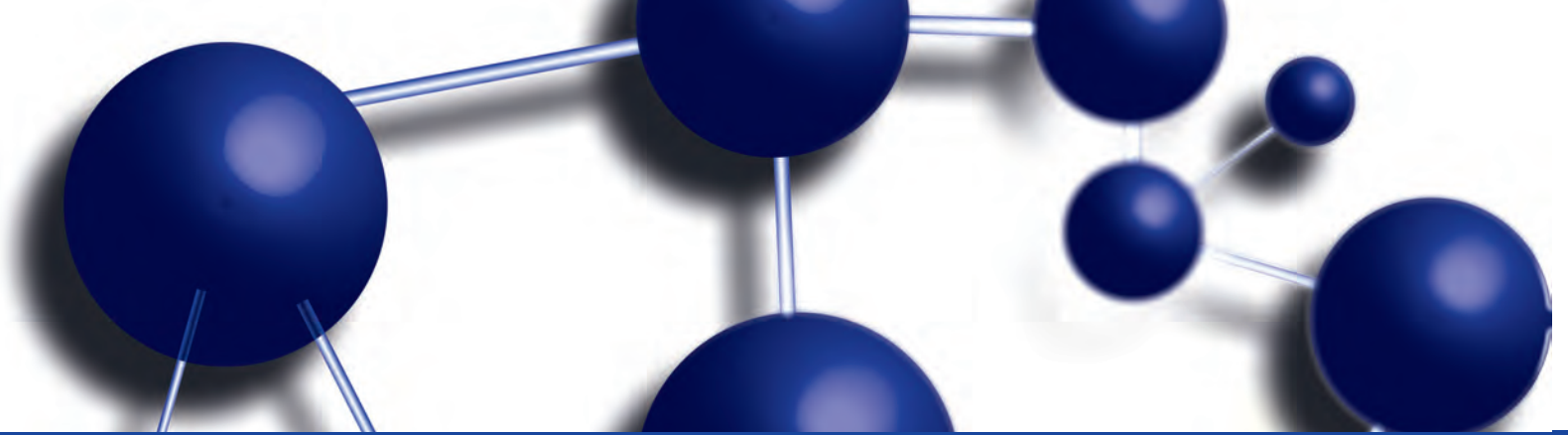
Combining the core modules' flexibility with the options for modification and extension makes the facility fit for the future.

The most common customizations include individual visualizations of test bed schematics, interfaces to proprietary devices or specialized math functions to expand the standard libraries.

Typical custom-specific modules are:

- Offline test preparation
- Customizable analysis functionality
- Configurable report generation





# Test Processes

## efficient and reliable

Modern products are calling for increasingly complex test and verification procedures in the course of their life-cycle. In the processes of developing and manufacturing innovative products meaningful test data have to be either simulated in the system or generated on the test bench before they are processed, analysed, evaluated and archived, for example for quality management purposes. Monitoring the test and measurement process is essential in equal measure in order to take early and adequate actions in case of problems, thus minimizing downtimes.

Smooth communication of data and information is one of the key factors for success in modern, globally operating enterprises. Structures are increasingly decentralized whilst the variety of customers and products keeps growing at the same time. Therefore, data and information are required to be instantly available with adaptable and efficient access rights control in place to protect them. What distinguishes successful enterprises is that their different divisions are interlinked by a network ensuring continuous data communication between them.

Treating testing as a holistic process is a key to success.

## References

### Audi AG

- Aeroacoustic Wind Tunnel
- Climate Wind Tunnel
- Thermo Wind Tunnel

### BMW Group

- AVZ Aerodynamics Test Center
- EVZ Energy Efficiency Test Center

### Volkswagen AG

- Aeroacoustic Wind Tunnel
- Climate Wind Tunnel

### FKFS

- Model Wind Tunnel

### Non-disclosed customer

- Aeroacoustic Wind Tunnel

### Non-disclosed customer in motorsports and series vehicle industry

- Aeroacoustic Wind Tunnel
- Motorsport Wind Tunnels

## WTCS at a glance

- Integration platform for all components of test facilities
- Centralized monitoring and control system
- Flexible test sequencing
- Management of tests and configurations to ensure traceability
- Well-structured data management
- Strict access control
- Distributed system
- Hardware off the shelf
- Standard interfaces / API
- High system availability and high data throughput

## About Werum Software & Systems

With a workforce of over 100, Werum Software & Systems AG is one of the largest employers for IT professionals in Germany. For more than 45 years we have been implementing sophisticated software and systems for a worldwide base of customers, among them many renowned companies from the automotive and aerospace industry as well as scientific institutions and public authorities.

Our activities focus on the support of customer-specific processes in the core areas of test data and information management, earth observation, eGovernment and enterprise information management. The software solutions are based on platforms specially developed for these areas.

Diversity, reliability, flexibility and fairness are part of our philosophy and create the basis for sustainable customer relations. We offer our international customers well-founded application know-how and the knowledge and experience gained in many years of implementing most diverse projects and IT solutions. Already in the run-up to project implementation we assist them in advisory capacity with regard to any IT-related aspects of the specific task setting. Long-term maintenance and care services for the solutions supplied are a matter of course for us.

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