Control Cube servo-controller with Cubus testing software

Intelligent Testing

Zwick / Roell

Zwick Roell – passion in customer orientation

Zwick at a glance

For more than 150 years, Zwick Roell has stood for extraordinary technical performance, innovation, quality and reliability in materials-s and components testing. Our customers trust Zwick because we are a global leader in static testing and are experiencing significant growth in the field of fatigue testing systems. With innovative product developments, a comprehensive range of products and global service, the family-owned company supplies tailored solutions to meet the highest demands - both in research and development and in quality assurance for more than 20 branches of industry. With around 1,000 employees, a production site in Ulm, additional subsidiaries in Europe, USA and in Asia, as well as 56 representative offices in 56 countries around the world, the Zwick name guarantees maximum product-t and service quality.

A passion for customer orientation is the basis for our entrepreneurial thought. Reliability, sincerity and professionalism determine our actions. We wish to establish long-term customer relationships based on mutual trust. Every customer is important to us, from major corporations to small companies. We always give our best: We help our customers to become more successful through competent advice, custom solutions, innovative products and a comprehensive range of services.

Control Cube and Cubus for maximum flexibility and efficiency in fatigue strength testing

For fatigue strength testing, servo-hydraulic testing systems are the preferred solution. The performance capabilities of these systems are essentially determined by the measurement and control electronics used, as well as the associated testing software.

Zwick offers the Control Cube servo-controller and Cubus testing software for this purpose. They are ideally suited for retrofitting to existing servo-hydraulic testing systems and for multi-axis applications. Zwick developed this system jointly with its partner CaTs[3] (Consultants in Automated Test & Structural-dynamic Simulation Systems). This company has many years of experience and competence in this field, which is reflected in a very powerful product that meets the steadily growing customer requirements while fulfilling the high safety and quality standards of Zwick.

An important goal of the development work was great flexibility and expandability of the test system, particularly in the face of frequently changing test requirements. Cubus software is distinctive for its great versatility and an exceedingly friendly user interface. Suitable Cubus test programs are available for everything from configuration of the test stand, through simple cyclical tests to advanced applications. QanTiM® iteration software is also available for simulating loads determined from real life operational conditions.

Figure 1: Administration building of Zwick Roell AG and Zwick GmbH & Co. KG in Ulm

Figure 2: Multi-axis test rig for service load simulation testing (picture: © IABG)

Servo-hydraulic testing technology from Zwick

Proven technology from a single source

In addition to the field of quasi-static materials testing and electro-mechanical drives, Zwick has long been active in the field of servo-hydraulic testing technology. Our product range covers everything from complete testing machines, through specimen grips, measurement and control electronics and testing software to hydraulic components and systems. Zwick offers everything to meet specific customer requirements – from the hydraulic power pack, through the hydraulic piping to the testing actuator. Zwick naturally also supports its customers with associated services. Zwick specialists are always available to provide competent, reliable assistance to customers in everything from installation, through maintenance and calibration to training and application-specific consultation.

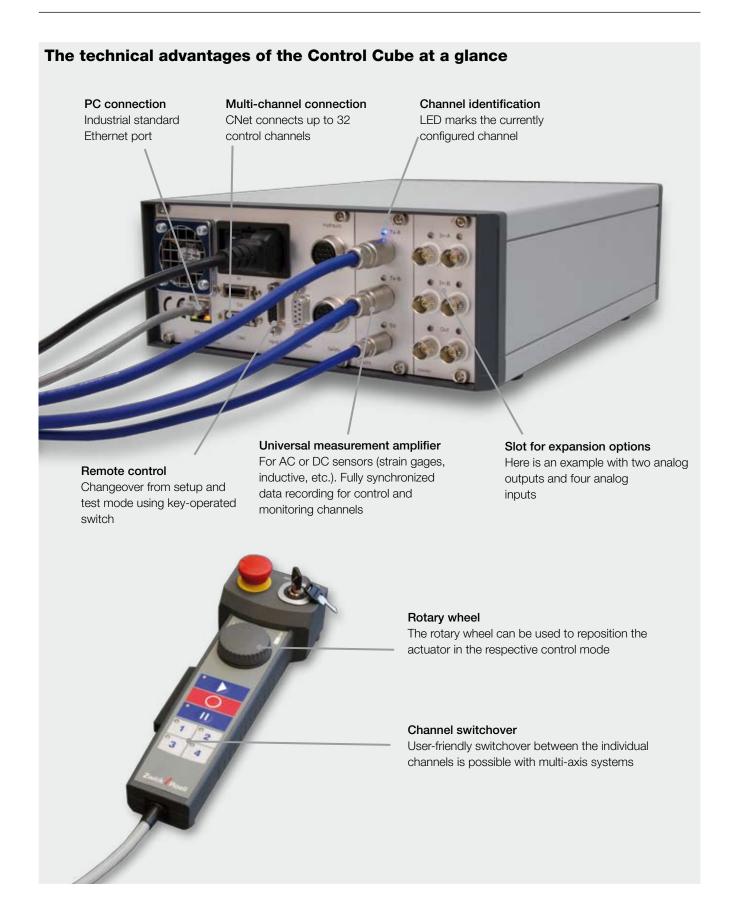Figure 2: Multi-axis FlexMAST test rig (picture: © Ford)

Figure 1: Modernized servo-hydraulic testing machines

Figure 3: New ring main to expand the central hydraulic oil supply

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The technical advantages of the Control Cube at a glance

PC connection
Industrial standard
Ethernet port

Multi-channel connection
CNet connects up to 32
control channels

Channel identification
LED marks the currently
configured channel

Remote control
Changeover from setup and
test mode using key-operated
switch

Universal measurement amplifier
For AC or DC sensors (strain gages,
inductive, etc.). Fully synchronized
data recording for control and
monitoring channels

Slot for expansion options
Here is an example with two analog
outputs and four analog
inputs

Rotary wheel
The rotary wheel can be used to reposition the
actuator in the respective control mode

Channel switchover
User-friendly switchover between the individual
channels is possible with multi-axis systems
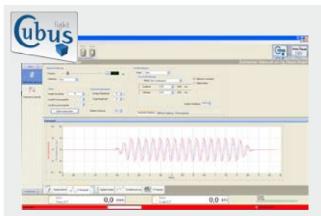
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Control Cube and Cubus

A measurement and control system, consisting of the Control Cube servo-controller and Cubus testing software, all with the following features:

- Short familiarization time and simple handling thanks to an intuitive and user-friendly presentation
- Adaptation to specific and complex testing tasks thanks to modular design and great versatility
- Multi-channel applications through simple expansion to up to 32 control channels
- Space-saving and flexible through compact half 19" width housing with integral signal generator
- Single- or dual-channel basic unit available
- Cyclic test can be validated though optimized 4-kHz data recording and control update
- Highly accurate and reliable test data recording with 19-bit resolution
- Reliable PC connection and high data transfer rate via Ethernet
- Basic Cubuslight and full Cubus suite of testing software for diverse customer-specific test tasks
- QanTiM® software package for simulating real world loads

Furthermore, daily work with testing systems is simplified by numerous helpful facilities. These include, for example, automatic optimization of the control parameters and adaptive control, which allow control parameters to be adjusted automatically to follow changing specimen characteristics during the course of testing. The diverse options for data recording, data presentation and export are also useful features. Connections for the servo valve, hydraulic supply, remote control and emergency stop are available as standard interfaces to the test environment. They are supplemented by universal measurement amplifiers as well as analogue and digital inputs and outputs. These can also easily be retrofitted.
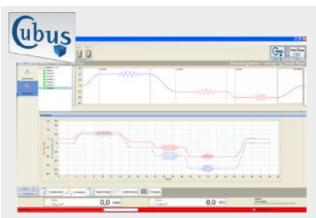
Cubus testing software

Cubus provides professional and highly efficient support, no matter whether you have to test a complete product, a component or a single material specimen. Cubus provides a modular software environment developed specifically for single- and multi-channel servo-hydraulic tests. In a single integrated application, Cubus permits complete configuration of the test environment while meeting all requirements for a modern test-rig control system and provides the necessary tools for recording and analyzing gathered measurements.

Basic Cubus^light software
Every Control Cube servo controller is supplied with basic Cubus^light software which offers all functionality required to configure a test stand and adapt it for the test task ahead. Moreover, Cubus^light incorporates a test module permitting simple cyclical tests to be performed.

Cubus testing software
Further Cubus test programs are available for advanced and special applications. These programs are carefully optimized for their respective test type.

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Cubus test options

Expanded cyclical tests
- Signal shapes: sinusoidal, square wave triangular, sawtooth, trapezoidal
- Fade-in cycles
- Peak and mean value control
- Cross-mode control possible
- Tolerance ranges

Block programs
- Graphic editor for the test sequence
- Simple selection of block elements
- Sequencing, repetitions, interlinking
- Block elements for ramp functions, cyclic functions, dwell, data acquisition, etc.
- Continuous display of the test progress and the active block element

Expanded ramp tests
- Graphic editor for the test sequence
- Simple selection of elements
- Sequencing, repetitions, interlinking
- Continuous display of the test progress and the active block element
- Block elements for simple ramp functions, stop phases, data recording, etc.

External tests
- External control without utilization of the controller's function generator
- Complete interface available for an external system
- Permits simulation of operating loads determined in real situations with the aid of optional QanTiM® iteration software

Cubus expansion options

Cubus testing software is based on an architecture that permits functionality to be adapted to individual test requirements by use of optional plug-ins. This simplifies operation for the user because only the functions that are actually needed for a test type are offered for selection.

Control
- Auto-tune
- Adaptive PID control
- Integrated PID tuning facility

Procedures
- Action to be performed in response to defined events
- Editor for procedures
- Event-action matrix

Measurement value recording and display
- XY chart
- Data export/ data display
- Strip chart
- Turning points capture

General functions
- Recording of events
- Virtual channels
- Password protection
- User management
- Transducer linearization
- External analogue command
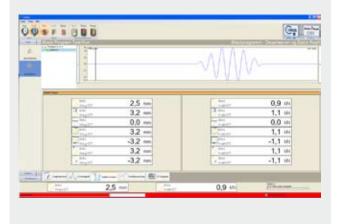- External monitor output ± 10V

Multi-channel applications
- Hydraulic grouping
- Global and local gain factor
- Multi-channel mode and setpoint
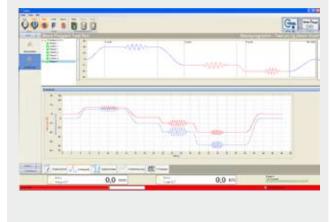
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Digital displays

Multiple digital displays ensure clarity for the user in multi-axis tests. Load cells, the extensometers and other sensors can be displayed independently or in individual groups. Various display modes are available for this purpose (DIRECT, AMP, MIN, MAX, RANGE, PEAK, TROUGH...)
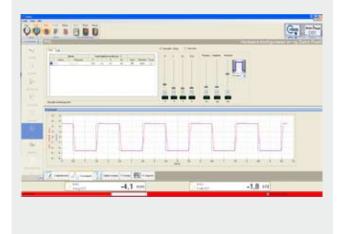

Real-time graphics

This function displays the current test progression in real time for the user. The real time graphics permits up to four different signal traces to be configured. This is particularly useful for monitoring control quality and to optimize if necessary.
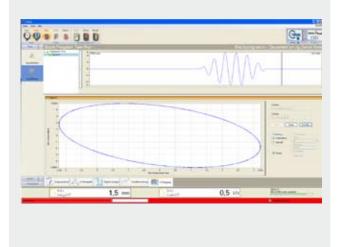

PID controller optimization

A clear layout of the control parameters allows the user to optimize the performance between the command and feedback with ease. Furthermore, the PID Auto-tune allows the optimization to be automated.

XY diagram

An XY plotting facility allows the user to display measured values or channels against each other (e.g. force against displacement). This can be used, for example, to show the energy loss of elastomers in a graphical form on a plot of force against displacement.

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