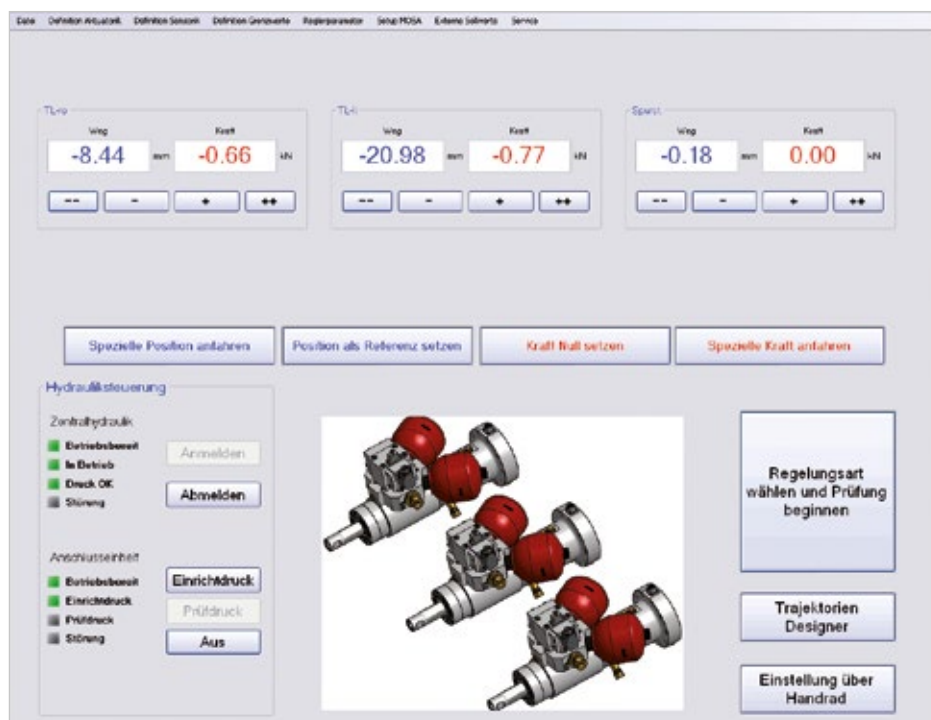




# S P E C I F I C A T I O N S H E E T



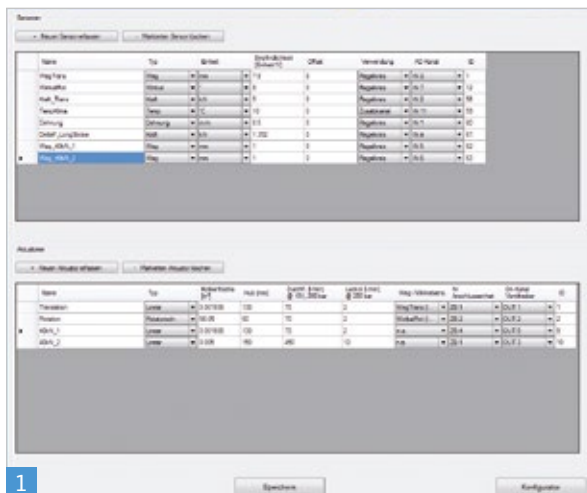
## Flexicon control system

AUTOMATED MEASUREMENT AND TEST SYSTEMS  
ASSEMBLY TECHNOLOGY  
CUSTOMIZED MACHINING CENTRES  
SOFTWARE ENGINEERING  
JOB-ORDER PRODUCTION

## GENERAL INFORMATION:

The Flexicon control system can define multiaxial testing processes (1-6 channels) based on its actuator and sensor library that can be generated as desired. To achieve this, the hardware components that are required and connected (via A/D and D/A channels as well as digital I/Os) in each particular case are assigned and grouped. After having been configured, the defined systems, including all program settings (e.g., limit values, controllers, setups, ...), can be saved and opened. The system features an option for communicating with the hydraulic connection unit through the system PLC for the logon, logoff, low pressure, and high pressure operating states.

- » Sensor and actuator library that can be defined and expanded as desired
- » Function generator (configured for 3 axes in this example)
- » Block program editor with exemplary block program



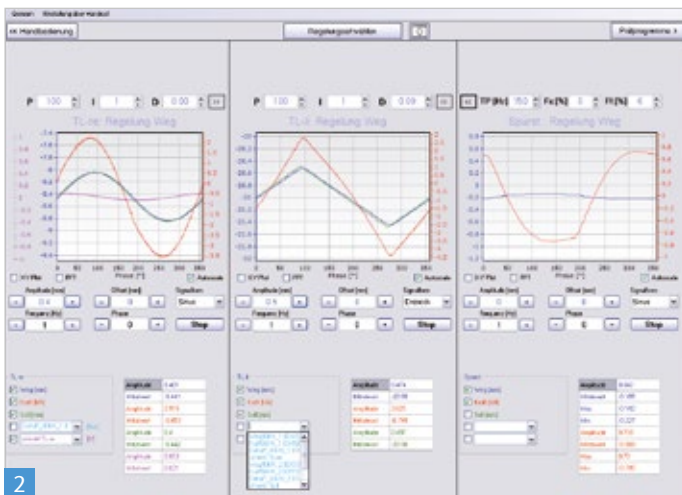
The calibration menu features options for setting the measurement and control variables, optimizing the valves and scaling the amplitudes and offsets of sensors according to their physical units. In addition, the stiffness can be adjusted in displacement control per channel and the dither signals and valve offsets can be set.

Implemented digital controllers are PID, PIDF and cascade, and peak value controllers for cyclic signals (sine, triangular, rectangular) featuring automatic correction of amplitude, mean value and phasing are also provided. This comprises control variables, such as displacement, force, angle, torque, elongation up to a control frequency of 10 Hz. In addition, the system features geometric correction for multi-channel test stands (e.g. hexapod, 6-axis, 4-axis, lever, rotary drives, etc.) as well as an option for stabilizing the control loop through differential pressure.

What is more, the system features a limit monitoring function for control and additional channels with selectable reactions (signal stop, HCU OFF, HPC OFF). This function can be enabled and disabled. The sampling frequency to achieve this can be adjusted to a maximum value of 5 kHz. If limits are exceeded, the corresponding value and time are logged.

The function generator is a tool where frequency, phase, amplitude, offset and cycle number for variables, such as displacement, force, angle, torque, and elongation can be set for 1 to 6 axes. This can be done for the sine, triangular and rectangular signal types. If necessary, a peak value controller can also be activated. Signals can be optimized by means of corresponding oscilloscopes.

In addition, all control and additional channels can be recorded and stored using the record function (start and stop) with an adjustable sampling frequency.



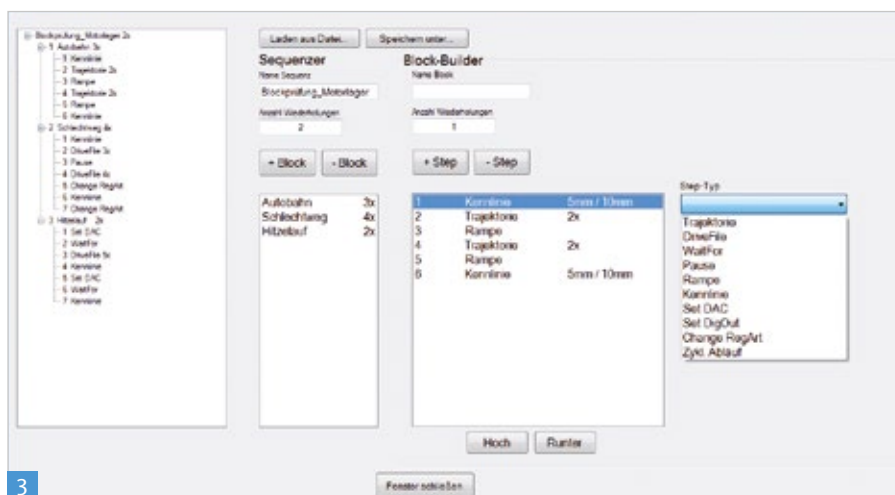
The external reference value input allows the program to make readjustments using target values that have been specified externally. The analog target values are connected to the selectable ADC inputs. The user can specify for each axis whether it is to be operated in displacement or force control mode. After the external reference value input function has been started, the axes move from the current actual value to the externally specified target value with a ramp. The ramp gradient can be entered individually. When the external reference value input function is stopped, the current actual value is applied as target value. Target values can be scaled from 10 to 100%, with the signals always being checked for limit values. An integrated watchdog function serves to monitor complete communication between real time, PC and PLC, thus providing additional safety.

The sweep function tool allows generating the following types with activation of the peak value controller: amplitude sweep, frequency sweep and sweep with constant acceleration. If required, additional modules for non-linear iteration are also available for testing tasks with strongly non-linear behavior of the units undergoing testing. Flexicon provides the ASCII data interface by default.

Flexicon's block program generator features comprehensive functions. It can be used to define and execute complex test runs for multiple axes. The block program generator is based on the basic software and has access to all test stand resources.

The following functions can be cascaded as desired:

- » Cyclic function specifications such as sine, triangular and rectangular signals with adjustable values for frequency, amplitude, offset, and phase
- » Ramps and holding times
- » Selectable control types (displacement/angle, force/torque, and elongation)
- » Phase control (master/slave)
- » Gains for amplitude and offset controller
- » Setting of digital outputs / waiting for digital inputs
- » Activation of peak value and offset controllers



- » Master axis flag (applies only to multi-axis systems); the test is completed when the load change counter of the master axis has elapsed
- » Programmable load change counter
- » When tests are aborted or completed and when defined events occur, programmed actions can be triggered
- » Loading, storing and following of block sequences with switchover of the control type between the blocks
- » Control of digital input and output channels
- » Programmable clock-controlled acquisition and storage of measurement data
- » User-defined directories for different data acquisition modes
- » Data storage in ASCII format
- » Monitoring of upper and lower limit values, exceeding and falling below the values with defined trigger signal in order to carry out actions
- » Digital display of command values

# Flexicon: The Modular Concept

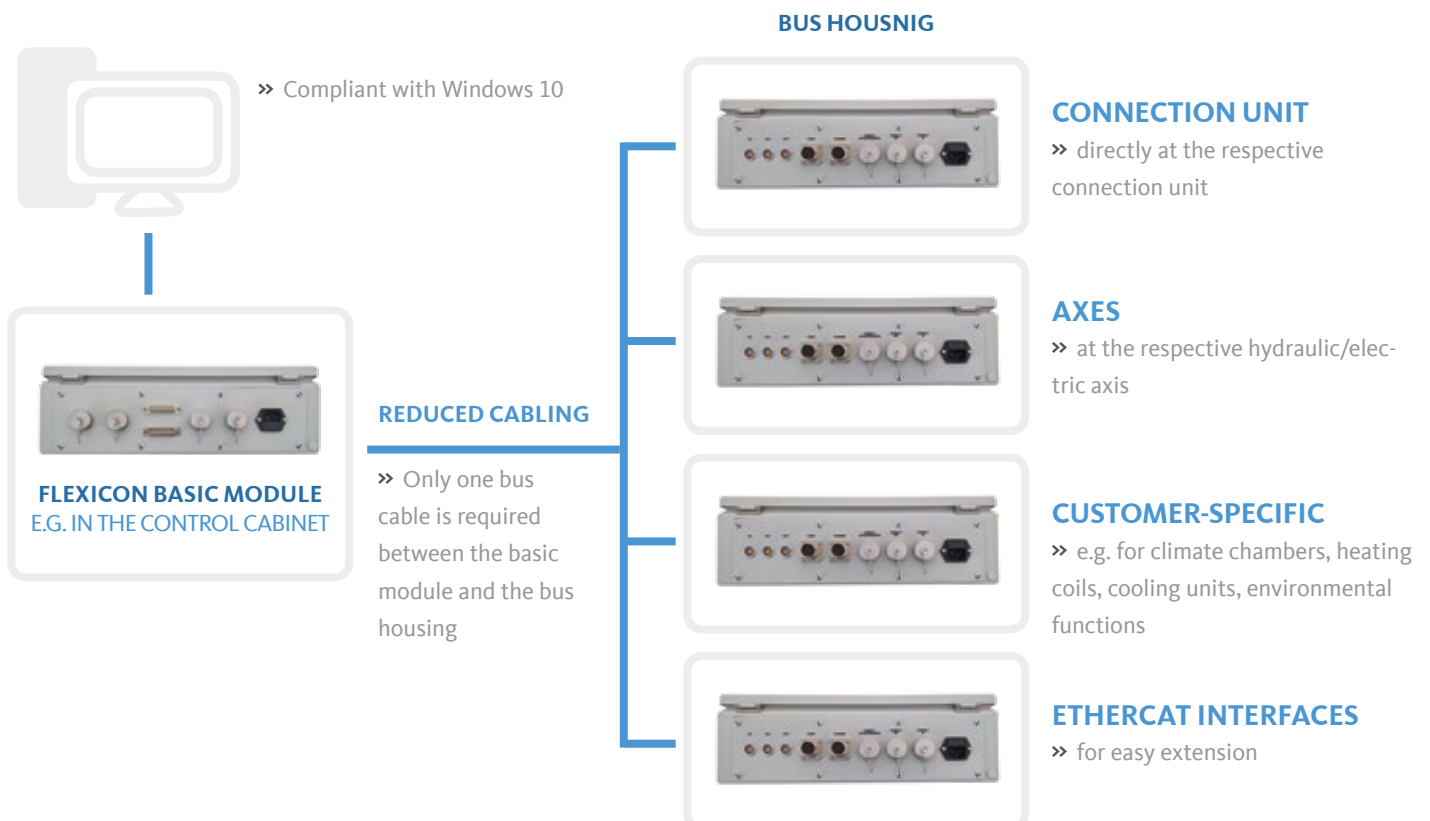
## BENEFITS AT A GLANCE

EtherCAT

MATLAB  
& SIMULINK

- » Easy integration of additional peripherals thanks to industry-proven **EtherCAT** Bus or conventional I/O interface
- » Expandability via **EtherCAT** terminals
- » Compact workflow
- » Customer-specific test modes with customized visualization
- » Robust and quickly converging iteration process dedicated for non-linear test specimens
- » Integration of customer functions via **Matlab&Simulink**
- » Customer options for position measurement systems (LVDT, SSI, EtherCAT or customized)
- » Mass inertia compensation of the coupling rod at the test specimen via acceleration sensors
- » Analog valve control (up to +/- 100 mA or +/- 10 V) as well as EtherCAT servo valves are enabled
- » Connection of up to 6 control axes at the basic module

## HARDWARE IN MODULAR DESIGN



## BASIC SOFTWARE

The basic software developed by FGB offers intuitive user guidance with customized interfaces for individual applications. The software consists of the following basic modules:

### BLOCK PROGRAM

» Dedicated program for user configuration using various modules

### SWEEPS

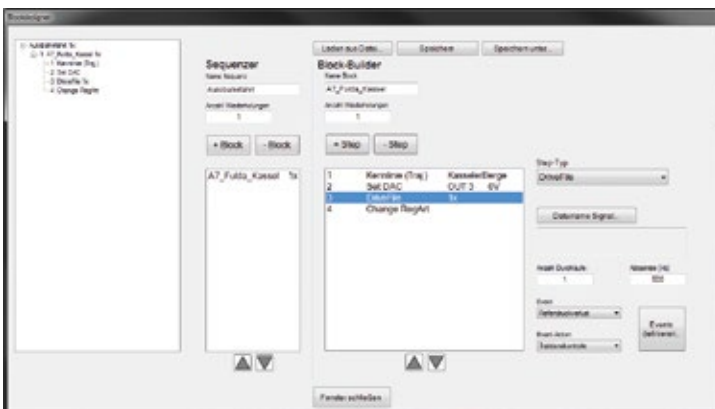
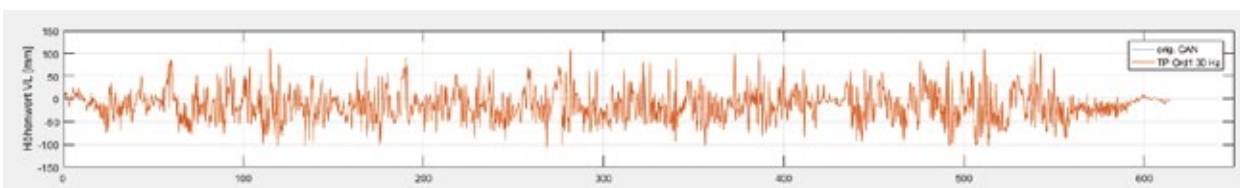
- » Frequency
- » Amplitude
- » Speed
- » Acceleration

### CASTER ANGLE PROJECTS

» Robust iteration also in highly non-linear systems

### EXTENSIONS

» Customer-specific extension by FGB or of the customer-provided Matlab/Simulink Code



## DID WE SPARK YOUR INTEREST?

We are looking forward to your inquiries. We would be happy to work with you to develop a solution that perfectly suits your requirements.

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