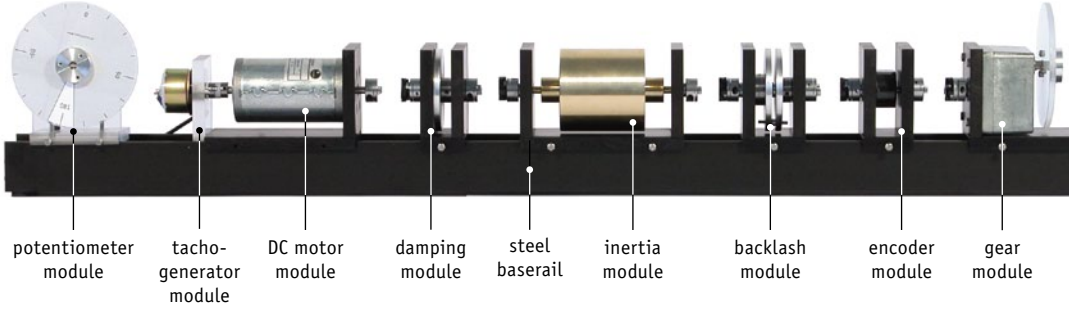
Modular Servo

An easy to reconfigure set-up to demonstrate servo control problems



Modular Servo is designed especially for the study and verification of basic and advanced control methods in practice. It includes demonstration of typical variable factors such as friction, damping and inertia as well as a number of position/speed control methods ranging from PID to LQ and time-optimal control.

DC motor module can be coupled with several other modules. A vast number of linear and nonlinear mechanical modules are designed to demonstrate the influence of backlash, damping, elasticity and friction. The units may be investigated individually before completing the system. Damping module consists of a paramagnetic disc which runs between the poles of a permanent magnet. Inertia module is equipped with a solid metal roll.

A metal base-rail provides firm fixing to the modules, enabling imitation of block schematic diagrams. There are no wired connections. Everything is "connected" via software. No mechanical skills are required to assemble a working system.

Modular Servo operates with a PC-based controller. The PC communicates with the position sensor and motor by the I/O board and the power interface.

The I/O board is controlled by the real-time software which operates in the MATLAB/Simulink RTW/RTWT environment. The preprogramed library of controllers and models built in Simulink supports Modular Servo.

A comprehensive range of experiments may be carried out using Modular Servo and associated software. An example shown in the figure below shows how the servo system tracks the desired position. The time and phase plane diagrams are presented.

Hardware:

- motor: DC, 12V, PWM controlled
- interface and power supply unit
- 7 mechanical modules
- position & speed sensors: incremental encoders tacho-generator
- aluminium base-rail
- RT-DAC I/O internal PCIe or external USB board (the PWM control and encoder logics are stored in a XILINX chip) or the single board RIO or a PLC

Dimensions: 900x100x145 mm