CONTROL UNIT FOR LABORATORY DEVICES USED IN MECHANICAL TESTING

Interreg ATCZ215
ImageHeadstart

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Overview

Control unit together with expansion modules enable the control of a wide range of custom laboratory devices primarily in the field of the material and biomedicine research equipped by the stepper or servo motor actuators. Expansion modules are connected to the control unit via daisy-chain bus and in the basic configuration the control system can operate with four stepper motor positioning stages and one servo motor positioning stage. The control system also provides support for the external/internal limit switches and encoders.

To satisfy the research specific needs (e.q. measurement of force, temperature etc.) the control unit includes multifunctional DAQ device (T7, Labjack corporation, USA) with 14 analog inputs (16- to 18-bit), 2 analog outputs (12-bit), 23 digital I/O, and up to 10 digital counters/timers. For measurement of the low-level signals such as bridge circuits (e.g. strain gauges) and thermocouples is the DAQ device equipped by the two-channel instrumentation amplifier with the user selectable gain.

The control unit is based on the micro-ATX or mini-ITX standard and optimized to achieve the low system latency of a control procedure, especially designed in an open-source project LinuxCNC. Thus, the architecture of the control system fully supports the RaPo control software.

Control unit (micro-ATX configuration)

Stepper motor expansion module

Functionality

Specification of the basic configuration (with one stepper and one servo motor expansion modules)

- control up to four stepper motor positioning stages
- control of one servo motor of positioning axis
- support connection of external/internal encoders and limit switches
- daisy-chain bus connection of expansion modules
- hardware architecture based on products of Mesa Electronic
- in micro-ATX configuration supports up to eight high speed RS-422 or RS-485 serial devices
- provides multifunctional DAQ device: 14 analog inputs (16- to 18-bit), 2 analog outputs (12-bit), 23 digital I/O, and up to 10 digital counters/timers.
- two-channel instrumentation amplifier for connecting of various sensors (strain gauges, thermocouples)
- emergency stop functionality
- modular and portable design
- powered by OS Linux with real-time kernel
- full support and optimization for the RaPo control software

Servo motor expansion module

DETEX testing solution: the control unit with the servo motor expansion module for control of the uni-axial loading device (nominal force 25 kN) suitable for X-ray imaging.

Application

Control unit (micro-ATX configuration) with the servo (voice-coil actuator) motor and stepper motor (two-axis table) expansion modules for the control of the micro-indentation stage.

Control unit (mini-ITX configuration) with the stepper motor expansion module for control of the uni-axial loading device (nominal force 3 kN) suitable for X-ray imaging.

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