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Process Control

Closed-loop control technology (UniTrain)

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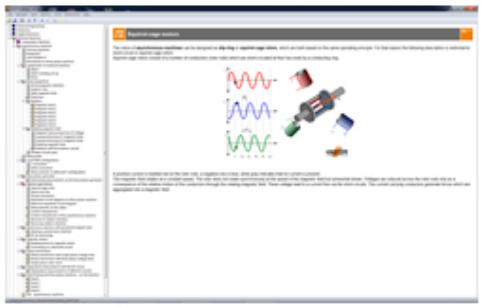
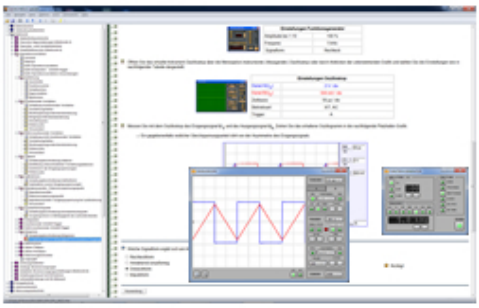
In the age of automation, closed-loop control technology is of supreme importance for modern, technical systems. Optimised control loops help engineers in the area of production and process control technology to efficiently manage such resources as energy and raw materials and ensure product quality. Furthermore, by integrating automatic technology, innovative, intelligent products can be made which are a prerequisite for being competitive on world markets. The spectrum of applications range from anti-locking systems in motor vehicles to auto-pilots in jumbo jets and position controls for satellites or space vehicles - from automatic range finding in pocket cameras to air-conditioning control in office buildings all the way to the automatic process control of chemical processing plants in the chemical industry. Using the training system for closed-loop control technology the student can obtain graphic and authentic training in the fundamentals and advanced topics of control engineering. This system utilises state-of-the-art training equipment like digital controllers and multimedia systems to provide all the technical know-how and hands-on skill the student requires.

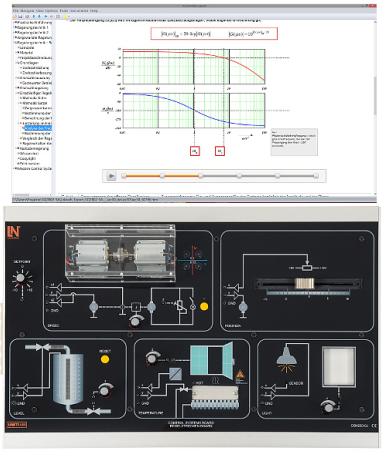
UniTrain multimedia courses on automation and control technology employ a large number of experiments and animations to give an introduction to control technology. Students taking the course become familiar with the components and various control loops along with their typical response and behaviour. Many experiments study controlled systems, determination of step responses and the optimisation of control loops. Real experiments provide training in the use of important aids such as Bode plots and locus diagrams.

List of articles:





Pos.	Product name	Bestell-Nr.	Anz.
1	**Course – Practical introduction to control technology**	CO4204-8J	1



Lieferumfang:

- 1 Experimentierboard Temperatur-, Füllstand-, Position-, Drehzahl- und Licht-Regelstrecke mit Eingängen zur Störgrößenaufschaltung
- Frei kombinier- und parametrierbar P-, I- und D-Regler
- Konfigurierbarer 2- und 3-Punkt Reglern mit einstellbarer Schalthysterese
- Virtuelle Instrumente zur Analyse und Optimierung der Regelkreise
- CD-ROM mit Labsoft-Browser und Kurssoftware

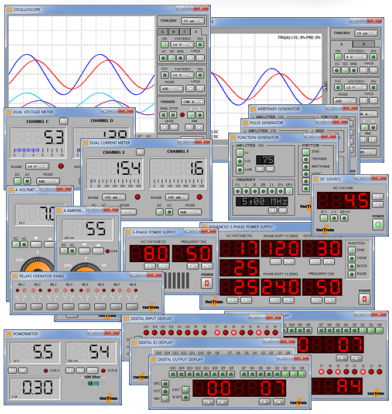
Lerninhalte:

- Kennen lernen der Wirkprinzipien der Steuerung und der Regelung
- Kennen lernen von Aufbau und Funktionsweise stetiger und unstetiger Regler
- Temperaturregelung mit Hilfe von schaltenden und kontinuierlichen Reglern
- Drehzahlregelung eines 4 Quadranten Antriebs
- Positionsregelung einer Linearachse
- Aufbau einer Lichtregelung zur Raumbeleuchtung
- Messung des Zeitverhalten von Regelkreisen: Aufnahme der Sprungantworten
- Experimentelle Untersuchung des Regelverhaltens verschiedener stetiger Regler
- Parametrierung und Optimierung des Regelkreise
- Untersuchung des Führungs- und Störverhaltens des Regelkreises
- Untersuchungen am geschlossenen Regelkreis

Additionally required:

Pos.	Product name	Bestell-Nr.	Anz.
2	**UniTrain Interface with virtual instruments (basic VI)**	CO4203-2A	1

The UniTrain Interface is the central unit of the UniTrain system. It incorporates all inputs and outputs, switches, power and signal sources and measurement circuitry needed to perform experiments. The Interface is controlled via the connected PC.



Equipment:

- 32-bit processor with storage memory for measurements
- USB interfaces, transfer rate 12 Mbits/s
- WLAN/WiFi interface, 2.4 GHz, IEEE 802.11 b/g/n
- Simultaneous connection of any number of Experimenters via serial bus system
- High-quality designer casing with aluminium feet and surface-hardened Plexiglas front panel
- Suitable for accommodating in training panel frames for DIN A4 training panels
- Designed for connection of 2-mm safety measuring leads
- Multi-coloured LEDs for displaying status
- Adjustable analog output, +/-10 V, 0.2 A, DC – 5 MHz, via BNC and 2-mm sockets
- 4 Analog differential amplifier inputs with 10 MHz band width, safe for voltages up to 100 V, sampling rate 100 mega samples, 9 measuring ranges, memory depth 4 x 8 k x 10 bits, inputs via BNC (2 inputs) or 2-mm sockets (4 inputs)
- 2 Analog inputs for current measurement, overcurrent-protected up to 5 A, sampling rate 250 kilo samples, 2 measuring ranges, resolution 12 bits, connection via 2-mm sockets
- 16-bit digital signal output, of which 8 bits are accessed via 2-mm sockets, TTL/CMOS, clock frequency 0 – 100 kHz, electric strength +/- 15 V
- 16-bit digital signal input, of which 8 bits are accessed via 2-mm sockets, memory depth 16 bit x 2 k, TTL/CMOS, sampling rate 0 – 100 kHz, electric strength +/- 15 V,
- 8 Relays, 24 V DC/1 A, of which 4 are accessed via 2-mm sockets
- Dimensions: 29.6 x 19 x 8.6 cm
- External power supply with wide range input 100-264 V, 47-63 Hz, output 24 V/5 A
- Weight (including power supply): 2.1 kg

Virtual instruments (meters and sources):

- 2 x Voltmeter VIs, 2 x Ammeter VIs: AC, DC, 9 ranges, 100mV to 50V, true RMS, AV
- 1 x VI with 8 relays, 1 x Multimeter VI: multimeter display (optional LM2330, LM2331 or LM2322) in LabSoft
- 1 x 2-channel ammeter VI: AC, DC, 2 ranges, 300 mA and 3 A, TrueRMS, AV
- 1 x 2-channel voltmeter VI: AC, DC, 9 ranges, 100 mV to 50 V, TrueRMS, AV
- 1 2-/4-channel oscilloscope: band width 10 MHz, 25 time ranges, 100 ns/div to 10 s/div, 9 ranges 20 mV/div to 10 V/div, trigger and pre-trigger, XY and XT modes, cursor function, addition and multiplication function for 2 channels
- 1 x Adjustable DC voltage VI 0 - 10 V
- 1 x Function generator VI: 0.5 Hz - 5 MHz, 0 - 10 V, sine, square, triangular,
- 1 x Arbitrary generator VI, 1 x Pulse generator VI
- 1 x VI with 16 digital outputs, 1 x VI with 16 x digital inputs, 1 x VI with 16 digital input/outputs. Display modes: binary, hex, decimal and octal numerals
- 1 x Three-phase power supply VI, 0 - 150 Hz, 0 - 14 Vrms, 2 A (requires CO4203-2B)
- 1 x Adjustable DC power supply VI, 3 x (-20 V - +20 V), 2 A (requires CO4203-2B)
- 1 x Three-phase power supply VI with additional phase-shift and clock rate adjustment (requires CO4203-2B)

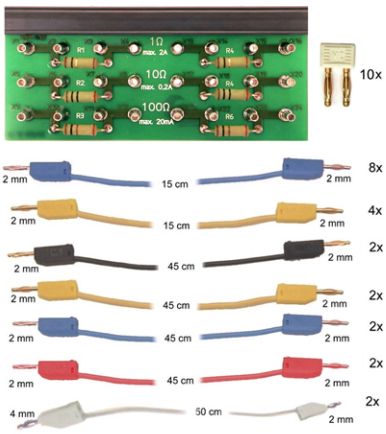
Includes:

- Interface
- Power supply
- Power lead
- USB cable
- CD with basic software
- Operating manual

System requirements:

- Personal computer with Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10 (32 or 64 bit version)
- CD-ROM drive for installing software
- USB port for connection to Interface

Pos.	Product name	Bestell-Nr.	Anz.
3	**UniTrain-I measurement accessories, shunts and connection cables**	SO4203-2J	1



Shunt resistors on a PCB, for current measurement using the analog inputs of the UniTrain system.

- 6 Shunt resistors: 2 x 1 ohm, 2 x 10 ohm, 2 x 100 ohm
- Screen print of symbols for identifying resistors, the voltage taps and current inputs
- 24 x 2-mm sockets
- Dimensions: 100 x 40 mm

Set of connection cables 2mm (22 pcs) for UniTrain consisting of:

- 8 x connection leads 2mm, 15cm, blue
- 4 x connection leads 2mm, 15cm, yellow
- 2 x connection leads 2mm, 45cm, black
- 2 x connection leads 2mm, 45cm, yellow
- 2 x connection leads 2mm, 45cm, red
- 2 x connection leads 2mm, 45cm, blue
- 2 x adapter leads 4mm to 2mm, 50cm, white
- 10 x 2-mm connector plugs / Plug spacing 5mm

Additionally recommended

Pos.	Product name	Bestell-Nr.	Anz.
4	**UniTrain storage case for one system**	CO4203-2Y	1

Sturdy aluminium case with moulded foam block to accommodate a complete UniTrain system (without equipment)

- Capable of accommodating 1 Interface, 2 Experimenters, 1 power supply as well as cables and smaller accessories
- Lockable padlock; stable padlock hinge
- Colours: aluminium, black, chrome
- Dimensions: 610 x 480 x 100 mm
- Weight: 4,6 kg