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Automotive Electric and Electronic Trainer



Automotive Electric and Electronic Trainer

A modern vehicle is characterised by its high degree of electrification. This means that most open and closed-loop control processes are carried out using electro-mechanical systems. These systems, as well as all those designed to enhance driver comfort and drivability, require a stable and fail-safe power supply to ensure the finest quality of driving, leading to utmost comfort for drivers.

Lucas-Nülle training systems for automotive technology offer trainees the outstanding opportunity to learn about the various aspects of how on-board vehicle networks are supplied with electrical power at an authentic practical level. They also get a vivid and detailed look at how the lighting systems work and how they can subsequently be enhanced.

Electric Generator Trainer



Electric Generator Trainer

An alternator is driven by a vehicle's internal combustion engine and converts mechanical energy into electrical energy. In order to charge a battery from the voltage generated by this means, it is nonetheless necessary to provide some voltage regulation. The following training systems demonstrate how this regulation is achieved by various regulating systems.

UniTrain



UniTrain

Please choose your product:

Three-phase Alternator/Generator



Three-phase Alternator/Generator

Virtually all modern motor vehicles are equipped with a threephase generator to produce the required electrical energy. With the UniTrain-I course the trainees gain insight into the generator's basic functions and learn how to control it. They also plan and carry out diagnostics, maintenance and repair work on the power supply and the starting systems.

List of articles:

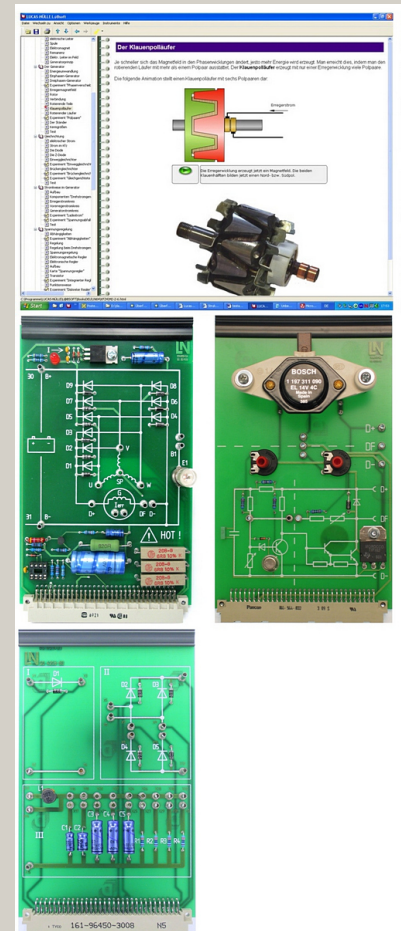
| Pos. | Product name | Bestell-Nr. | Anz. |
|------|--|-------------|------|
| 1 | Course - Automotive 4: Alternator/3-phase generator | SO4204-7D | 1 |

Includes:

- 1 Experiment card with three-phase generator/alternator, bridge rectifier and battery replacement circuit featuring charge monitoring light
- 1 Experiment card with integrated (original automobile component) and discretely assembled voltage regulators
- 1 Experiment card with half-wave and bridge rectifiers and load circuit
- CD-ROM with Labsoft browser and course software

Course contents:

- Introduction to the basic terminology of magnetism/electromagnetism
- Explaining the Lorentz force phenomenon
- Introduction to the design and function of single-phase and three-phase generators
- Experimental determination of phase-shift with a three-phase generator
- Determining the number of pole pairs of a three-phase generator by measurement
- Introduction to the functioning of diodes
- Identifying difference between Zener and normal diodes
- Introduction to the functioning of transistors
- Explain the design and function of half-wave and bridge rectifiers
- Investigation of half-wave and bridge rectifiers by measurement
- Introduction to circuits in automobiles
- Experimental determination of the functioning of a charge control light



- Experimental determination of the conditions for charging a battery
- Introduction to the principle of voltage regulation in vehicles
- Introduction to the design and function of electromagnetic and electronic voltage regulators
- Investigation of how alternator voltage depends on engine speed and load by measurement
- Measurement of threshold voltage and switching tolerance for a voltage regulator
- Fault simulation (8 simulated faults activated by relay)
- Course duration 7.5 h approx. (fault finding 1.5 h approx.)

Additionally required:

The UniTrain-I system is a computer-based training and experimentation system for vocational and further training and education in the areas of basic and advanced electrical engineering and electronics. Its multimedia courses combine cognitive and hands-on (haptic) training units into a comprehensive unified concept, specifically enabling students to acquire skills in the handling of equipment. Starting with basic courses and advancing to cover a huge variety of electrical engineering and electronics topics, a wide range of multimedia courses is available for study in school or in professional and advanced training courses. The UniTrain-I system is completely self-contained and can be used anywhere at any time. The multimedia learning environment the system provides high degrees of motivation, and maximum learning effectiveness in laboratories, at work or at home. It thus becomes a guarantor for effective and efficient study. Access to the multimedia courses and control of virtual instruments and experiment hardware is provided by LabSoft, the system's open experiment platform. The courses teach the theoretical building blocks and provide experiments to be carried out using the course-specific experiment hardware. The intelligent measurement interface supplies the analog and digital measuring and control I/O and represents, in combination with the system's virtual instruments, a high quality item of laboratory equipment. In addition, students' progress can be monitored and electronically documented on the basis of fault finding experiments with faults simulated by the hardware as well as tests of knowledge. The electrical and electronic circuits needed for the experiments are connected to the system with the aid of an Experimenter module.

| 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
- 3 variable analog outputs +/- 20V, 1 A, DC-150 Hz (requires CO4203-2B)
- 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, 100 mV to 50 V, true RMS, AV
- 1 x Power meter, 9 ranges, 100 mV to 50 V
- 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 VI Spectrum Analyzer: 9 voltage ranges 100 mV to 50 V, input frequency range 3 Hz to 1 MHz, time domain display
- 1 x VI Bode-Plotter: 9 voltage ranges 100 mV to 50 V, frequency range 1 Hz - 5MHz, time domain display and locus diagram
- 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)
- CD-ROM drive for installing software
- USB port for connection to Interface

3 UniTrain Experimenter

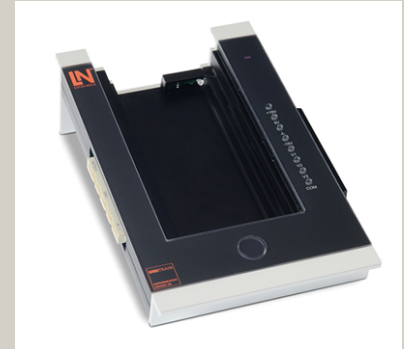
CO4203-2B

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UniTrain Experimenter for coupling to the UniTrain Interface or to other Experimenter modules.

Equipment:

- Connects to the UniTrain Interface and additional Experimenters via UniTrain bus
- UniTrain bus connection for experiment cards
- High-quality designer casing with aluminium feet and surface-hardened Plexiglas front window
- Suitable for accommodating training panel frames for DIN A4 training panels
- Fixed and variable voltages available via 8 2-mm sockets
- Designed for connection of 2-mm safety measuring leads
- Accommodates UniTrain experiment cards
- Eject mechanism for UniTrain experiment cards with return spring
- Accommodates a breadboard for experimenting with discrete components and integrated circuits
- Accommodates a multimeter using IrDa interface
- Dimensions: 29.6 x 19 x 8.6 cm
- Weight: 1.0 kg



4 UniTrain measurement accessories, shunts and connection cables

CO4203-2J

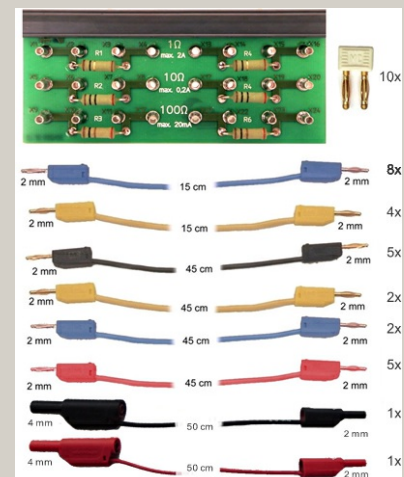
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Shunt resistors on a PCB, for current measurement using the analog inputs of the UniTrain system.

- 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 (28 pcs) for UniTrain consisting of:

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



Additionally recommended

| Pos. | Product name | Bestell-Nr. | Anz. |
|------|---|-------------|------|
| 5 | 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

