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Automotive | Hybrid & EV

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.

Training Panel Systems



Training Panel Systems

Please choose your product:

Three-phase Generator with Multifunction Controller Trainer



Three-phase Generator with Multifunction Controller Trainer

Item list ASA6

This training system is used to examine how energy is generated in modern motor vehicles. Today's compact generators make use of a monolithic controller. This kind of multifunction controller (MFC) has now largely replaced hybrid controllers. A progressive sequence of experiments gradually introduces students to the subject of power generation in automobiles.

Basic equipment set, consisting of:

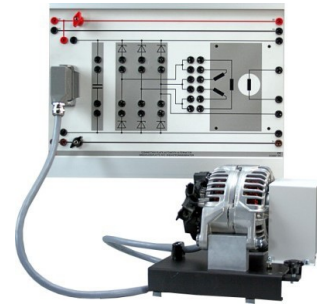
Basic equipment set, consisting of:

Pos.	Product name	Bestell-Nr.	Anz.
1	Alternator	CO3221-1A	1

It is possible to simulate practical faults on all the components of the generator in order to investigate their effects on the output voltage from the generator itself.

- Educationally oriented design
- How 3-phase alternating current is produced in vehicles KFZ
- Rectification of AC
- Field windings in delta circuits

- A conventional 12V car battery is needed to complete the experiments.
- Voltage with no load: 14V
- Current: 60A
- Lead for connection to alternator, 1.5 m long
- Dimensions: 297 x 342 x 145mm
- Weight: 6.8kg



2 Multi-function controller with protective diodes

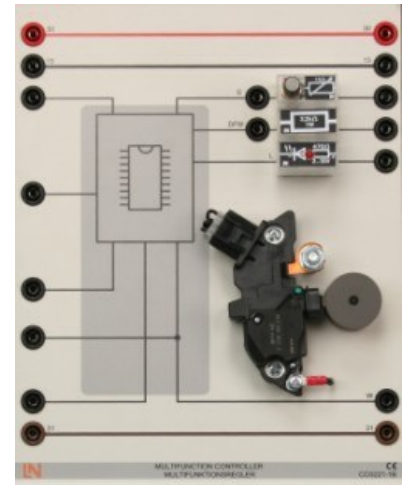
CO3221-1B

1

This training system is used to study the generation of electricity in modern motor vehicles. Modern compact generators use a monolithic controller, a so-called multi-function controller, which has nowadays largely replaced hybrid controllers. Experiments, each building on the knowledge gained previously, guide trainees towards an understanding of the generation and use of electrical energy in vehicles.

The multi-functional controller provides a variety of capabilities. Like the power zener diodes, it is mounted on a separate board for better educational effect.

The following regulator functions should be set up for study and conveyed during the experiment:



Battery sensing

Voltage regulation direct via terminal "S" and the positive of the battery itself.

Controlled pre-excitation

Pre-exciter current controlled by the regulator by means of pulse width modulation.

“Alternator rotating” detection

Exceeding a certain voltage level for a given phase should indicate that the alternator is rotating.

Emergency regulation

If the battery sensing connection is broken, the controller should switch to emergency regulation via the alternator's B+ terminal.

Load-response functions

Two load-response functions are to be studied:

Control of load switching for electrical loads during starting and while driving.

Fault display function

This controls the lamp display depending on the alternator's operating status.

Alternator monitor light

This indicates alternator power and improves charging response.

3 Drive unit for alternator with rev counter and engine management CO3221-1E

1

The drive unit is designed in the form a model typically used in industry and mounted on a base frame to damp down oscillations. It consists of a digital controller and a powerful drive motor. The control unit combines the latest technology with ease of use.



The controller has the following features:

- Regulation of idling speed on starting
- Continuous speed regulation
- Controllable via separate ignition lock
- Digital display of revs
- Drive motor connected directly to controller via compact plugs
- Thermal monitoring of motor
- Dimensions: 297 x 460 x 420mm (HxWxD)
- Weight: 18kg

A three-phase connection is not required since the drive motor is powered from the 230V mains.

The motor has the following features:

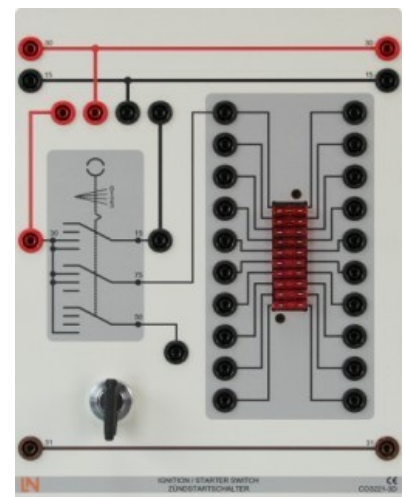
- Runs after starting like a vehicle engine with a specific idling speed
- Power: 1.5kW/230V
- Motor with temperature monitoring
- Nominal voltage 12A
- Speed range 400 – 4500rpm
- Dimensions: 360 x 300 x 200mm (HxWxD)
- Weight: 21kg

4 Ignition Key with fuse

CO3221-3D

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Safety starter motor ignition switch with three switching levels and three positions to supply current to terminals 75, 15 and 50. 10 fuse plugs are included which can accommodate plug-in vehicle circuit breakers. The circuit breaker connectors can be tapped via 4-mm safety sockets and can clearly and easily be connected via space-saving jumpers to supply current to terminals 15 or 30. Power supply is laid out for improved educational effect at the top and bottom of the board and colour-coded in accordance with DIN72551.



- I/O: 4mm safety sockets
- Dimensions: 297 x 228 x 90mm
- Weight: 1kg

Media:

Pos.	Product name	Bestell-Nr.	Anz.
5	Interactive Lab Assistant: Generator with multi-function Controller	SO2803-1E	1

This multimedia course imparts to you all the theoretical knowledge you need and also provides practical experiments so that you can master the necessary diagnostic skills, all in a modern and attractive design. Countless animations show trainees how hybrid regulators work, while the practical experiments solidify that knowledge. The course offers trainees a perfect guide to leads them through the entire topic. Numerous tests of knowledge mean that the trainees can obtain continuous feedback on their progress, meaning that any areas of concern can be quickly identified and remedied.



- Fundamentals of power generation
- Alternator voltage regulation
- Functionality of a rectifier
- Alternator fault diagnostics
- Multi-function controller
 - Battery sensing
 - Controlled pre-excitation
 - Monitoring of alternator activity
 - Emergency control
 - Fault indication
 - DF (digital field) monitor
 - Load response

System requirements:

- Personal computer with Windows Vista, Windows 7, Windows 8, Windows 8.1
- CD-ROM drive for installing software
- USB port for connection to Interface

Measuring instruments:

Pos.	Product name	Bestell-Nr.	Anz.
6	Adapter BNC/4mm safety sockets, insulated	LM9019	3
	Adapter plug for connecting BNC connector to 4-mm safety sockets		
	<ul style="list-style-type: none">• BNC plug, 2 insulated 4-mm safety sockets• Contact rings and sockets for internal pin of BNC connector are made of gilded brass• CAT II/1000 V		



7	Test lamp	LM8205	1
	Vehicle voltage tester. Due to its small current consumption of 1.5 mA, the CAR-CHECK tester is particularly well suited to finding faults with electronic components. Conventional test lamps often cause damage to these. Polarity indication via two LEDs.		
	<ul style="list-style-type: none">• Nominal voltage range: 3...48 V• Length of lead: 150 cm• Weight: 0.2 kg		



8 Multi13S digital multimeter

LM2330

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Universal precision lab multimeter and temperature meter with IR interface for high-quality, universal measurement and testing in educational settings, power plants, process control installations etc.

- 3¾-digit multimeter; resolution: $\pm 3,100$ digits
- Measurement classification CATII-1000 V
- Can be connected to UniTrain system via IR interface
- Voltage and current measuring ranges: 30 mV-1000 V DC, 3 V-1000 V AC; 3 mA-16 A DC; 30 mA-10 A AC
- Resistance ranges: 30 ohm-30 Mohm
- Special functions: °C for temperature measurements using PT100/1000 thermocouple (optional accessory)
- Continuity and diode testing
- Automatic range selection and battery shut-off, min./max. and data hold function
- Safety fuse for current measurement range up to 300 mA
- Protection against high currents in the mA range for nominal voltage of 1000 V
- Display with bar chart and backlighting
- Includes protective sleeve, measuring leads, 1 x spare fuse, 9V battery, calibration certificate



9 Modular Measurement Interface

CO3221-6C

1

The CarTrain Interface takes the form of a DIN A4 experiment card with rounded corners, colour-coded in compliance with DIN72551 for educational assistance.



Safety measurement sockets are also coded on the basis of DIN72551.

The design resembles circuit diagrams depicted in a detached or exploded view with power supply wiring running between panels.

- Interface for multimedia experiment literature – measurements need to be copied into the experiment instruction pages using drag and drop.
- Two voltage values and one current can all be measured simultaneously
- 3-channel oscilloscope function can be used at the same time as the multimeter display
- Measurement range: $V < 250 V = / \sim$, $I < 15 A = / \sim$ direct measurement within the circuit
- USB interface
- External power supply to ensure measurements can be made even when short circuits are present
- Current measuring range protected by automatic circuit breaker
- Dimensions: 228 x 296 x 125 mm (WxHxD)
- Weight: 2 kg



Additionally recommended

Pos.	Product name	Bestell-Nr.	Anz.
10	<p>Main headlight unit with side light, headlight range control & indicator (right)</p> <p>Complete headlight unit with headlight range control</p> <ul style="list-style-type: none"> • Operating voltage: 12 V • Operational units: Actuator motor for range control Indicator light PY 21W Dipped headlight H7 55W Main beam H7 55W Parking light T 4W • Inputs/outputs: 4mm safety sockets • Dimensions: 297 x 228 x 160 mm 	CO3216-2N	1
			
11	<p>Dual-channel PWM generator</p> <p><u>Includes:</u></p> <p>1 Training panel (dual-channel PWM generator, switchable between PWM or direct feed to output)</p> <p><u>Training contents:</u></p> <p>Dual-channel PWM generator for use in circuits typical in motor vehicles.</p> <p>Functions of modern on-board networks</p> <p>Compliance with German traffic regulations (StVZO)</p> <p>Control parameters</p> <p>Reading and interpreting circuit diagrams</p> <p>Assembly of both simple and more complex circuitry</p> <p>Fuse protection for circuits</p> <p>Making measurements and finding faults</p> <p>Circuit variants for daylight running lights</p> <p>Circuit variants for tail/brake lights</p>	CO3221-1F	1
			

12 **Digital dual trace storage oscilloscope w. colour display, incl. probes 30MHz**

LM6210

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Digital storage oscilloscope with colour LCD display, high resolution, backlighting and USB port for transmission of large quantities of data at high data rates.

Technical data:

- Bandwidth 30MHz/125MS/s
- Maximum input voltage 400V
- 8" TFT colour display
- USB port, USB flash disk, LAN, VGA
- Cursor function
- Five automatic measurement functions, storage and retrieval of traces
- Edge and video trigger function
- Safety specifications: EN 61010-1
- Supplied with accessories: 2 probes, mains lead, USB cable, software CD
- Dimensions: 350x157x120mm (WxHxD)
- Weight: 1.0kg



13 **Set of circuit breakers for vehicles (10A/15A)**

SO3216-8R

5

- Single-pole thermal circuit breaker for vehicles, slim format with coloured manual trip switch
- Reliable tripping response thanks to snap-action trip switch
- Tamper-proof rip interlock to prevent reactivation of the circuit till the fault is rectified
- Plugs into low-profile vehicle fuse box
- Nominal voltage 12V

The set comprises the following components:

- 1x 10A vehicle circuit breaker
- 1x 15A vehicle circuit breaker



Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
14	Protection cover for three-level experiment trolleys	ST8010-9Y	1
	<p>Dust cover for three-level experiment trolleys</p> <ul style="list-style-type: none"> • For protecting equipment from dust and damp • For keeping equipment out of sight (the cover must not be transparent, so is therefore opaque) • Colour: matt dark grey with printed LN logo in orange • Material: nylon fabric with polyurethane coating • High resistant to tearing, impregnated to be washable and waterproof 		
15	Set of 4mm safety connection components for modulare training system "Alternator"	SO3216-8W	1
	<p>Set of connectors including:</p> <ul style="list-style-type: none"> • 1 x Positive terminal • 1 x Negative terminal • 1 x Battery lead, red • 1 x Battery lead, brown • 2 x Safety connector plugs 19/4mm, red • 18 x Safety connector plugs 19/4mm, black • 10 x Safety connector plugs 19/4mm, white with tap connection • 6 x 4mm safety measuring leads, 100 cm, black • 4 x 4mm safety measuring leads, 50cm, black • 2 x 4mm safety measuring leads, 100cm, red • 2 x 4mm safety measuring leads, 100cm, brown 		

16 **AGM 50Ah/12V battery with wooden case and circuit breaker**

CO3221-1M

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- Absorbent glass mat (AGM) battery, 55 Ah/12 V
- Acid-resistant housing
- Automatic circuit breaker for protection against short circuits
- 4mm safety connectors
- Terminals for battery cables

Dimensions: 325 x 330 x 275 mm

Weight: 23.5 kg



17 **Deposit certificate for starter batteries**

BD3216-1A

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Pfandgutschein

Deposit voucher



18 **Mobile aluminum experiment stand, 3 levels, power strip with 6 sockets, 49"x28"x79" WxDxH (1250x700x1995mm)**

ST7200-4C

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High-quality mobile experiment and demonstration trolley from the SybaPro range featuring aluminium table legs and low-level shelf. This trolley is suitable for mounting under-table cabinets and is compatible with all add-ons and extensions in the SybaPro range.

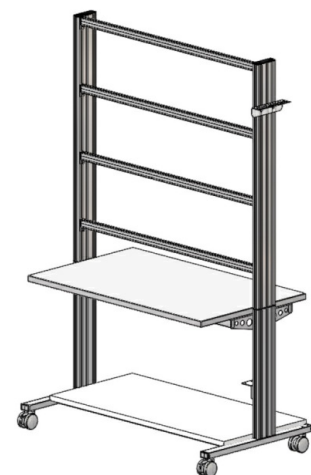
It is supplied with one shelf, an angle bracket for attaching a PC and a cable holder.

Table top + Shelf:

- 30-mm table top made of highly compressed, multi-layer fine chipboard conforming to DIN EN 438-1
- Colour grey, RAL 7035, with 0.8-mm slightly textured laminate coating (Resopal) on both sides, conforming to DIN 16926
- Resistant to many chemicals and reagents including dilute acids and alkalis
- Resistant to heat, e.g. molten solder or heating at specific points such as by soldering tips or cigarette ends
- Frame with solid impact-resistant protective edging made of 3mm thick RAL 7047 coloured plastic
- Coating and adhesive are PVC free
- Power strip with 6 outlet sockets mounted underneath the table top, lead and earthed plug

Frame:

- 2 extruded aluminium profiles with multiple grooves 1800 x 120 x 40 mm (WxHxD)
- 8 equally sized grooves in extruded aluminium profiles (3 on



- each side and 1 each on the front and back)
- Grooves accommodate standard industrial mountings
 - 4 H-shaped aluminium profiles, 1150 mm, for 3-layer organisation of DIN A4 panels
 - Space for extension of power supply duct
 - Base made of rectangular tubing with 4 swiveling double casters, 2 of which have brakes
 - Table frame made of tough combination of rectangular tubing around the full perimeter
 - Acid-resistant epoxy-resin coating, 80 µm thick (approx.), colour RAL 7047

Cable holder:

- Width 200 mm with 12 cable slots to accommodate 48 x 4-mm safety measurement leads

PC attachment bracket:

- With 3 screw-on rubber stoppers, dimensions 65x65x114 mm approx. (top fixing for PC)

> The height of the cable holder and PC attachment bracket can be adjusted along the aluminium profiles

> For attachment to left or right, fastening materials included

> Acid-resistant epoxy-resin powder coating of thickness 80 µm approx., colour RAL 7047

Dimensions:

- Height of table top 760 mm
- 1250 x 1970 x 700 mm (WxHxD)

The mobile experiment stand is supplied in kit form and needs to be assembled by customers themselves.