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Automotive | Hybrid & EV

Fundamentals of Automotive Technology Trainer

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Teaching fundamentals is always the vital cornerstone for solid and efficient education. Several training courses have been specifically developed for this topic area to teach trainees step by step the basic knowledge to be covered in detail at a later date. The courses are particularly suited for school education and require little or no previous knowledge.

Each multimedia course starts by imparting the theoretical foundations before solidifying that knowledge by means of practical measurements. The particular focus is on handling measuring instruments and the way that simple electric circuits operate.

EloTrain - Electronic and Electric Trainer

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Please choose your product:

Fundamentals of electronics/electrical engineering in motor vehicles (4-mm plug-in system)

Fundamentals of electronics/electrical engineering in motor vehicles (4-mm plug-in system)
Equipment set ATF4

This equipment set provides the perfect introduction to automotive technology since it forms the cornerstone for essential understanding of electrical engineering and electronics as used in motor vehicles. Due to the immense degree of networking and the high density of control units which can be found in any modern vehicle, an extreme level of “electronification” has now been reached in consequence. Never before has it been such a vital part of mechanics’ training to thoroughly grasp these basics.

The EloTrain training system approaches this very aspect and offers trainees to build on and deepen not only their theoretical knowledge but also their practical skills in this area. An interactive course, which can alternatively be supplied in the form of a handbook, guides trainees through the theory and practical experiments. Starting with fundamental topics, such as Ohm’s law, measurement of electrical variables and basic types of circuit, the course also details all the most important electrical components (capacitors, transistors, coils, etc.). The course is rounded off with more advanced experiments involving a CAN bus.

Time-efficient use of the set is assured by the compact design, where everything is kept in a handy case. It contains all the necessary components and therefore makes it possible to set up the training system in a matter of minutes.

Basic equipment set, consisting of:

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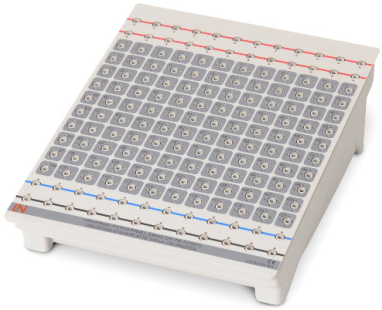
Pos.	Product name	Bestell-Nr.	Anz.
1		PS4200-2C	1

Pos.	Product name	Bestell-Nr.	Anz.
2	**EloTrain plug-in board 2/4mm, 120 nodes**	CO3535-5H	2



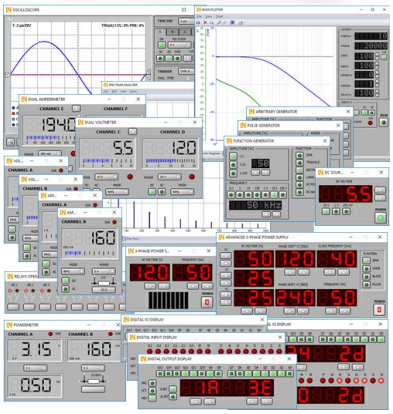
Plug-in panel for components with 4mm or 2mm plugs, for the assembly of highly compact electrical, electronic or digital circuits using plug-in components. A grid of 120 nodes allows for clear assembly of circuits even when components are packed densely together. Circuits are assembled by plugging in components between nodes. Connections can be made between nodes using 2mm/7.5mm jumpers.

- Suitable for 4mm plug-in components und 2mm plug-in components
- Suitable for DigiTrain system components
- 100 nodes featuring 4 x 2mm sockets and 1 x 4mm socket
- 20 nodes featuring 3 x 2mm sockets and 1 x 4mm socket
- 19mm grid for 4mm sockets, 7.5mm grid for 2mm sockets
- Four power supply or bus rails each with 12 x 2 mm sockets and 12 x 4 mm sockets
- Ergonomically optimised thanks to console housing
- For mounting in panel mounting frames or experiment case
- Max. permissible contact current 10A
- WxHxD 228 x 297 x 100mm

Additionally required:

Pos.	Product name	Bestell-Nr.	Anz.
3	**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:

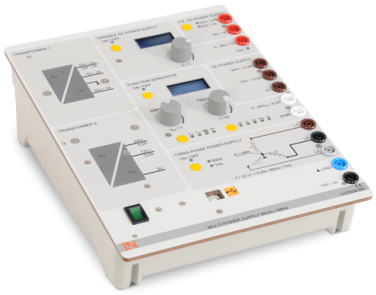
- Personal computer with Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10 (32 or 64 bit)
- CD-ROM drive for installing software
- USB port for connection to Interface

Media:

Pos.	Product name	Bestell-Nr.	Anz.
4	**Interactive Lab Assistant: "Fundamentals of electronics/electrical engineering in motor vehicles" including printed version** This interactive course includes all topics needed for a simple introduction to electrical engineering/electronics in motor vehicles. Starting with fundamental topics, such as Ohm's law, measurement of electrical variables and basic types of circuit, the course also details all the most important electrical components (capacitors, transistors, coils, etc.). The course is rounded off with more advanced experiments involving a CAN bus. In addition to theory, which is explained with the help of numerous pictures and animations, the course also focuses heavily on practice. Trainees carry out up to 29 different practical experiments and therefore learn about all the relevant components (resistors, capacitors, field effect transistors) in detail. As an alternative, the course can also be printed in the form of a handbook using the practical print version.	SO2803-2C	1

Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
5	**Multi Power Supply 4x DC, 2x AC, 3-phase, function generator**	CO3538-8M	1



Multifunctional, compact power supply including function generator and three-phase source, suitable for any basic or advanced experiments in the fields of electrical engineering, electronics and digital electronics. It can be operated as desktop device or mounted in an experiment frame. The power supply has protective isolation and provides safety extra-low voltage in compliance with EN 61010. A standard 230-V plug is enough to connect it up. All outputs have self-resetting circuit breakers to cut off the power safely in the event of a current overload. The equipment is maintenance-free and especially suited for use by beginners. Modern power supply technology allows for low power consumption and reduced power loss.

- Stabilised fixed voltages, +15 V, -15 V, both 1 A
- Stabilised fixed voltage, +5 V, 1 A
- Stabilised fixed voltage for vehicles, 12 V, 1 A
- Stabilised adjustable voltage, 0 ... 30 V, 1 A with adjustable current limitation
- AC voltages, 12V, 24V, both 200 mA, 50 Hz
- Three-phase generator with 3 phases and N
    - Amplitude 3 x 7/12 V
    - Output current max. 3 x 200 mA,
    - Frequency 1 Hz or 50 Hz
- Function generator
    - 0.1 Hz ... 1 MHz in 5 ranges
    - Output signals: sine-wave, triangle, square-wave, digital
    - Output voltage: -10 V ... 0 ... 10 V
    - Output with attenuator: 10:1
    - Output current max.: 200 mA
- Short-circuit-proof or with self-resetting circuit breakers on all outputs
- 6 Buttons for various functions
- 17 LEDs for use as status signal lights
- 2 LCD displays with blue illumination
    - Display of DC voltage, current and current limitation
    - Display of AC voltage and frequency
- USB port so that voltage sources can be controlled by computer
- Illuminated mains switch
- Experiment board with console housing
- Dimensions: 297 mm x 228 mm x 100 mm
- Weight: 3.5 kg

Measuring instruments:

Pos.	Product name	Bestell-Nr.	Anz.
6	**Adapter BNC/4mm safety sockets, insulated** Adapter plug for connecting BNC connector to 4-mm safety sockets • 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	LM9019	3
7	**Test lamp** 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. • Nominal voltage range: 3...48 V • Length of lead: 150 cm • Weight: 0.2 kg	LM8205	1

8 **Multi13S digital multimeter** LM2330 3

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: ±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 **Digital dual trace storage oscilloscope w. colour display, incl. probes 30MHz** LM6210 1

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

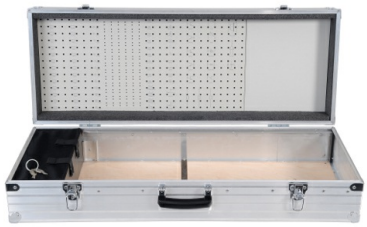
Technical data:

- 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

Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
10	**EloTrain case to hold 2 DIN A4 boards, power supply and for storing plug-in components**	SO5127-3B	1

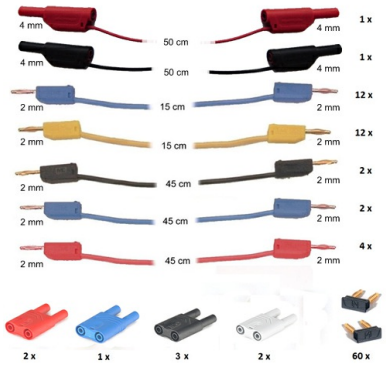
Handy aluminium profile case with handle and removable lid for storing a complete experiment system with 4mm and/or 2mm plug-in components, incl. a printed storage panel for the accommodation of the EloTrain basic equipment set, the automotive equipment set or additional component sets to be integrated into the removable lid.



- Capable of accommodating a power supply and universal plug-in board both measuring 456mm in width
- Capable of accommodating more than 100 plug-in components in the lid
- Locking compartment for small parts and experiment leads
- Closable locks with strong hinges
- Colours: plain aluminium, black, chrome
- Dimensions: 820 x 320 x 200mm
- Weight: 3kg

11 **EloTrain set of connection cables and plugs for 4mm system** SO5146-1M 1

EloTrain measuring lead and plug set 4 mm-system:



- 12 measuring leads, 2mm, 15cm, blue
- 12 measuring leads, 2mm, 15cm, yellow
- 2 measuring leads, 2mm, 45cm, black
- 4 measuring leads, 2mm, 45cm, red
- 2 measuring leads, 2mm, 45cm, blue
- 1 safety measurement lead 4mm, 50 cm, black
- 1 safety measurement lead 4mm, 50 cm, red
- 60 jumpers 2mm / 7.5mm, black
- 3 safety-jumpers 4mm / 19mm, black
- 2 safety-jumpers 4mm / 19mm, red
- 1 safety-jumper 4mm / 19mm, blue
- 2 safety-jumpers 4mm / 19mm, white