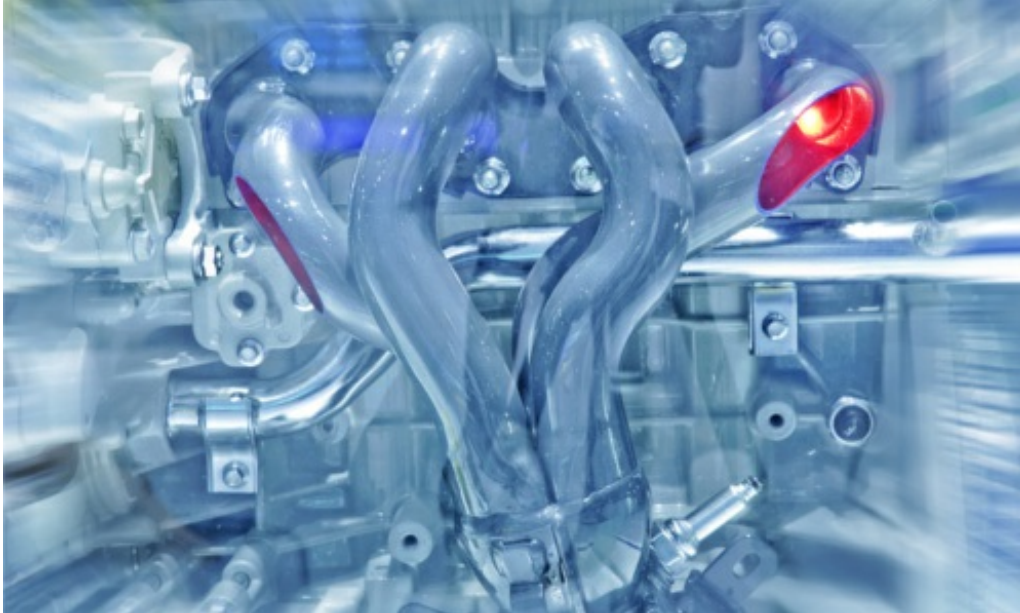




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### Diesel Engine Trainers



#### **Diesel Engine Trainers**

Other than Otto's four-stroke engine, the diesel engine, developed by Rudolf Diesel in 1892, is the most important type of engine used to power all kinds of vehicles nowadays. Thanks to their superior efficiency, high torque and low revs, diesel engines have long become established for all types of vehicles. Ongoing development has also made them both quiet and clean. Diesel engines are characterised by their direct injection and unaided ignition. The power of such engines is not regulated by the volume of air but by the injected fuel. This is sometimes called quality management. A diesel motor usually operates with a lean fuel mixture. Developments over recent years have meant that normally aspirated diesel engines are largely obsolete. Modern engines are usually supercharged by means of an exhaust gas turbocharger in order to achieve optimum fuel supply.

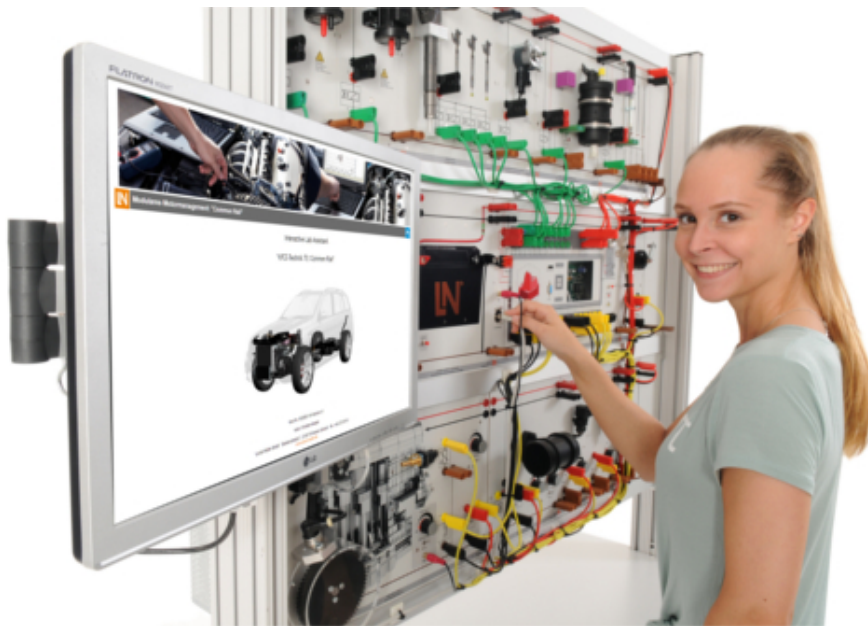
# Engine Management Trainer



## Engine Management Trainer

The engine control unit is the central control element for an engine. In modern vehicles, all the engine functionality is stacked together in this one controller; it implements the entire engine management functionality. The controller obtains all the necessary information by means of its own sensors. It utilises the IPO model (input-process-output) to assess incoming data and then send out signals to operate the necessary actuators. It is necessary for trainees to understand not only the individual components but also the complex control loops involved. Understanding an engine management system is a basis for more advanced investigation of a given engine as a whole.

# Training Panel Systems



## Training Panel Systems

Please choose your product:

# High-Speed Glow System



## High-Speed Glow System (Equipment set: ATS1)

This training environment comprising a high-speed glow system is ideal for practical and in-depth education on modern glow systems in passenger cars and commercial vehicles. A use of the latest educational concepts and

numerous interactive animations for graphic representation of complex arrangements in automotive technology guarantees trainees a special learning experience.

In addition, didactically designed experiment hardware allows a mediation of diagnostic skills which trainees can directly apply in daily workshop activities.

The experiment hardware consists of real automotive components. Each component is treated realistically as an individual entity, and as part of an entire assortment comprising the high-speed glow system. This makes it possible to practically demonstrate the relationships arising from the principle of input, processing and output.

The associated software incorporates the full course and provides multimedia representations of the provided hardware components. Students are thereby encouraged to operate interactively on a regular basis. Also described are numerous procedures for experiments and measurements involving the components.

Simple wiring ensures fast and immediate start-up of the training system.

### **Training content**

- Fundamentals of auxiliary start equipment
  - Special aspects of a diesel engine
  - Purposes of auxiliary start equipment
  - Glow system's components
- Learning about a glow system's components
  - Voltage supply and cabling
  - Control lamps
  - Glow plugs
  - Glow plug controller
- Understanding the function of various glow phases
  - Pre-glow
  - Standby glow
  - Start glow
  - Afterglow
  - Intermediate glow
- Studying a glow system's diagnostic functions
  - Understanding examples
  - Testing a glow system

### **Skills**

This course is meant to impart the following skills and competencies to students:

- Analyzing customers' complaints
- Developing test routines
- Diagnosing malfunctions in start systems with the aid of manufacturers' documentation and diagnostic equipment
- Reading and evaluating approval certificates
- Using circuit diagrams
- Ascertaining system-specific relationships from circuit diagrams and function plans
- Recognizing the impact of a failure on the general system and determining diagnostic strategy
- Evaluating readings

The training system comprises:

- Hardware components from a variety of automotive manufacturers
- Hardware and software for theoretical and practical instruction
- Software for independent studies

Electrical connections are established via 4mm safety jacks. Employed here are coloured 4mm safety measurement jacks which facilitate learning. The sensor signals, actuator controls and power supply sockets are

colour-coded.

Dimensions and weight:

- Approximately 297 x 570 x 100 mm (HxWxD)
- Approximately 3.8 kg

Scope of delivery:

- Training system with 230V/50 Hz mains connection
- USB cable
- CD with basic software
- Operating instructions

System requirements:

- Personal computer with Windows 7 (32 or 64 bit version) or Windows 8
- CD-ROM drive for software installation
- USB interface for connecting measurement hardware

Basic equipment set, consisting of:

**Basic equipment set, consisting of:**

Pos.	Product name	Bestell-Nr.	Anz.
1	<b>High speed glow plug controller</b>	CO3221-4N	1

Includes:

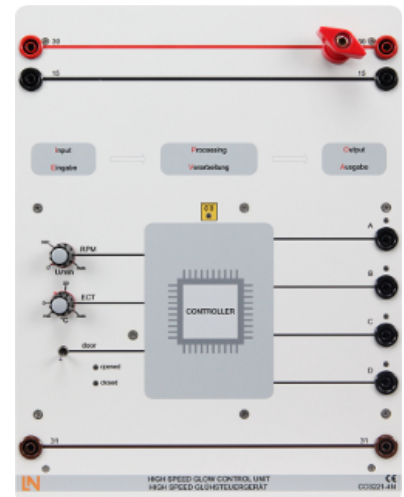
High-speed glow plug control unit for constructing a high-speed glow system with phase-shift control of glow plugs.

Experiment hardware includes:

- Educational depiction of how the controller works using the IPO (input-process-output) model.
- Control of the glow indicator light to indicate glow status and faults.
- Engine speed pre-set for controller.
- Coolant temperature pre-set for controller.
- Door contact switch indicating door position as open or closed.
- Controller for controlling four separate high-speed glow plugs.
- Phase-shift control of high-speed glow plugs.
- Four indicators to display control status and outputs to the high-speed glow plugs.
- Monitored controller outputs with fault display via the glow-plug indicator lights.
- Separate control of each individual high-speed glow plug via 4-mm safety sockets.
- Pulse-width modulated control of glow plugs at 12 V rms for 2 seconds and 5 V rms afterwards.
- Start of glowing process initiated by closing driver's door or switching on ignition.
- Colour printing of front panel.
- Terminals 30, 15 and 31 are laid out from left to right to make the circuit structure easier to learn and understand.
- 12 V power supply via screw terminals.

Dimensions: 297 x 228 x 100 mm

Weight: 1.2 kg approx.



## 2 High-speed glow plugs

CO3221-4M

1

### Includes:

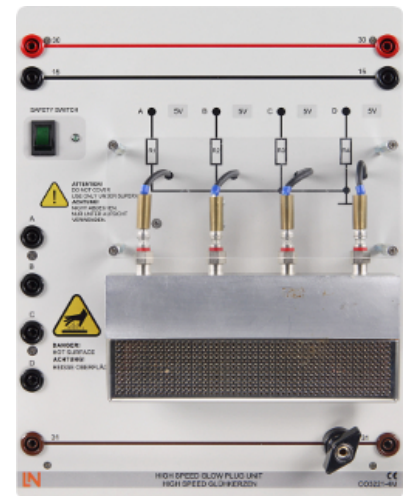
Four high-speed glow plugs for constructing a high-speed glow system.

### Experiment hardware includes:

- Built-in protective circuitry for components in order to protect against short-lived faulty wiring.
- Power supply for protective circuitry 110 V – 240 V AC.
- Separate control of each individual high-speed glow plug via 4-mm safety sockets.
- Pulse-width modulated control of glow plugs at 12 V rms for 2 seconds and 5 V rms afterwards.
- Negative terminal for overall power supply connected via screw terminal.
- Colour printing of front panel.
- Terminals 30, 15 and 31 are laid out from left to right to make the circuit structure easier to learn and understand.
- 12 V power supply via screw terminals.

Dimensions: 297 x 228 x 100 mm

Weight: 1.2 kg approx.



## 3 Ignition / starter switch

CO3221-1G

1

Safety ignition/starter switch with three switching levels and settings for energizing terminals 75, 15 and 50. Connections for the fuses are established via 4mm safety jacks, which can be bridged in an organized manner by means of compact jumpers for feeding from terminal 15 or 30. To facilitate an overview for students, the power supply installation is highlighted by means of a colour scheme according to DIN72551 at the board's upper and lower edges.

- Inputs and outputs: 4mm safety jacks
- Dimensions: 297 x 228 x 90 mm
- Weight: 0.8 kg





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4 **Set of connection components for glowing (17 pieces)**

CO3221-1N

1

Set of glow connectors (17 parts)

- 1 connection cable for starter battery, positive pole, 100 cm, red
- 1 connection cable for starter battery, negative pole, 100 cm, black
- 2 safety bridging plugs, 4 mm, red
- 5 safety bridging plugs, 4 mm, black
- 4 bridging plugs with tap, 4 mm, red
- 2 measuring leads, 4/2 mm, 100 cm, red

**Power supply:**

Pos.	Product name	Bestell-Nr.	Anz.
5	<b>AGM 50Ah/12V battery with wooden case and circuit breaker</b>	CO3221-1M	1

- 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



Media:



Pos.	Product name	Bestell-Nr.	Anz.
6	<b>Interactive Lab Assistant: High-speed glow plug systems</b>	SO2803-1W	1

This ILA course on high-speed glow plug systems includes all the theoretical background essential for understanding the overall system. All the content is imparted by means of simple text and impressive animations. In addition, the course guides trainees through the individual practical experiments and thus ensures that it is easy to carry out the experiments and obtain the requisite results, since all students can work on their own at their own speed. All experiment results including results from various knowledge tests are saved to the course specifically for each student so that they can be assessed at any time.



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.
7	<b>UniTrain Interface with virtual instruments (basic VI)</b>	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

**8 UniTrain measurement accessories, shunts and connection cables**

CO4203-2J

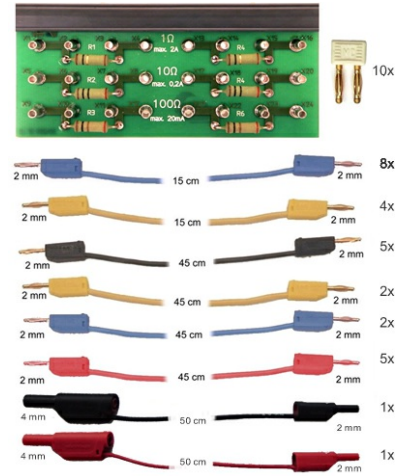
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Shunt resistors on a PCB, for current measurement using the analog inputs of the UniTrain system.

- 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.
9	<b>Protection cover for three-level experiment trolleys</b>	ST8010-9Y	1

Dust cover for three-level experiment trolleys

- 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



**Accessories:**

Pos.	Product name	Bestell-Nr.	Anz.
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10 **Mobile aluminum experiment stand, 3 levels, power strip with 6 sockets, 49"x28"x79" WxDxH (1250x700x1995mm)**

ST7200-4C

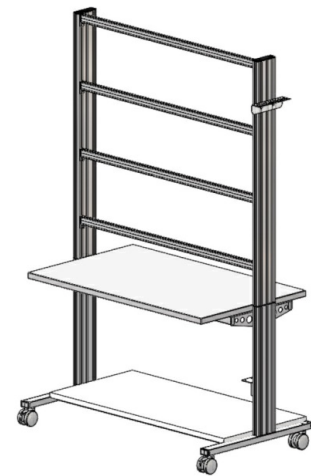
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High-quality mobile experiment and demonstration trolley from the SybaPro range featuring aluminium table legs and low-level shelf. This trolley is suitable for mounting under-table cabinets and is compatible with all add-ons and extensions in the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