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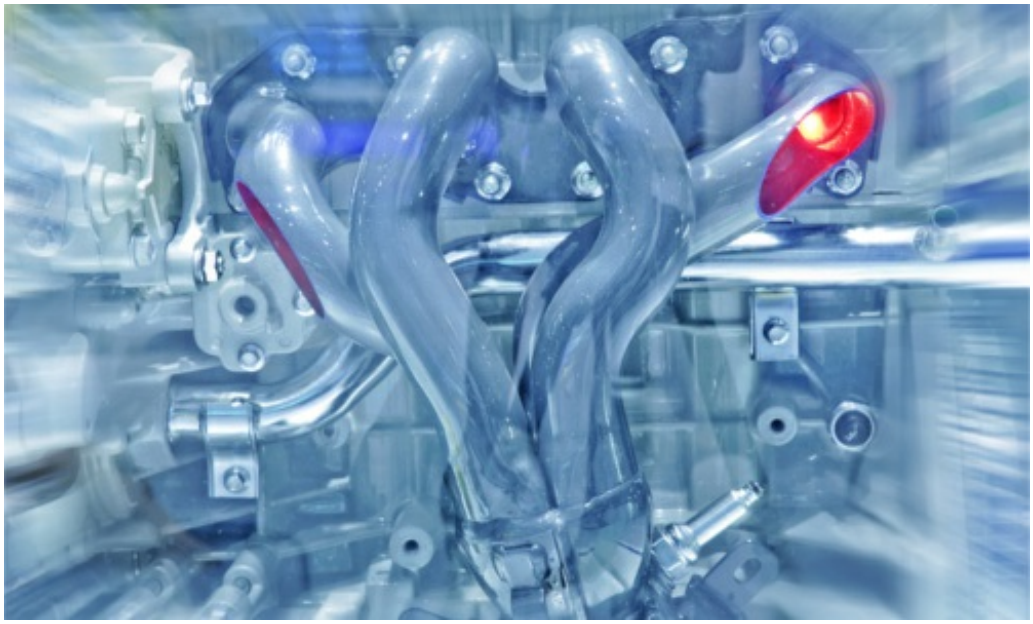


Diesel Engine Trainers

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.

Injection Trainer

Injection Trainer

What factors lie behind the “running” of a diesel engine? How can toxic constituents of the exhaust be reduced? These matters are all a question of the injection system and that is why this topic is so interesting. Our training systems make it all easy to understand. They allow students to control their own learning progress to become familiar with injection systems, sequences and quantities. In order to cover the functionality of systems already available on the market, students can switch between different types of injector so that they can personally work through the whole scope of the topic.

UniTrain

UniTrain

Please choose your product:

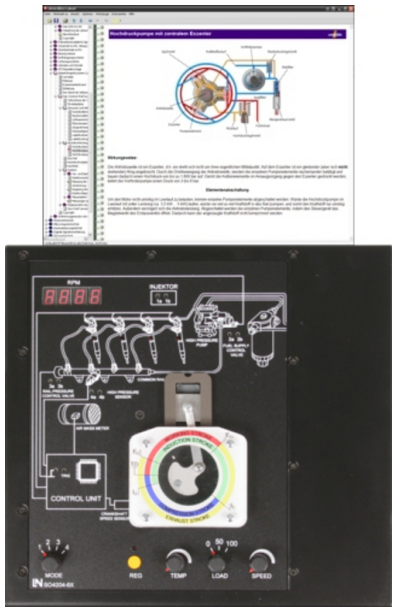
Common Rail Diesel Injection System

Common Rail Diesel Injection System

What goes into making a diesel engine run “smoothly“? How can engines be designed to lower exhaust gas emissions? The fact that everything is just a question of the injection system makes this field all the more exciting. This topic is made easier to comprehend using our training system which empowers the trainee to learn about injection pressures, processes and air-fuel quantities in a self-controlled learning process. Covering the entire spectrum of systems available on the market the trainees are able to switch between the various injector types and thus gain an overview of the entire topic.

List of articles:

Pos.	Product name	Bestell-Nr.	Anz.
1	**Common rail diesel injection system** Includes: Training panel with: • Mechanical model of crankshaft and cylinder • Variable rpm • Variable load • Variable temperature • Minimum of four variable injector modes • Regeneration mode • RPM counter • Measurement options on injector • Measurement options at fuel quantity control valve • Measurement options at rail pressure sensor • Measurement options at rail pressure control valve • CD-ROM with LabSoft browser and course software Course contents: • Requirements of diesel injection systems • Design and operation of the common-rail system • Fault localisation in a common-rail system • Injection response of common-rail units • Design and control of solenoid valve injector • Design and control of piezo-injectors • Design and operation of sensors and actuators • Design and operation of high-pressure generating systems • How high-pressure regulation works • Pilot injection • Main injection • Post injection • Regeneration of soot particle filter • Zero fuel correction • Course duration: 20 h approx.	CO4204-6X	1

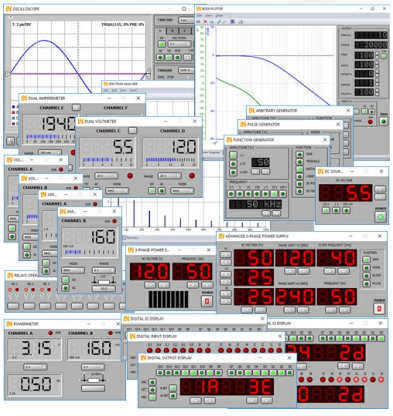


Additionally required:

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

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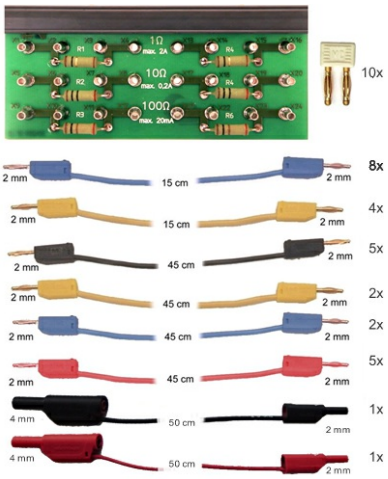
3 **UniTrain measurement accessories, shunts and connection cables** CO4203-2J 1



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 (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.
4	**UniTrain storage case for experiment board**	SO4203-2V	1

Sturdy aluminium case with moulded foam block to accommodate an experiment board

- Capable of accommodating 1 experiment board and smaller accessories
- Lockable padlock; stable padlock hinge
- Colours: aluminium, black, chrome
- Dimensions: 600 x 450 x 175 mm
- Weight: 2.5 kg