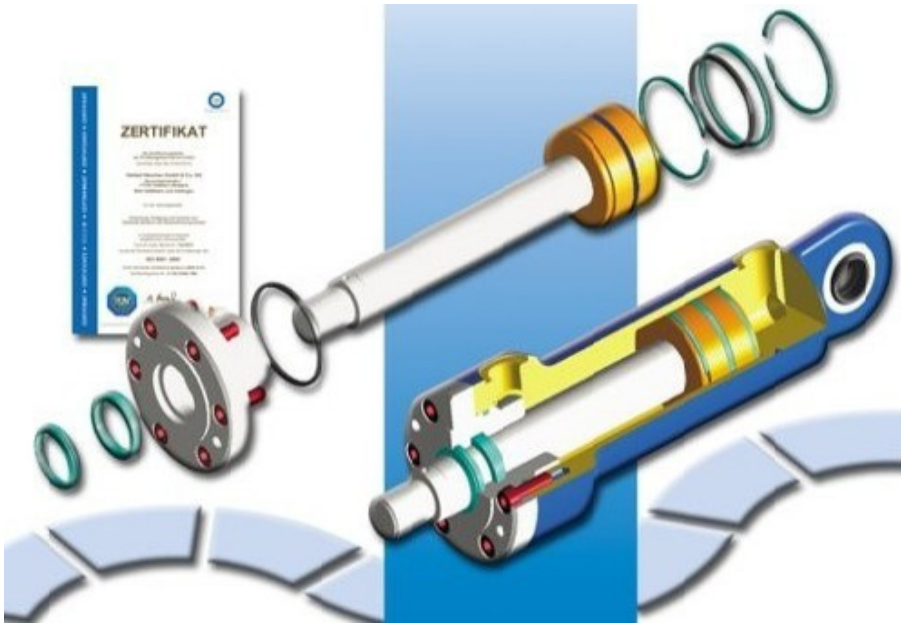


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# Machinery and Systems Engineering

## Fluid Power



### **Pneumatics / Hydraulics**

As a competent partner for education and training, we offer tailor-made solutions for pneumatics and hydraulics for virtually every educational need.

The training systems are modular workstations based on stable workstations.

They offer the opportunity to create practical training setups for different technologies with components from the industrial sector and to carry out coordinated project tasks.

The interactive e-learning courses tailored to the training systems support knowledge transfer.

# Pneumatics with UniTrain



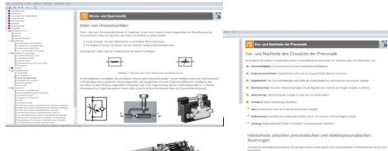

## Pneumatics with UniTrain

UniTrain multimedia courses on fluid power provide knowledge and skills necessary for understanding, controlling, operating and maintaining fluid power systems. With the aid of animations and numerous practical experiments using realistic systems, the various courses work through the basics, principles and properties of components in fluid power systems.

### Supplementary virtual instruments in LabSoft for the courses "Pneumatics / Electropneumatics" and "Hydraulics / Electrohydraulics"

- Function block editor
- Pressure gauge
- Path-Time diagram

### List of articles:

Pos.	Product name	Bestell-Nr.	Anz.
1	<b>UniTrain Course - Pneumatics</b>	CO4205-5E	1
	<p>The course imparts the basic knowledge of pneumatics. In all practice-related project tasks, core and specialist qualifications are imparted in an integrated manner, including independent planning, execution and control.</p> <p>Basic training in a wide range of vocational fields is intended to impart skills and qualifications in a practice-oriented manner. In order to carry out a qualified professional activity, the pupils should in particular learn how to plan, carry out and control independently as well as how to act in the overall context of the company.</p>	 	

## Learning content

Occupation-specific specialist qualifications, e.g. the manufacture, assembly and disassembly of assemblies and systems, should be taught integrated with core qualifications, e.g. the planning and organisation of work and the evaluation of work results. Business processes and quality assurance systems in the area of application are, among other things, learning contents of the occupation-specific technical qualification.

In detail:

- Understanding physical laws of pneumatics such as pressure difference and compressibility.
- get to know and take into account the legal requirements and safety regulations
- learn and use the most important symbols of pneumatics
- understand the function of basic pneumatic circuits
- recognize the typical behavior of pneumatic components in different operating situations
- Determine characteristic values
- Creating circuit diagrams with the circuit diagram software
- open virtual instruments from the course software

pneumatic components

ExperimentalBoard

with:

- 1 x pressure gauge 0 to 10 bar
- 1 x 3/2 shut-off valve, mechanically operated
- 1 x pressure control valve
- 1 x pressure sensor
- 1 x pneumatic distributor, 6-fold
- 1 x 3/2-way valve, push-button, not actuated open (NO)
- 3 x 3/2-way valve, push-button, not actuated closed (NC)
- 1 x shuttle valve, OR
- 1 x double pressure valve, AND
- 2 x Double-acting cylinder,  $d = 10 \text{ mm}$ ,  $h = 80 \text{ mm}$  with travel stop
- 1 x single-acting cylinder,  $d = 10 \text{ mm}$ ,  $h = 25 \text{ mm}$
- 2 x 3/2-way valve, sensing roller
- 1 x 5/2-way valve, with spring return, pneumatically operated
- 2 x 5/2-way valve, impulse, pneumatically actuated
- 2 x Proximity switch, pneumatic, with holder
- 2 x throttle check valve
- 2 x potentiometer
- 1 x quick exhaust valve
- 2 x non-return valve, pilot operated
- 1 x Quick coupling
- 10 x sealing plugs
- 5 x T-distributor
- 1m hose 6mm
- 5m hose 4mm

learning contents

- path-step diagram
- path-time diagram
- Direct control of single-acting cylinders, extending
- Direct control of single-acting cylinders, retracting

- Direct control of double-acting cylinders
- Indirect control of double-acting cylinders
- Speed regulation of double-acting cylinders
- Speed regulation of double-acting cylinders with quick exhaust valve
- Control of double-acting cylinders with impulse valve
- Travel-dependent control of double-acting cylinders
- Logic control with two pressure valves 1
- Logic control with two pressure valves 2
- Logic control with alternating and dual pressure valves 1
- Logic control with alternating and dual pressure valves 2
- Sequence control of two double-acting cylinders
- Stop control through pilot-operated check valves
- Manual operation of cylinders with speed regulation
- Control of double-acting cylinders with proximity switches
- Endless switching with stop switch

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## 2 UniTrain Course - Electropneumatics

CO4205-5F

1

The course imparts the basic knowledge of electropneumatics. In all practice-related project tasks, core and specialist qualifications are imparted in an integrated manner, including independent planning, implementation and monitoring.

Basic vocational training in a wide range of occupational fields is intended to impart practical skills and qualifications. In order to carry out a qualified professional activity, the pupils should in particular learn how to plan, carry out and control independently as well as how to act in the overall context of the company.



### Learning content

Occupation-specific specialist qualifications, e.g. the manufacture, assembly and disassembly of assemblies and systems, should be taught integrated with core qualifications, e.g. the planning and organisation of work and the evaluation of work results. Business processes and quality assurance systems in the area of application are, among other things, learning contents of the occupation-specific technical qualification.

### In detail:

- Basics of Pneumatics/Electropneumatics
- Reading of pneumatic and electrical circuit diagrams
- Function of single- and double-acting cylinders
- Holding member controls
- Functionality of the various directional control valves
- Basic circuits with AND/OR connections
- Basic circuits with self-retaining
- Travel-dependent controls
- Recording of distance/time diagrams
- Time-dependent controls, pick-up and drop-out delays
- Sequence controls and clock chains
- Connection-programmed controls
- Programmed logic controllers
- Creating pneumatic circuit diagrams with the software

- Create electrical circuit diagrams with the editor and control hardware directly
- open virtual instruments from the course software

pneumatic components

ExperimentalBoard with:

Technical data:

- 24V/2A DC power supply
- 1 x Snap-action switch normally open/ normally closed
- 3 x push-button make/break contact
- 3 x relay 24V DC with 3 change-over contacts
- 1 x time relay on-delayed, adjustable from 0.1 - 15s
- 1 x time relay, off-delayed, adjustable from 0.1 - 15s
- Pressure sensor 1V/bar, 0-10V
- Pressure switch, adjustable switching threshold from 0.5 to 8 bar
- 6 x end position initiators 24V DC, reed contacts
- 3 x double acting cylinders, 80mm stroke with throttle valves and end position initiators 24V DC (reed contacts)
- 1 x single-acting cylinder, 50mm stroke with throttle valve
- 1 x vacuum gripper
- Compact valve island with 3 x 5/2-way valve monostable 24V DC with return spring and 3 x 5/2-way valve bistable 24V DC with electrically operated impulse valves on both sides
- Pressure regulator 0 - 10 bar

### 3 Pneumatic accessories

SE2905-1K

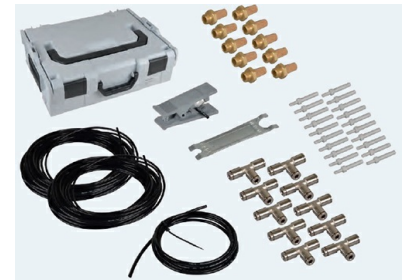
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Set of accessories to match the "Basic level pneumatics" and "Basic level supplement" equipment sets.

All components are supplied in a stackable plastic box (L-Boxx).

Consisting of:

- Plastic hose 4 x 0.75, PU, black, supplied in 10 m lengths
- Plastic hose 6.0 x 1.05, PU, supplied in 2 m lengths
- Tube cutter
- Unfastening tool
- Noise attenuators, G1/8, supplied in packs of 10
- T-connectors, 4 mm, supplied in packs of 10
- Connecting plugs, 4 mm, supplied in packs of 20



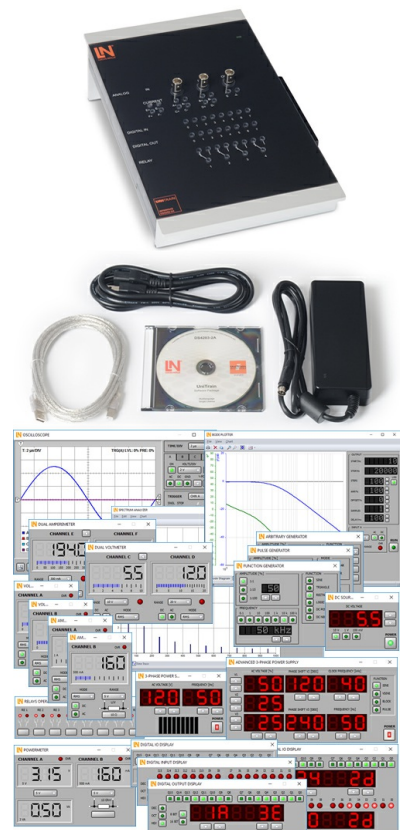
Additionally required:

Pos.	Product name	Bestell-Nr.	Anz.
4	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



## 5 UniTrain measurement accessories, shunts and connection cables

CO4203-2J

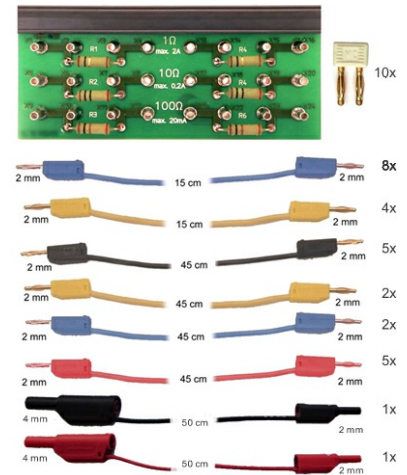
1

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



## 6 Mini compressor, low-noise

SE2902-9K


1

Low-noise, miniature piston compressor with double-cylinder engine

- Intake capacity: 35 ltr./min
- Fully automatic switch-on/switch-off
- Pressure gauge
- Output pressure regulator and display
- Tank pressure release valve
- Maximum pressure: 6bar
- Tank volume: 3.5 ltr.
- Noise level: 40 dB (A)
- Operating voltage: 230 V AC
- Current consumption: 1.4 A
- including connection hose
- Dimensions: 370x135x315 mm (HxWxD)
- Weight: 6 kg



## Additionally recommended

Pos.	Product name	Bestell-Nr.	Anz.
7	<b>UniTrain storage case for one system</b>	CO4203-2Y	1
	<p>Sturdy aluminium case with moulded foam block to accommodate a complete UniTrain system (without equipment)</p> <ul style="list-style-type: none"><li>• Capable of accommodating 1 Interface, 2 Experimenters, 1 power supply as well as cables and smaller accessories</li><li>• Lockable padlock; stable padlock hinge</li><li>• Colours: aluminium, black, chrome</li><li>• Dimensions: 610 x 480 x 100 mm</li><li>• Weight: 4,6 kg</li></ul>		

8	<b>UniTrain Storage Case for Experimentboard Pneumatics/Electropneumatics</b>	CO4203-2L	1
	<p>Aluminium profile case with handle and foam block to hold an experimental board</p> <ul style="list-style-type: none"><li>• 1 experimental board and small material can be mounted</li><li>• Lockable padlock; stable padlock hinge</li><li>• Colour: aluminium, black, chrome</li><li>• Dimensions: 770 x 400 x 176 mm</li><li>• weight: 6,8 kg</li></ul>	